



# 2008 Minerals Yearbook

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**FRENCH GUIANA, GUYANA, AND SURINAME**

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# THE MINERAL INDUSTRIES OF FRENCH GUIANA, GUYANA, AND SURINAME

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## FRENCH GUIANA

French Guiana is an overseas department of France. Since 1946, French Guiana's economy has been dependent on that of France through trade and subsidies. The mineral sector is administered by France. Gold was the main mineral commodity exported from French Guiana; such goods as chemicals, food, fuels, machinery, and transport equipment were imported from France. The leading industries in the country were aerospace (mainly at the French space center in Kourou), fishing, forestry, and gold mining (U.S. Central Intelligence Agency, 2009).

### Minerals in the National Economy

French Guiana's natural resources included, in order of value, gold, petroleum, kaolin, niobium, tantalum, and clay. The French Government declared a moratorium in February 2009 on all mining and exploration activities in French Guiana until a new "mining framework" is completed and assessed. This announcement suspended the granting of mining licenses pending the outcome of environmental reviews of exploration on all French Guiana concessions (Golden Star Resources Ltd., 2009; IAMGOLD Corp., 2009a, b).

### Production

In 2008, the leading mineral commodities produced in French Guiana included cement, clays, gold, niobium and tantalum, sand, and crushed stone (table 1).

### Structure of the Mineral Industry

In recent years, the mineral industry of French Guiana has been focused on gold and petroleum exploration. Gold exploration was conducted by Golden Star Resources Ltd. of the United States. Golden Star held 100% interest in the Paul Isnard gold project, which is located in the western part of French Guiana 200 kilometers (km) west of Cayenne. The property is accessible from St-Laurent-du-Maroni, either by air or road. The Paul Isnard project covers rocks of the lower Proterozoic Paramacca Formation that contain gold mineralization in the form of pyritic disseminated zones and sulfide-rich shear zones. In December 2008, Golden Star included an inferred mineral resource estimate of 9.2 million metric tons (Mt) grading 2.5 grams per metric ton (g/t) gold at Montagne d'Or on the southern boundary of the Paul Isnard concession. Golden Star temporarily reduced exploration activities at the Paul Isnard gold project because the Government suspended the granting of mining licenses pending the outcome of environmental reviews of exploration in the country (Golden Star Resources Ltd., 2009).

IAMGOLD Corp. of Canada held a 100% interest in Camp Caiman, which is a development project located 45 km southeast of Cayenne. The project consists of a 30-square-kilometer (km<sup>2</sup>) mining concession obtained in November 2004 for a period of 25 years and two adjacent exploration permits—the 20-km<sup>2</sup> Tresor permit to the west and the 21-km<sup>2</sup> Patawa permit to the east. The feasibility study for the Camp Caiman project was completed in August 2005 and updated in 2007. Probable reserves 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 resources, including reserves, contain 49.8 t (1.6 million troy ounces) of gold (IAMGOLD Corp., 2009a).

### 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. Extensive exploration by Golden Star outlined a potential for gold resources within graphitic and tuffaceous Armina sediments. Upon the Government's completion of the new mining framework, Golden Star expected to start environmental, geologic, and mining studies at the Paul Isnard gold project, including airborne topographic surveys, airborne geophysical surveys, metallurgical studies, and a soil geochemical survey (Golden Star Resources Ltd., 2009).

Once these studies are completed and the necessary permit approvals are obtained from the French authorities, IAMGOLD will review the feasibility study suggested for the Camp Caiman gold project that envisions development of the deposit using an open pit mining method for an estimated cost of \$115 million (IAMGOLD Corp., 2009a).

#### 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. Tullow's drilling success in the West African Transform Margin region led the company to completely reevaluate its deepwater acreage in French Guiana during 2008. Tullow had a 97.5% interest in the extensive (35,200-km<sup>2</sup>) French Guiana Maritime license. 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. In 2008, in addition to the potential 1-billion-barrel Matamata prospect mapped in the northwestern

part of the block, a number of high-impact, high-risk leads were identified in the southeast. 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 southeastern portion of the block to advance a number of known leads to drillable prospect stage. Tullow was expected to select and define prospects with potential hydrocarbon systems by early 2009, and a drilling campaign would follow in 2010 or 2011 (Tullow Oil plc, 2009a, b).

## Outlook

Once the new mining framework is in place, gold exploration and investment activities in French Guiana will likely continue at projects with significant gold anomalies, such as the Wayamaga contact between the Armina and the Orapu Formations where Golden Star has outlined a potential for gold resources. Golden Star and IAMGOLD are also likely to move forward with their Paul Isnard and Camp Caiman gold projects, respectively (Golden Star Resources Ltd., 2009; IAMGOLD Corp., 2009a).

Tullow's petroleum exploration projects are expected to progress and expand through new ventures, portfolio management, license rounds, and exploration. These activities will continue in 2009, and key exploration campaigns are planned for 2010 and 2011 (Tullow Oil plc, 2009a, b).

