26 Philippines

26.1 Summary of Coal Industry

26.1.1 Role of Coal in the Republic of the Philippines

Currently, coal-fired thermal power plants remain the number one producer of electricity and accounted for a total of 5,568 megawatts (MW), or 33 percent, of the Republic of the Philippines' total installed power generating capacity in 2012 (PDOE, 2014a). The Philippines consumed 16.3 million tonnes (Mmt) of coal in 2012, around 75 percent of which was for power generation (EIA, 2014; Ocampo, 2012). The Philippines relies on imports to meet coal demand, importing 10.6 Mmt from Indonesia and 277 thousand tonnes from Vietnam in 2011 (Ocampo, 2012). The Philippine Energy Plan 2012-2030 (PEP) projects coal demand to increase by more than 70 percent between 2012 and 2030 (PDOE, 2014b).

The country's recoverable coal reserves, as shown in Table 26-1, are estimated at 315 Mmt, with most reserves as lignite. Total coal resources compiled by the Geothermal and Coal Resources Development Division (GCRDD) of the Department of Energy of the Philippines, are estimated at a minimum of 2,268.4 Mmt (USGS, 2006).

The Philippines produced 8.0 Mmt of coal in 2012, the highest annual production to date. Coal production is increasing rapidly, more than doubling between 2008 and 2012 (EIA, 2014). The PEP projects domestic coal production to continue to increase, reaching more than 11 Mmt in 2015 and more than 12.5 Mmt in 2020 (PDOE, 2014b).

Table 26-1. Philippines' Coal Reserves and Production

Indicator	**Anthracite & Bituminous** (million tonnes)	**Sub-bituminous & Lignite** (million tonnes)	**Total** (million tonnes)	**Global Rank** (# and %)
Estimated Proved Coal Reserves (2011)	41	275	315	41 (0.04%)
Annual Coal Production (2012)	8.0	0.0	8.0	29 (0.10%)

Source: EIA (2014)

The combined lignite and sub-bituminous coal reserves of the Philippines, including indicated and inferred reserves, are about 1,899.2 Mmt, which make up about 84 percent of the total coal reserves of the Philippines. The remaining reserves are composed of bituminous and semi-anthracite coal (USGS, 2006).

The Philippines has 19 coal districts. The largest total coal resource is estimated at 570 Mmt of sub-bituminous coal and is located in the Semirara coal district located on Semirara Island, which is located approximately 280 kilometers to the south of Manila and can be seen in Figure 26-1 below, just south of Mindoro (Ocampo, 2012). The northern part of Semirara Island is dominated by the Panian coalfield, the largest of three coalfields on the island. Other coalfields on Semirara include the East Panian, and Himalian coalfields (USGS, 2006). A fourth coalfield, the Unong coalfield, has been mined out. Other coal districts with large reserves include Cagayan-Isabella of northern Luzon and Sultan-Kudarat of Mindanao. Reserves and coal rank for all of the Philippines' coal districts are shown in Table 26-2 below.

Figure 26-1. Philippines' Coal Resources

Sources: Modified from Schwochow (1997); USGS (2006)

Table 26-2. Philippines' Coal Districts

Coal District	Coal Rank	Coal Reserves (million tonnes)
Samar-Leyte	Lignite	27.0
Cotabato	Sub-bituminous/Lignite	230.4
Quirino	Sub-bituminous/Lignite	0.7
Cagayan-Isabella	Sub-bituminous/Lignite	336.0
Sarangani	Sub-bituminous/Lignite	120.0
Sultan-Kudarat	Sub-bituminous/Lignite	300.3
Sorsogon	Sub-bituminous	1.0
Negros	Sub-bituminous	4.5
Davao	Sub-bituminous	100.0
Batan Island	Sub-bituminous	11.8
Masbate	Sub-bituminous	2.5
Quezon-Polilio	Sub-bituminous	6.0
Semirara	Sub-bituminous/Bituminous	570.0
Surigao	Sub-bituminous/Bituminous	209.0
Zamboanga-Sibugay (Malangas)	Sub-bituminous/Bituminous	45.0
Cebu	Sub-bituminous/Bituminous	165.0
Catanduanes	Bituminous/Anthracite	1.2
Bukidnon	Unknown	50.0
Maguindanao	Unknown	108.0

Sources: USGS (2006); Ocampo (2012)

26.1.2 STAKEHOLDERS

Table 26-3 identifies potential key stakeholders in the Philippines' coal mine methane (CMM) development.

