



2011 Minerals Yearbook

FRENCH GUIANA, GUYANA, AND SURINAME
[ADVANCE RELEASE]

THE MINERAL INDUSTRIES OF FRENCH GUIANA, GUYANA, AND SURINAME

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FRENCH GUIANA

French Guiana has been an overseas department of France since 1946, and it is subject to French and European Union (EU) law. French Guiana's economy is dependent on that of France and the EU through trade and subsidies. In 2011, besides gold mining, other important industries in French Guiana were aerospace (mainly at the French space center in Kourou), fishing, and forestry. The mineral sector was administered by France. The country's leading mineral commodity export continued to be gold; the country imported chemicals, food, fuels, machinery, and transport equipment from France (U.S. Central Intelligence Agency, 2012; U.S. Department of State, 2012).

According to the French Ministry of Ecology, Energy, and Development, the policy objectives of France are also generally valid for its overseas territories; these include the goal of energy autonomy by 2030 and adoption of energy efficiency regulations conforming to local conditions. In the area of environmental policy, the local governments in French Guiana were working with the mining operations to prepare a Departmental mining plan that would guarantee the development of sustainable mining while taking into account French Guiana's economy and its environmental issues. The plan was expected to be completed and adopted in the foreseeable future (Ministry of Ecology, Energy, and Development, 2009).

Minerals in the National Economy

French Guiana's natural resources include (in order of value), gold, petroleum, kaolin, niobium, tantalum, and clay. In February 2009, the French Government declared a moratorium on all mining and exploration activities in French Guiana until a new "mining framework" was completed and assessed. This announcement also suspended the granting of mining licenses pending the outcome of environmental reviews of exploration on all French Guiana concessions. A draft mining framework was published by the French authorities in June 2009. By November 4, 2009, the French authorities had published a working document as a first step. As of the end of 2011, however, a new mining framework had not yet been approved (Ministry of Ecology, Energy, and Development, 2009; IAMGOLD Corp., 2012a; U.S. Central Intelligence Agency, 2012).

The moratorium on the issuance of mining licenses continued to affect the proposed development of IAMGOLD Corp. of Canada's Camp Caiman project, which is located 45 kilometers (km) southwest of Cayenne, the capital of French Guiana. Following the results of the January 10, 2010, referendum in which French Guiana rejected greater autonomy from France; IAMGOLD made the decision to record noncash impairment for the net carrying value of the project. On August 26, 2010,

the French Government, through the Prefect of French Guiana, released a decision which again denied a mining permit for the Camp Caiman project. IAMGOLD filed an appeal of this new decision on October 26, 2010, with the assistance of environmental experts. The company indicated that it would continue to work with Government officials and key stakeholders to develop a plan that would allow development of the Camp Caiman deposit, subject to appropriate restrictions and regulations (IAMGOLD Corp., 2012a–c).

Production

In 2011, the leading mineral commodities produced in French Guiana were cement, clays, crushed stone, gold, niobium (columbium) and tantalum, and sand. Data on mineral production are in table 1.

Structure of the Mineral Industry

In recent years, the mineral industry of French Guiana had been focused on gold and petroleum exploration. Golden Star Resources Ltd. of Canada sold the Paul Isnard exploration project and additional projects to Auplata S.A. of France on December 2, 2010. Auplata entered into a joint-venture agreement with Columbus Gold Corp. of Canada to complete the exploration and to develop the Paul Isnard gold prospect. Columbus had the right to earn an initial 51% interest in the Paul Isnard project by incurring \$7 million in exploration expenses, and it commenced drilling in August 2011. The remaining interest, equal to 49%, was held by Auplata (34%) and Pelican Venture SAS (15%). On June 30, 2011, Columbus announced that it had closed its previously announced transaction with Auplata and had secured the exclusive right to acquire up to a 100% interest in the Paul Isnard project. Upon Columbus earning 51% interest in the project, it would have an option to increase its interest to 100% by completing a bankable feasibility study during a 4-year period and by incurring an additional \$7 million in expenditures on the project. As of January 13, 2011, the Paul Isnard project contained an inferred resource of 1.9 million troy ounces [59.1 metric tons (t)] of gold in the Montagne D'Or gold deposit within 36.7 million metric tons (Mt) of ore grading 1.6 grams per metric ton (g/t) gold (Columbus Gold Corp., 2012a; 2012b, p. 70; Reuters.com, 2012).

The Paul Isnard project is located within the northernmost of two east-west trending Proterozoic greenstone belts that make up the French Guiana sector of the Guiana Shield. This greenstone terrain hosts significant gold deposits in French Guiana and neighboring countries, including those in the Rosebel Formation in Suriname, and is generally considered to represent an extension of the productive and much more extensively explored and developed Birimian System greenstone belts of West Africa. The property is located in the western part of French Guiana, 200 km

west of Cayenne, and it is accessible from St-Laurent-du-Maroni by air and road. The Paul Isnard prospect covers rocks of the lower Proterozoic Paramaka Formation, which contains gold mineralization in the form of pyritic disseminated zones and sulfide-rich shear zones (Columbus Gold Corp., 2012a; Reuters.com, 2012).

IAMGOLD held a 100% interest in the Camp Caiman gold project. According to the feasibility study for the Camp Caiman project, the deposit's proven and probable minable reserves as of January 2009 were estimated to contain 34.2 t (1.1 million troy ounces) of gold within 12.3 Mt of ore averaging 2.8 g/t gold; measured and indicated reserves were estimated to contain 49.8 t (1.6 million troy ounces) of gold within 20.4 Mt of ore averaging 2.5 g/t gold; and inferred reserves were estimated to contain 7.7 t (249,000 troy ounces) of gold within 3.8 Mt of ore averaging 2.1 g/t gold (IAMGOLD Corp., 2012a).