## References Cited

- Golden Star Resources Ltd., 2009, South American exploration—Paul Isnard gold deposit: Golden Star Resources Ltd. (Accessed May 5, 2009, at <http://www.gsr.com/Operations/SouthAmerican.asp>.)
- IAMGOLD Corp., 2009a, Camp Caiman is a development project: IAMGOLD Corp. (Accessed May 5, 2009, at <http://www.iamgold.com/campcaiman.php>.)
- IAMGOLD Corp., 2009b, Open letter to stakeholders: IAMGOLD Corp. press release, March 27, 5 p. (Accessed May 5, 2009, at [http://www.iamgold.com/images/products/AR\\_2008.pdf](http://www.iamgold.com/images/products/AR_2008.pdf).)
- Tullow Oil plc, 2009a, French Guiana operations and licenses—Operations: Tullow Oil plc. (Accessed May 5, 2009, at <http://www.tulloil.com/tlw/operations/sa/frenchguiana/>.)
- Tullow Oil plc, 2009b, 2008 Annual report and accounts—The next phase of growth: Tullow Oil plc. (Accessed May 5, 2009, at <http://www.investis.com/tlw/ir/reportspres/finreportspres/2009/reports/ar2008/ar2008a.pdf>.)
- U.S. Central Intelligence Agency, 2009, French Guiana, in *The world factbook*: U.S. Central Intelligence Agency. (Accessed May 5, 2009, at <http://www.cia.gov/cia/library/publications/the-world-factbook/geos/fr.html>.)

## GUYANA

In 2008, the value of Guyana's exports was estimated to be about \$740 million; exports included such commodities as bauxite and alumina, food products, gold, and timber. Guyana's export partners included Canada (19%); the United States (17%); the United Kingdom (9%); Portugal (8%); France, Netherlands, and Trinidad and Tobago (5% each); Jamaica (4%); and others (28%). Imports were valued at about \$1.2 billion and included such products as food, machinery, manufactures, and petroleum. Guyana's import partners included Trinidad and Tobago (26%), the United States (21%), Cuba and China (7% each), the United Kingdom (6%), and others (33%) (Bank of Guyana, 2009; U.S. Central Intelligence Agency, 2009).

## Minerals in the National Economy

The mining and quarrying sector continued its strong performance by increasing production by 6.1% in 2008. Gold production increased by 9.7% owing to prices that increased by about 25% compared with those in 2007. Bauxite production decreased by 6.7%, reflecting the drop in world demand in the second half of the year. Diamond production decreased by 37.2%, partly as a result of productive capacity being diverted to the gold sector (Bank of Guyana, 2009; Guyana Land of Six Peoples, 2009).

## Government Policies and Programs

According to Sacre-Coeur Minerals, Ltd., Guyana has been friendly towards foreign investment during the past decade, particularly to investment in natural resources development. General business, mining, and tax laws are well developed and uniformly administered, including duty-free and tax-free import privileges for forestry and mining equipment (Sacre-Coeur Minerals, Ltd., 2009a).

The Guyana Geology and Mines Commission (GGMC) is the Government agency that regulates all activities in the mining sector 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 sector. The petroleum section, which regulates all activities in the crude oil industry, provides timely economic, environmental, and technical advice, and supports competitiveness and efficiency in the 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, a 50% profit share, and a 10% reduced consumption tax on fuel for petroleum exploration operations, among other incentives (Guyana Geology and Mines Commission, 2009).

## Production

In 2008, Guyana continued to be one of the main bauxite producers in the world. Other mineral commodities produced in Guyana included diamond, gold, and sand and gravel. The mining and quarrying sector's output remained about the same level as in 2007 (table 1; Bank of Guyana, 2009).

## 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.

On February 13, 2007, an agreement was reached between Bosai Minerals Group Company Ltd. (a privately owned company based in China) and IAMGOLD to acquire 70% of

Omai Bauxite Mining Inc. (OBMI) for \$46 million. Bosai indicated its intention to invest \$1 billion in an alumina refinery and aluminum smelter once the Guyanese Government approved the acquisition of OBMI. National Industrial and Commercial Investments Ltd. (NICIL) oversees the Government's 30% stake in OBMI. BHP Billiton Ltd. of Australia and Goldstone Resources Inc. of the United Kingdom were interested in laterites as a source of bauxite; Guyana Goldfields Inc. and Sacre-Coeur were interested in developing, in order of value, gold and diamond mines (Guyana Goldfields Inc., 2009; Guyana Land of Six Peoples, 2009; Sacre-Coeur Minerals Ltd., 2009b, c).

## Commodity Review

### *Metals*

**Bauxite and Alumina.**—In 2008, bauxite production decreased to 2.1 Mt from 2.25 Mt in 2007. A separate breakdown of production amounts for the Kwakwani and the Linden bauxite mines was not available. The value of exports of bauxite, however, increased to \$67.3 million from \$62.8 million in 2007 owing to higher prices for metallurgical-grade bauxite used for the production of alumina (table 1; Bray, 2009; Guyana Land of Six Peoples, 2009).

According to the GGMC, feasibility studies were to be conducted for an alumina plant with a capacity of at least 250,000 metric tons per year (t/yr), a hydroelectric plant, and a smelter. For that purpose, the Guyana Government and Russia's United Company RUSAL entered into a letter of intent to conduct the feasibility studies, which could start by the end of 2011. The Omai bauxite mine contains estimated reserves of 200 Mt. OBMI's target for production was planned to be 400,000 t/yr of calcinated bauxite. Also, BHP Billiton and Goldstone Resources were planning to evaluate the Pakaraima laterites as a source of bauxite feed for an alumina plant (Mining Top News, 2008; Guyana Geology and Mines Commission, 2009; Guyana Land of Six Peoples, 2009).

