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WOODWORKING
AND
POWER PLANTS

HEILBORN GMBH

16120

FEASIBILITY STUDY

FOR A STEAM-TURBO POWER GENERATION SYSTEM

FOR VANUA LEVU, FIJI

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July 1986

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LIST OF ABBREVIATIONS

- UNIDO	United Nations Industrial Development Organisation
- UNDP	United Nations Development Program
- FEA	Fiji Electricity Authority
- FSC	Fiji Sugar Corporation Ltd
- FFI	Fiji Forest Industries Ltd
- h	hour
- t	tons
- kW	kilo-watt
- kWh	kilo-watt hour
- MW	mega-watt
- MWh	mega-watt hour
- km	kilometer(s)
- m3	cubic meter(s)
- bar	general pressure
- barg	bar gauge, effective pressure
- bar abs	bar absolute, (1 barg + atmospheric pressure)
- C	degree centigrade
- kJ	kilo-joule
- MJ	mega-joule
- hph	horse-power hour
- DN	diameter nominal (of pipes and valves)
- PN	pressure nominal (of pipes and valves)
- MV	medium voltage
- Ah	ampere hour
- m. c.	moisture content
- TCH	ton cane hour
- NCT	non-crushing time (period when sugar mill is not in operation)
- CT	crushing time (period of operation of sugar mill)

EXECUTIVE SUMMARY

In planning to develop power generation on the island of Vanua Levu, in particular, the area covered by the Labasa power grid, the GOVERNMENT OF FIJI considers to examine the possibility of utilising available bagasse and waste wood in the region, to replace diesel generation as far as possible.

In response to the request from the Government of Fiji, the UNITED NATIONS DEVELOPMENT PROGRAM has agreed to finance technical assistance through the UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANISATION (UNIDO) for the compilation of the required techno-economic feasibility study. Acting in agreement, UNIDO engaged HEILBORN ENGINEERING PTE LTD to compile the feasibility study.

The power demand on the Labasa grid is forecasted at:

- 12,522 MWh in 1985;
- 16,500 MWh by 1990;
- 21,000 MWh by 1995;
- 26,000 MWh by 2000.

Based on our technical and economic evaluations, we are recommending that the power requirements be met by:

- the existing steam turbo-generation plant (after major improvements have been carried out as per our recommendations), at Fiji Sugar Corporation (FSC) sugar mill in Labasa, which can provide 6,955 MWh by the year 2000. This plant will be providing power during the mill's crushing season (normally between May to September).
- a new 3MW steam turbo-generation plant, to be integrated into the FSC plant. In the initial years, this plant will operate mainly during the non-crushing time (normally from October to April of the following year) but will also be operated during crushing time in the later years, when the generation from the major improved existing plant of the Fiji Sugar Corporation is already at maximum, but cannot meet with the power demands of the Labasa grid.
- the existing diesel station of FEA, supplementing the supply of the above two plants whenever necessary to meet with the power demands of the Labasa grid, and to meet with peak load requirements.

The fuel required at the integrated FSC plant consist of bagasse, sawmill waste and logging waste. Based on our field investigations, taking conservative projections, these are available in sufficient quantities over the forecasted period to fuel the integrated FSC plant. Summarily, the requirements of biomass fuel are:

	1990	1995	2000
- bagasse	10000t	10000t	10000t
- sawmill waste	20000t	24000t	24000t
- logging waste	8750t	12000t	15000t

Mention must be made here that the integrated power plant of FSC can be operated even longer than we have considered. Our calculations were made on the conservative side in terms of availability of waste, and logistics of supply. The fact is that replacement of diesel generation can be maximised by operating the integrated plant at FSC for as long as possible in terms of fuel availability - our calculations in this study, have been based on generation and operation levels which are very easily attainable.

The new steam turbo-generated power plant is to be integrated into the existing plant of the FSC. Based on our field observation, there are two possibilities for doing this, and our proposal is shown in Annex J. The site chosen allows for best cross-utilisation of the existing equipment as well as allowing for sufficient storage space for the logging waste used as a fuel.

In considering the technology to recommend, two possible alternatives were considered, viz direct combustion in a boiler and utilising the heat energy to drive steam turbines or wood gasification where the resulting gas will operate gas engine generating sets. Our recommendation is for a steam turbo system since this technology is already well proven under Fijian conditions, (besides the capacity range required, makes wood gasification a highly questionable solution) and allows for cross utilisation of existing facilities.

In operating the new plant, FSC could deploy their personnel who, incidently during the period of full operation of this plant, (during non-crushing time), are not fully occupied with the mill's sugar production. Total number of operators required to run the new plant is 18.

In terms of production costs, the main cost items for the integrated FSC plant, are the costs for raw material sawmill waste and logging waste at the new power plant. Overhead costs stem mainly for wear and tear spare parts and regular maintenance work. This being a supply of public utility, no costs are necessary for sales and promotional work.

Due to the long delivery time for the turbo generating sets and boiler, it is anticipated that the construction and installation phase of the project will occupy one year. In making out our time schedule, we have ensured that minimal disruption to normal sugar mill operations are occuring. Actual installation time is 3 months.

The total investment costs for the integrated plant consist of

- Fixed Investment Costs	F$
land, site preparation, development	35,000.-
buildings and civil works	70,000.-
plant machinery and equipment	5,356,000.-
Total fixed investment costs	5,461,000.-
Pre-production capital expenditures	178,608.-
Total investment costs	5,639,608.-

Our assumption is that financing for the project for 50% of the investment costs is possible. Considerations are for interest rate of 11.2% per annum, with grace period of 1 year, with full repayment of the loan in 10 years.

Total production costs for the project vary over the years because generation is meeting with demands. As an example however, based on the year 1990 (estimate 48.2% utilisation of the normal capacity of the integrated plant), production costs are:

- raw material (sawmill waste)	216,400.-
- raw material (logging waste)	100,820.-
- utilities	3,610.-
- energy	7,220.-
- labour, direct	79,470.-
- repairs, maintenance	57,720.-
- spares	86,570.-
- factory overheads	25,240.-
factory costs	577,050.-
- administrative overheads	12,730.-
- depreciation	281,980.-
- financial costs	245,772.-
Total production costs	1,117,532.-

or a unit generating cost of F$0.07 per kWh, as compared to the present cost of F$0.1073 per kWh (or our projected price of F$0.1170 by 1990) from diesel generated power.

Depending on the sales price of power from FSC to FEA, we have analysed the financial performance of the project accordingly. Briefly, the three prices considered are a) at FEA's full cost if generating by diesel; b) at 90% of FEA's full cost if generating by diesel; c) at 85% of FEA's full cost if generating by diesel.

Based on the different sales prices, our financial analysis shows:

Net Present Value at 8%

	Results at sales price of diesel generation	Results at sales price 10% below diesel generation	Results at sales price 15% below diesel generation
NPV	F$6,118,681	F$4,720,026	F$4,022,492
IRR	20.39%	17.87%	16.56%
ROE1	23.83%	19.71%	17.56%
ROE2	24.53%	20.77%	18.85%

E1 = Total equity paid : net income
E2 = Initial equity paid : net cash return

Thus it can be seen that the recommended project is economically viable.

Our conclusions are that a biomass based power generation system is a viable consideration. Based on our evaluations, we recommend that a system combining power supplies from the FEA diesel station (supplementary) with supplies from the FSC, provides for the best technical and economic solution.

Such a thermal system of power generation can generate power in exact accordance to the grid demands. Stored fuel can be utilised to cater for the fluctuations. In our evaluations, we had also considered if hydro-power had a role to play. Technically, the 'run of the stream' hydro-plant, will technically be inadequate in comparison to the recommended thermal system. This is because the hydro-plant can only generate power according to the stream flow available and this could very well be different to the power demand pattern.

In an integrated power plant as we proposed, surplus bagasse and waste wood can be fully utilised as cheap fuel. Besides the savings in foreign exchange, it also provides for an efficient and economical system for disposal of waste, which would otherwise be a big social problem. In conclusion, we recommend that the project be implemented as it does indeed fulfill the requirements of the Governmentof Fiji.

SECTION I - IDENTIFICATION OF PROJECT PARAMETERS & EVALUATION OF TECHNICAL OPTIONS

SECTION I - IDENTIFICATION OF PROJECT PARAMETERS & EVALUATION OF TECHNICAL OPTIONS

1.0 PROJECT BACKGROUND AND HISTORY

1.1 Introduction

The Government of Fiji, in planning to develop power generation in Labasa, on the island of Vanua Levu, considers to examine the possibility for power generation on the basis of available bagasse and waste wood in the region.

The country has abundant sources of bagasse and waste wood. Sugar cane is the major agricultural cash crop in Fiji. The sugar cane industry dominates the industrial sector and to a considerable extent, the whole economy.

In addition, 250,000 ha., of Fiji are covered with hardwood and extensive areas have been planted with Pinus Caribaea. The land areas under natural forest is estimated to be about 850,000 ha. Of this, about 300,000 ha., are regarded as suitable for commercial exploitation; a further 250,000 ha, is regarded as conservation forest, on which logging would be undesirable, mainly because of the steep terrains. The remainder is regarded as non-commercial because of low yields per ha., or because dominant species are non-merchantable.

From the above, it appears that Fiji has enough raw materials to consider the possibility of power generation based on bagasse and/or waste wood in Labasa.

1.2 Project Background

The present power requirements in Vanua Levu are being met by supplies from the Fiji Electricity Authority which is operating its own diesel generation station, supplemented by supplies from the Fiji Sugar Corporation, which sells power to the Fiji Electricity Authority, during the cane crushing season.

In planning to meet with the future power requirements, the Government of Fiji is interested to replace diesel generation as far as possible, by hydro and/or biomass powered stations. The effect of this is two-fold, that is, saving on diesel fuel cost (saving on foreign exchange) and in the case of a biomass powered station, the socio-benefit of an efficient and economic system of waste disposal.

To enable the Government to take a decision, there is an urgent need to examine the possibility of a biomass fueled power station, vis-a-vis other alternatives by study and review of the work done in previous reports as far as bagasse and wastewood utilisation is concerned. The Government therefore requested short-term UNIDO assistance to prepare a report on the possibility of developing a project based on available data and study. The objectives and scope of contract of the report, are as defined in Annex A.

1.3 The Principals

In response to the request from the GOVERNMENT OF FIJI, the UNITED NATIONS DEVELOPMENT PROGRAM has agreed to finance technical assistance to the Government through the UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANISATION, for the compilation of a techno-economic feasibility study on the use of bagasse and/or wastewood for power generation in Labasa, Fiji.

In this connection, UNIDO acting in agreement with the Government of Fiji, has engaged HEILBORN ENGINEERING PTE. LTD., to provide the services for, and perform the work required in the compilation of the required feasibility study.

To formalise the engagement of Heilborn Engineering Pte. Ltd., a UNIDO Contract No: 86/22, Project No: SI/FIJ/86/801, Activity Code SI/02/31.7, was concluded on 4th April 1986, between:

- The UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANISATION of Wagramerstrasse 5, A-1220 Vienna, Austria

  and

- HEILBORN ENGINEERING PTE. LTD., of No.1, Jalan Seaview, Singapore 1543, Republic of Singapore.

It is also relevant to state here the role of the FIJI ELECTRICITY AUTHORITY as the Government agency charged with the responsibility of meeting with the power requirements of Vanua Levu.

1.4 Project History

The Government had already prepared various studies and reports on the possibility of utilising bagasse and waste wood, for development of power generation to replace the existing diesel powered installations. Notably, these recent reports and studies are:

- "Vanua Levu Energy Study" by Shedden Pacific, 1982;
- "Vanua Levu Hydro-Electric Study; Supplementary Report" by Gibb Australia, 1984;
- "Vanua Levu Hydro-Electric Study, Review Report; Lovo Scheme by Gibb Australia, 1985;
- "Labasa Regional Water Supply Study" by Fawcett, Wilton and Bell, 1985.

Summarily, these documents have dealt with power generation from hydro, with referenced realisation of the potential of biomass fuel utilisation. However, to take a decision on utilisation of biomass fuel, the need for in-depth evaluations of same, (by study and review of the work done in the previous reports as far as bagasse and wastewood utilisation is concerned) is apparent. Accordingly, the preparation of such a techno-economic study was awarded to Heilborn.

2.0 FIELD MISSION

Heilborn's team commenced on its fact-finding field mission in mid-April 1986.

During its field mission, working closely with the Resident Representative of the UNDP in the Project Area, and in attachment to the Fiji Government counterpart agency, Heilborn's team were able to st dy existing conditions and collect data relevant to the preparation of this study.

