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Technical Cooperation by the Government of Japan

Application

By the Government of Cambodia for a Development study on the feasibility of establishing a 180 MW gas turbine generation plant to the Government of Japan.

1. Study Digest

(1) Study Title:
Feasibility study on the establishment of a 180MW CC Gas Turbine Generation Plant.

(2) Location:
Sihanoukville

(3) – 1 Responsible Ministry:
Ministry of Industry, Mines and Energy (MIME)

(3) – 2 Implementing Agency:
Electricité du Cambodge (EDC) in cooperation with MIME Energy Department

(4) Justification of the Study:

Objective
The objective is to determine the feasibility of establishing a 180MW Gas Turbine plant in Sihanoukville between 2002 and 2005 to supply electricity to Sihanoukville, Phnom Penh and towns and communities along the route of a transmission link between Phnom Penh and Sihanoukville.

Beneficiaries
In the medium term over the next 10 years, it is estimated that half a million people in the southern part of Cambodia and Phnom Penh would benefit from access to cheaper electricity supplies.

Cambodia Power Sector Strategy
The 180MW Gas Turbine Project is an integral part of the Cambodia Power Sector Strategy. This Strategy has been developed in cooperation with the World Bank. It specifies an optimum investment plan to supply the growth in demand for electricity over the period 1999-2016. The Strategy will make a major contribution to the Royal Government of Cambodia's energy objectives by providing affordable electricity nationwide to many more Cambodians. It will also contribute to environmental objectives including lowering the level of green house gas emissions.

(5) Estimate starting date and duration:
April 2000, duration 1.5 years

(6) Prospective funding source after the study results (including external assistance):
Grants and concessional loan packages plus Government equity and private sector funds. The financial options for establishing the gas turbine facility will be investigated as part of the feasibility study.

(7) Other related projects, if any.

(i) The electricity supplies of Phnom Penh and Sihanoukville are being rehabilitated and expanded to cover more communities with support from JICA, the World Bank, ADB and others. The majority of this work will be finalized by the year 2000.

(ii) The World Bank has secured on Cambodia's behalf a Japanese PHRD Grant to undertake a feasibility study on establishing the transmission grid between Sihanoukville and Phnom Penh and for a feasibility study on Rural Electrification in the southern provinces of Cambodia. The 180MW Gas Turbine facility will be connected to this southern grid. The World Bank has already commenced the preparation of a loan credit proposal for implementation of the southern grid and rural electrification. It is seeking support from OECF to co finance the project.

(iii) A Technical Cooperation proposal has been submitted to the Government of Japan for a feasibility study of the 125MW Kamchay hydro project, which is planned to be commissioned by 2008. This will be the second major contribution to generation capacity for connection to the southern grid after the 180MW gas turbine plant that is the subject of this Application.

2. Terms of Reference (TOR)

(1) Necessity and justification of the Study

Rehabilitation of Cambodia's electric supplies, which was severely damaged by war and neglect, began in 1994. The rehabilitation concentrated on the supplies in Phnom Penh, Siem Reap and Sihanoukville. As a result of the rehabilitation work, the number of consumers in these cities connected to supplies has increased from around 30,000 to 120,000.

Notwithstanding these improvements Cambodia still has the lowest per capita consumption (55kWh/year) and the lowest electrification ratio (12% of households) among the developing countries of the Asia Pacific region. The price of electricity is also the highest in the region. This is the result of the small size of generation units, dependence on oil-based generation with high transport cost on the Mekong and by road to provinces and large distribution losses particularly in the provinces where the electricity supplies have not been rehabilitated.

To provide high quality electricity supplies at affordable costs the Cambodian Government will implement a Power Sector Strategy. This Strategy is based on extensive study sponsored by the World Bank: Power Transmission Master Plan and Rural Electrification Strategy[1] and ADB: Power Rehabilitation II Project[2] of the least cost means of satisfying forecast electricity demand. The Strategy has three investment components: (i) the development of a generation and transmission grid to link large generating units to Phnom Penh and the provincial capitals (ii) provincial towns' electrification plan to rehabilitate supplies until the grid is extended to provinces and provide peak power once it is (iii) the implementation of a Rural Electrification Plan. The investment requirements for Stage 1 (1999 – 2003) of these three components are respectively $276 million, $45 million, and $35 million.

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[1] Power Transmission Master Plan & Rural Electrification Strategy: World Bank, July 1997. This Strategy evaluated the least cost means of satisfying forecast demand for electricity in Cambodia. It recommended the establishment of a national electricity grid and expansion of electricity generation using gas turbines and hydro with the first unit a 180 MW CC gas turbine in Sihanoukville.

[2] Power Rehabilitation II Project, ADB, January 1998. This project evaluated the rehabilitation of electricity supplies of 8 provincial capitals. It recommended the installation of modern distribution systems in these capitals and that ADB make funding available for this work.