**Gold.**—In 2008, gold production in Guyana increased to 8.1 t from 7.4 t in 2007. Guyana Goldfields was focused primarily on the exploration and development of gold deposits in the Guiana Shield of South America. The company's principal interest was in the Aurora gold property, where the company continued to conduct exploration and development work. The Aurora property consists 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 in the Amazon Craton; it contains 114.8 t of measured and indicated reserves and 53.5 t of inferred resources. The grade for the open pit mining was 3 g/t and the grade for the underground mining was 6.5 g/t. The Aurora gold mine was to be developed by 2010 with an initial investment of \$175 million and an operating cost of \$350 per troy ounce and would produce about 9.3 t/yr (300,000 troy ounces per year) of gold for more than 15 years of mine life. On January 28, 2009, Guyana Goldfields acquired the Aranka gold property, which is located 30 km northeast of the Aurora area and has 19 contiguous prospecting licenses. 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., 2008, 2009).

Sacre-Coeur held four gold permits—the Kartuni regional block, the Lower Puruni regional block (Million Mountain), the Northwest regional block, and the Oko regional block. The Million Mountain area and the adjacent Peters Mine area constituted one of Guyana's leading gold mining centers. A trenching and sampling program conducted by Sacre-Coeur confirmed a similar pattern of significant gold mineralization. Placer gold operations were also active along a number of local streams, and river dredging had taken place along the Puruni River as well. The field work identified seven new highly prospective targets for gold mineralization in addition to zone 1 on the Million Mountain Block, and drilling had been conducted in and around the main pit at zone 1; each of these new zones is characterized by a silica-rich intrusive body intruded into brittle greenstones (Sacre-Coeur Minerals, Ltd., 2009b, c). On September 22, 2008, the company reported such preliminary estimates as 14.3 Mt grading 1.0 g/t Au containing 14 t (451,397 troy ounces) of gold (12.1 t grading 1.0 g/t Au measured and 2.2 t grading 0.9 g/t Au indicated). On December 12, 2008, Sacre-Coeur announced that core drilling had intersected a porphyry-type mineralized body containing significant amounts of gold (14.41 g/t), copper (1.00% Cu), and molybdenum (up to 0.18% Mo) and minor amounts of silver on its Million Mountain project (Sacre-Coeur Minerals, Ltd., 2009a).

Vannessa Ventures Ltd. 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. Vannessa Ventures indicated that no cyanide would be used in its gold production; rather, a froth flotation process would be used (Vannessa Ventures Ltd., 2008; Guyana Land of Six Peoples, 2009).

### *Industrial Minerals*

**Diamond.**—In 2008, diamond production in Guyana decreased to 168,900 carats from 268,945 carats in 2007 (table 1). During 2008, two Canada-based companies were actively prospecting for diamond in Guyana: Sacre-Coeur and Vannessa Ventures. Sacre-Coeur held prospecting permits for the Kurupung River region, which is an important historic diamond producer in Guyana; the Potaro-Kuribrong regional blocks, which are located in north-central Guyana; and a claim-permit and claim-license in the Mahdia-Issano regional block, which is located in northwestern Guyana. Vannessa Ventures held interest in the Maple Creek and the Potaro projects in Guyana. In 2008, the Maple Creek project produced some diamond (Vannessa Ventures Ltd., 2008; Olson, 2009; Sacre-Coeur Minerals, Ltd., 2009b, c).

### *Mineral Fuels and Related Materials*

**Petroleum and Natural Gas.**—Canada-based CGX Energy Inc., which was a crude oil and gas exploration company, held interest in 39,659 km<sup>2</sup> (9.5 million acres) in four properties offshore Guyana: the Corentyne License Annex, the Corentyne License, and the Pomeroun License (the company had 100% ownership in each); and the Georgetown License (25% interest).

Onshore, the company had a 62% interest in the Berbice License property, as well as several significant targets identified in the Corentyne Petroleum Prospecting License (PPL), including the Eagle prospect, which covers 117.4 km<sup>2</sup> (29,000 acres) and has an estimated mean resource potential of 610 million barrels (Mbbbl) of oil, and the Wishbone West prospect, which has an estimated mean resource potential of more than 100 Mbbbl of oil. However, because of disputes concerning the offshore border between Guyana and Suriname, particularly the long-standing dispute with Suriname about the axis of the territorial sea boundary in potentially oil-rich waters, access to a portion of the contracted area in the Corentyne PPL was extended to June 2013 (CGX Energy Inc., 2009).

According to GGMC, four companies were licensed to undertake exploratory work in Guyana: Century Guyana Ltd., CGX Energy, Exxon Mobil Corp. of the United States, and Repsol YPF, S.A. of Spain. Other companies interested in Guyana's petroleum sector included ON Energy Inc. (which was a subsidiary of CGX Energy Inc.) 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 area and that ON Energy would be drilling in Berbice and Canje; CGX would also be doing work offshore. ON Energy left Guyana in 2007, however, after drilling three wells and coming up dry (Guyana Geology and Mines Commission, 2009).

In November 2008, Tullow added to its portfolio of South American projects through the acquisition of a 30% interest in the Georgetown block offshore Guyana from the YPF Group. The block covers 11,100 km<sup>2</sup> in water depths of 50 to 200 meters (m) and has geologic characteristics similar to those of French Guiana and to proven basins on the other side of the Atlantic. A 1,880-km<sup>2</sup> 3-D seismic survey was acquired during the fourth quarter of 2008, and the focus for 2009 was to be the interpretation and integration of these new data with the objective of identifying exploration targets for drilling in 2010 (Tullow Oil plc, 2009).

