Extended Annual Review Report

Project Number: 7178/1923
February 2007

Viet Nam: Loan and Political Risk Guarantee to the Phu My 3 Power Project

In accordance with ADB's public communications policy (PCP, 2005), this completion report excludes information referred to in paragraph 126 of the PCP.

Asian Development Bank

CURRENCY EQUIVALENTS

Currency Unit – dong (D)

		At Appraisal	At Project Completion
		23 August 2002	28 February 2004
D1.00	–	US$0.0001	US$0.00006
US$1.00	–	D15,337	D15,738

ABBREVIATIONS

ADB	–	Asian Development Bank
BOO	–	build-own-operate
BOT	–	build-operate-transfer
BOT Company	–	Phu My 3 BOT Power Company Limited
BP	–	BP Holdings B.V.
BPEOC	–	BP Exploration Operating Company Limited
COD	–	commercial operations date
CSP	–	country strategy and program
DONRE	–	Department of Natural Resources and Environment
DSCR	–	debt service coverage ratio
EIA	–	environmental impact assessment
EIRR	–	economic internal rate of return
EMG	–	environmental management group
EPC	–	engineering, procurement, and construction
EVN	–	Electricity of Vietnam
FIRR	–	financial internal rate of return
IPP	–	independent power producer
ISO	–	International Organization for Standardization
LRMC	–	long-run marginal cost
LTMC	–	long-term maintenance contract
MIGA	–	Multilateral Investment Guarantee Agency
MOI	–	Ministry of Industry
MOST	–	Ministry of Science and Technology
NO_x	–	nitrogen oxide
OHSAS	–	Occupational Health and Safety Assessment Series
O&M	–	operation and maintenance
PDMP	–	Power Development Master Plan
PetroVietnam	–	Vietnam Oil and Gas Corporation
PM 2.2	–	Phu My 2.2. Power Project
PM3	–	Phu My 3 Power Project
PMPGC	–	Phu My Power Generation Center
PPA	–	power purchase agreement
PPP	–	public-private partnership
PRG	–	political risk guarantee
RRP	–	report and recommendation of the President
SCI	–	Sembcorp Industries Limited
SO_2	–	sulfur dioxide
TA	–	technical assistance
WACC	–	weighted average cost of capital
XARR	–	extended annual review report

WEIGHTS AND MEASURES

Btu (British thermal unit)	–	252 calories
kV (kilovolt)		1,000 volts
kW (kilowatt)	–	1,000 watts
MW (megawatt)	–	1,000,000 watts
GWh (gigawatt-hour)	–	1,000,000 kilowatt-hours
TWh (terawatt-hours)	–	1,000,000,000 kilowatt-hours

Vice President	L. Jin, Operations Group 1
Director General	R. Bestani, Private Sector Operations Department
Director	J. Yamagata, Private Sector Operations Department
Team leader	S. Thongplengsri, Investment Specialist, Private Sector Operations Department
Team member	R. Caluag, Associate Project Analyst, Private Sector Operations Department

CONTENTS

EXECUTIVE SUMMARY

In October 2002, the Board of Directors of the Asian Development Bank (ADB) approved (i) a loan of up to US$40 million, and (ii) a political risk guarantee (PRG) covering a principal amount of up to US$35 million and interest thereon, in favor of commercial lenders to Phu My 3 BOT Power Company Limited (the BOT Company) for the Phu My 3 Power Project (PM3). The funds, sourced from ADB's ordinary capital resources, were to be used to construct a 716.8 megawatt gas-fired combined-cycle power station located in Phu My industrial complex in Tan Thanh district of Ba Ria–Vung Tau province about 75 kilometers southeast of Ho Chi Minh City, Viet Nam. This extended annual review report assesses ADB's support to help develop PM3. It is based on the findings of the Extended Annual Review Mission fielded during 16–20 October 2006, as well as information gathered from legal and ADB Board documents, audited financial statements, and related operation and business reports.

PM3 was structured as one of the first independent power producer (IPP) projects under a 23-year build-operate-transfer (BOT) arrangement with the Ministry of Industry. PM3 was developed and is operated by the BOT Company, a limited liability company incorporated in Viet Nam. PM3 was constructed over 2.6 years at a cost of US$385.9 million. ADB provided a direct loan without government guarantee of US$37.5 million and a PRG to cover commercial bank loans of US$30.0 million. The BOT Company entered into a 20-year power purchase agreement with Electricity of Vietnam as offtaker of electricity under the Project and a 20-year gas supply agreement with Vietnam Oil and Gas Corporation to source gas from Nam Con Son basin in southern Viet Nam. Since commercial operation date on 1 March 2004 until the end of June 2006, PM3 supplied about 10,420 gigawatt-hours of electricity to Electricity of Vietnam.

The evaluation criteria used for PM3 are based on the draft guidelines for the preparation of extended annual review reports for private sector investment operations. In this regard, ADB's participation in PM3 was evaluated using four criteria: (i) development impact, (ii) ADB's investment profitability, (iii) ADB's work quality, and (iv) ADB's additionality.

The development impact of PM3 is rated excellent. It was evaluated using four criteria: (i) private sector development; (ii) business success; (iii) economic sustainability; and (iv) environment, social, health, and safety performance. The contribution to private sector development is rated excellent overall. PM3 is the first large-scale BOT gas-fired power plant and contributes to more reliable base load and more diversification of energy sources in Viet Nam. PM3 also serves as a successful model for the development of an integrated gas for power project. The contractual structure and legal documentation could be used as basis for future IPP projects. The smooth operation of PM3 could create demonstration and catalytic effects for future private sector participation in the power sector.

In terms of business success, PM3 is rated satisfactory. PM3 has been operating satisfactorily and involves the transfer of technology and best practices in power plant operation.

PM3's economic sustainability as well as its environment, social, health, and safety performance are rated excellent. The economic internal rate of return was recalculated and is higher than indicated in the Board document. PM3 was certified International Organization for Standardization (ISO) 9001 for quality management, ISO 14001 for environment management standards, and Occupational Health and Safety Assessment Series 18001 for occupational health and safety management system. PM3 has had excellent safety records for more than 1,000 days of operation without any incidents resulting in lost time and a satisfactory environment record with zero breach.

The investment outcome of PM3 is rated satisfactory as interest payments were made on time. Since project approval, Viet Nam's country risks have improved significantly. Meanwhile, the criteria for ADB's work quality consisting of (i) screening, appraisal, and structuring; (ii) monitoring and supervision; and, (iii) ADB's role and contribution are all rated excellent. ADB played an important role as a provider of a direct loan and PRG to catalyze commercial financing. ADB's involvement also enhanced confidence of the project sponsors to invest in PM3 as the first large-scale IPP given the strength of ADB's public and private operations and long-term participation in the development of the power sector in Viet Nam.

Overall, PM3 is rated excellent. PM3 succeeded in meeting its primary development objectives to (i) ease Viet Nam's power supply shortfall in a least cost manner and reduce the power system's dependency on hydropower, (ii) expand consumer access to competitively priced and reliable power supply within a relatively short time, (iii) support the commercialization of indigenous natural gas, and (iv) promote good commercial practices in power plant operation and management.

Two main lessons are drawn from PM3. For any future integrated gas for power project, the timing for upstream and downstream projects must coincide to ensure the most efficient use of resources. The Government must consider tradeoffs between (i) direct negotiation processes and timely project development, and (ii) competitive bidding processes and the consequent least cost tariffs. Project document negotiations need to be synchronized to ensure consistency in terms and principles. In conclusion, ADB can draw on experiences and lessons from PM3 as one of the successful examples for future involvement in the power sector.

I. THE PROJECT

A. Project Background

1. In October 2002, the Board of Directors of the Asian Development Bank (ADB) approved (i) a loan of up to US$40 million, and (ii) a political risk guarantee (PRG) covering a principal amount of up to US$35 million and interest thereon, in favor of commercial lenders to Phu My 3 BOT Power Company Limited (the BOT Company) for the Phu My 3 Power Project (PM3). The funds, sourced from ADB's ordinary capital resources, were to be used to construct a 716.8 megawatt (MW) gas-fired combined-cycle power station located in Phu My industrial complex in Tan Thanh district of Ba Ria–Vung Tau province about 75 kilometers southeast of Ho Chi Minh City, Viet Nam. PM3 is to provide a lower cost and more reliable power supply for the national power grid, as well as for industrial parks and population centers in southern Viet Nam.

2. In the early 1990s, a major natural gas reserve was discovered at the Nam Con Son basin, about 370 kilometers offshore in southern Viet Nam, representing about 40% of the total known natural gas reserves of the country. The Nam Con Son basin gas production project was awarded to BP plc, one of the world's largest petroleum and petrochemical groups, and its partners through international competitive bidding. Simultaneous with the award, the Government of Viet Nam started negotiations with BP plc for the development of PM3 as an integral part of the Nam Con Son basin gas project, which requires committed offtakers. In December 1998, the Ministry of Industry (MOI) approved the feasibility study for PM3 to be developed on a build-operate-transfer (BOT) basis.

3. PM3, a gas-fired power plant, was expected to enhance the diversification of energy sources away from hydropower and enable efficient use of indigenous natural gas. During project inception in 2000, Viet Nam had total installed capacity of 6,195 MW, available capacity of 5,814 MW, and peak demand of 4,890 MW. The country's electricity generation capacity consisted of hydropower plants producing 55%, gas turbine and diesel plants 23%, and other thermal plants 22%. A substantial portion of electricity demand remained unserved with power generation per capita of 341 kilowatt-hours in 2000. In the base-case scenario of the 5th Power Development Master Plan, the country was expected to need to expand its installed capacity by more than four times from 7,771 MW in 2001 to 34,791 MW in 2020. During this period, the country will require total investments of almost US$46 billion to maintain supply-demand equilibrium including US$22.3 billion in new generation capacity. Electricity of Vietnam (EVN), the dominant state-owned corporation engaged in the generation, transmission, and distribution of electric power, does not have capacity to finance these substantial investments. Realizing this constraint, the Government has been strongly encouraging investments in independent power producers (IPPs),[1] which accounted for only 8% of generation capacity in 2000.

4. At the time of project inception, the Government had not considered bidding for any power projects. The decision to conduct international competitive bidding for Phu My 2.2 Power Project (PM2.2)[2] was made later. Nevertheless, PM3 and PM2.2 were processed in parallel. PM3's tariff was benchmarked against that of PM2.2, thereby providing assurance that the tariff is at the lowest level. In January 2001, the Government approved the tariffs of both PM3 and

[1] In the context of Viet Nam, IPP arrangements comprise three main types, (i) BOT or build-own-operate projects wholly owned by publicly owned Vietnamese entities other than EVN, (ii) joint ventures involving EVN investments with other partners, and (iii) BOT or build-own-operate projects wholly owned by private sector investors.

[2] On 2 July 2002, the ADB Board approved a loan of $50 million and a PRG under the coguarantee program of $25 million to Mekong Energy Company Ltd. for the Phu My 2.2 power project.