While on its field mission, in accordance to the scope of the contract, the sole focus was on matters relevant to bagasse and waste wood utilisation. At this initial stage of its fact-finding investigation, the team could already establish that the base for such a project is sound. The availability of biomass fuel and existing facilities at Vanua Levu allowed the team to identify various technical options open (with final recommendation on the best option to be made after home office evaluation of the techno-economics of these options). These technical options (for a biomass fuel based power generation system) consist of various permutations on sources of power generation (identified and studied during the field mission) from the Fiji Sugar Corporation Ltd, a probable new steam turbo-powered generation plant (either independent or integrated to the operations at the Fiji Sugar Corporation), with supplementary diesel generation from the Fiji Electricity Authority.

This preliminary results of the field mission was conveyed to the Fiji Electricity Authority when the team met with the Authority in Lautoka. During this meeting the team was also requested to consider if hydro-power had a role to play in the power generation system based on biomass fuel. Accordingly, this request was taken into consideration and added to the permutations available for techno-economic evaluations.

At the end of the field mission, the team's conclusion was that indeed there is a basis for a feasible project. However, to identify which of the several technical options would lead to the most economic system of power generation and fulfill the requirements of replacement of diesel generation by as much as possible, requires analysis at the home office (where it is possible to identify for example, possible capital investment costs with its easy access to various machinery and equipment manufacturers).

2.1 Present Load and Load Forecast

This study is confined to the island of Vanua Levu, in particular, the area encompassed by the Labasa power grid.

The largest load centre on the island of Vanua Levu, is the town of Labasa, Macuata Province.

Based on the information from the Vanua Levu Energy Study, Review Report, Lovo Scheme by Gibb, summarily, in 1983, the maximum power demand in the Labasa System was 2.8 MW, and the units generated some 10.2 GWh including 2.6 GWh purchased from the FSC.

Forecasts prepared by the FEA anticipate that load will grow at 5.5% to 6.2% per annum between 1985 and the year 2000. Based on the Gibb and FEA forecast, and based on actual demands in 1986, we have accordingly established the load forecast up to the year 2000. This is shown in Annex B.

- 12,522 MWh in 1985;
- 16,500 MWh by 1990;
- 21,000 MWh by 1995;
- 26,000 MWh by 2000.

For the purpose of this study, the load forecast, load duration curves in crushing time and non-crushing time, calculation of minimum diesel supply for peak load coverage, are shown in Annex B. These and standard electrical calculations, form the basis of our calculations.

2.2 Present Situation

The FIJI ELECTRICITY AUTHORITY (FEA) is the Government agency, charged with the responsibility to provide for the island's power and energy requirements. At present, the FEA meets its responsibility by providing power and energy from its own diesel station, supplemented by purchase of surplus (over production) power which is generated by the FIJI SUGAR CORPORATION (FSC) sugar mill, during the mill's crushing season (normally during the months of May to November).

The FEA diesel station currently has a total installed capacity of 4.322 MW. Details of the equipment in the diesel station are given under section "2.5.1 Present Existing Conditions".

As mentioned previously, the power and energy demands on the FEA, are met by the FEA's own diesel station and supplemented by the purchase of surplus power from the FSC sugar mill during the crushing season. The FSC has been supplying power to the FEA grid during the cane harvest season since 1979.

The installed turbo-plant at the FSC, (for bagasse or oil firing) is also described under section "2.5.1 Present Existing Conditions".

Under normal situation, the internal electrical load of the FSC is between 2.7 MW to 3.2 MW. It follows that theoretically, there is excess power available from FSC (provided they have enough bagasse). Additionally, FSC has never supplied FEA in the non-harvest season and occasionally, FSC has even used FEA power to restart after a total outage in the cane harvest season or during testing of plant, shut downs and start ups in the crushing season.

2.3 Future Possibilities

It is the Government's intention to determine the amount of biomass energy that can be absorbed by the Labasa grid to replace the supplementary diesel generation as far as possible.

Towards this end, this study investigates the various possible techno-economic alternatives, with respect to utilising bagasse and/or waste wood for the generation of power. These alternatives will examine possible permutations on FEA supply (diesel-powered, hydro-powered), FSC supplement (steam turbo-powered) and a probable new steam turbo-powered station (either operated by FEA or FSC or others).

The extent of steam turbo-powered supply is dependent not only on the process technology, but ultimately, on the availability, long term reliability and logistics involved in the securing of the biomass fuel. It is generally accepted that steam turbo-generation in an area of high availability of biomass fuel, plays a dual role, in providing for a source of cheap energy (or at least saving of foreign exchange in a non-oil producing country) as well as providing an economical and socially acceptable means of disposal (compared to dumping).

2.4 Biomass Availability - Present and Projected

Our investigation into biomass fuel for power generation, for the purpose of the study, is restricted to bagasse and waste wood. Although no other biomass fuel was identified during our mission, in principle, if these are available, they may also be utilised.

2.4.1 Bagasse

The following data relating to fibre and bagasse production, at Labasa, for the seasons of 1981 to 1985 were collected from the FSC:

	1981	1982	1983*	1984	1985
Cane Crushed	930,263	1,140,552	761,587	1,136,861	934,250
Average Fibre %	12.10	12.49	12.10	12.41	12.80
Start of Crush	12/05	02/06	25/05	29/05	21/05
End of Crush	16/11	19/01/83	20/10	06/01/85	19/11
Length of Season (weeks)	26.8	33.2	21.3	31.8	28.0
Tonnes Fibre Produced	112,562	142,455	92,152	141,084	119,584
Tonnes Bagasse Produced	225,124	284,910	184,304	282,168	239,168

*short crushing season due to drought

On the basis of the above datum, barring drought, over this 5 year period, the cane crushed is at an average of 1,000,000 tonnes.

The trends in production levels, do not appear to be influenced in any significant manner, by factors other than

- drought and/or
- the present production capacity of the FSC plant.

One would expect world sugar prices, market demands etc to influence production levels, but it is apparently not the case here. If this were the case, over the 5 years under study, it is reasonable to expect that the production levels would have shown fluctuations to reflect these influences (provided of course that the nominal installed production capacity will allow for an actual production level significantly higher than 1,000,000 tonnes of cane crushed per year).

Thus, it can be assumed that, there will not be any significant expansion that will allow for an upper limit production level significantly higher than 1,000,000 tonnes of cane crushed per year (and if this proves to be incorrect, any expansion, will only provide for more fuel and hence confirming this project's viability). To be conservative, we have thus assumed no significant expansion at FSC.

In attempting to identify the lower limit, one has to consider that sugar cane is the major agricultural cash crop in Fiji and that the sugar cane industry dominates the industrial sector and to a considerable extent, the whole economy. Furthermore, the industry has been well established and thus provides a means of livelihood for much of the population. As such, in the foreseeable future, one cannot see the introduction of another industry which can displace the sugar cane industry from its position of dominance on the economic ladder.

Economies of scale for the sugar industry are also well established, thus the lower limit production level, is not expected to drop (under normal conditions of climate and plant operation) much below 1,000,000 tonnes of cane crushed per year. This in fact means that we can safely consider that bagasse will be at least available at the present levels.

We were also informed that FSC has secured long term contracts with the European Economic Community for supply of their sugar at profitable prices, and this further confirms the availability of bagasse for the future.

As a result, the study considers that the quantity of bagasse available over the period 1986 to the year 2000, will be the average of all values previously collected for the period 1981 to 1985, viz:

Cane Crushed	1,000,000 tonnes
Intake rate	250 TCH => 4,000 operating hours
Start of Crushing	24/05
End of Crushing	10/12
Length of Season	28.22 weeks
Average Fibre Content (0% m.c.)	average 12.3%
Bagasse (50% m.c.)	= 2 x 12.3% = 24.6%

(see also Annex D)

2.4.2 Waste wood

Waste wood can be obtained from the forest and from production processes. Logistics of transportation of these necessarily narrows the possible sources to areas close to Labasa (for easy access and transportation).

The main reason for the above criteria, is the need to evaluate the possibility of economic utilisation of waste wood as an alternative fuel (to diesel) for power generation. Since unutilised waste wood is non-cash generating (in actual case, it is even a liability as costs are involved in its disposal), transportation costs will constitute the bulk of any calculation, if one is to assign a cash value to waste wood (another being cost of capital and operating costs involved in organising of waste wood collection). Thus, any reduction in the cost of transportation (by way of ease of access and short transportation distances), will have a pronounced effect on the eventual cash value assigned to the waste wood.

Waste Wood from Production Processes

a) Fiji Forest Industries Ltd

Based on the above considerations, the main timber mill on Vanua Levu which generates a significant quantity of mill waste, is the integrated wood processing complex of FIJI FOREST INDUSTRIES (FFI). This complex is situated at Malau, about 15 km from Labasa.

To project on the future availability of waste wood from the complex, it will be relevant to look into the development of the complex, both in terms of growth in production mix, as well as log inputs.

FFI commenced operation with a sawmill in 1964, and over the years, moved into veneer production in 1970, plywood production in 1973 and blockboard in 1977. Statistics collected over the period 1981 to 1985, show that log inputs into the complex grew from 38,300 m3 to 46,030 m3.

Log Input Volumes (in m3/year)

1981	1982	1983	1984	1985
38,300	33,870	43,030	45,150	46,030

Currently, part of the waste wood from the complex is used as boiler fuel, for the generation of process steam, while any surplus is dumped into the sea at the mill's boundary. Figures collected from the complex's operation, giving the quantity of waste wood generated and its internal utilisation for generation of process steam are shown on the next page.

1985

tctal log input into the complex - 46,030 m3

According to figures available from FFI,
waste wood generated (50%) - 23,015 m3
waste wood for own use (33%) - 7,595 m3
surplus waste wood available = 15,420 m3

It is also further learnt that this complex is marketing through its own organisation in Western Australia where the company enjoys an established reputation in a steady and secure market. Thus, it is reasonable to conclude that the complex will grow and remain viable in the future.

b) Other Sawmills

Additionally, in terms of waste wood availability, two of the larger sawmills within the vicinity of Lambasa, must also be considered. The sawmills are the Waiqele Sawmill and Vunimoli Sawmill. Statistics of log input into the sawmills are shown below:

Log Input Volumes (in m3/year)

	1981	1982	1983	1984	1985
Waiqele	4,820	3,130	2,940	4,310	6,830
Vunimoli	1,960	790	570	1,100	6,210

These statistics show that both sawmills are expansion orientated. As they are operating under same conditions as FFI, we can assume that the total waste generated from the two sawmills will be 6,520 m3. If, in future, they will require process steam (for kiln dryers), then, we can consider an internal waste wood utilisation factor of 20%. (FFI has a 33% utilisation factor because the plywood processing has a high demand for process steam). In case they enter into plywood production, then, more log input will be necessary, and even if the higher utilisation factor of 33% is used, this will be compensated by the larger volume of waste wood produced.

In our projections, we consider that these two sawmills will not be requiring process steam, and that the total of 6,520 m3 of waste wood will be available. However, in case they do, the short-fall in waste wood, (1,300 m3) can be covered by several other smaller sawmills nearby (their waste wood output have not been taken into our calculations, to provide for a safety margin in our projections).

Consequently, the quantity of waste wood available in 1985, from these three companies, totals to approximately 21,940 m3. Based on modest projections, it is safe to assume the availability of waste wood as follows:

Projected Waste Wood Availability from Sawmills (in tons)

1988	1989	1990	1991	1992	1993	1994	1995
18400	19200	20000	20800	21600	22400	23200	24000

Currently, all wood waste which is not utilised, is deposited into the sea. In view of the pollution problems caused, such disposal is socially undesireable, and presents only a short term option open to the companies. As such, these companies will be most interested to supply their surplus waste wood to interested parties since this not only solves their disposal problem, but also generates cash.

Waste Wood from Logging Operations

The exploitation of forests in Fiji, comes under the direct management of the MINISTRY OF FORESTRY. The forest may sometimes stand on land belonging to private owners, but the Ministry of Forestry has the right to work the forest.

As the Department does not operate its own timber processing plant(s), logging is dependent directly on the Department's harvesting program and on demand for logs. The demand varies from one concession to another, according to their input requirements of the processing plants drawing from the concession. Consequently, the quantity of waste wood from logging operations varies.

However, on an average, based on current felling and trends in the locality of Labasa, the Ministry estimates that by 1988, a volume of some 8,750 tons of waste wood per year from logging operations, can be safely made available for further utilisation. This is projected to increase to 12,000 tons by 1995 and to 15,000 tons by the year 2000. In view of the Ministry's far sighted policy on logging control and reafforestation, in terms of timber availability, this is a safe projection. In addition to this, another forest region, within a 60 km distance from Labasa, is producing large quantities of forest thinnings and logging waste, which can be utilised. Again, to provide for a safety margin in our projections, these are not considered in our projections.

Based on our site study, we are of the opinion that the volume of waste generated by logging and forest thinnings (in addition to waste from production processes), can adequately meet with immediate and future fuel demands of a steam turbo-powered station. Caution is however necessary here because although supply is secure, costs are not necessarily low (and certainly will tend to increase as forest operations enter further and further into the concession), and the logistics of continuous supply to the power station must be properly considered.

