SUMMARY OF THE NAM SAI YAI

HYDROELECTRIC POWER DEVELOPMENT PROJECT

OCTOBER 1968

GOVERNMENT OF JAPAN

1. Preface

Submitted herewith is the Report on Nam Sai Yai Hydroelectric Power Development based on field investigations carried out between October 1967 and March 1968 in response to the request of the Government of Thailand.

The report comprises of two parts; basin plan studies and feasibility studies.

The Report of the basin plan gives the development method by which the water resources of the entire Sai Yai River (Maenam Sai Yai) Basin can be most effectively utilized and covers studies not only of hydroelectric power development but also of agricultural development. Included in the report is the development of the neighboring Prachantakham River (Maenam Prachantakham) Basin which is related with the development of the Sai Yai River.

The Nam Sai Yai Basin Plan may be outlined as consisting of the construction of 3 reservoirs and 4 power stations, which will produce a maximum output of 99 MW and 332,000 MWh of energy per year, and of a fourth reservoir which will irrigate 13,300 ha of cultivated land. The project will create a benefit-cost ratio of 1.2 at an interest rate of 6% per annum.

The report of the feasibility studies deals with the No. 2 and No. 3 Nam Sai Yai Power Stations which were found most economical among the four power stations in the studies mentioned above. The combined maximum output of 70 MW and annual energy production of 230,000 MWh of the two power stations will be transmitted to the existing Korat Substation by a transmission line 109 km long. The benefit-cost ratio of the two power stations, including the irrigation phase, is 1.29 which shows that the project can be developed very economically.

2. Power Demand (See Fig. 2)

The growth in demand for electric power in Thailand has been spectacular in recent years, growth rates of 34%, 34.6% and 30.3% in energy consumption have been recorded in the years 1965, 1966 and 1967, respectively. These high growth rates are considered to have been caused by rapid industrialization, improvement in the living standard, of the people servicing of potential demand due to development of new power sources and expansion and interconnection of transmission and distribution lines. It is thought that this marked growth trend will continue in the future.

Since the NEEA System and the YEA System will be interconnected by a tie line at the beginning of 1970, it is expected that the two systems will thereafter be operated on an integrated basis. Under such a circumstance, it is estimated that the power and energy demand of the two systems will grow to 756 MW and 3,851 million KWh respectively in 1970, and 1,580 MW and 8,295 million KWh in 1975.

To cope with the growing demand, both the NEEA System and the YEA System are going ahead with programs of capacity additions, but there will arise the need to add supply capability between 1972 and 1974.

Therefore, in order to meet this requirement, it will be necessary to develop new power sources by the end of 1972. The development of the No. 2 and No. 3 Nam Sai Yai Power Stations is considered most desirable from both technical and economical points of view to satisfy the predicted requirement for supply capability.

3. Outline of Project (See Fig. 1)

(1) Reservoir and Dam	(No. 1)	No. 2	No. 3	(No. 4)	
Reservoir					
Total catchment area (sq.km)	(124)	295	298	(455) (95)	(Sai Yai River) (Sai Noi River)
Normal high water surface level (m)	(727.5)	591.0	510.0	(44.0)	
Effective storage capacity (million cu.m)	(90)	110	1.6	(24.0)	
Available drawdown (m)	(14.5)	15.0	3.0	(7.0)	
Dam					
Type	(Fill Dam)	Rock and Earth-Fill	Earth-Fill	(Fill Dam)	
Height (m)	(59)	40	28	(39) (45)	

	Length (m)	(395)	1,346	540	(300) (600)
	Volume (thousand cu. m)	(840)	1,700 (Included Dike)	400	(500) (700)
(2)	Power Station	(No. 1)	No. 2	No. 3	(No. 4)
	Max. available discharge (c.m.s.)	(10.0)	20.0	20.0	(21.0)
	Firm discharge (c.m.s.)	(3.1)	6.4 (7.3)	6.4 (7.3)	(7.4)
	Rated head (m)	(86.7)	74.3	333.3	(119.4)
	Installed capacity (kW)	(8,000)	12,000	58,000	(21,000)
	Available energy (MWh/Year)	(21,000)	40,000 (42,000)	190,000	(79,000)
(3)	Transmission Line	115 kV x 109 (134) km			
(4)	Irrigation				
	Irrigable area (ha)	7,000 (13,300)			
	Gross irrigation water requirement (c.m.s.)	0.6 - 7.1 (1.8 - 13.4)			
	Main canal length (km)	63.5 (76)			

Note: Figures in parenthesis are of the basin plan studies.

