

PD-CRA 128

④

**Sverdrup**

**KARNAFULI THIRD UNIT**

**FINAL REPORT**

**DECEMBER 5, 1981**

**Submitted by**

**SVERDRUP & PARCEL AND ASSOCIATES, INC.**

**417 Montgomery Street  
San Francisco, CA 94104  
USA**

**This report is submitted in compliance with the terms of Article 1.4.2 of the contract for Engineering Services between the Bangladesh Power Development Board and Sverdrup & Parcel and Associates dated August 26, 1976.**

KARNAFULI THIRD UNIT

FINAL REPORT

DECEMBER 5, 1981

	<u>Page</u>
INTRODUCTION	1
CONTRACTS	3
PDB/SPA	3
SPA/A-C	3
PDB/Vinnell	3
PERSONNEL	6
PROJECT BUDGET	7
FINANCING	9
General	9
Engineering Services	9
Replacement Parts and Services	9
Procurement of Parts by Vinnell	10
Construction	10
PROJECT EXPENDITURES	12
MAJOR IMPEDIMENTS TO PROGRESS OF THE WORK	13
Corrosion	13
1) Stator	13
2) Thrust Bearing	14
3) Guide Bearings	14
Coil Failure	14
Shortage of Personnel	15
TERMINATION OF SPA/PBD CONTRACT	16
Completion of Work under Contract	16
SUMMARY	18

KARNAFULI THIRD UNIT  
FINAL REPORT  
DECEMBER 5, 1981

INTRODUCTION

The Karnafuli Dam and the first two generating units of the Karnafuli Power Plant were completed in 1962. As part of the initial project, the foundation and superstructure of the powerhouse were constructed so as to provide for the future addition of a third generating unit. The penstock for the third unit, and certain other appurtenant works, were also constructed as components of the initial project.

In 1968 the Water and Power Development Authority authorized addition of the third unit. Financing was arranged through the United States Agency for International Development. Sverdrup & Parcel and Associates, Inc., was engaged to perform engineering and consulting services for the Project. Sverdrup & Parcel completed the additional design and prepared documents for procurement of the additional turbine, generator, and auxiliary equipment in 1969.

During the period when tenders were being received for supply of equipment for the Third Unit, the Allis-Chalmers Corporation (A-C) proposed that they not only supply the equipment, but also act as prime contractor for construction and installation. The PDB accepted the Allis-Chalmers proposal. Sverdrup and Parcel then amended the contract documents so as to include construction as well as supply of equipment. In due course, the Black and Veatch construction organization, as subcontractor to Allis-Chalmers, began mobilization for the work and Allis-Chalmers began shipment of the equipment. In 1971 the work was terminated because of the unsettled conditions brought about by the War of Independence.

In 1973 the Bangladesh Power Development Board engaged Black & Veatch, Inc. to appraise the status of the interrupted work and to determine whether replacement parts might be required to complete the project. In November of 1973, Black and Veatch engaged Sverdrup & Parcel to inspect certain distressed cargo which had been in transit at the time of the War of Independence. In February of 1975 Sverdrup and Parcel, accompanied by a representative of Allis-Chalmers, again inspected the equipment which had been delivered to the site and prepared a list, insofar as it could be determined at the time, of missing items and items which, although damaged or deteriorated, might be repaired. At this stage of the project a list of required replacement parts was prepared and submitted to the PDB.

Based on the apparent scope of the work (as defined by the February 1975 appraisal), the PDB requested Sverdrup and Parcel to prepare a draft contract whereby SPA would procure the replacement parts and perform other engineering services. Meanwhile the PDB negotiated funding for the project with USAID. The various negotiations were completed in August 1976 and led to a series of contracts which are described in more detail in the following sections of this report.

## CONTRACTS

PDB/SPA: On August 26, 1976 the Bangladeshi Power Development Board and Sverdrup and Parcel and Associates, Inc. entered into an Agreement for Engineering and Consultant Services relating to design, equipment procurement, construction, and commissioning surveillance of the Karnafuli Third Unit Project.