In terms of costs, waste wood from production processes are cheaper than that from logging operations and again, this is cheaper than forest thinnings and logging waste from the forest region 60 km away from Labasa. In view of this, in our calculations, we will utilise waste wood from production processes first (and if this is insufficient, then we utilise logging waste and finally forest thinnings).

A graphic representation of the bagasse and waste wood (from production processes and logging operations only, since forest thinnings are only a supplementary source) availability, is provided in Annex C.

2.5 Technical Evaluations on Plant Capacity and Source of Power Generation

Technical data and efficiency levels of a steam turbo-power plant (bagasse and waste wood fired) at various power outputs are:

EFFICIENCY at	30 bar/400 C	40 bar/450 C
Block	21.0	22.84
Plant	18.90	20.56
75% load	15.4	16.756
66% load	14.6	15.87
50% load	12.66	13.775
40% load	11.0	12.0
33% load	9.56	10.4
25% load	7.18	7.81

Source: Heilborn calculations based on standard electrical procedures.

Plant Output boiler conditions (in barg / deg C)	3,000 kW 30/400	 40/450	3,500 kW 30/400	 40/450
own consumption %	10	10	10	10
generator output (kW)	3,333	3,333	3,889	3,889
block efficiency	21.0%	22.8%	21.0%	22.8%
plant efficiency	18.9%	20.5%	18.9%	20.5%
fuel heat kW	15,873	14,634	18,519	17,073
MJ/h	57,143	52,682	66,667	61,463
100% bagasse, 50% m.c., 7574 kJ/kg (in kg/h)	7,620	7,024	8,889	8,195
100% saw waste, 70% m.c., 10500 kJ/kg (in kg/h)	5,442	5,532	6,349	5,854
100% forest waste, 100% m.c., 8372 kJ/kg (in kg/h)	6,827	6,294	7,965	7,343
boiler heat transfer (0.83) (in kW)	13,175	12,146	15,371	14,171
(in MJ/h)	47,429	43,726	55,335	51,014
heat rate/steam (in kJ/kg)	2,790	2,890	2,790	2,890
steam flow (t/h)	17.0	15.13	19.83	17.65
cooling water flow at delta g = 8 C (m3/h)*	1,015	912.5	1,184	1,065
at delta g = 10 C (m3/h)*	812	730	947	852

*difference between the temperature of cooling water at inlet and at outlet.

To identify the plant capacity, in the context of Vanua Levu, it is necessary to conrider existing facilities in order that relevant economic factors (such as the possibility to meet power requirements by joint-generation with organisations such as FSC) are taken into account.

In view of the possibility for joint-generation of power, the approach taken in this study cannot be restricted only to a new steam turbo-powered installation. To allow for a true economic analysis on the viability of the project, the study approaches the subject as follows:

- load forecasting
- present and projected availability of biomass fuel;
- technical analysis of existing facilities;
- optimum utilisation of the biomass fuel in the existing facilities (both on 'as is basis' and 'improved basis'), and the resultant power that can be generated;
- optimum utilisation in a new steam turbo-powered plant;
- results of matching the resultant power available against the forecasted loads, to determine the quantity of diesel generated power that can be replaced by the system;
- and additionally, to consider also if hydro-power can play a significant role in the overall power generation scheme;

2.5.1 Present Existing Conditions

The project engineering must necessarily be centered around the present existing conditions in Labasa. In any considerations on power generation from biomass fuel, the four main parties involved are:

- the FIJI ELECTRICITY AUTHORITY as the party responsible for meeting with the power requirements of Labasa;
- the FIJI SUGAR CORPORATION LIMITED as the party having surplus bagasse and presently selling surplus (overproduction) power to the FEA. In addition, its steam turbo-powered plant can be improved/expanded (as per our recommendations) to provide more power for sale to the FEA;
- the MINISTRY OF FORESTRY as the party with available waste wood from its forest logging operation and forest thinnings;
- the FIJI FOREST INDUSTRIES LIMITED as the main party with available waste wood from its timber processing operation, (the other parties being the Waiqele and Vunimoli Sawmills);

For project engineering purposes, it is only necessary now to evaluate the conditions at FEA and FSC, since as far as the other parties are concerned, their influence on the project relates to economics and logistics and not technology.

The FIJI ELECTRICITY AUTHORITY

The FEA presently operates a diesel station, with a total installed capacity of 4.322 MW, consisting of:

1 unit Ruston VBCX - 0.18 MW site rating, (age 17 years)
1 unit National - 0.18 MW site rating, (age 45 years)
1 unit Ruston VBCX - 0.53 MW site rating, (age 17 years)
3 units Ruston 6ATC - 3.432 MW site rating, (age 13 years)

To cater to peak loads as forecasted up to the year 2000, the firm capacity of this station must however be increased to 4.125 MW in 1990, 5.250 MW in 1995 and 6.500 MW in the year 2000. (Firm capacity = total installed capacity minus installed capacity of largest generating unit, when it is not in operation). For FEA, this means mobilising of unused equipment which were redundant, after the hydro power station on Viti Levu went into operation. This situation at FEA means that supply of supplementary power from diesel generating sets will not pose any problems of large capital investment. It is only necessary for them to identify the capacity requirements, and mobilise unused equipment.

The FIJI SUGAR CORPORATION LTD

Related to steam turbo-generation of power, the FSC is operating the following equipment:

Boilers

1 unit Yoshimine, 136 t/h - 17.2 barg / saturated steam
1 unit Thompson, 43.5 t/h - 17.2 barg / saturated steam

Turbines

1 unit Shin Nippon, Model HO-182R, 4.0 MW
1 unit Allen, Model T2/77668, 2.5 MW
1 unit Worthington, Model 24509-U13912, 0.75 MW

Further technical specifications of the above mentioned equipment are given in Annex D.

2.6 Technology

Taking into consideration FEA's request for identifying if hydro-power had a role to play in the scheme of power generation, the technology to be considered will be that of hydro-generation of power and thermal generation of power.

2.6.1 Hydro-Power Generation

Several studies are already available with respect to hydro-power generation in Vanua Levu. As such, the technicalities of the system and results can be obtained from the studies and reports of Shedden Pacific, Gibb and Fawcett, Wilton and Bell.

Of particular relevance to this study, is that the hydro-power generation proposed (1st stage), is the 'run of the stream' Lovo scheme. Such a scheme will technically be inadequate in comparison to thermal generation of power, because the hydro-plant can only generate power according to the stream flow available and this could very well be different to the pattern of power demand.

2.6.2 Biomass Thermal Power Generation

In utilising of biomass fuel for the generation of power, generally, two options are possible, viz direct combustion in a boiler to generate steam to drive steam turbines or wood gasification with the utilisation of the gas in gas engine generating stes. Having observed the competent operations at FSC's steam turbo-generation plant, we are recommending that this be the system for Vanua Levu.

This technology has been preferred because:

- the technology is well knownin Fiji, in the sugar industry;
- it allows for possible optimum utilisation of capital equipment already available (for example by joint-generation of power between FEA and FSC);
- this, in turn provides for various permutations thus allowing for clear comparision of the techno-economic reslults for each permutation;

As steam turbo-generation is now operated at FSC, we have investigated in details, its operation and have made recommendations on possible improvements at this station, as per Annex D.

Steam turbo-generation of power, essentially is the measured burning of biomass fuel in a steam boiler, to produce steam which then drives a steam turbine. In practice, it is necessary to calculate the exact balancing of the fuel requirements and balancing of the equipment.

Wood gasification is not recommended because of the difficulty in efficient operation and current lack of experience in the world with reasonably sized plants (and there are no operating units in Fiji). The wear and tear of the gas engines is very high and in our range requirement of 3 MW to 4 MW, it cannot be recommended.

2.6.2.1 Technical Implications at FSC Mill

Full details of our evaluations are given in Annex D. We have considered the technological implications under two circumstances, viz:

- minor improvements to the existing equipment, which involves conversion of the two drive turbines to the 17 bar stage (from the existing 11 bar stage) and providing the injection pump with an electric motor. This involves work at the medium pressure stage (see Annex D for explanation).

- major improvements to the existing equipment, which involves the installation of superheaters to the existing operating boilers, an additional transformer and a desuperheater. This involves work at the high pressure stage (see Annex D for explanation).

We recommend that the major improvements be implemented. The consequences of our recommendations (details are in Annex D) can be summarised as follows:

Present Existing Situation

The following data were collected from the FSC, with respect to the existing equipment:

Existing Pressure Stages at FSC

a) Existing high pressure stage at 17.2 barg saturated steam
   Connected to this high pressure line, are:
   - 2 boiler outlets
   - 8 turbine inlets

b) Existing medium pressure stage at 11 barg saturated steam
   Connected to this medium pressure line, are:
   - 4 drive turbine inlets

c) Existing low pressure stage at 1.0 barg saturated steam
   Connected to this low pressure line, are:
   - process steam for heating
   - 12 turbine outlets
   - 1 reducing station

Existing Operating Boilers at FSC

a) Yoshimine: 136 t/h · 17.2 barg / saturated steam
designed boiler efficiency at 89%
for calculations, we use 80%

fuel consumption:
80 C => 17.2 barg/sat:
net heat exchange = 2,800 - 350 = 2450 kJ/kg
fuel rate = 2450 kJ/kg : (7574 x 80%)
= 0.404 kg bagasse/kg steam

b) Thompson: 43.5 t/h - 17.2 barg / saturated steam
designed boiler efficiency at 80%

Existing Main Turbines

steam rate of existing main turbines:

a) Shin Nippon model HO-182, 15.33kg/hph (20.6 kg/kWh)
(leveller and mills)

b) Shin Nippon model B6-R2-R, 14.05kg/hph (18,8 kg/kWh)
(shredder)

c) Shin Nippon model B6-R5-R, 15.9 kg/kWh (generator)

With the minor improvements mentioned, it is possible to convert the two drive turbines at the 11 bar stage, to the 17 bar stage. This results in a higher expansion head and consequently, an improvement in the steam rate by 4.4 kg/kWh (17.5% better than the existing steam rate of 25.0 kg/kWh at the medium pressure stage):

With the major improvements recommended, the installation of superheaters in the existing boilers, will again increase the expansion head in the turbines. The consequence of this is a 13% improvement in steam rate over the present rate at the high pressure stage.

In achieving a better steam rate, two results are significant, that is, less bagasse fuel is needed (in both the minor improvements and major improvements) and, in the case with the major improvements, additionally, by-pass steam is available. In having to use less bagasse than present, the excess bagasse and by-pass steam (in the case of major improvements) can be used to generate power.

In Annex D, we have shown that the surplus bagasse available with minor improvements to the FSC equipment totals to 11,680 t per year (with no by-pass steam), while that available after major improvements, is 11,200 t per year (and additionally, also by-pass steam). It must be noted that while the surplus bagasse can be utilised in the major improved FSC plant to generate power, the same is not true in the case of only minor improvements to the FSC plant unless new generating units are installed.

The significant results when making major improvements to the FSC plant, over the existing situation, are:

- plant in balance at 11% fibre content and steam rate of 550 kg/TCH (compared to existing 12% fibre content and steam rate of 600 kg/TCH);

- total power which can be generated is 6,955,000 kWh/year (compared to existing 2,124,248 kWh/year or 2,449,000 kWh/year in the case of minor improvements to the plant):

These figures as calculated, are on the conservative side and can be easily achieved in practice. Since we can assume that the FEA will purchase all the power that the FSC can generate (to replace diesel generation), even better performance at the FSC plant can be achieved in practice (in view of our conservative calculations).

To achieve better performance, the FSC may also look into improvements at their sugar processing plant. Such improvements (we have already commented for example, on the evaporators, in Annex D), will result in lower steam rates which means less bagasse is needed as fuel. The resulting surplus can then be used to generate even more power for sale to the FEA.

Additionally, to increase the calorific value of the bagasse, drying of the bagasse may also be considered. We have not considered such measures in this study since our intention is to study the viability of the project, under stringent conditions - and not under ideal conditions. Even so, the results are positive and indicate that replacement of diesel generated power by biomass fuel, in the context of the Labasa grid, is technically and economically viable.

2.7 Technical Options

As mentioned under "2.3 Future Possibilities", our field mission resulted in identification of several technical options, which are permutations on power generation with respect to facilities available in Labasa.