Figures not in parenthesis are of the feasibility studies.

4. Estimated Construction Cost

Structures	Construction Cost in 1,000 US$
(1) Dam	
No. 1	(3,900)
No. 2	4,700
No. 3	1,000
No. 4	1,800 (4,900)
Subtotal	7,500 (14,500)
(2) Power Station	
No. 1	(2,800)
No. 2	6,500
No. 3	8,200
No. 4	(8,500)
Subtotal	14,700 (26,000)
(3) Transmission Lines and Substations	3,300 (3,900)
(4) Irrigation	
Main canals, laterals, other works	2,300 (3,600)
Total	27,800 (48,000)

Note: Figures in parenthesis are of the basin plan studies.
Figures not in parenthesis are of the feasibility studies.

5. Economic Evaluation

	Generation	Irrigation	Total
Benefit (B) (1,000 US$)	2,120 (2,779)	736 (1,308)	2,856 (4,087)
Cost (C) (1,000 US$)	1,707 (2,413)	500 (995)	2,207 (3,408)
B/C	1.24 (1.15)	1.46 (1.31)	1.29 (1.20)

Note: Figures in parenthesis are of the basin plan studies.

Figures not in parenthesis are of the feasibility studies.

6. Recommendations

The Nam Sai Yái No. 2 and No. 3 Project is judged to be technically and economically feasible. It will be necessary for construction of this project to be started in early 1971 with various preliminary works including access roads, field offices and living quarters completed by the end of 1970. The definite study of the project should be completed by the first quarter of 1970 after which tenders should be invited and contracts awarded for the various components of the work.