Under the terms of the agreement Sverdrup and Parcel was to prepare designs, drawings, specifications and contract documents for construction of the project and for procurement of equipment, to procure the equipment, and to assist the PDB in selecting local construction contractors or, alternatively, to assist the PDB should they elect to perform construction using PDB's own staff. The list of "Replacement Parts" which had been compiled during the February 1975 inspection was included as a appendix to the contract and formed the basis for the scope of the procurement services.

SPA/AC: Pursuant to the primary agreement, SPA prepared a contract whereby the Allis-Chalmers Corporation (A-C) would furnish most of the replacement parts and would provide the services of representatives experienced in the installation of the various components of the equipment. The Contract was entered into on the 18th of July 1977, between Allis-Chalmers and Sverdrup and Parcel acting as agents for the PDB. The list of Replacement Parts previously prepared was modified so as to include only such parts as would normally be supplied by Allis-Chalmers and was included in their contract. Parts not normally supplied by Allis-Chalmers, e.g., steel reinforcing rods, paint, lighting fixtures, were to be procured by SPA.

It is to be noted that Allis-Chalmer's role in the revitalized Project was significantly different from their role in the original (1968) concept: in the earlier project A-C was the equipment supplier and prime construction contractor under direct agreement with the PDB. Under the 1977 agreement A-C would only provide certain parts and consultation during assembly. Under the original agreement, A-C would have been responsible for commissioning the unit and would warrant its satisfactory operation for a specified period thereafter. Under the terms of the later agreement, A-C would not be responsible for commissioning of the unit and assumed only a very limited warranty of parts.

PDB/Vinnell: Concurrently with the procurement of Replacement Parts, SPA began preparation of technical specifications for construction and installation of the project by PDB staff.

In approximately March of 1977, the PDB proposed that only the electrical/mechanical installation be undertaken by the PDB staff and that the civil works portion of the project be constructed by contract. In accordance with the Board's proposal, SPA's home office prepared contract documents for the civil works in April of

1977 and, concurrently, the Project Manager solicited statements of qualifications from local civil works contractors. Statements of qualifications were received from several potential contractors, however only two, M/S L.K. Siddiqi & Co. Ltd. of Chittagong, and M/S M. R. Sikder of Dacca, were found to be qualified.

Later, in August 1977, SPA was requested to also prepare specifications and contract documents for mechanical and electrical work, i.e., installation of the turbine, generator, and controls. These specifications were to have been used in the event that the PDB elected to install the equipment using local contractors. They were submitted to the PDB in November 1977.

Partially because of the lack of a sufficient number of local potential contractors (which would have resulted in a situation not conducive to truly competitive bidding), and partially because of the problems of coordination which would be inherent in having independent contractors and PDB personnel working simultaneously in very close quarters, the decision was made by the PDB (with USAID concurrence) to have the entire work performed by U.S. contractors. The contract documents were therefore again revised so as to be appropriate for bidding by U.S. Contractors.

In January of 1978 SPA began informal inquiries to determine the interest among U.S. contractors for bidding on the work. After receiving authority from the PDB, a more formal appraisal of the qualifications was made, and subsequently three contractors were requested to visit the project preparatory to submitting bids. The three firms were:

- A. Fischbach & Moore, International
- B. Vinnell Corporation
- C. Morrison-Knudsen, International

On 15 December, 1978, the contract for construction was awarded to the Vinnell Corporation of Alhambra, California, U.S.A. The bid price was U.S. \$4,846,538. and Taka 14,458,238.

Amendment No. 1 to the Vinnell Contract provided for additional costs not to exceed U.S. \$56,500 and Taka 188,000 per month for five months. The additional costs were incident to a project delay while the main generator shaft and certain other parts were being refurbished in Japan.

Amendment No. 2 to the Vinnell contract provided for an additional cost of U.S. \$ 3,467.41. These costs were incident to Vinnell's transporting certain heavy parts from Chittagong to the Karnafuli Hydro Station.

