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OED SPECIAL STUDIES 85035--003

Elec. Power Striky - Malaysia - NEB

1971-1972



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LEMBAGA LETRIK NEGARA, TANAH MELAYU.

Ibu Pejabat, 129, JALAN BANGSAR, KUALA LUMPUR.



NATIONAL ELECTRICITY BOARD OF THE STATES OF MALAYA.

> Head Office, 129, JALAN BANGSAR, KUALA LUMPUR.

> > P.O. BOX 1003

PETI SURAT 1003 Talipon K.L. 27791 (20 talian) "Taligeram TRANG"

Bil. Surat Tuan

Bil. Surat Kita CHA.014/7/6D CKF/TPT

June 1st, 1971.

BY AIR MAIL

Mr. Francois Ettori, Programming and Budgeting Department, International Bank for Reconstruction & Development, 1818 H Street, N.W., Washington, D.C.20433, U. S. A.

Dear Mr. Ettori,

Further to our General Manager's letter to you dated May 11th 1971, I forward herewith the following statements:

- (a) Statement showing the generation projects not covered by IBRD Loans in particular to the breakdown of expenditure between foreign and local components of the Malacca Power Station -Stages I, II and III and the Johore Bahru Power Station - Stage I.
- (b) Statement of monthly data showing the generating capacity out of service in the thermal plants of the interconnected western networks for period September 1968 to August 1970.

2. I would like to draw your attention that the figures shown in the statement under (a) above differ from those previously supplied to you following a detailed analysis to ascertain the foreign exchange components of the Malacca Power Station - Stages I, II and III and the Johore Bahru Power Station - Stage I.

3. Please let me know if you require any further information.

Yours sincerely,

(Chan Kai 400) Financial Controller National Electricity Board

Encls:

LOMBACA LETRIK NEGARA. TANAN MELAYU

JAN.

NATIONAL ELECTRICITY BOARD OF THE STATES OF MALAYA

Head Office, 129, JALAN BANGSAR, KUALA LUMPUR,

P.O. BOX 1003

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NATIONAL ELECTRICITY BOARD OF THE STATES OF MALAYA

OTHER GENERATION PROJECTS NOT COVERED BY IBRD LOANS

(In M\$million)

Year	Malaco Stages	ca Power Sis I, II and	tation d III	Joho: Stat	re Bahru Po ion - Stage	ower e I	Others								
31st August	Local	Foreign	Total	Local	Foreign	Total	Local	Foreign	Total						
1958	2.6	6.3	8.9	_	_	-	1.6		1.6						
1959	1.2	6.5	7.7	-	-	-	0.3	-	0.3						
1960	0.3	2.1	2.4	-	-	-	2.8	-	2.8						
1961	0.4	1.1	1.5	2.0	0.3	2.3	0.8	-	0.8						
1962	-	-	-	2.6	3.7	6.3	1.6	-	1.6						
1963	-	-	-	3.3	7.0	10.3	1.6	100	1.6						
1964	-	-	-	0.6	2.9	3.5	1.0	· ·	1.0						
1965	0.2	1.2	1.4	0.1	0.2	0.3	3.1	-	3.1						
1966	1.0	1.9	2.9	0.1	0.8	0.9	1.6	· _ ·	1.6						
1967	0.3	0.5	0.8	-	-	-	1.3	-	1.3						
1968	-	0.2	0.2	-	-	- i	1.6	-	1.6						
1969	-	-	-	· -		-	1.0	-	1.0						
1970	-	-	-	-	-	1	1.5		1.5						
Total	6.0	19.8	25.8	8.7	14.9	23.6	19.8		19.8						

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CKF/TPT Kuala Lumpur 31st May 1971

Month	Installed Capacity <u>M.W.</u> Total Wes ten not work (Hycho + Therme)	Average Capacity out of service for Planned <u>Maintenance</u> <u>M.W</u> .	Average Capacity out of service for Breakdown <u>Maintenance</u> <u>M.W</u> .	Total Capacity out of service for Main- <u>tenance</u> <u>M.W.</u>	Remarks
September'68	445.423	5	50	55.0	Western Network
October 1968	11	20	12.5	32.5	13
November 168	H	7.5	-	7.5	Ħ
December '68	11	10	-	10.0	Ħ
January 1969	11	22.5	-	22.5	n
February '69	11	2.5	37.5	40.0	17
March 1969	11	57.5	-	57.5	n
April 1969	11	22.5	-	22.5	"
May 1969	505.423	10		10.0	Tuanku Ja'afar P.S. 1st Set synchronised
June 1969	11	-	-	-	oo webvern wetwork.
July 1969	II	• -	55	55.0	Western Network.
August 1969	565.423	48.75	5	53.75	Tuanku Ja'afar P.S. 2nd Set synchronised to Western Network.
September '69	565.423	40	-	40.0	Western Network
October 1969	. п	30	10	40.0	H
November 169	21	35	10	45.0	11
December '69	11	1.0	10	20.0	tt
January 1970	13	2.5	60	62.5	75
February 1970) "	5	15	20.0	п
March 1970	n	57.5	25	82.5	н
April 1970	n	-	35	35.0	n
May 1970	n	45	10	55.0	11
June 1970 40	625.423	60	22.5	82.5	Sultan Ismail P.S. synchronised to Western Network.
July 1970	11	12.5	12.5	25.0	Western Network.
August 1970	n	22.5	10	32.5	17

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

INTERNATIONAL DEVELOPMENT ASSOCIATION

OFFICE MEMORANDUM

April 19, 1971

TO: Mr. Richard H. Sheehan

FROM: R.V. Sear and C. de Beaufort

SUBJECT: MALAYSIA - Loans 458-MA, 579-MA and 700-MA National Electricity Board (NEB) Third, Fourth and Fifth Power Projects Full Supervision Report

In accordance with Terms of Reference dated January 29, 1971 a supervision visit was made to Malaysia between February 10, 1971 and March 3, 1971.

1. PROJECT DATA

	Loan 458-MA	Loan 579-MA	Loan 700-MA
Original Loan Amount (millions)	US\$37.0	US\$11.5	US\$20.0
Present Loan Amount net of cancellations (millions)	US\$29.5	US\$ 9.5	US\$20.0
Amount disbursed Dec. 31, 1970 (millions)	US\$25.7	US\$ 3.1	US\$ 0.06
Amount committed (millions)	US\$ 3.8	US\$ 6.4	US\$ 1.0
Signing Date:	7/26/1966	1/9/1969	7/16/1970
Effective Date:	8/30/1966	3/4/1969	9/29/1970
Original Closing Date:	9/30/1970	3/31/1973	1/31/1975
Present Closing Date:	3/31/1972	3/31/1973	1/31/1975
Date of Last Supervision Mission:	10/7/1970	10/7/1970	10/7/1970
Rate of exchange:	US\$1.00 = M	\$3.00	

The projects under various loans consist of:

<u>Loan 458-MA</u> (i) the construction of the Tuanku Ja'afar thermal station, with an initial capacity of 120 MW (2 x 60 MW); (ii) the expansion of the Sultan Ismail steam station at Johore Bahru by the installation of 2 - 30 MW units; (iii) the installation of the third 50 MW unit at Woh plant and 1.4 MW of additional capacity at Odak hydro plant of the Batang Padang scheme; (iv) transmission system expansion.

Loan 579-MA (i) the second stage of the Tuanku Ja'afar plant consisting of the addition of 2 x 60 MW steam units; (ii) the second stage of the Prai station consisting of the addition of 1 x 30 MW steam unit and (iii) transmission line extensions.

The Bank loan of US\$9.5 million would be used to finance the foreign exchange cost of the Prai station and transmission line project and the miscellaneous items for the Port Dickson plant. The Boilers, Turbo-alternators and Steel Structures for Port Dickson are being financed through bilateral sources or from supplier credits.

Loan 700-MA (i) the third stage of the Tuanku Ja'afar plant consisting of 3×120 MW steam electric units, (ii) transmission lines and associated substations.

The Bank loan of US\$20 million would be used to finance the foreign exchange cost of civil works; electrical and mechanical equipment and material (except the Boilers and Turbo Alternators which will be financed through supplier credits); transmission line and substation equipment and material and consulting services.

2. SUMMARY

Loan 458-MA. All works constructed under this loan have been satisfactorily completed. The only remaining item is the 30 MW steam electric unit at Sultan Ismail plant which is now undergoing its acceptance tests. NEB has cancelled a further US\$2 million from the loan with the Bank's agreement. Total cancellations are US\$7.5 million due principally to equipment tenders in 1968 which were about US\$6 million below the original estimate. The remaining US\$1.5 million resulted from reduced interest during construction. The balance in the loan amount of about US\$3.8 million is expected to be disbursed by the closing date March 31, 1972. No further reporting will be made on this loan.

Loan 579-MA. Construction of the third 30 MW steam electric unit at Frai plant is progressing satisfactorily and completion is now expected in April 1971, about 4 months behind the original schedule but will not cause any power shortage. At Tuanku Ja'afar plant the piling for steam electric units 3 and 4 (2 x 60 MW) has been completed and steel erection for the power house and boiler has started. The chimmay is about 60% completed. This station may be about 6 months behind schedule due to strikes and delays in the turbine manufacturer's works. Equipment is scheduled for delivery in about 6 month's time. On the basis of the present load forecast and assuming the plant goes into service at the newly scheduled date (August 1972), no power shortages are expected. NEB has cancelled US\$2 million from this loan with the Bank's agreement because the civil works contract, won by a local firm, is to be paid for in local currency from NEB's own funds. It was originally estimated that a large component of this contract would be in foreign currency. To: Mr. Richard H. Sheehan - 3 -

April 19, 1971

Loan 700-MA. Tenders have been received for the boilers and turbo alternators and are being evaluated by the consultants. Soil tests have been made at the site and civil works designs are being completed. No significant disbursements have yet been made from this loan. Progress is satisfactory at this early stage.

System Demand Forecast. In February 1970 a comprehensive review of the load forecast was made to take account of the various events which occurred during 1969-70 and which tended to slow down economic growth. This forecast was again reviewed and actual results during 1970 show that it remains substantially unchanged. The present trend is just slightly below the previous forecast by about 1-2%, not sufficient to justify any change to the construction program particularly as some delays in the in-service date of new plant is now expected.

<u>Future Expansion</u>. In September 1970, NEB decided to accept a Canadian \$50 million credit to finance the Temengor hydroelectric project (260 MW) which it has selected as the next step of power system expansion. NEB have just reached agreement on a consulting services contract with Shawinigan Engineering, Canada and is awaiting action by the Malaysian Government to consummate a Canadian bilateral loan to finance these consulting services.

Financial Aspects. During its fiscal year August 31, 1969/70 favorable hydrological conditions enabled NEB to earn a rate of return of 9.8%, well above the rate of 8% agreed upon with the Bank. Forecasts through 1978 show that NEB's financial position will remain sound and that its rate of return will average about 8.2% with minor fluctuations around that level.

<u>Management</u>. On March 1, 1971, NEB's new chairman Y.B. Tan Sri Haji Abdul Aziz bin Mohd. Zain, took office: A number of changes to the board also took place. These changes do not appear to give any cause for concern. The only change to management was the appointment of Mr. Chan Kai Foo as Financial Controller. This appointment was approved by the Bank. Other changes affecting the General Manager are being reviewed by the Board since he reaches retirement age later this year. Under the existing loan agreements NEB must give the Bank the right to comment on changes at the management level and it is expected that NEB will do so in due course. While the general and financial situation of NEB presents no special problems, the staffing of the organization under the special conditions existing in Malaysia does present a matter which the Bank should keep under review. No special action is recommended at present.

3. ACTION RECOMMENDED

No specific action is recommended.

The next regular supervision mission should take place in February/March 1972 when the future Transmission and Substation System loan should be reviewed and an appraisal date determined.

4. PHYSICAL EXECUTION OF PROJECT

Tuanku Ja'afar Station

Units 1 and 2 of this plant were completed in September 1969 but shortly thereafter troubles with overheating and vibration of the generators of both units was experienced. During 1970 the manufacturer (Toshiba, Japan) has completed corrective measures on both machines which are now operating satisfactorily. The guarantee period has been extended for one year.