PM2.2. Following the issuance of the investment license and signing of all major project agreements in May 2001, the sponsors approached ADB for assistance in August 2001 and reaffirmed their request in January 2002. In response to the sponsors' request, ADB provided concept clearance on 21 February 2002 and fielded due diligence missions during March–May 2002.

5. The BOT Company was established as a special purpose company incorporated in Viet Nam. It is a joint venture among three parties, each owning 33 1/3%: (i) B.P. Holdings B.V. (BP), a wholly owned subsidiary of BP plc based in the Netherlands; (ii) SembCorp Utilities Private Limited, a wholly owned subsidiary of SembCorp Industries based in Singapore; and (iii) a Japan-based consortium comprising Kyuden International Corporation, a 100% subsidiary of Kyushu Electric Power Co., Inc, a Japanese regional power producer, and Sojitz Corporation (formerly Nissho Iwai Corporation), a leading Japanese industrial and trading house.

B. Project Features

6. PM3 involved the construction, operation, and transfer of a 716.8 MW gas-fired combined-cycle power plant providing dependable capacity to the grid operated by EVN. It represents the largest privately owned power plant built under a 23-year BOT contract between MOI and the BOT Company. PM3 consists of three facilities: (i) the power plant, (ii) the early transfer infrastructure facilities provided by the BOT Company, and (iii) the Viet Nam side infrastructure facilities provided by the Government. The power plant facilities are to be transferred to EVN after 20 years of operation. The BOT Company covered the cost of building the early transfer infrastructure facilities comprising the interconnection line, part of the cooling channel, the liquid fuel pipeline, and the data connection; and transferred them to EVN in July 2006. The Government covered the cost of the Viet Nam side infrastructure facilities, which include the Phu My distribution center, part of the cooling channel, the port and secondary fuel delivery facilities, and the gas distribution facilities.

7. Under the power purchase agreement (PPA), EVN will purchase the capacity and energy output of the plant for 20 years following the commercial operation date (COD) on a take-or-pay basis. Under the gas supply agreement, Vietnam Oil and Gas Corporation (PetroVietnam) will supply PM3 with natural gas from the Nam Con Son basin delivered via the Nam Con Son pipeline over 20 years. The gas price is a pure pass-through item under the PPA, whereby EVN pays a tariff incorporating a fuel charge.

8. The 23-year BOT contract entered into by MOI, the BOT Company, and the sponsors defines the rights and obligations of the relevant parties in implementing PM3. It entitles the BOT Company and sponsors to assign their rights under the project agreements, among other things, as security to the financing parties. In addition to the BOT contract, PM3 benefits from the government guarantee, issued by the Ministry of Planning and Investment for and on behalf of the Government in favor of the sponsors and the BOT Company, which guarantees the performance obligations of the Vietnamese counterparties under the project agreements including EVN, PetroVietnam, and MOI. The guarantee also covers the convertibility into and availability of dollars, and provides that the legal and tax regimes agreed upon will remain valid and stable for the duration of PM3.

C. Progress Highlights

9. PM3 was constructed under a fixed-price, turnkey EPC contract[3] over 2.6 years, from August 2001 to February 2004. The completion date was about 2 months behind the original schedule. Siemens AG was awarded the EPC contract through competitive bidding in 1999 and also provides maintenance services to PM3 under the long-term maintenance contract (LTMC) executed later in May 2002.

10. PM3 was completed at a total cost of US$385.9 million. PM3 was financed by debt of US$289.4 million and equity of US$96.5 million. The debt financing comprises a direct loan from ADB of US$37.5 million, a direct loan from Japan Bank for International Cooperation, and commercial bank loans. In addition to providing a direct loan without government guarantee, ADB provided a PRG in favor of five commercial lenders to cover US$30.0 million of their loans.[4] PM3 is the first project for which ADB provides parallel PRG cover with the Multilateral Investment Guarantee Agency (MIGA) and Nippon Export and Investment Insurance.

11. Overall, PM3 has contributed to broader access to competitively priced and reliable power supply in Viet Nam. Furthermore, as a gas-fired power plant, it helps diversify energy sources away from hydropower, which accounted for the largest share of total installed capacity in the country at the time of the project inception. PM3's basic data is in Appendix 1. A detailed project description and a summary profile of the sponsors are in Appendix 2.

II. PROJECT EVALUATION

A. Overview

12. The assessment of PM3's development outcome is based on four categories: (i) private sector development, (ii) ADB's investment profitability, (iii) ADB's work quality, and (iv) ADB's additionality. The main categories and subcategories were rated according to the draft guidelines for the preparation of extended annual review reports for private sector investment operations.

B. Development Outcome

13. PM3 achieved the development impact objectives set out in the RRP by (i) providing additional reliable base-load capacity to mitigate the forecast power shortage in Viet Nam especially in the dry season, (ii) expanding consumer access to power and helping the Government attain its goal of electrifying 85% of the Vietnamese households by 2005, (iii) supporting the commercialization of indigenous natural gas to replace imported fuel oil and provide environmentally clean energy, (iv) transferring the best available technology and best practices in power plant operation, and (v) bringing in private sector investments in the power sector and freeing up limited Government funds for use in areas that require public expenditure. The description of Viet Nam's power sector is in Appendix 3.

---

[3] The EPC contract includes performance guarantees for on-time completion, capacity heat rate, and availability targets backed by liquidated damages provision.

[4] Credit Agricole Indosuez; Credit Lyonnais S.A.; Fortis Bank S.A./N.V.; Mizuho Corporate Bank, Ltd.; Bank of Tokyo-Mitsubishi, Ltd.

14. The assessment of private sector development impacts classified as beyond company impacts and direct company impacts is in paras. 15-20. The detailed assessment of individual indicators is provided in the private sector development impact checklist in Appendix 4.

1. Private Sector Development

a. Beyond Company Impacts

15. PM3 and PM2.2, the only large-scale foreign-owned BOT projects in the country, have contributed significantly to a higher share of IPPs as well as share of gas-fired power plants in Viet Nam. Currently, Viet Nam has total installed capacity of 11,386 MW comprising 78% from EVN-owned power plants and 22% from non-EVN-owned power plants.[5] Of the non-EVN-owned or IPP projects, PM3 and PM2.2 represent more than 50%, with each project accounting for about 10% of total system capacity. In addition to PM3 and PM2.2, no other BOT project is foreign owned. Other foreign-owned IPP projects are of smaller scale and implemented under a build-own-operate structure. Many IPP projects that have either operated subsequent to the operation of PM3 or are to be implemented on a priority basis are scheduled for operation by publicly owned agencies as the Government prefers to retain control over implementation to ensure timely project completion before the forecast short-term power shortages.

16. Aside from these projects, the Government strongly promotes private sector investments in the power sector. According to the Electricity Law, which came into effect in July 2005, the state monopoly will be limited to power sector transmission, national load dispatch, and strategically important large power plants. Investments from either foreign private sector investors or joint ventures between foreign investors and domestic enterprises are encouraged for nonstrategic power generation and power distribution. The Government strongly promotes foreign investments in the power sector and recently passed the Investment Law to ensure more equal treatment of foreign and local investors. The law states various modalities of investments including build-own-operate and BOT arrangements. The successful operation of PM3 creates a substantial demonstration impact for foreign investments in Viet Nam's power sector.

17. Currently, no model contractual framework is available for IPPs. Detailed regulations need to be developed to support private sector investments in general under the Investment Law and specifically in the power sector under the Electricity Law and new road map for power market development. The Government, EVN, and the BOT Company indicate that PM3 has been implemented smoothly, and the contractual framework and legal documentation of PM3 could be used as a basis for the future IPPs. Nevertheless, regulations, guidelines, or model documents will need to be developed taking into consideration the changing regulatory and institutional landscape. International experience and lessons should be considered. In this regard, ADB has provided technical assistance (TA) to help the new Electricity Regulatory Authority of Viet Nam, which was established as a separate institution in October 2005, design market structure and market rules, and provide guidelines for procuring new generation capacity.[6] The TA activities include reviewing existing PPAs, including those of PM3 and PM2.2, and recommending how IPPs can participate in the market.

18. PM3 supported the development of indigenous gas production in Viet Nam by serving as an integral part of the Nam Con Son basin gas project, which requires committed offtakers. The

[5] Including those owned by other state-owned entities and private sector sponsors.
[6] ADB. 2006. *Technical Assistance to Viet Nam for Power Market Design*. Manila.

block 6.1 gas field and the Nam Con Son pipeline were developed by BP together with PetroVietnam and other private sector partners.[7] BP applied modern technology to manage the Project, which involved the development of the Lan Tay and Lan Do fields, and the laying of a two-phase offshore pipeline, the longest of its kind in the world. Gas production started in November 2002 and currently supplies about 40% of Viet Nam's electricity demand. During the development and operation, BP transferred know-how and technical skills to PetroVietnam's staff. BP plans to replicate the gas for power model of PM3 to the development of other projects in Viet Nam, such as development of a gas field and a power plant in Nhon Trach.

b. Direct Company Impacts

19. The sponsors have transferred considerable technology and know-how to local staff, especially in the areas of plant operation, and health and safety procedures through both on-the-job and classroom training. PM3 is currently implementing a localization plan to promote competent local staff to replace some expatriate staff in middle management positions. The BOT Company arranged training programs for its staff in various areas including operation, safety management, finance, English language, and computer programs.

20. In terms of governance and sound operating systems, PM3 has obtained International Organization for Standardization (ISO) 9001 certification for quality management, ISO 14001 certification for environment management standards, and Occupational Health and Safety Assessment Series 18001 certification for occupational health and safety management system. In addition, PM3 set standards in terms of environmental, health, and safety procedures by taking the lead in establishing an environmental management group (EMG) for power plants located in the Phu My Power Generation Center and shared knowledge in environmental management in the EMG.

21. The contribution to private sector development is rated excellent overall and on most individual indicators in the private sector development impact checklist in Appendix 4.

2. Business Success

22. PM3's operating and financial performance is considered satisfactory. Higher capacity charges offset the lower than projected energy charges resulting from lower than projected dispatch factors. Operating profits and net profits in 2005, which is the first full year of operation, were slightly higher than the original projections.

23. PM3 has been servicing debt obligations on time and was able to repatriate profits to the shareholders. The project sponsors view PM3 as a successful investment and are planning to explore other power projects in Viet Nam. BP plans to replicate this model of a gas for power project for the development of other gas fields and power plants. The business success is, therefore, rated satisfactory.

