

ORIGINAL DIRECT

N. Nekrassoff-Ceccatto/lk

Mr. Vladimir Baum, Director
Resources and Transport Division

3 April 1974

TE 210 (2) IBRD

RECORDS CONTROL
APR 11 1974

Nicolas V. Gleboff, Acting Deputy Director
Europe, Latin America and Interregional Projects Branch
Office of Technical Co-operation

HAITI - Assistance technique au secteur transports
HAI-74/006/A/01/42

-
1. Please find attached one copy of a project summary concerning the above request.
 2. Although this particular project does not seem to appear as described in the Country Programme for Haiti for the period 1973/1977, we feel that it might be the result of a modification of project "HAI-72/008, Engineering and feasibility study of the northern road, Port-au-Prince/Cap Haitien" listed under the sector "Transport and communication". The IBRD is being proposed as Executing Agency.
 3. We would appreciate receiving your comments by 15 April 1974.

ORIGINAL DIRECT

N. Nekrassoff-Ceccatto/lk

Mr. Simos Vassiliou, Assistant Director-in-charge
Development Planning Advisory Services, CDPFP

3 April 1974

TE 210 (3) IBRD

Nicolas V. Gleboff, Acting Deputy Director
Europe, Latin America and Interregional Projects Branch
Office of Technical Co-operation

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ORIGINAL DIRECT

2 April 1974

Mr. M. Doo Kingué, Assistant Administrator
And Director, Regional Bureau for Africa
United Nations Development Programme

Robert J. Crooks, Director
Office of Technical Co-operation, ESA

MAURITIUS: MAR/73/007 - Quatre Soeurs Hydro Power Project

1. With reference to Mr. Saunders' memorandum of 7 March 1974, we are pleased to offer the following comments on the abovementioned project.

2. The supporting information given with the above request does not provide any figures of maximum demand and it is, therefore, not possible to assess a date when the proposed new hydro power station will be needed on the electricity supply system of Mauritius. Drawing No. 2149, attached to the request, indicates plant commissioning for the latter part of 1977, but the timing shown on this drawing is in error since the working period allotted to the hydraulic engineer is shown as the first three months of 1974. Because of recruitment problems, it will be difficult to arrange the arrival of experts in Mauritius before the beginning of 1975. This matter should be brought to the attention of the Central Electricity Board since such a delay may affect their forward planning.

3. In view of the present dependence of the electricity supply sector upon diesel power, a further diversification towards hydro power seems to be basically a good idea, particularly in view of recent increases which have taken place in diesel oil prices. A certain local competence appears to exist in hydro development, since a 10 MW power station was commissioned at Ferney in 1971 by the Board's engineers and local civil engineering contractors. In these circumstances, it seems reasonable that the Government should only request the assistance of three United Nations experts. Since all phases of the project will be controlled and directed locally, and that considerable inputs will be provided by the Central Electricity Board, we suggest that the project might best be fulfilled by the provision of experts on an OPAS basis. This would have the advantage that the experts would be under the direct control of the CEB and integrated in the closest possible manner with the local project activities. A further advantage would be that the IPF burden would be reduced, since some of the expense would be absorbed by the CEB, which is doubtless a commercially-oriented organization with operational revenues at its disposal.

4. After the basic design parameters have been fixed for the project and reasonable estimates have been formulated for the various cost items, there will be a need, finally, to evaluate the overall economics of the scheme against available alternatives. We, therefore, believe that the services of an economist would be useful at this stage, and, subsequently, to assist in approaching potential sources of finance for the project.

5. Since Mauritius is a volcanic island, there is a possibility that it may have exploitable resources of geothermal energy. We have very little information available on this subject, but should be glad to comment further if we could be provided with details of any local hot spring occurrences.

KH

c.c. Mr. Baum
Mr. Radovic
Mr. John Birt, Resident Representative, Mauritius

UNITED NATIONS
DEVELOPMENT PROGRAMME



866 UNITED NATIONS PLAZA
NEW YORK, N.Y. 10017

PROGRAMME DES NATIONS UNIES
POUR LE DEVELOPPEMENT

RECEIVED
1 - MAY 1974
28 MAR 1974

INTEROFFICE MEMORANDUM

TO: Mr. Robert Crooks, Director,
Office of Technical Co-operation

FROM: Michel Doo Kingué, Asst. Administrator
and Director, Regional Bureau for Africa

SUBJECT: MAR/73/007 - Hydro Power Project

Date: 26 March 1974
PR/SECTION FOR AFRICA/OTC
DP/MAR/73/007

SENDER'S TELEPHONE EXTENSION: 5245

1. Please refer to our memo of 7 March under cover of which we submitted to you a project proposal for the above-referenced project. We have now received a complete Project Document from the Resident Representative, a copy of which is attached to this memo. We should be grateful for your comments on this Project Document. Please note that it includes several elements which were not conveyed in the earlier tentative proposal.

