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INTERNATIONAL DEVELOPMENT ASSOCIATION

YANHEE ELECTRICITY AUTHORITY

THAILAND

THIRD YANHEE PROJECT

March 1, 1965

Projects Department

CURRENCY EQUIVALENTS

1 U.S. $	=	20.8 Baht (B)
1 Baht	=	4.8 U.S. ¢
1 million Baht	=	48,077 U.S. $

YANHEE ELECTRICITY AUTHORITY

THAILAND

THIRD YANHEE PROJECT

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YANHEE ELECTRICITY AUTHORITY

THAILAND

THIRD YANHEE PROJECT

SUMMARY

i. The Yanhee Electricity Authority (YEA) has requested a loan to help finance a project which would include the installation of 140 MW of new hydro generating capacity and additions to transmission facilities. The request was for a loan to cover foreign exchange expenditures of about US$7.3 million. Analysis indicated, however, that a sound financing plan could be achieved with a smaller loan and during negotiations it was agreed that a loan of US$6.0 million would be appropriate.

ii. This would be the Bank's third loan to YEA. The projects previously financed are largely completed.

iii. YEA is a bulk power supplier; it does no retail distribution. Present facilities include 140 MW of hydro power capacity, 150 MW of modern steam power capacity, about 75 MW of older steam and diesel power capacity and an extensive transmission system.

iv. The early installation of the proposed new hydroelectric units is justified by the savings in fuel costs which would result between 1967 and 1969.

v. YEA is a Government-owned organization, established in connection with the first Bank loan (175-TH). Its management is competent and it is well organized and staffed; it is the major power entity in Thailand. The power sector as a whole is not efficiently organized, however, and the Government is expected to propose a major reorganization soon. Any proposal which would affect YEA will require Bank approval and YEA's new role will have to be carefully considered when the Government's intent becomes known.

vi. YEA's financial situation is sound and the first years of operation have shown a constantly improving earnings picture. With the completion of the Yanhee Project (financed by the first loan) and the beginning of its operation during 1964, the pressures on YEA for substantial rate reductions have become strong. In order to safeguard YEA's financial position, it was agreed during negotiations that YEA would consult with the Bank prior to any change in its rates in order to reach a mutually satisfactory understanding regarding such changes. This undertaking applies to the next six years through 1970. On this basis the proposed project would be suitable for a loan of US$6.0 million for a term of 20 years including 4 years grace on amortization.

YANHEE ELECTRICITY AUTHORITY

THAILAND

THIRD YANHEE PROJECT

I. INTRODUCTION

1. The Yanhee Electricity Authority (YEA) applied for a loan to cover the foreign exchange cost of a project which includes the installation of Units 3 and 4 at Bhumibol dam plus additional transmission facilities. The project would cost about US$9.8 million before interest and of this, the foreign exchange component would be about US$7.3 million. The financial analysis discussed later indicates, however, that YEA's own financial capabilities make it unnecessary for the entire foreign exchange component to be covered by borrowings and that a viable financing plan can be achieved by a loan of US$6.0 million.

2. This would be the third loan to YEA. The first, for US$66 million in 1957 (175-TH), was for the Yanhee[1/] hydro project in northern Thailand and the second, for US$6.6 million in 1963 (333-TH), was for transmission system additions. The Yanhee project is now completed and in operation; facilities financed by the second loan are under construction. The Yanhee project included a major dam with provisions for eight 70 MW generating units, of which two were installed initially. A double circuit 230 kv transmission system between the dam and Bangkok was financed by the previous loans as were numerous lower voltage lines and substations.

3. This report is based on information prepared by YEA and on the findings of an appraisal mission which visited Thailand in March 1964. At that time it was planned that loan negotiations would be held in October. These were delayed until January 1965 at the request of YEA.

II. THE POWER INDUSTRY IN THAILAND

4. Six separate government authorities are now responsible for planning, constructing and/or operating generation and/or distribution facilities in Thailand. These are:

Yanhee Electricity Authority	(YEA)
Metropolitan Electricity Authority	(MEA)
Lignite Authority	(LA)
Northeast Electricity Authority	(NEEA)
National Energy Authority	(NEA)
Provincial Electricity Authority	(PEA)

5. There are also a few privately owned utilities. These are controlled by both the NEA and the Department of Public Works. In addition, the Royal Irrigation Department (RID) has an important role in power planning in connection with its responsibility for water resource development for irrigation, navigation and flood control.

1/ The name of the dam was later changed to Bhumibol.

6. These various organizations are responsible to three different ministries. YEA, the LA and the NEEA receive their policy directions from the Office of the Prime Minister, the MEA and the PEA from the Ministry of the Interior, and the NEA from the Ministry of National Development. Coordination has been poor in the past and competition between some of the organizations (for instance, for Government funds) has been fierce.

Yanhee Electricity Authority

7. The YEA was created in 1957 as a condition of the first loan. It is the sole agency responsible for generation and transmission in the central, most populated part of the country. It does no retail distribution, selling at present only at wholesale to other utilities. Its service area will extend ultimately to 33 of the 71 provinces of Thailand. It has a Board consisting of a Chairman and not less than four nor more than six other members, exclusive of the General Manager who is an ex-officio member. The Chairman and members are appointed for six-year terms by the Council of Ministers, one-half being reappointed or replaced every three years. The Board appoints the General Manager subject to the approval of the Council.