Commodity Review

Metals

Gold.—Gold exploration and investment activities in French Guiana were ongoing at projects with significant gold anomalies, such as the Wayamaga contact between the Armina and the Orapu Formations and the Paul Isnard gold prospect. Extensive exploration had been conducted at Paul Isnard, including airborne topographic surveys, airborne geophysical surveys, metallurgical studies, and a soil geochemical survey. The resource confirmation and potential expansion within the Montagne d'Or gold deposit took place in the second half of 2011 (Columbus Gold Corp., 2012b, p. 79).

IAMGOLD was planning to develop the Camp Caiman gold deposit using an open pit mining method. The mill would process 5,500 metric tons per day (t/d), or more than 2 million metric tons per year (Mt/yr), of ore, subject to the mining and milling capacities for the diverse categories of gold in the estimated reserves and resources. IAMGOLD was awaiting passage by the Government of the new mining framework before proceeding (IAMGOLD Corp., 2012b).

Mineral Fuels

Petroleum.—In South America, Tullow Oil plc of the United Kingdom had interests in the prospective Guyana basin, which includes French Guiana, Guyana, and Suriname. According to Tullow, the Guyana Basin offers significant frontier exploration opportunities, including geologic structures that are similar to those of the Jubilee field of Ghana across the Atlantic Ocean. The first test was the Zaedyus-1 well in French Guiana, where oil was discovered in September 2011. In 2012, followup drilling in French Guiana and Guyana would be aimed at further establishing this area as a prospective petroleum province. Thus far, Tullow had collected more than 9,000 km of two-dimensional (2-D) seismic data and 380 km of three-dimensional (3-D) seismic data in the basin's Guyane Maritime block to advance a number of known leads to drillable prospect stage. Tullow's drilling program in an area of 2,500 square kilometers (km²) was based on the 3-D seismic data completed in March 2010. Tullow was also drilling a

strategic deepwater basin-testing well on the Zaedyus prospect. Tullow's joint-venture partners—Royal Dutch Shell plc of the Netherlands and Total S.A. of France—were discussing a comprehensive followup exploration and appraisal program, which would include 3-D seismic acquisition and a drilling program and was scheduled to commence in mid-2012. The drilling program was expected to start with an appraisal well on the Zaedyus prospect and be followed by an exploration well on one of the neighboring prospects. The companies received the Ministerial Order granting Total, Tullow, and Shell approval for both the transfer and renewal of the Guyane Maritime license on December 22, 2011. The partnership was planning that Shell would be the operator of the ship in the Zaedyus block in 2012 (Tullow Oil plc, 2012).

Outlook

The working document developed by the Government of France in June 2009 provides for a consultative process in which investors are to be active participants in the development of the new mining framework. Once the new mining framework is in place, however, gold exploration and investment activities in French Guiana will also likely continue at projects with significant gold anomalies, such as the Wayamaga contact between the Armina and the Orapu Formations where Columbus has outlined a potential for gold resources. Based on its expectations regarding the new mining framework, Columbus though the Government of France would not object to Columbus's planned acquisition of a 100% interest in the Paul Isnard gold project in French Guiana, pursuant to the terms of the agreement between Columbus and Auplata. Consequently, Columbus and IAMGOLD are likely to move forward with their Paul Isnard and Camp Caiman gold projects, respectively (Columbus Gold Corp., 2012a; IAMGOLD Corp., 2012d–e).

Tullow's petroleum exploration projects are expected to continue and Tullow expects to expand its drilling program beyond the appraisal of the Zaedyus discovery to the neighboring prospects. The evaluation of exploration data collected during 2009–10 will continue in 2011, and renewal of the Guyane Maritime license key exploration campaigns are planned for 2012 (Tullow Oil plc, 2012).

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GUYANA

Guyana's gross domestic product (GDP) based on purchasing power parity increased to \$5.7 billion in 2011 from a revised \$5.5 billion in 2010, or by more than 3.6%. This increase was in spite of the effects of the global financial crisis and was attributed to positive performances in the communication, construction, services, and transportation sectors. The agriculture and manufacturing sectors also recorded positive growth whereas the growth rate of the mining and quarrying sector remained at about the same level as that of 2010. Inflation was 3.3% in 2011 compared with 4.5% in 2010. The value of Guyana's exports was estimated to be about \$1.13 billion in 2011 compared with a revised \$885 million in 2010; leading mineral commodity exports were, in order of value, gold and bauxite. Guyana's export partners included Canada and the United States (which each received 24.6% of Guyana's exports), Ukraine (6%), the Netherlands (4.9%), Trinidad and Tobago (4.6%), Jamaica and Portugal (4.5% each), and the United Kingdom (4.1%). Imports were valued at about \$1.8 billion compared with \$1.4 billion in 2010 and included such products as, in order of value, petroleum and derivatives, machinery, manufactures, and food. Guyana's import partners included Trinidad and Tobago (24.2%), the United States (23.1%), China and Cuba (6.7% each), and the Republic of Korea (4.1%) (Bank of Guyana, 2012, p. 7, 9, 15–17; U.S. Central Intelligence Agency, 2012).

Minerals in the National Economy

The leading sectors of the Guyanese economy were, in order of value, services (64.7%), agriculture (21.8%), mining (10.5%), and manufacturing (3%). In 2011, Guyana's mining sector increased on account of positive growth in the output of bauxite, by almost 68%; gold, by 17.7%; and diamond, by more than 4.7% compared with the outputs in 2010 (table 1; Bank of Guyana, 2012, p. 10, 15).