2. A decision on the executing agency for the project has not yet been taken, notwithstanding the indication on the covering page of the Project Document that the IBRD is to be the executing agency.

C.C. given to Subba Rao/Bradbury for comments
2 April 1974

C.C. Zelleke 2/April/74.

UNITED NATIONS DEVELOPMENT PROGRAMME

Project of the Government of
MAURITIUS

Title: Quatre Soeurs Hydro Electric Scheme

Number: MAR/73/007/A/01/42

Sector: Natural Resources

Duration: Eleven months

Subsector: Electric Power

Government Co-operating Agency:
Central Electricity Board

Executing Agency:
International Bank for
Reconstruction and
Development (IBRD)

Date of Submission:

Starting Date: 1 July 1974

Government contribution: 392,500
(Rupees)

UNDP contribution: 100,000
(US Dollars)

Approved: _____
on behalf of the Government
(signature)

Date _____

on behalf of Executing Agency
(signature)

Date _____

on behalf of UNDP
(signature)

Date _____

I. BACKGROUND AND SUPPORTING INFORMATION

1. Justification for the project

The implementation of a hydro electric scheme on Grand River South East forms part of the Country's objectives for Power Development and research for optimal use of water power as a complementary element and economical competitor to additional power production by diesel-driven generating sets requiring the importation of fuel oil into the country.

The proposed Scheme would make use of part of the vast catchment area of Grand River South East, 65 sq. miles located between the isoyetal lines of 3,000 mm. (120 inches) and 4,500 mm. (180 inches) of annual rainfall. The flow of Grand River South East and its main tributary, Deep River, is gauged near the outlet to the sea, that is downstream of all abstractions for irrigation etc... These river gaugings show that there is some 8,800 million cubic feet of water being discharged into the sea every year. The concept of a scheme for impounding the surplus waters of Grand River South East and using same for the generation of electrical energy is obviously justified in the cadre of the national 5-year plan for development of our natural resources. The power that would be produced in the Beau Champ area would easily be injected into the island power grid by the construction of an H.T. Transmission Line of 22kV from the proposed Quatre Soeurs power station to FUEL near Centre de Flacq with connections to the existing Ferney-Flacq H.T. line and to distribution power lines in the Beau Champ area.

From Ferney area, south of Quatre Soeurs, the existing 22kV H.T. line to Wooton major sub-station in the centre of the Island, will be converted into a 66kV H.T. line with the object of conveying the power generated at Ferney Station together with part of the electrical energy from the proposed Quatre Soeurs Power Station to central distributing sub-stations.

The harnessing of waterpower potential on G.R.S.E. would thus complete the development of hydro electric schemes in the south-eastern quadrant of Mauritius, viz. the Ferney hydro power station of 10 MW capacity on River des Créoles, coupled to the Grid in 1971 and the Eau Bleue Power Station of 4MW capacity coupled to the Grid in 1962.

2. Institutional Framework

The Central Electricity Board was set up in Mauritius in 1952. In the year 1956 the Board took over the General Electric Supply Company, the largest privately-owned Power Company in the Island. The Board was then onwards totally in charge of Power Production and Development in Mauritius.

The Central Electricity Board is a para-statal body run by a Board approved by Government. The General Manager is on the Board and is in charge of the Organization.

Financial

In 1972 the Net Book Value of the Board's Assets amounted to Rs. 93 million; the turnover was Rs. 30 million and the Return on Average Net Fixed Assets in operation was 8.62%

	<u>1971</u>	<u>1972</u>	<u>1973 (estimated)</u>
Sales in CWh	120.54	135.22	154.6
Average Selling Price per kWh (cents)	21.14	20.99	-

Personnel

On the 31st December 1972 the number of Staff Employees was 489, workers 782, apprentices and trainees 52, making a total personnel of 1,323 in number.

Production and Load Growth

<u>Year</u>	<u>Forecast</u> <u>GWh</u>	<u>Actually</u> <u>Generated</u> <u>GWh</u>
1970		135.99
1971	145	148.19
1972	157	164.26
1973	181.5	186.81

The forecast generation for 1973 based on average climatic conditions is as follows:

Hydro Units	73.5 GWh, i.e. 40%
Thermal Units	83.0 GWh, i.e. 46%
Units purchased from Sugar Factories	25.0 GWh, i.e. 14%
Total Forecast	<u>181.5 GWh</u>

With the industrialisation of Mauritius, setting up of the Free Export Zones (Coromandel Industrial Zone, etc.) the power demand is at present a very pressing problem for the Central Electricity Board.