Table 26-3. Key Stakeholders in the Philippines' CMM Industry

Stakeholder Category	Stakeholder	Role
Mining companies	▪ 3 Kings Sunrise Mining Corp. ▪ A Blackstone Energy Corp. ▪ Abacus Coal Exploration & Development Corp. ▪ Adlaon Energy Development Corp. ▪ Agusan Petroleum & Mineral Corp. ▪ Aragorn Coal Resources, Inc. ▪ ASK Mining & Energy Corp. ▪ Batan Coal Resources Corp. ▪ Benguet Corp. ▪ Bislig Ventures Construction & Development Corp. ▪ Blackgem Resources & Energy, Inc. ▪ Bonanza Energy Resources, Inc. ▪ Brixton Energy & Mining Corp. ▪ Calatrava Coal Corp. ▪ Cedaphil Mining Corp.	Project hosts

Table 26-3. Key Stakeholders in the Philippines' CMM Industry

Stakeholder Category	Stakeholder	Role
Mining companies (con't)	▪ Coal Mountain Ventures, Inc. ▪ Core8 Mining Corp. ▪ D.M. Consunji-Construction Equipment Resources, Inc. ▪ D.M. Wenceslao & Associates, Inc. ▪ Daguma Agro-Minerals, Inc. ▪ Dell Equipment & Construction Corp. ▪ E-Oil & Gas Company, Inc. ▪ Filsystems, Inc. ▪ First Asian Resources & Mining Corp. ▪ Forum Cebu Coal Corp. ▪ Great Wall Mining & Power Corp. ▪ Guidance Management Corp. ▪ Ibalong Resources & Development Corp. ▪ Il Rey'c Exploration & Mining Corp. ▪ Lebach Mining Corp. ▪ LIMA Coal Development Corp. ▪ Monte Oro Resources & Energy, Inc. ▪ MS-SK Coal Corp. ▪ Oriental Energy & Power Generation Corp. ▪ Philippine National Oil Company ▪ Rock Energy International Corp. ▪ Samaju Corp. ▪ SERI ▪ Semirara Mining Corp. ▪ SKI Energy Resources, Inc. ▪ Sultan Energy Philippines Corp. ▪ Titan Mining & Energy Corp. ▪ Visayas Multi-Minerals & Trading Corp.	Project hosts
Engineering, consultancy, and related services	▪ R.M.B. Earth Science Consultants Ltd.	Technical assistance
Universities, Research Establishments	▪ Philippine Council for Industry and Energy R & D ▪ Cebu Institute of Technology	Technical assistance
Regulatory Agencies and Government Groups	▪ Philippine Department of Energy ▪ Philippine National Oil Company ▪ Philippine Department of Environment and Natural Resources – Mines and Geosciences Bureau	Project identification and assessment support

Sources: PDOE (nd); PMEA (nd); TFL (2009); USGS (2006); Ocampo (2012)

26.1.3 STATUS OF COAL AND THE COAL MINING INDUSTRY

The Philippines' largest coal producer is Semirara Mining Corp., which accounts for about 94 percent of domestic coal production (Ocampo, 2012). Additional resources are being mined in Cebu, Zamboanga Sibugay, Albay, Surigao del Norte, and Negros provinces as shown in Table 26-4.

Currently most of the coal mined in the Philippines is from the large surface mine at Semirara; however, the remainder is produced from small underground mines (Flores, 2014). The Integrated Little Baguio colliery is the Philippines' largest semi-mechanized underground mine and is located in Malangas, Zamboanga-Sibugay (PNOC-EC, 2012).

Table 26-4. Coal Production by Area 2011

Area	Production (million tonnes)	Percent of Total Production	Coal Operator
Semirara Island, Antique	7,190,363	94.47	▪ Semirara Mining Corporation
Zamboanga Sibugay	168,951	2.22	▪ PNOC-EC ▪ Filsystems ▪ Brixton Energy & Mining Corp.
Cebu	85,063	1.12	▪ Adlaon Development Corp. ▪ SERI ▪ Ibalong Resources Dev. Corp. ▪ Il Rey'c Exploration & Mining Corp.
Surigao del Sur	26,980	0.35	▪ Bislig Venture & Dev. Corp.
Albay	18,395	0.24	▪ Batan Coal Corp. ▪ Samaju Corp. ▪ Lima Coal Mining Corp. ▪ Ibalong Resources Dev. Corp.
Negros	2,060	0.03	▪ Calatrava Coal Miners' Cooperative
Small-scale Coal Mining	119,521	1.57	

Source: Ocampo (2012)

The Philippines consumes all domestically-produced coal and relies on imports to meet power generation, cement production, and industrial process demand (Ocampo, 2012). As of 2013, the country was operating 14 coal-fired power plants with combined capacity of 5,568 MW (PDOE, 2014c) as shown in Table 26-5.