Government Policies and Programs

In Guyana, all mineral rights are vested in the State. The Guyana Geology & Mines Commission (GGMC) is the Government agency that regulates all activities of the Mines Division and the Petroleum Division in accordance with the Mining Act of 1989. The GGMC examines Guyana's mining concessions, mining and prospecting permits and licenses, and quarry licenses; it also promotes mineral development and performs mineral exploration. The Mines Division of the GGMC provides services to the mining industry. Mining licenses, which are issued in the production phase, are granted for a period of 20 years and can be renewed indefinitely. Operating plans must be filed with the GGMC. Annual dues are progressive, beginning at \$0.50 per acre and increasing to a maximum of \$3.00 per acre during the 6 years allowed for the prospecting phase. Once production begins, the prospecting license must be converted to a mining license, and the annual dues increase to \$5.00 per acre. Gold production from all types of mineral concessions in Guyana is subject to a statutory 5% net smelter return royalty, which is payable to the Guyana Gold Board. From time to time, the Government of Guyana has reduced this royalty to a lesser figure—during periods of low gold prices and under individually negotiated tax concessions—to motivate development of major mineral projects (Guyana Geology & Mines Commission, 2012a, b).

The Petroleum Division regulates all activities in the crude oil industry; provides timely economic, environmental, and technical advice; and supports competitiveness and efficiency in the petroleum sector. The GGMC issues three types of licenses: the petroleum prospecting license, which is issued for a period of 4 years, with two optional renewals to extend the exploration period for 3 more years each; the petroleum production license, which runs for 20 years; and the production-sharing agreement, which offers such incentives as a 75% cost recovery, 50% profit share, and 10% reduced consumption tax on fuel for petroleum exploration operations, among other incentives (Guyana Geology & Mines Commission, 2012b).

Production

In 2011, Guyana continued to be a significant industrial minerals producer in the world. The output of the mining and quarrying sector increased significantly (by 19.2%) compared with that of 2010. The country produced more than 1.8 Mt of bauxite, 52,273 carats of diamond, and about 11,293 kilograms (kg) of gold; the output of construction materials, crushed stone, and sand remained at about the same levels as those of 2010 (table 1; Bank of Guyana, 2012, p. 10).

Structure of the Mineral Industry

Table 2 is a list of the major mineral industry facilities in Guyana. The table provides the location and production capacities of these facilities. Bosai Minerals (Guyana) Inc. (a subsidiary of Bosai Minerals Group Co., Ltd.) operated a bauxite mine and processing operation at Linden, Guyana. This operation produced the well-known RASC refractory bauxite, as well as chemical and cement grades. The operation's annual production amounted to more than 1.6 Mt in 2011 compared

with almost 1.1 Mt in 2010. These grades of bauxite are exported worldwide by Bosai Minerals. BHP Billiton Ltd. of Australia and Goldstone Resources Inc. of the United Kingdom were interested in exploring laterites for a source of bauxite. Guyana Goldfields Inc. (a Canadian-based junior mineral exploration company primarily focused on the exploration and development of gold deposits in the Guiana Shield in South America) was undertaking technical studies to advance and develop the Aurora gold project in Guyana. Sacre-Coeur Minerals Ltd. of Canada was engaged in the acquisition, exploration, and development of properties for the potential mining of diamond and gold in the Guiana Shield. It had narrowed its exploration focus to two major properties known as the Lower Puruni Block, which includes the Million Mountain properties, and the Northwest District Block; both contain hard-rock gold resources and alluvial material. Both areas have long histories of gold production back to the 1800s (Bank of Guyana, 2012, p. 10; Guyana Goldfields Inc., 2012; Nanchuan Minerals Group, 2012; Sacre-Coeur Minerals Ltd., 2012).

Commodity Review

Metals

Bauxite and Alumina.—In 2011, the production of bauxite increased to more than 1.8 Mt compared with almost 1.1 Mt in 2010; the metallurgical-grade bauxite would be used for the production of alumina (table 1; Bank of Guyana, 2012, p. 15–16).

According to the GGMC, the Government and United Company RUSAL of Russia entered into a letter of intent to conduct feasibility studies, which could start by the end of 2011, for an alumina plant with a capacity of at least 250,000 metric tons per year (t/yr), a hydroelectric plant, and a smelter (Guyana Geology & Mines Commission, 2012b).

The Omai bauxite mine contains estimated reserves of 200 Mt. Bosai Minerals, which owns the mine, planned to produce 400,000 t/yr of calcinated alumina. Also, BHP Billiton and Goldstone Resources were planning to evaluate the Pakaraima laterites as a source of bauxite feed for an alumina plant in the Pakaraima region (Guyana Geology & Mines Commission, 2012b).

Gold.—In 2011, the production of gold increased to 363,083 troy ounces (11,293 kg) from 308,438 troy ounces (9,594 kg) in 2010. Gold production in Guyana was accomplished by small and medium-scale miners that benefited from the higher gold prices in the international market. Several major gold ventures were commissioned by foreign investors in the past 10 years, including the world class Omai gold mine, which was a joint venture of two North American mining companies, IAMGOLD and Golden Star Resources Ltd. (Bank of Guyana, 2012, p. 10–11, 15–16).

Guyana Goldfields Inc. (GGI), a junior mineral company based in Canada, was focused on the exploration and development of gold deposits in the Guiana Shield in South America. GGI's land position amounted to more than 500,000 acres. The company was undertaking technical studies to advance and develop its 100% interest in the Aranka and the Aurora gold projects in Guyana. Both properties consisted

of a number of gold deposits, which are located on the eastern side of the Aurora zoned intrusion in the Cuyuni greenstone belt of the Guiana Shield. GGI's current (2011) gold resources amounted to about 208,400 kg (6.7 million troy ounces). GGI planned to begin production at the Aurora gold project by 2013 and to produce an average of 7,776 kilograms per year (250,000 troy ounces per year) during a 17-year mine life with cash operating cost of \$364 per troy ounce. Guyana Goldfields expected that the Aurora gold project would be a large, highly profitable world-class gold mine that would be developed and come online in the next 2 years. The Aranka gold project was in the prospecting and exploration stage. Current activities included field mapping, geochemical sampling, and testing of potential zones by trenching and exploratory drilling (Guyana Goldfields Inc., 2012).