8. Although created by law in 1957, the YEA did not come into being as an operating utility until late 1961 when it assumed responsibility for the power supply of Bangkok. Its physical plant at that time consisted of one new 75 MW steam unit, financed through the U.S. Ex-Im Bank, and miscellaneous generating sources transferred to it by two utilities previously operating in Bangkok. These miscellaneous generating facilities totalled about another 75 MW. YEA subsequently secured a further Ex-Im Bank credit for a second 75 MW steam unit. This unit has been in operation since June 1963. Since YEA existed only on paper at the time of the first loan, the responsibility for carrying out the first project (Yanhee project) was delegated to the RID. This project is now substantially completed and in operation under YEA management. The formal transfer of assets to YEA is under way.

9. YEA as an organization has developed well. Its management is good. It can be judged the most competent of the various organizations involved in power activities.

Metropolitan Electricity Authority

10. The MEA was also created as a result of the first loan, which required that one agency (there were two) be formed to carry out the reconstruction of distribution facilities in Bangkok, and to be the retail marketing agency. MEA has done a good job and it can be judged that the Bank's objectives in insisting that a new agency be formed have been successfully satisfied. MEA has a Board of 7 - 11 members.

Lignite Authority

11. The LA was formed in 1960 from a predecessor agency called the Lignite Thermal Power Organization. It has two lignite fired steam plants,

one in northern Thailand (12.5 MW) and one in the south (40 MW). It also has 69 kv and 115 kv transmission facilities but does no retail marketing itself. In addition it sells lignite, its principal customer being YEA. It has a Board of 6 - 8 members.

Northeast Electricity Authority

12. The NEEA was formed in 1962 to carry out the Nam Pong hydro project (27 MW) in northeastern Thailand. Its activities have been limited, most of the responsibility for the project being delegated to NEA. It has a Board of 6 - 8 members.

National Energy Authority

13. NEA is the senior authority in terms of age. It was established in 1953 for the purpose of "procuring and establishing energy works," for formulating policy in connection with energy production, for devising standards, and for prescribing rates for the sale of energy. Its present activities are centered on the construction of the NEEA's Nam Pong project and on the Nam Pung hydro project (6.5 MW). It has a Board of 13 - 17 members.

Provincial Electricity Authority

14. The PEA was established in 1960 as a successor to the Provincial Electricity Organization. It is responsible for distribution throughout Thailand except for the Bangkok and suburban area and also for generation in areas where service from bulk power suppliers (YEA - LA - NEEA) is not available. The PEA's role is probably more difficult than that of the other organizations. Its operations are scattered throughout the country and its markets are poor compared to the investments and labor required to serve them. Its management has been weak. It has a Board of 7 - 11 members.

15. The personnel employed by the above agencies totals more than 10,000 exclusive of consultants and contractors.

16. For several years the Government has been trying to find some scheme of reorganization to reduce the waste inherent in the present overlapping setup. There have been at least eight studies or recommendations in the last few years, some more comprehensive than others, but all aimed at trying to achieve greater efficiency and control within the industry. Some have advocated a "regional" approach - where the country would be divided into three or four zones, with one authority responsible for all electric power matters within one zone; others have advocated a "functional" approach - one generation authority and one distribution authority for the whole country. The most recent study, made by the Scandinavian Engineering Corporation for the Minister of National Development, recommends that all existing authorities be abolished and one new authority (National Power Authority - NPA) be established. Liabilities and assets of the existing authorities would be taken over by the NPA.

17. A far-reaching proposal such as now recommended by Scandinavian Engineering would obviously require careful consideration. However it is by no means certain that the recommendations made in the latest study will be endorsed by the Government. The study covered only organizational aspects; it did not go into financial aspects in any detail nor did it make concrete suggestions as to how the NPA would be staffed. Since under existing loan agreements the Bank's consent is required for any change in the YEA Act a major reorganization of the power industry involving YEA would have to be submitted to the Bank for approval.

III. THE POWER MARKET

18. The YEA service area extends from Chiengmai in the north to both sides of the Gulf of Thailand below Bangkok in the south. The Bangkok area is referred to as the primary market, with the rest of the service area called the rural market. The rural market is further divided into three stages, each representing an area or group of towns to be connected at a certain time in accordance with transmission line construction schedules. The Bangkok market is by far the more important; present estimates are that it will account for more than 80 per cent of total system load during the balance of the 1960's.

19. Power demand has increased rapidly since YEA started operations in 1961. Load growth was 14 per cent in 1962, 18 per cent in 1963 and about 23 per cent for fiscal year 1964. Three factors made these growth rates possible. First, the MEA made good progress in the reconstruction of Bangkok distribution facilities; second, YEA was able to provide reliable service in adequate amounts and third, a modern rate structure was introduced late in 1962. Such rapid load build-up was not expected at the time of appraisal for the previous loan; present estimates are justifiably more optimistic.

20. Part of this optimism results from a significant build-up of medium and small industry in the areas south and east of Bangkok. As this has occurred during the past two years without a great deal of promotional efforts, the Government is now reviewing means by which it might give further impetus to the trend. It is an advantage of course for both the Government and YEA-MEA to see new industry locating in the area and from

the utilities' point of view, particularly satisfying to see an industrial build-up in a relatively well defined area where there is no congestion. Another factor contributing to more optimistic load growth estimates is the recent but still limited availability of consumer credit. Credit availability should lead to load growth from consumer appliances such as refrigerators, stoves and air conditioning. These add to important loads, especially in a place as large as Bangkok (2 million) where the appliance market is in its infancy.

