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DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
Washington, D.C. 20523

CAPITAL ASSISTANCE PAPER

Proposal and Recommendations
For the Review of the
Development Loan Committee

PHILIPPINES - TIWI GEOTHERMAL GENERATION
AND TRANSMISSION PROJECT

AID-DLC/P-2002

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June 15, 1973

MEMORANDUM FOR THE DEVELOPMENT LOAN COMMITTEE

SUBJECT: Philippines - Tiwi Geothermal Generation and
Transmission Project

Attached for your review are the recommendations for authorization of a loan in an amount not to exceed \$4,200,000 to the Government of the Republic of the Philippines to assist the National Power Corporation of the Philippines (NPC) in financing the foreign exchange costs required to construct and install both a geothermal electric power generation facility at Tiwi, Albay in South Luzon and the related transmission lines and substations.

Please advise us as early as possible but in no event later than close of business on Friday, June 22, 1973 if you have a basic policy issue arising out of this proposal.

Development Loan Committee
Office of Development
Program Review

Attachments:

Summary and Recommendations
Project Analysis
ANNEXES 1 - 10

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Summary and Recommendations

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SUMMARY AND RECOMMENDATIONS

1. Borrower/Beneficiary - The Republic of the Philippines will be the Borrower and The National Power Corporation (NPC) will be designated as the Beneficiary and implementing agency.
2. Loan - (a) Amount -- Up to \$4,200,000 to be made available over a three year period.

(b) Terms -- The loan will have terms of 40 years, including a ten year grace period, with an interest rate of 2% during grace and 3% throughout the remaining life of the loan. The reloan from the Government to NPC will be on terms and conditions satisfactory to A.I.D.
3. Description of the Loan - The loan will provide the foreign exchange required to construct a 10.5 MW geothermal electric power generation facility at Tiwi, Albay in Southern Luzon and approximately 317 kilometers of 69 KV transmission line and required substations. The transmission system will interconnect the Tiwi geothermal facility with load centers in Southern Luzon and a 230 KV line (presently out for bid) connecting the Manila area with Naga City in Southern Luzon. (See Map Page 8).
4. Purpose of Project - The objective of the loan is twofold:
(1) construct a pilot generating plant to facilitate the introduction of an electric power generating source in the Philippines using geothermal energy as an alternative to fossil fuel which must be imported, and (2) to assist in the electrification of Southern Luzon provinces of Camarines Sur, Albay and Sorsogon by constructing a 69 KV transmission network which will connect this area to the Luzon Grid system.
5. Project Costs - Total cost of the project is about \$6,204,000 (in \$000).

	<u>Foreign exchange</u>	<u>Local</u>	<u>Total</u>
Generating Plant*	2926	864	3790
Transmission	1212	1202	2414
Total	\$4138	\$2066	\$6204
- (*includes \$60,000 training)
6. Statutory Checklist - All statutory criteria have been met (See Annex 2).
7. Country Team Views - The country team recommends approval of this loan.
8. Other Sources of Funds - The Export-Import Bank of the U.S. is not interested in financing this project.
9. Environmental Considerations - The impact of this project on the natural environment has been reviewed (See Annex 10 for details).

10. Issues - None.

11. Recommendations - Authorization of a loan to the Republic of the Philippines in an amount up to \$4.2 million to finance the foreign exchange costs of goods and services required for the construction of a 10.5 MW geothermal power plant at Tiwi, Albay in the Philippines and related transmission facilities. The loan will be subject to the following terms and conditions:

(a) The loan to be repaid in 40 years including a ten-year grace period on repayment of principal.

(b) Interest on outstanding principal to be charged at the rate of 2% per annum during the grace period and 3% thereafter with funds relent to NPC on terms and conditions satisfactory to A.I.D.

(c) Repayment of principal and interest in United States dollars.

(d) The GOP will covenant to provide the local currency and/or other resource requirements for completion of the project on a timely basis and in the manner herein described.

(e) The loan shall be subject to other terms and conditions set forth in Section VI of the attached CAP and the loan authorization.

DEVELOPMENT LOAN PROJECT COMMITTEE

A.I.D./W

Chairman
Country Desk
Engineer
Legal Advisor
Loan Officer

Alexander R. Love (ASIA/CD)
Wade Hall (ASIA/EA)
Raymond Stokely (SER/ENGR)
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Tom Rishoi (ASIA/CD)

I. BACKGROUND

A. Country

In the last year the Philippines has suffered one of the worst floods of the century in the Central Luzon area. President Marcos has imposed martial law, and a new constitution establishing a parliamentary system of government has been promulgated. The President has announced that martial law will continue under the new constitution and that elections for a national assembly will be postponed for six or seven years. The President is undertaking social and economic reforms in the country and has announced that aside from law and order, implementation of an agrarian reform program is a high priority in the Philippines development program for the immediate future. In addition to decrees on agrarian reform, the President has promulgated decrees on tax reform and on a number of bills which had been awaiting Congressional approval including the customs and tariff bill and the government reorganization bill.

B. Multilateral Approach to Development

Prior to 1971, official U.S. aid to the Philippines consisted largely of commodity sales under PL 480, various programs of grant-financed technical assistance, and a modest level of development lending for such public sector activities as irrigation, pilot rural electrification cooperatives, and feasibility studies of other projects and programs having developmental priority; development loan assistance was also provided to the private sector for several industrial projects and to furnish seed capital for a development finance company.

In late 1969, the GOP asked the IBRD to organize and chair a consultative group (CG) of donor and potential donor countries. The request resulted in part on external payments crisis then facing the country, but it also reflected a growing awareness by the GOP that development efforts could be substantially enhanced by the coordination and direction of official foreign assistance which a consultative group could provide.

The CG was formally established in 1971, under IBRD chairmanship with Australia, Japan, Spain and the U.S. as members; Canada, Germany, India, the Netherlands, New Zealand, Switzerland, the U.K., and DAC/OECD as observers; and the ADB, IMF and UNDP as participating agencies. New Zealand and France had just become formal members. At the first meeting of the CG in May 1971, it was concluded that approximately \$200 million in official external concessionary assistance would be needed by the Philippines in each of the four succeeding years. In response to this recognized need, which was reiterated at the Second CG meeting in May 1972 (prior to the floods), some \$216 million was pledged, approximately \$55 million coming from the U.S. (\$20 million loan for rural electrification, and \$35 million in PL 480 Title I sales).

Following the 1972 floods, the IBRD assessed the impact on the economy and concluded that an additional \$100 million as quick-disbursing assistance was needed to offset the adverse BOP effects of the floods. The U.S. again responded with a \$20 million program loan (authorized in February 1973) and additional PL 480 sales. Further, in direct response to the immediate and extensive damage caused by the floods, the U.S. provided \$50 million in grant assistance to help finance the rehabilitation of major irrigation and flood control systems, provincial roads and other infrastructure, the construction of some 1,500 typhoon-resistant schools, and a program of accelerated rice production.

C. U.S. Development Objectives in the Philippines

The A.I.D. program in the Philippines is designed to support the nation's recovery efforts and assist in those sectors where past progress has failed to bring increased benefits to the bulk of the population. Accordingly, the program is concentrated in two sectors: (1) rural development and agriculture, and (2) family planning.

Special efforts are also being made to assist selected local and provincial governments to accelerate their economic development activities in the rural areas. One such area is the one to be serviced by the proposed project--the Bicol (Southern Luzon).

D. The Southern Luzon Region (The Bicol)

The proposed project is designed to contribute to the economic development of the mainly rural southern Luzon region often referred to as the Bicol Region. The region, located on the southern most tip of Luzon, constitutes 6% of the country's total land mass and ranks ninth in territorial size among the 11 Philippine regions. The region has a population of about 3.0 million. Relative to other parts of the country, the region is economically depressed. A 1967 study by the United Nations and the Philippines National Economic Council categorized the Bicol Region as a "downward transitional area" based on past economic performance, as borne out by the following facts:

a. The annual rate of population growth for the region at 2.3% is less than the national average of 3.1% indicating a loss of population through out-migration, a sign of basic economic weakness.

b. The regional per family income of about ₱1,500 or \$225 per annum is among the lowest of the nation's 11 regions.

c. Employment in the industrial and service sectors are the second lowest among the 11 regions.

d. Due to inadequate infrastructure, the region is virtually isolated from the rest of Luzon and Metropolitan Manila.

Between 1961-69, valued added (GNP) grew by 5.3% per annum, compared with the country's average of 5.5%. The regional economy is predicted to slacken further over the next decade. The projections, however, assume that no deliberate changes in the regional development pattern will be made.

A preliminary strategic framework has been developed for the entire region in order to try to avert the discouraging forecasts cited above. The objectives of the program are: (1) to increase agricultural productivity, (2) to increase employment opportunities, (3) to provide for more equitable distribution of wealth, and (4) to promote agro-industrial and industrial development.

E. Power Sector

1. General

During the latter part of the 1960's, the power sector experienced rapid growth. But despite the expansion electricity had reached only about 20 percent of the population, mostly in big cities and towns, by the end of the decade. On an annual basis, installed capacity increased by 15 percent during 1966-70 and sales by 19.5 percent. In order to meet a continuing growth in demand for energy this decade it is expected that capacity will have to grow by at least 19 percent per annum during 1973-77, or by 250 MW per year, doubling the existing capacity. Because of the projected growth in demand and the larger share of future power generation to be provided by the National Power Corporation (NPC), public investment in power would have to increase substantially over the next five years.

The tables below show estimated growth in generating capacity (1969-1984):

Power Demand (System Load Forecasts MW)

	1969	1974	1979	1984
Philippines ^{1/2/}	1338	2395	3914	5858
Luzon Grid ^{2/}	1151	1789	2938	4958
Southern Luzon ^{3/} (immediate Tiwi service area)		13	31.7	47.7

^{1/} Includes Luzon, Mindanao, and Visayas.

^{2/} Source: Electric Power Industry Survey: Philippines, 1964, and The Philippines Power Program, Power Development Council, March 1971.

^{3/} Source: "Feasibility Report on the Tiwi Geothermal Project" by NPC, March 5, 1973.

Energy Requirement (Generation Forecast GWH)

	<u>1969</u>	<u>1974</u>	<u>1979</u>	<u>1984</u>
Philippines ^{1/2/}	7055	12,745	20,867	31,041
Luzon ^{2/}	5961	10,724	17,605	25,978
Southern Luzon ^{3/} (immediate Tiwi service area)		29	105	195

As the above figures indicate the energy demand and requirement quadruples from 1969 to 1984.

2. Assistance to the Power Sector

The Philippines is presently providing strong political and financial support to a national electric power program. Major foreign assistance donors contributing to the Philippines electrification effort are the International Bank for Reconstruction and Development, the Asian Development Bank and the United States (A.I.D.). A.I.D.'s assistance to the program has centered around rural provincial electrification with other donors (IBRD, ADB, etc.) assisting with generation and transmission. The IBRD, for example, has assumed responsibility for financing generation and transmission on the Luzon Grid, and ADB for financing G&T on the Mindanao Grid. The GOP is now looking to the Japanese Government to assume a similar role in the Visayas.

In FY 1972-1973, foreign assistance loans and commitments to the electric power program were as follows:

- IBRD/IDA - \$32 million for the construction of the 150-MW Bataan Thermal Plant (No. 2), about 1400 KM of transmission line and 24 substations. Completion is expected in 1976.
- ADB - \$23.4 million for the construction of the 50-MW Maria Cristina Unit No. 5, 1,250 KM of transmission line and 21 substations. Completion is expected in late 1975.
- ADB - \$21.0 million for the construction of the 180-MW Agus II project.
- Japanese - \$30 million in reparations for rural electrification.
- U.S.A. - \$20 million DL for rural electrification.
- U.S.A. - \$1.5 million grant technical assistance for rural electrification.

Although A.I.D. has been requested to finance the initial Tiwi pilot plant and related 69 KV transmission facilities, it is expected that future geothermal plants will be at the more economical size of 50 MW plant and will be financed by the IBRD as part of their concentration on the Luzon Grid. It is believed that our assistance to the development of the new energy resource could contribute greatly to the Philippines power base and further the electrification effort. Also provision of an economic energy source to Southern Luzon should lead to the development of this predominately rural area and facilitate the establishment of electric cooperatives in Southern Luzon.

3. Power Development in Southern Luzon (Bicol)

The Southern Luzon Region lacks basic power infrastructure. Generation is by small diesel and hydro plants with a total capacity of about 7 MW to serve a population of approximately 3.0 million people in the Bicol area. Transmission facilities are marginal with about 90 KM of 34.5 KV line. The line is inadequate to support area electrification. The limited distribution systems are handled by private franchises. Feasibility studies have been completed for three new electric coops in the area. However, implementation of these coops by NEA is being deferred until grid system extension is completed to the coop areas. (See map page 8).

F. Geothermal Development

Although geothermal energy has been used in Italy to generate power since 1904, it is for practical purposes a comparatively new source of energy. Additional geothermal fields have been developed at the Geysers in northern California, at Wairiki in New Zealand, in Mexico, and most recently in El Salvador where a project has just gotten underway with assistance provided by the United Nations and the International Bank for Reconstruction and Development. Considerable additional survey work and exploratory drilling is underway in the world at present, but commercial operation is negligible outside of the Italian, California and New Zealand fields. One problem limiting more rapid development of these resources is the limited techniques available to locate the geothermal reservoirs. For this reason, geothermal power development is concentrated in those areas of the world where overt indications of geothermal resources exist on the earth's surface, e.g., hot springs, volcanoes, geysers, hot spots, etc. The Philippines is one such area. Other problems restricting development include technological developments required to commercially utilize low heat sources and high brine fluids. The characteristics of the Philippines field are such that conventional technology can be used.

In the Philippines, various agencies including the Commission on Volcanology, the National Science Development Board, and the Bureau of Mines have been involved in studies of the Tiwi geothermal area. These studies led the GOP to proclaim the Tiwi, Albay area as a mineral reservation for the purpose of exploiting geothermal energy for electric power

generation and placed it under the administrative control of the National Power Corporation (NPC). On September 10, 1971, the NPC and Union Oil of California through its subsidiary Philippines Geothermal, Inc. (PGI) entered into a contract for the exploitation of the Tiwi fields. (The terms and conditions of Union's agreement with NPC are summarized in Annex 9). The results of Union's drilling efforts to date are discussed in Section III.B on energy resource evaluation.