In relation to (i) the development of a generation and transmission grid to link large generating units to Phnom Penh and the provincial capitals, the Investment Program comprises:

a) Establishment of the 180MW gas turbine facility between 2002 and 2005 (the subject of this Application).

b) The implementation of the first stage of the National Grid between 2002 and 2004 to link Sihanoukville with Phnom Penh via Kampot and Takeo.

c) Establishment of a branch link to Vietnam for import and export of power.

d) Connection of the 120MW Kamchay hydropower project to the grid at Kampot in 2008 to satisfy demand growth after this time. (This Project is the subject of a separate Technical Cooperation Application to Japan.)

The advantage of this integrated development program is that it is estimated that it could reduce the cost of electricity generation by 40% and provide cheaper electricity to not only Phnom Penh but also provincial towns along the route of the transmission grid. It would also provide the basis for rural electrification in the Southern part of Cambodia. Other benefits include a reduction in environmental emissions and particularly emissions of greenhouse gases and the establishment of gas turbine generation in Sihanoukville would make off shore gas resources more economically viable.

(2) Objectives of the Study

Immediate Objectives

The objective is to determine the feasibility of establishing a 180MW Gas Turbine plant in Sihanoukville between 2002 and 2005 to supply electricity to Sihanoukville, Phnom Penh and towns and communities along the route of a transmission link between Phnom Penh and Sihanoukville.

Medium Term Objectives

(i) To improve the quality and affordability of electricity supplies in Cambodia.

(ii) Make electricity available to a much broader section of Cambodia's community.

(iii) Develop a Cambodian infrastructure including the electricity infrastructure that it is competitive with the infrastructure of regional countries.

(iv) Financial viability of Cambodia's electricity sector.

Broader Objectives

To contribute to the Royal Government of Cambodia's energy sector development policy. The Royal Government of Cambodia formulated an energy sector development policy in October 1994; its objectives are.

To provide an adequate supply of energy throughout Cambodia at reasonable and affordable price.

To ensure a reliable, secure electricity supply at prices, which facilitate investment in Cambodia and development of the national economy.

To encourage exploration and environmentally and socially acceptable development of energy sources needed for supply to all sectors of the Cambodian economy.

To encourage efficient use of energy and to minimize detrimental environmental effects resulting from energy supply and use.

(3) Study Area
Sihanoukville

(4) Scope of the Study

Phase I – Inception and Project Planning

(i) Review existing data and information and undertake an initial site investigation.

(ii) Formulation of a detail plan for the feasibility study including demand assessment, field investigations, economic and financial analysis, and engineering and environmental investigation in relation to the power plant's location.

Phase II – Field Investigations and Power Market Study

(i) Review of the electricity demand forecast to 2016 and fuel costs.

(ii) Analysis of the impact on electricity demand of reduced electricity prices estimated to be achieved by the project.

(iii) Site investigations including plant location, water supplies, environmental impact and supply of construction materials.

Phase III – Analysis and Studies

(i) Analysis of the data gathered in previous stages.

(ii) Formulation of alternate development plans.

(iii) Feasibility design in relation to the preferred investment plan including site evaluation, major structures, equipment, sub-stations, water supply and environmental aspects.

(iv) Estimate the cost of construction and operation and construction time table.

(v) Formulation of institutional arrangements for implementation of project.

(vi) Formulation of environmental plan and monitoring system.

Phase IV – Project Evaluation

(i) Economic evaluation of the least cost development plan and calculation of economic and financial rates of return.

(ii) Evaluation of options for funding the project, recommendation on the preferred funding and preparation of specifications and documentation in relation to the preferred funding option.

(iii) Recommendation on the implementation of the gas turbine project.

Phase V – Training

Throughout the course of the feasibility study, the foreign experts will train local counterparts in all aspects of undertaking the feasibility study.

(5) Study Schedule
Commence April 2000, duration 1.5 years

(6) Other Relevant Information

The Government's approach to implementing the Cambodia Power Sector Strategy is to negotiate development partnerships for different components of the Strategy:

For the southern grid, the World Bank together with co-financing by OECF is proposed.

For the two main generation units the gas turbine facility in Sihanoukville and the Kamchay hydro project, Japanese support is proposed.

For provincial electrification, ADB assistance has been targeted.

3. Undertakings of the Government of Cambodia.

In order to facilitate a smooth and efficient conduct of the Study, the Government of Cambodia shall take necessary measures:

(1) To secure the safety of the Study team.

(2) To permit the members of the Study team to enter, leave and sojourn in Cambodia in connection with their assignments therein, and exempt them from alien registration requirements and consular fees.

(3) To exempt the Study team from taxes, duties and any other charges on equipment, machinery and other materials brought into and out of Cambodia for the conduct of the Study.