21. The 1964 (fiscal year) peak load in Bangkok was about 164 MW, an increase over the 1961 peak (3 years) of 66 per cent. In addition about 12 MW of rural load was added during the last quarter of the year. In 1965 a second block of rural load (12 MW) will be added, and in 1968 a third block (9 MW).

22. Demand and energy forecasts are shown in Annex 1. System demand would increase from 176 MW in 1964 to 393 MW in 1970. Discounting the three block additions of rural load, this would represent an annual average growth rate of 14 per cent, decreasing from 17 per cent in 1965 and 1966 to 11 per cent in 1969 and 1970. Energy sales would follow the same trend. These estimates appear high but could easily prove conservative as the present load base, on which the estimates are built, is so low, relative to the population and importance of the service area, that even higher growth rates would not be surprising as the benefits of reliable service become appreciated.

IV. THE PROJECT

23. The project includes the installation of Units 3 and 4 (70 MW each) at the Bhumibol dam, penstocks and ancillaries for Units 5 and 6 and additions to the transmission system.

24. The work at the dam would be straightforward since provisions were made during initial construction for future installation of up to eight units. The specifications used for procurement of major equipment for the first two units would be used again and work would be carried out by YEA forces with assistance from manufacturers' erection supervisors.

25. Transmission system additions would include the enlargement of existing 230 kv substations in Bangkok and lower voltage transmission lines and substations to connect three more towns[1/] into the system. The map at the end of this report shows the general characteristics of the YEA system.

1/ Nakorn Nayok, Prachinburi and Samut Songkram.

26. The cost estimate is summarized below:

At Bhumibol Dam	Foreign ($)	Local (Baht)	Total ($)
	(thousands)		
Penstocks, gates, etc. Units 3-6	1,000	6,240	1,300
Turbines, generators, etc. Units 3-4	2,100	5,410	2,360
Power transformers and breaker	470	1,250	530
Other	680	8,620	1,095
	4,250	21,520	5,285
230 kv Transmission			
Power transformers	320	420	340
Synchronous condenser	450	1,040	500
Other	362	2,500	482
	1,132	3,960	1,322
115 kv and 69 kv Transmission			
Lines and substations	775	8,140	1,166
Land and ROW's	-	6,000	288
Engineering	288	3,000	432
Miscellaneous and contingencies	883	9,500	1,340
	1,171	18,500	2,060
Total	7,328	52,120	9,833

27. The estimate includes contingencies of about 10 per cent and 20 per cent respectively on the foreign and local currency components which should be adequate.

28. Bids would be obtained on an international basis early in 1965 for those items involving the longest delivery. With normal manufacturing and delivery times it is expected that the third unit would be in operation in the last half of 1967, and the fourth unit in 1968. The 230 kv transmission work in Bangkok would be completed in 1967, the 69 kv line work somewhat sooner. This schedule is realistic.

29. Construction expenditures would be made about as follows:

Fiscal years ending September 30,	1965	1966	1967	1968	Total
	(in thousands of dollars equivalent)				
Loan	314	1,874	3,231	581	6,000
Other	172	1,224	1,444	993	3,833
Total	486	3,098	4,675	1,574	9,833

The loan of US$6.0 million equivalent would cover the foreign exchange cost of equipment to be installed at the dam of about US$4.25 million; the cost of a synchronous condenser and 230 kv substation extensions in Bangkok of about US$1.13 million and engineering and contingencies of about US$0.62 million.

V. JUSTIFICATION FOR THE PROJECT

30. The proposed project includes extensions to the transmission system which are necessary to satisfy load growth. This part of the project is required in any case if YEA is to fulfill its utility responsibilities. The justification for installing Units 3 and 4 and penstocks for Units 5 and 6 is not as clear cut, however, as with present load forecasts, YEA would not need the full capacity of the additional units until 1970. Their installation could therefore be delayed by as much as one year for Unit 3 and 2 years for Unit 4 from the presently proposed schedule. The installation of penstocks for future units could also be delayed but the decision to do the work while the original construction trestle is still in place is sound. This trestle and the remaining cranes will be moved to another site within a few years. The reason for YEA proposing an earlier installation of Units 3 and 4 is the savings in fuel costs which would result. It should be emphasized that a substantial part of these savings would be in foreign exchange, which would justify the incurrence of a foreign exchange loan to achieve them. The schedule proposed for the installation of the units can only be justified if the savings in fuel purchases over the period 1967-70 would actually offset the cost of money involved in an earlier investment. That this is the case is shown in the following paragraphs.

31. Because of the long transmission distance between the dam and load center, YEA's generating sources will be operated so that one 75 MW steam unit in Bangkok will be carrying 20 MW of load at all times. Hydro capacity will be dispatched next to allow the utilization of maximum hydro energy. Capacity requirements over and above the base 20 MW of steam plus whatever hydro is installed will then be met by increasing the output of the partially loaded steam unit and finally by the second 75 MW steam unit or, in certain cases, from diesel units.

32. The energy to be produced from thermal and hydro sources with various combinations of thermal and hydro installations can be determined through the use of simulated load duration curves. Two conditions are shown below; Scheme I shows energy sources with installation of Units 3 and 4 in mid-1967 and early 1968 as proposed, Scheme II with Units 3 and 4 delayed until needed for capacity. There would be no difference in 1970 as both Units 3 and 4 would be required by that time in any case.