Taking into account the request of the FEA to consider hydro-power, the permutations considered are:

OPTION REF.	IDENTIFICATION OF SOURCE OF POWER SUPPLY
LAB7	FSC Integrated Power Plant, 3.5 MW, 30 bar/400 C, FSC's supply from plant with minor improvements (which is supplying 2,449 MWh in 1985, and projected to 2,500 MWh from 1990 onwards and surplus 10,000 t bagasse which is unutilised) FEA diesel supplementary supply
LAB9	FSC Integrated Power Plant, 3.5 MW, 30 bar/400 C, FSC supplying from major improved power plant (which is supplying 2,449 MW in 1985, 6,270 MW by 1990, 6,955 MW by 1990 and thereafter, with full utilisation of the surplus 10,000 t bagasse) FEA diesel supplementary supply
LAB11	FSC Integrated Power Plant, 3.0 MW, 30 bar/400 C, FSC supplying from major improved power plant FEA diesel supplementary supply
LAB13	FSC supplying from major improved power plant FEA diesel supplementary supply
LAB14	Lovo Hydro scheme (as studied by Gibb), FSC supplying from major improved power plant FEA diesel supplementary supply
LAB15	Lovo Hydro scheme FSC's supply from plant with minor improvement FEA diesel supplementary supply
LAB33	Independent Power Plant, 3.5 MW, 30 bar/400 C, FSC's supply from plant with minor improvement FEA diesel supplementary supply
LAB36	Independent Power Plant, 3.0 MW, 30 bar/400 C, FSC's supply from plant with minor improvement FEA diesel supplementary supply

NOTE:

1. The permutations as shown in Annex E, do not represent the complete range of permutations which we have evaluated (which were eliminated for reasons such as high demand of biomass fuel, low efficiency etc). To reduce the number of unnecessary pages, we annexed only the feasible options.

2. The Option Reference does not denote any order of merit.

3. "FEA diesel supply" refers to supply of power from FEA's existing diesel station (which has to increase its firm capacity to 4.125 MW in 1990, 5.250 MW in 1995 and 6.5 MW in the year 2000).

4. "FSC supplying from major improved plant" refers to supply of power from FSC's plant, after major improvements described in Annex D have been carried out.
The main advantage of this is that the 10,000 t excess bagasse are fully utilised to generate electrical power.

5. "FSC supply from plant with minor improvement" refers to supply of power from FSC's plant, after minor improvements described in Annex D have been carried out.
However, the excess bagasse of 10,000 t cannot be utilised to generate power, since no additional generating equipment is available.

6. "Independent Power Plant" refers to a new plant, physically separate from FSC's mill (ownership of this plant is not identified).

7. "FSC Integrated Power Plant" refers to a new plant which will be installed at FSC's mill, and integrated into its steam turbo-power generating plant.

3.0 HOME OFFICE EVALUATIONS

Having identified various possible permutations on the source of power generation, it is now necessary to evaluate the technical, cost and other merits of each of the possible options.

Based on the load forecast, load duration curve, monthly load curves and standard electrical calculation procedures, evaluations for the various options (in terms of supply of power, fuel requirements and cost of generation) are now given in Annex E.

In the following page, the basis and summary of our evaluations are provided for easy reference.

Energy Demand, Peak Loads, Possible Supply & Fuel Availability

			1985	1990	1995	2000
1	Total demand	MWh	12,522	16,500	21,000	26,000
2	Average load	kW	1,429	1,883	2,397	2,968
3	Max peak load	kW	3,040	4,125	5,250	6,500
4	Peak load hours	h	4,120	4,000	4,000	4,000
5	Average max load (CT)	kW	1,800	2,380	3,000	3,750
6	Average min load (CT)	kW	800	1,060	1,350	1,700
7	Average max load (NCT)	kW	2,200	2,780	3,400	4,170
8	Average min load (NCT)	kW	1,200	1,460	1,750	2,100
9	Demand in NCT	MWh	7,425	9,900	12,600	15,600
10	Demand in CT	MWh	5,098	6,600	8,400	10,400
11	Operating hours (NCT)	h	5,110	5,110	5,110	5,110
12	Operating hours (CT)	h	3,650	3,650	3,650	3,650
13	Average load in NCT	kW	1,453	1,937	2,465	3,052
14	Average load in CT	kW	1,396	1,808	2,301	2,850
15	FSC max supply (inst)	kW	1,200	3,500	4,000	4,000
16	FSC supply from minor improved plant	kW	2,449	2,500	2,500	2,500
17	FSC average load (4000h)	kW	612	625	625	625
18	FSC minimum load	kW	500	500	500	500
19	FSC max supply from major improved plant	MWh	n.a.	6,955	6,955	6,955
	Min. supply by diesel for improved plant:					
20	in CT	%	n.a.	5.0	5.0	5.0
21	in CT	MWh	n.a.	330	420	572
	Min. supply by diesel for power plants:					
22	3.5MW (indep & NCT	%	n.a.	1.5	1.5	5.0
23	integrated) in NCT	MWh	n.a.	150	189	780
24	(independent) in CT	%	n.a.	12	12	12
25	(independent) in CT	MWh	n.a.	792	1,080	1,248
26	3MW (indep & in NCT	%	n.a.	1.5	3.3	12.0
27	integrated in NCT	MWh	n.a.	150	441	1,872
28	(independent) in CT	%	n.a.	12	12.0	13
29	(independent) in CT	MWh	n.a.	792	1,008	1,352
30	FSC supply from major improved plant in CT	MWh	n.a.	6,220	6,955	6,955
31	FSC av. load (improved)	kW	n.a.	1,570	1,740	1,740
32	Hydropower Gibb) total	MWh	n.a.	8,400	9,380	10,110
33	Hydropower supply (CT)	MWh	n.a.	3,325	3,325	3,325
34	Hydro average load (CT)	kW	n.a.	911	911	911
35	Hydro average load (NCT)	kW	n.a.	993	1,185	1,328
36	FSC major impr. supply if hydro is running	MWh	n.a.	2,945	4,655	6,553
37	Available bagasse	t/yr	2,000	10,000	10,000	10,000
38	Avail. sawmill waste	t/yr	16,000	20,000	24,000	24,000
39	Avail. logging waste	t/yr	5,300	8,750	12,000	15,000

Key: CT = crushing time, NCT = non-crushing time
n.a. = not applicable

Summary of Technical Evaluations (as detailed in Annex E)

OPTION REF.	SOURCE OF POWER GENERATION		1985	1990	1995	2000
	Total Demand	MWh	12,522	16,500	21,000	26,000
	- in NCT	MWh	7,425	9,900	12,600	15,600
	- in CT	MWh	5,028	6,600	8,400	10,400
LAB13	FSC major imp.					
	plant supply	MWh	2,449	6,270	6,955	6,955
	FEA diesel	MWh	10,073	10,230	14,045	19,045
LAB15	Hydro supply	MWh	-	8,400	9,380	10,110
	FSC minor imp.					
	plant supply	MWh	2,449	2,500	2,500	2,500
	FEA diesel	MWh	10,073	5,600	9,120	13,390
LAB14	Hydro supply	MWh	-	8,400	9,380	10,110
	FSC major imp.					
	plant supply	MWh	2,449	2,940	4,655	6,553
	FEA diesel	MWh	10,073	5,160	6,965	9,337
LAB7	Integrated 3.5MW					
	power plant	MWh	-	13,050	17,303	21,452
	FSC minor imp.					
	plant supply	MWh	2,449	2,500	2,500	2,500
	FEA diesel	MWh	10,073	942	1,197	2,048
LAB9	Integrated 3.5MW					
	power plant	MWh	-	9,750	13,436	17,693
	FSC major imp.					
	plant supply	MWh	2,449	6,270	6,955	6,955
	FEA diesel	MWh	10,073	480	609	1,352
LAB11	Integrated 3.0MW					
	power plant	MWh	-	9,750	13,184	16,601
	FSC major imp.					
	plant supply	MWh	2,449	6,270	6,955	6,955
	FEA diesel	MWh	10,073	480	861	2,444
LAB33	Independent 3.5MW					
	power plant	MWh	-	13,058	17,303	21,452
	FSC minor imp.					
	plant supply	MWh	2,449	2,500	2,500	2,500
	FEA diesel	MWh	10,073	942	1,197	2,048
LAB36	Independent 3.0MW					
	power plant	MWh	-	13,058	17,051	20,276
	FSC minor imp.					
	plant supply	MWh	2,449	2,500	2,500	2,500
	FEA diesel	MWh	10,073	942	1,449	3,224

3.1 Preliminary Selection of Technical Options

The summary of technical evaluations are represented graphically in Annex F. As it is the aim to replace the supplementary FEA diesel generation as far as possible, it can be seen that Option Ref. LAB13, LAB14 AND LAB15, though technically feasible, do not fulfill the aim of this study.

This means that:

- hydro-generation (Option Reference LAB14 and LAB15) is not favoured because substantial fuel diesel supplementary will be necessary already by the year 1995. These options are not achieving the aim of replacement of diesel generation and we do not recommend further consideration of hydro-generation. Furthermore, in view of the high capital costs for such a system, there is no economic justification to consider hydro-power, (when compared to the necessary prolonged rate of depreciation) since, by 1995, there will be substantial costs involved in having to supplement the power supplied by the hydro scheme, with diesel.

- similarly, Option Ref. LAB13 (where FSC is supplying only from its major improved plant) does not fulfill the aim of replacing diesel generation since the necessary fuel diesel supplementary is even more than in Options Ref. LAB14 and LAB15.

Thus, it remains to evaluate further, the remaining technical options, and list them in order of technical merit, cost merit and merit in terms of fulfillment of the aims of this study.

3.2 Comparison of Merits of the Remaining Options

3.2.1 Technical Merits

Technically, Options Ref. LAB7 and LAB33 are identical. Both are operating on the same technical basis - the only difference being in their capital investment costs. As such, on technical merits, they must be ranked equally.

Technical results of Option Ref. LAB36 show that with a 3.0 MW steam turbo-powered station, the partial load factor and thus efficiency (in the use of biomass fuel) of this option, is much better than it is in Option Ref. LAB7 and LAB33. Thus, on technical merits, it is ranked higher than these two other options.

Technical comparisons of Option Ref. LAB9 against Option Ref. LAB11 again show a better partial load factor and efficiency for Option Ref. LAB11 against Option Ref. LAB9. Accordingly, Option Ref. LAB11 is ranked technically higher than Option Ref. LAB9.

To summarise the technical evaluation, in order of technical merits, we recommend the following:

	Option Ref.	Power Generation Source
1.	LAB11	- FSC integrated power plant, 3.0 MW, 30 bar / 400 C FSC supply from power plant with major improvements FEA diesel supplementary supply
2	LAB9	- FSC integrated power plant, 3.5 MW, 30 bar / 400 C FSC supply from power plant with major improvements FEA diesel supplementary supply
3.	LAB36	- Independent power plant, 3.0 MW, 30 bar / 400 C FSC supply from power plant with minor improvements FEA diesel supplementary supply
4.	LAB7	- FSC integrated power plant, 3.5 MW, 30 bar / 400 C FSC supply from power plant with minor improvements FEA diesel supplementary supply
5.	LAB33	- Independent power plant, 3.5 MW, 30 bar / 400 C FSC supply from power plant with minor improvements FEA diesel supplementary supply

3.2.2 Cost Merits

In Annex G, calculations are made for each of the remaining options, on the basis of the cost of steam turbo-generated power. For details of the calculations, please refer to Annex G.

Since the demands of supplementary diesel generated power varies with each option, it was therefore necessary to also consider the total costs of diesel generated power (given by the FEA at F$0.10733 per kWh) for each of these options. This will then provide us with the basis of comparing the cost merits of each option - that is, what will be the total cost to provide for the power demands, with each of these options. It is only after this is identified that we can justify which of these options is most economical.

Generating Costs of Steam Turbo-generated Power

Option Ref.		1990	1995	2000
LAB7	(Fct/kWh)	9.667	8.629	8.991
LAB9	(Fct/kWh)	8.374	7.651	8.133
LAB11	(Fct/kWh)	7.763	7.158	7.532
LAB33	(Fct/kWh)	12.467	10.625	10.621
LAB36	(Fct/kWh)	10.947	9.560	9.688

Total Cost of Power

Option Ref.	1990	1995 (in F$/year)	2000
LAB7			
- steam turbo	1,503,979	1,708,867	2,153,437
- diesel generation	101,105	128,474	219,812
- total of system	1,605,084	1,837,341	2,373,249
LAB9			
- steam turbo	1,341,503	1,560,023	2,004,613
- diesel generation	51,518	65,364	145,110
- total of system	1,393,021	1,625,387	2,149,723
LAB11			
- steam turbo	1,243,632	1,441,505	1,774,279
- diesel generation	51,518	92,411	262,315
- total of system	1,295,150	1,533,916	2,036,594
LAB33			
- steam turbo	1,939,642	2,104,156	2,543,947
- diesel generation	101,105	128,474	219,812
- total of system	2,040,747	2,232,630	2,763,759
LAB36			
- steam turbo	1,703,122	1,869,120	2,206,557
- diesel generation	101,105	155,521	346,032
- total of system	1,804,227	2,024,641	2,552,589

Summary of Cost Merits

Option Ref.	LAB7	LAB9	LAB11	LAB33	LAB36
Ranking in terms of:					
- unit cost of turbo-generation	3	2	1	5	4
- cost of supplementary diesel	3*	1	2	3*	4
- total cost of system	3	2	1	5	4

*(these two options are ranked identically as the cost for both, of supplementary diesel, is the same)

The results thus show that the selection of the best option, in terms of cost merits, will be between Option Ref. LAB9 and Option Ref. LAB11

3.2.3 Other Merits

The merits comparison done thus far, narrows down the selection of the best option to Option Ref. LAB9 and Option Ref. LAB11.