NPC has recently concluded another contract with Union Oil for development of a second geothermal area in the central Philippines.

In addition, the New Zealand Government is providing grant technical assistance to the Philippines Government for preliminary survey and exploration of geothermal potential on the island of Leyte in the Visayas.

II. THE NATIONAL POWER CORPORATION - THE BENEFICIARY

A. General

The National Power Corporation (NPC), the Beneficiary, was created by Commonwealth Act No. 120 of 1936 to control all water rights in the Philippines and to develop and generate hydroelectric power. Later, NPC was authorized to generate power from other sources. Subsequent amendments to the Act converted NPC into a stock corporation whose shares are wholly government-owned. The authorized capital stock of ₱300 million (U.S. \$46 million) is fully issued.

NPC has concentrated its efforts on the major islands of Mindanao, Visayas and Luzon (outside the Manila area) with Luzon having the heaviest concentration.

Recently NPC has had two far reaching revisions to its charter in 1971 and 1973. These revisions had the effect of giving NPC broad authority including setting tariffs (rates), contracting and tax exempt status. Prior to these revisions NPC management was hampered by administrative restrictions and lack of authority. These revisions are discussed in greater detail in Annex 6.

The prime foreign lenders to NPC are the International Bank for Reconstruction and Development and the Asian Development Bank. In connection with a recent IBRD loan, an engineering consulting firm was engaged to organize NPC's management on a sound basis. Their task involved the reorganization of managerial duties; the introduction of new systems and procedures; on-the-job training of personnel; work on the improvement of NPC's information systems and requirements, the accounting system, audit capability and staffing. NPC has adopted and implemented most of the consultants recommendations.

A.I.D. has not in the past provided assistance to NPC. However, it is our belief that NPC together with its prime lenders have taken appropriate steps to insure that it has the ability to effectively administer large capital projects.

B. Financial

NPC in the past has been troubled by poor earnings, inadequate capital, poor financial and operating information and inadequate authority to remedy the problem. With the recent revisions of its charter, NPC was able in 1971 to increase its tariff by 42% to P.059/KWH (about 8.7 mills U.S.) and improve its earnings. However, earnings are still inadequate with the rate of return on NPC's assets in 1970 at 3%--not enough to cover cost of capital so net earnings resulted in a deficit. This situation continued through 1971 until a 42% rate increase became effective the last two months of the year. The return during 1971 was 2.6%. These returns however tend to be overstated because they are based on historical value of assets which understate present worth. Condensed balance sheets and profit and loss statements for 1971 and 1972 are shown in Annex 6.

The IBRD as a condition to its loan has required NPC to take appropriate action to increase its rate of return to 6% in 1973 and 8% thereafter. Correspondingly, NPC has agreed to raise its average Luzon rate currently P.059/KWH to P.074/KWH over a three year period in annual increases of P.005/KWH.

Another NPC problem which has the effect of lowering its return is "unpaid accounts." NPC has taken positive steps to eliminate the problem including: threat of disconnection, back account settlement on installation basis, use of suasion through the Development Bank of the Philippines for commercial enterprises and the Ministry of Finance for Municipalities, cities and provinces, and imposition of a penalty of 1% per month on accounts unpaid.

NPC's estimated long term debt as of June 30, 1972 is summarized below:

	Millions \$
NPC bond payable	28.8
Morgan Guaranty Bond	2.1
Due to GOP Agencies	.8
Reparation Commission (Japan)	1.1
Sub total	<u>\$32.8</u>
Foreign Loans:	
U.S. Ex.-Im. Bank	.9
IBRD Loans	25.3
ADB Loans	.04
Sub total	<u>\$26.2</u>
TOTAL LONG-TERM DEBT	<u>\$59.0</u>

The local currency debt is mainly from GOP financial institutions. The NPC bonds are payable over 30 years at rates varying from 4% to 7%. Sinking funds administered by the Central Bank have been created to repay them. The revised charter provides for a maturity of ten years or more on future bond issues.

NPC's charter does not allow for payment of dividends. All funds generated after covering operating expenses are applied to meeting debt service requirements, maintaining adequate working capital and financing capital expenditures. NPC is attempting to operate with a 1.3 ratio of annual revenue to annual debt service. However, until new tariff rates become effective it is unlikely they will be able to meet this target. In 1971, the debt/equity ratio was 49/51. With projected increase in borrowing, it is expected to reach 59/41 by 1975.

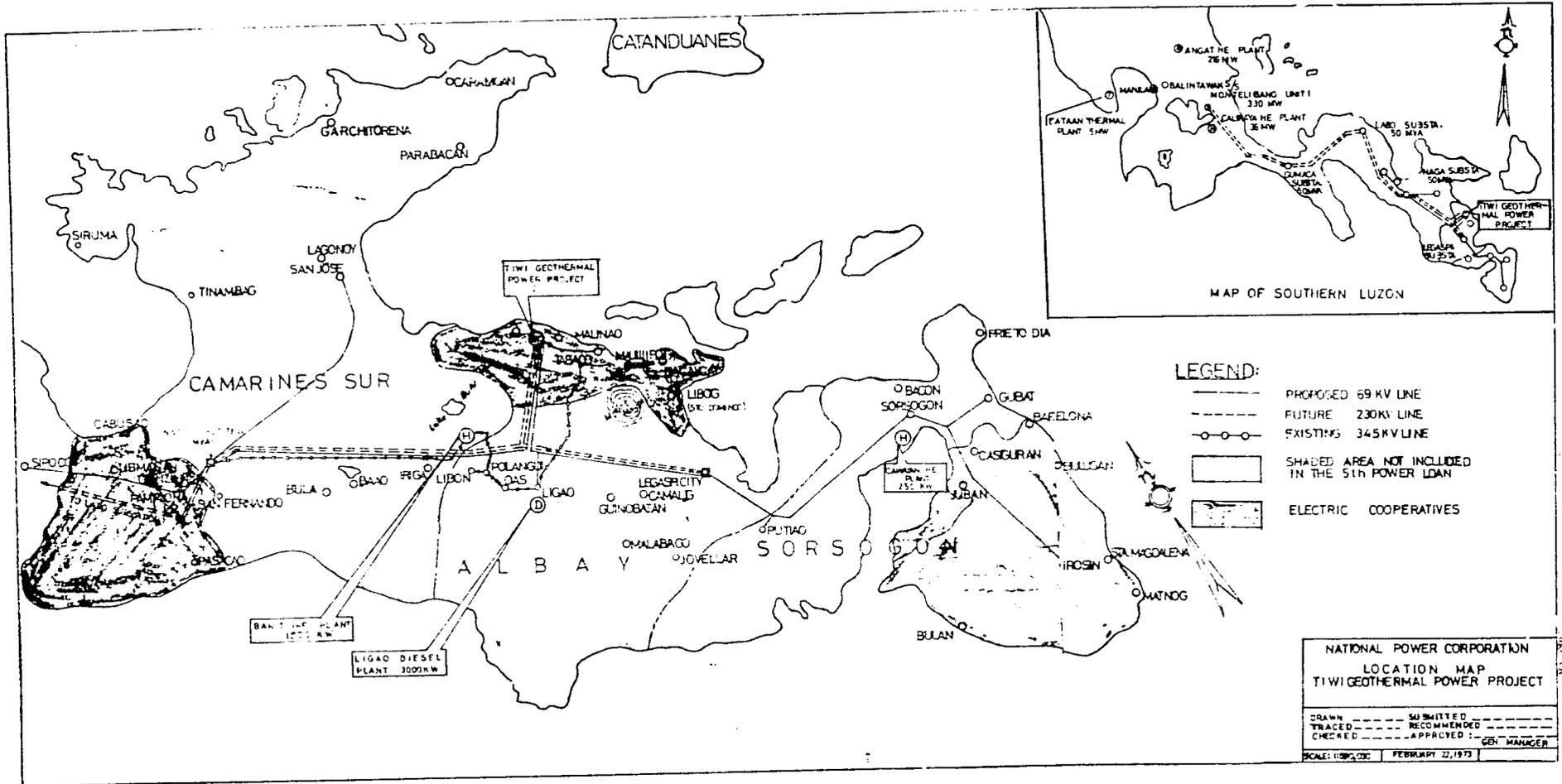
II. THE PROJECT

A. Project Description and Estimated Costs

The proposed project is to be located near Tiwi, Albay in Southern Luzon, a small town on the southeast coast of Luzon island.

1. Energy Resource

A.I.D. will provide no financing for this portion of the project. A.I.D. is however integrally concerned about the adequacy of the energy reservoir and the energies economical recovery. Energy will be supplied to the power plant in accordance with the terms of Union/PGI's contract with NPC which is basically a fuel supply contract. Under the contract, Union/PGI and NPC entered into a partnership for the purpose of performing exploratory drilling, test well analysis, and development and operation of the geothermal resource production system. In the Union/NPC joint venture, Union contributes 75% of the capital required (approximately the foreign exchange costs) and NPC, a 25% partner, covers the peso portion of the reservoir exploitation costs. In short, Union is responsible for delivering dry steam to the power plant, and disposing (recycling) of effluents and condensate. Union will recapture its investment through a payment by NPC of 2.5 mills U.S. per kilowatt hour of power generated through the use of the geothermal resource. Union will charge an additional 3.0 mills U.S., paid on the same basis as the 2.5 mills, as a service fee. Salient features of this contract are summarized in Annex 9). It should be noted, however, that Union and NPC, after a year of operation under this contract, have found parts of it which require review and/or clarification, e.g., millage rate charged for steam, application of 85% feasibility criteria. etc. Union and NPC therefore plan to review key provisions of the contract in July 1973.



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2. Engineering Design and Supervision

The project provides for the services of a qualified code 941 consulting firm for design, preparation of bidding documents, prequalification of construction firms, analysis of construction bids, and engineering supervision of construction of the geothermal Generating Plant. NPC will furnish the engineering services required for design, procurement and supervision of construction of the 69 Kv transmission lines with direct hire staff.

3. Training

NPC will recruit personnel to operate and maintain the geothermal plant from its existing steam plant and other steam power plants in the Philippines. In order to acquaint them with the special operating problems that arise in a geothermal plant, six technicians will be given approximately 6 months of on-the-job training in the U.S. at the geysers or at other similar type geothermal plants. Funds have been included for the purpose.

4. Generating Plant

The proposed generating facility consists of a single 10.5 MW generator and a step-up transmission substation at the plant with two out going circuits. The plant will receive steam from the Union/NPC system and convert its energy into electric power using a turbo-generator of conventional technology. The plant will use an induced draft cooling tower.

5. Transmission System

The proposed transmission system includes about 317 kilometers of 69 KV line (single circuit, wood poles) and required substations. The line will connect Tiwi, San Jose, Legaspi City, Naga City and south to Irosin at the southern tip of Luzon in addition to intermediate points as load projections warrant. The line will provide power to existing private franchises and subsequently to the three new electric coops which are planned for construction in the provinces of Camarines Sur, Albay and Sorsogon. The 69 KV line will connect at Naga City with a 230 KV line from the Manila area. For a more detailed list of the transmission system see Annex 4.

6. Cost Estimates

The estimate cost of the generation plant and related transmission system amounts to \$4,138,000 and ₱14,152,000 (or \$2,066,000 equivalent) broken down as follows:

Generation and Transmission

	<u>Capital Cost in \$000</u>		
	<u>Foreign Exchange</u>	<u>Local Costs</u>	<u>Total</u>
(A) <u>Production Plant and Transmission Plant</u>			
1. Structure & Improvements	45	183	228
2. Turbo generator unit	1547	211	1758
3. Accessory electrical eqpt.	184	38	222
4. Misc. power plant eqpt.	71	6	77
5. Substation equipment	120	16	136
6. Direct costs (items 1-5)	1967	454	2421
7. Engineering	345	47	392
8. Contingency 10%	231	50	281
9. Escalation 14%	323	70	393
10. Interest during construction	-	243	243
11. Sub-total	<u>\$2866</u>	<u>\$864</u>	<u>\$3730</u>
(B) <u>Transmission Lines and Substations</u>			
1. 69 KV lines/317 km	570	773	1343
2. Substations (3)	387	59	446
3. Land and land rights		15	15
4. Transportation equipment	40	3	43
5. Direct costs (items 1-4)	997	850	1847
6. Engineering	57	102	159
7. Contingency 10% - Escalation 5%	158	142	300
8. Interest during construction	-	108	108
9. Sub total	<u>\$1212</u>	<u>\$1202</u>	<u>\$2414</u>
(C) <u>Training</u>	60	-	60
(D) TOTAL COST OF PROJECT	<u><u>\$4138</u></u>	<u><u>\$2066</u></u>	<u><u>\$6204</u></u>

B. Technical Evaluation

1. Energy Resource

Power generation from geothermal energy involves the economic recovery of heat contained beneath the earth. Given present technology economic recovery requires two natural conditions to exist: (1) the heat (energy) must be near the earth's surface, and (2) in order to convey the heat (energy) to the surface generating facility, underground fluid (water or steam) reservoirs must exist concurrent with the hot earth. The fluid then acts as a means of energy conveyance. Research is underway on

other ways to exploit geothermal energy; however, economic recovery for power generation is presently limited by the above factors.

The Tiwi field lies on two major fracture systems and is surrounded by several volcanoes and hot springs indicating possible geothermal potential--energy near the earth's surface and underground water reservoirs.

After several exploratory efforts in the Tiwi area by various GOP organizations, NPC engaged Union Oil (PGI) to assist in the exploitation of the field. Three production wells have been drilled by Union to date and 800 acres of commercial producing reservoir have been proven. Costs of drilling the first two wells was \$1.7 million however costs for additional wells are expected to be reduced to about \$400,000 per well. The wells produce an average of 300,000 lbs/hr. of fluid which is 20% saturated steam. This represents sufficient steam to generate approximately 12.8 MW capacity of power or 2.3 MW more than the initial Tiwi geothermal plant.