3. Economic Sustainability

24. PM3 was included as part of the least cost generation source for Viet Nam even under the reduced load growth scenario. PM3's tariff was benchmarked against that of the PM2.2 power project, which was awarded through competitive bidding to ensure the least cost tariff. PM3 has contributed to additional reliable base-load capacity, especially during the dry season

[7] BP holds a 35% share in block 6.1 gas field and about 32.67% in the Nam Con Son pipeline.

when hydropower plants are operating at a low load. Since 1997, Viet Nam has experienced power shortage during the dry season every year except 1999. The problem became more serious in 2005 with the shortage of 290 GWh compared with the annual average of 9.6 GWh during 2000–2004. Given PM3's role as one of the base-load power plants and strong demand for electricity, its output is considered incremental. Since obtaining an adequate measure of consumer willingness to pay is difficult without survey data, the long-run marginal cost was used as a supply-side proxy to capture consumer willingness to pay and to estimate PM3's economic benefits. The construction and O&M costs of the associated infrastructure facilities, including the transmission lines and distribution network, were also taken into consideration in calculating economic costs of PM3.

25. The EIRR was recalculated and is higher than the original estimate in the RRP, due to differences in the calculation of economic benefits and estimate of project costs of associated facilities. The revised economic benefits are based on a study that includes analysis of long-run marginal cost while the RRP figures were based on average retail tariffs. Although the assumption in this extended annual review report is more optimistic than that in the RRP, it is believed to be reasonable in light of strong growth in demand for electricity in Viet Nam. The estimated project costs of associated facilities were also revised based on the actual data together with analysis of power transmission and distribution systems in the above study. PM3's economic sustainability is, therefore, rated excellent.

4. Environmental, Social, Health, and Safety Performance

26. ADB classified PM3 as environment category A with potential environmental impacts if the appropriate mitigation measures are not properly incorporated in the design and O&M.[8] PM3 operates continuously, 24 hours per day, 365 days per year except during maintenance; and supplies electricity to the grid according to the dispatch instructions from the national load dispatch center of EVN. The primary fuel is natural gas from Nam Con Son basin. The plant is also capable of operating on distillate fuel oil if the gas supply is interrupted.

27. PM3 has conducted environmental monitoring consistent with the environmental impact assessment in general, and submits a quarterly report to the Department of Natural Resources and Environment in accordance with the regulatory requirements. In addition, the EMG pioneered by PM3 recruited the Vietnam Environment and Sustainable Development Institute to monitor environmental impacts in the Phu My Power Generation Center and submit reports to the EMG on a quarterly basis.

28. With natural gas as the primary fuel, nitrogen oxides (NO_x) comprise the only stack emissions of significant interest and are measured continuously. The plant is equipped with low NO_x burners for operation with natural gas. The emissions of NO_x and sulfur dioxides, aqueous discharges, and noise comply with Vietnamese standards and World Bank guidelines. Environmental mitigation measures as indicated in the summary environmental impact assessment have been implemented. Furthermore, the Natural Resources and Environment section of People's Committee of Ba Ria-Vung Tau nominated PM3 for consideration by the Board of the Environmental Award, Ministry of Natural Resources and Environment, as a candidate for the 2006 environment award on the basis of strict observation of the laws relating

[8] The environmental impact assessment report for the Project was prepared by ESB International, Ireland, in January 2002 in accordance with the scope and format under the World Bank's Operations Policy 4.01: Thermal Power: Guidelines for New Plant in the World Bank's *Pollution Prevention and Abatement Handbook* (1998). The summary environmental impact assessment was circulated to ADB's Board of Directors on 9 May 2002.

to environmental protection and active participation in education and community awareness campaigns on the environment.[9]

29. PM3 has developed a procedure to assess health and safety risks in workplace conditions and activities to ensure all control measures are in place with its accreditation to Occupational Health and Safety Assessment Series 18001. As of September 2006, the plant has had an excellent safety record of over 1,000 days without any time lost to workplace incidents. PM3 considers health and safety a high priority and allocates substantial budget for this purpose. A detailed assessment of environment, health, and safety performance is provided in Appendix 5.

30. The project site occupies 24 hectares of the 152 hectare Phu My Power Generation Center, leased from the Urban Development and Construction Company of Ba Ria-Vung Tau province, which acquired, leveled, and fenced the project site. The resettlement of affected families was completed in 1996. The Urban Development and Construction Company dealt with all issues regarding compensation. PM3 had no direct role or participation in this regard. The project site is not in areas inhabited by indigenous peoples so it does not impact indigenous peoples.

31. In terms of social impact, PM3 contributed to an increase in the country's electrification rate. By 2004, 88% of households received electricity, ahead of the targeted rate of 85% for 2005. Associated with PM3 is the development of early transfer infrastructure facilities and Viet Nam side infrastructure facilities that expand the distribution of the gas supply and serve as key infrastructure for the electricity transmission network in the south.

32. PM3 promoted job creation during construction and operation. At the community level, PM3 stimulates economic development in Tan Thanh district where the plant is located. PM3 was recognized as the best taxpayer in Ba Ria–Vung Tau province. The gross domestic product per capita in the district increased by an annualized rate of about 23% during 2002–2005, significantly higher than the overall growth rate of the country. The BOT Company has also initiated various community development campaigns.

33. The BOT Company gives high priority to the environment, health, and safety. It was the key driving force for establishing the EMG, and coordinates with the local authority to ensure proper measures are taken. In terms of social impact, PM3 has contributed to enhancing the electrification rate in Viet Nam, created jobs, and engaged in various community support programs. In view of these, PM3's environment, social, health, and safety performance is rated excellent.

C. ADB's Investment Profitability

34. The investment outcome is rated satisfactory. The interest rate margin charged on ADB's direct loan was benchmarked against that of ADB's direct loan to PM2.2, which was considered the most direct comparable, and to the composite margin of the PRG-covered loan.[10] The PRG pricing and fees were derived from the comparison with the terms of the MIGA PRG and the PRG pricing for PM2.2, in which ADB is acting as the Guarantor of Record. Since project approval, Viet Nam's country risks have improved significantly. Viet Nam's sovereign

[9] PM3 was awarded by the *Saigon Times* as one of the top companies in the area of environmental protection in 2006.

[10] The sum of the commercial banks' own lending margin and the PRG premium.

credit rating was upgraded from B1 in July 1998 to Ba3 in July 2005 and Ba2 in May 2006 by Moody's. Standard & Poor's assigned a credit rating of BB– in May 2002 and revised its outlook to positive from stable in October 2005 given the excellent export-led growth prospects, conservative policy management, and favorable external debt position.

35. Since the COD, PM3 has never experienced any problems regarding EVN payments. PM3 has been making interest payments on time. Loan repayments that commenced on 1 March 2005 have been made on time with final repayment scheduled in 2016. ADB's investment profitability is rated satisfactory.

D. ADB's Work Quality

36. ADB's work quality is assessed excellent taking into consideration three categories: (i) screening, appraisal, and structuring; (ii) monitoring and supervision; and (iii) ADB's role and contribution.

1. Screening, Appraisal, and Structuring

37. ADB took the lead role in the due diligence process that covered key project issues including the competitiveness of the project tariff, financial sustainability of the offtaker, and reasonableness of the buyout option of the Government provided in the PPA. At the time of project processing, the Government also awarded PM2.2 through a competitive bidding process. Both PM3 and PM2.2 were among the first IPPs of significant scale and major users of indigenous gas. Being a direct lender and provider of PRG for both projects, ADB played a critical role in mobilizing commercial financing since commercial banks hesitated to lend on an uncovered basis given the market conditions, political situation, and lack of track record for IPP projects in Viet Nam at that time. PM3 represents the first occasion in which ADB, MIGA, and Nippon Export and Investment Insurance worked in parallel as political risk guarantors and/or insurers on the same transaction. This collaboration is in line with the ADB policy to increase operation cooperation and risk sharing with other political risk guarantors and/or insurers, including multilateral and bilateral agencies such as MIGA and Nippon Export and Investment Insurance.

38. PM3 was structured as a typical project finance transaction. PM3 was executed under a 23-year BOT contract entered into by MOI, the BOT Company, and the project sponsors. The BOT contract specifies the rights and obligations of all the relevant parties in implementing PM3. The Government also provides guarantee undertakings to cover performance obligations of the Vietnamese counterparties under the project agreements. Processing both PM2.2 and PM3 during the same period facilitated negotiations with the Government, especially on the issue of tariff increase, and expedited the finalization of project documents by adopting standardized documents. ADB's Board of Directors approved PM3 on 18 October 2002. Financial closure was achieved with the signing of the finance documents on 12 June 2003; the first disbursement was made on 20 November 2003.

39. The ADB PRG covers (i) currency convertibility and transfer; (ii) expropriation, confiscation, and nationalization; (iii) political violence including war, terrorism, and/or civil disturbances; and (iv) inability of the ADB guaranteed lenders to enforce any arbitral award following breach of contract, including payment default of the Government under its guarantee in respect of certain obligations of the Vietnamese parties under the project agreements. The coverage of the ADB PRG enhances the confidence of commercial banks participating in the transaction. The participation of ADB as one of the cofinanciers also brought confidence to the

private sector sponsors given the long-term involvement of ADB and continual policy dialogue with the Government in the development of the power sector.

40. ADB's performance in terms of screening, appraisal, and structuring is rated excellent.

2. Monitoring and Supervision

41. ADB has been closely monitoring project implementation. The Common Terms Agreement enumerates the reporting covenants of PM3, which include the submission of annual forecasts, financial statements including those of EVN and PetroVietnam, O&M reports and programs, operating budgets and reports, health, safety and environment reports, and insurance documentation. The Common Terms Agreement specifies the timing for submission of these reports. With the exception of the financial statements of EVN and PetroVietnam, PM3 has complied with all reporting requirements in a timely manner.[11]

42. ADB participation in both PM3 and PM2.2 enabled information sharing on certain key areas. Moreover, ADB's Private Sector Operations Department also coordinated with the Southeast Asia Department to follow up on compliance with covenants relating to EVN's financial performance under certain public sector projects, and general development in the power sector. Post board approval in 2003 and following the COD in 2004, the Private Sector Operations Department fielded two missions. The first mission was in November 2005 for an annual review and the second in October 2006 for the extended annual review. Both missions included meetings with PM3 management and site visits for physical inspection of the plant's operations. The Extended Annual Review Mission included meetings with MOI, EVN, Electricity Regulatory Authority of Viet Nam, and BP to assess the overall development outcome of PM3 and progress in the development of the power sector in Viet Nam.

43. ADB's performance in terms of monitoring and supervision is, therefore, rated excellent.

3. ADB's Role and Contribution

44. PM3 supported the Government's reform objective of promoting private sector provision of power generation requirements through a BOT framework as stated in its Power Sector Policy Statement (August 1997) and the 5th Power Development Master Plan (June 2001). PM3 is also consistent with ADB's sector strategy that supported private sector investments in the sector to free up Government funds for funding of the basic social sector, thereby contributing to the overarching goal of poverty reduction. PM3 is in line with the Viet Nam country strategy and program (CSP) (2002-2004) at the time of project approval.[12] Promotion of sustainable economic growth through private sector development was one of the strategic priorities for ADB under the 2002–2004 CSP (footnote 19), which advocates ADB playing a catalyzing role for private investment in infrastructure provision including the use of PRG to address creeping expropriation through ex-post introduction of taxes and fees and breach of contract. PM3 is also consistent with the current CSP (2007–2010),[13] which supports ADB's private sector operations through the use of its investment products, i.e., equity, debt, political risk guarantees, and partial credit guarantees, and TA to promote expansion of power generation capacity in Viet Nam.