(millions of kwh)

	Scheme I (as proposed)			Scheme II (units delayed)	
Fiscal Year	Thermal	Hydro	Total	Thermal	Hydro
1967	255	1,005	1,260	320	940
1968	192	1,248	1,440	305	1,135
1969	186	1,384	1,570	275	1,295
1970	205	1,520	1,725	205	1,520

33. The major differences between the two schemes during the period under review are the phasing of the capital expenditures and the variable cost, mainly fuel for thermal generation. The earlier capital outlays in Scheme I with resulting savings in operating cost have to be measured against identical capital investments made at a later date, which would however require higher operating expenditures in the meantime. The variable costs of hydro operations and other costs common for both schemes are not significant.

34. For purposes of comparison, the two different streams of capital and operating expenditures for Scheme I and Scheme II were discounted at various interest rates in order to find the rate of interest at which the discounted value of the two schemes would be equal. It was found that the savings in operating cost for the 3-year period 1967-69 would be equivalent to a return of 30% on the earlier investment of Scheme I. Since the cost of money in Thailand is considerably lower than this, the proposed program of unit installations is justified.

VI. FINANCIAL ASPECTS

Rates

35. YEA has the right to set its own rates. The present rate structure is the standard demand-energy type, whereby unit kwh costs decrease with increasing load factor. When YEA first started operations in 1961 the average bulk rate to MEA was 38 satang/kwh (18.3 US mills). With an increasing number of industrial and off-peak consumers in MEA's system, the load factor improved so that the average unit price is presently about 36 satang/kwh (17.3 US mills).

36. It has been generally expected in Thailand that rates could be lowered considerably after the completion of the Yanhee project and the availability of "cheap" hydro power. However, since the capacity of Yanhee will not be fully utilized for some time and in view of the fact that at least for the present the full cost of the project is charged to power despite its multipurpose aspects, the reduction will be gradual and moderate at the beginning. The forecast income statements in this report illustrate this point, the average level of revenues decreasing from 36 satang/kwh to 33 satang/kwh (15.9 US mills) in fiscal year 1965 when Yanhee power would be available for the first full year; further decreases would bring the average down to 27 satang/kwh (13 US mills) by the time the project is completed.

Auditors

37. A provision of the YEA Act requires YEA to have an annual audit. The Government Audit Council was originally designated by the Government and YEA as the auditor but since it did not have adequate experience in public utility accounting, the Bank requested that outside auditors be retained. The Government subsequently agreed to retain Coopers and Lybrand to assist the GAC in the YEA audit. This arrangement has been accepted by the Bank with the understanding that it will be continued for three years.

Present Financial Position

38. Condensed balance sheets for the three fiscal years ending September 30, 1963 are shown in Annex 2. In 1963 the Yanhee investment is recorded for the first time under work in progress although, as of the close of the fiscal year 1963, the full financial and technical responsibility for Yanhee still rested with the Royal Irrigation Department (paragraph 8).

39. Annex 3 shows more recent figures as of September 30, 1964. They have to be considered as preliminary pending the external audit by Coopers and Lybrand. The presentation also assumes that all foreign exchange debt would be stated at the present exchange rate of B 20.8 : US$1 rather than at the somewhat lower rates in effect at the time of the drawdown. To the extent that this caused an increase in the baht equivalent, fixed assets and work in progress financed by such loans were revalued. Total fixed assets in operation and work in progress amounted to about B 3,367 million as of September 30, 1964. After deducting the accumulated depreciation reserve of B 104 million, net fixed assets were B 3,263 million (US$157 million equivalent).

40. YEA's capitalization as of September 30, 1964 can be summarized as follows:

	(in millions of Baht)	%
Equity and surplus		
Government equity contributions	1,210.77	
MEA property transferred free of charge	136.59	
MEA contribution in aid of construction1/	.60	
Earned surplus	109.77	
	1,457.73	43%
Long-term debt outstanding		
IBRD Loans: 175-TH, 5-3/4%, 1957-82	1,313.63	
333-TH, 5½%, 1963-83	88.34	
Ex-Im Bank Credits: 1065, 5½%, 1959-73) 1769, 5-3/4%, 1962-76)	406.16	
Government Loans: B 40 million, 4%, 1963-83	20.00	
B 65 million, 5-3/4%, 1964-84	65.00	
MEA debt assumed on transfer of properties	17.91	
Total long-term debt	1,911.04	57%
Total capitalization	3,368.77	100%

41. Equity amounted to 43% per cent of total capitalization. The Government contributions were made in the past to cover local costs of the Yanhee project and of the Bangkok steam units. The YEA Act provides that the Government would appropriate funds as needed should YEA's revenues be insufficient to meet its financial requirements. This has been the case in the past prior to the completion of YEA's Bangkok steam plant in 1963.

1/ This item does not appear in Annex 2 because it is deducted from fixed assets in operation.

42. Outstanding long-term debt represented about 57% per cent of total capitalization. The amounts of the loans and their purposes were as follows:

(a) US$66 million for the Yanhee project (175-TH), substantially all of which has been disbursed.

(b) US$6.6 million for the transmission line extension project (333-TH) of which more than half has been drawn down by YEA.

(c) US$14 million and US$10 million for the two 75 MW Bangkok steam units from Export-Import Bank loans.

(d) A local currency loan of B 40 million was obtained from the Government for transmission line extensions in connection with the Second Yanhee Project; by the end of fiscal year 1963/64 only half of this loan was utilized. Another Government loan of B 65 million was for the April 15, 1964 debt service payment on Loan 175-TH which became due prior to the completion of the Yanhee Project; the 20-year term includes a grace period of 5 years on interest and of ten years for amortization.