Presently Union, for short range purposes, is planning to space wells every 40 acres. However, after operating the plant for several years, it can be determined whether well spacing can be reduced to 20 acres doubling the 800 acre field capacity. A resistivity survey of the Tiwi area indicates that 5600 acres contain geothermal heat at drillable depths. There was good correlation between initial resistivity mapping and the three successful wells drilled by Union over the initial 800 acres tested and proven out. For this reason, it is likely that the 5600 have geothermal energy productive capacity. In fact, the New Zealand hot water reservoir at Wairakei with a lesser acreage has supported over 200 MW of generating capacity for 20 years and is still producing. At a rate of 4.3 MW generating capacity per well (average of the three wells) With 40 acre spacing, Tiwi could produce sufficient energy for about 600 MW or at 20 acre spacing 1200 MW.

The three wells drilled by Union are producing super heated water at bottom reservoir temperature of about 480-520 F and surface temperature of about 250-340 F. The fluids produced contain about five percent non-condensable gases composed mainly of carbon dioxide (CO₂). No significant hydrogen sulfide is present. The wells were drilled to depths of 4840 feet, 3756 feet and 7730 feet with a diameter of 9-5/8 inches.

Of the three wells, only the first has been evaluated by an independent consultant Dr. Henry Ramey a geothermal specialist from Stanford University. On the basis of his analysis of Union's well data representing three months production on the first well, he concluded that the reservoir is likely to be sufficient for a 21 MW power plant. He stated that the risks involved would be of the same order of magnitude as that involved in installations of initial power plants in other currently developed geothermal areas. In order to perform certain reservoir tests six months to a year of historical production data is desirable. Historical production data from only one well is sufficient to perform these tests.

Union Oil has just stopped production of well No. 1 and has submitted the data to A.I.D./W and NPC. Union is continuing to produce the second and third wells.

The loan will require as a condition precedent that an additional evaluation of the Tiwi geothermal field be conducted by an independent consultant covering test data taken over a minimum of a six-month period and that the results of the evaluation are satisfactory to A.I.D. NPC will also be required to arrange for a continuing testing and monitoring program of the field during the project implementation period.

We are convinced that given existing evaluative information on the reservoirs together with the additional independent appraisals, certainty regarding reservoir validity will be acceptable.

2. Geothermal Generating Plant

The 10.5 MW plant will utilize conventional technology. A turbo generator will be powered by geothermal steam provided in accordance with the Union/NPC contract. Union will flash the hot water from the reservoir into saturated steam and deliver it to the generating plant at 100 lbs./sq. in. gage. The steam contains five percent non-condensable gases which is quite high and requires a vacuum on the main condenser. Although no appreciable amount of hydrogen sulfide has been reported present in the steam, this does not insure its non-existence for the life of the plant. Measures will be taken to prevent turbine corrosion from hydrogen sulfide and funds have been included in the plant estimate for this purpose. A direct contact main condenser will be used in conjunction with an induced draft cooling tower to condense the steam and maintain a vacuum on the turbine exhaust end.

In order to assure that the new power loads which would be served by this plant receive reliable service, it would normally be necessary to install another unit or units of standby generating capacity totalling at least 10.5 MW. In this case, it is possible to install the single geothermal generating unit and still render highly reliable electric service to the area since a 230 KV transmission line of the Luzon Grid bringing power to Naga City will be in service when the plant is ready to operate.

It is desirable to operate the generating plant at a load factor of 90% or better in order to maximize test benefits of the viability of the geothermal field. This will be accomplished by supplying power to the southern Luzon area and to the Luzon Grid load via the 230 KV line from Naga north.

3. Transmission System

The project includes 31.7 KM of single circuit 69 KV transmission lines to deliver power to three proposed rural electric cooperatives, numerous provincial towns, and to the Luzon Grid via the 230 KV

step-down substation at Naga City. Annex 4 lists the individual segments of transmission line and the substation/switching stations to be constructed.

The 69 KV transmission network will have adequate capacity to serve the outlying areas for many years. It is estimated given projected load centers that the line can carry about a 40 MW capacity. It will be necessary to overlay it with a 230 KV line from Naga City to Legaspi in a few years to deliver bulk power to the Legaspi area. Assuming the geothermal resource at Tiwi is large enough and can be developed economically, the 230 KV line from Tiwi to Naga City would be needed to deliver some of this bulk of power into the Luzon Grid. This 230 KV line will not make the 69 KV line obsolete because it will be needed to serve the individual cities and franchisers along the 230 KV line route.

NPC has the experience and personnel necessary to design and implement the construction program for the transmission system. NPC has been involved in the design and implementation of similar types of transmission programs in the Philippines and has a set of standards for single circuit wood pole 69 KV transmission. NPC owns stands of timber from which transmission poles for the program can be obtained.

4. Finding of Technical Soundness

A suitable plant site has been selected. Contractual arrangements have been made with Union to deliver steam to the turbine throttle and to dispose of liquid effluent from the plant, as appropriate. Experienced thermal generating plant personnel are available to NPC from its Bataan No. 1 thermal plant and from Meralco plants in the Manila area. However, the loan proposes to train about six employees, each for about a year. Training will occur at operating geothermal plant such as the geysers in California.

Regarding Section 611 of the FAA, financial and engineering plans have been completed and reasonable firm cost estimates to the U.S.G. are available. This project is technically sound. It is our judgement that the project objective as explained above will be reached.

C. Economic Analysis

This analysis is divided into a load analysis of the southern Luzon region and a project analysis of the proposed generation and transmission project.

1. Load Analysis

Local distribution in provinces of Albay, Camarines Sur and Sorsogon is to be accomplished primarily by existing private franchise-owned distribution facilities in the area, assisted by the construction of three new rural electric cooperatives. This proposed A.I.D. loan provides no financing for distribution, although the electric coops would be eligible for financing under A.I.D.'s FY 1972 \$20 million rural electrification loan.

The ten-year load forecast developed by NPC for the three province area (Camarines Sur, Albay and Sorsogon) is as follows:

(MW)

	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Albay	9.6	12.02	13.3	17.1	18.4	19.5	20.6	22.1	23.5	24.9	22.8	24.5
Sorsogon	1.01	1.05	1.7	2.0	2.4	2.8	3.1	3.7	4.5	5.1	5.6	6.1
Camarines Sur	1.38	1.39	4.1	5.3	7.3	9.4	10.8	12.7	14.9	17.0	19.3	22.2
	<u>11.99</u>	<u>14.46</u>	<u>19.1</u>	<u>24.4</u>	<u>28.1</u>	<u>31.7</u>	<u>34.5</u>	<u>38.5</u>	<u>42.9</u>	<u>47.0</u>	<u>47.7</u>	<u>52.8</u>
Utilization of Existing Facilities	7.3	7.3	7.3	7.8	8.3	9.1	9.6	10.0	10.7	11.0	6.9	7.1
Excess Demand	4.7	7.1	11.8	16.6	19.8	22.6	24.9	28.5	32.2	36.0	40.8	45.7

As the above figures indicate, the 11.8 MW load in FY '76 is expected to rise sharply to 16.6 MW in the following year, mainly due to the load build-up in the utility sector. Relieved of the generation responsibility, the private franchise electric utilities will be able to devote more of their capital funds to expanding to new areas, improve existing service facilities and initiate load promotion activities, all of which would tend to increase power demand.

Normal growth patterns of approximate 13% annually characterize the 1977-85 period. This is based on NPC overall experience in the Luzon Grid which had a growth rate of 22% per year from 1960-1971. The commercial and light industrial component of the utility load is expected to be stimulated by the advent of low-cost power not presently available in the area and other government sponsored economic development programs for the region.

Only two industrial loads were included in the forecast-- Legaspi Oil Company and Richfield Hemp Industries. Aggregate projections of probable industries were avoided (even in the later years) as a test of the viability of the Tiwi project. However approximately 1.8 MW of National Irrigation Administration's (NIA) irrigation loads in the three provinces are included in the initial load pick-up. This is approximately 20% of the pump irrigation capacity that NIA plans to install in Albay, Sorsogon and Camarines Sur in consonance with the GOP's high priority policy on rice production. Legaspi Oil is forecasted to draw only a portion of its total requirements from NPC since its manufacturing process makes self-generation economical.

Electric power is expected to have more significant economic impacts in the Naga-Legaspi strip than in other parts of the Region since a higher percentage of the Region's population and a larger number of production enterprises are located there. However, development impact is expected in all areas serviced by the project.

2. Project Economic Analysis

Details on computation of costs, returns, etc., used in the following analysis are in Annex 8.

(A) Transmission

The cost of the 69 KV line is about \$2.4 million and it will cost about \$13,000 a year for operation and maintenance of the line.

To analyze the economic viability of constructing the 69 KV transmission network, we compared the cost of power delivered to selected load centers over the line to the cost of delivering such power by local (diesel) generating plants. This transmission network will be supplied, as a least cost source, by Manila area based fossil fuel plants with transmission south to Naga. The alternative to constructing the 69 KV line is to use local diesel generation. Summary of unit costs follow:

Manila/Naga (230 KV line) per KWH	8.3 mills U.S.
Local diesel generation per KWH	15.0 mills U.S.

or 6.7 mills per KWH of power delivered to distribution point is available for 69 KV system costs.

At present load projections for the area, the tariff needed to break even using diesel generation of 15 mills KWH would pay back capital costs on 69 KV transmission line in three years. See computation Annex 8.

However, realistically we must assume that a tariff comparable with that charged in other areas serviced by the Luzon Grid will be used, i.e., 10.8 mills/KWH in order to arrive at a pay back period. Using this rate, the pay back period is 5-1/2 years.

The internal rate of return for the 69 KV system using present load projections, a 40 MW system capacity and 30 year life is 20%.

(B) Pilot Plant

To analyze the economics of the project, its financial return is computed and a unit cost (\$/KWH) comparison is made of an economic sized 150 MW fossil fuel plant located in the Manila

area with power transmission south from Manila area using the 230 KV line. On the basis of the transmission analysis, we assume the 69 KV line will be so constructed that the same market will be served from either source--Tiwi or Naga via the 230 KV line.

Assuming a 90% load factor, a 30-year plant life, and using a 10.8 mill U.S. (wholesale) power tariff, the rate of return on the 10.5 MW unit including transmission is 4-1/2%. Although this return is marginal vis-a-vis NPC target of 8%, there are several factors listed below that are expected to improve the return.

To determine the costs of the project which should be attributed to the pilot project objective, as opposed to load service, we compared Tiwi to the present least cost alternative--power supplied by the Manila/Naga 230 KV line. Power from the 10.5 MW Tiwi unit has an annual cash cost of 6.4 mills per KWH, i.e., no amortization or interest costs on investment. Power from the Manila area at the Naga 230 KV substation will cost about 8.3 mills U.S. per KWH. Using this price as a market price for Tiwi power at the plant bus, a difference of about 1.9 mills per KWH is available for amortization and interest on Tiwi investment--the non-cash costs. However, this debt service will cost about 4.3 mills per KWH. In other words the plant will require a subsidy of 2.4 mills per KWH or \$200,000 per year.

There are several events expected in the future which favor further geothermal development:

- increase in cost of fuel oil for fossil fuel fired plants;
- lowering of rate which NPC must pay Union Oil for the steam (energy resource);
- use of higher technology geothermal units which would increase their efficiency;
- increased load in the south, allowing larger Tiwi units to service local load and forcing the fossil fuel units to absorb transmission loss.

However, one of the most important aspects of geothermal development to the Philippines cannot readily be quantified--the value of having an indigenous energy source and not having to rely on oil imports.

(C) Effect of Proposed Project on NPC

The proposed generation and transmission project should in the long run have a positive effect on NPC financial situation. The transmission line, with a 20% return, will contribute immediately to increasing NPC's overall return. Geothermal development and use of large economic units will also add to NPC's overall return even though the initial 10.5 MW Tiwi return will be marginal.

D. Environmental

Union Oil (PGI) has prepared a review of the environmental impact which the proposed project and possible future geothermal projects will have. Salient features of the report are contained in Annex 10. Subjects covered are: effect on the present use of the area, visual impact, effect of air quality, effect on noise level, effect on water supply, possible ground subsidence, effect of disposal of Tiwi effluent on the marine environment, and geothermals impact vis-a-vis other forms of power generation in the Philippines.

Of the above areas of potential environmental pollution, the effect of Tiwi effluent on the marine environment is the most serious, especially since the local population along the Philippine Sea where Tiwi effluent will ultimately be disposed is reliant on fishing as a means of support. There are no toxic substances in the effluent. The concern is the effect of the hot water effluent on the relatively cooler ocean. The 10.5 MW plant will be disposing of a relatively small amount of effluent--400 gallons per minute. The effluent will be cooled in ponds first and then injected into the Visitang Naga River below the level where the river is used for water supply thereby further cooling the effluent before it enters the ocean. For these reasons, its effect on the local marine environment should be acceptable. With larger units, if the effluent is not reinjected into the reservoir, the problem will become more severe and major preventative measures may be required.

Tiwi's impact on the environmental areas studied was found to be acceptable. A major effort is being made and will continue to be made to minimize risk to the environment.

E. Employment Generation Considerations

It is expected that the proposed project will have both a direct and indirect effect on employment. The implementation and operation of the generating plant and transmission system will require manpower recruited from the Philippine labor market. Construction of the generation plant will utilize the services of a foreign construction firm and cannot realistically rely heavily on labor intensive techniques. However, the construction of the transmission system will be by NPC force account or local contractors. Unskilled local labor can be used for clearing right-of-way, pole hole digging, etc. The project will try to maximize labor intensive techniques of construction to the extent practicable.

Indirect employment generation benefits can be related to the electrification of the Southern Luzon region. A long range power program utilizing firm power from Tiwi will be established and three electric distribution cooperatives created. In short, a major constraint to area development will be reduced and growth in the industrial, agricultural and service sectors can be expected to significantly increase employment and general standards of living.