Piling for units 3 and 4 (2 x 60 MW) is finished and steel erection for the power house and boiler has started. The chimney is about 60% completed. The work on site is progressing satisfactorily at this stage, however, completion of the plant is expected to fall about 6 months behind schedule due to strikes and delays in the turbo alternator manufacturer's factory (Parsons, England). Equipment delivery is now scheduled to start in about 6 months. On the basis of the present load forecast and assuming that there are no further delays, the units should be in service by August 1972 and no power shortages are anticipated. However, NEB and its consultants are still discussing the details of control instrumentation for the boiler and turbo alternator and some further delay and price increase could result from this.

The tenders for the boilers and turbo alternators for units 5, 6 and 7 (3 x 120 MW) have been received and are being evaluated by the consultants. Soil tests have been carried out at the site and civil works designs are being completed. The civil engineering consultants (Shawinigan Engineering, Canada) have associated with the Malaysian firm of Ganendra, Ahmad and Associates who are preparing drawings under the supervision of a resident engineer from Canada. The arrangements appear at this early stage to work satisfactorily.

No significant disbursements have been made from the loan account yet and it is still too early to comment on the cost estimate.

Sultan Ismail Station

The first 30 MW unit was placed in service in 1968.

Construction of the second unit is almost complete and the acceptance tests have been started.

Woh and Odak and Transmission System

All work on these parts of the program have been satisfactorily completed and no further reporting will be made.

Prai Station

Construction is progressing satisfactorily and completion is expected in April 1971 which is about 4 months behind the original schedule but will not cause any power shortages.

Transmission Lines

Work has started on the Bentong-Raub - Mentakab transmission lines which will eventually connect Kuantan on the East coast with the Western network. At this early stage progress is satisfactory and completion is scheduled for early in 1972.

Cost Estimates

The actual cost of the work under Loan 458-MA has been very substantially below the original estimate due to unusually low bids for equipment received in 1968. Since most of the work has been completed or is nearing completion, NEB cancelled US\$5.5 million of the loan in 1970 and during the present mission a further cancellation of US\$2 million was approved. Of the total cancellation of US\$7.5 million, about US\$6 million was due to actual costs being below estimate and about US\$1.5 million resulted from reductions in the provision for interest during construction. The balance of about US\$3.8 million in the loan account is expected to be disbursed by the closing date March 31, 1972. The costs of work under Loan 579-MA at this time appear to be about 20% below estimate on the Bank financed portion of the project (US\$11 million) principally due to the civil works contractor's request for payment of part of the foundation and steel costs in local currency which would consequently be paid by NEB and not financed from the loan account. In view of this NEB has cancelled US\$2.0 million from the loan account with the Bank's agreement.

5. OPERATING RESULTS AND FORECAST

Load Forecast. During May 1969 serious civil disturbances took place and caused a prolonged slowdown in economic growth in Malaysia. There has since been a gradual improvement in the economic climate and the public have resumed their normal pattern of life - curfew was completely lifted in August 1970.

When the Fourth Power Project loan was made in December 1968, owing to a number of uncertainties, among them the planned withdrawal of the British armed forces in 1970-71 - a "normal" and a "lower" load forecast were made so that the justification of the power generation planting program could be assessed under the estimated worst conditions. It was seen that the "lower" forecast would not materially affect the program and would only warrant delays of less than one year. Part of this was due to the planned substantial increase in sales to the Perak River Hydroelectric Company (PRHE) a privately-owned company serving most of the State of Perak. Since then PRHE has signed a revision to this agreement and again revised its purchase agreement upwards. The first step of the contract went into effect when units 1 and 2 of Tuanku Ja'afar station went into service (1969-70) and the subsequent steps will become effective as units 3 and 4 and later 5, 6 and 7 go into service. These bulk sales to PRHE will largely offset the system sales shortfall from the 1968 forecast. A revised forecast was made in 1970 to reflect all these changes. A further review of this forecast was made during the present mission based upon the actual results of 1970 and confirms that the forecast remains substantially unchanged. The present trend is only 1-2%

below the previous forecast and is not sufficient to warrant any change to the construction program particularly since some delays in the in service dates of new plant is now envisaged. A detailed review of the load forecast is given in Annex 1.

Operating Results and Forecast. NEB's rate of return increased from 8.8% during its fiscal year August 31, 1968/69 to 9.8% in 1969/70. The results for 1969/70 exceeded the projected return of 7.5% mainly because of considerable savings in fuel costs as a result of exceptionally heavy rainfall in the Cameron Highlands' catchment area. There were also savings on taxes which had been conservatively estimated in view of uncertainties surrounding the application of the 1969 amendment to the Income Tax which removed NEB's tax exempt status. It is expected that the Department of Inland Revenue will soon rule on the remaining uncertain points. The most important of these are the question of whether "interest" paid on NEB's common stock will be considered as pure interest or as a dividend which would not be deductible, and the question whether NEB is still exempt from payment of the 2% payroll tax. Pending a ruling, tax and dividend payments have been held up.

Partly because of the favorable operating results and the postponement of tax and dividend payments and partly because of savings on construction costs and some slippage in the investment program, NEB's liquidity is at the moment unusually high. Payments to be made as soon as the tax ruling will have been issued, and possibly some purchases of short-term government bonds, are expected to reduce the liquidity soon to a normal level. The short-term bonds would be held until more funds than provided by cash generation will be needed for the construction program. Such cash deficits are forecast for fiscal years 1972, 1973 and 1974.

The mission reviewed NEB's financial forecasts through 1978 and found them reasonable. They show that NEB's financial position will remain sound and that its rate of return will average about 8.2% with minor fluctuations around that level. The minimum rate of return agreed with the Bank is 8%. Interest coverage and debt service coverage will remain adequate.

6. ORGANIZATION AND MANAGEMENT

NEB is going through the first major change at the Board and Management level since Malaysia's independence in 1957 at which time the program of Malayanization was started and former expatriate staff were gradually replaced by Malaysians.

The NEB Chairman was replaced on March 1, 1971 by Y.B. Tan Sri Haji Abdul Aziz bin Mohd. Zain who was a prominent judge and later associated with the Education Ministry.

The Board itself has had five members replaced and a new member added. Annex 2 gives the names of the new Board of Directors.

These changes to the chairman and board have taken place smoothly but it will take a little time before the new members become familiar with their responsibilities.

Among management personnel the only change has been the appointment of Mr. Chan Kai Foo to the position of Financial Controller to replace Mr. L.H. Tan who resigned in 1970. The Bank approved this appointment. At present the Board of Directors and the Government are reviewing the position of the General Manager and deputy Chairman, Mr. Raja Zainal who reaches retirement age later this year. The Bank has the right under existing loan agreements to comment on changes at the management level and it is expected that NEB will notify the Bank in due course of any contemplated changes. While the general and financial situation of NEB presents no special problems, the staffing of the organization under the Government's policy of giving preference to Malays in employment does present a matter which the Bank should keep under review. No special action is recommended at present.

7. FUTURE PROGRAM

In September 1970, NEB decided to accept a Canadian \$50 million Credit to finance the Temengor Hydro electric plant (260 MW) which NEB has decided will be the next step of power system expansion after the Tuanku Ja'afar plant is brought to its ultimate capacity of 600 MW. NEB has reached agreement with Shawinigan Engineering, Canada on a contract for consulting engineering, detailed design and construction supervision of this project. Steps are now being taken to consummate a bilateral credit between the Malaysian and Canadian Governments to finance this contract.

cc: Messrs. Chadenet, Baum, Rovani, John King, Engelmann, Lee, Lithgow, Perch, Weiner, Armstrong, Howell, Berrie, Jennings, White, Saeed/Bomani, Amin-Arsala (EA&P), Hasal (Controller's), Awunyo (Legal), Central Files (2), Division Files, Chron. File, Dept. Black Book, Div. Black Book

RVSear/CdeBeaufort:pww IBRD

ANNEX 1 Page 1 of 3 pages

MALAYSIA

Western Network Maximum Demand

Review of Load Forecast

for ten year period 1971-1980

1. In the light of the actual maximum demands recorded at the various main intake substations, during system peak for the year ended 31st August, 1970, the load forecast for the ten year period 1971-1980 has been revised downward slightly but the trend remains substantially the same as the load forecast made in February, 1970. The total system MD for the years have been reduced slightly, varying from 2 MW to 13 MW. The reduction of 13 MW is in 1971, owing to the delay in wayleave approval for the Bentong/Raub/ Mentakab scheme, which accounts for some 8 MW, and the remaining 5 MW are due to reductions at Cameron Highlands (Talam Mines) and Port Dickson.

2. The MD for the various substations remain the same except for the following revisions:-

- (a) Cameron Highlands The MD has been reduced by 2 MN each year, since Talam Mines has decided to obtain their additional requirements from the Perak Hydro system.
- (b) Segambut/Pudu Ulu/ -K.L. (South).
 Future Setapak/Ampang/ Sg.Besi/Sg.Way
 The total MD for all these substations remain substantially the same, but the MD for Pudu Ulu have been reduced while those for K.L. (South) have been increased correspondingly.
- (c) Batu Tiga The day peak is almost double the evening peak, due to some of the factories working only one shift. Moreover, the anticipated domestic housing development, and new state capital have been delayed, and so the MD for 1971-1974 have been reduced slightly.
 - The housing development around Klang has increased tremendously, presumably due to the delay in the implementation of the housing schemes in Batu Tiga. This, together with slight increases in industrial loads, has accounted for nearly 3 MW of extra load over the last 12 months. The MD have been revised slightly higher.

(d) Klang

(e) Port Dickson

- Shell Refinery has not confirmed their preliminary enquiry for Board supply and the load forecast has therefore been reduced by 1.6 MW in 1972 to 4.5 MW in 1980.

(f) Penang

- Agreement has been reached with Penang City Council to take out supply from 1972 onwards, with an initial supply of 1.2 MW rising to 21.5 MW in 1980. The previous forecast has been revised upwards for 1978-1980 only.

February 15, 1971

ANNEX 1 Page 3 of 3 pages

MALAYSIA

ESTIMATED LOWER LIMIT M.D. (MW)