The general trend of the load Growth in 1973 is of the order of 13%.

The Board is actually augmenting its Plant Availability mainly through the addition of more Diesel-Driven Generating Sets in the Port Louis region. However, the studies of potential Hydro-Electric Power are being accelerated so as to exploit our natural resources, especially in view of the steadily increasing cost of fuel oil imported in Mauritius.

Actual Power Plant Capacity and Mode of Generation

Central Electricity Board

Thermal diesel-driven power plants:

	<u>Installed Capacity</u>	<u>Augmentation by the end of 1973</u>
St. Louis Power Station	16,000 kW	
Fort Victoria	<u>12,000 kW</u>	<u>12,000 kW</u>
		40,000 kW

Both Stations located near Port Louis.

Hydro Power Stations

Located island-wide, and more specifically
in centre, west and south and south east regions

Total capacity CEB 25,000 kW

By the end of 1973 65,000 kW

Sugar Factories Power Plant:

Total capacity 13,500 kW

TOTAL PLANT CAPACITY 66,500 kW

By the end of 1973 78,500 kW

Power Development

Engineering studies including both field investigations and design work for both Thermal and Hydro-Electric development are carried out departmentally under the general directions of the General Manager and Deputy General Manager. The development studies are more specifically carried out by the Generation Engineers (Thermal and Hydro).

The development work for Hydro-Electric power which includes the main objective of this request for the proposed Quatre Soeurs Hydro-Electric Scheme, will be carried out by local counterparts to overseas technical experts:

3. Provisions for Government follow-up

This is a project with Investment potential. If recommended, investment will possibly amount to around US \$6 million, for which external capital assistance will be sought (see Advance Valuation in Annex)

4. Other related activities

None

5. Future UNDP Assistance

Technical assistance might be required during the implementation of the scheme as follows:

- (a) One Design Engineer would be required for finalising the design of the new 22kV H.T. Transmission line and ancillary structures proposed from Quatre Soeurs to FUEL, near Centre de Flacq.
- (b) One Civil Engineer and a Quantity Surveyor would be required during the period of Implementation of the Scheme for Site Management and supervision in collaboration with Mauritian counterparts.
- (c) A Pipe-line Erector would be required for supervision of erection of the proposed steel pressurepipeline of 75 inches diameter (1,90 metre).
- (d) A Machine Erector from the overseas suppliers could take charge of the erection of the generating sets and ancillaries.

II. OBJECTIVES OF THE PROJECT

This project has been identified within the 1973 Country Programme Review, and subsequently approved in principle. Funds have been earmarked there for.

Long-range objectives

The generation of Hydro-Electric Power through the implementation of a project on G.R.S.E. Power through the implementation of a project on G.R.S.E. with a power station near Quatre Soeurs Village on the South Eastern Coast which will export electrical energy on the national inter-connected Power Grid.

Immediate Objectives

The follow-up of topographical surveys and hydrological studies, being now carried out as departmental development work, by a Feasibility Study carried out by technical experts. The proposed phasing of this Feasibility Study is shown further on. It will be noted that a first feasibility Report would be required after five months of investigations and that the final Feasibility and Valuation Report would be required at the end of the engineering studies with the object of drafting working drawings and contract documents.

III. WORK PLAN

A. Description of Project Activities

Grand River South East will be impounded at about Elevation 325ft. above sea level and 0.57 miles (about 1 km) N.N.W. of Mount le Chat. The dam will be about 2,000 ft. in length and 50 ft. high. Intake works will be located on the right-hand bank and will lead to a tunnel some 1,500 ft. long, driven through the mountain to a surge shaft located on the 350 ft. contour line in the Quatre Soeurs Valley. From the surge shaft water will be conveyed by a high pressure steel pipeline, about 2,900 ft. long, to a power station situated near Quatre Soeurs Village at about Elv. 20 ft. and about 800 ft from the actual coastline.

Topographical field-work and hydrological studies are presently being carried out. The parameters of the Project are still undefined but the following preliminary assessment would give the main indications for water availability and power output to be expected from the Scheme.