IV. ECONOMICS

A. The Philippine Economy

1. Recent Economic Development in the Philippines

The Philippines' pattern of development in recent years has been characterized in general by periods of rather strong growth, followed by Balance of Payments (BOP) crises necessitating restrictive measures and other adjustments which, in turn, usually placed additional strains on the economy. Despite an annual average growth rate of about six percent over the decade of the 1960's, the matter of external payment requirements was somewhat neglected and large borrowings from abroad were needed to finance current account deficits. Much of this borrowing, heaviest in the latter half of the decade, was in the short-to-medium term category. Toward the end of 1969, a major crisis occurred which finally resulted in long-overdue action. A major economic stabilization program was adopted in February 1970 which included a de facto devaluation of the peso and measures designed to limit further increases in short-to-medium term external debt. After an initial slowdown, the economy resumed reasonable growth in 1971 (approximately 6.5% increase in GNP) and continued showing signs of improvement through the first half of 1972, although decreased rice production and other difficulties caused BOP problems to persist.

The severity of the impact to the economy of the July-August 1972 floods is seen in the sharp dip of the GNP growth rate to 4.0 percent for CY 1972, compared to 6.6 percent estimated for the twelve months ending in mid-1972. Government planners, perhaps optimistically, expect the growth rate for CY 1973 to bounce back to 7.0 percent.

Recovery from flood damage (roads, irrigation, etc.) and expansion of agricultural production will play a key role in the GNP performance for 1973. The picture is mixed at present, with severe drought in the south affecting the corn, coconut, banana and pineapple crops and with logging activity restricted in part to limit depletion of national forest resources. The prospects for sugar are bright. The staple crop, rice, is heavily dependent on weather conditions during the main July-November growing season, but hopes are for a recovery after two poor seasons.

Private investment has taken an upturn, and new government measures are aimed at stimulating greater investment and channelling it into such priority areas as oil exploration, manufactured goods for export, labor-intensive industries and industries dispersed outside the greater Manila area. Private foreign capital has also flowed into the country's financial institutions. Particularly significant was a \$50 million 5-year loan to the Development Bank of the Philippines by an international consortium of banks including West European, Japanese and Australian institutions joining U.S. banks for the first time in such a venture. Whether funds are largely speculative or will remain for longer-term investment remains to be seen.

2. Philippines' Balance-of-Payments Position and Debt Service Capacity

A summary of the Philippines' BOP position in 1969-72 and debt service situation for the same period is shown in Annex 7.

By 1971, the GOP performance had improved markedly. For example, in 1969, foreign exchange reserves declined by \$136 million whereas 1970 showed an increase of \$23 million, and 1971 showed further increase of \$7 million. The trade balance also improved during that period from a deficit of \$258 million in 1969 to much smaller deficits of \$7 million and \$42 million in 1970 and 1971, respectively.

Although preliminary figures for the first half of 1972 showed a deterioration in several respects, the last half of 1972 and the first four months of 1973 present a different picture. The economic situation vis-a-vis the balance of payments improved markedly during this period. The improvement is felt to be the result of a shift to basic consumer goods (food and shelter) produced in the Philippines. The cause of the shift was the floods. Imports declines 15% in the first four months of 1973 as compared to 1972. A cause of import reduction was the low level of raw material imports for industrial use.

Export earnings at the same time increased. A result of world market increase in prices of traditional Philippines exports such as forestry and coconut products and copper.

IBRD near term export projections are estimated at about 7 percent per annum for 1973-75, but significant export growth will depend on world copper prices, realization of increased nickel production, and the Philippines' ability to compete in the market with other LDC's for export manufactures. On the import side, the Philippines are faced with the need to finance increased imports to achieve the projected 6.5 percent growth in GNP without resorting to short-term credits.

The debt service ratio was 26.8 percent in 1970, 27.6 percent in 1971 and 22.8 percent in 1972. It is projected to stabilize at a level of 25.5 by 1975. The Philippines' debt service ratio is high by almost any standard and suggests extreme vulnerability to sudden declines in export earnings and/or declines in capital inflows both of which have occurred in the past. These projections assume that a very substantial increase in long-term official assistance will be forthcoming to offset the lower private flows. The required increase is from actual official assistance level of \$51 million in 1971 to an average of about \$200 million annually from 1972-1975. The increased assistance should result in a substantial improvement in the structure and maturity of the Philippine debt.

B. Impact on U.S. Balance of Payments

The impact of this loan on the U.S. balance of payments should be favorable. Goods and services financed by this loan will be obtained from A.I.D. Geographic Code 941 (U.S. and Lower Income Countries), and it is expected the U.S. will supply essentially all the goods and services imported. Follow-up orders of spare parts, equipment and materials will result in additional U.S. exports on a commercial basis.

V. LOAN ADMINISTRATION

A. Implementation Plan

NPC has proposed an implementation plan which essentially separates the transmission system and the geothermal generating plant into two sub-project activities for the purpose of project implementation. This separation appears sensible and recognizes the fact that there is in-country capability (within NPC and local firms) for design and construction of the 69 KV transmission system; while the geothermal generating plant will require outside assistance for the design, procurement and construction phases.

1. Transmission

NPC will handle the major implementation activities of the transmission system, e.g., design, procurement, construction supervision and to a certain extent actual construction. For work not actually constructed by NPC force account, local Philippines contractors will be used. Loan financed procurement therefore will be restricted to the financing of 69 KV conductors, line material, substation equipment, etc. Engineering, if any, financed by A.I.D. will be restricted to costs associated with review and assistance on procurement actions on IFB preparation, etc.

2. Generating Plant

For implementation of the generating plant, NPC proposes to retain a U.S. engineering firm to provide the plant design and specifications, assist in procurement including IFB preparation and bid review and award, and provide contract supervision.

NPC proposes that the basic plant (including the step-up substation) be constructed under a supply and erect "turnkey" contract except for civil works which will be contracted locally.

The single contract approach appears sensible for this project, particularly in view of NPC's concern to shorten construction time. The civil works could also possibly be included in the general contract and this option will be reviewed with NPC at the appropriate time.

B. Implementation Schedule

GENERATING PLANT

1. Loan Authorization	June 30, 1973
2. Loan Agreement Negotiated and Signed	August 15, 1973
3. Conditions Precedent to Opening Letter of Commitment Met	September 1, 1973
4. Project Engineer Selection and Contract Negotiated	October 15, 1973
5. Specification and IFB prepared for Single Resp. Contract	January 1, 1974
6. Conditions Precedent to Construction Met and Construction Contract	May 1, 1974
7. Construction Completed and Preliminary Operation	December 31, 1975
8. Commercial Operations Initiated	May 1, 1976

TRANSMISSION SYSTEM

1. Loan Authorization	June 30, 1973
2. Loan Agreement Negotiated and Signed	August 15, 1973
3. Conditions Precedent to Opening Letter of Commitment	September 1, 1973
4. IFB's for Materials Issued	November 15, 1973
5. Construction Commences	May 15, 1974
6. Construction Work Completed	February 1, 1976

Using the above implementation schedules, the majority of the funds are expected to be disbursed within two years.

C. Loan Disbursements

SCHEDULE OF DISBURSEMENTS

<u>Year</u>	<u>Foreign Exchange</u>	<u>Local Currency Equivalent</u>	<u>Total</u>
1973	195	80	275
1974	940	960	1900
1975	2705	940	3645
1976	<u>298</u>	<u>86</u>	<u>384</u>
TOTAL	4138	2066	6204

VI. CONDITIONS PRECEDENT AND COVENANTS

A. Conditions Precedent to Opening Letters of Commitment

1. Opinion by the Secretary of Justice that the loan agreement has been duly authorized and executed on behalf of the Philippine Government and is a valid and legally binding obligation in accordance with its terms.

2. Opinion of the Principal Legal Officer of NPC, or other legal counsel satisfactory to A.I.D. that the loan agreement has been duly authorized and executed on behalf of NPC and is a valid and legally binding obligation in accordance with its terms.

3. Names of the persons who will act as the representatives of the GOP and NPC, together with evidence of their authority and specimen signature of each.

4. Evidence satisfactory to A.I.D. of the availability of local currency for the project.

5. A draft contract between NPC and an engineering consultant for the engineering and construction supervision associated with the geothermal plant and, if required, for review of the design and procurement documents associated with the 69 KV transmission line.

B. Conditions Precedent to Procurement Associated with the 69 KV Transmission Line

1. Completion of final design and related materials requirements, and if necessary review by an outside consultant.

2. Draft materials procurement invitations to bid in accordance with A.I.D. Capital Projects Guidelines.

3. Evidence that the right-of-way, right-of-entry, real property leases or acquisitions necessary for completion and operation of the transmission line have been obtained or plans made and financing provided therefore.

4. Evidence that the National Electrification Administration has approved and made arrangements to carry out the construction of the proposed Electric Cooperatives facilities at Albay, Camarines Sur and Sorsogon.

C. Conditions Precedent to Construction of the Generating Plant and Related Substations

1. Completion of a supplementary report by the Philippines Geothermal, Inc. (PGI) covering a minimum period of six month test of the steam reservoir and demonstrating reasonable assurances of availability of steam for the proposed plant. The report shall be reviewed by an independent consultant or consultants satisfactory to A.I.D.

2. Evidence that the right-of-way, right-of-entry, real property leases or acquisitions necessary for completion and operation of the generating plant have been obtained or plans made and financing provided therefore.

3. Contract for supply and construction of the generating plant and related substation, selection of the firm and terms of the contracts to be in accordance with A.I.D. Capital Projects Guidelines for construction services.

4. Evidence of arrangement for timely construction of related civil works.

Covenants

D. GOP Covenants

1. Make available to NPC on a timely basis: (a) peso funds required for implementation and completion of the project, (b) any foreign exchange necessary to complete the project if loan proceeds are not sufficient, and (c) any supplemental peso funds and/or foreign exchange required to provide for supplemental steam wells if required for operation of the generating facility.

2. Assist NPC to carry out the project or cause the project to be carried with due diligence and efficiency, in conformance with sound engineering, construction, financial and management practices and any plans, specifications, contracts, schedules or other arrangements approved by A.I.D.

E. NPC Covenants

1. Make available any peso proceeds necessary for timely completion of the project, including any proceeds required of NPC under its contract with Union/PGI to complete the wells and necessary field collection system to provide sufficient steam supply to the generating plant.

2. Maintain for the economic life of the generating plant, with Union/PGI or other qualified firm, arrangements for operation and maintenance of the steam wells and collection facilities and the undertaking of periodic drilling of supplemental wells to maintain sufficient steam supply to the generating plant.

3. Implement the proposed Luzon rate increases to provide an average rate of ₱.074/KWH by January 1, 1976.

4. Submit for A.I.D. approval, prior to implementation, issuance or execution of all plans, specifications, construction schedules, bid documents, documents concerning solicitation of proposals relating to Eligible Items, all contracts, and all modifications of any of these documents.

5. Carry out the project, or cause the project to be carried out, with due diligence and efficiency, and in conformity with sound engineering, construction, financial, administrative and management practices, and any plans, specifications, contracts, schedules and other arrangements, and with all modifications therein, approved by A.I.D.

6. Adequately maintain, repair and operate, in accordance with sound public utility practices, all Eligible Items and any facilities constructed by NPC in connection with their use.

7. Carry out or cause to be carried out a well testing and monitoring program on the Tiwi geothermal field to extend through the duration of project implementation.

DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D.C. 20523

CAPITAL ASSISTANCE LOAN AUTHORIZATION

Provided from: Development Loan Funds
The Philippines: Tiwi Geothermal Project

Pursuant to the authority vested in me as Assistant Administrator, Bureau for Asia, Agency for International Development (hereinafter called "A.I.D.") by the Foreign Assistance Act of 1961, as amended, and the Delegations of Authority issued thereunder, I hereby authorize the establishment of a loan pursuant to Part I, Chapter 2, Title I, the Development Loan Fund, to the Government of the Republic of the Philippines (hereinafter called the "Borrower") of not to exceed Four Million Two Hundred Thousand Dollars (\$4,200,000) to be made available to assist the National Power Corporation of the Philippines (NPC) (hereinafter called "Beneficiary") in financing the foreign exchange costs required to construct and install both a geothermal electric power generation facility at Tiwi, Albay in South Luzon and the related transmission lines and substations. This loan is to be subject to the following terms and conditions:

1. Interest Rate and Terms of Repayment

This loan shall be repaid by the Government of the Republic of the Philippines within forty (40) years after the date of the first disbursement thereunder including a grace period of not to exceed ten (10) years. The interest on the unrepaid principal balance of the loan shall accrue from the date of the first disbursement at the rate of two percent (2%) per annum during the grace period and at the rate of three percent (3%) per annum throughout the remaining life of the loan.

2. Currency of Repayment

Provision shall be made for repayment of the loan and payment of the interest in United States dollars.

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3. Other Terms and Conditions:

a. Equipment, materials, and services financed under this loan shall have their source and origin in countries under A.I.D. Geographic Code 941 (Selected Free World).

b. The Borrower shall relend the proceeds of this loan to the Beneficiary for the purposes herein provided on terms and conditions satisfactory to A.I.D.

c. This loan shall be subject to such other terms and conditions as A.I.D. may deem advisable.

D. G. MacDonald
Bureau for Asia

Date

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STATUTORY CHECKLIST1. COUNTRY PERFORMANCEA. Progress Towards Country Goals

1. FAA §§ 201 (b) (5), 201 (b) (7), 201 (b) (8), 208. Discuss the extent to which the country is:

- | | |
|--|--|
| <p>(a) Making appropriate efforts to increase food production and improve means for food storage and distribution.</p> | <p>(a) Food production is top priority of Marcos Administration with goal of achieving self-sufficiency in rice and corn and accelerated production of livestock, poultry, fish, fruits and vegetables. Plans for expanded warehousing and distribution of the increased output of grains are being prepared and carried out with help from IBRD loan.</p> |
| <p>(b) Creating favorable climate for foreign and domestic private enterprise and investment.</p> | <p>(b) See FAA 620(c) (1), page 3.</p> |
| <p>(c) Increasing the people's role in the development process.</p> | <p>(c) The four-year agriculture program is increasing the productive capability of Philippine farmers. The Presidential arm for Community Development carries out programs at the barrio (village) level throughout the Philippines. A Decentralization Act providing more autonomy to the Province was enacted in 1967. Provincial Development Councils are operating or being established in fifteen pilot Provinces.</p> |
| <p>(d) Allocating expenditures to development rather than to unnecessary military purposes or intervention</p> | <p>(d) More than 70% of the national budget is allocated to social and economic development. One-fourth of the budget goes to education,</p> |

in other free countries' affairs.