Certainly if one is considering only the maximum replacement of supplementary diesel generation, then the choice must be for Option Ref. LAB9. However, since the difference is marginal, we consider that the better technical merits of Option Ref. LAB11 more than compensates for this.

The biomass fuel consumption of Option Ref. LAB11 is far less than that of Option Ref. LAB9. This again makes Option Ref. LAB11 an easier system to operate in terms of logistics involved in supplying of biomass fuel to the system.

4.0 SUMMARY AND RECOMMENDATIONS

On the basis of the load forecast, we have identified that a system to provide for the power requirements of the Labasa grid, must necessarily be a steam turbo-generated power plant, operating with supply of power from the FSC and supplementary diesel supply from the FEA.

Insofar as hydro-power generation goes, our study and calculations show that this does not provide for an economical system, and we do not recommend that this be considered.

Our recommendations are:

- the system of power generation should consist of
  a new steam turbo-powered plant (3.0 MW, 30 bar, 400 C)
  power supply from the FSC power plant (after major improvements to its existing equipment)
  with supplementary diesel supply from the FEA.

- the new steam turbo-powered plant should be integrated to the FSC plant as this is the most practical way to operate. It is in practice not possible to really operate this plant as an independent entity because of problems in operation in terms of employment. Since the plant will not be in continuous operation (for example during FSC's crushing season, it will operate only when the FSC system is shut down) how does one employ staff?

  In view of the fact that the FSC staff will be available in the non-crushing season (when this new steam turbo-powered plant is to be operated continuously), we consider that it is ideal to utilise them for operating this plant. It then ensures full employment of FSC staff and provides experienced operators for the new plant.

- the present FSC steam power generating plant should be improved. The investments involved are minimal in comparision to the better efficiency and generation of more units of power for sale to the FEA.

Thus, our recommendation is that the Option Ref. LAB11 be implemented as the best option that will fulfill the power requirements of the Labasa Grid.

SECTION II - DETAILED ANALYSIS ON RECOMMENDED TECHNICAL OPTION

SECTION II - DETAILED ANALYSIS ON RECOMMENDED TECHNICAL OPTION

1.0 PROJECT PROPOSAL

1.1 Introduction

Section I, "2.5 Technical Evaluations on Plant Capacity and Source of Power Generation" dealt with the various options open for consideration. It has been shown that some of the options (Option Ref. LAB13, LAB14 and LAB15), very clearly do not fulfill the aim of replacing diesel generated power, to any considerable extent, and were eliminated.

Further evaluations (on the basis of cost of generation of power) done on the remaining options led to our recommendation of Option Ref. LAB11. Technically, it has been shown that this option allows for a high replacement of diesel generated power. However, the financial analysis in terms of economical viability of the project must be made. To do this, it is necessary to consider the investments at the FSC and the implications to FEA as the power supplying authority.

2.0 POWER DEMAND AND PLANT CAPACITY

Load forecast as referred to in Section I, shows total demands in Vanua Levu at:

- 12,522 MWh in 1985;
- 16,500 MWh by 1990;
- 21,000 MWh by 1995;
- 26,000 MWh by 2000

To meet with the above demands, we have recommended that generation of power be from the following sources (details of evaluations and capacities have been provided in Section I "2.5"):

- FSC integrated power plant, 3.0 MW, 30 bar / 400 C
  (supplying 9,750 MWh by 1990, 13,184 MWh by 1995 and 16,601 MWh by 2000)
- FSC supplying from its major improved power plant
  (supplying 2,449 MWh in 1985, 6,270 MWh by 1990, and 6,955 MWh from 1995 onwards)
- FEA diesel supplementary supply.
  (supplying 480 MWh by 1990, 861 MWh by 1995 and 2,444 MWh by 2000)

Generation Program at FSC

Year	1988	1989	1990	1991	1992
FSC Major Improved Plant supplying (MWh)	5996	6133	6270	6407	6544
FSC Integrated New Power Plant supplying (MWh)	8469	9062	9750	10488	11156
Total generated by FSC	14465	15195	16020	16895	17700
FEA Diesel supplement (MWh)	435	455	480	505	550
TOTAL DEMAND LABASA GRID	14900	15650	16500	17400	18250

Year	1993	1994	1995	1996	1997
FSC Major Improved Plant supplying (MWh)	6681	6818	6955	6955	6955
FSC Integrated New Power Plant supplying (MWh)	11904	12522	13184	13995	14775
Total generated by FSC	18585	19370	20139	20950	21730
FEA Diesel supplement (MWh)	615	730	861	1050	1270
TOTAL DEMAND LABASA GRID	19200	20100	21000	22000	23000

Year	1998	1999	2000
FSC Major Improved Plant supplying (MWh)	6955	6955	6955
FSC Integrated New Power Plant supplying (MWh)	15485	16115	16601
Total generated by FSC	22440	23070	23556
FEA Diesel supplement (MWh)	1560	1930	2444
	24000	25000	26000

Details of these calculations are shown in Annex H. Additionally, in Annex I, the load curves and minimum supply by diesel power plant curve, are shown.

Since this is a supply of public utilities, there is no necessity for detailed market analysis except for the load forecasting and corresponding appropriate generation of power demanded by the forecast. As such, it can be assumed that the generated power will be totally absorbed by the Labasa grid.

Before the sales revenue can be calculated, it is necessary to determine the 'sales price' from FSC to FEA. The FEA's cost of power generation, from its diesel station is F$0.1077 per kWh. Assuming an annual increase of 3% per annum, by 1988, the generating cost will be F$0.1142 per kWh. As such, the FEA's generating cost will be the base price and any 'sales price' from the FSC cannot be more than this (neglecting the plus factor of foreign exchange savings to the Government).

Consequently, we are now considering the 'sales price' at 3 levels, that is, at price of diesel generation, 15% below this price and another at 10% below.

Year	1988	1989	1990	1991	1992
At diesel price (F$)	0.1142	0.1176	0.1212	0.1248	0.1285
15% below (F$)	0.0971	0.0999	0.1030	0.1061	0.1092
10% below (F$)	0.1028	0.1058	0.1091	0.1123	0.1156

Year	1993	1994	1995	1996	1997
At diesel price (F$)	0.1323	0.1363	0.1403	0.1446	0.1489
15% below (F$)	0.1125	0.1158	0.1192	0.1229	0.1265
10% below (F$)	0.1191	0.1226	0.1262	0.1301	0.1340

Year	1998	1999	2000
At diesel price (F$)	0.1534	0.1579	0.1627
15% below (F$)	0.1304	0.1342	0.1383
10% below (F$)	0.1381	0.1421	0.1464

For the Government, the results of this study, will allow them to study the viability of investments at FSC. If profitable, it will form the basis for the Government to negotiate with the FSC to implement the project. The actual manner of implementation (financing etc) will have to be decided upon at that time.

From the FEA's point of view, as the power supplying authority, the study will provide the basic information on their possible future sources of power. Additionally, according to the results of the financial analysis done here, it will also provide them with the information necessary for their negotiation of price of power generated by the FSC.

Sales Revenue of FSC

Year	1988	1989	1990	1991	1992
FSC generation (MWh)	14465	15195	16020	16895	17700
Sales Price (F$/kWh)	0.1142	0.1176	0.1212	0.1248	0.1285
Total Sales (F$)	1651910	1786930	1941630	2108500	2274450
Sales Price (F$/kWh)	0.1028	0.1058	0.1091	0.1123	0.1156
Total Sales (F$)	1487000	1607630	1747780	1897310	2046120
Sales Price (F$/kWh)	0.0971	0.0999	0.1030	0.1061	0.1092
Total Sales (F$)	1404500	1518000	1650000	1792600	1932800

Year	1993	1994	1995	1996	1997
FSC generation (MWh)	18585	19370	20139	20950	21730
Sales Price (F$/kWh)	0.1323	0.1363	0.1403	0.1446	0.1489
Total Sales (F$)	2458800	2640130	2825500	3029370	3235600
Sales Price (F$/kWh)	0.1191	0.1226	0.1262	0.1301	0.1340
Total Sales (F$)	2213480	2374770	2541540	2725600	2911820
Sales Price (F$/kWh)	0.1125	0.1158	0.1192	0.1229	0.1265
Total Sales (F$)	2090800	2243000	2400600	2574800	2748800

Year	1998	1999	2000
FSC generation (MWh)	22440	23070	23556
Sales Price (F$/kWh)	0.1534	0.1579	0.1627
Total Sales (F$)	3462500	3642760	3832560
Sales Price (F$/kWh)	0.1381	0.1421	0.1464
Total Sales (F$)	3098970	3278250	3448600
Sales Price (F$/kWh)	0.1304	0.1342	0.1383
Total Sales (F$)	2926200	3096000	3257800

3.0 BIOMASS FUEL INPUTS

3.1 At FSC New Integrated Power Plant

At the new integrated power plant, calculations have been made in Annex H regarding the sawmill and logging waste requirements (also graphically shown in Annex I). Based on figures obtained in Labasa, costs are:

a) Sawmill waste

- Price per ton of chipped sawmill waste ex-FFI factory (see Annex R)	F$ 5.00/ton
- Transportation costs F$0.50 per km per lorry	
- Total distance between sawmills and FSC plant averages at 15 km.	
- Cost per lorry load = F$0.50 x 15 km = F$7.50	
- 2 tons of chips loaded per lorry, that is	F$ 3.75/ton
- Other miscellaneous costs estimated at 10%	F$ 0.87/ton
Price of sawmill waste, in 1986 delivered to FSC	F$ 9.62/ton

The other two sawmills will be supplying waste in slab-form. Thus, price per ton will be cheaper (no chipping costs) and load per lorry will be 5 tons (chips are occupying a larger volume). However, for conservative calculations, we consider price for sawmill waste at F$9.62/ton delivered FSC factory.

In our calculations, we have anticipated that the price of sawmill waste will increase by 3% per annum.

b) Logging Waste

- Price per ton, at forest loading point, inclusive of collection costs and loading costs	F$14.00/ton
- Transportation costs F$0.50 per km per lorry	
- Total distance between forest and FSC plant averages at 40 km	
- Cost per lorry load = F$0.50 x 40 km = F$20.00	
- 6 tons of logging waste loaded per lorry, ie	F$ 3.33/ton
- Other miscellaneous costs, estimated at 10%	F$ 1.73/ton
Price of logging waste, in 1986 delivered to FSC	F$19.06/ton

Prices here are also expected to increase by 3% per annum.

Production Costs (biomass fuel inputs)

Year	1988	1989	1990	1991	1992
FSC new power plant					
waste requirements:					
sawmill waste (tons)	18400	19200	20000	20800	21600
cost/ton (F$)	10.20	10.51	10.82	11.15	11.48
total cost (F$)	187680	201790	216400	231920	247970
forest waste (tons)	4655	4589	4700	5224	5561
cost/ton (F$)	20.22	20.82	21.45	22.09	22.76
total cost (F$)	94130	95540	100820	115400	126570

Year	1993	1994	1995	1996	1997
FSC new power plant fuel					
waste requirements:					
sawmill waste (tons)	22400	23200	24000	24000	24000
cost/ton (F$)	11.82	12.18	12.54	12.92	13.31
total cost (F$)	264770	282580	300960	310080	319440
forest waste (tons)	6068	6376	6592	8373	10040
cost/ton (F$)	23.44	24.15	24.87	25.61	26.38
total cost (F$)	142240	153980	163950	214430	264860

Year	1998	1999	2000
FSC new power plant			
waste requirements:			
sawmill waste (tons)	24000	24000	24000
cost/ton (F$)	13.71	14.12	14.54
total cost (F$)	329040	338880	348960
forest waste (tons)	11371	12918	13942
cost/ton (F$)	27.17	27.98	28.83
total cost (F$)	308950	361450	401950

4.0 LOCATION AND SITE

Our on site investigations at FSC, allowed us to identify the possibility of locating a new steam turbo power plant at the site of the existing installations of FSC. For purpose of identifying the location, and that of our project proposal, we have enclosed in Annex J, a Proposed Layout Plan for the new power plant.

The site has been chosen to be close to the existing power station for easy cross-utilisation of equipment whenever possible. Another factor which was considered in the determination of the site, is that of waste wood storage. According to the Fiji Forest Industry, waste wood from their production will be sold already chipped. As such storage of this will be fairly easy in a chips storage silo (as recommended in our list of equipment).