(4) To exempt the Study team from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Study team for their services in connection with the implementation of the Study.

(5) To provide necessary facilities to the Study team for remittance as well as utilization of the funds introduced in Cambodia from Japan in connection with the implementation of the Study.

(6) To secure permission for entry into private properties or restrict areas for the conduct of the Study.

(7) To secure permission for the Study to take all data, documents and necessary materials related to the Study out of Cambodia to Japan.

(8) To provide medical services as needed. Its expenses will be chargeable to members of the Study team.

(9) The Government of Cambodia shall bear claims, if any arises against member(s) of the Japanese Study team resulting from, occurring in the course of or otherwise connected with the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the member of the Study team.

(10) Electricité du Cambodge in cooperation with MIME Energy Department shall act as counterpart agency to the Study team and also as coordinating body in relation with other governmental and non-governmental organizations concerned for the smooth implementation of the Study.

The Government of Cambodia assures that the matters refereed in this form will be ensured for a smooth conduct of the Development Study by the Study team.

Signature: _____

Title: SECRETARY OF STATE

On behalf of the Government of Cambodia

Date: MAY 10, 1999

Cambodia Power Sector Strategy
World Bank Mission – May 16-21, 1999

Aide Memoire

A World Bank mission[1] visited Phnom Penh from May 16 to 21, 1999, to undertake the field consultation for the draft report Cambodia Power Sector Strategy. During its stay the mission met with authorities and staff of the Ministry of Industry, Mines and Energy (MIME), management and staff of Electricite du Cambodge (EDC); as well with representatives the Ministry of Economy and Finance (MEF). This Aide Memoire summarizes the mission's findings and agreements reached. The Aide Memoire would be ratified by Bank management The mission would like to thank the organizations met for their excellent preparation work and support

A. Power Sector Strategy

1. The proposed draft report Cambodia Power Sector strategy aims to support the Government in its objectives to: (a) improve sector efficiency and reducing electricity costs, (b) consolidate the ongoing reform, and (c) address the sector's social concerns, particularly the extension of electricity services to rural areas. The mission held extensive discussions on the report with MIME and EDC. It was acknowledged that the close dialogue held between the policy team established by MIME and Bank missions had been useful in regaining the momentum needed for the continuation of the power sector reform, in particular the enactment of the Electricity Act and establishment of a regulatory body (the Electricity Authority of Cambodia - EAC)

2 Main points discussed and agreements reached are summarized below

- There was overall agreement on the main recommendations of the report regarding the need and means to: (a) continue the commercialization of EDC; (b) establish a suitable legal and regulatory framework; and (c) formulating and implementing a rural electrification strategy. Actions proposed to meet these objectives are summarized in Attachment 1.
- MIME felt that there was need to strengthen the report's statements on MIME's and EDC's technical assistance needs to implement the proposed strategy, particularly in regard to the preparation of hydropower projects. It was agreed to incorporate explicitly these needs and review the recommendations on hydropower
- The meetings discussed the different options for the future evolution of the power sector, including the role of private and public sector and ways to gradually introduce more competition. It was agreed that, once the electricity legal and regulatory framework is in place, all parties - public and private - should compete in equal conditions and that further expansion of EDC's role would be justified when there are clear economic and technical advantages, or to meet social objectives that cannot be met otherwise The mission stressed that an essential condition for an efficient development of the sector will be the Government's commitment to respect the commercial autonomy of EDC and the operational independence of the EAC

[1] The mission comprised Enrique Crousillat (Mission leader) and Mac Cosgrove-Davies (Rural Electrification Specialist).

- Questions were raised on the role of the EAC vis-à-vis MIME and EDC. The mission explained that the report intends to reflect the provisions of the draft Electricity Act and related Sub-decree (as of February 1999); i.e. the report does not aim to make any proposals different to those of the said legal documents. It was agreed that MIME would advise the Bank on any corrections necessary in the draft report to reflect accurately the latest versions of the Electricity Act and Sub-decree as approved by the Council of Ministers or the Inter-Ministerial meeting

- The mission reviewed with EDC and MIME the rural electrification (RE) section of the report and agreed on changes needed to more accurately reflect the current status in Cambodia. The mission presented an overview of selected RE programs in other countries. The overview highlighted aspects such as (a) private provision of electricity services; (b) incorporation of all appropriate types of electrification including grid extension, mini-grids, and battery-based systems using conventional and renewable energy sources; (c) light-handed regulation for smaller power providers; and (d) the possible creation of a Rural Electrification Fund to support commercial RE development. There was general agreement on the proposed approach to developing a rural electrification strategy.