(c) Willing to contribute funds to the project or program.

(f) Making economic, social, and political reforms such as tax collection improvements and changes in land tenure arrangement; and making progress toward respect for the rule of law, freedom of expression and of the press, and recognizing the importance of individual freedom initiative, and private enterprise.

(g) Responding to the vital economic, political, and social concerns of its people, and demonstrating a clear determination to take effective self-help measures.

nearly 10% to agriculture and natural resources, and almost 20% to transportation and communications. Less than 15% of the budget goes for national defense.

(e) The GOP will finance or arrange for the financing of all local cost of the project.

(f) The GOP, ever since its establishment as an independent nation in 1946, has patterned its government after that of the United States, adopting the same democratic principles and strongly supporting a free and open society. On September 22, 1972, President Marcos, citing a serious threat to their system from both the extreme left and right, invoked martial law and, ruling by decree, ordered an accelerated implementation of essential reforms long needed to improve the efficiency of the government, to reduce widespread crime and corruption, to speed development efforts aimed primarily at improving the social and economic well-being of lower income groups. Over the last five years the GOP has increased revenues through improved administration and new tax laws, the most recent being a stabilization tax imposed on traditional high level exports following the devaluation of the peso in 1970.

(g) As a result of the disastrous summer of 1972 floods, the Marcos' Administration has embarked on a large scale reconstruction program with the help of USAID. This program is directly meeting the needs of the devastated communities of Luzon. Included in the program are: a school reconstruction and textbook programs as well as on road building, irrigation and other infrastructure programs.

Other self-help development programs are rural electrification, water supply, irrigation, and rice production.

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B. Relations with United States

1. FAA § 620(c). Is the government indebted to any U.S. citizen for goods or service furnished or ordered where: (a) such citizen has exhausted available legal remedies, including arbitration, or (b) the debt is not denied or contested by the government, or (c) the indebtedness arises under such government's, or a predecessor's unconditional guarantee?
1. No
2. FAA § 620(d). If the loan is intended for construction or operation of any productive enterprise that will compete with U.S. enterprise, has the country agreed that it will establish appropriate procedures to prevent export to the U.S. of more than 20% of its enterprise's annual production during the life of the loan?
2. Not applicable.
3. FAA § 620(e)(1). Has the country's government, or any agency or subdivision thereof, (a) nationalized or expropriated property owned by U.S. citizens or by any business entity not less than 50% beneficially owned by U.S. citizens, (b) taken steps to repudiate or nullify existing contracts or agreements with such citizens or entity, or (c) imposed or enforced discriminatory taxes or other exactions, or restrictive maintenance or operation conditions? If so, and more than six months has elapsed since such occurrence, identify the document indicating that the government, or appropriate agency or subdivision thereof, has taken appropriate steps to discharge its obligations under
3. The Parity Amendment, an Ordinance appended to the Philippine Constitution on March 12, 1947, and effective by its terms until July 3, 1974, permitted U.S. citizens, as distinguished from other aliens, to acquire and hold "public agricultural land" and to operate public utilities with the same rights and privileges as citizens of the Philippines. The Supreme Court of the Philippines has held that the right of U.S. citizens to acquire and hold such property, to operate utilities and to export natural resources will expire on July 3, 1974. The GOP's intentions regarding this decision are unclear, but at present there is no indication that the GOP contemplates any act contravening FAA § 620(e)(1).

international law toward such citizen or entity? If less than six months has elapsed, what steps if any has it taken to discharge its obligations?

4. FAA § 620(j). Has the country permitted, or failed to take adequate measure to prevent, the damage or destruction by mob action of U.S. property, and failed to take appropriate measures to prevent a recurrence and to provide adequate compensation for such damage or destruction?

4. The GOP has taken all reasonable measures to protect U.S. property. On infrequent occasion when damage has occurred, proper compensation has been made without delay.

5. FAA § 620(1). Has the government instituted an investment guaranty program under FAA § 221 (b)(1) for the specific risks of inconvertibility and expropriation or confiscation?

5. Yes.

6. FAA § 620(o). Fisherman's Protective Act of 1954, as amended, Section 5. Has the country seized, or imposed any penalty or sanction against, any U.S. fishing vessel on account of its fishing activities in international water? If, as a result of a seizure, the U.S.G. has made reimbursement under the provisions of the Fisherman's Protective Act and such amount has not been paid in full by the seizing country, identify the documentation which describes how the withholding of assistance under the FAA has been or will be accomplished.

6. No.

7. FAA § 620(q). Has the country been in default, during the period in excess of six months, in payment to the U.S. on any FAA loan?

7. No.

3. FAA § 620(t). Have diplomatic relations between the country and the U.S. been severed? If so, have they been renewed?

3. Diplomatic relations between the country and the U. S. have not been severed.

3. Relations with Other Nations and the U.N.

1. FAA § 620(i). Has the country been officially represented at any international conference when that representation included planning activities involving insurrection, or subversion directed against the U.S. or country receiving U.S. assistance?

1. No.

2. FAA § 620(a), 620(n). Has the country sold, furnished, or permitted ships or aircraft under its registry to carry to Cuba or North Vietnam items of economic, military, or other assistance?

2. No.

3. FAA § 620(i); App. § 108. What is the status of the country's U.N. dues, assessments; or other obligations? Does the loan agreement bar any use of funds to pay U.N. assessments, dues, or arrears?

3. The Philippines is not in default with respect to its dues, assessments or other obligations to the U.N. The Loan Agreement and disbursement procedures will ensure that loan funds are not used for payment of U.N. obligations.

3. Military Situation

1. FAA § 620(i). Has the country engaged in or prepared for aggressive military efforts directed against the U.S. or countries receiving U.S. assistance?

1. No.

2. FAA § 620(s). What is (a) the percentage of the country's budget devoted to military purposes, (b) the amount of the country's foreign exchange resources used to acquire military equipment, and

2. Annual defense budgets average less than 15% of the national budget. Approximately one-third of this amount is for maintenance of peace and order. Philippine foreign exchange resources used to acquire

(c) has the country spent money for sophisticated weapons systems purchased since the statutory limitation became effective?

military equipment are negligible. We know of no diversion of either development assistance or of PL 480 sales to military expenditures. We are not aware of any diversion of Philippine resources for unnecessary military expenditures.

II. CONDITIONS OF THE LOAN

A. General Soundness

Interest and Repayment

1. FAA § 201(d). 201(b)(2).
Is the rate of interest excessive or unreasonable for the borrower? Are there reasonable prospects for repayment? What is the interest rate during the grace period and during the period following the grace period? Is the rate of interest higher than the country's applicable legal rate of interest?

1. The rate of interest is considered reasonable and repayment of the loan with interest is within the financial capability of the borrower. Interest through the grace period will be at the rate of 2% per annum, and 3% thereafter. This rate is not higher than the applicable legal rate of interest in the Philippines.

Financing

1. FAA § 201(b)(1). To what extent can financing on reasonable terms be obtained from other free-world sources, including private sources within the U.S.?

1. Financing is not considered to be available from other sources on terms comparable to this proposed loan.

Economic and Technical Soundness

1. FAA § 201(b)(2), 201(e).
Is the activity economically and technically sound?

1. The activity is economically and technically sound.

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2. FAA § 611(a)(1). Have engineering, financial, and other plans necessary to carry out assistance, and a reasonable firm estimate of the cost of assistance to the U.S., been completed.

2. Yes

3. FAA § 611(b); App. § 101. If the loan or grant is for a water or related land resources construction project or program, do plans include a cost-benefit computation? Does the project or program meet the relevant U.S. standards and criteria used in determining feasibility?

3. Yes

4. FAA § 611(e). If this is a Capital Assistance Project with U.S. financing in excess of \$1 million, has the principal A.I.D. officer in the country certified as to the country's capability effectively to maintain and utilize the project?

4. The principal A.I.D. officer in the Philippines has so certified (see Annex 3).

B. Relation to Achievement of Country and Regional Goals

Country Goals

1. FAA § 207, 281(a). What is this loan's relation to:

(a) Institutions needed for a democratic society and to assure maximum participation on the part of the people in the task of economic development.

(a) The GOP is trying to bring many political, economic and social reforms in conjunction with implementing an effective economic stabilization and flood rehabilitation program. The GOP is also engaged in a nation-wide rural electrification program. This project will provide the basis for the GOP's explorations of an indigenous energy resources, and assist in providing economical energy to reach the maximum number of people. The GOP has several agencies and cooperative organizations operating in this area.

(b) Enabling the country to meet its food needs, both from its own resources and through development, with U.S. help, of infrastructure to support increased agricultural productivity.

(c) Meeting increasing need for trained manpower.

(d) Developing programs to meet public health needs.

(e) Assisting other important economic, political, and social development activities, including industrial development; growth of free labor unions; cooperatives and voluntary agencies; improvement of transportation and communication systems; capabilities for planning and public administration; urban development; and modernization of existing laws.

2. FAA § 201(b)(4). Describe the activity's consistency with and relationship to other development activities, and its contribution to realizable long-range objectives.

3. FAA § 201(b)(9). How will the activity to be financed contribute to the achievement of self-sustaining growth?

4. FAA § 201(f). If this is a project loan, describe how such project will promote the country's economic development, taking into account the country's human and material

(b) Availability of economical power should contribute to increased agricultural productivity.

(c) No direct relationship

(d) The loan will have no direct effect on public health programs.

(e) The loan will contribute to the country's economic development and especially of Southern Luzon which should facilitate the development of commercial and industrial enterprises.

2. This loan is directly related to the goal of nation-wide electrification which is being approached in a multi-lateral framework.

3. The electric power being financed is a basic input in the infrastructure leading to self-sustaining growth.

4. The project is designed to exploit an indigenous energy resource and in that process to utilize inasmuch as possible local materials and labor. The provision of adequate power will promote economic development.

resource requirements and the relationship between ultimate objectives of the project and overall economic development.

5. FAA § 201(b)(3). In what ways does the activity give reasonable promise of contributing to development of economic resources, or to increasing productive capabilities.

6. FAA § 281(b), How does the program under which assistance is provided recognize the particular needs, desires, and capabilities of the country's people; utilize the country's intellectual resources to encourage institutional development; and support civic education and training in skills required for effective participation in political processes.

7. FAA § 601(a). How will this loan encourage the country's efforts to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture, and commerce; and (f) strengthen free labor unions?

5. Increased electric power capacity will provide a necessary basis for economic development.

6. This project will assist in the expansion of industry and agriculture and make possible the creation of more jobs; it will also increase the availability of electricity for private consumption. The project will have only indirect effect on education and training.

7. The loan will facilitate purchase by the country of needed equipment and services. The project will stimulate industrial and commercial activities in such areas as agriculture, business, intermediate processing of agriculture products, and small manufacturing, which will increase the probable quantity and value of commodities available for export, will assist the Philippines in developing more sophisticated products which may be competitive in international trade and create a demand for many new products and equipment required for new commercial and industrial enterprises and private consumption; (b) through improved opportunities for new commercial and industrial enterprises; (c) power supplied by virtue of this project will be retailed by distribution cooperative and private utilities; (d) no direct effect; (e) through availability of better quality electric power service together with a program to increase electric power consumption; (f) no direct effect.

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8. FAA § 202(a). Indicate the amount of money under the loan which is available to encourage economic development through private enterprise; available to intermediate credit institutions or other borrowers for use by private enterprise; and being used to finance procurement from private sources.

9. FAA § 611(a)(2). What legislative action is required within the recipient country? What is the basis for a reasonable anticipation that such action will be completed in time to permit orderly accomplishment of purposes of loan?

8. It is anticipated that the total amount of the loan will be used to finance procurement from private sources.

9. No legislative action is required.

Regional Goals

1. FAA § 619. If this loan is assisting a newly independent country, to what extent do the circumstances permit such assistance to be furnished through multilateral organizations or plans?

1. Not applicable.

2. FAA § 209. If this loan is directed at a problem or an opportunity that is regional in nature, how does assistance under this loan encourage a regional development program? What multilateral assistance is presently being furnished to the country?

2. The loan is not directed at a regional problem. However, it is being furnished in the context of multilateral aid to the Philippines by a number of donors including Japan, IBRD and the ADB.

C. Relation to U. S. Economy

Employment, Balance of Payments, Private Enterprise

1. FAA §§ 201(b)(6); 102, Fifth What are the possible effects of this loan on U.S. economy, with special reference to areas of substantial labor surplus? Describe the extent to which assistance is constituted of U.S. commodities and services, furnished in a manner consistent with improving the U.S. balance of payment position.

1. Although goods and services of Code 941 source and origin are eligible for financing under the loan, it is anticipated that the actual procurement of non-U. S. goods and services will be minimal.

2. FAA §§ 612(b); 636(h). What steps have been taken to assure that, to the maximum extent possible, foreign currencies owned by the U.S. and local currencies contributed by the country are utilized to meet the cost of contractual and other services, and that U.S. foreign-owned currencies are utilized in lieu of dollars?

2. All local costs of contractual and other services will be financed by the GOP from their own resources or from private sources.