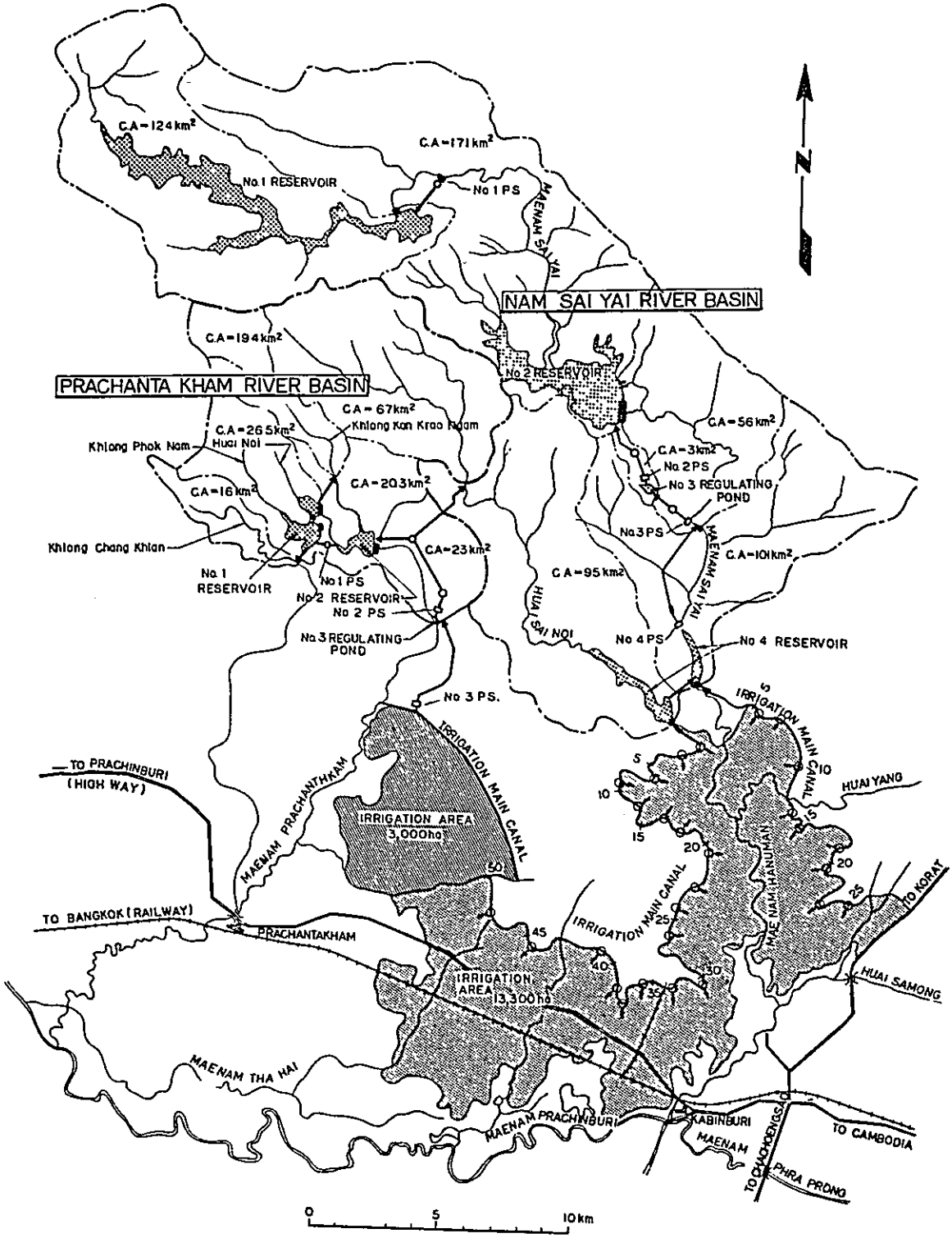
The abovementioned schedule is fairly tight and it will be necessary for field surveys required for the definite study to be started immediately. These surveys would be comprised of material investigations for the dam and other structures, core borings and preparation of topographical maps necessary for design of structures. Fortunately, a fair amount of borings and topographical maps for the Nam Sai Yai Project have already been prepared. Further investigations of the topography and geology of the power station sites and