(e) The MEA debt taken over by YEA represents suppliers' credits and a U.S. foreign aid loan, both payable in baht.

Past Earnings Record

43. Income statements for the four fiscal years ending September 30, 1964 are shown in Annex 4. It should be noted that YEA started operations only in fiscal year 1961 after completion of the first 75 MW thermal unit. Net income from operations increased from B 51.6 million in 1962, the first full year of operation, to B 63.8 million in 1963 representing a return on net fixed assets in operation of more than 8%. The drop in 1964 to 6.9% is caused by the inclusion of the Bhumibol dam investment for part of the year and has been explained in paragraph 36.

Proposed Financing Plan

44. Forecast sources and applications of funds are given in Annex 5. The cash flow for the four years 1965-68 during which the proposed project would be carried out can be summarized as follows:

(See next page)

Financial Requirements:	In millions of Baht	In millions of US$
Construction requirements	346.03	16.7
Debt service requirements	782.20	37.6
Various provisions	29.63	1.4
	1,157.86	55.7
Would be met from:		
Internal cash generation	943.79	45.4
Borrowings	213.76	10.3
Government equity contribution	15.00	.7
	1,172.55	56.4
Increase in cash balances available for future construction	14.69	.7
Internal cash generation net of total debt service	161.59	-
Expressed as % of construction requirements	46.7%	-

45. This financing plan is realistic. It takes a conservative approach to the rate question which is explained in more detail in paragraphs 48 and 49. Internal cash generation after meeting the sizable debt service requirements would finance about 47% of capital expenditures comprising the proposed project, the completion of the Second Yanhee Project and miscellaneous small capital improvements. YEA's own resources together with the assumed borrowings would, after minor adjustments, leave a margin of about B 15 million which might either be considered as additional contingency for the period under review or could be available for future construction.

46. The assumed sources of long-term debt included in this financing plan are:

(a) The existing Loan 333-TH would be fully disbursed in fiscal year 1964-65.

(b) The proposed Bank loan of US$6 million equivalent representing about 61% of the total project cost has been assumed at an interest rate of 5½% and for a term of 20 years including a grace period of 4 years. During negotiations it was agreed that YEA's overall financial situation does not justify financing of the full foreign exchange cost of the project which would amount to US$7.3 million. The list of goods was therefore limited to the items mentioned in paragraph 29 totalling US$6 million.

(c) The Government will make available a local currency loan of B 20 million for the proposed project at 4% interest and for a term of 20 years including a grace period of 5 years. This loan has more the character of a line of credit and YEA will make use of these funds only to the extent required.

47. No significant Government contributions are assumed for the period of the forecast. The estimated Government equity contribution in 1965 represents the reimbursement from the Government for import duties paid by YEA.

Estimated Future Financial Position

48. Forecast income statements, sources and applications of funds and the resulting balance sheets are given in Annexes 4, 5 and 3 respectively. These forecasts illustrate the basic assumption that YEA would lower its rates if and when this was compatible with its general financial situation.

49. The decreases in average revenue as presented in the forecasts based on assumed rate reductions would still leave YEA in a satisfactory position. Net income from operation is forecast to increase from B 143.10 million in 1965 to B 202.54 million in 1970 resulting in an increase of the return on total net fixed assets in operation from 4.7 per cent in 1965 to 6.4 per cent in 1970. If one takes into consideration that about 25 per cent of the Yanhee investment could be allocated to other than power aspects the corresponding returns on the power investment would rise from 5.7 per cent to 8.1 per cent. These returns are satisfactory.

50. Internal cash generation in 1963-64 was not adequate to cover debt service for the first full year's payment on Loan 175-TH which had to be made prior to the completion of the Yanhee project. This deficiency was made up by a Government loan (paragraph 42 (d)). The future cash accumulations will however be adequate to meet debt service. The year-end cash balances shown are higher than would normally be required because semi-annual debt service payments on Loan 175-TH fall due within 15 days after the close of each fiscal year. Taking these higher year-end cash balances into consideration, the annual debt service coverages ranging between 1.1 and 1.4 times would be acceptable.

51. The main problem for YEA will be to maintain a satisfactory financial position in view of general pressures for rate reductions. The rate covenants of the previous two loans (175-TH and 333-TH) which reflect the provisions of the YEA Act require in essence that rates should provide revenues sufficient to cover (a) operating costs and (b) debt service and produce (c) a surplus to finance a substantial portion of future expansion.

52. As explained in paragraphs 16 and 17 above, it is probable that the Thai industry will be reorganized within the next few years and this reorganization would involve a thorough reappraisal of the entire tariff situation. In these circumstances the Bank was satisfied with a statement by YEA that it would consult with the Bank prior to any change in its present rate structure or rate level. Bearing in mind the timing of the expected reorganization and the fact that the Bank's consent is required for any change in the YEA Act, YEA's obligation to consult on rate changes is limited to a six-year period ending in 1970.

53. The debt limitation covenant in the previous loan agreements specified that the borrower should not incur any additional long-term debt without the prior agreement of the Bank. In view of the limited nature of YEA's expansion program for the next few years which appears fully financed with the help of the proposed Bank loan and a Government loan, there seems to be no immediate need for YEA to incur additional long-term debt. Taking furthermore into account the high debt service burden which YEA has to carry for the Bhumibol dam investment and which is illustrated by the low annual debt service coverages (see paragraph 50), there is a good reason to have a firm control for some years over additional long-term borrowings which YEA might want to incur. The debt limitation covenant of the previous loan agreements has therefore been maintained for the proposed loan.