Table 26-5. Coal-fired Power Plants as of 2013

Facility Name	Capacity (MW)		Number of Units	Location	Owner	Year Commissioned
	Installed	Dependable				
Pagbilao	764.0	764.0	2	Pagbilao, Quezon	TeaM Pagbilao	1996
Calaca	600.0	510.0	2	Calaca, Batangas	SEM Calaca Power Corp.	1984
Masinloc	630.0	630.0	2	Masinloc, Zambales	Masinloc-Power	1998
Sual	1,294.0	1,294.0	2	Sual, Pangasinan	TeaM Sual Corporation	1999
Quezon Power	511.0	460.0	1	Mauban, Quezon	Quezon Power Phils.	2000

Table 26-5. Coal-fired Power Plants as of 2013

Facility Name	Capacity (MW)		Number of Units	Location	Owner	Year Commissioned
	Installed	Dependable				
APEC	50.0	42.0	1	Mabalacat, Pampanga	Asia Pacific Energy Corp.	2006
UPPC	30.0	24.0	1	Calumpit, Bulacan	United Pulp & Paper Co., Inc.	1998
Mariveles Coal	651.6	495.0	2	Marveles, Bataan	GN Power Mariveles Coal Plant	2013
Mindanao Coal	232.0	210.0	2	Villanueva, Misamis	STEAG State Power Inc.	2006
PEDC Coal	164.0	164.0	2	Iloilo City, Panay	Panay Energy Development Corporation	2011
Toledo Power Corp.	88.8	60.0	4	Toledo City, Cebu	Global Business Power Corp.	1993
Cebu TPP (Salcon)	106.8	106.8	2	Naga, Cebu	Salcon Phils.	1981
CEDC Coal	246.0	246.0	3	Toledo City, Cebu	Cebu Energy Development Corporation	Testing and commissioning as of 2013
Korea Electric Power Corp. Coal	200.0	200.0	2	Naga, Cebu	KepCo-Salcon	2011
Total	**5,568.2**	**4,995.8**				

Source: PDOE (2014c)

There are also 10 cement plants operating on coal as well as six industrial plants, including smelting, and phosphate, alcohol, and rubber production (Ocampo, 2012).

26.2 Overview of CMM Emissions and Development Potential

The Global Methane Initiative (GMI) International CMM Projects Database currently identifies no CMM recovery projects in the Philippines.

A CMM project was planned by Semirara Mining Corp. which signed a memorandum of agreement in late 2009 with Endesa Carbono S.L. to implement a CMM extraction, flaring, and power generation project on Semirara Island (Gatdula, 2011); however, the project was abandoned. The proposed project would have captured methane released by the open pit mining operations through pre-mining drainage. The captured methane and the electricity generated were expected to

reduce greenhouse gas emissions by an average of 385,478 tonnes of carbon dioxide equivalent per year (UNFCCC, 2011).

A 2008 report indicated that a preliminary evaluation of CMM in the Visayan and Zamboanga Basins suggests a potential for gas drainage development during mining (Flores et al, 2008).

26.2.1 CMM Emissions from Operating Mines

Table 26-6 summarizes the Philippines' CMM emissions.

Table 26-6. Philippines' CMM Emissions (million cubic meters)

Emission Category	2000	2005	2010	2015 (projected)
Total CH_4 Emitted	14.2	30.2	26.5	29.0

Source: USEPA (2012)

The Philippines has a number of gassy coal mines, as indicated by a number of methane-related mine accidents. An explosion in the town of Imelda in Zamboanga Sibugay province caused the death of a worker and injured four others in December 2009. In 1995, a coal mine tunnel in Malangas was destroyed by a massive methane gas explosion, which killed more than 100 people (Mining-Technology.com, 2009).

26.2.2 CMM Emissions from Abandoned Mines

No information relating to recovery or use of CMM from abandoned mines was found.

26.2.3 CBM from Virgin Coal Seams

The United States Geological Survey (USGS) and the Philippines Department of Energy (PDOE) launched a collaboration to determine the methane gas content and adsorptive capacity of Philippine coal. The study entitled "Assessment of Philippine Coal Bed Methane" identified several coals, from lignite to semi-anthracite, in the country that possess large gas storage capacity. In Table 26-7 below, the results of the study are summarized. Total potential minimum coal bed methane (CBM) in-place resources in the Philippines are estimated at 16,416 million cubic meters (m^3).