The average annual yield of G.R.S.E. and its main tributaries Deep River, has been assessed to be of the order of 8,800 M.C.F., exclusive of existing water abstractions and of relatively large floods outside the range of the automatic flow recorder. If the following conditions and parameters could be found feasible for the Scheme, viz:-

- (a) Part of the waters of Deep River be diverted into G.R.S.E. in the region of Belle Rive - La Commune.
- (b) A storage of some 100 million cubic feet capacity be provided by the proposed dam at Elv. 325 ft.
- (c) About 90% of surplus waters of G.R.S.E. plus part of Deep River be considered as mean annual utilizable river yield.
- (d) Installed capacity be of 10 MW at proposed power station.

Then the theoretical annual output would be of the order of 29GWh of electrical energy.

B. Description of UNDP inputs

It is intended to continue departmental work for surveying, river gauging and hydro-electric feasibility studies.

Expertise that is proposed to be carried out by specialists engineers under the United Nations Development Programme has been divided into three phases as shown on attached chart.

Phase A: 1 Hydrologist Engineer to check upon departmental design and to go further studying water availability, if required, using simulation methods (three months).

Phase B: 1 Civil Engineer for about four months assisted by one assistant civil engineer. The C.E. to be experienced in soil and site investigations, interpretation of drilling results, preliminary design of cut-off walls and grouting works.

The assistant C.E. to help the C.E. and to draft advance estimates for structures and overheads for the Scheme.

Note that the first Feasibility Report should be submitted to the CEB Board four months after the arrival of abovementioned expert.

Phase C: 1 Design Engineer experienced in hydro electric scheme to finalise details of Works, draft specifications, contract documents for international tendering and submit final valuation of the scheme to the Board (six months)

1 Assistant Design Engineer to help the design engineer in all his duties, especially those of Quantity Surveying.

Note that the final report and tender documents should be ready eleven months following the arrival of the experts. The ordering of plant and equipment, the design of which will still rely largely on the Board's Engineers, could be placed sometime before calling for tenders for the main civil engineering works.

c. Description of Government inputs

The CEB staff will work in close liaison with the experts, and logistical assistance will be provided as necessary.

All the necessary equipment will be supplied.

ANNEX

ADVANCE VALUATION

Quatre Soeurs Scheme

The following estimates have been worked out according to 1973 prices. A Financial Contingency has been indicated over and above the estimate so as to actualise the valuation for the implementation period, that is, about October 1975 to the end of 1977.

<u>Items</u>	<u>Million Rupees</u>
1. Dam and Intake Works	6.900
1a. Land Acquisition (Reservoir area)	1.600
2. Tunnel and Surge Shaft	2.033
3. Steel penstock and valves, concrete supports and erection	3.473
4. Power Station, substation structures, Tailrace and Related Works	1.100
4a. Land Acquisition for P/Stn, pipe track, tailrace	0.048
5. Generating sets (2 No. 5 MW), switchgear and elec. equipment (stn. & sub/stn.), travelling crane and erection of all plant	3.500
6. Deep River diversion works	0.490
7. Surveys, exploratory drillings; departmental supervision and overheads (Feasibility and Construction periods)	0.458
	<hr/>
SUB TOTAL	19.602
Technical Contingency	1.960
	<hr/>
SUB TOTAL	21.562
	<hr/>
Financial Contingency	5.217
	<hr/>
Advance Estimated TOTAL	26.779
	<hr/>

COMPLEMENTARY INSTALLATIONS
(transmission lines and substations)

Section A: 22 kV link between GRSE Power Station to FUEL Substation

1. Installation of outdoor 6.6/22kV substation at GRSE; includes the installation of two transformers and control equipment for four outgoing feeders. (The cost of the transformers are not included as the equipment is to be transferred from Ferney to GRSE)	Rs 300,000
2. Extension of 22kV substation at FUEL; includes civil works and additional control equipment.	Rs 200,000
3. Erection of a Double Circuit 22kV line from GRSE to FUEL. Approximately 9 miles of line.	Rs 1,400,000
SUB TOTAL	Rs 1,900,000

Section B: Conversion of Ferney - Wooton Link from 22kV to 66kV operation.

1. Erection of a 66kV substation at Ferney; includes the installation of three transformers and associated switchgear	Rs 1,730,000
2. Connection of the Ferney - Wooton Link to the 66kV busbars at Wooton: includes the installation of control equipment.	Rs 170,000
SUB TOTAL	Rs 1,900,000
TOTAL	Rs 3,800,000

(Estimated cost based on 1973 prices)

Contingencies to cover expected price increases by 1975	Rs 1,900,000
	Rs 5,700,000

[illegible]

Project Budget Covering UNDP Contribution
(in US Dollars)