VII. CONCLUSIONS

54. The present organization of the power sector in Thailand is inefficient and difficult to control. A reorganization is overdue and will likely be proposed by the Government soon. Any proposal which would affect YEA will require the Bank's approval and YEA's new role will have to be carefully considered (paragraph 17).

55. The project is justified. It is relatively simple and the arrangements for carrying it out are acceptable. The cost estimate is based on prices for identical equipment previously purchased by YEA after securing international bidding. Ample contingencies have been included to cover any unforeseen cost increases.

56. YEA has good and competent management and is adequately staffed. Its present financial position is sound and should remain satisfactory in the future, given the specific commitment on rates (paragraph 52).

57. The project would be suitable for a loan of US$6.0 million for a term of 20 years including 4 years grace on amortization.

March 1, 1965
IBRD

ANNEX 1

POWER AND ENERGY FORECAST

YANHEE ELECTRICITY AUTHORITY

THAILAND

Actual (fiscal years)	Demand (MW) Bangkok	Demand (MW) Rural	Energy Sales (Gwh) Bangkok	Energy Sales (Gwh) Rural	Energy Sales (Gwh) Total
1961	99	-	(YEA in operation only part of year)		
1962	113	-	480	-	480
1963	133	-	564	-	564
Forecast					
1964	164	12*	673	15	688
1965	190	26**	835	65	900
1966	214	35	937	87	1,024
1967	242	41	1,057	102	1,159
1968	271	56***	1,182	139	1,321
1969	297	61	1,293	150	1,443
1970	326	67	1,417	165	1,582

* Stage 1 rural load

** Stage 2 rural load

*** Stage 3 rural load

August 10, 1964

YANHEE ELECTRICITY AUTHORITY

Balance Sheets 1961-63

(in millions Baht)

September 30,	1961	1962	1963
ASSETS			
Fixed assets in operation	615.30	660.56	927.61
Less: Depreciation reserve	9.80	34.57	62.14
Net fixed assets in operation	605.50	625.99	865.47
Work in progress 1/	26.56	138.43	2,011.08
Total net fixed assets	632.06	764.42	2,876.55
Current assets			
Cash	16.87	30.64	39.10
Accounts receivable - MEA	25.66	39.69	43.81
Other current assets 1/	25.11	30.91	34.61
Total current assets	67.64	101.24	117.52
Deferred charges	2.38	1.78	3.27
Total assets	702.08	867.44	2,997.34
LIABILITIES			
Government equity contributions	192.83	228.75	1,065.69
Properties transferred from MEA	140.41	140.41	136.59
Earned surplus	16.43	53.05	97.62
Total equity	349.67	422.21	1,299.90
Long-term debt			
IBRD loans 175-TH and 333-TH 2/	18.39	20.08	1,175.69
Export-Import Bank loans	261.96	346.68	397.98
Loans from MEA	27.44	23.16	17.91
Total long-term debt	307.79	389.92	1,591.58
Current liabilities			
Current portion of long-term debt	16.41	32.80	70.30
Accounts payable	12.08	15.10	17.34
Other current liabilities	16.05	7.23	17.99
Total current liabilities	44.54	55.13	105.63
Deferred credits	.08	.18	.23
Total liabilities	702.08	867.44	2,997.34

1/ Work in progress in 1961 and 1962 excludes the Yanhee project which was constructed by the Royal Irrigation Department. In 1963 the capital expenditures for Yanhee are for the first time included prior to the take-over by YEA, in fiscal year 1963-64. - Work in progress has been adjusted by transferring from current assets expenditures applicable to construction work.

2/ Loan amounts in 1961 and 1962 represent disbursements from loan 175-TH for a transmission line project of YEA. The amount on Sept. 30, 1963, includes total disbursements of loan 175-TH as of this date plus initial disbursements of loan 333-TH.

August 10, 1964

THAILAND

YANHEE ELECTRICITY AUTHORITY

Estimated Balance Sheets 1964-1970

(in millions of Baht)

September 30,	1964 1/	1965	1966	1967	1968	1969	1970
ASSETS							
Fixed assets in operation	3,243.29	3,251.29	3,479.30	3,487.30	3,640.30	3,730.12	3,749.87
Less: Depreciation reserve	104.10	174.40	250.20	326.00	406.10	488.70	571.70
Net fixed assets in operation	3,139.10	3,076.89	3,229.10	3,161.30	3,234.20	3,241.42	3,178.17
Work in progress	123.45	214.42	76.85	187.40	90.69	25.06	48.44
Total net fixed assets	3,262.64	3,291.31	3,305.95	3,348.70	3,324.89	3,266.48	3,226.61
Net current and other assets	105.53	124.02	141.60	120.85	132.82	184.88	214.44
Total assets	3,368.17	3,415.33	3,447.55	3,469.55	3,457.71	3,451.36	3,441.05
LIABILITIES							
Government equity contributions	1,210.77	1,225.77	1,225.77	1,225.77	1,225.77	1,225.77	1,225.77
Properties transferred from MEA	136.59	136.59	136.59	136.59	136.59	136.59	136.59
Earned surplus	109.77	150.84	213.30	262.51	336.05	437.96	539.16
Total equity	1,457.13	1,513.20	1,575.66	1,624.87	1,698.41	1,800.32	1,901.52
Long-term debt:							
IBRD loans 175-TH and 333-TH	1,401.97	1,408.98	1,362.20	1,310.24	1,255.22	1,197.08	1,135.55
Proposed IBRD loan	-	6.53	45.52	112.72	124.80	119.79	114.50
Other existing loans	424.07	381.62	339.17	296.72	254.28	211.84	169.82
Government loans	85.00	105.00	125.00	125.00	125.00	122.33	119.66
Total long-term debt	1,911.04	1,902.13	1,871.89	1,844.68	1,759.30	1,651.04	1,539.53
Total liabilities	3,368.17	3,415.33	3,447.55	3,469.55	3,457.71.	3,451.36	3,441.05