Sacre-Coeur had been exploring for gold in Guyana and held six gold permits—the Kartuni regional block, the Kurupung regional block, the Lower Puruni regional block, the Million Mountain property, the Northwest regional block, and the Potaro-Kuribrong regional block. It narrowed its exploration focus to two major holdings, which together comprised 859 km² of the most highly prospective permits. The two large blocks of properties—the Lower Puruni Block, which includes the Million Mountain properties, and the Northwest District Block—were both targets for hard-rock gold resources, and they also contain large volumes of alluvial material. Each of these new zones was characterized by a silica-rich intrusive body intruded into brittle greenstones (Sacre-Coeur Minerals, Ltd., 2012).

Infinito Gold Ltd. of Canada held 100% interest in the Marudi Mountain gold project, which is divided into the following four zones: the Marudi Ridge, the Mazoa, the Paint Mountain Ridge, and the Peace Creek-Toucan Hill. Infinito Gold and Guyana Frontier Mining Corp. of Canada completed a definitive purchase and sale agreement on December 22, 2010. Under the terms of the agreement, Infinito transferred to Guyana Frontier a 100% right, title and interest in and to the holding companies, free and clear of all encumbrances and the interests of others. Infinito retained no interest in or liability, including reclamation liability, associated with the holding companies (Guyana Frontier Mining Corp., 2012a, b; Infinito Gold Ltd., 2012).

On December 23, 2010, Guyana Frontier and Infinito announced the completion and execution of the Infinito Agreement, whereby Guyana Frontier acquired 100% of the outstanding shares of the Infinito's subsidiaries. Guyana Frontier's Marudi Mountain gold project covers an area of 54.67 km² (13,502 acres), which is located in the Marudi Mining District of southwestern Guyana. According to Guyana Frontier, the Marudi property warrants continued systematic exploration and development (Guyana Frontier Mining Corp., 2012a).

Industrial Minerals

Diamond.—In 2011, diamond production in Guyana increased to 52,273 carats from 49,920 carats in 2010. Diamond production in Guyana was by small-scale operations and artisanal miners (table 1). During 2010–11, two Canada-based companies were actively prospecting for diamond in Guyana—Infinito and Sacre-Coeur. Infinito held interest in the Potaro and

Maple Creek diamond projects. Infinito had an agreement for both diamond prospects on February 23, 2011, with Guyana Frontier in which Guyana Frontier acquired 100% interest in return for cash and a gross overriding royalty. Under the terms of the purchase and sale agreement with Infinito, Guyana Frontier granted Infinito the right to receive a 2% royalty for all future mineral production from the Potaro-Maple Creek diamond projects, to a maximum of \$2,000,000 in royalty payments. Sacre-Coeur held prospecting permits for the Kurupung River region, which is a historic diamond-producing area in Guyana; the Potaro-Kuribrong regional block, which is located in north-central Guyana; and a claim-permit and claim-license in the Mahdia-Issano regional block, which is located in northwestern Guyana (Guyana Frontier Mining Corp., 2012b; Infinito Gold Ltd., 2012; Sacre-Coeur Minerals, Ltd., 2012).

Mineral Fuels and Related Materials

Petroleum and Natural Gas.—The Canada-based oil and gas exploration company CGX Energy Inc. was focused on the exploration for oil in the Guyana-Suriname Basin. CGX held interest in 39,659 km² (9.5 million acres) offshore Guyana. The company had interest in the following four offshore properties: the Corentyne License, the Corentyne License Annex, and the Pomeroun License (100% ownership in each); and the Georgetown License (25% interest). Several significant targets had been identified in the Corentyne Petroleum Prospecting License (PPL), including the Eagle prospect, which covers 117.4 km² (29,000 acres) and has an estimated potential resource of 610 million barrels (Mbbbl) of oil. CGX announced the results of the drilling of the Eagle-1 exploratory well on the company's 100% owned and operated Corentyne PPL. The Eagle-1 well reached a total depth of 4,328 meters (m) in the upper Cretaceous Maastrichtian geologic zone and discovered oil and gas. CGX announced that drilling at the Jaguar-1 well, which is located on the company's 25%-owned Georgetown PPL, was expected to commence further tests in early 2012. The partners to the Georgetown PPL included Repsol Exploración S.A (Repsol) of Spain (15%), as operator, along with YPF Guyana Ltd. of the United States (30%), and Tullow Oil plc of the United Kingdom (30%). The Jaguar-1 well was expected to be drilled to a depth of 6,500 m to test the Turonian geologic zone. CGX contracted the *Atwood Beacon* jack-up drilling rig (operated by Atwood Oceanics Pacific Ltd.) to drill the Jaguar-1 well on the Georgetown Block offshore Guyana. Inclement weather conditions, however, meant that the well drilling could commence by early 2012, and operations to drill the well were expected to take 180 days to complete (CGX Energy Inc., 2012a, b; Tullow Oil plc, 2012).

Tullow had significant exploration acreage in French Guiana, Guyana, and Suriname, and the company was attempting to replicate in South America the success of the West African Jubilee play. The first test of this was the drilling of the *Zaedyus-1* well in French Guiana, which successfully discovered oil in September 2011. In 2012, followup drilling in French Guiana and Guyana aimed to further establish this area as a new petroleum province (Tullow Oil plc, 2012).