COUNTRY: Mauritius

PROJECT NO.: MAR/73/007/A/01/42

PROJECT TITLE: Quatre Soeurs Hydro Electric Scheme

		m/m	<u>TOTAL</u> \$	m/m	<u>1974</u> \$	m/m	<u>1975</u> \$
20	SUB-CONTRACT COMPONENTS						
21	Sub-contracts (estimates of actual costs)						
21-01	Hydrologist Engineer	3	12,000	3	12,000		
o02	Civil Engineer	4	16,000	4	16,000		
-03	Civil Engineer Assistant	4	16,000	4	16,000		
-04	Design Engineer	6	24,000	2	8,000	4	16,000
-05	Design Engineer Assistant	6	24,000	2	8,000	4	16,000
29	Component total	23	92,000	15	60,000	8	32,000
40	EQUIPMENT COMPONENT						
41	Expendable equipment		5,000		5,000		
49	Component total		5,000		5,000		
50	MISCELLANEOUS COMPONENT						
53	Sundry		3,000		3,000		
59	Component total		3,000		3,000		
99	GRAND TOTAL		100,000		68,000		

Project Budget Covering Government Contribution
(in Mauritian Rupees)

COUNTRY: Mauritius

PROJECT NO.: MAR/73/007/A/01/42

PROJECT TITLE: Quatre Soeurs Hydro Electric Scheme

		<u>Total</u>		<u>1974</u>		<u>1975</u>
	m/m	Rs.	m/m	Rs.	m/m	Rs.
10	PROJECT PERSONNEL COMPONENT					
15-01	Engineer	11 55,000	7	35,000	4	20,000
-02	Assistant and Technicians (2)	3/33 82,500	21	52,500	12	30,000
-03	Land Surveyor	11 33,000	7	21,000	4	12,000
19	Component total	5/55 170,500	35	108,500	20	62,000
40	EQUIPMENT COMPONENT					
42	Non-expendable component	200,000		150,000		50,000
49	Component total	200,000		150,000		50,000
50	MISCELLANEOUS COMPONENT					
53	Sundry	22,000		14,000		8,000
59	Component total	22,000		14,000		8,000
99	GRAND TOTAL	392,500		272,500		120,000

UNITED NATIONS



NATIONS UNIES

INTEROFFICE MEMORANDUM

MEMORANDUM INTERIEUR

TO: Mr. R. J. Crooks, Director
A: Office of Technical Co-operation, ESA

DATE: 22 March 1974

THROUGH:
S/C DE:

FROM: Vladimir Baum, Director
DE: Resources and Transport Division, ESA

SUBJECT: MAURITIUS: MAR/73/007 - Quatre Soeurs Hydro Power Project
OBJET:

The supporting information given with the above request does not provide any figures of maximum demand and it is, therefore, not possible to assess a date when the proposed new hydro power station will be needed on the electricity supply system of Mauritius. Drawing No. 2149, attached to the request, indicates plant commissioning for the latter part of 1977, but the timing shown on this drawing is badly in error since the working period allotted to the hydraulic engineer is shown as the first three months of 1974.

Clearly, if the normal United Nations procedure is adopted for the provision of the necessary experts, it will be difficult to send the first one to Mauritius before the beginning of 1975. This matter should be brought to the attention of the Central Electricity Board since such a delay may badly affect their forward planning.

In view of the present dependence of the electricity supply sector upon diesel power, a further diversification towards hydro power seems to be basically a good idea, particularly in view of recent increases which have taken place in diesel oil prices. A certain local competence appears to exist in hydro development, since a 10 MW power station was commissioned at Ferney in 1971 by the Board's engineers and local civil engineering contractors. In these circumstances, it seems reasonable that the Government should only request the assistance of three United Nations experts. Since all phases of the project will be controlled and directed locally, and that considerable inputs will be provided by the Central Electricity Board, we suggest that the project might best be fulfilled by the provision of experts on an OPAS basis. This would have the advantage that the experts would be under the direct control of the CEB and integrated in the closest possible manner with the local project activities. A further advantage would be that the IPF burden would be reduced, since some of the expense would be absorbed by the CEB, which is doubtless a commercially-oriented organization with operational revenues at its disposal.

After the basic design parameters have been fixed for the project and reasonable estimates have been formulated for the various cost items, there will be a need, finally, to evaluate the overall economics of the scheme against available alternatives. We, therefore, believe that the services of an economist would be useful at this stage and, subsequently, to assist in approaching potential sources of finance for the project.

Since Mauritius is a volcanic island, there is a possibility that it may have exploitable resources of geothermal energy. We have very little information available on this subject, but should be glad to comment further if we could be provided with details of any local hot spring occurrences.

Mr. Lao

Would you
please look
into this
and give us
the benefit
of your advice?