1/ Final figures as of September 30, 1964 are not available yet. The figures presented differ from the actual balance sheets for previous years, shown in Annex 2, in the following points: (a) Outstanding foreign exchange loans were uniformly valued at B 20.80:1US$. An equivalent upward adjustment was made in the valuation of fixed assets financed by these loans. (b) The current portion of long-term debt has been eliminated from current assets and is shown added back to long-term debt.

February 3, 1965

THAILAND

YANHEE ELECTRICITY AUTHORITY

Income Statements 1961-1970

(in millions of Baht)

Fiscal year ending September 30,	Actual 1961 1/	1962	1963	1964	Forecast 1965	1966	1967	1968	1969	1970
Sales in millions of kwh		480	564	716.18	900	1,024	1,159	1,321	1,443	1,582
Average revenue in satang/kwh		38	37	36	33	33	30	27	27	25
Operating revenues	62.78	180.10	209.08	258.52	297.00	333.29	344.02	353.98	393.63	391.84
Operating cost:										
Fuel cost	21.36	72.47	85.67	82.85	40.00	40.00	65.00	45.00	45.00	45.00
Other operating cost	10.43	33.11	34.13	47.40	43.60	46.60	50.90	53.40	56.60	61.30
Depreciation	7.01	22.95	25.46	40.80	70.30	75.80	75.80	80.10	82.60	83.00
Total operating cost	38.80	128.53	145.26	171.05	153.90	162.40	191.70	178.50	184.20	189.30
Net income from operation	23.98	51.57	63.82	87.47	143.10	170.89	152.32	175.48	209.43	202.54
Other income	-	.59	.30	-	-	-	-	-	-	-
Net income before interest	23.98	52.16	64.12	87.47	143.10	170.89	152.32	175.48	209.43	202.54
Total interest	14.46	16.98	23.57	70.62	107.04	105.53	103.93	100.20	99.85	93.72
Interest charged to construction (credit)	(6.91)	(1.88)	(7.49)	(4.33)	(8.10)	(1.80)	(4.52)	(3.80)	-	-
Foreign exchange loss	-	.43	.43	-	-	-	-	-	-	-
Total income deductions	7.55	15.53	16.51	66.29	98.94	103.73	99.41	96.40	99.85	93.72
Net profit	16.43	36.63	47.61	21.18	44.16	67.16	52.91	79.08	109.58	108.82
Bonus and welfare fund	-	-	3.04	1.48	3.09	4.70	3.70	5.54	7.67	7.62
Earned surplus	16.43	36.63	44.57	19.70	41.07	62.46	49.21	73.54	101.91	101.20
Net fixed assets in operation 2/	*454.11	625.99	*745.73	*1,273	3,077	*3,153	3,161	3,234	3,241	3,178
Net income from operation expressed as % of above item	5.3	8.2	8.6	6.9	4.7	5.4	4.8	5.4	6.5	6.4

1/ In operation only part of the year. Return calculation has been adjusted accordingly.
2/ Year-end figures are used except in cases marked with an asterisk (*) where adjustments were made to reflect part-year operation to new investment.