of various materials for the dam are necessary and for the tunnel construction, sufficient data for determination of a construction schedule must be collected.

In connection with the Nam Sai Yai No. 1 Power Station, including No. 1 Reservoir and No. 4 Power Station, it is desirable to conduct a feasibility study. Ground surveys and geological investigations of the No. 1 Reservoir dam site and the sites of the major structures of the

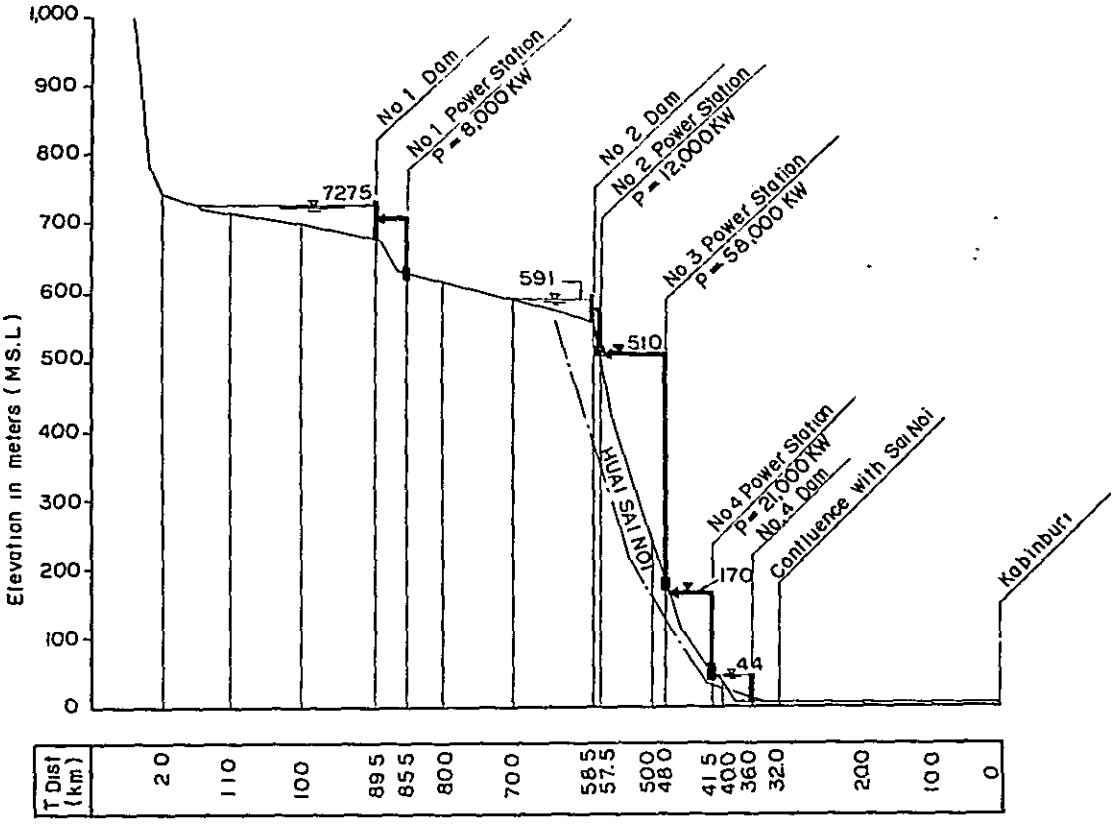
No. 1 and No. 4 Power Stations are considered the work that should be initiated at once.