**Uranium.**—U3O8 Corp. continued to explore for uranium, focusing on the Roraima Basin in Guyana; the company considered the Roraima Basin to be geologically similar to the Athabasca Basin, which contains the world's largest resource of uranium. The company obtained exclusive uranium exploration rights from the GGMC for two permitted areas in western Guyana for a total of 1.3 million hectares. Under the agreement with the GGMC, U3O8 Corp. has the right to apply for a maximum of 35 prospecting licenses. The GGMC granted U3O8 Corp.'s indirectly wholly owned subsidiary, Prometheus Resources Guyana, two reconnaissance permits—the CM permit (Permit A) and the PMCR permit (Permit B) for uranium exploration in Guyana (U3O8 Corp., 2008).

U3O8 Corp reported significant intercepts of uranium mineralization from an additional 15 bore holes drilled in the Accori North C (ANC), which is an albitite-hosted breccia

zone of the Kurupung batholith, near the Roraima Basin. ANC is the fourth uranium-bearing structure to undergo relatively close-spaced drilling in the batholith, and it constituted part of U3O8 Corp's pipeline of basement-hosted targets in the Kurupung area, which was a promising uranium district in Guyana. By the end of 2008, U3O8 Corp. had drilled a total of 20 bore holes for 4,244 m at the ANC. According to the company, ANC is the fourth structure in the Kurupung area to demonstrate significant uranium grades concentrated within mineralized shoots, and it could potentially add to the company's resource base (U3O8 Corp., 2009).

## Outlook

Production in the mining sector will likely continue to be dominated by the production of bauxite. OBMI expects to produce 400,000 t/yr of calcinated bauxite. Gold exploration activities in Guyana are likely to continue as a result of several gold exploration projects that progressed during 2007-08. Offshore hydrocarbon exploration in Guyana will likely increase because of the progress in the resolution of the maritime boundary disputes between Guyana and Suriname. Prometheus Resources' future plans in Guyana include a detailed exploratory program in its uranium permit areas (Guyana Land of Six Peoples, 2009).

According to the GGMC, there are some indications of the presence of natural gas on the two Essequibo Islands of Leguan and Wakenaam. However, study and analysis would need to be carried out to determine if the findings are commercially feasible. Also, the GGMC foresees positive prospects for the production of bio-diesel, ethanol, and hydropower. ESSAR Steel of India is building a large steel mill in Trinidad and Tobago and is working with the GGMC to evaluate various potential iron ore bodies in Guyana. The GGMC is also working with ESSAR to reevaluate potential manganese ores in Guyana and whether any iron or manganese could be found to use in its steel mill in Trinidad and Tobago (Guyana Geology and Mines Commission, 2009).

## References Cited

- Bank of Guyana, 2009, Annual report 2008—Georgetown, Guyana: Bank of Guyana, 115 p. (Accessed May 7, 2009 at <http://www.bankofguyana.org.gy/Documents/HalfYear/HalfYear2008.pdf>.)
- Bray, E.L., 2009, Bauxite and alumina: U.S. Geological Survey Mineral Commodity Summaries 2009, p. 28-29.
- CGX Energy Inc., 2009, Update 2008—Corporate profile, offshore Guyana exploration: CGX Energy Inc., 32 p. (Accessed March 11, 2009, at <http://cgxenergy.ca/documents/CGX2008YEMDAandFinancials.pdf>.)
- Guyana Geology and Mines Commission, 2009, The mining sector in Guyana—Unlocking the mineral and petroleum wealth of Guyana: Guyana Geology and Mines Commission. (Accessed May 12, 2009, at <http://www.ggmc.gov.gy/index.html>.)
- Guyana Goldfields Inc., 2008, Latest news and maps—Northern Guyana, mineral property location: Guyana Goldfields Inc. (Accessed March 5, 2009, at <http://www.guygold.com/Projects.php>.)
- Guyana Goldfields Inc., 2009, Investment highlights: Guyana Goldfields Inc. (Accessed March 5, 2009, at <http://www.guygold.com/>.)
- Guyana Land of Six Peoples, 2009, Guyana—The week in review: Guyana Land of Six Peoples. (Accessed May 13, 2009, at <http://www.landofsixpeoples.com/index.html>.)

Mining Top News, 2008, Mining and exploration industry news—Bosai Mining acquires South America bauxite mining company: Mining Top News. (Accessed March 5, 2009, at <http://www.miningtopnews.com/bosai-mining-acquires-south-america-bauxite-mining-company.html>.)

Olson, D.W., 2009, Gemstones: U.S. Geological Survey Mineral Commodity Summaries 2009, p. 64-65.

Sacre-Coeur Minerals, Ltd., 2009a, News & articles—The Million Mountain project: Sacre-Coeur Minerals, Ltd. (Accessed May 20, 2009, at [http://www.scm minerals.com/news\\_20081212.htm](http://www.scm minerals.com/news_20081212.htm).)

Sacre-Coeur Minerals, Ltd., 2009b, Properties & projects—Mining in Guyana: Sacre-Coeur Minerals, Ltd. (Accessed May 20, 2009, at [http://www.scm minerals.com/properties\\_mining.htm](http://www.scm minerals.com/properties_mining.htm).)