3. FAA § 601(d); App. § 109. If this loan is for a capital project, to what extent has the Agency encouraged utilization of engineering and professional services of U. S. firms and their affiliates? If the loan is to be used to finance direct costs for construction, will any of the contractors be persons other than qualified nationals of the country or qualified citizens of the U. S.? If so, has the required waiver been obtained.
 4. FAA § 608(a). Provide information measures to be taken to utilize U. S. Government excess personal property in lieu of the procurement of new items.
 5. FAA § 602. What efforts have been made to assist U. S. small business to participate equitably in the furnishing of commodities and services financed by this loan?
 6. FAA § 621. If the loan provides technical assistance, how is private enterprise on a contract basis utilized? If the facilities of other Federal agencies will be utilized, in what ways are they particularly suitable; are they competitive with private enterprise (if so, explain); and how can they be made available without undue interference with domestic programs?
 7. FAA § 611(c). If this loan involves a contract for construction that obligates in excess of \$100,000, will it be on a competitive basis? If not, are there factors which make it impracticable?
3. See Item 1 above.
 4. Excess property is not appropriate or practical for use for the nature of project contemplated for financing under this loan.
 5. Procurement of services (and related goods) as appropriate, will be carried out according to procedures of advertising and publicity which will afford U.S. small business the opportunity to participate equitably.
 6. Services will be financed under this loan will be performed by private firms (or individuals) on a contract basis.
 7. Yes.

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8. FAA § 601(b). Describe the totality of effort by the President in host country to encourage and facilitate participation of private enterprise in achieving the purposes of the Act.

8. Private enterprise is being utilized to the maximum extent practicable under this loan.

Procurement

1. FAA § 604(a). Will commodity procurement be restricted to U. S. except as otherwise determined by the President?
2. FAA § 604(b). Will any part of this loan be used for bulk commodity procurement at adjusted prices higher than the market price prevailing in the U. S. at the time of purchase?
3. FAA § 604(e). Will any part of this loan be used for procurement of any agricultural commodity or product thereof outside the U. S. when the domestic price of such commodity is less than parity?
4. FAA § 604(f). Will the Agency receive the necessary pre-payment certifications from suppliers under a commodity import program agreement as to description and condition of commodities, and on the basis of such, determined eligibility and suitability for financing?

1. Procurement of services and related commodities under this loan will adhere to the President's directives regarding the untying of A.I.D. procurement as set forth in applicable A.I.D. Regulations.
2. No.
3. No.
4. Not applicable.

D. Other Requirements

1. FAA § 201(b). Is the country among the 20 countries in which development loan funds may be used to make loans in this fiscal year?
2. App. § 106. Does the loan agreement provide, with respect to capital projects, for U. S. approval of contract terms and firms?

1. Yes.
2. Yes.

3. FAA § 620(k). If the loan is for construction of a production enterprise, with respect to which the aggregate value of assistance to be furnished will exceed \$100 million, what preparation has been made to obtain the express approval of the Congress? 3. Not applicable.
4. FAA § 620(b), 620(f); Has the President determined that the country is not dominated or controlled by the international Communist movement? If the country is a Communist country (including, but not limited in FAA § 620(f) and the loan is intended for economic assistance, have the findings required by FAA § 620(f) and App. § 109(b) been made and reported to the Congress? 4. The Philippines is not dominated or controlled by the international Communist movement.
5. FAA § 620(h). What steps have been taken to insure that the loan will not be used in a manner which, contrary to the best interest of the United States, promotes or assists the foreign aid projects of the Communist-bloc countries? 5. The loan agreement will contain implementation controls prohibiting such use.
6. App. § 110. Will any funds be used to finance procurement of iron and steel products for use in Vietnam other than as contemplated by § 110? 6. No.
7. FAA § 636(i). Will any part of this loan be used in financing non-U.S. manufactured automobiles? If so, has the required waiver been obtained? 7. No.
8. FAA §§ 620(a)(1) and (2), 620(p). Will any assistance be furnished or funds made available to the government of Cuba or the United Arab Republic? 8. No.
9. FAA § 620(g). Will any part of this loan be used to compensate owners for expropriated or nationalized property? If any assistance has been used for such purpose in the past, has appropriate reimbursement been made to the U.S. for sums diverted? 9. No.

- | | |
|---|---|
| <p>10. <u>FAA § 201 (f)</u>. If this is a project loan, what provisions have been made for appropriate participation by the recipient country's private enterprise?</p> | <p>10. The local cost portion of the project is expected to be accomplished through use of contracts with private firms in the recipient country.</p> |
| <p>11. <u>App. § 104</u>. Does the loan agreement bar any use of funds to pay pensions, etc., for persons who are serving or who have served in the recipient country's armed forces?</p> | <p>11. Yes. The loan agreement will cover this requirement.</p> |
| <p>12. <u>MAA § 901.b</u>. Will the loan agreement provide for compliance with U.S. shipping requirements, that at least 50% of the gross tonnage of all commodities financed with funds made available under this loan (computed separately by geographic area for dry bulk carriers, dry cargo liners, and tankers) be transported on privately owned U.S.-flag commercial vessels to the extent such vessels are available at fair and reasonable rates for U.S. flag vessels?</p> | <p>12. Yes. The loan agreement will cover this requirement.</p> |
| <p>13. <u>App. § 102</u>. Have obligations for engineering and architectural fees and services over \$25,000 on any one project been reported to Congress bi-annually?</p> | <p>13. Yes.</p> |
| <p>14. <u>FAA § 481</u>. Has the President determined that the recipient country has failed to take adequate steps to prevent narcotic drugs produced or procured in, or transported through, such country from being sold illegally within the jurisdiction of such country to U.S. Government personnel or their dependents or from entering the United States unlawfully?</p> | <p>14. No.</p> |
| <p>15. <u>App § 111</u>. Is the loan being used to transfer funds to world lending institutions under FAA §§ 209(d) and 251(h)?</p> | <p>15. No.</p> |

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16. App. § 501. Are any of these funds being used for publicity or propaganda within the United States?

16. No.

17. FAA § 612(d). Does the United States own host country excess foreign currency and, if so, what arrangements have been made for its release?

17. The Philippines is not an excess currency country.

18. FAA § 604(d). Will provision be made for placing marine insurance in the U.S. if the recipient country discriminates against any marine insurance company authorized to do business in the U.S.?

18. Yes. An appropriate provision will be included in the loan agreement.

MALACAÑANG
MANILA

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USAID/C&R

Mr. Thomas C. Niblock
Director
United States Agency for
International Development
Ramon Magsaysay Center
Roxas Boulevard, Manila

S i r :

This refers to the Tiwi Geothermal Power Project of the National Power Corporation, involving the following:

A 10.5 Mw Geothermal Power Plant in Tiwi, Province of Albay;

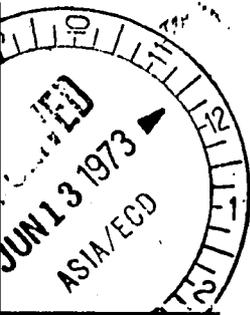
Approximately 317 kms. of 69 kv transmission lines and associated substations in the provinces of Albay, Camarines Sur and Sorsogon;

Consulting engineering services in the design, preparation of contract documents, bidding, and construction of the Tiwi Geothermal Power Plant; and

Training of personnel in the engineering, operation and maintenance of geothermal power plants;

which I have approved and authorized for immediate implementation.

Pursuant to the provisions of Republic Act No. 4860, as amended, and such other applicable laws, an application for a loan in the principal amount not to exceed FOUR MILLION FIVE HUNDRED



A handwritten signature in dark ink, consisting of a stylized, cursive letter 'J' followed by a flourish.

- 2 -

THOUSAND U.S. DOLLARS (US\$4,500,000) is hereby submitted to your agency for the purpose of financing the construction of the aforesaid project. Considering that the proposed installation at Tiwi is a pilot plant which cannot qualify for a loan under commercial terms and conditions, it is requested that the Philippine Government be authorized to relend this sum to the National Power Corporation under US-AID's terms and conditions to the Government.

I hereby designate Hon. Cesar Virata, Secretary of Finance, to exercise the powers conferred upon me by the laws of the Philippines, to negotiate and contract said loan with your agency, in the name and behalf of the Republic of the Philippines and the National Power Corporation.

I also authorize Mr. Ramon R. Ravanzo, General Manager of the National Power Corporation and Vice-Chairman of its Board, and Mr. Jorge A. Gonzales, NPC Chief Legal Counsel, to assist the Secretary of Finance in negotiating for the loan.



By the President:



ALEJANDRO MELCHOR
Executive Secretary

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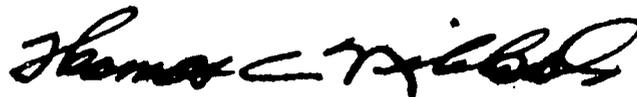
U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT
Manila, Philippines

Ramon Magsaysay Center
1680 Roxas Boulevard

Telephone: 59-80-11

CERTIFICATION PURSUANT TO SECTION 611 (e) OF
THE FOREIGN ASSISTANCE ACT OF 1961, AS AMENDED

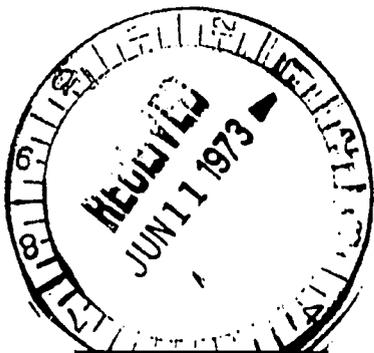
I, Thomas C. Niblock, the principal officer of the Agency for International Development in the Republic of the Philippines, having taken into account among other things, the maintenance and utilization of projects in the Philippines previously financed or assisted by the United States, do hereby certify that in my judgment the Philippines has both the financial capability and the human resources capability to effectively utilize the capital assistance to be provided by the Tiwi Geothermal Project loan.



Thomas C. Niblock
Director

JUN 4 1973

Date



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ANNEX 4

The proposed lines and substations included in this project are as follows:

<u>Transmission Lines</u>	<u>Voltage, KV</u>	<u>Length, KM</u>
1. Tiwi Geothermal Plant - Naga Substation	69	71
2. Tiwi Geothermal Plant - Legaspi Substation	69	57
3. Naga Substation - Sipocot	69	34
4. Naga Substation - San Jose	69	45
5. Tap line to Ligao Substation - Ligao Substation	69	7
6. Legaspi Substation - Sorsogon Substation	69	51
7. Sorsogon Substation - Irosin	69	36
8. Tap lines to Juban & Gubat	69	<u>10 *</u>
Total		<u>305</u>
<u>Substations</u>	<u>Voltage, KV</u>	<u>KVA Capacity</u>
1. Tiwi Geothermal Plant	13.8/69	14,000
2. Naga	69	Switching Substa.
3. Legaspi	69	Switching Substa.
4. Sorsogon	69	Switching Substa.
5. Iriga	69/34.5	2,000

* Since these proposed links were established 12 additional kilometers of the transmission line have been added, but are not included in this breakdown.

The Philippines Power Sector1. General

The Philippines power sector has grown rapidly over the last several years. It is estimated that capacity will have to grow at least 19 percent per year over the next five years in order to meet demand growth. Total public investment during 1973-77 envisaged by the Government will be about ₱2.2 billion, compared to ₱300 million in the previous five years. About 25 percent of the project outlays are for transmission and distribution facilities. Slippage in the large components of new projects, whose status is still uncertain, however, is likely to result in actual disbursements being 20-30 percent less than this program indicates.

The country is not rich in known energy resources. Hydro-electric sources, which account for about one-third of present installed power capacity, are limited. Geothermal development is just beginning, and it could provide a significant energy base in later years. In the near future thermal and hydroelectric energy would continue to satisfy the bulk of the needs. The table below indicates the projected division between Thermal and Hydro generating plants in the Luzon Grid.

	<u>1974</u>	<u>1979</u>	<u>1984</u>	<u>1989</u>
Nuclear Thermal	--	--	500	2400
Fossil Fuel Thermal	1922	2747	3077	3077
Hydro	427	842	2142	3642
Total	2349	3589	5719	9619

(at Generator in MW)

*Source: The Philippin Power Program, Power Development Council; March, 1971.

These sources already provide 92 percent of the total electric energy generated in the Philippines. A greater reliance on thermal power, however, could add seriously to the pressures on the balance of payments situation, because of the increased demand for imported oil. As a matter of long-term strategy, the Philippines will have to diversify its energy base. The Tiwi pilot geothermal plant of 10 MW capacity is expected by 1976 with larger units possibly following. A nuclear power plant of 500 MW capacity is being planned for the later 1970s, but it would not be operational until the late 1980s.

Until recently the sector has been dominated by two utilities - the Manila Electric Company (Meralco) and the NPC, which, together have accounted for about 90 percent of total generation. In addition there are some 460 small private or municipal utilities that distribute power received from NPC and Meralco or produced by their own generating facilities. As a result, the sector has been poorly coordinated. A recent decree makes NPC responsible for developing generation supplying the grid system. The Decree also makes the Power Development Council

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responsible for more effective planning and implementation of electrification projects within the sector and the National Electrification Administration responsible for converting small private/municipal systems to electricity cooperatives. It is anticipated these steps will contribute to more effective coordination of planning and development of the power sector.

2. National Planning and Coordination

The coordinated growth of power supply in the Philippines is complicated geographically by the isolation of the many islands, and administratively by the difficulties of trying to integrate publicly-owned and privately-owned utilities. In the rural areas, conflicts are bound to arise between the private companies that serve small towns but not the adjacent rural communities, and the government-sponsored cooperatives that soon will be impinging on their franchise areas.

The lack of an effective national planning body which can guide coordination is a serious problem. It seems logical to rely on Meralco for the continued supply of its franchise area and to direct NPC to the urgent task of supplying power to the provinces. However, the growth of NPC and Meralco in Luzon calls for the integrated development and operation of hydro, thermal, pumped-storage and possibly nuclear and geothermal plants in the not too distant future, and suitable coordination will be important.

3. Future Plans

Total installed capacity in Luzon is expected to increase by 69% from 1,630 MW (83% of the national total) to 2,755 MW between mid-1971 and mid-1977.