On April 19, 1980 a separate agreement was entered into between Vinnell and the PDB whereby Vinnell would expeditiously procure parts for the project. The maximum amount to be reimbursed to Vinnell for parts was U.S. \$ 200,000.00 plus Taka 3,250,000. The fee to Vinnell for these services was U.S. \$30,000 plus Taka 487,500.

By mid 1981 it became apparent that the Contractor was not staffing the project with personnel adequately trained in testing and commissioning procedures. In August of 1981, the Vinnell Corporation proposed that testing and commissioning be performed by PDB staff. By letter dated August 8, 1981 the Chief Engineer (PSC) of the PDB offered to make testing equipment available to the contractor and to provide engineers to assist in the testing, but that the prime responsibility was to remain with the Contractor. The Contractor accepted this counter-offer.

## PERSONNEL

Under the terms of the 1976 SPA/PDB contract for engineering services, Sverdrup & Parcel was required to maintain a Project Manager at the site of the work.

During the term of the agreement, the following SPA personnel were posted to the project:

<u>Representative</u>	<u>Position</u>	<u>From</u>	<u>To</u>
Mr. W. D. Brooks	Project Manager	9/17/76	6/24/78
Mr. K. A. Pflueger	Resident Mechanical Engineer	4/07/77	11/19/78
Mr. E. E. Lazovic	Resident Electrical Engineer	2/23/77	7/20/77
Mr. R. L. Jordan	Project Manager	10/24/78	8/16/79
Mr. C. Chau	Resident Civil Engineer	4/11/80	9/28/80
Mr. B. Hrabe	Resident Civil Engineer	6/22/79	3/21/80
Mr. A. Myers	Acting Project Manager	9/14/79	12/08/79
Mr. E. E. Graham	Resident Electrical Engineer	4/16/79	6/30/79
Mr. J. M. Noda	Acting Project Manager	11/08/79	2/29/80
Mr. W. Bochman	Resident Electrical Engineer	2/26/80	4/11/80
Mr. R. M. Cattlin	Project Manager	2/09/80	12/15/81
Mr. C. Ioannides	Resident Electrical Engineer	5/04/80	11/23/81

In addition to the resident Sverdrup & Parcel representatives listed above, the following personnel traveled to the site periodically for management and administration purposes:

- Mr. C. L. Cutting, Vice President
- Mr. T. L. Anderson, Vice President
- Mr. C. I. Donald, Project Engineer
- Mr. F. T. Brokaw, Electrical Engineer

Support was provided by Sverdrup & Parcel's home office engineering staff. Primary among these engineers were:

- Mr. J. M. Noda      Chief Engineer/San Francisco. (As noted above, Mr. Noda also represented Sverdrup & Parcel and Associates as Acting Project Manager for a short period).
- Mr. G. B. Walker      Chief Mechanical Engineer/San Francisco.
- Mr. G. S. Lee      Chief Electrical Engineer/San Francisco. (Mr. Lee had previously acted as Project Engineer for the Karnafuli Third Unit Project during the period 1968-1970).

PROJECT BUDGET  
(U.S. Dollar Component)

The U.S. dollar budget for the project was originally categorized in a manner reflecting the anticipated methods of payment. Initially, payment to SPA for its Engineering Services, and for SPA-procured replacement parts, was made through Letters of Credit established with the Bank of America acting as correspondent Bank for Sonali Bank of Bangladesh. The Letters of Credit were funded under USAID Letter of Commitment #388-W-007.

In mid-project (April 1980) it was determined that certain terms in the Letter of Credit were contrary to USAID policy. The Letters of Credit thereupon became invalid for procurement of Parts, but remained valid for Engineering and Technical Services. USAID established a Direct Reimbursement Authority (DRA) which was initially for parts only but later (when the Letters of Credit expired) was expanded to include payment for Services.

The Vinnell Corporation was paid directly by USAID for the construction of the Unit. In July 1980, an Imprest account, administered by SPA, was established at the Bank of America in San Francisco for payment to Vinnell for certain parts which required on an emergency basis.