Sacre-Coeur Minerals, Ltd., 2009c, Properties & projects—The Million Mountain property: Sacre-Coeur Minerals, Ltd. (Accessed May 20, 2009, at [http://www.scm minerals.com/properties\\_million.htm](http://www.scm minerals.com/properties_million.htm).)

Tullow Oil plc, 2009, Guyana operations and licenses—Operations: Tullow Oil plc. (Accessed May 20, 2009, at <http://www.tulloil.com/tlw/operations/sa/guyana/>.)

U3O8 Corp., 2008, Home—Roraima Basin in Guyana, current exploration U3O8 Corp. (Accessed March 11, 2009, at <http://www.u3o8corp.com/>.)

U3O8 Corp., 2009, Guyana—Uranium system in the Kurupung Batholith: U3O8 Corp. (Accessed May 20, 2009, at <http://www.marketwire.com/press-release/U3O8-Corp-TSX-VENTURE-UWE-992456.html>.)

U.S. Central Intelligence Agency, 2009, Guyana, *in* The world factbook: U.S. Central Intelligence Agency. (Accessed May 7, 2009, at <https://www.cia.gov/library/publications/the-world-factbook/geos/gy.html>.)

Vannessa Ventures Ltd., 2008, Mining diamonds and gold in the new millennium: Vannessa Ventures Ltd. (Accessed March 5, 2009, at <http://www.zibb.com/all/theme/cq/Vannessa+Ventures+Limited>.)

## SURINAME

In 2008, Suriname's mineral industry included (1) the mining of bauxite; (2) the refining of alumina; and (3) the production of cement, gold, iron ore, and petroleum; small amounts of copper, nickel, and platinum; and quarried clays, kaolin, and sand and gravel. Suriname has a rich mining history. Its role as one of the major bauxite and alumina producers in the world spans more than 90 years; Alcoa Inc. of the United States and BHP Billiton Plc of the United Kingdom were the operators. Suriname's petroleum sector began operations in the early 1960s. Government-owned Staatsolie Maatschappij Suriname N.V. 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 flourished (Staatsolie Maatschappij Suriname N.V., 2009; U.S. Central Intelligence Agency, 2009; World Bank, The, 2009).

### Minerals in the National Economy

In Suriname, mineral production has been focused on alumina, bauxite, gold, and petroleum. In 2008, the petroleum sector's financial performance was \$355 million with a net profit of \$225 million and a contribution to the Government's budget of \$150 million. Suriname's total exports, among which were included such mineral commodities as alumina and crude oil, were valued at about \$1.4 billion. Suriname's export partners in 2008 included Canada (27%), Norway (20%), Belgium and the United States (9% each), the United Arab Emirates (8%), France (7%), and others (20%). Imports in 2008 were valued at about \$1.3 billion and included such products as capital equipment, foodstuffs, and petroleum. Suriname's import partners included the United States (27%), the Netherlands (17%), Trinidad and

Tobago (14%), China (6%), Japan (5%), and others (31%) (Staatsolie Maatschappij Suriname N.V., 2009; U.S. Central Intelligence Agency, 2009).

### Production

In 2008, the production of alumina increased by almost 4% compared with that of 2007; in the same timeframe, bauxite production increased by almost 3.5%. The production of crude petroleum in 2008 increased by 12.5% compared with that of 2007; production of petroleum derivatives, however, decreased by 7%. Data on mineral production are in table 1.

### Structure of the Mineral Industry

In 2008, the main bauxite operators in Suriname were Alcoa's subsidiary Suriname Aluminum Co. (Suralco) and BHP Billiton. According to Alcoa, Suralco held 55% interest in all the bauxite mining and alumina refinery operations in Suriname, and the remaining 45% was owned by BHP Billiton. BHP Billiton managed four bauxite open pit mines, and Suralco held their production licenses, which were issued by the Surinamese Government and were due to expire in 2033 (Alcoa Inc., 2009a; BHP Billiton Plc, 2009). Table 2 is a list of the major mineral industry facilities in Suriname. The table provides the location and production capacities of these facilities.

### Commodity Review

#### Metals

**Bauxite and Alumina.**—In 2008, the production of alumina decreased by almost 14% compared with that of 2007; bauxite production increased by 3.5% (table 1). Production operations in Suriname included four bauxite mines and the Paranam refinery. The country's open pit bauxite mines were the Coermotibo Mine, the Kaaimangrasie Mine, the Klaverblad Mine, and the Lelydorp III Mine. The Kaaimangrasie and the Klaverblad bauxite mines were developed at a cost of \$300 million to replace the Coermotibo and the Lelydorp III bauxite mines, which were depleted in early 2008. The Kaaimangrasie Mine is located 38 km southeast of Paramaribo and 24 km east of the Paranam refinery. The mine was expected to be operating at a projected production capacity of 2 million metric tons per year (Mt/yr) of bauxite by November 2009. The Klaverblad facility is located 23 km southeast of Paramaribo (the capital of Suriname) and 11 km east of the Paranam refinery facility. The Klaverblad Mine was scheduled to be operational by August 2011 (BHP Billiton Plc, 2009).

Alcoa's subsidiary Suralco focused on mining bauxite, from which alumina is produced and then used to make aluminum. Bauxite production began along the Cottica River in the jungle village of Moengo in 1922. Under an agreement that Suralco signed with the Government of Suriname on January 27, 1958, Suralco built a dam, a hydropower plant, an aluminum smelter, an alumina refinery, and other facilities. In 2008, Suralco produced about 5,350 metric tons per day (t/d) of alumina at its Paranam plant (Alcoa Inc., 2009c, d).