	Central Network		-							1077	1978	1979	1980
			970 ctual)	<u>1971</u>	<u>1972</u>	1973	1974	1975	1976	19/1	1970	2717	
1.	Cameron Highlands (including Talam Mines)	-i -	4.61	5.0	5.50	6.00	6.50	7.00	7.50	8.00	8.50	9.00	9.50
2.	Rawang	}											
3. (a) (b)	Segambut Future Setapak))											
4. (a) (b)	Pudu Ulu Future Ampang/Sungei Besi)											
5. (a) (b)	Kuala Lumpur South Future Sungei Way							0(7.00	286 00	300.00	31/1-00	328.00	343.00
6.	Bungsar) 18	32.17	203,00	215.00	229,00	249.00	207.00	200.00	,			
7.	Ayer Hitam	Ì											
8. (a) (b)	Batu Tiga 66 kV Future 132/33/11 kV)											
9• (a) (b)	Klang 66 kV Klang 2nd Main Intake	}		24									
10.	Bangi)		190									
11.	Seremban (including Senawang Industrial Area Substation))	7.60	8.95	9.85	10,80	11.90	13.10	14.40	15.80	17.40	19.10	21.00
12.	Kuala Pilah		1.34	1,56	1.68	1.81	1.95	2.10	2.26	2.44	2.64	2.84	3.08
13.	Gemas		2.17	2.40	2.60	2.80	3.22	3.45	3,80	4.20	4.70	5.20	5.70
14.	Rantau		1.60	1.80	1.90	2.00	2.10	2.20	2.30	2.40	2.50	2.60	2.70
15.	Alor Gajah		2.27	2.47	2.73	3.13	3.44	3.77	4.22	4.72	5.29	5.93	6.65
16.	Malacca))		14.00	13.60	14.30	15.00	15.75	16.50	17.30	18,20	19.10	20.00	21.00
17.	Merlimau)		2 20	3 80), 10	1 1.1.	L.80	5.18	5.60	6.00	6.45	7.00	7.60
18.	Muar		3.10	3.02	1.39	L.90	5.50	6.15	6.90	7.70	8.60	9.60	10.70
19.	Batu Pahat		6.00	6 50	8.00	8.50	9.00	9.50	10.00	10,50	11.00	11.50	12.00
20.	Port Dickson		0.00	-	0.96	1.02	1.08	1.14	1.20	1,28	1.34	1.42	1.50
21.	Bentong			-	1.53	1.55	1.57	1.60	1.63	1.65	1.68	1.70	1.72
22.	Raub			-	5.10	5.22	5.34	5.45	5.58	5.70	5.82	5.97	6.10
23.	Mentakab			_		4.70	5.40	6.00	6.80	7.70	8.70	9.60	10.50
24.	Kuantan Total Tanamission L	05585	228.86	253.00	277.64	300.85	326.55	350.14 14.00	375.49	396.29 15.80	417.72 16.70	439.46 17.50	462.75 18.50
	Central Networ	k Total	235.36	263.10	288.74	312.85	339.65	364.14	390.49	412.09	434.42	456.96	481.25
	Northern Network (including												
	Perak Hydro)		50.00	50.00	110.00	120.00	130.00	140.00	150.00	160.00	170,00	180.00	190.00
1. 2. (a)	Taiping Banak Carbide		9.20	10.25	10.70	11.13	11.55 12.50	12.00 13.10	12.50 13.70	13.00 14.40	13,50 15,10	14.00 15.90	14.50 16.70
(0)	Perit Puntar		2.25	2.70	2.90	3.10	3.32	3.55	3.80	4.06	4.35	4.65	4.97
3. 1.	Parit		24.00	25.00	28.00	30.60	33.90	37.20	41.30	45.40	50.50	56.00	62.00
4. C	Frai		3.38	3.42	3.76	4.14	4.56	5.02	5.52	6.08	6.70	7.36	8.10
5	Alon Star		7.60	8.40	8.80	9.20	9.60	10.00	10.50	11,00	11.50	12.00	12.50
7.	Penang		-	-	1.20	3.30	5.60	8.00	10.50	13.10	15.70	18.50	21.50
	Total Transmission I	Losses	96.43 2.70	110.57 4.40	176.66	193.37	211.03 8.40	228.87	247.82	267.04 10.70	287.35 11.50	308.41 12.30	330.27 13.20
	Northern Netwo	ork Total	99.13	114.97	183.70	201.07	219.43	237.97	257.72	277.74	298.85	320.71	343.47
	Sustan Total		334.00	378.07	472.44	513.92	559.08	602.11	648.21	689.83	733.27	777.67	824.72
	System Total			21-1-1									

MALAYSIA

NATIONAL ELECTRICITY BOARD

BOARD OF DIRECTORS

Y.B. Tan Sri Haji Abdul Aziz bin Mohd. Zain

Y.M. Raja Tan Sri Zainal bin Raja Sulaiman, P.S.M., J.M.N., J.P.

General Manager and Deputy Chairman

Chairman

Y.B. Tan Sri T.H. Tan, P.M.N., C.W.E., M.P.

Enche P.P. Narayanan

Y.B. Enche Chan Keong Hon, J.S.M., A.M.N., S.M.S., P.J.K., M.P.

Enche Tan Toh Hong

Enche Abdul Razak bin Yusof, S.M.T., J.P.

Enche Mohd. Jumah bin Mat Satir

Dr. Nik Hussein bin Abdul Rahman

Enche Lim Sun Hoe

Enche Bhupinder Singh

Enche Kim Kok Kwang

.1

DISBURSEMENT SCHEDULE FROM MARCH 31, 1971 TO PROJECT COMPLETION

1. 1 . 1	Projects' Department	Public Utilities Projects	2.	Division	Power I
3. 1	Loan/Credit	No. 458-MA	4.	Country	Malaysia
5. 1	Project's Nam	me Third Power Pro	ject		
6. (Original Amon	unt 1/US\$29.5 million	7.	Date Sign	July 26, 1966
	, F.)		8.	Present C	losing Date March 31, 1972
9.	Amount Undis	bursed as of December	31,	1970 <u>US</u>	5,800,830
	<u>1</u> /	Net of cancellations (US\$5.5 million cance (US\$2.0 million cance	alre ellec	eady made, i in 1970) i in 1971)	if any.
		FORECAST OF D	ISBUF	SEMENTS	
Quarte	er Ending	Estimated Di. (In Qua	sburs rter)	sements	Undisbursed Balance
March	31/71	Cancelled 2,000,0 Disbursement 1,200,0	00		2,600,830
June 3	30/71	700,0	00		1,900,830
Septer	mber 30/71	700,0	00		1,200,830
Decemb	per 31/71	600,0	00	-	600,830

FORECAST OF DISBURSEMENTS

Quarter Ending	Estimated Disbursements (In Quarter)	Undisbursed Balance
March 31/72	600,830	an a she an
June 30/72	-	*
September 30/72		
December 31/72		
March 31/73		
June 30/73		
September 30/73		
December 31/73	• •	
March 31/71,		
June 30/74		
September 30/74		
December 31/74		
March 31/75		
June 30/75		
September 30/75		•

December 31/75

1

C

* Total cancellation US\$7.5 million out of US\$37.0 million due mostly to about US\$6 million in Port Dickson and Sultan Ismail equipment prices being below estimate. Also, about US\$1.5 million reduction in interest during construction and about US\$0.5 million in transmission lines and substations which were not built.

Loan 458-MA

هيانيا
<u>73</u>
utilite.
ce
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3,276,671

2,476,671

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September 30/71

1,400,000

800,000

December 31/71

FORECAST OF DISBURSEMENTS

Loan 579-MA

Quarter Ending	Estimated Disbursements (In Quarter)	Undisbursed Balance
March 31/72	500,000	1,976,671
June 30/72	600,000	1,376,671
September 30/72	600,000	776,671
December 31/72	600,000	176,671
March 31/73	176,671	-
June 30/73	*	
September 30/73		
December 31/73		
March 31/74		
June 30/74		
September 30/74	÷ .	
December 31/71		
Manch 31 /75		
Iuno 30/75		
Decombon 31/75		-

* Due to shift in civil works and steel structure payments from estimated foreign to actual payments in local currency.

C

Projects Public Utilities 1. Division Power I 2. Department Projects Country Malaysia Loan/Credit No. 700-MA 4. 3. Project's Name Fifth Power Project 5. Original Amount 1/ 20.0 million 7. Date Signed July 16, 1970 6. Present Closing Date January 31. 1975 8. Amount Undisbursed as of December 31, 1970 19,941,194 9.

1/ Net of cancellations already made, if any.

FORECAST OF DISBURSEMENTS

Quarter Ending	Estimated Disbursements (In Quarter)	Undisbursed Balance
March 31/71	80,000	19,861,194
June 30/71	100,000	19,761,194
September 30/71	100,000	19,661,194
December 31/71	300,000	19,361,194

DISPURSEMENT SCHEDULE FROM MARCH 31, 1971 TO PROJECT COMPLETION

Loan' 700-MA

FORECAST OF DISBURSEMENTS

1

C

Quarter Ending	Estimated Disburgements	Undisbursed Balance
and a support of the second	(In Quarter)	
March 31/72	400,000	18,961,194
June 30/72	500,000	18,461,194
September 30/72	1,500,000	16,961,194
December 31/72	2,000,000	14,961,194
March 31/73	2,500,000	12,461,194
June 30/73	3,000,000	9,461,194
September 30/73	2,000,000	7,461,194
December 31/73	2,000,000	5,461,194
March 31/74	2,000,000	3,461,194
June 30/74	1,500,000	1,961,194
September 30/74	1,000,000	961,194
December 31/74	500,000	461,194
March 31/75	461,194	-
June 30/75		
September 30/75		
December 31/75	and the second se	

LEMBAGA LETRIK NEGARA, TANAH MELAYU.

Ibu Pejabat, 129, JALAN BANGSAR, KUALA LUMPUR.

PETI SURAT 1003



NATIONAL ELECTRICITY BOARD OF THE STATES OF MALAYA.

> Head Office, 129, JALAN BANGSAR, KUALA LUMPUR.

> > P.O. BOX 1003

15th April, 1971.

Talipon K.L. 27381 (7 tama) K.L. 27381 (7 tama) K. L. 27791 (20 talian)

Bil. Surat Tuan Bil. Surat KitaCHA. 14/7/6D/36 SV/JC

> Mr. Franceis Etteri, Hotel Goodwood, Singapore.

"Taligeram TRANG"

Dear Mr. Etteri,

As discussed during your visit to this office, I am attaching herewith a statement showing costs of capital projects carried out by NEB from 1958 to 1970.

The statement required by you from the Generation Department of the Board will be sent by them in due course direct to your Washington address.

Yours sincerely,

(Chan Kai Foo)