45. ADB's role and contribution to PM3 is, therefore, rated excellent.

---

[11] PM3 explained in practice, despite its request, the timing for submission of reports by EVN and PetroVietnam is beyond its control.
[12] ADB. 2002. *Country Strategy and Program (2002-2004): Viet Nam*. Manila.
[13] ADB. 2006. *Country Strategy and Program (2007-2010): Viet Nam*. Manila.

E. ADB's Additionality

46. PM3 was among the first BOT IPPs in Viet Nam. The Government did not have experience in implementing a similar large-scale BOT project. As a result, ADB added significant value during PM3's execution phase by building confidence among commercial lenders and project sponsors. ADB's role as a provider of PRG enhances protection to commercial lenders in addition to the guarantee undertakings from the Government. Moreover, ADB has been a long-term partner with the Government in developing the power sector. During project inception, ADB's public sector operations provided TA to develop a road map for power sector reform that recommended the unbundling and commercialization of EVN, establishment of tariff regulation for power market, and creation of a power market.[14] The complementarities between ADB's public and private sector operations promote confidence among project sponsors and financiers, and ensure that the evolving regulatory and institutional framework will be on track. Without ADB assistance, the financial closure of PM3 would not have been finalized on a timely basis or with appropriate financing terms given perceived high country risks and lack of precedent cases for large-scale BOT IPPs in the country. The successful operation of PM3 create a demonstration impact for the development of future foreign-owned IPPs in Viet Nam. The project sponsors are considering other opportunities in Viet Nam and indicate potential collaboration with ADB in a similar financing structure.

47. ADB will continue to remain actively involved in the development of the power sector in Viet Nam. The Private Sector Operations Department is coordinating with the Southeast Asia Department to explore other potential large-scale power projects that could be structured in the form of public-private partnerships. The current CSP continues to support private sector investments and public-private partnership financing modalities to finance infrastructure requirements. ADB will provide TA to support MOI in undertaking the tender process for O Mon II[15] as a build-own-operate or BOT project by an IPP. The expected outcomes include a set of draft project agreements such as a PPA, an implementation agreement, a gas supply agreement, and a land-lease agreement to be used in the tendering of O Mon II. ADB is also considering a public-private partnership modality to support some other thermal power projects. In this regard, the existing legal documentation and contractual arrangements of PM3 in conjunction with international best practices, and current requirements of financial institutions can be used as the basis for the design of a contractual framework that could also be applicable to similar power projects.

48. ADB's financial assistance was crucial for the successful financial closure and timely realization of PM3. ADB's involvement and supervision of PM3 has helped to ensure the operation meets standards and complies with environmental and social safeguard requirements. Furthermore, the successful implementation of PM3 provides lessons and know-how for future development of other IPPs including the projects under consideration for potential ADB assistance. ADB's additionality is, therefore, assessed as excellent.

F. Conclusion and Overall Rating of the Operation

49. In conclusion, PM3 is rated excellent. The ratings are summarized in Table 2. PM3 is among the first BOT projects in the power sector and the first integrated gas for power project in

[14] ADB. 2001. *Technical Assistance to the Socialist Republic of Viet Nam on Roadmap for Power Sector Reform*. Manila.

[15] O Mon II is one of 4 thermal power plants being developed in the O Mon thermal power complex located 300 kilometers south of Ho Chi Minh City.

Viet Nam. Since the COD, PM3 has been operating satisfactorily and supplying electricity to EVN that accounts for almost 10% of total system capacity. As a gas-fired combined-cycle power plant, PM3 provides additional reliable base-load capacity to the country that is still substantially relying on hydropower. The associated project facilities include expansion of the transmission line and distribution network in the south, which contributes to the country's increased rate of electrification.

50. At the community level, PM3 created employment during the construction and operation. Moreover, PM3 has implemented various community development programs and was named one of the top 40 companies by *Saigon Times* in terms of social responsibility.

51. At the company level, PM3 has achieved satisfactory financial performance and met sponsors' expectations. PM3 demonstrated the best technology of power plant operations and best practices in environmental, health, and safety management. The foreign sponsors have transferred technology and know-how to local employees through both on-the-job training and classroom training courses.

52. ADB has played an important role by providing a direct loan and a PRG to catalyze financing from commercial lenders. ADB involvement has promoted confidence among the project sponsors and the cofinanciers that led to the success of project execution. The Government, sponsors, and lenders view PM3 as successful and indicate that it could be used as basis for future development of other IPP projects in Viet Nam.

Table 2: Evaluation of the Phu My 3 Power Project

Item	Unsatisfactory	Partly Unsatisfactory	Satisfactory	Excellent
A. Development Outcome				X
1. Private Sector Development				X
2. Business Success			X	
3. Economic Sustainability				X
4. Environment, Social, Health, and Safety Performance				X
B. ADB's Investment Profitability			X	
C. ADB's Work Quality				X
1. Screening, Appraisal, and Structuring				X
2. Monitoring and Supervision				X
3. ADB's Role and Contribution				X
D. ADB's Additionality				X

ADB = Asian Development Bank.
Source: Asian Development Bank

III. ISSUES, LESSONS, AND RECOMMENDATIONS

A. Lessons and Recommendations

53. **Seamless Development of Upstream and Downstream Activities.** PM3 is considered the first integrated gas for power project as it serves to ensure sufficient use of gas after the development of Nam Con Son basin. The Government plans to develop other large-scale gas

for power complexes, namely O Mon and Nhon Trach. Experiences indicate that the development of each complex requires seamless and integrated development of upstream and downstream components from gas-field development and pipeline transmission, to power generation facility to ensure satisfactory contractual arrangements and consistent completion time. Having the same sponsor as the developer of both a gas field and a power plant could facilitate integrated development, but implies that a project would be subject to direct negotiation, not competitive bidding. There could be trade-offs between integrated development and timely implementation of the whole production chain of gas for power on one hand, and competitive bidding and the assurance of competitive tariffs on the other hand. In the case of PM3, the PM2.2 tariff, which was subject to competitive bidding, was considered a benchmark to ensure a competitive tariff.

54. **Synchronization of Project Documents and Negotiations.** Key project documents are recommended to be finalized at the same time to ensure consistency in terms and principles.

B. Issues to Monitor

55. **PPAs and the Power Market.** The Government's policy as stated in the Electricity Law is to develop a power market based on the principles of transparency and competition to achieve economic efficiency and to attract investments from foreign and domestic investors. The law also envisages the establishment of a competitive power market in the medium term. According to the road map for power market development, the power market will be developed through three phases, (i) competitive generation market (2005–2014), (ii) competitive wholesale market (2015–2022), and (iii) competitive retail market (from 2022 onward). IPPs, including PM3, will continue to sell electricity to EVN under the signed long-term PPAs. The market rules and detailed regulations need to be developed to ensure proper functioning of the market in line with the restructuring of EVN. In this regard, ADB provides TA (footnote 7)[16] to assist in designing the market structure, devising a framework for regulatory instruments and market rules, and preparing guidelines for procuring new generation capacity. PM3 is expected to continue to supply power in accordance with the PPA. Given the significant role of PM3 in supplying about 10% of electricity to the country, the possibility of renegotiating the PPA is remote.[17] Nevertheless, to ensure a smooth interface between the existing and the new IPPs as well as EVN-owned generators, the TA will review the existing PPAs and recommend how IPPs could participate in the proposed power market without renegotiating the PPAs.

56. **IPP Project Structure and Extent of Government Guarantee.** Based on discussions during the extended annual review mission, all relevant parties view the Project as satisfactory and indicate that the BOT arrangement for PM3 could be used as a basis for future IPP/BOT projects. However, the development of future projects will substantially hinge upon the evolving legal and institutional setup in Viet Nam's power sector. The comprehensive Government guarantee as provided for PM3 is deemed by the project sponsors and the lenders as necessary for future IPPs. However, the Government needs to review the approaches and scope of its guarantee that will be acceptable to investors and financiers, and at the same time will not adversely affect its fiscal position considering the need to provide financing support or guarantee for other state-owned entities in other sectors. Under the TA to prepare a project to support public-private development of the O Mon thermal power complex, one of the activities will be to recommend the specific contractual framework including gas supply and power

[16] It is a follow-on TA of the TA on Roadmap for Power Sector Reform (footnote 21).

[17] In addition, the new Investment Law states that if a newly promulgated law or policy adversely affects the lawful benefits enjoyed by an investor prior to the effectiveness of such law or policy, the investor will be guaranteed to enjoy incentives as stated in the investment certificate or other compensation methods will be available.

purchase arrangements, conditions, incentives, and guarantees that should be offered by the Government to support the development of the O Mon power project on a cost competitive and timely basis.[18] Concurrently, the International Finance Corporation will provide advice to assist the Government in structuring and executing a selected transaction including preparation of contractual and bidding documents. Close coordination among donor agencies is thus necessary to ensure synergies and efficient use of resources.

57. **EVN's Financial Condition.** Since the COD, EVN has been honoring its payment obligations and the government guarantee has not been utilized. Going forward, EVN will have to continue making substantial investments to expand its capacity to meet the rapid growth in demand. In this regard, EVN will need to mobilize more debt financing and operate with higher leverage. The ongoing equitization program is subject to the evolving power market landscape. According to EVN's financial projection, it will need to increase tariffs to maintain prudent financial ratios as covenanted under the loan agreements.[19] The Prime Minister recently approved a tariff increase of an average 7.6% effective 1 January 2007. ADB must continue the ongoing policy dialogue with EVN and MOI and closely monitor EVN's financial performance to ensure smooth restructuring and prudent financial performance.

[18] ADB. 2006. *Technical Assistance to the Socialist Republic of Viet Nam for Preparing the Support for Public-Private Development of the O Mon Thermal Power Complex Project.* Manila.

[19] ADB. 2004. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan to the Socialist Republic of Viet Nam for the Northern Power Transmission Sector Project* (Loan 2128-VIE); and ADB. 2005. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan to the Socialist Republic of Viet Nam for the Northern Power Transmission Expansion Sector Project* (Loan 2225-VIE).

BASIC DATA
Investment Summary

A.	Investment Identification	
1.	Country	Viet Nam
2.	Loan Number	7178/1923
	Political Risk Guarantee Number	GU 1923
3.	Type of Business	Conventional Energy Generation
4.	Project Title	Phu My 3 Power Project
5.	Investee Company and/or Borrower	Phu My 3 BOT Power Company Limited
6.	Amount of Approved ADB Assistance	
	Direct Loan	US$40.0 million
	PRG	US$35.0 million
7.	Project Completion Report Number	PCR: VIE 980

ADB = Asian Development Bank; PRG = Political Risk Guarantee.