Alcoa managed the Afobaka hydroelectric facility and the Paranam alumina refinery operations in Suriname. The refinery completed a 250,000-t/yr expansion in early 2005. 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., 2009b).

**Gold.**—The Rosebel open pit gold mine was acquired by IAMGOLD in November 2006 through its merger with Cambior Inc. In 2008, IAMGOLD's interest in Rosebel Mine was held through a 95% interest in Rosebel Gold Mines N.V. (RGM), and the remaining 5% was held by the Government of Suriname. The Rosebel Mine was located approximately 100 km south of Paramaribo. The mining permit was granted until 2027. The mine facilities include a 20,000-t/d processing plant, which includes crushing and grinding and gravity separation and recovers more than 25% of the gold; a cyanidation circuit; and a carbon-in-leach plant (IAMGOLD Corp., 2009b).

In 2008, Rosebel produced 10.3 t of gold compared with 9.4 t in 2007 (table 1). At yearend 2007, proven and probable reserves were estimated to be 118.2 t (3.8 million troy ounces) of gold, which was sufficient for more than 9.6 years of mine operations. In addition, the Rosebel Mine contains measured and indicated resources of 317.3 t (10.2 million troy ounces) of gold and inferred resources of 7.1 t (227,000 troy ounces) of gold (IAMGOLD Corp., 2009a).

In 2008, Golden Star Resources Ltd. of the United States indicated an extensive gold anomaly in eastern Suriname; the anomaly ranges from 12 to 15 km along the northern flank of the Brokolonko Range and extends to the southwest of the Gross Rosebel property. In late 2006, Golden Star had entered into a joint-venture agreement with Newmont Overseas Exploration Ltd. (a subsidiary of Newmont Mining Corp. of the United States). The agreement was to explore the 743-km<sup>2</sup> Saramacca gold project, which is located in the Brokolonko Range. Under the agreement, Newmont could earn 51% interest in the project by investing \$6 million during a period of 5 years. During the first year, Newmont's investment of \$1.1 million was to fund exploration efforts, such as diamond core drilling, ground geophysical surveys, and soil augering. Other planned works included mapping of the area and reconnaissance sampling. According to Golden Star, the Guiana Shield remains a highly prospective area for the discovery of major new gold mines, and Saramacca is one of the most promising exploration prospects on the Shield (Golden Star Resources Ltd., 2009).

### **Mineral Fuels**

**Petroleum and Natural Gas.**—Staatsolie, which is owned by the Government of Suriname, was engaged in exploration, drilling, production, refining, marketing, sales, transport, and generation of electricity and steam. Staatsolie's institutional activities included the contracting, promotion, and monitoring activities of other oil companies on behalf of the Government of Suriname. Staatsolie's leading crude oil fields were, in order of value, the Tambaredjo and the Calcutta. In 2008, Staatsolie's refinery operational capacity was 7,000 barrels per day (bbl/d)

of crude oil. Its refinery products included, in order of value, diesel, fuel oil, and asphalt bitumen. Most of these petroleum derivatives were consumed in the local market and the surplus was exported to the Caribbean. As agent for the Government, Staatsolie actively promoted the hydrocarbon potential of Suriname and monitored petroleum agreements on behalf of the state (Staatsolie Maatschappij Suriname N.V., 2009).

Staatsolie's petroleum operations began onshore in the Saramacca District, which is located 55 km west of the capital, Paramaribo. In 2008, the company's crude production from the Calcutta and the Tambaredjo oilfields totaled 5.4 million barrels. The majority of the production was from the Tambaredjo field. In the neighboring Calcutta field, full-scale production activities started in March 2006. Staatsolie's exploration strategy was driven by its objective to increase onshore crude production to 16,000 bbl/d by 2012. In its plan for the period of 2008-10, onshore exploration would focus on areas outside of Calcutta and Tambaredjo, and exploration of coastal areas outside the current fields was expected to start by 2009. In early 2007, proven reserves stood at 13 Mbbbl in the Calcutta field, 57 Mbbbl in the Tambaredjo field, and 18 Mbbbl in the Tambaredjo northwest area (Staatsolie Maatschappij Suriname N.V., 2009).

Paradise Oil Company N.V., which was a wholly owned subsidiary of Staatsolie, was established in December 2005 (and fully operational since May 2006) to operate in joint-venture operations that involved the parent company and third parties. Operations of Paradise Oil and its partners would be conducted through a production-sharing contract with Staatsolie. In February 2007, Staatsolie signed its first production-sharing contract for the Coronie and the Uitkijk onshore blocks through its Paradise Oil affiliate. The production-sharing contract involved a joint venture between Paradise Oil and Hardman Resources Ltd. of Australia, which was a wholly owned subsidiary of Tullow. Under the agreements, Hardman was to acquire a 40% working interest by funding an initial exploration program with \$8.5 million; Paradise Oil was the operator and owned 60% of the interests. The onshore blocks covered an estimated area of 6,716 km<sup>2</sup> (2,593 square miles) (Coronie) and 1,961 km<sup>2</sup> (757 square miles) (Uitkijk); both of the blocks are located adjacent to the Calcutta and the Tambaredjo oilfields (Staatsolie Maatschappij Suriname N.V., 2009; Tullow Oil plc, 2009a).