Expansion of generation plant is planned as follows:

<u>Plant</u>	<u>Capacity MW</u>	<u>Owner</u>	<u>Commissioning Date</u>
1. Bataan No. 1	75	NPC	1972
2. Snyder No. 2	300	Meralco	1972
3. Montelibano No. 1	300	Meralco	1974
4. Bataan No. 2	150	NPC	1975
5. Montelibano No. 2	300	Meralco	1976
6. Tiwi No. 1	10	NPC	1976

NPC and Meralco operate independently and each utility is installing capacity sufficient to meet the demand on its own grid. However, the two grids are interconnected, and there is seasonal exchange of energy between the two systems. There would be technical and economic advantages if expansion of the two systems could be planned with closer cooperation. Ultimately, agreement for joint development, with shared investment, might be envisaged. However, Meralco is reluctant to rely on NPC undertakings, given NPC's dependence on Government. In February 1971, a joint working committee was set up by the two utilities as an initial but important step to coordinate development.

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Expansion in Luzon will require further thermal and possible geothermal installation. Feasibility studies for the Upper Pampanga hydro-electric plant (100 MW) are already available. Studies for the Caliraya pumped storage scheme and the Chico River hydro-electric plants (450 MW approximately) are being financed by the IBRD.

NPC is planning to double its generating capacity on Mindanao from 150 MW at present by adding a 5th unit of 50 MW to Maria Cristina by 1974 and the 120 MW Agus II hydroelectric plant by 1976. It also plans construction of about 1,300 km of transmission lines to cover the island. No plans have been made for expansion in other areas, but a feasibility study for power development in the Visayas is to be undertaken. The foreign exchange cost of expansion in Mindanao is to be provided by loans from the Asian Development Bank. A first loan of U.S. \$23.4 million equivalent was made in 1971. A second loan for about U.S. \$21 million was made in 1972.

In 1972-76 foreign loans for power development of over U.S. \$130 million are expected--U/S/\$50 million from the IBRD and IDA for NPC's Luzon expansions, U.S. \$40 million from ADB for NPC's Mindanao expansions, and U.S. \$40 million from U.S. AID for NEA's cooperatives--on reasonable terms and conditions. On the other hand, the private utilities, mainly Meralco, can only obtain financing at interest rates and maturities (10-12 years at 10% annual interest) which would add to the national burden of relatively short-term foreign debt in view of the country's heavy foreign debt service burden (see Section III.A). The small private utilities have had practically no access to foreign credits; the Utilities Development and Finance Corporation is trying to resolve this problem and has obtained a U.S. \$5 million credit line from the Export-Import Bank of the U.S.

The National Power Corporation

The National Power Corporation (NPC) was established in 1936 by Commonwealth Act No. 120. NPC's corporate powers are vested in the National Power Board (the Board), which has seven members, including the General Manager, who is ex-officio Vice-Chairman. The Chairman and the other five members are appointed by the President of the Philippines, with the consent of the Commission on Appointments of the Congress. Since then, NPC has been revised several times. The two most recent revisions are summarized below.

NPC's Revised Charter 1971

NPC's new Charter was approved by the Government of the Philippines in September 1971. This charter had become necessary for a number of reasons explained below, but most particularly because of the legal difficulties involved in the implementation of tariff increases. In effect, though NPC's tariff had been exempted from the control of the Public Service Commission (PSC) which exercises control over all other power utilities, the effect of this exemption had been paradoxically to make NPC tariff increases subject to lower courts decisions when they were appealed to the courts. The courts effectively delayed the implementation of the increases for years by issuing injunctions blocking collections pending hearing of the appeals. The new charter allows NPC to fix its own tariffs and gives the PSC and the Supreme Court sole jurisdiction in case of appeals. During the hearing of any appeals, NPC's tariff increases cannot be deferred.

The main new provisions of the revised charter are summarized below:

(a) The powers of the Board (i.e., to make policy and to advise) and of the general manager (i.e., to execute and administer) have been clarified, which should now obviate conflict between members of the Board and management.

(b) NPC has been given full authority to award contracts for construction and repair work.

(c) NPC is empowered to set tariffs provided a maximum rate of return of 10% is not exceeded.

(d) PSC now has jurisdiction (in place of the lower court) to settle, within 90 days, appeals against new tariffs set by NPC. Implementation of the new tariff cannot be deferred. Final appeal is to the Supreme Court.

(e) NPC is now exempted from all taxes, duties or fees. This exemption reduces the size of the tariff increases which would otherwise be necessary to yield a required minimum rate of return.

(f) Each region is to be represented on the Board, and have its own manager and tariffs. These measures are evidence of the Government's strong wish to accelerate electrification by NPC in the less-developed areas of the country.

Revision of NPC's Charter 1973

The most recent legal changes regarding the electric power industry is "Presidential Decree No. 40" signed into law on April 3, 1973. This Decree establishes as national policy:

(1) The objective of area coverage primarily through island grid systems and electric power cooperatives.

(2) NPC is given authority to set up and own transmission line grids and generating facilities in Luzon, Mindanao and other major islands.

(3) Distribution of power generated by NPC shall be undertaken by cooperatives, private utilities, local governments, and other duly authorized entities subject to state regulation.

(4) Within the area embraced by a grid set up by the NPC, the state shall determine privately-owned generating facilities which should be permitted to remain in operation.

(5) It is the ultimate objective of the state for the NPC to own and operate as a single integrated system all generating facilities supplying electric power to the entire area embraced by any grid set up by the NPC.

(6) The Power Development Council shall be expanded and strengthened to make it more effective in the planning and implementation of power and electrification projects and in the redirection and re-orientation of the various sectors of the industry towards national development goals.

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The National Power Corporation Balance Sheet

<u>D e t a i l s</u>	<u>Fiscal Year</u> <u>1970-71</u>	<u>Fiscal Year</u> <u>1971-72</u>	<u>Increase</u> <u>(Decrease)</u>
Utility Plant (Net) P	836,062,864.11	P 854,223,175.74	P18,160,311.63
Other Property & Investments	53,147,657.11	55,627,769.44	2,480,112.33
Current & Accrued Assets	121,120,166.93	118,917,353.71	(2,202,813.22)
Deferred Debits	<u>11,266,111.82</u>	<u>14,339,137.33</u>	<u>3,073,025.51</u>
TOTAL ASSETS	<u><u>P1,021,596,799.97</u></u>	<u><u>P1,043,107,436.22</u></u>	<u><u>P21,510,636.25</u></u>
<u>CONTINGENT DEBIT</u>			
War Losses (Per Contra)	<u><u>P 1,394,892.50</u></u>	<u><u>P 1,394,892.59</u></u>	<u><u>P - -</u></u>
<u>LIABILITIES & OTHER CREDITS</u>			
Proprietary Accounts:			
Capital Stock P	300,000,000.00	P 300,000,000.00	P - -
Capital Surplus (441,481.59)	(1,045,281.59)	(603,800.00)
Earned Surplus	86,058,415.80	108,432,831.25	22,374,415.45
Appraisal Surplus	176,501,735.79	174,467,486.28	(2,034,249.51)
Long-Term Debts	368,326,773.32	396,335,978.39	28,009,205.07
Current & Accrued Liabilities	66,759,291.90	40,773,560.02	(25,985,731.88)
Deferred Credits	<u>24,392,064.75</u>	<u>24,142,861.87</u>	<u>(249,202.88)</u>
TOTAL LIABILITIES & OTHER CREDITS	<u><u>P 1,021,596,799.97</u></u>	<u><u>P1,043,107,436.22</u></u>	<u><u>P21,510,636.25</u></u>
<u>CONTINGENT CREDIT</u>			
War Losses (per Contra)	<u><u>P 1,394,892.59</u></u>	<u><u>P 1,394,892.59</u></u>	<u><u>P - -</u></u>

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Comparative Condensed Statement of Income and Expenses.

<u>Details</u>	<u>FY 1970-71</u>	<u>FY 1971-72</u>	<u>Increase (Decrease)</u>
Sales of Elec. Energy	P60,941,308.72	P90,849,111.53	P29,907,802.81
Operating Expenses	<u>27,558,281.50</u>	<u>33,357,631.83</u>	<u>5,799,350.33</u>
Operating Income	P33,383,027.22	P57,491,479.70	P24,108,452.48
Other Income	<u>3,473,730.48</u>	<u>5,807,307.00</u>	<u>2,333,576.52</u>
Total Income	P36,856,757.70	P63,298,786.70	P26,442,029.00
Interest Expenses & Other Income Deductions	<u>34,767,792.47</u>	<u>39,138,808.12</u>	<u>4,371,015.65</u>
Net Income (Loss) be- fore Income Tax	P 2,088,965.23	P24,159,978.58	P22,071,013.35
Provision for Income Tax	<u>3,527,438.00</u>	<u>- -</u>	<u>(3,527,438.00)</u>
Net Income (Loss)	<u>(P 1,438,472.77)</u>	<u>P24,159,978.58</u>	<u>P25,598,451.35</u>

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Balance of Payments
(millions US\$)

aid-DLC/P-2002

Item	1960	1969	1970	1971	1972
Merchandise trade (net)	-29	-257	-7	-37	-122
Export <u>/a</u>	575	875	1,083	1,149	1,108
Imports	604	1,132	1,090	1,186	1,230
Services (net)	-115	-132	-141	-88	-45
Transfers (net)	140	157	119	134	188
Current account surplus (+), deficit (-)	-4	-234	-29	+9	+21
Direct foreign investment (net)	29	6	-29	-4	-25
Medium- and long-term loans (net) <u>/b</u>	36	150	134	36	159
Private	45	127	94	-34	-
Public	-9	23	40	70	159
Short-term private loans (net)	-1	67	76	92	56
Loans to banking system (net)	1	79	47	-17	-9
Central Bank	5	67	58	4	-64
Commerical banks	-4	12	-11	-21	55
Other items <u>/c</u>	-28	57	-52	28	-70
Errors and omissions	-33	-125	-147	-144	-132

/a Includes non-monetary gold./b Excludes Central Bank and commerical banks./c Includes change in Central Bank's foreign exchange holdings, monetary gold, use of IMF standby credit, allocation SDR's and change in commercial banks' assets and foreign currency deposits.Service Payments on Medium- and Long-Term Debt /a

Item	1969	1970	1971	1972
Amortization	182	263	302	249
Interest	51	65	69	79
<u>Total</u>	<u>233</u>	<u>328</u>	<u>371</u>	<u>328</u>
Debt Service Ratio % <u>/b</u>	20.7	24.5	26.3	22.8

/a Excludes repayment of IMF standby credit./b Ratio of service payments to exports of goods and services.Source: "Current Economic Position and Prospects of the Philippines",
IBRD, April 20, 1973.

PROJECT ECONOMICS1. Explanation of diesel comparison

Diesel units, placed where the 69 KV line would be tapped for distribution, have been selected as the least cost alternative means of supplying power to the southern Luzon area, i.e., without the 69 KV transmission network. Cost estimates are underestimated because reliance on standby diesel units has been minimized. Capital cost of the diesels is estimated to be \$291/KW of capacity. Other significant costs are diesel fuel at 10.44 mills U.S. per KWH at the plant bus, interest at 7%, maintenance, labor, interim replacement, etc. Unit cost for diesel generation is estimated to be about 15.0 mills U.S. per KWH at plant bus in southern Luzon.

2. Explanation of Manila/Naga tie line

A 230 KV transmission line will be completed to Naga City in 1976. It will connect Naga to the Luzon Grid. Although extension of the line further south is planned, its completion is scheduled several years behind that of the link to Naga and in any event subtransmission such as the 69 KV network would continue to be needed.

The National Power Corporation's (NPC) engineer has determined that power in the Manila area, using a 150 MW fossil fuel plant, can be produced at plant bus for about 7.3 mills U.S./KWH at current fuel and equipment costs. The cost of the line loss is estimated to be 1.02 mills for a total cost at Naga of about 8.3 mills. No attribution of 230 KV line capital costs is made because it services points between Naga and Manila and would be constructed even if the 69 KV line were not.

3. Payback period 69 KV transmission line

A. At diesel break-even wholesale tariff (7%, 20 years diesel capitalization)

Southern Luzon load available for Pick-up			Unit Margin mills/KWH (Diesel break-even tariff rate of bus)	Annual Margin (\$000)	Cum
<u>Year</u>	<u>MW</u>	<u>GWH/Yr.</u>			
1976	11.8	1033	6.7	692	692
1977	16.6	1454	6.7	974	1666
1978	19.8	1734	6.7	1162	2828
1979	22.6	1980	6.7	1327	4155
1980	24.9	2181	6.7	1461	5616

Payback period for \$2.4 million is about three years.

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B. At average Luzon grid wholesale tariff

<u>Year</u>	<u>GWH/Year</u>	<u>Unit Margin Mills/GWH (Wholesale tariff Luzon Grid)</u>	<u>Margin</u>	<u>Cum</u>
1976	1033	2.5	258	258
1977	1454	2.5	363	621
1978	1734	2.5	433	1054
1979	1980	2.5	495	1549
1980	2181	2.5	545	2094
1981	2497	2.5	624	2718
1982	2821	2.5	705	3423
1983	3154	2.5	788	4211

Payback period for \$2.4 million is 5-1/2 years.

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4. Rate of return on 69 KV transmission network with 30-year life, 40 MW capacity, capital cost \$2.4 million and \$13,000 annual O&M, using unit margin (Luzon wholesale tariff 10.8 mills/KWH less cost of power at Naga via 230 KV tie line 8.3) and projected southern Luzon load growth.

<u>Year</u>	<u>GWH</u>	<u>Unit Margin Mills U.S.</u>	<u>Annual Recovery or Margin (\$000)</u>	<u>Less O&M (\$000)</u>	<u>Net Margin</u>	<u>Present Value Factor at 20%</u>	<u>Present Value</u>
1976	103.3	2.5	258	13	245	.833	204
1977	145.4	2.5	363	13	250	.694	245
1978	173.4	2.5	433	13	420	.579	243
1979	198.0	2.5	495	13	282	.482	232
1980	218.1	2.5	545	13	532	.402	214
1981	249.7	2.5	624	13	611	.335	205
1982	282.1	2.5	705	13	692	.279	193
1983	315.4	2.5	788	13	775	.233	181
1984-							
20006*	350.4/yr.	2.5	876/yr.	13/yr.	863	.948	<u>811</u>
							<u>2,528</u>

*System reaches 40 MW capacity in 1984
returns become constant.