However, logging waste must be stored in an open yard for chipping. Thus, the site chosen for the new power plant has also provision of an open yard nearby, to minimise on the cost of conveyors necessary between the storage yard, chipper and chips storage silo. Thus, the proposed location is well suited to the new power plant.

5.0 PROJECT ENGINEERING

5.1 Technology

A steam turbo power plant transforms the binding chemical energy of fuel, inside a boiler, into heat energy which in turn generates steam at high pressure and temperature. At the turbine connected downstream, the velocity energy will be transformed to rotation energy which then generates electricity in the coupled generator. Annex K shows a typical Balance Diagram for a 3MW steam power plant.

A steam turbo power plant consists generally of the following main components:

- fuel storage and transport system
- steam boiler plant
- steam turbine genset
- condensing plant
- cooling water supply system
- thermal water treatment plant (degasification)
- chemical water treatment plant (purification)
- pumps and piping equipment
- electrical distribution and transforming plant

5.2 The Production Process at FSC

5.2.1 Fuel Storage and Transport System

The following fuel will be needed:

Sawmill waste

The chipped slabs and sawdust will be supplied from the nearby FFI sawmill in Malau. The material arriving will be fed into the feed hopper next to the fuel silo from where it will be transported by a scraper chain conveyor into the silo.

Logging waste

This material from the forest and a small portion of sawmill waste from the Waiqele and Vuniroli sawmills has to be chipped by a drum chipper which is installed next to the silo or feed hopper. The chipped material will be transported again by the scaper chain conveyor to the silo.

Bagasse

Surplus bagasse can also be used as fuel, in the power plant. It can be tranported either by a conveyor from the bagasse silo to the feeding hopper or by cartloaders from the open air storage to the hopper.

A drum chipper is needed to chip the slabs supplied from two sawmills and the logging waste from the forest. The chipped material from the FFI sawmill will be fed directly by a feed hopper. Bagasse can be fed in by the feed hopper also.

A cylindrical steel silo of a capacity of 1000 m3 installed beside the bagasse silo stores mainly chipped waste wood. This may also be used as a surge bin for bagasse. Due to fire risks, fermentation losses, etc, storage of bagasse poses problems. We recommend that instead of having problems in bagasse storage, all surplus bagasse be immediately utilised as fuel (at the major improved power plant and/or at the new integrated power plant). In doing so, no storage is necessary and, savings in purchase of waste wood is possible.

Transportation of the fuel from the silo will be via a long belt conveyor to the boiler infeed. The construction of the existing bagasse conveyor can be used for supporting of the fuel belt conveyor.

5.2.2 Steam Boiler Plant

The waste wood and bagasse fired boiler will be integrated into the existing boiler house. There are some possibilities to integrate the new boiler to the existing plant, viz by replacing the old saturated steam boiler or to install the boiler in the free space between the two big existing boilers. A check must however be made as to whether one of the chimneys can be used or a new one has to be installed.

The boiler is provided with a special grate (moving grate), a superheater, economizer and an air preheater to optimize its efficiency.

5.2.3 Steam Turbine Generator Set

The recommended turbine design is a multi-stage condensing turbine with a self-regulated brushless three-phase alternator. Excess steam is extracted from the turbine to supply the degasifier.

The turbine set will be installed in a new machine hall which is to be an extension of the existing machine hall. There are two alternatives shown in Annex I proposing same.

The exhaust steam (vacuum condition) will be condensated in a water cooled condenser, placed under the turbine. Due to this arrangement of the condenser under the turbine (best solution) the turbine set has to be placed on a table foundation, which will be approximately 4m high.

The condenser is provided with a steam ejector for retention of vacuum. The condensate produced will be pumped by the condensate pumps, back to the boiler via the degasifier/feedwater tank. A level controller keeps the water level constant in the collecting tank of the condenser (hotwell).

5.2.4 Supply of Cooling Water

The necessary cooling water, (850m3/hr for condensing and 50m3/hr for turbine and generator), will be taken from the nearby river, which is also being used for cooling of the evaporators of the process plant.

In anticipation of blockage of the cooling pipes, the following equipment is also necessary:

- sieves (rough dirt)
- suction baskets (pump protection)
- self-cleaning filters in delivery pipe

The return pipeline will end down-stream of the intake under river level, in order to save pump-head.

5.2.5 Make-up Water, Condensate and Feed Water Supply

To replace the water and steam losses in the plant (0.5m3/h), raw water from the existing source will be chemically treated at a small water treatment plant.

The water treatment plant is desigred as a double-line demineralisation plant in fluidised bed process. The plant is controlled from the feed water tank level-controller via a solenoid valve.

At the degasifier the condensate from the condenser and the make-up water from the water treatment plant will be thermally degassified. The feed water tank connected below, then collects the treated water.

The electric driven feed water pump pumps the feed water into the boiler, thus providing for a closed circulation system. The turbo-pump switches on automatically in case of electricity black-out or in case of fall in pressure of the feed water supply.

The feed water controller regulates the water level in the boiler drum.

5.2.6 Electrical Equipment

The power generated at the alternator will be distributed in a MV main distribution board to the step-up transformer, to the existing MV plant distribution board and to the step-down transformer for the auxiliary drive of the power plant.

The generator is connected by a motor operated circuit breaker to the main busbar. The step-up transformer is connected to the existing transmission lines by an air type load break switch.

The alternator can be synchronised in single operation to the main distribution board automatically by frequency, voltage relay and automatic parallel switch unit.

The generator is protected against over current, reverse power, earth fault, differential current, and extreme winding temperature.

The generated power at FSC can be transmitted to the FEA diesel plant via the existing underground high voltage cable (11kV) of size 3x95mm aluminium, over the 4 km distance. The normal current is 282A which means 5.3 MVA power. The short circuit current of this system is 8.8kA. The short circuit current of the existing plant can be limitted by an inductive choke. A second underground cable of same size (distance of 0.5 km), is connected to the overhead line to Malau. As such, the maximum generated power of 4 MW can be transmitted via the existing cable system of FEA.

5.3 Operating Parameters

The new power plant is operating normally only in the non-crushing time, which is approximately 5110 hours per year. All inspections, maintenance and repairs will be carried out during the cane crushing season.

During the crushing season, the new power plant will be operated only during the shut down of the sugar mill, estimated at about 100 hours. A graphic representation of the expected operating hours of this power plant is included in Annex L. Additionally, the new power plant is also designed to operate during crushing season, during the years when the power demand is more than what the improved existing plant can cope with. Coverage of peak loads will be by the diesel station.

At the beginning of the crushing season, there is normally not as much bagasse available as is needed for power generation. Therefore, in the first two months (which we estimate to be the period of bagasse deficiency), waste wood fuel could be used instead either at the improved existing plant (which is our recommendation) or at the new integrated power plant.

Towards the end of the crushing season, there is normally more bagasse available than being consumed at the boiler. This surplus bagasse has to be stored in the bagasse silo and/or waste wood silo and/or in the open. It can then be used instead of waste wood and in doing so, there is a compensating balance to the heavier use of waste wood at the start of the crushing season.

5.4 Equipment List

Based on the recommended technology and the project parameters, the necessary machinery and equipment and the related investment, are shown in the following page. In Annex M, general specifications of the machinery and equipment are provided and can be used for the preparation of tender documents if necessary.

Data used in this section, have been derived from relevant manufacturers of machinery and equipment (see Annex M). However, our use of prices and specifications from these manufacturers, do not in any way, reflect any recommendation or endorsement of their products, on our part. These data are purely indicative.

Investment Cost for 3.33 MW Power Plant (nominal capacity)

	Independent Plant US$	Integrated Plant US$
1 wood fired steam boiler 30 bar 400 grd C 18.0 t/hr	1,022,730.-	1,022,730.-
1 turboset with condenser 3,333 kW 6.6 kV 50 cycles	1,136,370.-	1,136,370.-
1 cooling water supply system	102,270.-	56,800.-
1 set pumps	102,270.-	86,400.-
1 set piping and insulation	352,270.-	227,300.-
1 feedwater tank/degasifier	40,910.-	34,600.-
1 fuel silo 1000 m3	86,360.-	86,360.-
1 fuel chipper and conveyers	147,730.-	113,700.-
1 bridge crane 12.5 t	52,270.-	52,270.-
1 demineralisation plant	27,270.-	23,200.-
1 electrical plant	272,730.-	231,800.-
1 set measuring and control	45,450.-	38,700.-
1 boiler/machine hall and constr.	363,640.-	136,400.-
fob seaport	3,752,270.-	3,246,630.-
estimated ocean freight 1500 m3	500,000.-	
estimated ocean freight 1280 m3		425,000.-
insurance	60,000.-	52,000.-
installation and commissioning	1,100,000.-	450,000.-
inland transport	70,000.-	70,000.-
contingencies	110,000.-	80,000.-
total price cif Labasa installed	5,592,270.-	4,323,630.-

Local investment cost for new power plant integrated to FSC plant

site preparation	F$ 25,000.-
civil works	F$ 50,000.-
pre-operation costs	F$ 25,000.-
	F$ 100,000.-

Data used in this section, have been derived from relevant manufacturers of machinery and equipment (see Annex M). However, our use of prices and specifications from these manufacturers, do not in any way, reflect any recommendation or endorsement of their products, on our part. These data are purely indicative.

It is also possible to minimise on foreign purchase, by involving local manufacturers and installation crew and this will be considered in our calculations.

To implement the major improvements which we have recommended, capital investment will be necessary for the following:

Investment Cost for Major Improvements to FSC Plant

		F$
steam pipeline for 2 drive turbines DN 200 x 150 m		10,000.-
superheater for Yoshimine boiler		200,000.-
transformer 1.5 MVA		40,000.-
replacement of 2.5 MW-turbine		30,000.-
new alternator for 2.5 MW-turbine		100,000.-
electric equipment		20,000.-
condensing turbine set (second hand)* consisting of:		
- second hand turbine	F$ 25,000.-	
- new alternator	F$ 40,000.-	
- condenser	F$ 40,000.-	
- piping	F$ 15,000.-	
- installation	F$ 10,000.-	
- electric equipment	F$ 30,000.-	
- foundation	F$ 15,000.-	
- contingencies	F$ 25,000.-	
		200,000.-
		600,000.-

*According to the FSC, they can purchase this set from Australia and will do this, if the major improvements will be implemented.

Local Investment Cost for Major Improvements

site preparation	F$ 10,000.-
civil works	F$ 20,000.-
total	30,000.-

On the basis of the above, it is possible to summarise the necessary investment for machinery and equipment for the project as in the following page.

Summary Total Investment Cost at FSC Plant

		local (US$)	foreign (US$)
1 wood fired steam boiler 30 bar 400 grd C 18.0 t/hr			1,022,730.-
1 turboset with condenser 3,333 kW 6.6 kV 50 cycles			1,136,370.-
1 cooling water supply system			56,800.-
1 set pumps			86,400.-
1 set piping and insulation		113,650.-	113,650.-
1 feedwater tank/degasifier			34,600.-
1 fuel silo 1000 m3		43,180.-	43,180.-
1 fuel chipper and conveyers			113,700.-
1 bridge crane 12.5 t			52,270.-
1 demineralisation plant			23,200.-
1 electrical plant			231,800.-
1 set measuring and control			38,700.-
1 boiler/machine hall and constr.		68,200.-	68,200.-
		225,030.-	
fob European seaport			3,021,600.-
estimated ocean freight 1280 m3			425,000.-
insurance			52,000.-
installation and commissioning		225,000.-	225,000.-
inland transport		25,000.-	45,000.-
contingencies		40,000.-	40,000.-
total price cif Labasa installed		515,030.-	3,808,600.-
x F$1.10	F$	566,540.-	F$4,189,460.-
land	F$	-	
site preparation	F$	35,000.-	
civil works	F$	70,000.-	
pre-operation costs	F$	25,000.-	
steam pipeline for 2 drive turbines DN 200 x 150 m	F$	10,000.-	
superheater for Yoshimine boiler	F$	200,000.-	
transformer 1.5 MVA	F$	40,000.-	
replacement of 2.5 MW-turbine	F$	30,000.-	
new alternator for 2.5 MW-turbine	F$	100,000.-	
electric equipment	F$	20,000.-	
condensing turbine set (2nd hand)	F$	200,000.-	
Total Investment Costs at FSC		F$1,296,540.-	F$4,189,460.-

6.0 PLANT ORGANISATION AND OVERHEAD COSTS

6.1 Plant Organisation

The new steam turbo-power plant will be operated and managed by the FSC in order to provide for a better utilisation of capital equipment and staff.

To run the new plant, additional operators will be required and these are considered under "7.0 Manpower". The anticipated operation is for the new plant to be run continuously over the mill's non-crushing season and during the crushing season, only when necessary, for example during shut downs and start ups of the existing power plant (after the major improvements proposed in this study has been completed).