Some urgency
attaches to this.
I am referring to
informally to save
time. Sincerely

UNITED NATIONS
DEVELOPMENT PROGRAMME



866 UNITED NATIONS PLAZA
NEW YORK, N.Y. 10017

PROGRAMME DES NATIONS UNIES
POUR LE DEVELOPPEMENT

INTEROFFICE MEMORANDUM

TO: Mr. Bahgat El-Tawil, Acting Director
Office of Technical Co-operation

FROM: John M. Saunders, Officer-in-Charge
Regional Bureau for Africa

SUBJECT: MAR/73/007 - Hydro Power Project

Date: 7 March 1974

FILE NO.: DP/MAR/73/007

SENDER'S TELEPHONE EXTENSION: 5245

1. In the context of the 1973 annual review of the Mauritius Country Programme, the Government requested that a new project proposal be added to the list of projects contained in the original Country Programme for Mauritius. The Country Programme for Mauritius has a small financial reserve in it and it is proposed to finance such a project out of this reserve.

2. Preliminary discussions have been held with the Government and Mauritius Central Electricity Board, in order to define an initial project proposal. As a result of these discussions, a very preliminary draft of a project proposal has been prepared by the Central Electricity Board, a copy of which is attached. We should like to stress that this Document is a very preliminary one and that considerable work will be required on it before it can be finalised into a full Project Document. Before proceeding any further with the Document we should like to have the benefit of any technical comments you may have on it. Please bear in mind that at this stage no executing agency for the project has been designated by UNDP, notwithstanding the indication in the document that the executing agency is the IBRD.

3. As we are anxious to move ahead with the preparation of more detailed proposals for this project, we should be grateful if you would give priority attention to it so that we can receive your comments as soon as possible.

B/F 24 March

RECEIVED
650
MAR 13 1974

OTC

CENTRAL ELECTRICITY BOARD

Request to the U.N.D.P. (Mtius)

for

Technical Financial and for Feasibility Studies

for an

Hydro-Electric Project in the

GRAND RIVER SOUTH EAST - QUATRE SOEURS REGION

Title : Quatre Soeurs Hydro Electric Scheme
Duration : (Feasibility Studies) approx. 2 years
Sector : Central Electricity Board
Development of Hydro Electric Power
Executive Agency : I.B.R.D.

1. INSTITUTIONAL FRAMEWORK

The Central Electricity Board was set up in Mauritius in 1952. In the year 1956 the Board took over the General Electric Supply Company, the largest privately-owned Power Company in the Island. The Board was then onwards totally in charge of Power Production and Development in Mauritius.

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Financial

In 1972 the Net Book Value of the Board's Assets amounted to Rs 93 million; the turnover was Rs 30 million and the Return on Average Net Fixed Assets in operation was 8.62%.

	<u>1971</u>	<u>1972</u>	<u>1973(estimated)</u>
Sales in GWh	120.54	135.22	154.6
Average Selling Price per kWh (cents)	21.14	20.99	-

Organization and Personnel

A general organization Chart attached hereto (Annex) shows the details of high administration and departmental organization. A copy of the Annual Report for 1972 is attached herewith (Annex) and shows the names of Board Members, General Manager, Deputy General Manager, and Heads of the seven Departments as well as the higher staff.

On the 31st December 1972 the number of Staff Employees was 489, workers 782, apprentices and trainees 52, making a total personnel of 1,323 in number.

Production and Load Growth

<u>Year</u>	<u>Forecast GWh</u>	<u>Actually Generated GWh</u>	<u>Actually Exported GWh</u>
1970		135.99	133.86
1971	145	148.19	145.72
1972	157	164.26	161.73
1973	181.5	186.81	184.1 (app.)

Total electrical energy generated this year and up to 30th of June 1973 is

90.47 GWh, of which:

Units by Hydro-Electric Mode : 46.71 GWh = 52.3%

Units by Diesel-Driven Sets : 43.65 GWh = 47.5%

Units purchased by C.E.B. from power generated
by Sugar Factories during crop time

(mid June to November) : 0.13 GWh = 0.2%

The forecast generation for 1973 based on average climatic conditions is as follows:-

Hydro Units	73.5 GWh, i.e. 40%
Thermal Units	83.0 GWh, i.e. 46%
Units purchased from Sugar Factories	25.0 GWh, i.e. 14%
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Actual Power Plant Capacity and Mode of Generation
Central Electricity Board

Thermal diesel-driven power plants:

	<u>Installed Capacity</u>	<u>Augmentation by end of 1973</u>
St. Louis Power Stn	16,000 KW	
Port Victoria	12,000 "	12,000 KW
		40,000 KW

Both Stations located near Port Louis.