B.	Investment Data	
1.	Concept Clearance Approval	21 February 2002
2.	Date of Board Approval	18 October 2002
3.	Signing Date of Legal Documents	
	Loan Agreement	12 June 2003
	Political Risk Guarantee Agreement	21 August 2003
4.	Date of Loan Effectiveness	
	In Loan Agreement	12 June 2003
	Actual	12 June 2003
	Number of Extensions	None
5.	Loan Closing Date (end of availability period)	
	In Loan Agreement	31 August 2004
	Actual	29 March 2004
	Number of Extensions	None
6.	Disbursements	

a. Direct Loan

Initial Disbursement	Final Disbursement	Time Interval
20 November 2003	29 March 2004	130 days

Effective Date	Original Closing Date	Time Interval
12 June 2003	31 August 2004	446 days

Amount Disbursed: US$37,460,526.01

b. ADB Political Risk Guarantee Covered Loan

Initial Disbursement	Final Disbursement	Time Interval
20 November 2003	29 March 2004	130 days

Effective Date	Original Closing Date	Time Interval
12 June 2003	31 August 2004	446 days

Amount Disbursed: US$29,968,420.81

7.	Loan Repayment	
	a. Direct Loan	
	Initial Repayment Date	1 March 2005
	Final Repayment Date	1 March 2016
	b. ADB Political Risk Guarantee Covered Loan	
	Initial Repayment Date	1 March 2005
	Final Repayment Date	1 March 2016

C. Data on ADB Missions

Name of Mission	Date	No. of Person-Days	No. of Persons	Specialization of Members
Kick-Off Meeting	19 Mar 2002	2	2	Investment officer, counsel
Loan Negotiations	12–13 Apr 2002	6	3	Investment officer, counsel, consultant
Loan Negotiations	24–26 Apr 2002	9	3	Investment officer, counsel, consultant
Due Diligence	7–9 May 2002	9	3	Investment officer, counsel, senior cofinancing officer
Loan Negotiations	15–17 May 2002	9	3	Investment officer, investment officer, counsel
Loan Negotiations	23–24 May 2002	4	2	Investment officer
Loan Negotiations	5–7 Jun 2002	4	2	Investment officer, counsel
Environmental Due Diligence	8–9 Jul 2002	2	1	Principal environmental specialist
Investment Negotiations	30 Jul–2 Aug 2002	12	3	Investment officer, counsel, senior financial analyst
Investment Negotiations	2–3 Sep 2002	6	3	Investment officer; head, project finance; senior cofinancing officer
Annual Review	24–25 Nov 2005	4	2	Structured finance specialist, senior investment officer
Extended Annual Review	16–20 Oct 2006	10	2	Structured finance specialist, associate project analyst

Sources: Asian Development Bank mission authorization requests and back-to-office reports.

PROJECT DESCRIPTION

A. The Project

1. The Phu My 3 Power Project (PM3), the country's largest privately owned power plant, was built under a 23-year build-operate-transfer (BOT) contract[1] between the Ministry of Industry (MOI) and Phu My 3 BOT Power Company Limited (the BOT Company). PM3 is located in the Phu My Power Generation Center[2] in Tan Thanh district of Ba Ria-Vung Tau province, which is 70 kilometers southeast of Ho Chi Minh City. The 24.3 hectare site for PM3 was selected for its proximity to gas supply pipelines, easy connection to the national power transmission grid, good transportation infrastructure, and access to cooling water. PM3 involved the construction and operation of a 716.8 megawatt (MW) gas-fired combined-cycle power plant providing electricity to the grid operated by Electricity of Vietnam (EVN).

2. PM3 consists of three facilities: (i) the power plant and early transfer infrastructure facilities provided by the BOT Company, and (ii) the Viet Nam side infrastructure facilities provided by the Government of Viet Nam. The power plant is equipped with Siemens' gas turbine with F class technology, which was selected for high efficiency and low emission electricity generation. Combined-cycle gas turbine technology allows for significantly faster construction than other thermal power plant technologies at a lower overall cost and minimal environmental impact. The early transfer infrastructure facilities consist of the interconnection line, part of the cooling channel, the liquid fuel pipeline, and the data connection. These were built at the cost of the BOT Company and then transferred to EVN in July 2006. The BOT Company has full access to these facilities during the term of the BOT contract and is compensated for the cost of these facilities through tariffs. The Viet Nam side infrastructure facilities were built at the cost of the Government and include the Phu My distribution center, part of the cooling channel, the port and secondary fuel delivery facilities, the gas distribution compound, the gas supply pipeline from the gas distribution compound to the site boundary, the main access roads, data connection, potable water connection, and other miscellaneous items.

3. The engineering, procurement, and construction (EPC) contract was negotiated and awarded to Siemens in May 2001 following international competitive bidding by six qualified original equipment manufacturers. The construction on-site started at the end of 2001 and the commercial operation date (COD) was declared on 1 March 2004. EVN purchases the electricity under a 20-year power purchase agreement (PPA) on a take-or-pay basis. Gas supply is provided by Vietnam Oil and Gas Corporation (PetroVietnam), the state-owned upstream oil company, from the Nam Con Son Gas Basin Block 6.1 jointly owned by BP, through its subsidiary BP Exploration Operating Company Limited. (BPEOC), Oil and Natural Gas Corporation Limited, and PetroVietnam. The gas is delivered via the Nam Con Son pipeline, which is jointly owned by BP, through BPEOC, Conoco Philipps, and PetroVietnam; and was operated during the first 5 years by BPEOC.[3] Similar to the PPA, gas supply is governed by a 20-year gas supply agreement on a take-or-pay basis. The gas price is a pure pass-through item under the PPA whereby EVN pays a tariff incorporating a fuel charge.

---

[1] The duration of the contract is 23 years from the date of issuance of the investment license on 22 May 2001, including time for construction and loan arrangement, time for setting up the BOT Company and performing the BOT Company's postlicensing obligations, and 20 years of operation.

[2] Total installed capacity of power plants in the Phu My Power Generation Center is 3,812 megawatts (MW) comprising Phu My 1 of 1,090 MW, Phu My 2.1 of 430 MW, Phu My 2.1 extension of 400 MW, Phu My 2.2 of 716 MW, Phu My 3 of 726 MW, and Phu My 4 of 450 MW.

[3] BP has been training PetroVietnam during the past 5 years and will officially hand over the pipeline to PetroVietnam by the end of 2007.

B. Project Sponsors

4. The BOT Company was initially 100% owned by BP Holdings B.V. (BP). BP obtained the BOT license, and negotiated and entered into the various contracts and agreements for the Project to ensure demand for gas supply from the Nam Con Son basin, which it was developing. Since power generation is not the core business of BP, a portion of its shares were sold to other sponsors in December 2001. In the current shareholding structure, BP, SembCorp Utilities Private Limited, and a consortium of Kyuden International Corporation and Sojitz Corporation (formerly Nissho Iwai Corporation) each hold one third of the BOT Company's shares. A brief profile of each project sponsor follows.

1. BP Holdings B.V.

5. Based in the Netherlands, BP is a wholly owned subsidiary of BP plc, which is one of the world's largest petroleum and petrochemical groups. BP plc's main activities are the exploration and production of crude oil and natural gas; and refining, marketing, supply and transportation, and manufacture and marketing of petrochemicals; with a growing presence in gas and power and in solar power generation. BP's business segments operate in more than 100 countries in Europe, North and South America, Australia, Asia, and Africa. BP plc is rated AA+ by Standard & Poor's and Aa1 by Moody's, and had total assets of US$206.9 billion, a reported turnover of US$262 billion, and a replacement cost profit[4] of US$19.3 billion in 2005. BP's ordinary shares are traded on stock exchanges in the France, Germany, Japan, Switzerland and United Kingdom. The company's shares are also listed in the form of American depository shares on the Chicago, New York, Pacific, and Toronto stock exchanges. In Viet Nam, a subsidiary of BP, BPEOC operates the Lan Tay and Lan Do gas fields and the Nam Con Son gas pipeline.

2. Sembcorp Utilities Private Limited

6. Sembcorp Utilities Private Ltd is a wholly owned subsidiary and operates as the utilities arm of Sembcorp Industries Limited (SCI). SCI is a leading utilities and marine group in Asia and provides integrated utilities and energy to industrial customers in Singapore, the United Kingdom, and the region. It is also a leading global marine and offshore engineering group. SCI is majority owned by the Government of Singapore through Temasek Holdings (Private) Limited with a 51% share. SCI had total assets of S$7.319 billion (US$4.613 billion), a reported turnover of S$7.409 billion (US$4.670 billion), and profit after tax and minority interests before exceptional items of S$278 million (US$175 million) in 2005. Sembcorp Utilities Private Ltd was the key earnings driver contributing profits of S$156 million (US$98 million) and turnover of S$3.280 billion (US$2.067 billion) to SCI, representing 56% of SCI's profits and 44% of turnover. SCI is listed on the main board of the Singapore Exchange and is a component stock of the Straits Times Index, MSCI Singapore, and other indices.

3. Kyuden International Corporation

7. Kyuden International Corporation was incorporated on 2 August 1999 and is a wholly owned subsidiary of Kyushu Electric Power Company. The principal business of the company is to invest in and hold shares in the capital stock of companies engaged in international electric utilities and to subcontract operation, repair, maintenance, research, and management services for international electric utilities. Established in 1951, Kyushu Electric Power Company, the parent company, generates, transmits, and distributes electricity on Japan's southernmost

[4] Replacement cost profit is before inventory holding gains and losses.

island. The company provides nuclear, thermal, and hydroelectric power generation to serve 8.2 million customers in the Kyushu region, which includes the cities of Nagasaki and Fukuoka. The company's other operations include telecommunications, information technology, facility construction and maintenance, liquefied natural gas, real estate, and recycling and environmental services. It also sells wholesale electricity and has international power production and consulting operations, primarily in Asia. For the fiscal year ended March 2006, Kyuden International Corporation had total assets of US$107 million, revenue of US$7.3 million, operating income of US$5.9 million, and net income of US$4.5 million; while Kyushu Electric Power Company had total assets of US$34.9 billion, operating revenue of US$11.9 billion, operating income of US$1.4 billion, and net income of US$654 million. Kyushu Electric Power Company is a listed company on the Tokyo Stock Exchange.