Staatsolie also supplied power to Suriname. A 14-MW powerplant at Tout Lui Faut had been in operation since July 2006. The Tout Lui Faut refinery used the steam that the powerplant generates, and the electricity was sold to the local power company for further distribution within the country. In early 2007, the powerplant's production reached 27 million kilowatthours, which was below projections, because it represented production for only part of the year. In 2008, Staatsolie expected to increase its powerplant production for its first full year of operation; in addition, the plant would be incorporated as a separate entity named Staatsolie Power Company Suriname N.V. (Staatsolie Maatschappij Suriname N.V., 2009).

In Suriname, Tullow's drilling program started in December 2007 with the drilling of five shallow wells in the Uitkijk license. The results were being reviewed and integrated into

the regional database. The Uitkijk drilling program was to be followed by a five-well exploration program on the Coronie Block by 2009 (Tullow Oil plc, 2009b).

## Outlook

Rosebel Gold Mines is continuing to plan for exploration for new deposits on the Rosebel property and on the adjacent Headley's Reef and Thunder Mountain properties, as well as on the Sara Creek project, which is located 80 km south of Rosebel. Golden Star's exploration will likely be carried out on its Saramacca gold project in Suriname, which lies within the same geologic-structural region as the adjacent Gross Rosebel Mine (Golden Star Resources Ltd., 2009).

IAMGOLD is expected to launch an \$18.4 million mill expansion project that would increase the annual life-of-mine production to between 9.3 and 9.5 t (300,000 and 305,000 troy ounces) from about 8.6 t (275,000 troy ounces), and reduce direct cash costs by approximately \$35 per ounce. This project could begin affecting production and costs by 2010. The expansion is expected to increase mill feed to 8.9 Mt/yr of ore from 8 Mt/yr and provide the option of an additional 15% to 25% increase of gold output should market conditions be appropriate (IAMGOLD Corp., 2009b).

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 supports alumina storage, refining, shipping facilities, thermal power, and the head office of Suralco (Alcoa Inc., 2009c).

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., 2009).

## References Cited

- Alcoa Inc., 2009a, Alcoa—Extraordinary times, extraordinary measures: Alcoa Inc., 159 p. (Accessed May 22, 2009, at [http://www.alcoa.com/global/en/investment/pdfs/2008\\_Annual\\_Report.pdf](http://www.alcoa.com/global/en/investment/pdfs/2008_Annual_Report.pdf).)
- Alcoa Inc., 2009b, Alcoa in profile—Suriname: Alcoa Inc. (Accessed May 22, 2009, at [http://www.alcoa.com/suriname/en/info\\_page/suriname\\_profile.asp](http://www.alcoa.com/suriname/en/info_page/suriname_profile.asp).)
- Alcoa Inc., 2009c, Alcoa in Suriname—Partners in development: Alcoa Inc. (Accessed May 22, 2009, at <http://www.alcoa.com/suriname/en/home.asp>.)
- Alcoa Inc., 2009d, Alcoa in Suriname—Overview: Alcoa Inc. (Accessed May 22, 2009, at [http://www.alcoa.com/suriname/en/alcoa\\_suriname/suriname\\_overview.asp](http://www.alcoa.com/suriname/en/alcoa_suriname/suriname_overview.asp).)
- BHP Billiton Plc, 2009, Annual report 2008—Suriname—Bauxite mining operations: BHP Billiton Plc. (Accessed March 11, 2009, at <http://www.bhpbilliton.com/bb/search/searchResults.jsp>.)
- Golden Star Resources Ltd., 2009, South American exploration—Saramacca gold deposits in Suriname: Golden Star Resources Ltd. (Accessed May 22, 2009, at <http://www.gsr.com/Operations/SouthAmerican.asp>.)
- IAMGOLD Corp., 2009a, Gold operations—Reserves and resources: IAMGOLD Corp. (Accessed May 22, 2009, at <http://www.iamgold.com/reserves.php/>.)
- IAMGOLD Corp., 2009b, Rosebel Mine: IAMGOLD Corp. (Accessed May 22, 2009, at <http://www.iamgold.com/rosebel.php/>.)
- Staatsolie Maatschappij Suriname N.V., 2009, Company profile—Confidence in our own abilities: Staatsolie Maatschappij Suriname N.V., 2 p. (Accessed May 21, 2009, at [http://www.staatsolie.com/Profile\\_fin.pdf](http://www.staatsolie.com/Profile_fin.pdf).)
- Tullow Oil plc, 2009a, The next phase of growth: Tullow Oil plc, 140 p. (Accessed May 22, 2009, at <http://www.investis.com/tlw/ir/reportspres/finreportspres/2009/reports/ar2008/ar2008a.pdf>.)
- Tullow Oil plc, 2009b, 2009 exploration program: Tullow Oil plc, 8 p. (Accessed May 22, 2009, at <http://www.investis.com/tlw/ir/reportspres/finreportspres/2009/presentations/agm2009/AGMPresentationFINAL.pdf>.)
- U.S. Central Intelligence Agency, 2009, Suriname, in *The world factbook*: U.S. Central Intelligence Agency. (Accessed May 21, 2009, at <https://www.cia.gov/library/publications/the-world-factbook/geos/ns.html>.)
- World Bank, The, 2009, Suriname—Data & statistics: The World Bank. (Accessed May 21, 2009, at <http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/LACEXT/SURINAMEEXTN/0,,menuPK:331321~pagePK:141132~piPK:141109~theSitePK:331295,00.html#summary>.)