- MIME would convey additional comments to the draft report by May 28, 1999

3 Next steps:

- It was agreed that the Bank will incorporate into the report the comments conveyed by MIME and EDC and subsequently proceed to publish a final report (gray cover) for broad dissemination (by end of June 1999)

- MIME will use the Bank's report to issue a Power Sector Strategy to be submitted to the Government for approval

B. Second Power Project

4. The mission discussed with MIME and EDC the scope of a second power project for Cambodia and carried-out initial co-ordination for project preparation. The mission confirmed that a PHRD grant (Japan) for an amount of US$ 700,000 has been awarded for the preparation of the project. Accordingly, preparatory activities could be initiated next World Bank fiscal year (beginning July 1999). Although the project is still at a level of conceptualization, it is expected to involve a co-financing operation. To this end, the Bank has approached informally OECF. The second project would address the following objectives: (a) support the Government's continued efforts to create an adequate environment for an efficient development and operation of Cambodia's power sector, including direct private participation and overall commercialization of the sector, (b) address the sector's social concerns increasing the access to electricity, particularly in rural areas; and (c) remove infrastructure bottlenecks and, thus, reduce the cost of electricity supply. To this end, the project would include tentatively the following components

- Support conventional grid extension and off-grid systems to serve about 20,000 new customers in the south-eastern provinces

- First stage of a 230kV transmission link from Phnom Penh to southern Cambodia, and associated substations

- Technical assistance for: (a) the consolidation of power sector regulatory framework, including training for the Electricity Authority of Cambodia, (b) strengthening the policy making capability of the MIME; and (c) improving EDC's commercial and financial

performance, and providing consulting services for detailed engineering, procurement and construction supervision.

5 It was agreed that the PHRD grant will be executed following a split execution modality Accordingly, MIME will manage funds for payment of local consultants, field surveys and other local costs; and the Bank will manage the funds used for hiring international consultants Next steps are:

- The Government (Ministry of Economy and Finance - MEF) to request the Bank to proceed with the split modality for execution of the PHRD grant To this end, the Bank will provide advice on the communications needed.
- The Bank will prepare a Grant Agreement to be signed by the Government (MEF) and Bank management in June 1999.

6 The PHRD grant proceeds would be used in the following activities:

- Sector Reform/Private Participation. Support the GOC's efforts to attract private generation within an open and competitive environment. These are: (a) procedures for the selection of Independent Power Producers; and contracting of IPPs, and (b) operational procedures for the power sector regulatory body. Both will be presented and discussed in a final seminar.
- Rural Electrification. Formulation of a strategy and 10-year program (see par 7)
- Transmission Lines. Feasibility study for the transmission link between Phnom Penh and southern Cambodia, including a review of the power market, assessment of alternative schemes, engineering design, environmental impact assessment, project planning, and economic and financial analyses

7 Draft TOR for a rural electrification strategy and 10-year RE implementation program (Attachment 2) were prepared by the mission and discussed with MIME and EDC. The energy specialist for the ADB Country Programming mission also attended this discussion The proposed consulting assignment is intended to assist in creating a practical program which would serve to coordinate both Government and donor-supported RE efforts throughout Cambodia MIME agreed to provide a revised draft of the TOR by May 28, 1999, for the Bank to prepare the bid package in a timely manner. Adherence to this schedule is critical since this Bank-executed, PHRD-funded work must be complete prior to appraisal of the proposed Second Power Project, tentatively scheduled for June 2000. Since the expected cost of this effort may exceed the available PHRD budget additional funding sources will be sought by the Bank and MIME ADB expressed general support for the effort, and will explore the potential for funding a portion of the work Other donors also have expressed potential interest in support

C. Phnom Penh Power Rehabilitation Project

8 Sector Reform MIME informed that the Electricity Act had been reviewed already by the Inter-Ministerial meetings and that it will be discussed at the Council of Ministers on May 21, 1999 Also, MIME presented a plan for the use of IDA proceeds in an amount of US$ 151,900 to support the establishment of the EAC and related consulting services. It was agreed that MIME will engage the services of two experts; namely a specialist in finance, accounting, tariffs and an expert in regulations and licenses for a total of about 8 months. It was also agreed to include the services of local legal consultants (4 months) and local experts/trainers in management, accounts and finance (4 months). Support to this effort will include also equipment and computer programs, equipment for MIME's provincial offices, support staff and miscellaneous expenses

9. Audits. The mission gave its no objection to EDC's proposal to award contract to the firm Ernst & Young to undertake the audits of EDC corporate and project accounts for FY98 subject to revising the scope of work in accordance to the Bank's suggestions of April 29, 1999. The Bank expects to receive a draft of the FY98 audit report, findings, and opinion before they are finalized. Also, the mission is satisfied with EDC's plan to address the issues raised by the auditor during the audits of FY97

10. The mission confirmed that project implementation continues progressing satisfactorily in most respects The project is expected to close by December 31, 1999, as planned. Uncommitted funds as of end of May 1999 are estimated at US$312,663, excluding the amount earmarked for MIME's technical assistance and assuming that the exchange rate between US$ and SDR will remain at 1.35. EDC proposes to use the balance of funds as follows:

- Power stations clean-up $ 33,600
- Testing equipment $ 100,000

The mission recommended EDC not to incur in these expenses nor make further commitments during the next 3 months, and monitor carefully the availability and flow of IDA funds in order to avoid the risk of over-committing resources.