According to the GGMC, four additional companies were licensed to undertake exploratory work in Guyana: Century Guyana Ltd., CGX, Exxon Mobil Corp. of the United States, and Repsol. Other companies interested in the Guyana's petroleum sector included CGX's ON Energy and Groundstar Resources Ltd. of Canada, and Sadhna Petroleum Inc. of Trinidad and Tobago. ExxonMobil planned to commence seismic work to determine whether drilling should take place offshore. Sadhna was to drill several wells along the coastal areas of Berbice and Demerara in the Takutu basin in the Rupununi; the GGMC would drill at three places in the northwest that had historical reports of gas emissions. GGMC also anticipated that Groundstar Resources would be doing work in the Takutu basin, and that ON Energy would be drilling in Berbice and Canje; CGX would also be doing work offshore (Guyana Geology & Mines Commission, 2012a).

Uranium.—U3O8 Corp. of Canada obtained exclusive uranium exploration rights from the GGMC for two permitted areas in western Guyana (the Kurupung Batholith and the Roraima basin) for a total of 1.3 million hectares. Under the agreement with the GGMC, U3O8 Corp. had the right to apply for a maximum of 35 prospecting licenses. U3O8 Corp. reported 32 holes completed in the drilling program on the Aricheng West structure in the Kurupung Batholith. U3O8 Corp. had also defined an initial NI 43–101 uranium resource in the Kurupung Batholith. The resource estimate was scheduled to be released in early 2012 and was expected to indicate 5.8 million pounds, or 2.6 Mt, of equivalent yellow cake-uranium concentrate (U₃O₈) at 0.100% cutoff (indicated reserves) and 1.3 million pounds, or 590,000 t, of U₃O₈ at 0.090% cutoff (U3O8 Corp., 2012).

Outlook

Bauxite, diamond, and gold will likely continue to be dominant mineral commodities in Guyana's mining industry. Bosai Minerals expects to produce 600,000 t/yr of calcinated alumina by 2015. Prospecting for diamond is likely to continue in the Kurupung River and the Maple Creek region, which are important historic diamond producing regions, and in the Potaro-Kuribrong regional blocks, which are located in north-central Guyana. Gold exploration activities are likely to continue as a result of several gold exploration projects that progressed in 2010. In Guyana, the Kurupung project is emerging into a large uranium district; thus, uranium exploration in western Guyana will likely intensify. The future plans of Prometheus Resources (Guyana) Inc. (a subsidiary of U3O8 Corp.) in Guyana include a detailed exploratory program in its uranium permit areas. Offshore hydrocarbon exploration in Guyana will likely increase because of the progress in the resolution of the maritime boundary disputes between Guyana and Suriname (Guyana Geology & Mines Commission, 2012a; U3O8 Corp., 2012).

According to the GGMC, there are some indications of the presence of natural gas on the two Essequibo Islands of Leguan and Wakenaam. Study and analysis would need to be carried out to determine if the findings are commercially feasible, however. Also, the GGMC foresees positive prospects for the production of bio-diesel, ethanol, and hydropower. ESSAR Steel Group of India is building a large steel mill in Trinidad and Tobago and is working with the GGMC to evaluate iron ore bodies in Guyana.

The GGMC is also working with ESSAR to evaluate manganese ore bodies in Guyana and whether any iron or manganese could be found to be used in its steel mill in Trinidad and Tobago (Guyana Geology & Mines Commission, 2012a).

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SURINAME

Suriname's GDP based on purchasing power parity increased to \$5.1 billion in 2011 from \$4.8 billion in 2010, or by about 6.3%. This increase was in spite of the effects of the global financial crisis and was attributed to positive growth of the mining and quarrying sector. Inflation was 19.5% in 2011 compared with 6.9% in 2010 owing to rising food and fuel prices. The value of Suriname's exports was estimated to be about \$1.6 billion in 2011 compared with \$1.5 billion in 2010; exports included such commodities as alumina, crude oil, gold, and lumber. Suriname's export partners included Canada (which received 36.8% of Suriname's exports), the United States (12.0%), Belgium (11.6%), the United Arab Emirates (9.5%), the Netherlands (6.1%), and Norway (5.5%). Imports were valued at more than \$1.4 billion compared with \$1.3 billion in 2010 and included such products as, in order of value, capital equipment, petroleum and derivatives, and

food. Suriname's import partners included the United States (which was the source of 26.6% of Suriname's imports), the Netherlands (16.0%), Trinidad and Tobago (15.1%), China (8.4%), Japan (5.5%), and Brazil (4.7%). In 2011, Suriname's mineral activities included the mining of bauxite; the refining of alumina; the production of cement, gold, iron ore, and petroleum and some byproducts of copper, nickel, and platinum; and the quarrying of clays, sand and gravel, and stone.

Suriname has an interesting mining history; its role as one of the leading bauxite and alumina producers in the world spans more than 90 years. Suriname mined bauxite, an ore from which alumina is extracted and used to make aluminum. The country's leading petroleum producer was the Government-owned Staatsolie Maatschappij Suriname N.V., which was founded on December 13, 1980, as a limited-liability company under Surinamese law. Since then, with the creation of Staatsolie and the introduction of joint ventures between the public and the private sectors, the petroleum industry has continued to develop (Alcoa Inc., 2012a; Staatsolie Maatschappij N.V., 2012; U.S. Central Intelligence Agency, 2012; U.S. Department of State, 2012).