TABLE 1  
FRENCH GUIANA, GUYANA, AND SURINAME: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Thousand metric tons unless otherwise specified)

Country and commodity		2004	2005	2006	2007	2008 <sup>e</sup>
FRENCH GUIANA <sup>e</sup>						
Cement	metric tons	62,000	62,000	62,000	62,000	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 <sup>2</sup>	do.	2,773 <sup>3</sup>	1,955 <sup>3</sup>	2,000 <sup>e</sup>	2,000 <sup>e</sup>	2,000 <sup>e</sup>
Sand		1,500	1,500	1,500	1,500	1,500
Stone, crushed		1,500	1,500	1,500	1,500	1,500
GUYANA <sup>4</sup>						
Bauxite, dry equivalent, gross weight		1,506 <sup>r,5</sup>	1,694 <sup>r,3,5</sup>	1,479 <sup>3,5</sup>	2,249 <sup>3,5</sup>	2,098 <sup>3</sup>
Clay <sup>5</sup>	metric tons	3,000	12,000 <sup>3</sup>	NA	NA	NA
Diamond	carats	444,940 <sup>r,5</sup>	356,948 <sup>r,3,5</sup>	340,544 <sup>3,5</sup>	268,945 <sup>3,5</sup>	168,900 <sup>3</sup>
Gold, mine output, Au content	kilograms	11,148 <sup>r,5</sup>	8,325 <sup>r,3,5</sup>	5,668 <sup>3,5</sup>	7,412 <sup>3,5</sup>	8,131 <sup>3</sup>
Sand	metric tons	142,092 <sup>r,5</sup>	573,150 <sup>3,5</sup>	285,000 <sup>3,5</sup>	285,000 <sup>3,5</sup>	290,000
Stone, crushed	do.	285,583 <sup>r,5</sup>	315,964 <sup>3,5</sup>	204,000 <sup>3,5</sup>	204,000 <sup>3,5</sup>	204,000
SURINAME <sup>e</sup>						
Aluminum:						
Bauxite, gross weight		4,052 <sup>3,6</sup>	4,757 <sup>3,6</sup>	4,924 <sup>3,6</sup>	5,054	5,230
Alumina		2,039 <sup>3,6</sup>	1,944 <sup>3,7</sup>	2,153 <sup>3,7</sup>	2,270 <sup>3,7</sup>	1,953 <sup>3</sup>
Cement, hydraulic		65	65	65	65	65
Clays, common		20	20	20	20	20
Gold, mine output, Au content	kilograms	8,513 <sup>2,3</sup>	10,619 <sup>3,8</sup>	9,362 <sup>3,9</sup>	9,360	10,300
Petroleum:						
Crude <sup>10</sup>	thousand 42-gallon barrels	4,100 <sup>3</sup>	4,380 <sup>3</sup>	4,800 <sup>3</sup>	4,800 <sup>3</sup>	5,400
Products	do.	2,500 <sup>3,10</sup>	2,700 <sup>3,10</sup>	2,500 <sup>3,10</sup>	2,500	2,325 <sup>3</sup>
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

<sup>e</sup>Estimated; estimated data are rounded to no more than three significant digits. <sup>r</sup>Revised. do. Ditto. NA Not available.

<sup>1</sup>Table includes data available through May 2009.

<sup>2</sup>Source: Direction Regionale de l'Industrie, de la Recherche et de l' Environment and Bureau de Recherches Géologiques et Minières.

<sup>3</sup>Reported figure.

<sup>4</sup>In addition to the commodities listed, Guyana also reported laterite production, in metric tons: 2004—44; 2005—12,000<sup>r</sup>; and 2006-08—NA and loam production, in metric tons: 2004—3,000; 2005—4,000; and 2006-08—21,017.

<sup>5</sup>Source: Guyana Geology and Mines Commission and the Bank of Guyana.

<sup>6</sup>Source: World Bureau of Metal Statistics.

<sup>7</sup>Source: BHP Billiton Group.

<sup>8</sup>Source: Cambior Inc.

<sup>9</sup>Source: IAMGOLD Corp.

<sup>10</sup>Source: Staatsolie Maatschappij Suriname N.V.

TABLE 2  
GUYANA AND SURINAME: STRUCTURE OF THE MINERAL INDUSTRIES IN 2008

(Thousand metric tons unless otherwise specified)

Country and commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity	
<b>GUYANA</b>				
Bauxite	Aroaima Bauxite Co. (United Company RUSAL, 90%, and Government, 10%)	Kwakwani, East Berbice District	2,000	
Do.	Omai Bauxite Mining Inc. (Bosai Mining Co. Ltd., 70%, and Government of Guyana, 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	1,500	
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	
<b>SURINAME</b>				
Alumina	Suriname Aluminum Co. (Suralco) (Alcoa, Inc., 55%, and BHP Billiton plc, 45%)	Refinery at Paranam, producing metallurgical-grade alumina	2,200	
Bauxite	do.	Klaverblad Mine, open pit mine, 23 kilometers southeast of Paramaribo; to commence in May 2007	2,000	
Do.	do.	Kaaimangrasie Mine, open pit mine, 38 kilometers southeast of Paramaribo; operations started in July 2006	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 of Suriname, 5%)	Brokopondo District, 100 kilometers south of Paramaribo	10,500	
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.				