E. Crousillat
World Bank

Phnom Penh, May 20, 1999

収集資料リスト

シアヌークヴィル・コンバインドサイクル発電開発計画　予備調査

番号	資料の名称	発行日	形態（図書・地図等）	収集資料	専門家作成資料	ＪＩＣＡ作成資料	テキスト	発行機関	取扱区分	図書館記入欄
1	Minutes of Meeting the Second Cambodia-Thai Technical Working Group Meeting at the Ministry of Industry, Mines and Energy, Cambodia on 15 May 1999	1999/5	コピー	○				MIME	JR・CR（　）・SR	
2	Agreement between the Royal Government of Cambodia and the Government of the Socialist Republic of Vietnam on the Power Sector cooperation	1999/6	コピー	○				MIME	JR・CR（　）・SR	
3	Minutes of Meeting on Power Development Cooperation between the Ministry of Industry, Mines and Energy of the Kingdom of Cambodia and the Ministry of Industry & Handicraft of Lao Peoples Democratic Republic at MIH, LAO PDR on 2 april 1999	1999/4	コピー	○				MIME	JR・CR（　）・SR	
4	Energy Development Plan	1999/10	コピー	○				MIME	JR・CR（　）・SR	
5	Application for Project – Type Technical cooperation with Japan International Cooperation Agency	1999/9	コピー	○				MIME	JR・CR（　）・SR	
6	Organization Chart	1998/12	コピー	○				MIME	JR・CR（　）・SR	
7	Budget and financial Data: Annual Budget of MIME from 1995 – 1999		コピー	○					JR・CR（　）・SR	
8	Monthly Bulletine of statistics	1999/5	コピー	○						
9	Stung Hav Sihanoukville Industrial Zones	1997/7	コピー	○					JR・CR（　）・SR	
10	Royaume du Cambodge: Sihanoukville Zonage	1984/9	コピー	○					JR・CR（　）・SR	
11	Minimum of Temperature from 1994 to 1998		コピー	○					JR・CR（　）・SR	
12	Daily Maximum and Minimum of Humidity from 1994 to 1998		コピー	○					JR・CR（　）・SR	
13	Wind Speed and Direction from 1994 to 1998		コピー	○					JR・CR（　）・SR	
14	General Population Census of Cambodia 1998: Final	1999/8	コピー	○					JR・CR（　）・SR	

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	Census Result Data Sheet									
15	Special Rehabilitation Assistance Project under ABD Loan No. 1199-CAM(SF) Project Completion Report Loan and Contract Summary in the Power Sector		コピー	○					JR・CR（ ）・SR	
16	Cambodian Population from 1994 to 1997		コピー	○					JR・CR（ ）・SR	
17	Construction Cost: Kirirom I Project		コピー	○					JR・CR（ ）・SR	
18	Orgchart of Ministry of Economic and Finance		コピー	○				MOEF	JR・CR（ ）・SR	
19	Review of ASEAN Gas Development		コピー	○					JR・CR（ ）・SR	
20	Map of Mined Areas in Cambodia	1999/8	コピー	○				CMAC	JR・CR（ ）・SR	
21	Organization of the Ministry of Environment		コピー	○				MOE		
22	Environmental Analysis Report: C4 Replacement Power Pant Phnom Penh, Kingdom of Cambodia	1997/10	コピー	○					JR・CR（ ）・SR	
23	Decree on the Establishment of Ministry of Environment(クメール語)		コピー	○					JR・CR（ ）・SR	
24	Prakas on the Establishment of Provincial & Municipal Environmental Department （クメール語）		コピー	○					JR・CR（ ）・SR	
25	Asian Development Bank, Loan No. 1345-CAM(SF) Power Rehabilitation Project: Environmental Study Report (Draft)	1996/3	コピー	○					JR・CR（ ）・SR	
26	Request for formalization of electricity Power Plant of Company"Cambodia Power Company LTD" （クメール語、英訳）	1998/8	コピー	○					JR・CR（ ）・SR	
28	Letter Agreement: IPP-2	1998/6	コピー	○				CPC	JR・CR（ ）・SR	
29	Phnom Penh Power Rehabilitation Project Technical Assistance Component: Establishing Environmental Management Capabilities	1999/6	コピー	○				SMEC	JR・CR（ ）・SR	
30	Financial Data at 31 December 1998 and 1997: Phnom Penh, Sihanoukville, Siem Reap and Kompong Cham		コピー	○				EDC	JR・CR（ ）・SR	