As a result of the above modifications in payment procedures, and to provide for additional funds, USAID restructured the budget, so that in the latter stages of the project, all U.S. dollar costs were being paid by USAID under direct reimbursement procedures. The budget categories and amounts at the conclusion of the Project, based upon available records in Sverdrup's San Francisco office are:

1.	Vinnell-Construction Contract:		
	(a) Construction Contract	\$4,846,538.	
	(b) Amend No. 1-Delays	350,000.	
	(c) Amend No. 2	<u>3,467.</u>	
	Sub-Total Vinnell		\$5,200,005.
2.	Vinnell - Parts & Refurbishing:		
	(a) Co. #1 - Kaptai-Kobe	\$ 74,303.	
	(b) Co. #2 - Chittagong - Kaptai	3,500.	
	(c) Purchase-Parts (SPA/Vinnell)	<u>230,000.</u>	
	Sub-Total		307,803.
3.	Sverdrup & Parcel:		
	(a) Engineering Services	\$1,471,210.	
	(b) Procure Parts L/Comm C0702	156,500.	
	(c) Procure Parts DRA 7A04	<u>529,475.</u>	
	Sub-Total		2,157,185.

4.	Allis-Chalmers:		
	(a) Purchase - Parts	\$2,092,246.	
	(b) Services	727,000.	
	(c) Remachining (Kobe)	<u>582,800.</u>	
	Sub-Total		\$3,402,246.
5.	Miscellaneous:		
	(a) Bridge Crane Inspection	15,000.	
	(b) Procurement of tools (Fischbach & Moore)	<u>22,000.</u>	
	Sub-Total		<u>37,775.</u>
	TOTAL		\$11,105,014.

The budget amounts shown above have been compiled on the basis of SPA's best available knowledge as of the date of this report. Adjustments will undoubtedly be required to reflect additional factors such as the separate agreement between the PDB and Allis-Chalmers for services subsequent to December 5, 1981.

## FINANCING

GENERAL: The U.S. Dollar costs of the project were financed primarily by USAID under the terms of Loan Agreement #388-W-007. The costs of Bangladesh personnel and certain other in-country costs (e.g. per diem taka expenses of expatriate personnel) were funded in local currency by the PDB. Some Grant funds were also provided by USAID.

The funds available for purchase of certain replacement Parts, and for Sverdrup & Parcel services, were set by contractual agreement and therefore were monitored closely by SPA.

Knowledge of the complete terms of the agreement between the government of Bangladesh and USAID was not necessary for Sverdrup & Parcel's performance of its services, and therefore overall adherence to the terms of the loan agreement was not monitored by Sverdrup & Parcel.

ENGINEERING SERVICES: In 1976, at the beginning of the current project, a Letter of Credit in favor of Sverdrup & Parcel was established with the Bank of America in San Francisco acting as correspondent for the Sonali Bank of Bangladesh. The initial amount of the L/C was \$532,340.00. In February of 1979 the amount was increased by \$285,010, and in May of 1979 by an additional \$351,858.00. The ultimate amount was \$1,169,208.00. The Letter of Credit was for payment for Engineering Services and purchase of certain services-related equipment. The letter expired in November of 1981, at which time all but \$100.00 had been paid to Sverdrup & Parcel and Associates.

Upon expiration of the Letter of Credit, Sverdrup & Parcel and Associates' further services were invoiced to USAID under a Direct Reimbursement Authority. As of December, 1981, the date of this report, an additional \$95,318.30 had been invoiced under the DRA procedure.

The total cost of Sverdrup & Parcel and Associates services during the five years that the agreement was in effect were approximately:

Under Letter of Credit	\$1,169,108.00
Under Direct Reimbursement Authority	95,318.30
TOTAL	<u>\$1,264,426.30</u>

As of the date of this report, final charges were being processed through the Sverdrup & Parcel's accounting system which will increase the total shown above by approximately \$65,000.