Hydro Power Stations

located island-wide, and more specifically
in centre, west & south & south E. regions

Total Capacity Hydro	25,000 kW
----------------------	-----------

Total Capacity C.E.B.	53,000 kW
-----------------------	-----------

By end of 1973	65,000 kW
----------------------	-----------

Sugar Factories Power Plant:

Total Capacity	13,500 kW
----------------	-----------

TOTAL PLANT CAPACITY	66,500 kW
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By end of 1973	78,500 kW
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Power Development

Engineering studies including both field investigations and design work for both Thermal and Hydro-Electric development are carried out departmentally under the general directions of the General Manager and Deputy General Manager (refer to 1972 Annual Report for names and professional status). The development studies are more specifically carried out by the Generation Engineers (Thermal and Hydro) - refer to Annual Report of 1972 for names and professional status.

The development work for Hydro-Electric Power which includes the main objective of this request for the proposed Quatre Socurs Hydro-Electric Scheme, will be carried out by the under-mentioned local counterparts to overseas technical experts:

Mr. R. Vigier de Latour, B.Sc., C. Eng., M.I.C.E.
assisted by Mr. Serge Sakir, Member Mauritius Institute of Surveyors,
Certificate in Hydraulics (1st class).

QUATRE SOEURS HYDRO-ELECTRIC SCHEME

2. OBJECTIVES OF THE PROJECT

(a) Long Range Objectives

The generation of Hydro-Electric Power through the implementation of a project on G.R.S.E. with a power station near Quatre Socurs Village on the South Eastern Coast which will export electrical energy on the national interconnected Power Grid.

(b) Immediate Objectives

The follow-up of topographical surveys and hydrological studies being now carried out as departmental development work by a Feasibility Study carried out by technical experts from overseas appointed by the Executive Agency. The proposed phasing of this Feasibility Study is shown on attached diagram (Annex). It will be noted that a first Feasibility Report would be required before the end of the first year of investigations, that the final Feasibility and Valuation Report

would be required in the second half of the second year of the engineering studies with the object of drafting working drawings and contract documents after some twenty months of study and design work.

3. JUSTIFICATION FOR THE PROJECT

The implementation of a hydro electric scheme on Grand River South East forms part of the Board's objective mentioned above for Power Development and research for optimal use of water power as a complementary element and economical competitor to additional power production by diesel-driven generating sets requiring the importation of fuel oil into the country.

The proposed Scheme would make use of part of the vast catchment area of Grand River South East, 65 sq. miles located between the isoyetal lines of 3,000 mm. (120 inches) and 4,500 mm. (180 inches) of annual rainfall. The flow of Grand River South East and its main tributary, Deep River, is gauged near the outlet to the sea, that is downstream of all abstractions for irrigation etc... These river gaugings show that there is some 3,800 million cubic feet of water being discharged into the sea every year. The concept of a scheme for impounding the surplus waters of Grand River South East and using same for the generation of electrical energy is obviously justified in the cadre of the national 5-year plan for development of our natural resources. The power that would be produced in the Beau Champ area would easily be injected into the island power grid since there is the high tension line of 22 kV leading from Beau Champ to a future 66 kV line will carry the power to the region of Port Louis while the existing 22 kV grid will distribute power throughout the northern part of Mauritius. From Ferney area the 66 kV line would carry power to the central major substation of Mooton near Curepipe while existing 22 kV lines would distribute power throughout the southern part of the island.

The harnessing of water power potential on G.R.S.E. would thus complete the development of hydro electric schemes in the south-eastern quadrant of Mauritius, viz. the Ferney hydro power station of 10 MW capacity on Rivier des Créoles, coupled to the Grid in 1971. It seems relevant to note that the Ferney Scheme had been designed exclusively by the Board's Engineers and implemented by Mauritian civil engineering contractors.

4. DESCRIPTION OF PROJECT

Grand River South East will be impounded at about Elevation 300 ft above sea level and 0.57 miles (about 1 km) N.N.W. of Mount Le Chat. The dam will be about 1,200 ft in length and 50 ft high. Intake Works will be located on the right-hand bank and will lead to a tunnel some 1,500 ft long, driven through the mountain to a surge shaft located on the 300 ft

contour line in the Quatre Soeurs Valley. From the surge shaft water will be conveyed by a high pressure steel pipeline, about 2,900 ft long, to a power station situated near Quatre Soeurs Village at about Elv. 25 ft and about 1,000 ft from the actual coastline.

