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E.O. 12065: N/A  
SUBJECT: TIWI GEOTHERMAL PROJECT COMPLETION REPORT

REF: (A) APP 3C, CH. 3, HB 3  
- (B) FRONTLINES DATED 10/5/76

SUMMARY: THIS CABLE CONSTITUTES THE PROJECT COMPLETION REPORT FOR THE SUBJECT PROJECT AS REQUIRED BY REF (A). THE PROJECT HAS MET ITS PURPOSE. REF (B) CONTAINS DETAILED DESCRIPTIVE NARRATIVE. NO ADDITIONAL AID FINANCED INPUTS ARE SCHEDULED FOR THE PROJECT AND, THEREFORE, MONITORING OF THIS PROJECT SHOULD TERMINATE WITH THE SUBMISSION OF THIS REPORT. END SUMMARY.

- 1. A. COMPLETE NAME: TIWI GEOTHERMAL GENERATION AND TRANSMISSION
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- B. LOAN NO.: 492-H-032
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- C. PROJECT NO: 492-26-220-262
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- D. TERMINAL DISBURSEMENT DATE: 12/31/77
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- E. IMPLEMENTING AGENCY: NATIONAL POWER CORPORATION
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- F. TOTAL AMOUNT OF DISBURSEMENTS: \$3,007,072.28
- 2. A. SUMMARY OF SERVICES PERFORMED AND GOODS FURNISHED
- BY MAJOR PROJECT COMPONENT BY CONTRIBUTOR (AID, HOST COUNTRY, AND OTHERS).
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THE PHILIPPINES HAS LONG BEEN KNOWN TO POSSESS GEOTHERMAL RESOURCES. IN 1970, THE PHILIPPINE GOVERNMENT SET ASIDE OVER 40,000 ACRES OF LAND AT TIWI IN ALEAY PROVINCE AS A GEOTHERMAL RESERVATION AND COMMISSIONED THE NATIONAL POWER CORPORATION (NPC) TO BEGIN COMMERCIAL EXPLORATION. AID'S INVOLVEMENT WITH GEOTHERMAL ENERGY IN TIWI BEGAN IN 1973 WITH A LOAN OF \$4.2 MILLION TO THE PHILIPPINE GOVERNMENT TO FINANCE A PILOT GEOTHERMAL PLANT. THE ORIGINAL PROJECT DESIGN CALLED FOR CONSTRUCTION OF A 10.5 MEGAWATT ELECTRIC POWER FACILITY PLUS 360 KILOMETERS OF 69 KV TRANSMISSION LINE AND RELATED SUBSTATIONS. RISING ENERGY COSTS HOWEVER, LENT URGENCY TO THE PROGRAM AND THE PHILIPPINE GOVERNMENT CHOSE TO FOREGO THE PILOT PLANT, USE ITS OWN AND OTHER RESOURCES, AND PROCEED DIRECTLY TO FULL-SCALE COMMERCIAL GEOTHERMAL GENERATION.

THUS, THE PLANNED AID-FUNDED PILOT PLANT WAS ABANDONED AND AFTER LENGTHY DISCUSSIONS WITH THE GOP, AN AMENDMENT TO THE LOAN AGREEMENT WAS FINALLY EXECUTED IN 1977. THIS AMENDMENT REDUCED THE LOAN TO \$3.3 MILLION AND PERMITTED THE FUNDS TO BE USED FOR FINANCING THE FOREIGN EXCHANGE COSTS OF MATERIALS FOR THE TRANSMISSION LINE AND SUBSTATIONS. THE GOP FINANCED, OR ARRANGED FINANCING, FOR ALL LOCAL COSTS OF THE PROJECT. THE MAJOR FOREIGN EXCHANGE COSTS WERE FINANCED UNDER SUPPLIERS' CREDITS. MITSUBISHI AND MITSUI OF JAPAN WERE CONTRACTED FOR THE DESIGN, MANUFACTURE, AND INSTALLATION OF MAJOR AND MINOR