4. Sojitz Corporation (formerly Nissho Iwai Corporation)

8. Nissho Iwai Corporation partnered with Kyuden International Corporation to jointly become one of the three sponsors of PM3. In October 2005, Sojitz Corporation was formed through the merger of Nissho Iwai Corporation and Nichimen Corporation. Sojitz is engaged in a wide and diverse range of activities including general trading; the purchase, sale, and trade of goods and commodities; and the manufacture and sale of a wide variety of products in Japan and internationally. It also provides services to a variety of industries; and is engaged in planning and arranging projects, and investing in a variety of business fields and financial activities. Sojitz has five main divisions: machinery and aerospace, energy and mineral resources, chemicals and plastics, real estate development and forest products, and a consumer lifestyle business. For the fiscal year ended March 2006, Sojitz had total assets of ¥2,421.7 billion (US$20.2 billion), net sales of ¥4,972.1 billion (US$41.4 billion), operating income of ¥76.2 billion (US$635 million), and net income of ¥43.7 billion (US$364 million). It is a listed company on the Tokyo Stock Exchange.

VIET NAM'S POWER SECTOR

A. Overview

1. Viet Nam is one of the fastest growing economies in Asia, recording an average annual economic growth in gross domestic product of about 7.5% over the past decade. Corresponding with rapid economic growth rates, demand for electricity in Viet Nam increased at an annualized rate of 13.7% during the past decade. During 2000–2005, peak load demand doubled from 4,893 megawatts (MW) in 2000 to 9,300 MW in 2005, while installed capacity increased from 6,233 MW to 11,386 MW. The growth in electricity consumption exceeded the forecast in the base scenario in the 5th Power Development Master Plan (PDMP). By 2004, electricity consumption reached 46,790 gigawatt-hours, the level originally envisaged for 2005 in the 5th PDMP. Viet Nam still significantly relies on hydropower, which accounts for about 37% of the current mix. As a result, the country's power system experiences low reserves during the dry season when hydropower plants can operate at only about 40%–50% of their rated output. The severe draught in 2005 resulted in energy shortages and underscored the need to enhance diversification of the fuel mix.

2. Subsequent to the discovery of gas reserves in Nam Con Son basin, large-scale, gas-fired power plants in the Phu My Power Generation Center have played a significant role as a key component for additional base-load capacity to meet the growing electricity demand and enhanced the diversification of energy sources during the past 5 years. During the preparation of the Phu My 3 Power Project (PM3) in 2001, hydropower accounted for about 55% of installed capacity with thermal power plants representing the rest. Since then, the share of hydropower has decreased to 35% and the oil and gas power plants account for the highest percentage of 50%. The evolution of Viet Nam's generating structure is consistent with the recommendation under the 5th PDMP that the least-cost power generation alternatives should utilize natural gas. Furthermore, PM3 and Phu My 2.2 also demonstrate the increasingly more important role of independent power producers (IPPs) in the power sector by together contributing to about 20% of demand compared with the share of all IPPs of only 8% at the time of project inception in 2000. The current capacity mix is in Table A3.1.

Table A3.1: Current Capacity Mix of the Viet Nam Power Sector
(megawatt)

Type of Plant	EVN Owned	Non-EVN Owned[a]	Total	Percent
Hydro	4,069	150	4,219	37.1%
Coal	1,245	210	1,455	12.8%
Natural Gas	3,037	1466	4,503	39.5%
Furnace Oil and Diesel	445	764	1,209	10.6%
Total	**8,796**	**424**	**11,386**	**100.0%**

EVN = Electricity of Vietnam.
[a] Non-EVN owned power plants include power plants owned by non-EVN public sector entities and those owned by private sector investors. Key privately owned power projects include Phu My 2.2, Phu My 3, Can Don, Formosa, Hiep Phuoc, and Na Duong.
Sources: Ministry of Industry and Electricity of Vietnam.

3. Viet Nam's power sector is dominated by Electricity of Vietnam (EVN), a state-owned corporation that engages in power generation, transmission, and distribution. At present, EVN has total installed capacity of 9,052 MW. In 2005, EVN generated 52.3 terrawatt-hours of electricity and purchased an additional 12.5 terrawatt-hours from IPPs and other neighboring

countries. The transmission network consists of 3,255 kilometers of 500 kilovolt (kV) double circuit backbone line from north to south, and 220 kV and 110 kV network connecting the load centers and most of the power plants except the larger power complexes, which are directly connected to the 500 kV network. The ongoing transmission expansion is mainly aimed at completing the 500 kV ring around Hanoi and Ho Chi Minh City, and installing and upgrading existing 220 kV substations to meet the increasing demand.

4. Eight power distribution companies, which are EVN subsidiaries,[1] purchase bulk power from EVN at administratively fixed bulk power tariffs for 110 KV and are responsible for power distribution to end users. EVN sets the bulk price tariffs to enable each power company to achieve a reasonable profit irrespective of its cost structure. The distribution companies directly supply industrial, commercial, and residential consumers in urban areas. Viet Nam has adopted a unique approach to rural electrification where EVN provides a medium voltage connection to commune centers, and the local communities are responsible for installing and operating the low voltage network. This approach enabled a significant increase in the electrification rate to 98% of communes and 90% of households by June 2005 compared to 62% of communes and 50% of households in 1995.

B. Projection of Electricity Demand and Supply

5. Viet Nam is endowed with considerable energy resources, including all primary energy types (coal, oil and gas, hydropower, and uranium). In addition, the country has some potential for renewable energy resources in the form of biomass, wind, and solar. Hydroelectric power plants are distributed throughout the country with most of the large hydropower projects in the northern and central regions. With substantial offshore natural gas reserves estimated at more than 400 billion m^3, Viet Nam has potential to increase gas production to 15 billion m^3 from the current 6.5 billion m^3 once the production in Malay and Cuu Long basins commences.

6. Electricity demand is expected to increase at 16% per annum during 2006–2010 and slow to 11% per annum during 2011–2015. The electricity demand projection is in Table A3.2. According to the draft 6th PDMP, coal will be increasingly used as key base-load capacity by 2020. The share of coal will more than double from 16% in 2006 to 34% in 2020, while the share of hydropower will decline from 37% in 2006 to 27% in 2020. Except for some large hydropower projects located in the Da River (Hoa Binh and Son La), all other hydropower projects in Viet Nam will be less than 1,000 MW, with the majority in the range of 150–400 MW. The additional gas will be supplied to new thermal power complexes such as O Mon (2,400 MW) and Ca Mau (1,440 MW). The country also plans to import power from the People's Republic of China and Lao People's Democratic Republic during the dry season.

7. The challenge in the power sector is to mobilize financial resources to finance capacity expansion to meet the rapid growth in demand. The power generation capacity additions during 2006–2015 are projected to be more than 24,000 MW, of which 10,000 MW are under construction and will be commissioned by 2010. According to the 6th PDMP, the total investment requirement for 2006–2015 is estimated at US$46 billion consisting of US$32 billion for generation, US$5 billion for transmission, and US$9 billion for distribution. The breakdown of the power sector investment program for 2006–2015 is in Table A3.3. With EVN's limited internal cash generation and capacity to increase debt burden, private sector investments will play an increasingly important role in bridging the funding gap. The share of EVN and non-EVN projects for new capacity additions will be 50:50 during 2006–2010 compared with around 70:30

[1] They are; PC1, PC2, PC3, PC Hanoi, PC HCMC, PC Hai Phong, PC Da Nang and PC Dong Nai.

during 2000–2005. Projected capacity additions with the breakdown by type of energy source and source of financing (EVN versus non-EVN projects) are provided in Table A3.4.

Table A3.2: Electricity Demand Projection (2005–2025)

Item	2005	2010	2015	2020	2025
Annual Demand (terrawatt-hour)	45.6	97.1	164.9	257.3	381.2
Growth in Demand (next 5 years) (%)	16.1	11.1	9.3	8.1	
Transmission and Distribution Losses and Self-Generation (%)	14.7	13.8	13.2	12.5	11.7
Annual Generation (terrawatt-hour)	53.6	112.7	190.0	294.0	431.6
Maximum Demand (megawatt)	9,500	19,550	32,200	48,650	71,400
Per Capita Consumption (kilowatt-hour)	549	1,106	1,774	2,629	3,703

Sources: Ministry of Industry and Electricity of Vietnam.

Table A3.3: Power Sector Investment Program, 2006–2015
(US$ billion)

Item	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2006–2015
Generation											
EVN	1.52	1.83	1.85	1.88	1.74	2.21	2.36	2.72	2.35	2.51	20.87
Non-EVN (IPPs)	1.53	2.40	2.20	1.26	0.65	0.65	0.59	0.52	0.72	0.74	11.27
Transmission (220 kV/500 kV)	0.44	0.41	0.48	0.57	0.50	0.41	0.40	0.42	0.47	0.57	4.68
Distribution (110 kV and less)	0.89	0.91	0.93	0.96	0.95	0.78	0.81	0.84	0.87	0.94	8.88
Total	**4.38**	**4.55**	**5.46**	**4.67**	**3.84**	**4.05**	**4.16**	**4.50**	**4.41**	**4.76**	**45.70**

EVN = Electricity of Vietnam, IPP = independent power producer, kV = kilovolt.
Source: Draft Sixth Power Development Master Plan.

Table A3.4: Projected Capacity Additions to Viet Nam Power System (2000–2015)
(megawatt)

	2000–2005		2006–2010		2011–2015		
Item	**EVN**	**Non-EVN**	**EVN**	**Non-EVN**	**EVN**	**Non-EVN**	**Total**
Hydro	1,265	75	4,250	725	6,050		12,365
Coal	600	210	900	1,500	1,300	1,300	5,210
Natural Gas /Furnace Oil	2,385	1,465	1,150	3,510		1,260	9,770
Total	**4,250**	**1,750**	**6,300**	**6,455**	**7,350**	**2,560**	**28,665**

EVN = Electricity of Vietnam.
Sources: Electricity of Vietnam, Draft Sixth Power Development Master Plan.

8. To attract private sector investments and commercial financing for non-EVN financed projects or public-private partnership projects, project finance transactions need to be well prepared and structured. The degree of sovereign guarantees needed to facilitate these investments, and implications for the overall debt sustainability of the country have to be carefully addressed. The divestiture (i.e., equitization) program of EVN also depends on investor desire to acquire EVN assets. This will be a challenging undertaking in the context of nascent market structure and regulatory regime for both the power sector and the capital market in Viet Nam.

C. Government's Power Sector Strategy

9. The Government's strategy is to develop the energy resources in an efficient manner to ensure adequate energy supply of reasonable quality and price to meet the energy needs arising from rapid socioeconomic development. To achieve this objective, the Government intends to (i) establish competitive power markets, (ii) diversify the sources of investments in the sector, (iii) develop new and renewable energy sources especially for supplying energy to remote and mountainous areas, (iv) promote trading of electricity with neighboring countries, (v) improve energy efficiency and conservation, and (vi) promote environmental sustainability of the sector.