(Chan Kal Foo) Financial Controller

NATIONAL ELECTRICITY BOARD - MALAYSIA

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TYPE OI	PROJECT		1958		1959	+		1960		190	61		1962		1	963		195	4	/	965		1966		1	967	1	1	968		19	769		19	170	
GENERATION	1	4	F Tetai	1 L	F	Tota!	L	F To	tal L	LF	Total	L	F	Total	L	F To	lel L	F	Total	4	F Tola	LL	1=	Total	L	F	Tatal	L	F 70	tal	L 1	= To	IRE	LI	E To	olai
. (a) Generation Proj	ects covered by Loan															-																				
Comeron Highlan	ds Hydro-Electric Scheme	0.5	- 0.5	1.2	1.4	2.6	5.2	9.6 14	1.8 9	.9 9.	7 19.6	14.1	18.9	33.0	7.9	15.5 23	4 3.8	3.7	7.5																	
Batang Padang H	Idro-Electric Scheme								0	.2 -	- 0.2	1.1	-	1.1	2.5	- 2.	5 9.4	+ 13.1	22.5	11.8	18.3 30.1	13.1	21.4	34.5	9.6	26.4	36.0 5	5.0	12.3 1	73 0	0.3 1	1.2 1	1.5 1	5.2 1	0.1	0.3
Prai Power .	Station Stage I (2x 30 Mw set)		-)		1				2.1	1 25	4.5	30	4.6 7.6	5.0	18.0	23.0	3.8	3.6	74	1.9	0.9	2.8	1.0	1.2 3	2.2 0	5.2	- 0	0.2
Prai Power S	tation Stage IT (1x30MW Set)														•								-									0.4 0	0.4 0	2.5 1	5.7 :	7.2
Port Dickson Po	wer Station Stage I (2×60MW)					-		a state of the sta												0.2	- 0.2	0.9		0.9	59	3.3	9.2 0	6.5	19.0 2	5.5 6	6.7 1	7.1 2	13.8	1.4 (0.1	1.5
Port Dickson Por	ver Station Stage II (2×60 MW)				1												•									are shared in the second					- 1	0.5 0	0.5	1.2	0.9	2.1
Port Dickson Pou	ver Station Stage III (3x120MW)										-							•																- 0	0.5	0.5
Johore Bahry Pou	ver Station Stages IJ III (2×30 MW)							1														1-0	0.4	1.4	1.8	6:4	8.2 1	1.1	2.0 3	3.1 1	1.2 1	0.7	1.9 1	•4	4.3 5	5.7
(6) Generation Pro	jects not covered by Loan				5																															
Johore Bahry Pow	v Station Stage I (3×10 MW)							1	2.	3 -	2.3	6.3	-	6.3	10.3	- 10.	3 3.5	-	3.5	0.3	- 03															
Malacca Power St	ation Stages I, II & III (4×10MW)	8.9	- 89	7.7	-	7.7	2.4	- 2.	4											1.4	- 1.4				-											
Other Generali	ng Plants (Diesel)	1.6	- 1.6	0.3	-	0.3	2.8	- 2.	8 2.	3 -	2.3	1.6	-	1.6	1.6	- 1.	6 1.0	-	1.0	3.1	- 3.	1 5.4	-	5.4	2.1	-	2.1 1	1.8	-	1.8	1.0	- 1	1.0 1	.5	- 1	1.5
	Total Generation	11.0	- 11.0	9.2	1.4	10.6	10.4	9.6 20	.0 14.	7 9.	7 24:4	23.1	18.9	42.0	22.3	15.5 37.	8 19.8	7 19.3	39.1	19.8 .	22.9 42.	2 25.4	39.8	65.2	23.2 3	39.7	62.9 16	6.3 .	34.2 5	0.5 1	10.2 2	1.1 3	1.3 1	5.4 1.	2.6 1	19.0
TRANSMISSI	<u>N</u>																				un des sets															
(a) Transmission L	ines covered by Loan			-				2 2 1 1																												
Transmission Lines	Associated with Cameron Highlande Hydro-								3.	0 0.	7 3.7	4.5	9.0	13.5	9.1	7.1 16.	2 5.0	2.9	7.9	7.7	- 77	3.4	-	3.4												
-do -	Electric Scheme Batang Padong + Prai		-			ų									1		0.6	0.1	01.7	5.0	4.5 9.5	8.9	13.9	22.8	6.6	12.3	18.9 2	.9	5.4 8	1.2	1.0	0.9 1	1.9			
- de-	South Malaya (PD Stage I								1				-												0.4	0.2	0.6 5	5.0	11.9 1	8.9	6.0	6.4 1	12.4	1.5 0	.8.	2.3
- do -	(P.D. Stage II & Prai Stage II)																																-7	0.1 (0.4 1	0.5
- do -	(PD Stage TTI)							-																												
	0												A second second																							
(Olher Transmi.	sion Lines not covered by Loan	1.8	- 1.8	4.9	-	4.9	2.8	- 2.8	p 0.	9 -	0.9	03	-	0.3	0.1	- 0.1	0.7	-	0.17	0.8	- 0.8	0.1	-	0.1	1.7	-	1.7 0	5.7	- 0	1.7 1	0.5	- 0	0.5 1	.3	- 1	1.3
5- -	Total Transmission	1.8	- 1.8	4.9	-	4.9 .	2.8	- 2.0	¢ 3.	9 0.7	7 4.6	4.8	9.0 1	3.8	9.2	7.1 16.3	6.3	3.0	9.3	13.5	4.5 18.0	12.4	13.9	26:3	8.7	12.5 .	21.2 8	3.6	17.3 2	5.97	7.5 7	7.3 14	4.8 2	.9 1	1.2 4	4.1
DISTRIBUTIO.	V				1		-										1				i								1-	1						
Projects not	overed by Loon - Total	7.6	- 7.6	10.5	-	10.5 1	10.8	- 10.,	8 11.4	4 -	11.4	133		13.2)	20.1	20.1	21.0		210.0	19.9	10.0	10.2		18.2	22.0		20 2	1.7	,	1.7 2	26.2	,			2	21.1
										-									~ ~ ~ ~		- 11.1	10.2	-	10.2	~5.7		3.9	7.7	- 20	17 ~	0.5 -		0.3 -		- 64/	
OTHERS	Total	1.8	- 1.8	2.6	-	2.6	1.3 .	- 1.3	1.6	5 -	1.6	1.9	-	1.9 3	32	- 3.2	4.5	-	44.5	3.4	- 3.4	4.8		4.8	3.0		3.0 1	1.8	-	1.8	1.8	- 1	1.8 7	.8	- 3	2.8
Expenditure - Encluding	Interest Capitalised (Istal 1+11+111+11)	22.2	- 22.2	27.2	1.4 2	28.6 2	25.3 9	.6 34.	9 31.1	6 10.	4 42.0	431 :	27.9 7	1.0 5	4.8 2	2.6 77.4	51.6	22.2	73.9	54.6 2	2.1. 21	10.8	53.7	114.5	58.0 5	5.2	11.0 5	51.4	51.5 10	2.9 /	5.8 21	8.4 7	4.2 3	32 /	3.8 4	47.0
Interest Capitalised			-			0.5		1.1			1.8			3.6		5.0			1.5	-0.0 2	14 04.1			3.11			6.1	1 5	10 10	1.6			2.8		(1	0.9
1 Expendition and 1.	a lateral Cohitalized	-	22.2		:	28.1		32	8		40.2		1	7.1	t	7.1			79		1.8	2		111.1		10	4.9		10	1.2		7	1.4		4	17.9

Expenditure on Capital Projects

(M # million) L = Local Expenditure

LEMBAGA LETRIK NEGARA, TANAH MELAYU.

Ibu Pejabat, 129, JALAN BANGSAR, KUALA LUMPUR.



NATIONAL ELECTRICITY BOARD OF THE STATES OF MALAYA.

> Head Office, 129, JALAN BANGSAR, KUALA LUMPUR.

> > P.O. BOX 1003

15th April, 1971.

PETI SURAT 1003 "Taligeram TRANG"

K. L. 27791 (20 talian)

Bil. Surat Tuan

Talipon K

Bil. Surat KitaCHA. 14/7/6D/36 SV/JC

> Mr. Francois Ettori, Hotel Goodwood, Singapore.

Dear Mr. Ettori,

As discussed during your visit to this office, I am attaching herewith a statement showing costs of capital projects carried out by NEB from 1958 to 1970.

The statement required by you from the Generation Department of the Board will be sent by them in due course direct to your Washington address.

Yours sincerely,

Chan Ka Foo)

(Chan Kal Foo) Financial Controller

/c.c. Mr. Francois Etteri, World Bank Room D660, 1818 H Street N.W. Washington D.C.20433, U.S.A.

LEMBAGA LETRIK NEGARA, TANAH MELAYU,

Ibu Pejabat, 129, JALAN BANGSAR, KUALA LUMPUR.

Talipon FETI SURAT 1003 "Talipon F. L. 27791 (20 talian)



NATIONAL ELECTRICITY BOARD OF THE STATES OF MALAYA.

Head Office, 129, JALAN BANGSAR, KUALA LUMPUR,

P.O. BOX 1003

15th April, 1971.

Bill. Surat Tuan

Bil. Surat KitaCHA. 14/7/6B/36

Mr. Frencois Ettori, Hotel Goodwood, Singapore.

Deer Mr. Ettori,

As discussed during your visit to this office, I am attaching herewith a statement showing costs of capital projects carried out by NRB from 1958 to 1970.

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Yours sincerely,

(Gman Kalftoo) Financial Controller

NOLLEUS SNOLLEUNNINGER

C.c. Mr. Francois Higori, MJ HEUSOLD Add D660, 1018 H Street N.W. Washington D.G. 20433, U.S.A.

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9				-										E,	pen	ditur	e o	iv C	apital	L Pn	ojects	5								(M#.	millio	n)	ihive		
* .								• •	,								702	the y	lear	ent	decl	3154	Augus	st-		•	,	-	united and and the second states	, 1	= = +	oreign	Expe	nditur	e ,	newspanning of the second s
		TYPE OF PROJECT	1 19	758	1	959	1	19	60	1	961		19	62	1	1963		1	934	1	196	5		1966		196	7		1968		19	769	1	1970	, ¬	TOTAL
-		FENERATION	1 4 1	F Total	L	F Tota	1	LF	Total	L	FI	Total	LF	Total	4	F	Tolei	2	F	Stat	LF	Total	4	I= To	Inc	LF	Total	L	F	Foint	LA	= Tolo	EL	F	TotalL	FTOTAL
	1	GENERATION .					+			1																										
	. (0	(a) <u>Semererron riojects covered og Loan</u>	0.5	2.5	10			0.	- 11.0	90	07	10 / 1/	1.1 15	.0 23.0	7.9	15.5	22 /1	2.0	2.7 4	5											4	-			42	6 58.9 101.4
340-MA (51	Cameron Highlands Hydro-Electric Scheme		- 0.5	1.2	1.4 2.	6 3	1.2 7.1	6 14.8	1.9	9.4	19.6 14	1.1 10	1.1	2.5	13:5	2.5	Q.10	12 11 29	.53 11	JEC 18.3	25 20.14	13.07	21.41 :	158	7.67 26.	41 35.0	5.04	12.32	17.36	0.28	1.24 1.	52 0.1	18 0.01	0-1953	2 92.85 145.97
50-MA	GH	Batang radang Hydro-Electric Scheme Oct Para Cilie Sta = (and 20 Min and)								0.2	-	0.2		- 11			~	2 12	2 25 10	. Ig	200 111	5 7.5	5.00	12.00 3	3.00	3. 54 3.	5F 7.4	1 1.89	0.94	2.83	1-02	1.23 2	2 0.7	lŦ -	0.1717	0 30.73 47.79
50-MA	GT	Prai rower Station Stage I (2:30 HW Ser)																d.12	L:40 4	2) 0	200 . 73	83. 19,		11 33 -	~ 33						0.02	0-40 0.	44 0.6	8 6.70	7.180.	507.12 7.62
579-MA	-CY	Hal Power Station Stage // (1x30MW Jet)							-												.15	. 45	n.al	0.02	. a)	5 91 3.	21 9.2	2 4.55	19.d.	25.59	6.70 1	7.13 22	.83 1.2	8 0.15	5 1.5321	639.66 61.26
+58-MA	GY	Port Dickson Power Station Stage I (2×60MW)															ł	•				025		0.00	14	•11 0	V# 1~				- 10 - 1	150	5 1.2	2 0.9	2.11	21.4 2.6
579-MA	NG	Port Dickson Power Station Stage II (2×60 MW)																													- 6			0.5	0.5	05 05
1 AM-007	bu	Port Dickson Power Station Stage III (3x120MW)																													1.0		0 1.1	1.2	6.7 6	E 12 0 00 1
458-MAP	Gut	Johore Bahru Power Station Stages IJ III (2×30 MW))																			三日	0.957	0.427 1	.4	.794 6.1	4 8.2	5 1.037	1.900	2.937 0	1.384 0	.269 0.6	53 0.21	3 -0.378	20.1594.1	128.6213.04
P	ic ((b) Generation Projects not covered by Loan	· · · · · · · · ·				_					·										T	-		-			0.052	0.134	2186 0	.775.0.	481 1.2	56 1.16	4.675	5.83612	10-2 4.28
		Johore Bahru Power Station Stage I (3×10 MW)					_			2.3		2.3 1	6.3	- 6.3	10.3	-	10.3	3.5	- 3	5 0	0.3 -	03														22.0T
		Malacca Power Station Stages I. II + III (4×104W)	8.7	- 89	7.7	- 4.	7 2	-4 -	- 2.4	-				· · · · ·						1	1.4 -	1.4														20.4
		Other Generating Plants (Diesel)	1.6	- 1.6	0.3	- 0	.3 2	.8 -	2.8	2.3		2.3 1	1.6 -	1.6	1.6	-	1.6	1.0	- 1	0 3	3.1 -	3.1	5.4		5.4	2.1 -	2.1	1.8	-	1.8	1.0	- 1.	0 1.5	-	1.5	26.2
		Total Generation	11.0	- 11.0	9.2	. 1.4 10	0.6 10	0.4 9.1	6 20.0	14.7	9.7 2	24:4 2	3.1 18	9 42.0	22.3	15.5 3	37.8	19.8 1	19.3 39	2.1 1	9.8 22	9 42.7	25.4	39.8 6	5.2 3	23.2 39	7 62.9	1 16.3	34:2	50.5	10.2 2	11-1 31	3 6.1	12.6	19.0	456.5
	<i>ii</i>	TRANSMISSION																				1											_			
		(a) Transmission Lines covered by Loan																						· · · ·										and the second sec		
210-MA	at	Transmission Lines Associated with Cameron Highlands Hydro	-							3.0	0.7	3.7 4	.5 9	.0 13.5	9.1	7.1	16.2	5.0	2.9 7	9	7.7 -	- 7.7	3.4		3.4				22.2						3	349.7 52.4
350-MA	Gr	- do - Batang Padong + Prai		-				1	-					1				0.57	0.10 0	2.67	5.96 4.1	\$9.9·\$	5 8.94	13.86 =	2.80	6.61 12	-31 18.4	92 2.91	5.39	8.30	1.00	0.86 1.	86 0.0	8 -0.07	F 0.01 2	5 36.93 62.01
458-MA	4	- do- South Malaya (PD Stage)	7										-	-												0.36 0	21 0.1	57 5.02	11.91	16.93	6.04	6-40 12	.44 1.	2 0.81	2.3342	9-19.33 32.27
579-MA	NC	- do- (P.D. Stage II & Prai Stage							- Andrewski -																								0.	1 0.4	0.50	10.40.5
TOD-MA	NB	- do - (PD Stage TTI)																																	-	
100 - 01				-																																
		de all Trining lines and marged by from	1.8	- 1.8	1.9	4.	9	2.8 -	2.8	0.9	-	0.9 0	3	- 0.3	0.1	-	0.1	0.7	- 0.	7 0	0.8 -	0.8	0.1	-	0.1	1.7 -	- 1.7	0.7	-	0.7	0.5	- 0	5 1.	3 -	1.3	16.6
		(0) UTHER HOASMISSION LIMAS UN COVER Dy LOUR	1.8	1.8	41	- 4	9 2	2.8 -	2.8	3.9	0.7	4.6 4	.8 9	0 13.8	9.2	7.1	163	6.3	3.0 9.	3 1	13.5 4.	5 18-0	12.4	13.9 .	263	8.7 12	.5 21.	2 8.6	17.3	25.9	7.5	7.3 14	.8 2.	9 1.2	4.1	163.9
		XIC-ALANT AL		- 1.0	141	1	1							1						T							ł				1					
	m	DISTRIBUTION	71	41			_														00	10.0	10.0	1	10.2	22.9	23 (24.7		24.2	26.3	_ 2	1.2 21	.1 -	21.1	228.9
		Projects not covered by Loon - Total	f.6	- 7.6	10.5	- 10.	5 10	0.8 -	10.8	11:4	-	11.4 12	53 -	- 133	20.1	- 0	20.1	21.0	- 21	1.011	7.7 -	14.7	18.2		0.2	~5.7	- 23.9			~7.7						
		Total			-		-								2.						. 1.	7.1	1.0		4.0	2.0	1	1.0		1.0	1.8		. 8 2.	8 -	2.8	34.5
	iv	OTHERS	1.8	- 1.8	2.6	- 2.	6 1	-3 -	1.3	1.6	-	1.61	9 -	1.9	32	- 3	2	4.5	- 4	:2 .	5.4 -	3.4	4.0	0.4	1.8	5.0 -	3.6	516	5.5	10	45.8	28.4 7	4.2 33	2 13.8	3 47.0	883.
To	stal 1	Expenditure - Encluding Interest Capitalised (Istal i+ 11 + 11 + 11)	22.2	- 22.2	27.2	1.4 28	.6 2	5.3 9.6	6 34.	31.6	10.4	42.0 4	51 27	.9 71.0	54.8	22.6 7	7.4	51.6 2	2.3 73	=9 3 1.5	06.6 27	4 84.	0 60.8	53.7	14.5	28.8 22	.2 11.0	514	5/5	102.7	400			1 1010	(0.9)	2.9.3
L	less :	: Interest Capitalised				0.	5		1.1			1.8	1	3.6			5.0		+	+5		1.8			3.4		104.1	9	1	1.6		7	.4		47.9	255
1	otal	Expenditure - excluding Interest Capitalised		22.2	1	28	1.1	1	33.8	1	-	40.2		67.4		1	2.4		72	24		82.	2]	1	1.1		104.7	1		.3			71			1 1000