February 3, 1965

ANNEX 4

THAILAND

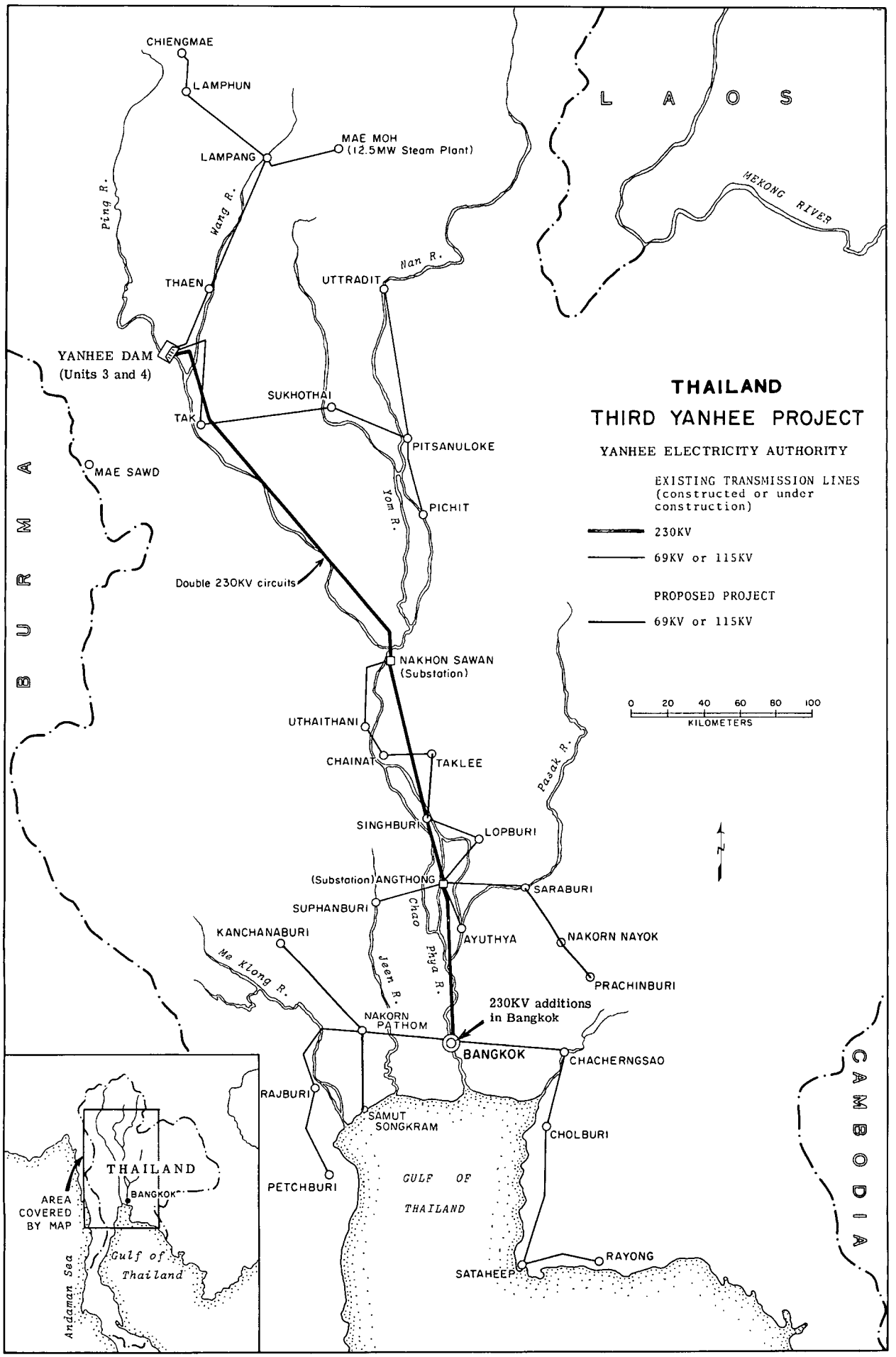
YANHEE ELECTRICITY AUTHORITY

Sources and Applications of Funds 1965-1970

(in millions of Baht)

Fiscal years ending September 30,	1965	1966	1967	1968	1969	1970	1965-1970
SOURCES OF FUNDS							
Internal cash generation:							
Net income before interest	143.10	170.89	152.32	175.48	209.43	202.54	1,053.76
Depreciation	70.30	75.80	75.80	80.10	82.60	83.00	467.60
Total internal cash generation	213.40	246.69	228.12	255.58	292.03	285.54	1,521.36
Borrowings:							
IBRD loan 333-TH	48.96	-	-	-	-	-	48.96
Proposed IBRD loan	6.53	38.99	67.20	12.08	-	-	124.80
Government loans	20.00	20.00	-	-	-	-	40.00
Total borrowings	75.49	58.99	67.20	12.08	-	-	213.76
Government equity contribution	15.00	-	-	-	-	-	15.00
Total sources of funds	303.89	305.68	295.32	267.66	292.03	285.54	1,750.12
APPLICATIONS OF FUNDS							
Additions to plant excl. capitalized interest:							
Second Yanhee Project (333-TH)	72.76	16.20	-	-	-	-	88.96
Proposed IBRD project	10.11	64.44	97.25	32.74	-	-	204.54
Other plant additions	8.00	8.00	16.78	19.75	24.19	43.13	119.85
Total additions to plant	90.87	88.64	114.03	52.49	24.19	43.13	413.35
Debt service:							
Interest - Existing loans (175-TH, 333-TH, Ex-Im Bank)	105.42	101.73	97.01	91.25	85.76	80.02	561.19
Proposed IBRD loan	.62	1.80	4.52	6.55	6.79	6.51	26.79
Government loans	1.00	2.00	2.40	2.40	7.30	7.19	22.29
Total interest	107.04	105.53	103.93	100.20	99.85	93.72	610.27
Amortization - Existing loans (175-TH, 333-TH, Ex-Im Bank)	83.55	88.38	93.56	96.62	99.74	103.13	564.98
Proposed IBRD loan	-	-	-	-	5.01	5.29	10.30
Government loans	-	-	-	-	2.67	2.67	5.34
Repayments to MEA	.85	.85	.85	.84	.84	.42	4.65
Total amortization	84.40	89.23	94.41	97.46	108.26	111.51	585.27
Total debt service	191.44	194.76	198.34	197.66	208.11	205.23	1,195.54
Provision for working capital	4.60	4.00	4.00	-	7.00	-	19.60
Bonus and welfare fund provision	3.09	4.70	3.70	5.54	7.67	7.62	32.32
Total applications of funds	290.00	292.10	320.07	255.69	246.97	255.98	1,660.81
Net cash accrual (deficit)	13.89	13.58	(24.75)	11.97	45.06	29.56	89.31
Cash at beginning of year	75.29	89.18	102.76	78.01	89.98	135.04	
Cash at end of year	89.18	102.76	78.01	89.98	135.04	164.60	
Times debt service covered by internal cash generation	1.1	1.3	1.2	1.3	1.4	1.4	

February 3, 1965



JANUARY 1965

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