EQUIPMENT, ERECTION OF A COOLING TOWER, AND THE INITIAL TESTING AND START-UP SERVICES FOR TWO 55 MW STEAM TURBINES

OF THE FOUR OTHER GEOGRAPHIC AREAS GIVEN PRIORITY FOR GEOTHERMAL DEVELOPMENT BY THE GOP, PHILIPPINE GEOTHERMAL, INCORPORATED (PGI), A SUBSIDIARY OF UNION OIL OF CALIFORNIA UNDER CONTRACT TO NPC, HAS SPENT ABOUT \$25.0 MILLION ON TWO AREAS. THE NEW ZEALAND GOVERNMENT HAS SPENT ABOUT \$8 MILLION OF A \$10.0 MILLION DOLLAR GRANT IN THE TWO REMAINING AREAS.

- B. STATUS OF COMPLETION OF PROJECT ELEMENTS INVOLVING CONSTRUCTION, IMPORT OF MATERIALS AND SUPPLIES AND TECHNICAL ASSISTANCE.
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ON JANUARY 12, 1979, PRESIDENT MARCOS THREW THE SWITCH INAUGURATING THE FIRST 55 MW UNIT OF THE GEOTHERMAL PLANT IN TIWI. THE 360 KILOMETERS OF AID FINANCED TRANSMISSION LINES ARE COMPLETE AND FIVE SUBSTATIONS ARE FINISHED AND ENERGIZED. THE TRANSMISSION SYSTEM INTERCONNECTS THE TIWI GEOTHERMAL FACILITY WITH LOAD CENTERS IN SOUTHERN LUZON AND A 230 KV LINE THAT CONNECTS THE MANILA AREA WITH NAGA CITY IN SOUTHERN LUZON. PHILIPPINE GEOTHERMAL UNDERTOOK THE EXPLORATION, DRILLING, AND DEVELOPMENT OF THE TIWI FIELD. NPC CONSTRUCTED TWO ELECTRIC POWER PLANTS EACH CONSISTING OF A 55 MEGAWATT DUAL PRESSURE ENTRY TURBINE GENERATOR. FORTY WELLS HAVE BEEN DRILLED WITHIN THE FIELD, BUT ONLY 15/20 ARE EXPECTED TO BE UTILIZED TO

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INCOMING  
TELEGRAM

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PRODUCE THE 110 MEGAWATTS OF POWER. PHILIPPINE GEOTHERMAL CONSTRUCTED THE GATHERING SYSTEM TO CONNECT THE WELLS TO THE PLANT. NPC PROJECT ENGINEERS STATE THAT THE TWO POWER UNITS WILL GO ON DRY-RUN FOR THREE MONTHS BEFORE COMMERCIAL POWER IS DISTRIBUTED TO THE ELECTRIC COOPERATIVES IN THE BICOL.

- C. SUMMARY OF ACCOMPLISHMENTS OF PROJECT IN LIGHT
- OF THE PURPOSE STATED IN THE PROJECT PAPER.

THE PURPOSE OF THE PROJECT, AS STATED IN THE AMENDMENT TO THE LOAN AGREEMENT, WAS TO CONSTRUCT APPROXIMATELY 360 KILOMETERS OF 69 KV TRANSMISSION NETWORK WHICH WOULD CONNECT THE SOUTHERN LUZON PROVINCES OF CAGAPINES SUR, ALBAY, AND SORSOGON TO THE LUZON GRID SYSTEM, AND ENHANCE THE POTENTIAL FOR RURAL ELECTRIFICATION. THIS PURPOSE IS SATISFIED. THE TIVI BLOCK OF POWER IS FED INTO THE LUZON GRID AND INSURES A MORE ADEQUATE AND RELIABLE SUPPLY OF ELECTRICITY FOR INDUSTRIAL AND DOMESTIC CONSUMERS IN SOUTHERN LUZON. BY TYING INTO THE LUZON GRID, THE DISTRIBUTION SYSTEM WILL ASSIST AT LEAST TEN RURAL ELECTRIC COOPERATIVES. WHILE IT IS STILL TOO EARLY TO CITE MUCH EVIDENCE THAT THE TIVI GEOTHERMAL PROJECT IS CONTRIBUTING TO THE ECONOMICALLY DEPRESSED BICOL REGION, THE ASSUMPTION THAT IT WILL REMAINS VALID. RELATIVE TO OTHER PARTS OF THE COUNTRY, THE BICOL HAS LACKED BASIC POWER INFRASTRUCTURE. TRANSMISSION FACILITIES WERE MARGINAL WITH ONLY 90 KILOMETERS OF 34.5 KV LINE--INADEQUATE TO SUPPORT AREA ELECTRIFICATION. THE 500 MEGAWATT PROVEN CAPACITY OF THE TIVI FIELD IS MORE THAN SUFFICIENT TO ENERGIZE THE ENTIRE BICOL AREA.