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31	Power Purchase Agreement for the whole of the output of a 37.1 MW Diesel Electrical Power Generating Plant and upgrading and reinforcement of certain transmission facilities in Phnom Penh, Cambodia		コピー	○					JR・CR（ ）・SR	
32	Invoice from Cambodia Utilities PTE LTD (IPP-1)	1999/5	コピー	○					JR・CR（ ）・SR	
33	Power Purchase Agreement: Confirmed copy – Includes Amendment No.1 (IPP-2)	1998/10	コピー	○					JR・CR（ ）・SR	
34	Utilization Facotr of IPP-2 （クメール語）		コピー	○					JR・CR（ ）・SR	
35	Facility Resistor for Sihanoukville Power Station		コピー	○				EDC	JR・CR（ ）・SR	
36	Analizing the LDC Cost (USD) from Jan.'98 to Aug. '99 (20 months)		コピー	○				EDC	JR・CR（ ）・SR	
37	Oil Price Singapore Market	1998/12	コピー	○				IMIC	JR・CR（ ）・SR	
38	Report on Load Variation from April 26 to May 30 and 28 June to October 24		コピー	○				EDC	JR・CR（ ）・SR	
39	Waiting Consumer at Phnom Penh		コピー	○				EDC	JR・CR（ ）・SR	
40	Third Meeting of the Expert Group on Power Trade (EGP-3) and Sixth Meeting of the Electric Power Forum (EPF-6) Phnom Penh, Cambodia, 27-29/10/1999: Updates Transmission and Generation Master Plans the Case Kingdom of Cambodia	1999/10	コピー	○				EDC	JR・CR（ ）・SR	
41	Diesel Oil Analysis		コピー	○				EDC	JR・CR（ ）・SR	
42	Buyer's Guide: Electrical Appliance Engineer		コピー	○					JR・CR（ ）・SR	
43	カンボジア石油情勢	1999/9	コピー	○				出光	JR・CR（ ）・SR	

Questionnaire and Reply

November 1 1999

Japan International Cooperation Agency

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1. General Information
2. Electric Power Situation
3. Operation/ Maintenance Training
4. Environmental Information
5. Data for Analysis

Note)

In case that the information required in this questionnaire has been provided for JICAProject Formulation Study Team in July 1999 and the information is updated one by now, it is requested to describe the situation in the column of "Availability" but not required to prepare the same information again.

1. General Information

Item	Description	Availability	Remarks
1. Policy on Electric Power Sector	a) Government policy on electric power development		
	1) Power Transmission Master Plan & Rural Electrification Strategy (WB)	No change	See note
	2) Cambodia Power Sector Strategy 1999 – 2016	No change	See note
	3) Rural Electrification Strategy & Implementation Plan for the province of:		
	- Kandal	No	Included in Phnom Penh
	- Takeo	See remarks	Included in ADB report
	- Kampot	See remarks	Included in ADB report
	- Kampong	See remarks	Included in ADB report
	4) Power Purchase Agreement for:		Signed agreement with electrical tariff, Max./ Min. Power and Energy range, etc
	- IPP-1	×	
	- IPP-2	×	
	- Kirirom	×	Kirirom: 12 years 7 US cent/kWh 12 upto 30: 6.16 US cent/kWh
	5) Interconnection (National Grid) plan and Agreement (MOU) with Thailand, Vietnam and Laos	○	1) Vietnam: (between Takeo is 115 kV) 2) Thailand: To be signed soon 3) Laos:
2. Organization	a) Organization chart of MIME	○	Number of personnel in each Department and confirmation of latest chart
	b) Other organizations concerned to this study		
	1) Ministry of Economy and Finance	○	
	2) Ministry of Environment	○	

Item	Description	Availability	Remarks
3. Law and Regulations	c) Concerned Regulations for Sihanoukville	×	Especially building close to seacoast. Related to Ministry of Construction and Urbanization
4. Electricity Law	d) Current situation	See remarks	Same as before
	e) Expected effective date	See remarks	Expected within this year: Same as before
5. Topographic and Geologic Information around the Project site	f) Maps	Not available	Less than Scale: 1/25,000 or 1/10,000
	g) Geologic information	×	
	h) Seismic	No data	5Around 30 years, there is no any earthquake at Sihanoukville
	i) Minimum temperature from 1994 to 1998	○	
	j) Information on Mines formerly laid around the Area	○	
6. Study Reports	k) Interconnection transmission lines:		
	1) Between Thailand to Bontey Mean Chey	No report	
	2) between Vietnam to; - Phnom Penh through Prey Veng and Svay Rieng – Phnom Penh through Takhmau	 ○ No report	
	b) Part 3 of "Power Transmission Master Plan & Rural Electrification Strategy (KH-SE-45254)	×	
7. Population	a) Phnom Penh (from 1994 to 1998)	○	With the number of Electrical consumer, Urban and Rural ratio, etc.
	b) Sihanoukville (from 1994 to 1998)	○	
	c) Kampot (from 1994 to 1998)	○	