REPLACEMENT PARTS AND SERVICES OF EQUIPMENT SUPPLIERS: In November of 1976 a Letter of Credit was established in favor of

Sverdrup & Parcel for the purchase of replacement parts for the Project, and for the services of Allis-Chalmers field representatives. The initial amount of the L/C was \$750,000. In November of 1977 it was increased by \$900,000 to a total of \$1,650,000.

The Letter of Credit expired on December 30, 1980 at which time the following amounts had been expended:

For replacement parts and Services supplied by Allis-Chalmers:	<u>\$1,599,772.76</u>
--	-----------------------

For replacement parts procured by Sverdrup & Parcel:	<u>\$148,544.50</u>
--	---------------------

In July of 1980, because of problems in the terms of the Letter of Credit for replacement parts, USAID established a Direct Reimbursement Authority for further purchase of parts. (Reimbursements for Allis-Chalmers services, as distinct from parts, continued to be made from the Letter of Credit until it expired in December of 1980. Payments made under the DRA increased the total amount paid to Allis-Chalmers for parts, services and freight as of December 4, 1981 to \$2,766,220.78.

As of the date of this report it is estimated that an additional amount of approximately \$200,000 will be required to pay Allis-Chalmers for services rendered but for which invoices have not yet been submitted.

PROCUREMENT OF PARTS BY VINNELL CORPORATION: In April of 1980 it became evident that certain replacement parts would be required on an urgent basis in order that construction of the unit not be delayed. An arrangement was therefore established by the PDB whereby the Vinnell Corporation (the construction contractor) would, upon approval by Sverdrup & Parcel on-site Project Manager, procure the parts and have them delivered to the Project. Pursuant to this arrangement, an Imprest Account, funded by a USAID advance payment, was established at the Bank of America in San Francisco, California. The account was administered by Sverdrup & Parcel and Associates, San Francisco office.

As of the date of this report, \$150,105.22 had been reimbursed to Vinnell for parts procured by them, and a fee of \$30,000 paid for their services resulting in a total of \$180,105.22. In addition, \$4,709.76 had been invoiced by them but not yet paid and it is estimated that approximately \$5,000 worth of parts had been purchased by Vinnell but not yet invoiced.

CONSTRUCTION: The contract with the Vinnell Corporation for installation of the unit was funded by USAID. Monthly progress payments were made upon submittal of invoices to the PDB. The invoices were certified by SPA in so far as confirming the degree of completion of

the work. Formal accounting of the invoicing and payments was not maintained by SPA, and SPA field records pertaining to the progress payments have not yet been released by the PDB. From information available at present, the contract amount, including Amendments 1 and 2, is U.S. \$5,200,005.41. The total amount paid is not known to SPA as of the date of this report.

PROJECT EXPENDITURES  
(U.S. Dollar Component)

Payments to the Vinnell Corporation for construction of the project were made directly to them by the PDB/USAID. SPA's records of these payments were not released by the PDB at the termination of SPA's contract; a precise accounting cannot, therefore, be presented in this Final Report. We believe, however, that such an accounting could be made from the records of USAID if not otherwise available to the PDB.

The Budget Items which were administered by Sverdrup & Parcel, and the amounts expended as of the date of this report, are:

<u>Budget Item</u>	<u>Budget Line</u>	<u>Budget Amount</u>	<u>Expenditures</u>
Purchase-Parts (SPA/Vinnell)	2-(c)	\$ 230,000	\$ 187,124 (*)
SPA:			
Engineering Services	3-(a)	1,471,210	1,335,606
Procure Parts L/Comm 00702	3-(b)	156,500	99,773
Procure Parts DRA 7A04	3-(c)	529,475	17,532
Subtotal		<u>2,157,185</u>	<u>1,452,911 (*)</u>
Allis-Chalmers:			
Purchase-Parts & Freight	4-(a)+(c)	2,675,246	2,240,415
Services	4-(b)	727,000	525,806
Subtotal		<u>\$3,402,246</u>	<u>\$2,766,221 (*)</u>

(\*) Figures shown are those actually billed as of the date of this report. Each of the firms involved (Sverdrup & Parcel, Vinnell Corporation and Allis-Chalmers) are currently accumulating accounting data preparatory to submitting final invoices.