.

LEMBAGA LETRIK NEGARA

Daripada: Ketus Jurutera (Penja	nean Kuasa) Kepada: Timbalan Pengurus Besar (Kejuruteraan).
Rujokan Kami:- CGE.14/7/5/59.	DI-TERIBHOkan Tuan: - 7 APR 1971
	. N. * T. M. Trikh: 3hb April 1971.

Batang Padang & Prai Development - I.B.R.D Loan No.350 MA South Malaya Power Development - I.B.R.D Loan No.458 MA

As requested we enclose herewith Appendices A to D showing details of costs and commissioning dates of major components of Power Stations included in the above mentioned projects which have been partly financed by the I.B.R.D.

It is to be noted that the 2nd Extension to Sultan Ismail Power Station under Loan No.458 MA (South Malaya Power Development) is still current and the major components (i.e. boiler and turbine) are expected to be commissioned towards the end of this month.

KETUA JURUTERA (PENJANAAN KUASA)

SS/SBL. AA.

MEMORANDAM

APPENDIX 'A' March 1971.

Actual Costs and Commissioning dates of the main components included in the projects partly financed by the World Bank

IBRD. Loan 350 MA

Batang Padang and Prai Power Development (i) Prai Thermal Power Station Costs. (Stage One) Boiler and Ancillary Plant. (two 30,000 lb/hr boilers) Offshore cost financed by IBRD = M\$ 4,862,957.93 Local cost financed by Board = M\$ 943,632.49 = M\$ 5,806,590.42 Total cost of boilers

Turbo-Alternators (two 30,000 kW turbo-alternators) Offshore cost financed by IBRD = M\$ 6,323,534.55 Local cost financed by Board = M\$ 608,447.76

Total Cost of turbo-alterna M\$ 6,931,982.31 -tors

Total Cost of Power Station

Civil Works = Equipment : = Consultants Services and N.E.B. =	M\$ M\$ M\$	20,735,000 21,025,000 3,777,000
expenses Interest during Construction =	M\$	2,410,000
Total cost of Power Station =	M\$	47,947,000

(ii) Commissioning Dates

Civil Works started at site in May 1963 on the site reclamation works. Turbo-alternator No.1 commissioned on 1st May 1967 and ended one months's reliability run on 1st June 1967 Turbo-alternator No.2 commissioned on 9th May 1967 and ended one month's reliability run on 9th June 1967.

IBRD Loan 458 MA

South Malaya Power Development

(1) Tuanku Ja'afar Thermal Power Station Costs (Port Dickson)

Stage One

Botlers and Ancillary Plant	(two 550,000 lb/hr.boilers)
Offshore cost financed by IB	$RD = M_{3}^{*}$ 7,365,000
Local cost financed by Board	= M\$ 767,000
Total cost of boilers	= M\$ 8,132,000

Turbo-Alternators (two 60,000 kW turbo-alternators) offshore cost financed by IBRD = M\$ 7,207,000 Local cost financed by Board = MS 493.500 Total cost of turbo-alternators MS 7,700,500

Total cost of Power Station

Civil Works Equipment	= M\$ = M\$	29,139,000 26,315,000
Consultants Services and N.E.B. expenses Interest during Construction	= M\$ = M\$	5,639,000 4,051,000
Total cost of Power Station	= M\$	65,144,000

(11)

Commissioning Dates

Civil Works started at site in October 1966 on the site reclamation works.

Turbo-alternator No.1 commissioned on 13th May 1969 and ended one months reliability run on 14th July 1969 Turbo-alternator No.2 commissioned on 23rd July 1969 and ended one month's reliability run on 28th August 1969

I.B.R.D LOAN 458 MA SOUTH MALAYA POWER DEVELOPMENT

(iii) <u>Sultan Ismail Thermal Power Station Costs</u> <u>Stage Two</u>

Boiler and	Ancillary	Plant	(ane 300,	,000 16/1	hr. boiler)
Offshore G	ost finance	ed by I	BRD	- 15	3,392,556
Local cost	financed	by Board	1	- M\$	362.124
	Total Cos	t of bo	iler	- M\$	3,754,680

Turbo-Alternator (one 30,000 kW turbo-alternator)

Offshore cost	financed b	y IBRD	= M\$	3,652,170
Local cost fi	nanced by B	oard	= M\$_	102,970
Tot	tal cost of	turbo-alter	nator M\$	3,755,140

Total Cost of Power Station

Civil Works =	M\$	3,430,000
Equipment =	M\$	8,200,000
Consultants Services and NEB expenses	= M\$	1,418,000
Interest during Construction =	M\$	1,414,000
Total cost of Power Station =	M\$	14,462,000

(iv) <u>Commissioning Dates</u>

<u>Civil Works</u> started at site in 12th July 1965 <u>Turho-alternator No.4</u> commissioned on 12th August 1967 And ended one months reliability run on 12th September 1967 <u>Boiler No.4</u> commissioned on 4th April 1968 and ended one months reliability run on 11th May 1968.

B. E. C. M.

I.B.R.D LOAN 458 MA SOUTH MALAYA POWER DEVELOPMENT

(v) <u>Sultan Ismail Thermal Power Station Costs</u> <u>Stage Three</u>

Boiler and Ancillary Plant (one 300,000 lb/hr. boiler)

Offshore Cost financed by IBRD ==	M\$	2,800,000
Local cost financed by Board =	M\$	819,000
Total cost of boiler	M\$	3,619,000

Turbo-Alternator (one 30,000 kW turbo-alternator)

Offshore cost financed by IBRD = M\$	2,673,200
Local cost financed by Board = M\$	398,200
Total cost of turbo-alternator = M\$	3,071,400

Total Cost of Power Station

Civil Works	М\$	2,435,000
Fouiment	M\$	8,281,000
Consultants Services and NEB expenses =	M\$	1,558,000
Interest during Construction	M\$	112,000
Total cost of Power Station =	M\$	12,386,000

(vi) Commissioning Dates

<u>Civil Works</u> started at site in 7th August 1968. <u>Turbo-alternator No.5</u> expected to be commissioned in April 1971 <u>Boiler No.5</u> expected to be commissioned in April 1971.

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

INTERNATIONAL DEVELOPMENT ASSOCIATION

OFF ICE MEMORANDUM

March 3, 1972

TO:	Mr. R. Vaughan Sear							
FROM:	Richard H. S	heehan						
SUBJECT:	PHILIPPINES	- Discuss with Asian Development Bank (ADB) on Financing of Malaysia's Temengor Power Project						
	MALAYSIA	- Loans 579-MA and 700-MA - Supervision Mission and Preappraisal Mission for Power VI						
	TUN IS IA	- Power I Supervision Mission and Preappraisal Mission for Power II						
	SWITZERLAND	- Loans 479-CH and 511-PE - Discussions with Consultants						
	ENGLAND	- Loans 579-MA, 700-MA and Future Power VI for Malaysia - Discussions with Consultants Terms of Reference						

Starting March 8, 1972 you will proceed to Manila to visit the ADB for discussions concerning their possible participation in the financing of the Temengor Project for the National Electricity Board of Malaya. At present the Bank's understanding is that up to Canadian \$50 million has been made available by CIDA to finance the foreign exchange cost of the project. Procurement is to be by international competition and the Canadian financing would only apply to contracts won by Canadian firms. Thus ADB could provide back up financing for contracts not won by Canadian suppliers. You should ascertain the types of contracts ADB is willing to finance and the total amount it would make available. Also, whether there would be any limit to the amount available for any one contract. The proposed Bank loan would finance the foreign exchange cost of the transmission line which would connect the Temengor Project to NEB's main 275 kV transmission network.

On March 19 you will proceed to Kuala Lumpur to carry out a supervision visit to NEB. You should pay particular attention to the following:

- 1) Review the status of the Temengor Project.
- 2) Review your discussions with the ADB on its participation in the financing of the Temengor Project.
- 3) Establish a tentative date for the appraisal of the Transmission Line Project to be financed by the Bank.

To: Mr. R. Vaughan Sear - 2 - March 3, 1972

- 4) Review progress on the Port Dickson steam plant and ascertain the effect of the delays in delivery of the Parson's turbines for units 3 and 4. Also review progress on units 5, 6 and 7 to ascertain whether delays are likely to occur in the delivery of equipment and the effect these delays might have on NEB's ability to meet forecast system demand.
- 5) Discuss recent government regulations requiring NEB to obtain government approval before placing orders above M\$1 million if the lowest tender is not selected.
- 6) Review the matter of management succession since the incumbent reaches retirement age this year.

On April 2 you will proceed to Singapore where you will visit the Johore Bahru plant site and review the forecast of load growth in the state of Johore. While in Singapore you should call on the Public Utilities Board for general discussions.

On April 5 you will proceed to Tunis where you will undertake a supervision and preappraisal mission with Societe Tunisienne de l'Electricite et du Gaz (STEG). The matters of special importance are:

- a) To discuss the preliminary review of bids for the gas turbine under Power I which are to be opened on March 31, 1972. Also, to review the procedures to be followed by STEG in evaluating these bids.
- b) To discuss terms of reference being prepared by STEG for consultants to be engaged for various studies under Power I.
- c) To review the specifications for transmission lines and substations under Power I.
- d) To discuss the studies now being made by STEG concerning the future extension of the transmission system.
- e) Make a preappraisal review of the feasibility studies being undertaken by STEG for its next power loan.

You should visit the Rhennouch plant site to review progress on Rhennouch I and make any other site visits deemed necessary.