10. According to the new Electricity Law that came into effect in July 2005, the Government aims to develop a power market based on the principles of transparency and competition to achieve economic efficiency, to attract investments from both state and nonstate sectors, and to ensure legitimate rights of the consumers and investors in the sector. The law further states that the state monopoly in the sector will be limited to power transmission, national load dispatch, and strategically important large power plants leaving power distribution and nonstrategic power generation to potential private sector investors. The law specifically encourages investments from foreign private sector investors and joint ventures between foreign investors and domestic enterprises in the power sector. To support these objectives, the Ministry of Industry (MOI) is entrusted with the responsibility of establishing a competitive power market including competitive bidding of IPPs in the medium term (2009–2012) and procuring new generation capacity on flexible terms to facilitate the transition to a competitive power market.

11. To support the implementation of the policy measures under the Electricity Law, in October 2005 the Electricity Regulatory Authority of Vietnam was established within MOI as a separate institution. The authority's key functions include (i) establishing tariff-setting principles including transfer pricing between sector entities, (ii) developing tariffs for regulated activities, (iii) approving power purchase agreements of the single buyer, (iv) ensuring the procurement of adequate new generation and transmission capacity, (v) monitoring implementation progress of new generation and transmission projects, and (vi) monitoring the functioning of the power market.

12. The road map for power market development envisages that the corporate restructuring of EVN will establish necessary conditions to prepare for the power market.[2] The Prime Minister recently approved conversion of EVN into a holding company. The Government will retain the multipurpose hydropower projects and the transmission network for national electricity supply for security reasons. According to the road map, the power market will be developed through three phases, (i) competitive generation market (2005–2014), (ii) competitive wholesale market (2015–2022), and (iii) competitive retail market (from 2022 onward). IPPs including PM3, will continue to sell electricity to EVN under the signed long-term power purchase agreements. The market rules and detailed regulations need to be developed to ensure proper functioning of the market in line with restructuring of EVN. One of the key issues is the degree of independence of a single buyer and the system operator from the rest of EVN. This will require transparent rules for market operation, dispatching of power plants, and settlement and appropriate regulatory oversight. If these conditions cannot be guaranteed, the single buyer and the system operator[3]

[2] ADB provided technical assistance to help the Government prepare such a road map: ADB. 2001. *Technical Assistance to the Socialist Republic of Viet Nam on Road Map for Power Sector Reform.* Manila.

[3] The entity responsible for scheduling and dispatching the power plants and operating the power system of the country.

will have to be separated from EVN. ADB has recently approved a follow-on technical assistance on power market design to provide guidance to the Government in making strategic decisions regarding the market structure; role of EVN and its subsidiaries, and their relationship with each other; framework for regulatory instruments and market rules; and guidelines for procuring new generation capacity including the terms of power purchase arrangements for new power plants and equitized power plants.[4]

[4] ADB. 2006. *Technical Assistance to the Socialist Republic of Viet Nam for the Power Market Design.* Manila.

PRIVATE SECTOR DEVELOPMENT CHECKLIST: INFRASTRUCTURE
Phu My 3 BOT Power Company Limited

Impact of the Project	Ratings				
	Impact to Date	Potential Future Impact (Sustainability) and Risk to Its Realization		Combined Rating[a]	Justification/Annotations
	Rating[b]	Rating[c]	Risk[d]		
1. **Beyond Company Impact**					
1.1. **Private sector expansion:** A pioneering or high-profile project contributes by facilitating in its own right, or paves the way for, more private participation in the sector and economy at large	Excellent	Excellent	Low	Excellent	PM3 was one of the first large-scale IPP projects and the first IPP for a gas-fired power plant. At the time of approval, the existing IPP projects were smaller. PM3 is a model gas for power project. PM3 has been operating satisfactorily. All relevant parties including EVN and PetroVietnam have honored their obligations under the contractual agreements. The successful development and operation of PM3 paves the way for private sector participation in future IPPs. The Government has initiated other large-scale thermal power complexes that will utilize indigenous gas and potentially involve private sector participation (e.g., O Mon and Nhon Trach power complexes).
1.2. **Competition**: Contributes new competition pressure on public and/or other sector players to increase efficiency, and improve access and service levels in the industry	Satisfactory	Satisfactory	Low	Satisfactory	Due to acute power generation capacity shortage, EVN plants are currently not competing with PM3. However, PM3 has regular meetings and workshops with EVN staff to discuss operating issues, and share knowledge and practices in power plant operation. In this regard, PM3 has disseminated its operating standards, especially relating to health and safety, to EVN and other relevant

Impact of the Project	Ratings				
	Impact to Date	Potential Future Impact (Sustainability) and Risk to Its Realization		Combined Rating[a]	Justification/Annotations
	Rating[b]	Rating[c]	Risk[d]		
					parties such as its local contractors.
1.3. **Innovation**: Demonstrates efficient new products and services, including areas such as marketing, distribution, tariffs, production, and technology; and of ways to cover or contain cost, manage demand, etc.	Satisfactory	Satisfactory	Low	Satisfactory	PM3 applies modern technology in power plant operations. The operating practices as well as health and safety procedures are up to international standards of the project sponsors. PM3 also demonstrates best practices in health and safety and was nominated by the People's Committee of Ba Ria-Vung Tau for consideration of the Board of the Environmental Award, Ministry of Natural Resources and Environment as a candidate for the 2006 environmental award on the basis of strict observation of the laws relating to environmental protection and active participation in education and community awareness campaigns on the environment.
1.4. **Linkages**: Relative to investments, contributes to notable upstream or downstream linkage effects to business clients, consumers, suppliers, key industries, etc. in support of growth	Excellent	Excellent	Low	Excellent	PM3 serves as a key component of the gas for power production chain by being a downstream user of indigenous gas discovered in Nam Con Son basin. BP, one of PM3's sponsors, entered into a joint venture arrangement with PetroVietnam and other private sector entities in the production of gas fields and development of gas pipelines from the gas fields to the Phu My industrial complex. To ensure sufficient use of gas, BP initiated the PM3 power project and later sold part of its shares to other sponsors with more experience in power

Impact of the Project	Ratings				
	Impact to Date	Potential Future Impact (Sustainability) and Risk to Its Realization		Combined Rating[a]	Justification/Annotations
	Rating[b]	Rating[c]	Risk[d]		
					plant operations.
1.5. **Catalytic element:** Contributes by pioneering and/or catalyzing finance, mobilizing or inducing more local or foreign market financing and/or foreign direct investment in the sector	Satisfactory	Excellent	Low	Excellent	ADB's lead role in due diligence and involvement in the transaction provided comfort and attracted private sector interest. Being a PRG provider, ADB also catalyzed commercial financing. The successful operation of PM3 creates a demonstration and catalytic effect for more private sector participation in the sector.
1.6. **Affected laws, frameworks, regulation:** Contributes to improved laws and sector regulation for PPPs, concessions, joint ventures, and BOT and build-own-operate-transfer projects; and liberalized markets as applicable for improved sector efficiency	Satisfactory	Excellent	Low	Excellent	The Government recently passed the Electricity Law and issued the road map for power sector development that envisages the phased establishment of a competitive power market. The Government strongly encourages investments from both domestic and foreign sources in the power sector. The recently issued Investment Law provides for more equal treatment for domestic and foreign investors. Detailed regulations and guidelines need to be developed for the implementation of these laws. The contractual framework and legal documentation of PM3 will be used as the basis for developing contracts for other IPPs.
2. Company Impact with Wider Potential					
2.1. **Know-how contribution:** Contributes to new strategic,	Excellent	Excellent	Low	Excellent	Transfer of technology and know-how

Impact of the Project	Ratings				
	Impact to Date	Potential Future Impact (Sustainability) and Risk to Its Realization		Combined Rating[a]	Justification/Annotations
	Rating[b]	Rating[c]	Risk[d]		
managerial, and operational skills with actual or potential wider replication in the sector and industry					has been considerable from the sponsors to local staff, especially in the areas of plant operations and health and safety procedures through both on-the-job and classroom training. PM3 has engaged a human resource consultant company to prepare a competency program for each position that will be used as a basis for recruitment and training activities as well as staff development plans.
2.2. **Demonstration of new standards: Contributes** new ways to operate the business and compete, and in reached investee performance against relevant best industry benchmarks and standards	Satisfactory	Satisfactory	Low	Satisfactory	PM3 uses modern technology for power plant operations (e.g., F class of gas turbine that is the latest available technology). No global standard for operation of gas-fired power plants is available due to differences in operating conditions, environment, technology, etc. However, compared with 190 combined-cycle power plants in the United States, PM3 was in the top 2 for heat rate, top 27 for capacity factor, and top 3 for total production cost. In terms of operating procedures, PM3 follows a manual for a power plant management system that comprehensively covers all areas of operation, including internal control procedures. In addition, PM3 was certified with ISO 9001 for quality management, ISO 14001 for environmental management, and OHSAS 18001 for occupational health

Impact of the Project	Ratings				
	Impact to Date	Potential Future Impact (Sustainability) and Risk to Its Realization		Combined Rating[a]	Justification/Annotations
	Rating[b]	Rating[c]	Risk[d]		
					and safety; and will maintain its operating procedures to comply with these standards.
2.3. **Improved governance:** Demonstrates as evident in set standards in corporate governance, stakeholder relations, environmental, social, health, and safety fields and/or in good energy conservation standards, etc.	Excellent	Excellent	Low	Excellent	PM3 took the lead in establishing an EMG within the Phu My Power Generation Center. The EMG also consists of representatives from Phu My 2.2 and EVN as the operator of other Phu My plants. PM3 shares knowledge in environmental management in the EMG. Regarding safety, PM3 has coordinated with other industries in the compound. For example, PM3 conducted a risk assessment with PetroVietnam and Phu My fertilizer plant to prevent ammonia release. It regularly conducts fire-fighting training in coordination with the provincial fire-fighting police.
3. Overall PSD Rating: Excellent, satisfactory, partly satisfactory, or unsatisfactory. The ratings are not an arithmetic mean of the individual indicator ratings, and do not have fixed weights. Need to consider actual impact (positive or negative), potential future impact, and the risk to its realization.	Excellent	Excellent	Low	Excellent	PM3 is the first large-scale BOT gas-fired power plant; it contributes to more reliable base load and more diversification of energy sources in Viet Nam. The Project also serves as a successful model for the development of an integrated gas for power project. The contractual structure and legal documentation could be used as the basis for future IPP projects. The smooth operations could create demonstration and catalytic effects for future private sector participation in the power sector.

Impact of the Project	Ratings				
	Impact to Date	Potential Future Impact (Sustainability) and Risk to Its Realization		Combined Rating[a]	Justification/Annotations
	Rating[b]	Rating[c]	Risk[d]		
					PM3 regards environment, health, and safety as priorities; adopts best practices in these areas; and shares the knowledge with other counterparts in the sector. The overall rating of the Project is assessed as excellent.

ADB = Asian Development Bank, BOT = build-operate-transfer, EMG = environmental management group, EVN = Electricity of Vietnam, IPP = independent power producer, ISO = International Organization for Standardization, OHSAS = Occupational Health and Safety Assessment Series, PM3 = Phu My 3 Power Project, PetroVietnam = Vietnam Oil and Gas Corporation, PSD = private sector development. .