The present value of the transmission system is just over 20% (\$2,528,000 present value vs. \$2,414,000 capital cost).

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5. Generation Plant

Analysis of the geothermal generating plant and the portion of the 69 KV transmission network which will be utilized by the 10.5 MW Tiwi plant follows:

A. Generation Costs

- 1) initial capital (investment) cost for generation is \$3,790,000 (including \$60,000 training and \$393,000 escalation) and for transmission \$2,414,000. Escalation on the plant is intended to cover all reasonable delays. For the purpose of the economic analysis, an expected escalation is more realistic than using the upper limit. Therefore, \$3,534,000 is used as a generating plant capital cost for the purpose of computing the project economics.
- 2) annual steam payment to Union and NPC for amortization of fixed investment and steam plant operation. To Union 5.5 mills U.S. and to NPC .833 mills U.S. based on power at Bus, 90% plant factor or 82.6 GWH/Yr -- \$516,000/yr.
- 3) annual interim replacement .35% of generating plant capital costs \$12,500/year.
- 4) annual insurance and taxes 1.0% of generating plant capital costs \$35,800/year
- 5) annual operating and maintenance of generating plant 1% of U.S. dollar capital costs \$29,200.

B. Transmission Costs

- 1) Tiwi 10.5 MW unit use of 69 KV line. The line has a capacity of about 40 MW or the 10.5 MW Tiwi unit will use approximately 26% of line capacity. Remaining line capacity will be used for transmission of power north when larger Tiwi units are installed or for transmission south with growth in southern Luzon load. We attribute 26% of 69 KV line costs to power from 10.5 MW Tiwi unit power or 26% of capital costs -- \$650,000.
- 2) annual operation and maintenance of transmission line is \$13,000/year or for sale of Tiwi generated power 26% x \$13,000 = \$2,400/year.
- 3) line loss is estimated to represent a 5% decline in revenues \$44,000 year.

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6. Cash Flow Analysis of Generating Plant

Tiwi annual cash costs at 90% loan factor are:

Payment to Union for steam	\$454,000
Interim replacement	12,500
Insurance and taxes	35,800
Operations and maintenance	<u>29,200</u>
	\$531,500

or 6.4 mill/KWH at plant bus.

* Non-cash annual cost items are amortization and interest on capital investment including NPC investment in reservoir exploration.

The cash costs can be covered using the 8.3 mills/KWH power rate projected for the purchase of power at Naga via the 230 KV transmission line with 1.9 mills/KWH available to cover non-cash cost items. .833 mill/KWH estimated to service NPC investment in the field and servicing generating plant debt which will require about 3.5 mills per KWH at plant bus. In other words, the 10.5 MW unit, if compared to unit prices at Naga via the 230 KV line, would require a subsidy of about 2.43 mills per KWH or about \$200,000 annually to assist in debt service. This subsidy would be required if terms to NPC were commercial in nature --7%.

- C. Revenues (Benefits) used in this computation are strictly those of revenues earned from the sale of power generated by the 10.5 MW Tiwi plant, figured at 90% load. Wholesale power rate is ₱.074/KWH or 10.8 mills U.S. Annual revenues are \$891,000.

Using the above figures, the rate of return on the generating plant and transmission plant is:

annual revenues - 10.8 mills x 82.5 GWH/year = \$891,000

capital costs = \$4.18 million

annual operating costs - \$643,000

funds available to service debt using annual is \$248,000.

Using this annual margin the internal rate of return is:

$\$4,180,000 + \$248,000 = 16.8 =$ present value factor

or a rate of return over 30 years of about 4-1/2%.

Union (PGI)/NPC Contract

The subject contract is of major importance to the project because it governs the terms and conditions under which steam (the energy source) will be provided for power generation. This includes exploration for geothermal resources, production of steam, and reinjection of effluent back into the reservoir. Salient features of the contract are discussed below.

Under the terms of the contract, NPC is responsible for all Philippine currency costs not to exceed 25% of the total "operating expenses" incurred by Union/PGI in any fiscal year. Union/PGI is responsible for all foreign exchange development costs and local costs for which NPC is not responsible, i.e., exceeding the 25% figure.

Union Oil (PGI) obtained no ownership rights in the field. To recoup its investment which is estimated by Union officials to reach a maximum net investment (Investment Minus Local Cost Reimbursements) for the Tiwi field of \$16.4 million by 1979 -- Union will receive payment in proportion to the electricity generated. Union will be paid the peso equivalent of 2.5 U.S. mills per kilowatt hour generated as reimbursement for expenses incurred by Union/PGI in conducting Exploration, Exploitation and Efficient Handling Operations. In addition, NPC will pay the peso equivalent of 3.0 U.S. mills per kilowatt hour generated as compensation for services rendered pursuant to the contract. In other words, for steam to produce power, NPC pays 5.5 U.S. mills peso equivalent per KWH of that power which is sold (guaranteed conversion to dollar at a fair rate).

Under the terms of the PGI/NPC contract, after the provision and installation of the first plant, which will complete the experimental phase of the operation, Union/PGI will continue its exploration upon notification to do so by NPC. At such time as PGI has discovered geothermal resources in sufficient quantity to supply a generating plant with a capacity of approximately 50 MW, it will conduct such engineering and geological studies and tests as are necessary to reasonably define the quantity and quality of the resources, and if determined sufficient and suitable for power generation, it will be offered to NPC. NPC will have ninety (90) days from the date of such offer to evaluate the information included in the offer and to determine whether the feasibility criteria provided for have been met. The feasibility tests require that (a) the cost of producing electrical energy from the geothermal plant shall not exceed eighty five percent of the cost of production from a 150,000 kilowatt conventional

oil-fired steam plant; and (b) the gross revenues of the plant shall be such that, after deducting payment to Union/PGI and NPC's share of Operating costs, the remaining balance shall be at least sufficient to meet debt service on the entire capital investment for the plant. This schedule of installation is to proceed until 250,000 kw capacity has been offered and accepted by the NPC. Portions of this contract may have to be renegotiated as the situation changes.

Note: Union has applied for political risk insurance to cover its investment in Tiwi through OPIC, and a decision on the application is scheduled for consideration at the May or June Board meeting at OPIC.

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Impact of Present and Future Project on EnvironmentTiwi Area

The Tiwi area is largely agricultural. It is situated on a piedmont plane developed with irrigated rice paddies in the lower elevations and coconut orchards on the higher ground. The municipality of Tiwi is residential. Within the geothermal preserve is a hot springs resort area and a National Park which features a surface thermal manifestation of boiling fumaroles and hot springs.

Effect on present use of the area: Each well drilled will require a well site of 1-1/2 acres during the drilling and testing operations. The production of each well (super heated water) will be transported through piping to a central gathering complex located adjacent to each plant site. The pipeline right-of-way will be 25 feet wide to include an access road. The piping will consist of various sizes of steel pipe supported on concrete pilars and insulated with fiberglass and asbestos covering. A few retaining ponds, probably one per plant, will be constructed for gathering, retaining and cooling condensate. Each pond will require a site of about 2-1/2 to 3 acres. Except for a portion of the drill site which will be restored when production commences, these areas will be removed from present agricultural use until eventual abandonment at the end of the project. The total acreage developed by each 50 MW plant will be initially 240 acres. Of this 240 acres, 18 acres will be required for well sites, 8 acres for access roads and pipeline right-of-way, and 3 acres for a retaining pond in addition to the plant area and relief station complex of 5 acres, for a total utilized area of 34 acres or 14% of the developed area. Additional drilling for each plant will involve 30 acres for well sites and 10 acres for right-of-way adding 40 acres utilized area to develop 600 acres. In summary, for each 50 MW plant operated, 74 acres of well sites, roads, right-of-ways, ponds and plant complex will be removed from present use.

Visual impact: The construction of well and plant sites and right-of-ways will alter the appearance of the area by requiring fill construction in the rice paddy areas and clearing of vegetation from orchard and dormat land areas. The structures on these sites and right-of-ways will consist of low lying pipes not exceeding 10 feet in elevation, and separation facilities not exceeding 12 feet in elevation at each well. Most valving and piping will be insulated with smooth surface covers which will not be unsightly and will do much to minimize the visual unattractiveness of this type of equipment.

White steam plumes will be emitted at various points within the entire complex. These will be episodic occurrences of short duration except for the plant cooling tower vapor which will be continuous.

A drilling derrick and associated equipment will be required at each site for about 40 to 50 days of operation when each well is initially drilled.

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Effect on air quality: Drilling and construction will require conventional gasoline and diesel powered equipment that emit the usual exhaust fumes. These quantities are not objectionable. Testing of the well releases large volumes of geothermal fluids as steam into the air. The water vapor condenses and less than five percent of the total gaseous emission is incondensable. This incondensable portion is 99.5% carbon dioxide with the remainder largely nitrogen with minute quantities of ammonia and methane and a trace amount of hydrogen sulfide. This small amount of gas is not objectionable in nature nor is it explosive or inflammable. Operations of the steam gathering system will require several points of episodic steam venting. These emissions will be relatively small and their nature as described above.

Effect on noise level: Drilling and construction equipment will be suitably muffled and will not present a unique noise pollution problem during the drilling and construction phase. The construction program is a mobile operation and the equipment will not be present and operating at any one place for long periods of time, but will move-on to other locations as work on one site is finished. The testing of wells and operation of the steam lines require periodic release of steam which will be properly muffled to create noise levels far below United States standards for safety. Noise pollution has been one of the objectionable features of other geothermal developments and much effort has gone into noise abatement equipment design and operational procedures to minimize noise. This expertise has been applied in the Tiwi operation and will continue to be utilized to eliminate objectionable noise.

Effect on water supply: The production of geothermal fluids from deep reservoirs does not interfere with the quantity or quality of near-surface fresh water sources of the community. Wells will be cased with three concentric cemented casings to a depth of 250+ feet and two concentric cemented casings to 100+ feet. In this way, no co-mingling of geothermal fluids with fresh water strata can occur. The residual water from the separation facilities will be kept physically out-of-contact with fresh water supplies and retained in ponds and transported in sealed conduits so that no contamination of domestic or agricultural water will take place. The geothermal effluent contains 10,000 ppm total solids which is mostly sodium chloride with some boron. No poisonous compounds which would endanger human or animal life are present in the geothermal water.

The water from the pilot plant will be transported to and disposed of in the ocean. The discharge of the 10,500 kilowatt plant will be about 400 gpm.

Reinjection of the effluent may become desirable or necessary after the initial operation of the pilot plant. From a resource evaluation standpoint, reinjection during the initial years of operation would mask the pressure depletion effect of fluid withdrawal from the geothermal reservoir and cause the evaluation of the resource size to be practically impossible. The initial reservoir testing is designed to cause the most adverse conditions

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possible to manifest themselves early to provide the data necessary for estimating reservoir parameters and arriving at an optimum reservoir management program to conserve the resource.

Possible subsidence: Extraction of large volumes of fluids can under certain geologic and hydrologic conditions, cause ground subsidence. The conditions necessary for subsidence are not apparent at the Tiwi area. The reservoir is highly competent altered volcanic rock with relatively low porosity that should not settle due to fluid withdrawal. The geothermal cell is believed to contain migrating and convecting fluids which will be replaced from natural water sources and result in little or no net withdrawal that would cause subsidence. Nevertheless, the pilot plant operation will be monitored to determine the existence of a possible subsidence problem and corrective measures will be taken as necessary.

Reinjection of production effluent would amount to 80% of the produced fluids and most likely relieve any subsidence problem that would occur.

Effect of effluent disposal into ocean: Plans for disposal of Tiwi 10.5 MW plant effluent are to use the nearby ocean. Point of entry will be where the Visitang Naga River enters the Philippine Sea. Effluent from the plant will be cooled in ponds prior to injection into the river. The Tiwi reservoir produces no toxic substance that would negatively effect the marine environment. Because the 10.5 MW plant will only discharge 400 gpm the effect of thermal pollution will be minimal. With future larger units, unless effluent is reinjected into the reservoir, the thermal polluting effect of the effluent on the marine environment could be significant. Before larger units are installed a complete analysis of the problem will be needed.

Alternatives to proposed development: The rapidly increasing requirement for power in the Philippines necessitates construction of additional power plants. The only known fuel source indigenous to the Philippines is the geothermal resource at Tiwi. If this resource is not developed, all new power plants will be fuel oil sources. These plants will add to the present air and thermal pollution levels of the Manila area. In contrast, the Tiwi development will not only have less impact, but the impact will be removed from the highly developed area of Manila.

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Table I

Composition of Noncondensables
in Flashed Steam

Naglagbong No. 1
February 21, 1973

<u>Compound</u>	<u>mol %</u>
Methane	0.07
Ethane	0.07
Propane	0.06
Hydrogen	0.27
Ammonia	0.0
Nitrogen & Carbon Monoxide	0.07
Hydrogen Sulfide	0.0
Carbon Dioxide	99.46

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Table II

Composition of Separator Water

Naglagbong No. 1
February 21, 1973

Temperature	120°F
pH	6.3
Sp. Grav. @ 60°F	1.006
Total Solids	10,385 ppm
Chloride	5,606 ppm
Carbonates	- (not detected, <1.0)
Bicarbonates	40 ppm
Sulphate	30 ppm
Nitrate	- (not detected, <1.0)
Ammonia/Nitrogen	.4 ppm
Phosphate	- (not detected, <1.4)
Hydrogen Sulphide	- (not detected, <1.0)
Boron	62 ppm
Silicon	118 ppm
Sodium	3,180 ppm
Potassium	242 ppm
Calcium	125 ppm

Spectrographic Analyse

Major	(>10%)	Sodium
Moderate	(1-10%)	Calcium, Potassium
Slight	(0.1-1%)	Boron, Silicon, Strontium
Trace	(<.1%)	Aluminum, Barium, Copper, Iron, Magnesium, Manganese