Item	Description	Availability	Remarks
	d) Takeo (from 1994 to 1998)	○	
	e) Takhmau (from 1994 to 1998)	○	
	f) Kampong Speu (from 1994 to 1998)	○	
	g) Kirirom (from 1994 to 1998)	×	
	h) Prey Veng (from 1994 to 1998)	×	
8. Future plan (17 years 2000 to 2016)	i) Generation		Confirmation of latest condition including expected target year/month, progress, etc. (Source: 17th ASEAN Ministers of Energy Meeting Country Report)
	1) Thermal Power Plant		
	– IPP-2 : 60 MW (May 2000)	No change	
	– Sihanoukville : 90 MW (2003)	No change	
	– Sihanoukville : 90 MW (2005)	No change	
	– Sihanoukville : 90 MW (2014)	No change	
	2) Hydro Power Plant		
	– Kirirom : 11 MW (2002)	No change	Which capacity is correct 10 or 11 MW
	– Prek Thnot : 18 MW (2002)	No change	
	– Kamchay site-1 : 47 MW (2008)	No change	Which capacity is correct 46 or 47 MW
	- Battambang N.1 & 2 : 60 MW (2011)	No change	
	– Stung Atay : 110 MW (2012)	No change	
	– Mid S.R.C. : 125 MW (2016)	No change	
	a) Transmission Lines		
	1) Kirirom and GS3 : 115 kV (2003)	No change	
	2) Prek Thnot and Kampong Speu : 115 kV (2003)	No change	
	3) Takhmau and Sihanoukville : 230 kV (2003)	No change	

Item	Description	Availability	Remarks
	4) Takhmau and GS2 : 115 kV (2003)	No change	
	5) Interconnection between Vietnam and Takeo : 230 kV (2004)	As remarks	Changed to 2008 from 2004
	6) NPP and Kampong Cham : 115 kV (2007)	No change	
	7) Kamchay and Kampot : 230 kV (2008)	No change	
	8) Phnom Penh and Battambang : 115 kV (2011)	No change	
	9) Phnom Penh and Prey Veng : 115 kV (2012)	No change	
9. Other Donors on Electric Power Sector	a) Lists of current project donated	○	Confirmation of latest condition to the list provided on July 1999
	b) Progress of current Project	○	
	c) Current condition of F/S with EGAT on the northern transmission link to Thailand	×	
10. Budget and Financial Data	d) Annual budget of MIME from 1995 to 1999	○	
11. List of Local Company	e) Specialist and/or Consultants		With the name of representative, address, TEL, FAX, home-page if any with unit price
	1) Technical guidance on Pollution control	×	
	2) Geotechnical Investigation	○	
	3) Topographical Surveyors	○	
	f) Engineering		
	1) Mechanical	○	
	2) Electrical	○	
	3) Civil	○	
	4) Architectural	○	
	g) Construction		

Item	Description	Availability	Remarks
	1) Mechanical 2) Electrical 3) Civil 4) Architectural	○ ○ ○ ○	
12. Oil and Gas Reserves	h) Current status of the study by: 1) Woodside Petroleum 2) Other company	 ○ ×	
13. Progress of F/S on Power Plant Project by SIEMENS		×	
14. General Information of IPP-2	a) EIA report b) Major procedures to get the approval of IPP	○ ×	Provide the copy of EIA report Itemize major procedures with related sectors such as PPA approved by MIME, etc.
15. Owner ship of the Plant	a) Who is the owner for 180 MW CCGT at Sihanoukville	○	EDC have the responsibility for operation and maintenance
16. Mines	c) Latest report of CMAC d) Map of Land Mines	○ ○	
17. IPP	e) Outline of major steps to finalize the IPP project f) Expected period to have the approval of IPP	× ×	Brief explanation only
18. Meteorological Data	g) Temperature h) Humidity i) Wind	○ ○ ○	Minimum 5 years (Except temperature record from 1994 to 1998)

Item	Description	Availability	Remarks
19. National Accounts	j) Gross Domestic Product (GDP) from 1995 to 1998	○	
	k) Gross National Product (GNP) from 1995 to 1998	×	
20. Related Development Plan	l) Outline of Industrial area at Sihanoukville	○	Planned completion year required power demand, etc.
	m) Others (related to Sihanoukville, Kampot, Takeo, Kandal and Kampong area)	×	