[a] The combined rating should weigh future impact and risk to its sustainable realization.

[b] Excellent, satisfactory, partly satisfactory, and unsatisfactory.

[c] Rating scale as above.

[d] Rating scale: Risk: High, medium, modest, and low.

Source: Asian Development Bank.

ENVIRONMENTAL, HEALTH, AND SAFETY PERFORMANCE

1. Phu My 3 Power Project (PM3) is a gas-fired combined-cycle power station with a design capacity of 716.8 megawatts (MW) constructed in the Phu My Power Generation Center (PMPGC) in Tan Thanhn district of Ba Ria-Vung Tau province. Gas supply is provided by Vietnam Oil and Gas Corporation (PetroVietnam), the state-owned upstream oil company, from the Nam Con Son Gas Basin Block 6.1, which is delivered via the Nam Con Son pipeline. Gas supply is governed by a gas supply agreement on a take-or-pay basis for 20 years. The electricity is purchased by Electricity of Vietnam (EVN), which is also under a 20-year power purchase agreement on a take-or-pay basis. The main design parameters for PM3 are in Table A5.1.

2. The PMPGC covers a total area of approximately 152 hectares (ha) of which PM3 has a 24.3 ha site. The PMPGC consists of five power generation plants: Phu My 1, Phu My 2.1, Phu My 2.2, Phu My 3, and Phu My 4, with a combined capacity of 3,812 MW. The power plants share a common infrastructure system including roads, cooling water supply intake and outlet structures, canals, gas pipelines, gas metering stations, and power transmission, which were developed along with the first power plant.

Table A5.1: Main Design Parameters for Phu My 3 Power Plant

Item	Data
Plant Location	Phu My Industrial Zone
Power Generation Capacity	716.8 MW
Annual Net Power Generation	4,698 GWh
Plant Concept	
Technology	Combined cycle system
No. of gas turbines/steam turbines	2/1
No. of heat recovery systems	1
Stack height	60 m
Type of Fuel	
Main	Natural gas from Nam Con Son
Emergency	Distillate fuel oil
Cooling Water	
Demand	16m^3/s
Temperature rise across condenser	7^oC
Intake	Sao river
Discharge	Thi Vai river
Emissions	
NO_x from	
Natural gas	63 mg/Nm^3
Distillate fuel oil	153 mg/Nm^3
SO_2 from	
Distillate fuel oil	85 mg/Nm^3
Noise Level	
Phu My complex boundary	70 dB[A]
Equipment (1 m distance)	90 dB[A]

$^{\circ}C$ = degree Celsius, dB[A] = decibels on the A scale, GWh = gigawatt hour, m = meter, m^3/s = cubic meter per second, mg/Nm^3 = milligram per standard cubic meter, MW = megawatt, NO_x = nitrogen oxide, SO_2 = sulfur dioxide.
Source: Phu My 3 BOT Power Company Limited.

A. Environmental Impacts and Mitigation Measures

3. The Asian Development Bank (ADB) classified the Project as environment category A with potential environmental impacts if the appropriate mitigation measures were not properly incorporated in the design, operation, and maintenance. The environmental impact assessment (EIA) on the Project was prepared by ESB International, Ireland in January 2002 in accordance with the scope and format under the World Bank's Operations Policy 4.01: Thermal Power: Guidelines for New Plant in the World Bank's *Pollution Prevention and Abatement Handbook*.[1] The summary EIA was circulated to ADB's Board of Directors on 9 May 2002.

4. According to the summary EIA, with natural gas being the primary fuel, nitrogen oxides (NO_x) are the only stack emissions of significant interest during normal operation; they are measured continuously. The plant is equipped with low NO_x burners for operation on natural gas. Water injection is used for NO_x suppression when burning distillate fuel oil (DFO). For the dispersion of emissions, the plant uses 60-meter stacks. The emission concentrations for NO_x and sulfur dioxide (SO_2) during normal gas operation are within Vietnamese regulations and World Bank guidelines. Since the commercial operation date, PM3 fired on DFO a few times a year during 2004–2006 when experiencing problems with the gas supply and during maintenance for PM3 and the Nam Con Son pipeline. The switch from gas to DFO and from DFO back to gas went smoothly. However, the emissions of NO_x when firing on DFO exceeded World Bank guidelines but were within Vietnamese regulations. To address this issue, PM3 plans to commission its existing low NO_x burner for the operation on DFO and will coordinate with the Department of Natural Resources and Environment (DONRE) on this matter.

5. PM3's water treatment facilities include a neutralization tank to control the pH. All surface drains are routed through oil interceptors. The effluent complies with Vietnamese standards and World Bank guidelines. Vietnamese regulations limit temperature to 40˚C in receiving waters used for sources of domestic water supply and to water bodies used for navigation, irrigation, bathing, aquatic breeding, and cultivation; while the World Bank guidelines limit temperature rise in the receiving water to 3˚C outside of the mixing zone. PM3 has complied with these standards except for a brief period when the temperature was recorded at higher than 40˚C at the seal pit. PM3 has no measuring device at the discharge point into the river and could not ascertain if the temperature at the discharge point exceeded the limit of 40˚C during that time. The temperature usually drops between the seal pit and the discharge point. PM3 will monitor the degree of temperature drop to ensure that the temperature will comply with the relevant standards at all times. Other major project impacts and mitigation measures during operation are summarized in Table A5.2.

6. Within 9 months from the commercial operation date, PM3 was able to obtain International Organization for Standardization (ISO) 14001 certification for environment management standards and Occupational Health and Safety Assessment Series (OHSAS) 18001 certification for occupational health and safety management system. PM3 was subsequently certified with ISO 9001 certification for quality management in April 2006. PM3 has conducted environmental monitoring consistent with the EIA in general and submits a quarterly report to DONRE in accordance with the regulatory requirements. The Health, Safety, and Environment Unit of PM3 headed by a unit manager, who is currently seconded from BP, is responsible for environmental management as well as health and safety aspects of operations. Given PM3's strict observation of the laws relating to environmental protection and active participation in education and community awareness campaigns on the environment, the

[1] World Bank. 1998. *Pollution Prevention and Abatement Handbook*. Washington D.C.

Natural Resources and Environment Section of the People's Committee of Ba Ria- Vung Tau nominated PM3 for consideration by the Board of Environmental Award, Ministry of Natural Resources and Environment, as a candidate for the 2006 environment award.

Table A5.2: Main Project Impacts and Mitigation Measures during Operation

Impact	Possible Effects	Assessment / Mitigation Measures
Discharge from stacks	Deterioration in ambient air quality: NO_x and SO_2 pollution	Use of natural gas as primary fuel to minimize SO_2, use of low-NO_x burners and water injection for control of NO_x; residual impact within national and international limits
Combustion of fossil fuel	Climate change from greenhouse effect	Emissions of CO_2 minimized by use of natural gas as fuel and by high plant efficiency; minor residual impact
Water treatment plant	Hazardous waste (contains strong acids and alkalis)	Treated in neutralization tank to pH 6−9; effluent complies with wastewater standards; negligible residual impact
Oil-contaminated surface water	Adverse impact on marine organisms if discharged directly	All surface drains routed through oil interceptors; effluent complies with wastewater standards; minor residual impact
Sewage	High BOD and microbiological pollutants	Sewage is treated to <20 mg/l BOD before discharge; minor residual impact
Blowdown from HRSG	Contains very low concentration of contaminants	No treatment necessary; negligible residual impact
HSRG acid cleaning	Hazardous waste (utilizes toxic chemicals)	Treated with the waste removed off-site for disposal; effluent discharged satisfies wastewater standards; minor residual impact
Chemicals (acid and alkali) stored on-site	Risk of chemical spillage	Stored bulk chemicals are bunded so that any spillage will be contained and controlled; no residual impact
Water intake	Loss of fish eggs and plankton	None; small residual impact in relation to overall abundance in the area
Intake screens	Loss of fish through impingement	Optimization of velocity of flow during abstraction; minor residual impact
Discharge of heated water	Impact on sensitive organisms	Discharge designed so that temperature rise will not exceed 3˚C outside the mixing zone; minor residual impact
Chlorination of cooling water	Impact of residual chlorine on ecosystem	Residual chlorine will not exceed 0.02 mg/l; negligible residual impact
Discharge of cooling water	Scouring of riverbed	None; permanent but local disturbance of area
General operation	Generation of waste	Disposal of waste by authorized local disposal company according to local regulations; no residual impact

˚C = degree Celsius, BOD = biological oxygen demand, CO_2 = carbon dioxide, HRSG = heat recovery steam generator, mg/l = milligram per liter, SO_2 = sulfur dioxide.
Source: Phu My 3 BOT Company Limited.

B. Environmental Monitoring in the PMPGC

7. Since PM3 is located in the PMPGC with other power plants and several environmental impacts cannot be attributed to specific plants, the EIA envisaged the establishment of an environmental management group (EMG) to monitor environmental impacts common to all power plants, such as ambient air quality, noise, and water discharges. In this regard, PM3 took

the lead in establishing the EMG that consists of representatives from EVN, PM2.2, and PM3. The EMG recruited Vietnam Environment and Sustainable Development Institute to monitor environmental impacts in the PMPGC and submit reports to the EMG on a quarterly basis.

8. According to the second quarterly report of 2006, the concentrations of NO_x and SO_2 in the ambient air inside the PMPGC are within the standards. Some measuring points outside of the PMPGC indicate high concentrations of dust due to poor quality of roads and high traffic. Most of the pollutants in the cooling water from power plants in the PMPGC had low concentrations except for ammonia and coliforms, which were higher than the effluent standards. Nevertheless, the concentrations of pollutants in the cooling water at the discharge gate were not higher than those in the intake source, implying the river water was already polluted. The issues of dust and pollutants in the effluents were also reflected in the baseline data in the EIA. The likely sources of these pollutants are wastewater from cities and industries upstream as well as natural biomass decay. PM3 informed DONRE of this issue and requested strict enforcement of environmental control standards, especially for certain industries upstream.

C. Health and Safety Performance

9. PM3 has developed a procedure to assess health and safety risks in workplace conditions and activities to ensure all control measures are in place with its accreditation to OHSAS 18001. As of September 2006, the plant has had an excellent safety record of over 1,000 days without any lost time to incidents. PM3 considers health and safety a high priority and allocates substantial budget for this purpose. Medical services including an in-house medical doctor and preventive medical treatment such as vaccination programs and annual checkup are provided for employees, free of charge. The BOT Company has provided a total of 4,820 training hours for Health, Safety, and Environment Unit staff since the beginning of 2005 and promotes a working environment where employees can be awarded for reporting any acts or behavior that is unsafe or could result in accidents, and suggesting corrective actions.[2]

[2] Under the STOP campaign, employees will fill in a card to report any unsafe behavior and suggest corrective actions. The campaign follows the safety observation cycle of decide, stop, observe, act, and report.