Minerals in the National Economy

In Suriname, mineral production was focused on alumina, bauxite, gold, and petroleum. The country's economy was dominated by the mining industry, with exports of alumina, gold, and petroleum accounting for about 85% of exports and 25% of Government revenues, making the economy highly vulnerable to mineral price volatility. Suriname's bauxite deposits have been among the world's richest. Since the world economic recession, the mining sector continued to struggle, and alumina declined in importance to the Surinamese economy. Suriname Aluminum Co. (Suralco) was forced to postpone all nonessential maintenance, stop all investments, and lower production. Another reason cited for the reduction in production was the expected depletion of reserves in the Kaaimangrasie and the Klaverblad bauxite mines. The company had to prepare its concession in the Nassau area in southeastern Suriname for mining. This new mine was expected to be ready for production in 2013. Additionally, Suralco launched a bauxite exploration division in 2010 to study possible bauxite residue in areas already mined. This residue was expected to be of a lesser quality, but would, with additional processing, provide sufficient bauxite to keep the refinery operational. In January 2011, the Government of Suriname officially announced that it was interested in resuming negotiations with Suralco regarding 40 years' worth of bauxite reserves in western Suriname in the Bakhuis area. Suralco was currently (2011) investigating the feasibility of developing a bauxite mine in eastern Suriname at the Lelydorp I bauxite deposits, which lie southeast of the Lelydorp II and III areas, and which were previously mined in the 1980s; the deposits are located about 12.2 km northwest of the Paranam alumina refinery in the Para District. Approximately 3 Mt of high-grade bauxite remained available at Lelydorp I, and the proposed project would recover bauxite from areas north and west of the original open pit (Alcoa, Inc., 2012a, b; Alumina Ltd., 2012).

In the formal gold sector, the Government of Suriname announced that it planned to sign an agreement in late 2012 with Suriname Gold Co., LLC (Surgold), which was the joint venture company of U.S. companies Alcoa Worldwide Alumina, LLC and Newmont Mining Corp. Newmont was the manager of Surgold and had the right to own up to 80% of Surgold's equity. Currently (2011), Surgold owns and operates the Merian gold project. The agreement would allow for the mining of gold in this project, which is located approximately 75 km south of the town of Moengo and about 30 km to the north of the Nassau mountains. Surgold anticipates that the project, if approved and constructed, would be similar to the Rosebel Mine and possibly be an open pit operation with gold ore processing and refining facilities. In January 2011, the Government began regulating the informal gold sector. Once considered small scale, this untaxed and unregulated sector was currently valued at an estimated \$1 billion annually. The Government set up commissions that would deal with organizing and registering miners, develop legislation to regulate the sector, and work on making the sector sustainable and environmentally safe (Suriname Gold Co., LLC, 2012; U.S. Department of State, 2012).

In 2011, Staatsolie reported a consolidated gross income of \$800 million, which was up by more than 41% compared with \$566 million in 2010. Staatsolie was in the midst of implementing a \$1 billion expansion project. Of this amount, 75% would come directly from domestic investments. Although Suriname's energy supply situation had improved, the country continued to have a shortage of energy to support expansion of its economy. The bauxite refinery at Paranam depended primarily on diesel-generated energy to support its refining operations. According to Surgold, any refinery built in southeastern Suriname would also have to be powered by diesel-generated energy. The doubling of the capacity of the power-generating plant of Staatsolie had helped ease the demand for power in Paramaribo. Actualization of the Tapa-Jai project was likely to further help ease demand issues (Staatsolie Maatschappij Suriname N.V., 2012; U.S. Central Intelligence Agency, 2012; U.S. Department of State, 2012).

Production

The leading mineral commodities produced in Suriname were alumina, bauxite, gold, cement, crushed stone, and sand in 2011. Data on mineral production are in table 1.

Structure of the Mineral Industry

In 2011, the main bauxite-alumina operators in Suriname were Alcoa Inc. of the United States and Alumina Ltd. of Australia. Suralco was owned jointly by Alcoa (60%) and Alumina (40%). Alcoa and Alumina mined bauxite, refined alumina, and operated smelting facilities in Australia, Brazil, Guinea, Jamaica, Spain, Suriname, and the United States (Alcoa Inc., 2012a, b; Alumina Ltd., 2012). Table 2 is a list of the major mineral industry facilities in Suriname.

Commodity Review

Metals

Bauxite and Alumina.—In 2011, alumina production in Suriname decreased to about 1.4 Mt from almost 1.5 Mt in 2010; bauxite production increased to more than 3.2 Mt from a revised almost 3.1 Mt in 2010, or by more than 3.2%. Production centers in Suriname included two bauxite mines and one alumina refinery. The country's open pit bauxite mines were the Coermotibo and the Moengo Mines. The Coermotibo Mine is located 23 km southeast of Paramaribo (the capital of Suriname) and 11 km east of the Paranam refinery. The Coermotibo Mine is located 38 km southeast of Paramaribo and 24 km east of the Paranam refinery. The Moengo Mine was not operating at its production capacity of 2 Mt/yr because world demand for aluminum remained weak (table 1; Alcoa Inc., 2012a, b; Bray, 2012).

Alcoa managed the Afobaka hydroelectric facility and the Paranam alumina refinery operations in Suriname. With its 2.2-Mt/yr alumina refinery and 100-megawatt (MW) hydroelectric facility, Suralco was the leading private enterprise in Suriname and a key supplier of alumina to Alcoa facilities and markets throughout Europe and the United States (Alcoa Inc., 2012a, b).