On April 18 you will proceed to Geneva for discussions regarding procurement procedures with ENDESA's representative in Geneva.

On April 20 you will proceed to Zurich for discussions with Electrowatt regarding the design of ENDESA's next hydro project. You will also contact Motor Columbus for discussions concerning the studies being undertaken for Empresas Electricas Asociadas (Lima Light's) proposed Salto Sheque hydro project. To: Mr. R. Vaughan Sear

On April 23 you will proceed to London for discussions with Preece Cardew and Rider concerning NEB's project. Particular attention should be paid to the feasibility report being prepared for the Temengor Transmission Line Project. Also any matters arising from your visit to NEB which might involve the consultants.

You will return to Washington about April 28. You should submit a back to office report immediately upon your return to the Bank and follow this with a supervision report as required.

Cleared	with	and	cc:	Mr.	Julin (EME&NA)	
				Mr.	Jentgen (EA&P)	
				Mr.	Vita (S.A.)	
				Mr.	Lehbert (S.A.)	

cc: Messrs. Chadenet Baum Ripman Lee van der Tak Weiner Armstrong Howell Berrie Jennings White Saeed/Bomani Petiot (Controller's) Prudence (Controller's) McCarthy (Controller's) von Busse (Controller's) Lecuona (Legal) Asser (Legal) Duval (Legal) Awunyo (Legal) Central Files Division Files Chron. File

RVSear: pww IBRD

Source: Branch Regard, Malaynia Anorte & aconomic Kullitin December 1970

Jadual IV.1

Bank2 Perdagangan

Kadar2 Bunga

(peratus sa-tahun)

Table IV.1

Commercial Banks

Interest Rates

(per cent per annum)

_		Simpana Fixed de	n tetap eposits		X	Kadar p Minin	oendahuluan m num advances	ninima ³ rate ³	
Tarikh perubahan	1 bulan	3 bulan	6 bulan	9-12 bulan	Simpanan2 tabongan ¹	Bersandarkan surat2 jaminan Kerajaan dll. ²	Bersandarkan saham2 dan sher2	Bersandarkan harta	Date of change
	I month	3 months	6 months	9-12 months	Savings deposits ¹	Against Government securities etc. ²	Against stocks and shares	Against property	
1960 1hb. Jul.		4	4	4	21/2	6	61/2	7	1960 Jul. 1
1961 28hb. Jul.		5	5	5	21/2	7	71/2	8	1961 Jul. 28
1962 2hb. Feb. 30hb. Ogos		4 <u>1</u> 4	4 <u>1</u> 4	$4\frac{1}{2}$	$2\frac{1}{2}$ $2\frac{1}{2}$	61 61 61	7 63	7 <u>1</u> 714	1962 Feb. 2 Aug. 30
1964 1hb. Jan. 25hb. Nov.	2 21/2	4	4 5	4 5	$2\frac{1}{2}$ $2\frac{1}{2}$	6 1 7	64 8	7 ¹ / ₄ , p.	1964 Jan. 1 Nov. 25
1965 1hb. Ogos	2 <u>1</u>	5	5	5	3	7	8	8	1965 Aug. 1
						Kadar 'a General ra	am Kao I	dar terpileh ⁴ Preferential rate ⁴	
1966 1hb. Okt.	21	5	5	5	3	71		7 ·	1966 Oct. 1
1967 20hb. Nov.	3	51	53	6	3	8		7 <u>1</u>	1967 Nov. 20
1968 1hb. Mei	3	51	53	6	31	8		71	1968 May 1

¹ Bank Simpanan Pejabat Pos membayar kadar bunga yang sama atas simpanan2 hingga 30hb. April, 1968. Mulai dari 1hb. Mei, 1968, kadar bunga Bank Simpanan Pejabat Pos telah di-naikkan kapada 4 peratus sa-tahun.

² Termasok pendahuluan2 bersandarkan surat2 jaminan Perbandaran dan barangan2.

Mulai dari 1hb. Oktober, 1966, kadar minima pendabuluan2 3 3 bersandarkan surat2 jaminan Kerajaan, saham2 dan sher2 dan harta telah di-ganti dengan kadar 'am dan kadar terpileh.

4 Kadar terpileh di-gunakan pada pendahuluan2 kapada Kerajaan2 Persekutuan dan Negeri dan badan2 awam yang ber-sandarkan surat2 jaminan Kerajaan dan/atau Perbandaran dan yang bersandarkan keluaran pertanian tempatan.

1 The Post Office Savings Bank paid the same rate of interest on deposits until April 30, 1968. As from May 1, 1968, the Post Office Savings Bank's interest rate was increased to 4 per cent per annum.

Include advances against Municipal securities and commo-2 dities.

With effect from October 1, 1966, the minimum advances rates against Government securities, stocks and shares and property were replaced by the general rate and the preferential rate.

The preferential rate applies to advances to Federal and State Governments and public authorities against Government and or Municipal securities and against local agricultural produce.

P-30

Jadual IV.2

Kadar2 Bunga bagi Surat2 Jaminan Kerajaan

(peratus sa-tahun)

Table IV.2
Interest Rates on Government Securitie
(per cent per annum)

	K J	adar dis Perbenda	kaun bil. haraan ¹	2		Surat2 jaminan Kerajaan Persekutuan ²							
Tarikh	Treas	sury bill a	discount	rate ¹		Fed	eral Gov	ernment .	securities	2.		Date	
Turikii	3 bulan	6 bulan	9 bulan	12 bulan	2 tahun	3 tahun	5 tahun	7 tahun	10 tahun	12-15 tahun	16-20 tahun	Duit	
	3 months	6 months	9 months	12 months	2 years	3 years	5 years	7 years	10 years	12-15 years	16-20 years		
1965 15hb. Mac.	5	5	5	5	5	-	51	-		-	53	1965 Mar. 15	
14hb. Jul.	1	1	1	1			-			-	53	Jul. 14	
26hb. Nov.						51	-		-	-	53	Nov. 26	
1966 18hb. Apr.						_	51	_	-	-	53	1966 Apr. 18	
12hb. Jul.						51		-		-	53	¥. Jul. 12	
12hb. Dis.					-	51		-	_		53	Dec. 12	
1967 27hb. Mac.					-	-	51		-		53	1967 Mar. 27	
15hb. Ogos					-		- '	51			57	Aug. 15	
20hb. Nov.	$5\frac{1}{2}$	51/2	5 <u>1</u>	5 <u>1</u>		-		-				Nov. 20	
15hb. Dis.			1	1	-	-	6				6 <u>1</u>	Dec. 15	
1968 15hb. Mac.					-	_	6	_	-		61	1968 Mar. 15	
10hb. Jun	41/2	41/2	41				-					Jun. 10	
1hb. Ogos	4	N	5						-		-	Aug. 1	
12hb. Ogos			1		-	53	6	-			61	Aug. 12	
2hb. Dis.			J.			53	6		-	-	61	Dec. 2	
1969 15hb. Jul.						53	6	-	-	_	61	1969 Jul. 15	
16hb. Dis.			1		-	53	6		6 <u>1</u>	$6\frac{1}{2}$	-	Dec. 16	
1970 6hb. Apr.	51	51	53		-	-		-	-	-		1970 Apr. 6	
15hb. Jun	1	1	1		-	51	6		61	61		Jun. 15	

Jadual





File Title		Barcode No					
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ж							
Additional Comments			18				
		The item(s) identified at removed in accordance w Policy on Access to I disclosure policies of the Wo	oove has/have been vith The World Bank nformation or other orld Bank Group.				
		Withdrawn by	Date				
	а	Sherrine M. Thompson	April 26, 2023				

Archives 01 (March 2017)

2. POWER DEMANDS, GENERATING PLANT AND

TRANSMISSION PROVISIONS

2.0 Introduction

There are some transmission limitations during the period under review, on power flows between the Northern Network centred on Prai and the Central Network centred on Kuala Lumpur. Nevertheless, the estimated power demands of the respective networks and the disposition of generating plants are such that it is justifiable to consider the relationship between power demands and generating plants for the Interconnected Network (Northern and Central Networks) as a whole in this present report.

2.1 Power Demands

2.1.1.1. The Northern Network has only been constituted within the past eighteen months from a number of isolated distribution systems previously supplied from individual (diesel) generation sources. During this period also the Board commenced to provide a bulk supply at Papan to the Perak River Hydro Electric Power Company. The bulk supply requirement is expected to reach 50 MW by 1971 but thereafter it may be reduced to 30 MW and remain at that level or it may possibly rise as high as 90 MW by 1976 depending on the Perak River Company's own generation plans.

2.1.1.2. There are thus no historical records of power demands available for the Northern Network as it is now constituted. In our report entitled "Market for Electricity Supplies" dated May 1965, however, there were shown historical records of power demands for the constituent parts of the Northern Network as it now operates, together with collated estimates for the future for the proposed network.

- 2.1.2.1. The Central Network has existed for many years but during the last four years it has been significantly extended in the Kuala Lumpur area and it has been extended more recently by means of the substantially completed 66 kV ring system Seremban-Gemas and Seremban, Malacca, Merlimau, Muar, Batu Pahat, Kluang.
- 2.1.2.2. In our report entitled "Market for Electricity Supplies" referred to above, collated estimates of future power demands for the enlarged Central Network were also given.
- 2.1.2.3. Estimates of future power demands for the Interconnected Network based upon the data in the report "Market for Electricity Supplies" appeared in our "Memoranda on Generating Plant and Transmission Provisions 1965-1970 and 1970-1975" of June 1965 and November 1965 respectively.

The Board in the letter of 2nd September, 1967, bearing the title 2.1.3.1. "Review of Generation and Transmission Studies" and reference CPE.9/1/25/97 supplied revised estimates of future power demands for the Northern and Central by up dated to 1968 by NEB-

Networks up to and including 1976. The estimates modified by subsequent information supplied to us appear in Column 9 of Appendices 2A and 2B to this Section, combined to form the Interconnected Network. These estimates include an extrapolation to 1977 from 1976 and they also include the following bulk supply power demands :-

Year ending at 31st August	Perak River Company MW	Penang Island MW	
1967	/ - \		
1968	30	-	(* * * x)
1969	40		
1970	- 50		
1971	50		
1972	30		•
1973	30	2.0	i of
1974	30	3.5	LOW
1975	30	5.0 54	W
1076	30	6.5	
1977	30	8.0	
	1		

The bulk supply to Penang Island will supplement the output of the Glugor Power Station (4 \times 10 MW installed) of the Georgetown City Council when its system demand exceeds the firm (30 MW) generation output.

Estimates of power demands continuing up to 1977 are required for the purposes of Volume II of this report. For convenience, therefore, Appendices 2A and 2B cover the period 1967 to 1977 inclusive.

2.1.3.2.

There is a possibility that the bulk supply power requirement of the Perak River Company at Papan or at Papan together with a possible second bulk supply infeed point, may continue to rise after 1971. Column 10 of Appendices 2A and 2B shows the Column 9 estimates of power demands adjusted for the following possible enhanced bulk supply requirements notified to us by the Board in the letter of 16th January 1968 under the title "Generating Plant Provisions 1968– 1972" and reference CPE.9/1/25/116.

MW
2
st
60
65
75
90
100 (extrapolated)

2.1.3.3

The estimated power demands in Columns 9 and 10 of Appendices 2A and 2B are referred to subsequently as the "lower" and "higher" estimates respectively. The lower estimates are approximately 15% less for the year 1968 than the estimates in the Memoranda referred to in paragraph 2.1.2.3 above but the rate of growth is such as to reach equality in 1975 with the estimates in the Memoranda. The higher estimates reach equality in 1973.

2.1.3.4. To date the growth of power demands has been slightly less than the earlier estimates but any shortfalls are attributable to the adverse effects of with wexternal political influences which have now ceased. In general it is understood with that the volume of new enquiries for the larger industrial supplies coupled with the consistent growth of power demands for domestic and commercial purposes are such as to justify the view that the earlier estimates will be reached and possibly surpassed by 1974 or 1975.

un

howp

2.1.3.5.

2.1.4.

Drawing Nos. 2/1 and 2/2 also show the lower and higher estimates of power requirements for the Interconnected Network.