Organisation wise, it will not be a problem as the introduction of the new plant will not cause any disruption to the mill's operation during the crushing season, since it is to be operated only occassionally (we have considered this to be 100 hours per crushing season).

When this plant has to run at full capacity, the sugar mill will be in non-crushing stage and thus, the operators can devote their time entirely towards its operation. This then is an ideal situation, that is, when the mill is running, maintenance work etc can be carried out (as necessary) at the new plant (because its output is not needed) and when the mill is not running, maintenance work can be carried out at the existing power plant, while the new plant is generating the needed power.

6.2 Overhead Costs

In a steam turbo-generated power plant, the overhead costs generally are in the range of 2% of the total initial investment cost. In this case, the overhead costs will be F$110,000.

This total consists of costs of:

- maintenance (32%)
- spare parts (48%)
- utilities (2%)
- energy (4%)
- factory overheads (14%)

6.2.1 Overhead Costs at FSC

a) At new integrated power plant

As mentioned in the previous page, overhead costs at this plant is expected to be F$110,000 per annum (with yearly increases of 3%).

b) At the FSC plant after major improvements

Based on the present figures of the FSC existing plant, we can estimate that the total overhead costs at the major improved plant will be F$60,000 per annum. This is expected to also cover cost of bagasse handling (since bagasse is considered at zero value to FSC). Yearly increases of 3% is also considered here.

Total Overhead Costs

	1988	1989	1990	1991	1992
Total Overhead Costs (in F$) consisting of:	170000	175100	180360	185760	191340
- maintenance (F$)	54400	56030	57720	59440	61230
- spare parts (F$)	81600	84050	86570	89160	91840
- utilities (F$)	3400	3500	3610	3720	3830
- energy (F$)	6800	7000	7220	7440	7660
- factory overheads (F$)	23800	24520	25240	26000	26780

	1993	1994	1995	1996	1997
Total Overhead Costs (in F$) consisting of:	197080	203000	209080	215360	221820
- maintenance (F$)	63060	64960	66910	68920	70980
- spare parts (F$)	94600	97440	100360	103370	106480
- utilities (F$)	3940	4060	4180	4310	4440
- energy (F$)	7880	8120	8360	8620	8880
- factory overheads (F$)	27600	28420	29270	30140	31040

Total Overhead Costs

	1998	1999	2000
Total Overhead Costs (in F$) consisting of:	228480	235330	242390
- maintenance (F$)	73110	75310	77560
- spare parts (F$)	109670	112960	116340
- utilities (F$)	4570	4710	4850
- energy (F$)	9140	9420	9700
- factory overheads (F$)	31990	32930	33940

7.0 MANPOWER

To operate the power generating plant at FSC, it will be necessary to deploy the following personnel:

12 plant operators
 4 unskilled workers - to handle fuel system
 2 loader operators - to handle transportation of fuel
 2 staff - for normal administrative functions
--
18 personnel

Costs associated with the employment of the above mentioned personnel are:

12 plant operators at F$4500/7mths each	F$54,000
4 unskilled workers at F$3000/7mths each	F$12,000
2 loader operators at F$4500/7mths each	F$ 9,000
2 staff at F$6000/7mths each	F$12,000

We have considered the costs only over the 7 months operation period as, we expect that during the crushing season, they can be deployed at the cane production.

These costs are expected to be valid for the year 1988 and to increase by 3% per annum thereafter.

Table of Manpower Costs

	1988	1989	1990	1991	1992
12 plant operators (F$)	54000	55620	57290	59000	60780
4 unskilled (F$)	12000	12360	12730	13120	13510
2 loader operators (F$)	9000	9270	9450	9840	10130
total production staff (F$)	75000	77250	79470	81960	84420
2 administrative	12000	12360	12730	13120	13510
total costs (F$)	87000	89610	92200	95080	97930

	1993	1994	1995	1996	1997
12 plant operators (F$)	62600	64480	66420	68410	70460
4 unskilled (F$)	13920	14340	14770	15210	15660
2 loader operators (F$)	10440	10750	11070	11400	11750
total production staff (F$)	86960	89570	92260	95020	97870
2 administrative	13920	14340	14760	15210	15660
total costs (F$)	100880	103910	107020	110230	113530

	1998	1999	2000
12 plant operators (F$)	72580	74750	77000
4 unskilled (F$)	16130	16620	17120
2 loader operators (F$)	12110	12470	12840
total production staff (F$)	100820	103840	106960
2 administrative	16130	16620	17120
total costs (F$)	116950	120460	124080

8.0 IMPLEMENTATION SCHEDULING

The implementation of the project, can be expected as shown in the Time Schedule provided in Annex O. Major equipment such as the turbine set and the boiler require long delivery times since these are generally manufactured only under order. Certainly, the delivery time is also dependent on whether the manufacturer/s chosen, is/are already having full orders booked or not. Thus, although the actual delivery time cannot be defined exactly, we expect that the delivery times as shown in Annex O, can be met by manufacturers.

In implementing the project, full co-ordination and co-operation between the parties involved is necessary. The major parties involved are:

- Government of Fiji
- The Fiji Electricity Authority and
- The Fiji Sugar Coropration Ltd.

We recommend that in order to ensure the success of the project, the responsibilities of each party be as summarised below:

The Government of Fiji

The Government's main role will be that of project instigator and co-ordinator. After having taken a decision together with the FEA, it will be necessary to enter into negotiations with the FSC on the possibility of integrating a new power plant into their existing system and to also implement major capital improvements there.

In terms of viability of the project, FSC can be informed of the results of this study. In addition, should the Government consider that additional incentives be given to the FSC, then, perhaps tax holidays, accelerated depreciation rates etc, may also be extended to FSC (perhaps this is in keeping with supply of public utilities). When the proposal is accepted, the Government may have a major role to play in seeking of finance for the project. In its capacity, it could possibly source finance more readily than a private corporation. Its further active role in the project will then very much depend on which party is sourcing the finance - if it is not, then, its function will be regulatory.

The Fiji Electricity Authority

As the authority charged with power supply, its main role is to advice the Government on whether to accept our recommended project in toto or not. Taking into account the savings in foreign exchange, together with the Government, a formula for the purchase price of power from the FSC can be worked out. Perhaps, a lower purchase price could be compensated for by factors discussed earlier (such as tax holidays, accelerated depreciation). It will be the responsibility of the FEA to guarantee the purchase of power from the FSC (at a fair price, which can be derived at using the results of our financial analysis) as surely this is the decisive factor on the viability of the project.

Once FSC is decided on implementing the project, FEA's support will be necessary in linking up the generated power from the FSC to the Labasa grid.

In financial terms, FEA may be interested to invest in the project together with FSC. As the power supplying authority, it may want to be involved in the source of generation also. Such a tie-up will have its advantage in securing of waste wood etc.

The Fiji Sugar Corporation

To minimise on capital investment, we have recommended that the project be integrated to the existing power plant of the FSC. For the FSC, this will not only provide for adequate profits, but will also mean fuller utilisation of existing capital equipment (and manpower to a certain extent).

When finance for the project can be secured, FSC could take a flexible stance in respect of its sales policy to the FEA. (Of course the pricing policy will very much depend on the incentives provided, the financial involvements, if any, of the FEA etc).

To generally summarise our recommendations, we wish to state that this project is primarily catering to the supply of public utilities. As such, profit considerations (while necessary), should not play a major role in the decision making. It is hoped that all parties involved can co-operate in making this a worthwhile venture to all concerned and to benefit the public eventually.

9.0 FINANCIAL EVALUATIONS

The main figures for the investment and the projected results of the project, are shown under three different financial analysis. These are at FSC's sales price to FEA at FEA's diesel generating price, at a 90% of FEA's diesel generating price, and at 85% of FEA's diesel generating price. For details of the calculations, please refer to the respective analysis in Annex P.

The summary figures of the financial analysis show the following:

Total initial investment

fixed assets: F$5,639,608-

Source of funds

equity: F$2,743,000.-
loans: F$2,743,000.-

Cash Flow from Operations

	100% diesel gen. price (F$)	90% of diesel gen. price (F$)	85% of diesel gen. price (F$)
1988			
gross income	523,896.50	358,810.00	276,545.00
net income	327,435.30	224,372.20	172,840.60
cash balance	273,476.40	170,413.40	118,881.80
net cashflow	854,992.30	751,929.30	700,397.80
1989			
gross income	666,417.00	487,116.10	397,465.60
net income	416,510.60	304,447.60	248,416.00
cash balance	421,712.90	309,649.80	253,618.30
net cashflow	972,507.30	860,444.10	804,412.70
1990			
gross income	824,090.50	630,248.60	532,526.60
net income	515,056.60	393,905.40	332,829.10
cash balance	519,848.00	398,696.80	337,620.50
net cashflow	1,039,921.00	918,769.50	857,693.30

Note: Table of Cash Flow from Operations for years 1991 - 2002 are shown in Annex Q.

Net Present Value at 8%

	Results at sales price of diesel generation	Results at sales price 10% below diesel generation	Results at sales price 15% below diesel generation
NPV	F$6,118,681	F$4,720,026	F$4,022,492
IRR	20.39%	17.87%	16.56%
ROE1	23.83%	19.71%	17.56%
ROE2	24.53%	20.77%	18.85%

E1 = total equity paid : net income
E2 = initial equity paid : net cash return

9.1 Sensitivity Analysis

To study the effects on the profitability of the recommended project, we have thus far, considered its economic performance under three different sales prices, that is:

- at FEA's diesel generating price
- at 90% of FEA's diesel generating price
- at 85% of FEA's diesel generating price

In Annex S, we have included results of the effects on the project's profitability, if prices for sawmill and logging waste increase. The analysis is based on:

- prices of sawmill and logging wastes increase by 25%, the effects on the profitability at sales price of a) diesel generating price, b) 90% of diesel generating price, c) 85% of diesel generating price.

- prices of sawmill and logging wastes increase by 30%, the effects on the profitability at sales price of a) diesel generating price, b) 90% of diesel generating price, c) 85% of diesel generating price.

The results can be summarised as follows:

a) at sales price of diesel generation,

Waste wood prices at	100%	120%	130%
Net Present Value at 8%	F$6,118,681	F$5,562,822	F$5,357,705
Internal Rate of Return	20.39%	19.47%	19.07%
Return on equity1	23.83%	22.38%	21.72%
Return on equity2	24.53%	23.17%	22.55%

b) at sales price of 90% of diesel generation,

Waste wood prices at	100%	120%	130%
Net Present Value at 8%	F$4,720,026	F$4,209,376	F$3,959,053
Internal Rate of Return	17.87%	16.94%	16.47%
Return on equity1	19.71%	18.22%	17.46%
Return on equity2	20.77%	19.41%	18.72%

c) at sales price of 85% of diesel generation,

Waste wood prices at	100%	120%	130%
Net Present Value at 8%	F$4,022,492	F$3,510,988	F$3,261,515
Internal Rate of Return	16.56%	15.60%	15.11%
Return on equity1	17.56%	16.00%	15.21%
Return on equity2	18.85%	17.46%	16.76%

Since waste wood is not a normal commercial commodity, its value is dependent mainly on buyer/seller agreement. To the seller, unutilised waste wood represents zero value and at times even costs (for disposal). Thus, any cash generated from waste wood is a bonus (provided costs involved in its sale are adequately covered by the sales price). Because of this, we do not anticipate that the price of waste wood as evaluated during our field mission, will vary by anything more than 30% (extreme high level).

Similarly, other items of production costs have been considered at realistic high levels and the economic results have been shown to be positive. Thus, it can be concluded that the recommended project is economically viable.

10.0 SUMMARY AND RECOMMENDATIONS

The technical and economic viability of the recommended project has been established in this section.

Fiji has good experience with the recommended technology and we do not anticipate any problems in its operation. Furthermore, the project will allow for cross-utilisation of existing capital equipment making for lowest additional capital requirements.

The system also provides for an efficient and economic disposal of biomass fuel and this takes care of future problems which would otherwise develop should the present undesireable practice of dumping be continued.

For the country, replacement of diesel generation of power would mean savings in valuable foreign exchange. The project can fulfill the needs of the Government in terms of supply of power via a suitable alternative compared to diesel generation.

As such, we recommend that the project be implemented in toto.

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ANNEX A

Objective:

To assess the techno-economic feasibility of and the power demand fuel availability for establishing a bagasse and/or waste wood fired power plant in or near Labasa.