- D. FURTHER INPUTS INTO PROJECT TO BE PROVIDED BY
- OTHERS AND EXPECTED COMPLETION OF SUCH INPUTS.

THE GOP CONTINUES TO ASSIGN HIGH PRIORITY TO GEOTHERMAL DEVELOPMENT. EXPANSION OF THE TIVI PLANT FROM THE CURRENT 220 MW TO 440 MW IS UNDER CONSIDERATION. ALSO BEING DISCUSSED, SUBJECT TO FURTHER EXPLORATION OF THE FIELD, IS PLANT EXPANSION IN THE MORE DISTANT FUTURE OF UP TO AN ULTIMATE CAPACITY OF 800 MW.

IN ADDITION TO THE TIVI PLANT, TWENTY-FIVE OTHER AREAS IN THE PHILIPPINES HAVE BEEN IDENTIFIED BY THE COMMISSION ON VOLCANOLOGY AND THE BUREAU OF ENERGY DEVELOPMENT (BED) AS HAVING GEOTHERMAL POTENTIAL. OF THESE, FIVE AREAS HAVE BEEN GIVEN PRIORITY FOR DEVELOPMENT BY THE GOP. THE GOP POWER DEVELOPMENT PLAN CALLS FOR DEVELOPMENT OF 1595 MW OF CAPACITY IN THESE FIVE AREAS BY 1987. THE BED ESTIMATES THAT \$675 MILLION FOR FIELD DEVELOPMENT AND \$750 MILLION FOR POWER PLANT CONSTRUCTION WILL BE REQUIRED OVER THE NEXT 10 YEARS TO ACCOMPLISH THIS GOAL.

THE PHILIPPINE GOVERNMENT HAS AN ONGOING NATIONWIDE ASSESSMENT OF THE COUNTRY'S GEOTHERMAL RESOURCES UNDER THE PHILIPPINE-ITALIAN TECHNICAL COOPERATION PROGRAM. THE ASSESSMENT ACTIVITIES WILL IDENTIFY PRIORITY AREAS TO BE FURTHER EXPLORED. THESE DEFINED AREAS CAN THEN BE

DEVELOPED BY BOTH LOCAL AND FOREIGN ENTITIES THROUGH A SERVICE CONTRACT SYSTEM WITH THE MINISTRY OF ENERGY. THE MINISTRY IS PRESENTLY SETTING GUIDELINES FOR THE ADOPTION OF SERVICE CONTRACTS, IN WHICH FOREIGN AND FILIPINO COMPANIES WITH PROVEN FINANCIAL, MANAGEMENT, AND TECHNICAL CAPABILITIES WILL BE ENCOURAGED TO PARTICIPATE.

- E. RECOMMENDATIONS ON EXTENT AND PERIOD OF FURTHER
- MONITORING.

NOTWITHSTANDING THE CONTINUED EXPANSION OF THE OVERALL PROJECT, AS DISCUSSED IN SECTION D, AID'S CONTRIBUTION TO THE SMALLER PROJECT HAS BEEN PROVIDED TO A DISCRETE ACTIVITY. THIS ACTIVITY IS COMPLETE. MONITORING OF THIS PROJECT SHOULD TERMINATE WITH THE SUBMISSION OF THIS PROJECT COMPLETION REPORT. MURPHY

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