Table 26-7. Philippines' Potential CBM In-Place Resources

Coal District Area	Coal Rank	Potential CBM In-Place Resources (million cubic meters)
Samar-Leyte	Lignite	183
Cotabato		1,037
Cagayan-Isabella		652 - 2,400
Negros	Sub-bituminous	5
Semirara		3,361
Surigao		1,120

Table 26-7. Philippines' Potential CBM In-Place Resources

Coal District Area	Coal Rank	Potential CBM In-Place Resources (million cubic meters)
Bataan Island	Bituminous	119
Catanduanes		36
Cebu		2,670 – 3,530
Zamboanga – Sibuguey (Malangas)	Semi-Anthracite	580 – 1,033

The potential minimum CBM in-place resources (in million m^3) estimated for Philippines coal districts based on ideal gas storage capacity (100 percent gas saturation).
Source: USGS (2006)

There are currently no CBM projects in the Philippines.

26.3 Opportunities and Challenges to Greater CMM Recovery and Use

The Philippines is a signatory to both the UNFCCC and the Kyoto Protocol (see Table 26-8). As a Non-Annex I Party to the Kyoto Protocol, it has no national emissions targets and was eligible to host mitigation projects under the Clean Development Mechanism (CDM). The Semirara CMM Project was stopped during validation as a CDM project.

Table 26-8. Philippines' Climate Change Mitigation Commitment

Agreement	Signature	Ratification
UNFCCC	June 12, 1992	August 2, 1994
Kyoto Protocol	April 15, 1998	November 20, 2003

Source: UNFCCC (2014)

26.3.1 Market and Infrastructure Factors

As mentioned in section 26.1.1, the PEP projects coal demand to grow by 70 percent between 2012 and 2030. With the increase in power demand, coal mining is expected to remain a steady source for power plants. Additionally, natural gas demand is expected to grow in the Philippines, opening up opportunities for CMM and CBM. As of 2013, installed natural gas power generation capacity was 3,537 MW including 675 MW of gas turbine capacity, or a 20 percent share of overall generating capacity (PDOE, 2014c). In 2013, the Philippines produced 3.5 billion m^3 of natural gas, consuming 3.3 billion m^3 for power production and 75 million m^3 for industrial use, including the Pilipinas Shell Refinery (PDOE, 2014d). During 2013, an average of 19 compressed natural gas (CNG) buses were loaded daily.

Total natural gas demand for the year 2014 is projected to reach 3.8 billion m^3, reflecting a projected increase in consumption of 13 percent in the power generating sector, 24 percent in the industrial sector and 74 percent in the transport sector. The transportation sector will see large gains as additional buses are expected to be brought online in 2014, and bidding for equipment and civil works for two additional CNG stations was completed in late 2013 (PDOE, 2014e).

26.3.2 Regulatory Information

The Philippine Department of Energy (PDOE) is the primary regulatory entity involved with CMM development. The PDOE regulates mine safety and sets limits for methane concentration in mine workings and ventilation air (PDOE, 1981). In 2007, at the Association of Southeast Asian Nations Forum on Coal, the Philippines discussed modifying the contracts and licenses for CBM development under coal operating contracts instead of service petroleum contracts (ASEAN, 2007). No guidelines or circulars concerning CBM development are available from the PDOE.

26.4 Profiles of Individual Mines

26.4.1 Panian Mine, Semirara Mining Corporation

Semirara Mining Corporation (Semirara) is the largest coal producer in the Philippines and is engaged in surface mining of thermal coal from the Panian mine on Semirara Island, in Antique province. Semirara Island covers an area of 55 square kilometers (km) and is located 350 km south of Manila. Coal resources have been discovered at four separate sites on Semirara Island, namely Panian, Bobog, Himalian and Unong; however, Semirara operates one mine at the Panian site. Operations at Unong mine ceased in 2000 after 17 years of extraction. Coal produced at the Panian mine is sold domestically to power plants, cement plants, paper mills, textile dying plants, canneries, food factories, a sugar mill, and a fertilizer plant. In 2007, Semirara commenced export to China and is now selling coal to China, India, Japan, Taiwan, and Thailand. In 2010, remaining recoverable reserves at Panian mine were estimated at 42.41 million metric tonnes (Semirara, 2014).

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