Topographical field-work and hydrological studies are presently being carried out. The parameters of the Project are still undefined but the following preliminary assessment would give the main indications for water availability and power output to be expected from the Scheme.

The average annual yield of G.R.S.E. and its main tributaries, Deep River, has been assessed to be of the order of 8,800 M.C.F., exclusive of existing water abstractions and of relatively large floods outside the range of the automatic flow recorder. If 30% of the flow be deducted as an estimate of the yield of Deep River and, further, if only 65% of the remaining volume be taken into consideration because the flash flood conditions and loss by spilling, the resulting utilizable yield from G.R.S.E. would be of the order of 4,000 M.C.F. per annum. With an average working head of 250 ft, the theoretical annual output would be approximately 20 GWh of electrical energy.

Reconnaissances in the project area have been shown that there exists a possibility for the diversion of surplus waters of the Deep River to G.R.S.E. by a relatively short aqueduct in the region of Belle Rive - La Commune. Further investigations would show whether such diversion works are feasible and give indications of any additional power potential.

5. WORK PLAN

It is intended to continue departmental work for surveying, river gauging and hydro-electric feasibility studies.

Expertise that is proposed to be carried out by specialists engineers under the United Nations Development Programme has been divided into three phase as shown on chart for Development Projects (Annex).

Phase A: 1 Hydrologist Engineer to check upon departmental design and to go further studying water availability, if required, using simulation methods.

Phase B: One Civil Engineer for about four months assisted by one associate expert. The C.E. to be experienced in soil and site nary design of cut-off walls and grouting works. The associate to help the C.E. and to draft advance estimates for structures and overheads for the Scheme.

Note that the first feasibility Report should be submitted to the Board about seven months after the arrival of above mentioned expert.

Phase C: One design Engineer experienced in hydro electric scheme to finalise details of Works, draft specifications, contract documents for international tendering and submit final valuation of the scheme to the Board.

One associate expert to help the design engineer in all his duties, especially those of Quantity Surveying.

Note that the final report and tender documents should be ready after about thirteen months following the arrival of experts. The ordering of plant and equipment, the design of which will still rely largely on the Board's Engineers, could be ordered sometime before calling for tenders for the main civil engineering works.

Notes referring to Development Projects Chart and Foreign Expertise

- (a) The participation of an Economist has not been indicated on the Chart, but it is understood that the U.N.D.P. would be prepared to appoint such a professional expert to assist in approaching potential sources of finance for the Scheme by providing high level advisory services.
- (b) Technical Aid during the Implementation has not been indicated on the Chart. The Board has professional and technician engineers for the supervision of construction. However, it may be of great help if a Civil Engineer and a Quantity Surveyor could be lent by the Executive Agency for full time management and supervision of the Construction Site over a period of about two and a half months.
- (c) It would further be appreciated if a machine erector from overseas suppliers could take charge of the erection of generating sets, his professional fees being procured by the Executive Agency and the local costs being paid by the Board.

6. ADVANCE VALUATION

The following estimates have been worked out according to 1973 prices. A Financial Contingency has been indicated over and above the estimate so as to actualise the valuation for the implementation period, that is mid 1976 to the end of 1978.

<u>Items</u>	<u>Million Rupees</u>
1. Civil Engineering Works, including dam and intake structures, tunnel and surge shaft, power station and substation structures	4.052
2. Penstock, including valves, concrete supports and pipe laying	1.825
3. Generating sets (2 No. 4 MW), switchgear, travelling crane, HT lines, transformers and erection	4.310
4. Land Acquisition	0.350
5. Departmental surveys and investigations (1974 to June 1975) and supervision of measurement of Works (from July 1976 to end 1978)	0.610 0.260
SUB TOTAL	10.797
6. Technical Contingency	1.080
ESTIMATE AS PER 1973 PRICES	11.877
Financial Contingency	4.840
	<u>16.717</u>

CP/


A.E./H.
4/2/74

DEVELOPMENT PROJECTS

QUATRE - SOEURS (G.R.S.E. MT Le Chat)

1974

JAN FEB MAR APR MAY JUNE JULY AUG SEP OCT NOV DEC

PHASE A

1 HYDROLOGIST ENGINEER

PHASE B

1 CIVIL ENGINEER (Experienced in soil investigation work & cut-off walls, grouting etc)

1 ASSOCIATE EXPERT (To help Civil Engineer and to draft advance estimates)

PHASE C

1 DESIGN ENGINEER (Finalizing details of works, specifications - Bill of quantities and valuation)

1 ASSOCIATE EXPERT

1st FEASIBILITY REPORT

ORDER & EQUIP

FINAL REPORT
TENDER DOCUMENT