Gold.—In 2011, the production of gold remained at about the same level as that of 2010 (675,165 troy ounces, or about 21 t). The gold production in Suriname was related to active mining by small and medium-scale miners that benefited from the continued high prices for gold. In 2011, Rosebel Gold Mines N.V. (RGM) was owned by IAMGOLD (95%) and the Government of Suriname (5%). The Rosebel Mine is located in the Brokopondo mineral district approximately 100 km south of Paramaribo. Gold mineralization at the Rosebel deposit is associated with north-dipping quartz and quartz-carbonate veins and pyrite alteration localized along shear corridors developed at contacts between sandstone and siltstone units in the Rosebel Formation. The mining permit was granted until 2027. In 2011, mining at Rosebel was carried out at the following five open pits, in order of volume: the Royal Hill, the Pay Caro, the East Pay Caro, the Koolhaven, and the Mayo. The following three additional open pits were planned to be in production by 2015 (in order of volume): the Rosebel, the Roma, and the J-Zone. Mining would continue to be by conventional open pit methods, using shovels and trucks. The mining and processing facilities included an 11-Mt/yr-capacity mill, which included crushing and grinding, and gravity separation; a cyanidation circuit; and a carbon-in-leach plant (IAMGOLD Corp., 2012a–d).

According to IAMGOLD, Rosebel produced 11,975 kg of gold in 2011 compared with 12,286 kg in 2010. On December 31, 2011, Rosebel's proven and probable gold reserves amounted to 186.4 Mt grading 1.0 g/t containing 178.2 t (5.7 million troy ounces) of gold; measured and indicated resources were 263.1 Mt grading 1.0 g/t containing 240.1 t (7.7 million troy ounces) of gold; and inferred resources were 13.9 Mt grading 0.7 g/t and containing 8.6 t (278,000 troy ounces) of gold; the mine was expected to be operating until 2026 (IAMGOLD Corp., 2012b, c).

Mineral Fuels

Petroleum and Natural Gas.—The production of crude oil in 2011 amounted to 5.84 million barrels (Mbbbl) compared with 5.8 Mbbbl in 2010; production of petroleum derivatives in 2011 was also at about the same level as in 2010. Data on mineral production are in table 1.

Staatsolie was engaged in exploration, drilling, production, refining, marketing, sales, transport, and generation of electricity and steam. Staatsolie's leading crude oilfields were, in order of value, Tambaredjo and Calcutta. In 2011, Staatsolie's refinery processing capacity was 7,350 barrels per day (bbl/d) of crude oil. Staatsolie's refinery products included, in order of value, diesel, fuel oil, and asphalt bitumen. Most of these derivatives were consumed in the local market, and the surplus was exported to the Caribbean. Staatsolie actively promoted the hydrocarbon potential of Suriname and monitored petroleum agreements on behalf of the Government (Staatsolie Maatschappij Suriname N.V., 2012).

Staatsolie's petroleum operations began onshore in the Saramacca District, which is located 55 km west of Paramaribo. In 2011, the company's crude production from the Calcutta and the Tambaredjo oilfields totaled 5.8 Mbbbl. The majority of the production was from the Tambaredjo field. In the neighboring Calcutta field, full-scale production activities continued in 2011. Staatsolie's exploration strategy was driven by its objective to produce 16,000 bbl/d of crude oil in 2011. In early 2011, proven reserves were 13 Mbbbl in the Calcutta field, 57 Mbbbl in the Tambaredjo field, and 18 Mbbbl in the Tambaredjo North-West area. With the Tout Lui refinery expansion project, Staatsolie planned to expand its refining capacity to 15,000 bbl/d and supply the local market with derivatives, including diesel and gasoline. The Italian company Saipem Società per Azioni was awarded the expansion contract. Construction would start in the first half of 2012 and was scheduled to be completed by the end of 2014 (Staatsolie Maatschappij Suriname N.V., 2012).

Staatsolie's 14-MW powerplant at Tout Lui Faut supplied power to Suriname. The Tout Lui Faut refinery used the steam that the powerplant generated. The electricity was sold to the local power company for further distribution within the country. The powerplant was to be incorporated as a separate entity named Staatsolie Power Company Suriname N.V. by early 2012 (Staatsolie Maatschappij Suriname N.V., 2012).

In South America, Tullow had exploration interests in the prospective Guyana Basin (which included French Guiana, Guyana, and Suriname) with a total acreage of 46,238 km². In December, in Suriname, Tullow finalized a production-sharing contract for a 30% interest in Block 47 with Staatsolie, which would enhance Tullow's portfolio of exploration areas in the Suriname-Guyana Basin. Planning was now well advanced to acquire more than 2,500-km² of 3-D seismic data, which could commence in the second quarter of 2012, subject to the necessary environmental approvals. Tullow anticipated that wells would be drilled as part of its medium-term exploration program in the Equatorial Atlantic region of South America. Tullow planned to operate the license full time and to finance it during the exploration phase. Staatsolie, however, had the option to participate during the development and production

phases by contributing 20% of the total cost (Tullow Oil plc, 2012, p. 5, 22).

Outlook

Suriname's economy is expected to continue to be dominated by the mineral resources sector, in particular the bauxite industry, followed by, in order of value, crude oil, gold, and possibly diamond mining. Proposals for exploration in the country's undeveloped regions of the interior traditionally inhabited by indigenous communities, however, have raised the concerns of environmentalists and human rights activists in the country and abroad. Suriname's economic prospects for the medium-term will depend on continued commitment to responsible monetary and fiscal policies and reforms to liberalize markets and promote competition. In Suriname, Rosebel's gold production in the years ahead is expected to increase owing to its investments in resource delineation, mine exploration programs, and additional leach tanks to improve recoveries. Mining gold at Rosebel will continue to be carried out at five open pits (in order of size): Royal Hill, Pat Caro, East Pat Caro, Koolhaven, and Mayo. Similarly, the following three additional open pits would be mined in the future: Rosebel II, Roma, and J-Zone. The mill expansion is expected to increase the mill feed to about 9 Mt/yr of ore from 8 Mt/yr and to provide the option of an additional 20% increase of gold output should market conditions be adequate (IAMGOLD Corp., 2012b, c).

The alumina industry in Suriname is expected to grow with the completion of the \$65 million 250,000-t/yr expansion of the Paranam facility that will support alumina storage, refining, shipping facilities, thermal power, and the head office of Suralco (Alcoa Inc., 2012a, b).