2. Electric Power Situation

Item	Description	Availability	Remarks
1. Existing Power Station	a) Resistor of thermal power plant at:		With installed/available capacity installed/Manufacturing year, thermal efficiency, fuel consumption, plant factor, kind of fuel, expected retired year in each generator set, etc.
	1) Phnom Penh	×	
	2) Sihanoukville	○	
	3) Kampot	BOT	
	4) Takeo	BOT	
	5) Takhmau	①	①: included in Phnom Penh
	6) Kampong Speu	×	Including IPP-1 and 2
	7) Kirirom		
2. Fault Record of Power Station	b) Phnom Penh	×	Applied only available generator set from Jan. 1996 to Sep. 1999
	c) Sihanoukville	×	
3. Power Consumption	d) List of waiting consumer		Consumers who have already issued request letter to MIME, EDC or Province
	Phnom Penh	○	
	2) Sihanoukville	×	
	3) Kampot	×	
	4) Takeo	×	
	5) Takhmau	①	①: included in Phnom Penh
	6) Kampong Speu	×	
	7) Kirirom	×	Not applicable
	b) Potential of commercial and industry for the above item 1) Phnom Penh	○	
	2) Sihanoukville	×	
	3) Kampot	×	
	4) Takeo	×	
	5) Takhmau	×	①: included in Phnom Penh
	6) Kampong Speu	①	
	7) Kirirom 1) to 7)	×	Not applicable
4. Organization Chart	a) EDC	No change	If any change to the list provided on July 1999

Item	Description	Availability	Remarks
5. Financial Report of EdC	a) Report for 1998	○	
6. Available Fuel analysis	b) Chemical and physical analysis of:		Including Low-calorific (net) value
	1) Heavy fuel oil	×	
	2) Diesel oil	○	
	3) Natural gas	×	with unit price
	4) Naphtha	×	
7. Design condition and system information	c) Climatic conditions	×	As a design criteria
	d) Outline of systems	×	Voltage, Power supply, etc.
8. Report of Load Variation at Phnom Penh	e) from 26 April to 30 May 1999	○	
	f) from 5 July to 1 August 1999	○	
9. Outline of the Existing Steam Turbine Generation Plant	g) Record of Installed and available capacity from 1995 to 1999	×	
	h) Record of Generated energy from 1995 to 1999	×	
	i) Thermal efficiency from 1995 to 1999	×	
	j) The number of Operation and Maintenance staff	×	
	k) Financial data	×	

3. Operation/Maintenance Training

Item	Description	Availability	Remarks
1. Operation and Maintenance	a) Training plan for the staff of: 1) Operation 2) Maintenance	 No idea No idea	MIME/EDC will consider this plan after construction of Combined Cycle power plant

4. Environmental Information

Item	Description	Availability	Remarks
1. EIA Reports	a) Sihanoukville conducted on 1999	○	Including Sihanoukville DEG Power Station
	b) EIA report of: - IPP-1 - IPP-2 - Kirirom	 × ○ ×	
2. River water analysis	c) Prek Roluos Rung River	×	
	d) Prek Thma Rung River	×	
3. Oceanographic at Sihanoukville Area	e) Ocean current	×	
	f) Maximum Wave height	×	
	g) Difference of High-Low Tied	About 50 cm	
4. Sub-Decree on EIA Process	h) Effective date	11 Aug. 1999	
	i) Role of MOE and List of Provincial Environmental Offices	○	By native language
	j) Environmental Application Form	×	Not finalized yet

5. Data for Analysis

Item	Description	Availability	Remarks
1. Construction cost of on-going project	a) Diesel engine generator	×	
	b) IPP-2	×	
	c) Hydro-power	○	Kirirom
2. Operation and Maintenance cost for above item 1	d) Number of Plant staff	×	
	e) O & M cost	×	Personnel expense, Material cost, etc.
	f) Administration expense	×	
3. Analysis Data	g) Discount rate	×	Used for project evaluation
	h) Internal rate or other conditions of available funds	×	
4. Data for cost estimation	i) Escalation rate (%) of:		During last five (5) years
	1) Construction materials	×	
	2) Labor cost	×	
	j) Land acquisition and compensation cost	×	Brief explanation only
	k) Customs expenses, rate for imported tax and duties	×	
5. The Life of facilities for depreciation	l) Gas Turbine Generator	×	
	m) Boiler and Steam Turbine	×	
	n) Condensate and Cooling water system	×	
	o) Fuel handling facility	×	
	p) Substation Equipment		

Item	Description	Availability	Remarks
	q) Ancillary facility for the Power Plant	×	
		×	
6. Governmental Formalities to get Proper Authorization for installing New Power Station	r) Kind of the formalities	×	Brief explanation only
	s) Period required	about 6 months	