Purchase rights can be exercised by the Board in respect of the Perak River Company's supply system in 1976, at the earliest. Such rights will also exist at subsequent intervals of time. In the report on the "Market for Electri– city Supplies" and in the "Memoranda on Generating Plant and Transmission Provisions 1965–1970 and 1970–1975" previously referred to, demand estimates were formulated on the basis that the 1976 purchase eights described would be exercised. It is understood that no decision on that matter has yet been taken and in this present report it is assumed that the Company's system will continue to operate independently after 1975 apart from the bulk supply from the Beard.

Separate estimates of power demands for the Northern and Central Networks, together with total requirements for the Interconnected Network, are shown below :-

	Northern	Network	Central	Total			
ending at 1st August	Lower	Higher	Network	Lower	Higher		
	MW	MW	MW	MW	MW		
1000	70		215	287	-		
1968	86	-	248	334	-		
1969	100		271	371	-		
1970	100		303	407	-		
1971	104	110	343	432	462		
1972	89	119	288	482	517		
1973	94	129	420	539	584		
1974	101	146	400	600	650		
1975	107	157	493	672	723		
1976	114	174	559	0/3	92412		
1077	127(a)	197(a)) 627(a)	/54(a)	024(a		

(a) Extrapolated.

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. There are no seasonal characteristics affecting the power (and energy) demands of the Board's Interconnected Network. This is principally due to the lack of climatic variation.

2.1.6.2. The Interconnected Network has very high (nearly 80%) average daily, weekly and annual system load factors. These high load factors and the demand characteristics which give rise to them are expected to continue throughout the period (up to 1977) under review.

2.1,6.3. Estimated demand curves for a typical week-day and Sunday in 1969 are shown as Drawing No. 2/3.

2.2. Existing Generating Plant

2.2.1. Steam Generating Plant

lun

- 2.2.1.1. Details of the existing oil fired steam generating plant at Connaught Bridge, Malacca and Prai Power Stations are well known and no further comment is considered necessary. "Sent-out" generating capacities are shown in columns 4, 5 and 6 respectively of Appendices 2A and 2B.
- 2.2.1.2. The first stage of construction (2 x 60 MW) of the new steam power station at Port Dickson is referred to in the Introduction (Section 1) and the "sent-out" capacity is shown in column 3 of Appendices 2A and 2B.
- 2.2.2. Hydro Generating Plant
- 2.2.2.1. The minor generating stations at Robinson Falls and Upper Telom (both in the Cameron Highlands) and Ulu Langat (east of Kuala Lumpur) are unregu lated run-of-river plants. Their aggregate minimum firm power output is shown
 in column 2 of Appendices 2A and 2B.

2.2.2.2. Major hydro generating plants are in operation at the Jor (100 MW installed) and Woh (150 MW installed) Power Stations. These plants are primarily designed for "peaking" operation due to the limited storage facilities available but under maximum run-off conditions they have a base load energy capability for short periods. They also have intermediate capabilities varying according to the run-off between the two extremes - minimum to maximum.

Associated with the Jor Station there is the Habu (5.5 MW installed) Power Station which precedes the Ringlet Falls Reservoir and has no water regulation. With the Woh Power Station there is associated the Odak (4.2 MW installed) Power Station operated from the Woh tail race re-regulation reservoir. Having regard to the relatively small power outputs of Habu and Odak it is convenient and justifiable to consider them with the parent Jor and Woh Stations.

The third 50 MW water turbine and alternator (bringing the installed capacity to 150 MW) was installed in Woh Power Station considerably in advance of the originally intended date in order to take advantage of extremely favourable tender prices.

w

2.2.2.3. Minimum run-off conditions (i.e. in the "dry" season of a "dry" year) for the Cameron Highlands (Jor Power Station) and Batang Padang (Woh Power Station) were estimated for the respective feasibility reports for these hydro electric schemes. The minimum run-offs were used for feasibility study purposes to calculate the minimum realisable peaking capacities which could be generated from time to time at the Jor and Woh Power Stations. These realisable peaking capacities depend upon the run-off, the system demand characteristics and the magnitude of the system peak demand.

Minimum realisable peaking capacities have been re-estimated for the revised system demand characteristics and the revised system demands and they are set out in Column 1 of Appendix 2A.

On present expectations the realisable peaking capacity under minimum run-off conditions will reach the installed generating plant capacity in the Jor and Woh Power Stations at about 1984.

2.2.2.4. Dry season run-off conditions higher than those estimated for the minimum year referred to in paragraph 2.2.2.3 above are expected in four years out of five years and these dry season conditions can be regarded as having an 80% probability of occurring in any individual year. The larger peaking capacities estimated to be realisable under these conditions and based upon the revised estimates of system demand and revised system demand characteristics are shown in column 1 of Appendix 2B.

Based upon present estimates the realisable peaking capacity under the 80% probability dry season run-off conditions described will reach the installed generating plant capacity by 1980 approximately.

2.3 Generating Plant Reserve Margins

2.3.1.

It is useful to reconsider the amounts of reserve generating plant which it will be desirable to hold against scheduled and unscheduled plant outage, having regard to the expected circumstances in the immediate future.

The following considerations are relevant to the determination of reserve generating plant margins :--

- Statutory requirements governing intervals between generating plant overhauls;
- Particular characteristics of the Board's individual generating plants;
- (iii) The relationship between the ratings of proposed additions of generating plant and the magnitude of the concurrent estimated system peak demands;
- (iv) Any transmission system limitations on power transfers which may govern the ability to compensate for the loss of generating capacity at individual stations supplying the Interconnected System.

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- 2.3.2.1 The Malayan Machinery Ordinance requires that pressure vessels shall be inspected and tested annually. Hence annual boiler overhauls are required, although steam turbine major overhauls can, if necessary, take place with longer intervals of time.
- 2.3.2.2. At the Connaught Bridge and Malacca Power Stations there is sufficient range connected boiler capacity to enable full turbo-alternator output to be maintained whilst one boiler is undergoing scheduled overhaul. Major turbo-alternator overhauls can be arranged, to some extent, for periods when larger reserve plant margins than the minimum are available, i.e. generally when additional generating plant has just been commissioned. It is justifiable to assume for the present purpose, therefore, that no reductions in the sent-out capacities of the Connaught Bridge and Malacca Power Stations will arise during the period under review, due to scheduled plant outage.
- 2.3.2.3. Generating capacities considerably in excess of the minima set out in column 1 of Appendices 2A and 2B will be available from the Jor and Woh Power Stations during heavy run-off periods of the year. As far as possible it will be desirable to undertake the scheduled overhaul of steam generating plant during such heavy run-off periods.
- 2.3.2.4. The three water turbines in the Woh Power Station are equipped with compressed air equipment for the depression of water in their spiral casings. This enables each machine to be operated for spinning reserve purposes with negligible water consumption and a relatively small power requirement.
- 2.3.3.1. Although the system demand is growing rapidly the effect of the introduction of progressively larger generating units of the most commonly available ratings is to vary considerably the relationship between the rating of the largest unit connected to the system and the system maximum demand.
- 2.3.3.2. Before the commissioning in 1969 of the first stage of the Port Dickson Power Station the largest single effective generating units will be the 30 MW sets at Prai Power Station and at that time one such set will represent approximately 10% of the estimated system maximum demand. (There will effectively be spare generating units in the Jor and Woh Power Stations at times of minimum run-off conditions so that the ratings of the generating units will not be relevant to the relationship between reserve plant margins and system maximum demands). When the first stage of the Port Dickson Power Station is put into operation in 1969 each of the 60 MW generating units will represent approximately 20% of the estimated system maximum demand and with the proposed commissioning of the next two 60 MW units in 1972 the corresponding figure will be approximately 14%. Similarly if the first 120 MW generating unit at Port Dickson is commissioned in 1974 its output will amount to approximately 21% of the estimated system demand whereas by the time the third such unit might be due for commissioning in 1976 its output would constitute only 17% of the demand.

An analysis of the capabilities of the Interconnected Network as it will be

constituted during the period under review has shown that in general the system could transmit the necessary power to compensate for the loss of a generating unit at its approximate extremities, e.g. Port Dickson and Prai provided that there are no transmission system faults. In the event of a fault at certain critical times difficulties might be experienced.

It is concluded, therefore, that the practice commonly applied to many highly developed supply systems of determining generating plant reserve margins by reference to calculations of plant outage on a mathematical probability basis is not yet appropriate to the Board's Interconnected Network. A more appropriate basis for the period under review will be to assume that with an increasing number of individual generating units connected to the system, the loss on outage of generating plant at any one time will consist of the largest generating unit together with one other smaller unit, the two units being approximately at opposite extremities of the system. This basis has been used in devising the generation plant development programme for the period under review.

2.4 Generating Plant Developments

2.3.4

2.3.5.

- 2.4.1.1. The relationship between the estimated system maximum demands ("higher" and "lower") and generating plant capacities is shown by Drawing Nos. 2/1 and 2/2 and Appendices 2A and 2B. The "slopes" of the "total" and "firm" generating plant lines in the Drawings show the increase of peaking capability from the Jor and Woh (Hydro) Stations with the increase of system maximum demand. From the information provided there, it is apparent that a deficiency of firm generating plant capacity is expected from August 1970 approximately under minimum run-off conditions in the Jor and Woh catchment areas and from about December of the same year under the 80% probability run-off conditions.
- 2.4.1.2. Lowest run-off conditions are normally experienced in June, July and August and Iow (although not lowest) run-off conditions may occur in January and February. It is desirable, therefore, to commission additional generating plant by December 1970 at the latest.
- 2.4.2.1. Pending further decisions on future hydro-generation development, generating plant re-inforcement must be of thermal (oil fired steam) type.
- 2.4.2.2. At Prai Power Station the turbine, boiler house and cooling water pump building accommodation, together with boiler, turbo-alternator and chimney foundation works, already exist for a third 30 MW generating unit. Skeleton facilities for the generator transformer 132 kV circuit already exist in the Station switchyard.
- 2.4.2.3. Site facilities will by 1970 already be in existence at Port Dickson for the addition of two 60 MW generating units although foundation works for the boiler, turbo-alternator and chimney, boiler and turbine house extensions and additional cooling water culverts will be required and as further described below it will be necessary to up-rate the transmission from Port Dickson to Kuala Lumpur (the principal load centre supplied by the Station at this stage) to 275 kV from the existing 132 kV operation.

Steam conditions for the Prai Station third (30 MW) generating unit and 2.4.2.4 the Port Dickson Station Nos. 3 and 4 (60 MW) generating units would be the same, viz. 900 pounds per square inch gauge and 900° Fahrenheit. The 60 MW hydrogen cooled sets at Port Dickson have, however, a slightly lower overall plant heat rate than the Prai generating sets.

und involve some site difficulties (although they would would still be proceeding when civil engineering works for ward ward what a works for the Nos. 1 and 2 (60 MW) sets would still be proceeding when civil engineering works for works for the Nos. 1 and 2 (60 MW) sets would still be proceeding when civil engineering works for works for the Nos. 1 and 2 (60 MW) sets would still be proceeding when civil engineering works for works for the Nos. 1 and 2 (60 MW) sets would still be proceeding when civil engineering works for works for the Nos. 1 and 2 (60 MW) sets would still be proceeding when civil engineering works for the Nos. 1 and 2 (60 MW) sets

The bulk supply at Papan to the Perak River Company is a base load and 2.4.2.6 by 1971 the base load power requirements for the whole of the Northern Network (including the bulk supply) is estimated to reach 72 MW. The sent out capacity of the Prai Power Station with two (30 MW) generating units installed and available is 57 MW. Annual overhaul requirements will reduce this capacity to 28 MW for approximately ten weeks of each year. If the power requirement of the bulk supply at Papan is reduced to 30 MW in 1972 and remains at that level additional base load generating capacity will, it is estimated, still be desirable within a further two years to meet the requirements of the Northern Network. Should the bulk supply power requirement increase to the higher levels shown in paragraph 2.1.3.2 additional generating capacity at Prai will become even more desirable.

Some base load generating capability is available from the Jor and Woh (hydro) Stations for very limited periods under the heaviest run-off conditions but the onset of these conditions is difficult of accurate prediction.

Power transfer capacity does exist between the Central and Northern Networks but the loss of a 132 kV circuit on the Woh-Papan section co-incident with the loss of one of the existing 30 MW generating units at the Prai Power Station could give rise to inability to meet the estimated "higher" power demands of the Northern Network.