## MAJOR IMPEDIMENTS TO PROGRESS OF THE WORK

During installation of the Karnafuli Third Unit several situations arose which resulted in unforeseen work, and additional time, being required for completion of the project. The major interruption was, of course, caused by the War of Independence. The consequences of this delay are discussed below.

### CORROSION

During the years between March of 1971 and August of 1976, many dedicated personnel of the PDB (whose identities are not known) took crucial, important steps to preserve much of the sensitive equipment which had been delivered to the site but which had not been installed in the protective environment of the power house. As an example of this foresight, the main power transformers had been maintained under a slightly pressurized nitrogen environment. Had this step not been taken, moisture would have caused corrosion of the internal components and rendered these expensive pieces of equipment useless. It is our understanding that, as of the date of this report, the unit has been operated at 30 MW for extended periods and for a short period at 50 MW; the transformers are apparently performing well.

Despite the success in protecting the transformers during the nine year hiatus, however, three other major components had been damaged by atmospheric corrosion to the degree that they were unusable. These items were:

- 1) The generator stator and its coils
- 2) The main generator thrust bearing
- 3) The guide bearing surfaces of the main turbine/generator shaft

1) Stator: The generator stator originally had been shipped in three segments. One segment had arrived at the site prior to March 1971 and had apparently been stored in the powerhouse. The other two segments, however, had been stored "offshore" (possibly Rangoon) for a period of approximately two years and were severely rusted. The stator coils had been mounted on all three segments at the factory.

It was first decided that the coils would be salvaged from the original segments and mounted on new laminations. It soon became apparent, however, that dismantling of the coils was, in some cases, causing damage to the insulation. As the final outcome, an entire new set of stator laminators and coils was purchased. The new stator was assembled in the powerhouse concurrently with other work and, in July of 1981, lifted into place in one piece.

2) Thrust Bearing: The problem of the main generator thrust bearing was also one of corrosion. Three sets of bearings, including both the runner and shoes, had been supplied as part of the original complement of equipment and were in storage at Kaptai. The bearings had been apparently stored outdoors or in an unprotected environment and although coated with grease the actual bearing surface had become pitted beyond the point where it could be repolished by locally available facilities.

The bearings had been manufactured originally by the Michelle Bearing Co. in England, and through special arrangements with Allis-Chalmers, two sets were returned to Michelle for refurbishing. The bearings were refurbished and returned to Chittagong but difficulties in processing them through customs resulted in their again being exposed to the weather for several weeks so that they became corroded beyond usable condition. There was little choice but to have them resurfaced again, so they were reshipped to Michelle. During the interim, however, Michelle indicated it had disposed of the necessary machine tools. Allis-Chalmers therefore had them transhipped to Kingsbury Bearing Co. in Philadelphia, Pennsylvania, where they were again resurfaced. One set was then shipped to the project by air, and the second set followed by sea. As of the date of this report, one set had been installed in the unit; a second refurbished set was in transit (possibly arrived on site but, if so, confirmation to Sverdrup & Parcel has not been made); and a third set, not yet refurbished, is in storage at the project.

3) Guide Bearings: The third major item of corroded equipment was the guide bearing surfaces on the main generator shaft. During an inspection made in November of 1973, light rusting of the bearing surfaces was noted. The bearing surfaces were cleaned and recoated with protective grease at that time; however, when it came time to install the shafts, it was found that corrosion had progressed to a degree such that remachining of the surfaces was mandatory. Because the dimensional tolerances of the bearing components are very critical, it was also necessary to remachine the matching non-rotating components. All of the parts to be remachined were shipped to Japan, the nearest location where the specialized machine-tools were available. The parts were returned to the site and installed in March of 1981, and further assembly of the unit resumed.