In order to carry out the agricultural development as quickly as possible, the various investigations recommended in Table 2-1 of the Appendix to the basin plan report should be initiated at once. The development scheme of the entire Prachinburi River (Maenam Prachinburi), including adjoining tributary basins and downstream areas of poor drainage that were outside the scope of the present study, should be established as early as possible.

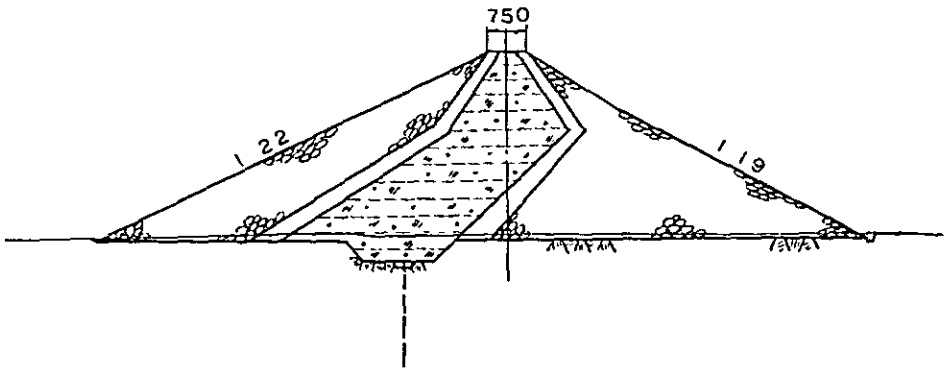
Fig. 1 GENERAL PLAN



Nam Sai Yai River Profile



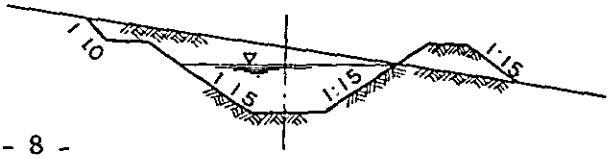
Rock–Fill Typical Section



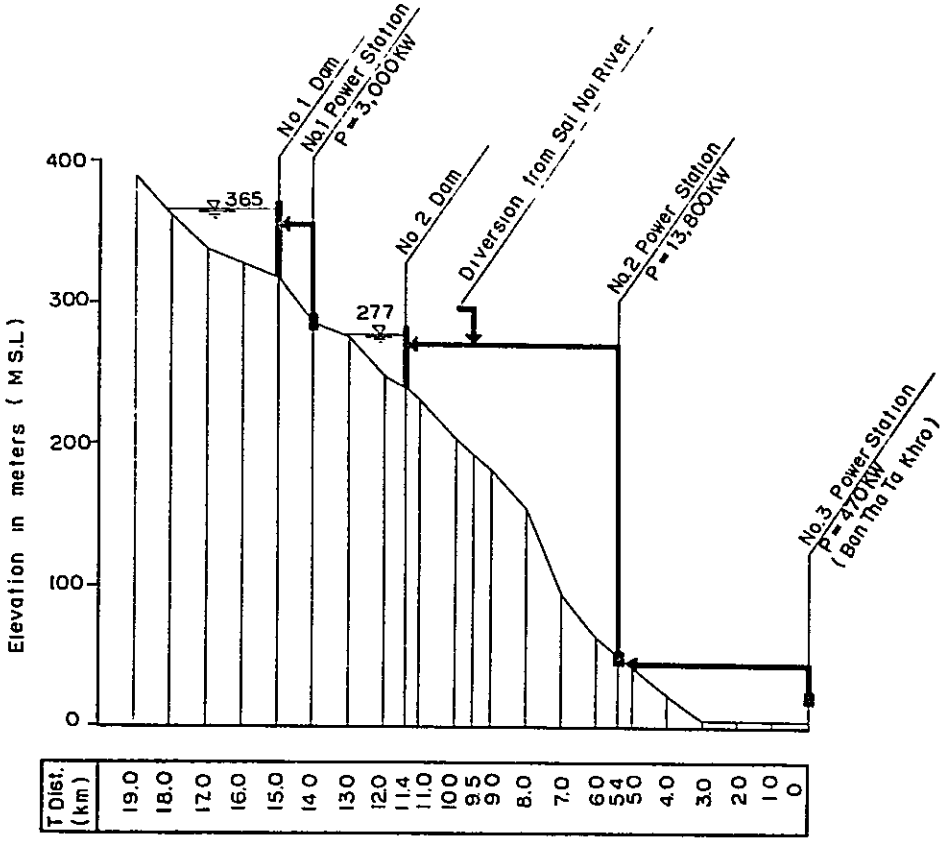
Typical Section of Tunnel

Typical Section of Irrigation Main Canal

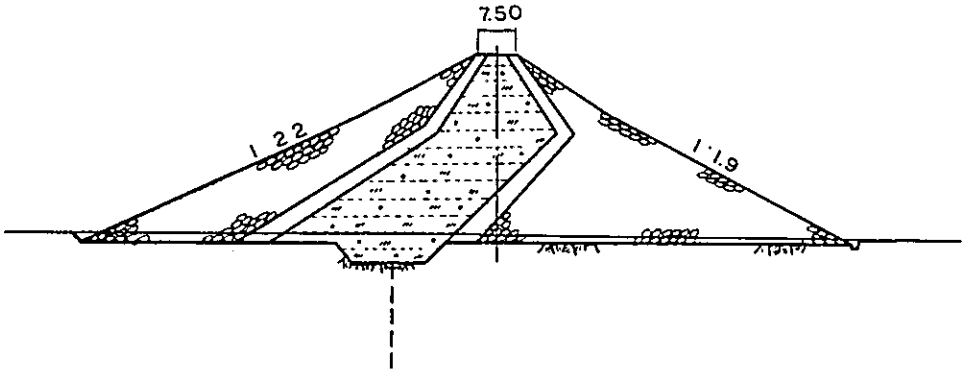
I = 1/3,000
n = 0.025



Prachantakham River Profile



Rock–Fill Typical Section



Typical Section of Tunnel

Typical Section of Irrigation Main Canal

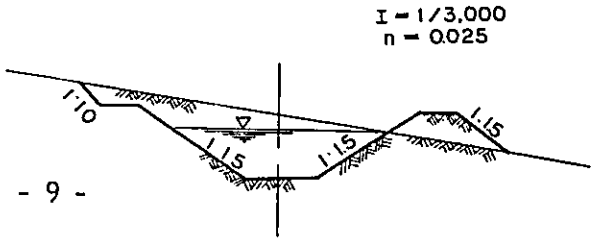


Fig. 2 POWER SYSTEM OF NEEA AND YEA