2.4.2.7 Consideration of the circumstances described above leads to the conclusion that it is desirable to select the third (30 MW) set for installation at Prai Power Station for commissioning by December 1970. The effect of this proposal is shown in Drawing 2/1 and 2/2 and Appendices 2A and 2B. Generating capacity available from the third set will release capacity from the Jor and Woh (hydro) Stations for transmission to the Central Network.

- 2.4.3.1 From Drawings Nos. 2/1 and 2/2 it can be seen that after the installation of the third (30 MW) generating unit in the Prai Station, system demands are expected to exceed the available firm generating capacity by the end of 1971 under minimum hydro run-off conditions and a little later under the 80% probability conditions.
- 2.4.3.2 To meet the situation described it is proposed that the No. 3 (60 MW) generating unit should be installed at the Port Dickson Power Station for commissioning at the end of 1971. The commissioning of the No. 4 generating unit would, however, also be required at an interval of less than one year thereafter so

that it is necessary to arrange for the construction of the two units as the subject of one set of contracts. Most advantageous prices for the two units can be secured if the second such unit is arranged for commissioning approximately three months after the first and a construction programme is proposed accordingly.

The Jor and Woh (hydro) Stations normally supply the peak period component of the Board's system demand. (For very limited periods of the year they can also supply a base load component). Their energy generation capability in relation to the system demand characteristics determines their peaking power capability. The balance of the system energy requirements are supplied from thermal generation sources and there would be adequate energy generation capacity from such sources to meet those requirements.

2.5. Transmission Developments

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2.4.4.

2.5.1 The transmission developments associated with the additional generating plant proposed for Port Dickson Power Station are being put forward as the subject of an I.B.R.D. Ioan application whereas it is understood to be the Board's intention to finance from its own resources the transmission developments proposed in connection with the additional generating plant in Prai Power Station.

Transmission developments involved by the proposed additional generating plant in the Port Dickson Power Station are, therefore, dealt with first in this sub-section.

2.5.7. Port Dickson Development

- 2.5.2.1. The power sent out from Port Dickson will be despatched to the Kuala Lumpur area, to the southern portion of the Central Network via the connection at 132 kV to Seremban and to the local distribution system. Power flows northwards to Kuala Lumpur South Sub-station will be at a maximum under emergency conditions when Malacca Power Station is operated at maximum sent-out capacity (38 MW) in order to permit the greatest possible power flow northwards.
- 2.5,2.2. Appendix 2C shows the derivation of the estimated power flows from Port Dickson Power Station to Kuala Lumpur South Sub-station. With the proposed commissioning in 1972 of Nos. 3 and 4 (60 MW) generating units the power flows described will exceed the capacity of the (275 kV construction) double circuit transmission line when operated at 132 kV, which is at present being constructed for commissioning and initial operation at 132 kV in 1969, in accordance with the recommendations in our reports:-

"Report on Generation and Transmission Developments 1966–1970" of August 1965.

"Report on Choice of Next Step in Transmission Voltage after 132 kV" of February 1967.

2.5.2.3. It is therefore recommended that to accompany the proposed installation of Nos. 3 and 4 (60 MW) generating units in the Port Dickson Power Station, the 132 kV transmission between Port Dickson Power Station and Kuala Lumpur South Sub-station, should be uprated to 275 kV operation.

2.5.2.4. The recommended rating of the interbus 132/275 kV transformer at Port Dickson is the subject of Appendix C to this report.

- 2.5.3. Prai Development
- 2.5.3.1. Industrial load with a requirement for high degree of security of supply is developing in the Prai area. The bulk supply to the Perak River Company will constitute a base load up to 1971 and thereafter is likely to be on a similar basis in respect of a power requirement of at least 30 MW and possibly more. By releasing power output from the Jor and Woh (hydro) Stations, Prai Power Station can assist in keeping to a minimum the reserve generating plant margins of the Interconnected Network. These considerations point to the desirability of a high degree of security for the Papan—Taiping—Prai 132 kV transmission which is at present of double circuit construction with one circuit strung.
- 2.5.3.2. In our "Memorandum on Generating Plant and Transmission Provisions 1965–1970" of June 1965 it was considered that the provision of the second circuit of the Papan–Taiping–Prai transmission lacked full justification largely because of the possibility of the early implementation of the Upper Perak (hydro) Development with a possible direct infeed from it to the Prai area. In the later Memorandum in respect of the period 1971–1975 in which an all thermal future generation development was considered it was suggested that those circumstances warranted a review of the previous recommendation and that there were substantial reasons for the installation of the second circuit with the third (30 MW) generating unit in Prai Power Station.
- 2.5.3.3. The installation of the third generating unit in Prai Power Station is recommended in paragraph 2.4.2.6. of this Section of the report. If the Upper Perak (hydro) Development is implemented there is now a possibility that there will be an interconnection at Bukit Berapit between the 275 kV transmission for it and the Northern Network. This possibility adds to the justification for a greater degree of security for the Papan—Taiping—Prai 132 kV transmission.

It is thereafter recommended that the second 132 kV circuit Papan-Taiping-Prai should be installed.

- 2.5.3.4. In terms of the additional security which it could offer it would be to the Board's advantage to proceed as soon as possible with the installation of the second circuit referred to.
- 2.5.4. Other Transmission Requirements
- 2.5.4.1. There are at present installed at the Papan Sub-station for the bulk supply to the Perak River Company, two 30 MVA 132/66 kV transformers. If the power requirements of the bulk supply increase after 1971 to the extent described in paragraph 2.1.5 above additional firm transformer capacity will be

required. It is desirable, therefore, to include at this stage provision for a third 30 MVA 132/66 kV transformer and the associated isolator switchgear.

2.5.4.2. The present power transfer capacity of 10 MW between Seremban and Malacca is determined by the design of the existing single circuit 66 kV transmission facilities. At Malacca the firm power capacity available is 38 MW derived from the sent-out generating capacity i.e. 38 MW from the 4 x 10 MW generating units of Malacca Power Station plus the transmission capacity of 10 MW referred to, less an allowance for the loss of one generating unit.

Appendix 2C shows an estimated power requirement of 33.5 MW for "Malacca and South" in 1974. Under emergency conditions it may also be necessary to supply the power demand of Kluang (approximately 7 MW) from Malacca instead of from the Sultan Ismail (Johore Bahru) Power Station. Consideration of a transmission reinforcement directly from Port Dickson Power Station to Malacca will, therefore, be required but this is recommended for review with the next stage of development after the present (Port Dickson and Prai Power Development) proposals.

2.5.4.3. A review has been made of estimated power requirements and transformer capacities at the 132 and 66 kV system sub-stations. (The Papan Sub-station is referred to separately in paragraph 2.5.4.1 above).

During the period up to 1972 there may be some deficiency of firm transformer capacity at the Pudu Ulu (Kuala Lumpur) area 132 kV sub-station but there will be an adequate margin of 132/33 kV transformer capacity for the Kuala Lumpur area as a whole, together with power transfer capability at 33 kV. It would appear, therefore, that any further reinforcement could be considered with the next stage of development.

The power demands at the Rawang 132 kV (step-down) sub-station may during the period under review exceed the firm transformer capacity. The rate of increase of demand at Rawang is, however, relatively low and it is suggested that any consideration of reinforcement could also await the next stage of development.

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APPENDIX 2A



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SASTER OF BRANKS AND CENTERATING CAPACITIES

ALL THERMAL DEVELOPMENT - MINIMUM RYDRO RUN OFF CONDITIONS

			1	2	з	4.	5	6	7	8	.9	10	
	Year Ending		Jor	Minor	Port Dickson	Connaught Bridge	Malacca	Prai	Total Generating	Firm Generating	Estim Maximum	nated Demand	
	31st August		(a)	(5)	(c)	(c)	(c)	(c)	Capacity	Capacity	Lower	Higher	
			MW	MW	MW	MW	MW	MW	MW	MW	MW '	MW	
	1967		60(d)	3	-	76	38	57	234	206(e)	229(f))	
	1968		119(a)	3	-	76	38	57	293	265(e)	287	>-(Id
	1060		128	3	114(h)	76	38	57	416	359(i)	334	-)	an
	1903		134	3	114	76	38	57	422	365(i)	371)	
_	1071		139	3	114	76	38	85	455	398(i)	407	_ {	
CT .	1072		146	3	228(h)	76	38	` 85	576	491(j)	432	462	
	1972		153	3	228	76	38	85	583	498(j)	482	517	
1 las to	[1974]		158	3	342(k)	76	38	85	702	588(1)	539	584	
ant cinst	1075		169	3	456(k)	76	38	85	827	685(m)	600	650	
19/1-10	1076		177	3	570(k)	76	38	85	949	807(m)	673	733	
	1970		185	3	570	76	38	85	957	815(m)	754	824	
	Notes	(a)	Estimated run-off co	realisable pea	king capacity u season of dry y	ınder minimum rear) — includes		(h) (i)	2 x 60 MW sets co Assumed outage of	mmissioned. of:1-60 MW	set at Port Dic	kson kson.	
		(b)	Habu and Minimum	Odak. run-off condi	tions (dry seaso	on of dry year) -		: ()	Assumed Outlage o	1 - 30 MW	set at Prai.		

Robinson Falls, Upper Telom and Ulu Langat.

Assumed outage of 1 - 30 MW set at Prai

Sent-out capacity.

Actual.

Jor and Habu only.

Jor and Habu, Woh and Odak.

(c)

(d)

(e)

(f)

(g)

1 x 120 MW set commissioned. (k)

APPENDIX XVIII

LOAD CURVE WESTERN NETWORK



INTERCONNECTED NETWORK . SYSTEM DEMANDS AND GENERATING CAPACITIES ALL THERMAL DEVELOPMENT - HYDRO RUN-OFF CONDITIONS AVAILABLE FOUR YEARS OUT OF FIVE

			2	3	4		5	6	7	8	9		10	
Year				Port	Connaught			0-si	Total	Firm	Estin	nat	ed	
at	8.	Jor	Hydro	Dickson	Bridge .	M	alacca	Prai	Generating	Generating	Maximum		Demand	
31st	O.	(a)	(b)	(c)	(c)		(c)	(c)	Capacity	Capacity	Lower		Higher	
August		(-,			NAVA/		MAN	MW	MW	MW	MW		MW	
		MW	MW	MW			20	57	256	227(e)	229(f)			
1967		82(d)	3	-	76		38	57	216	287(2)	287		-	
1968		142(g)	3	-	76		38	57	310	207(1)	334		-	
1969		151	3	114(h)	76		38	57	439	362(1)	071			
1070		161	3	114	76		38	57	449	392(1)	3/1			
1970		101	2	114	76		38	85	480	423(i)	407		-	
1971		164	3	229/b)	76		38	85	604	519(j)	432	1	462	
1972		174	3	228(1)	70		20	85	611	526(j)	482		517	
1973		181	3	228	76		30	05	734	620(1)	539		584	×
1974		190	3	342(k)	76		38	00	764	630(1)	600		650	
1975		200	3	342	76		38	85	/44	700(1)	673		733	
1076		212	3	456(k)	76		38	85	870	728(m)	073		004	
1970		274	3	570(k)	76		38	85	996	854(m)	/54		024	
Notes	(a) (b) (c) (d)	Estimate season c Minimur Robinso Sent-out Jor and	ed realisable peal onditions – incl n run-off condit n Falls, Upper T t capacity Habu only t outage of : 1-	king capacity u udes Habu and ions (dry sease Telom and Ulu 30 MW set at F	under three we I Odak on of dry year Langat Prai	eek dr	Y	(h) (i) (j) (k) (l) (m)	2 x 60 MW sets co Assumed outage o Assumed outage o 1 x 120 MW set co Assumed outage o Assumed outage o	mmissioned of: 1-60 MW set 1-30 MW 5 ommissioned of: 1-120 MW s 1-30 MW 5 1-30 MW	t at Port Dicks at at Port Dicks " " Prai et at Port Dick et at Port Dick " " Prai	son son ksoi	1 1	

Jor and Habu only Assumed outage of : 1-30 MW set at Prai (e)

Actual (f)

Jor and Habu, Woh and Odak (g)

APPENDIX 28