COIL FAILURE: Upon attempted energization of the unit on November 9, 1981, smoke was detected coming from the vicinity of the air-gap between the stator and the rotor; the unit was immediately shut down. An investigation indicated that the insulation on two stator coils was burned. Mr. T.L. Anderson, Sverdrup & Parcel Vice President, and Mr. R.M. Cattlin, Sverdrup & Parcel Project Manager, then consulted with the Power Board officials to determine a course of action for putting the the unit back on line. It was later determined that only one coil was burned and it is our understanding

that this coil has been bypassed and that unit has operated, for a short time, at full rated capacity without further damage to the stator. (The unit is being operated at reduced capacity, but the limitation is not due to the stator coil problem).

SHORTAGE OF PERSONNEL: Another factor affecting the implementation of the project was the construction contractor's failure to provide an adequate number of trained personnel to install, test and start the unit. At one point the contractor requested the PDB to relieve him of the responsibility for start-up. The PDB chose not to do so, but did provide certain personnel to assist.

## TERMINATION OF SVERDRUP & PARCEL AND ASSOCIATES/PDB CONTRACT

The contract between Sverdrup & Parcel and the PDB for Engineering Services expired, under its own terms, on December 5, 1981. On November 13, 1981, after the problems of the November 9th attempted start-up, Mr. Anderson discussed with Mr. A. Rahman (Member, G & T) of the PDB, the possibility of extending the contract until repairs were effected. The decision was made by the PDB not to extend the contract. Because no further work was planned prior to the December 5th termination date, Mr. Anderson directed Sverdrup & Parcel's representatives to assemble the project files in an orderly manner, deliver such of the files to the Board's Project Director as was appropriate, and to depart the site as soon as possible. Sverdrup & Parcel's Project Manager departed the site on November 20, 1981. Sverdrup & Parcel's job files had been packed for return to Sverdrup & Parcel's home office; however, as of the date of this report, they have not been forwarded to Sverdrup & Parcel.

## COMPLETION OF WORK UNDER THE CONTRACT

With submittal of this report, Sverdrup & Parcel has completed its services under the terms of the August 26, 1976 Agreement, as amended, relative to the Karnafuli Third Unit.

As a consequence of delays in construction, together with the PDB's decision to not extend SPA's contract beyond December 5, 1981, SPA was unable to be present at the final commissioning of the Karnafuli Third Unit. SPA did, however, provide consulting services during the pre-commissioning testing and, except for the privilege of being present when the unit was released for commercial operation has completed all items in the Scope of Services contained in the Contract dated August 26, 1976 and its subsequent amendments.

Three items of Service, were, under the terms of the contract, to be submitted after completion of the Project. These were:

- 1) Prepare an Operations and Maintenance Manual (Contract Section 1.3.2)
- 2) Revise the construction tracings to show as-built conditions. (Contract Section 1.3.3)
- 3) Submit a final report with certification of the suitability of the Project for final acceptance.

Items #1 and #2 were transmitted to the PDB by letters dated December 17, 1981.

In respect to item #3, this Final Report cannot include a certification of suitability for Final Acceptance because the PDB elected to let SPA's contract expire, and thereby terminated SPA's services, a few days prior to placing the unit in commercial operation. Section 1.2.13 of the contract anticipated the possibility that SPA might be unable to so certify. As required by that Section, however, SPA did, prior to termination of its services, explain the specific reasons why the unit was not acceptable and recommended steps to be taken to place the unit in operation. It is our present understanding that the unit is now in operation but our responsibility to certify the unit at a future date has been abrogated by the PDB's decision to dispense with our services during the period of final modifications.

## SUMMARY

Despite the difficulties encountered during the fourteen years that were required to complete the project; difficulties which included armed conflict, a change of government, severe climatic conditions (causing corrosion of stored equipment), changes in philosophy regarding construction contracting, changes in funding procedures, shortages of skilled craftsmen, inadequate staffing by the construction contractor and possible sabotage during start up, the Karnafuli Third Unit is now operating on a continuous basis and limited in capacity only by an apparently remediable lubrication problem in the thrust bearing. Although all concerned would have desired that the project be implemented in a more normal manner, Sverdrup & Parcel takes pride in having overcome these problems and succeeded in adding this valuable project to the economic well-being of the People's Republic of Bangladesh.