Crude petroleum production in Suriname is expected to continue to increase. Staatsolie's exploration strategy is driven by its objective to increase onshore crude production to 16,000 bbl/d by 2012 (Staatsolie Maatschappij Suriname N.V., 2012).

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TABLE 1
FRENCH GUIANA, GUYANA, AND SURINAME: PRODUCTION OF MINERAL COMMODITIES¹

(Thousand metric tons unless otherwise specified)

Country and commodity		2007	2008	2009	2010	2011 ^e
FRENCH GUIANA^c						
Cement	metric tons	62,000	62,000	62,000	89,064 ^{r,2}	62,000
Clays	do.	5,000	5,000	5,000	5,000	5,000
Columbite and tantalite	kilograms	1,500	1,500	1,500	1,500	1,500
Gold, mine output, Au content ²	do.	2,000	2,000	2,000	1,140 ^{r,2}	1,300
Laterite		650 ^c	650	650	680 ²	700
Sand		1,500	1,500	1,500	437 ^{r,2}	500
Stone, crushed		1,500	1,500	1,500	1,200 ^{r,2}	1,200
GUYANA^{3,4}						
Bauxite, dry equivalent, gross weight		2,239 ⁵	2,109 ⁵	1,485 ^{r,5}	1,083 ^{r,5}	1,818 ⁵
Diamond	carats	268,945	168,926	143,982 ⁵	49,920 ⁵	52,273 ⁵
Gold, mine output, Au content	kilograms	7,412	8,131	9,326 ^{r,5}	9,594 ⁵	11,293 ⁵
Sand	metric tons	285,000	290,000	478,572 ⁵	652,175	652,200
Stone, crushed	do.	204,000	204,000	340,016 ⁵	514,932 ⁵	515,000
SURINAME^c						
Aluminum:						
Bauxite, gross weight		5,273 ^{r,5}	5,333 ^r	3,388 ^r	3,104 ^r	3,236 ⁵
Alumina		2,178 ^{r,6}	2,154 ^r	1,536 ^r	1,486 ^r	1,421 ⁵
Cement, hydraulic		65	65	65	65	65
Clays, common		20	20	20	20	20
Gold, mine output, Au content	kilograms	9,360	9,798 ⁵	16,497 ^{r,5}	20,686 ^{r,5}	21,000
Petroleum:						
Crude ⁷	thousand 42-gallon barrels	4,800	5,600	6,000 ^{r,5}	5,800 ^{r,5}	5,840 ⁵
Products	do.	2,500	2,917 ⁵	2,943 ⁵	2,940	2,940
Sand and gravel:						
Gravel		35	35	35	35	35
Sand, common		160	160	160	160	160
Stone, crushed and broken		50	50	50	50	50

^eEstimated; estimated data are rounded to no more than three significant digits. ^rRevised. do. Ditto.

¹Table includes data available through May 31, 2012.

²Source: Direction Regionale de l'Industrie, de La Recherche et de l' Environment and Bureau de Recherches Géologiques et Minières and Minerals Questionnaire 2010–11.

³In addition to the commodities listed, Guyana also reported loam production, in metric tons: 2007–11—21,017.

⁴Source: Guyana Geology and Mines Commission, the Bank of Guyana, and Minerals Questionnaire 2010–11.

⁵Reported figure.

⁶Source: BHP Billiton Group.

⁷Source: Staatsolie Maatschappij Suriname N.V.

TABLE 2
GUYANA AND SURINAME: STRUCTURE OF THE MINERAL INDUSTRIES IN 2011

(Thousand metric tons unless otherwise specified)

Country and commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
GUYANA				
Bauxite		Aroaima Bauxite Co. (United Company RUSAL, 90%, and Government, 10%)	Kwakwani, East Berbice District	2,000
Do.		Bosai Minerals (Guyana) Inc. (Bosai Minerals Group, 70%, and Government, 30%)	Omai bauxite mine and processing plant located close to Linden on the Demerara River about 100 kilometers south of Guyana's capital city of Georgetown	1,200
Diamond	carats	Infinito Gold Ltd.	Maple Creek Mine, Kurupung region	145,000
Gold	kilograms	Guyana Goldfields Inc.	Aurora Mine, Cuyuni	10,000
Gravel		Baracara Quarries (private)	Quarry near Bartica, Mazaruni-Potaro District	100
Silica sand		Minerals and Technology Ltd. [Minerals and Chemicals of Texas (United States)]	Sand Hills, Demerara River, West Demerara District	300
Stone		Mazaruni Granite Products Inc. of Guyana (private)	Mazaruni River	3,650
SURINAME				
Alumina		Suriname Aluminum Co. (Suralco) (Alcoa, Inc., 60%, and Alumina Ltd., 40%)	Refinery at Paranam, produces metallurgical-grade alumina	2,200
Bauxite		do.	Coermotibo Mine, open pit mine, 23 kilometers southeast of Paramaribo	2,000
Do.		do.	Moengo Mine, open pit mine, 38 kilometers southeast of Paramaribo	2,000
Cement		Vensur N.V. (private, 100%)	Paramaribo, District of Para	60
Gold	kilograms	Rosebel Gold Mines N.V. (IAMGOLD Corp., 95%, and Government, 5%)	Brokopondo District, 100 kilometers south of Paramaribo	12,500
Petroleum	thousand 42-gallon barrels	Staatsolie Maatschappij Suriname N.V. (Government, 100%)	Tambaredjo, District of Saramacca	4,500
Do.	do.	do.	Calcutta field (58 wells)	460
Petroleum products	do.	do.	Tambaredjo, District of Saramacca	2,600
Do., do. Ditto.				