Terms of Reference:

To investigate into the locally available bagasse and/or waste wood and to prepare a techno-economic feasibility study, in particular to carry out the following tasks:

(a) study and review the work done in previous reports as far as bagasse and wood utilisation is concerned;

(b) determine as accurately as possible the amount of bagasse likely to become available during the years 19[illegible]7-2000 from the FSC mill. In this exercise, the future sugar market, plant improvements envisaged by FSC, the government policy regarding sugar industry and other relevant factors should be taken into account;

(c) determine the amount of waste wood likely to become available from major logging concerns during the same period;

(d) study the feasibility of utilising these materials for the generation of power and determine the optimum ways of doing this using proven technology;

(e) determine the energy available to FEA from these biomass sources. Using the load forecast given in Vanua Levu Hydro-Electric Study, Supplementary Report by Gibb, determine the amounts of biomass energy that can be absorbed by the Labasa grid to replace the supplementary diesel generation as far as possible. In this respect, the assumptions made in the Gibb report on the available FSC generation should be disregarded;

(f) prepare a construction programme necessary to implement (d) above, identifying all necessary equipment in sufficient detail from which tender documents can be prepared if necessary. Also determine capital costs, running costs and the cost of per unit generation over the period concerned.

(g) propose suitable guidelines and recommendations for interphasing of activities between the Authority and other organisations involved, both during the construction period and later operations. This should cover financial and organisational aspects.

A

ANNEX B
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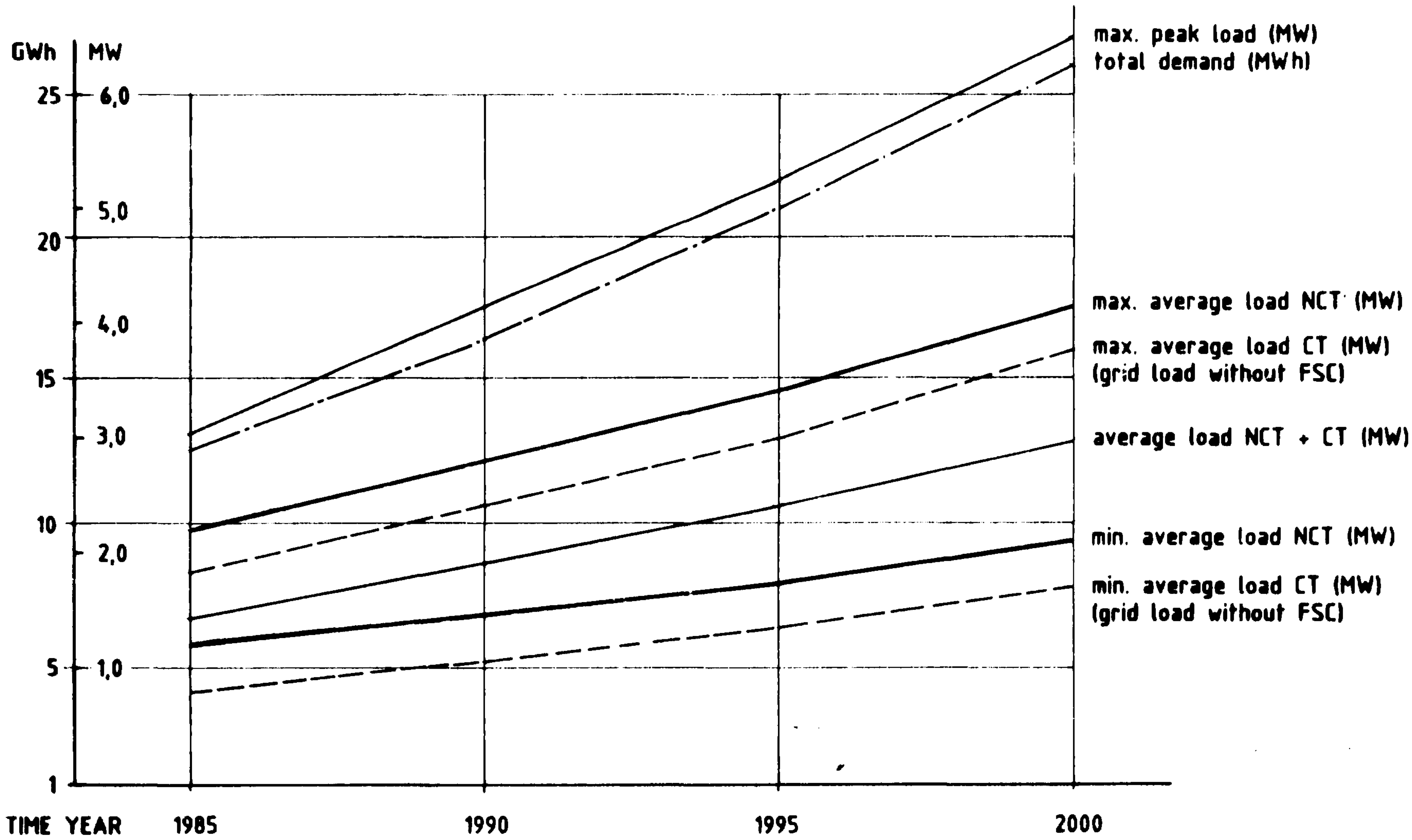
FIJI - LABASA POWER STUDY
DEMAND, LOADS as assumed



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FIJI - LABASA POWER STUDY
LOAD DURATION CURVE OF CT

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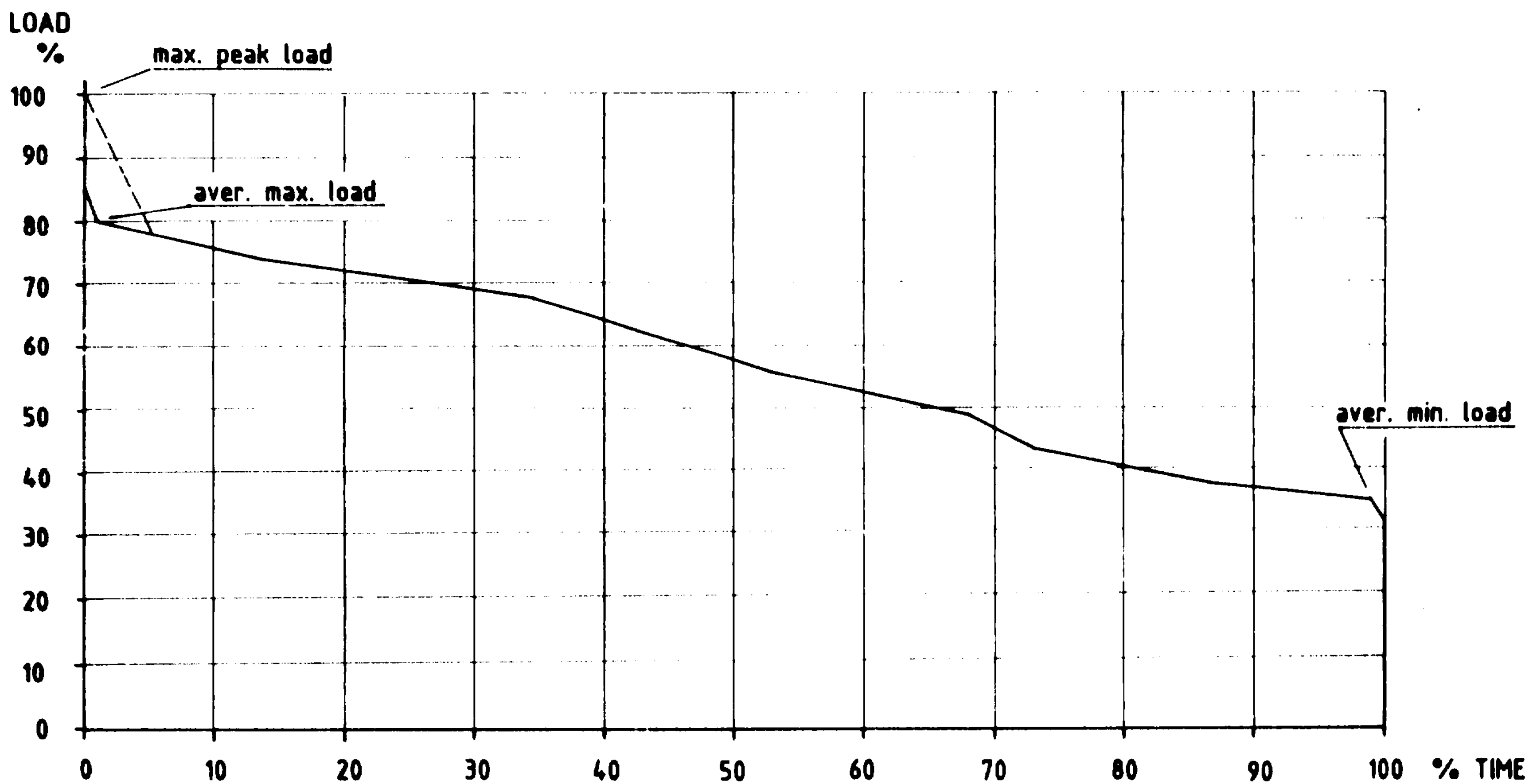
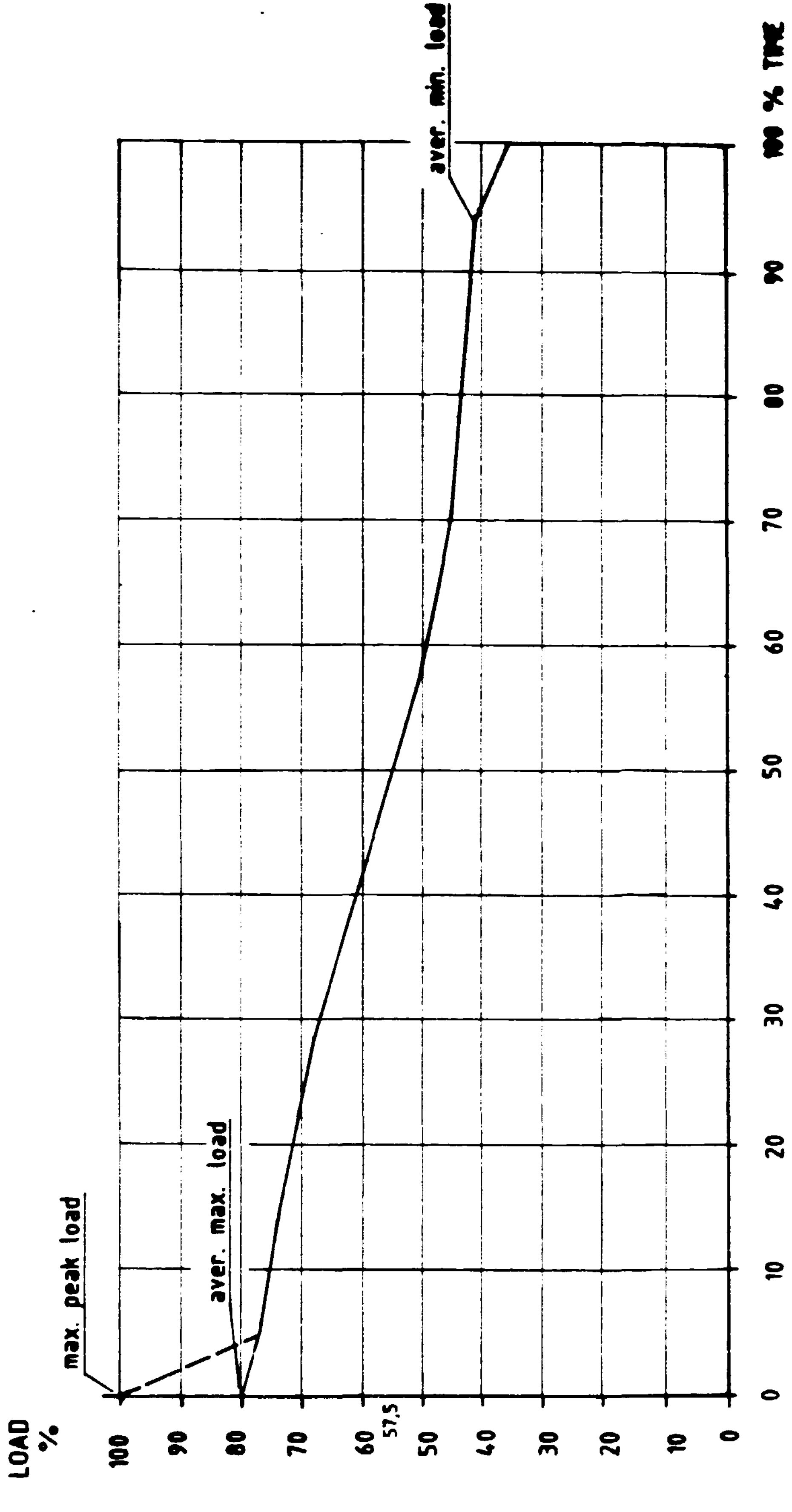
LOAD DURATION CURVE of FEA LABASA SYSTEM IN CT

(average weekly)



LOAD DURATION CURVE
of FEA LABASA SYSTEM in NCT
(average weekly)



FIJI - LABASA POWER STUDY

LOAD DURATION CURVE OF NCT

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FIJI - LABASA POWER STUDY
SAMPLE CALCULATION OF
MIN. DIESEL SUPPLY TO COVER PEAK LOAD

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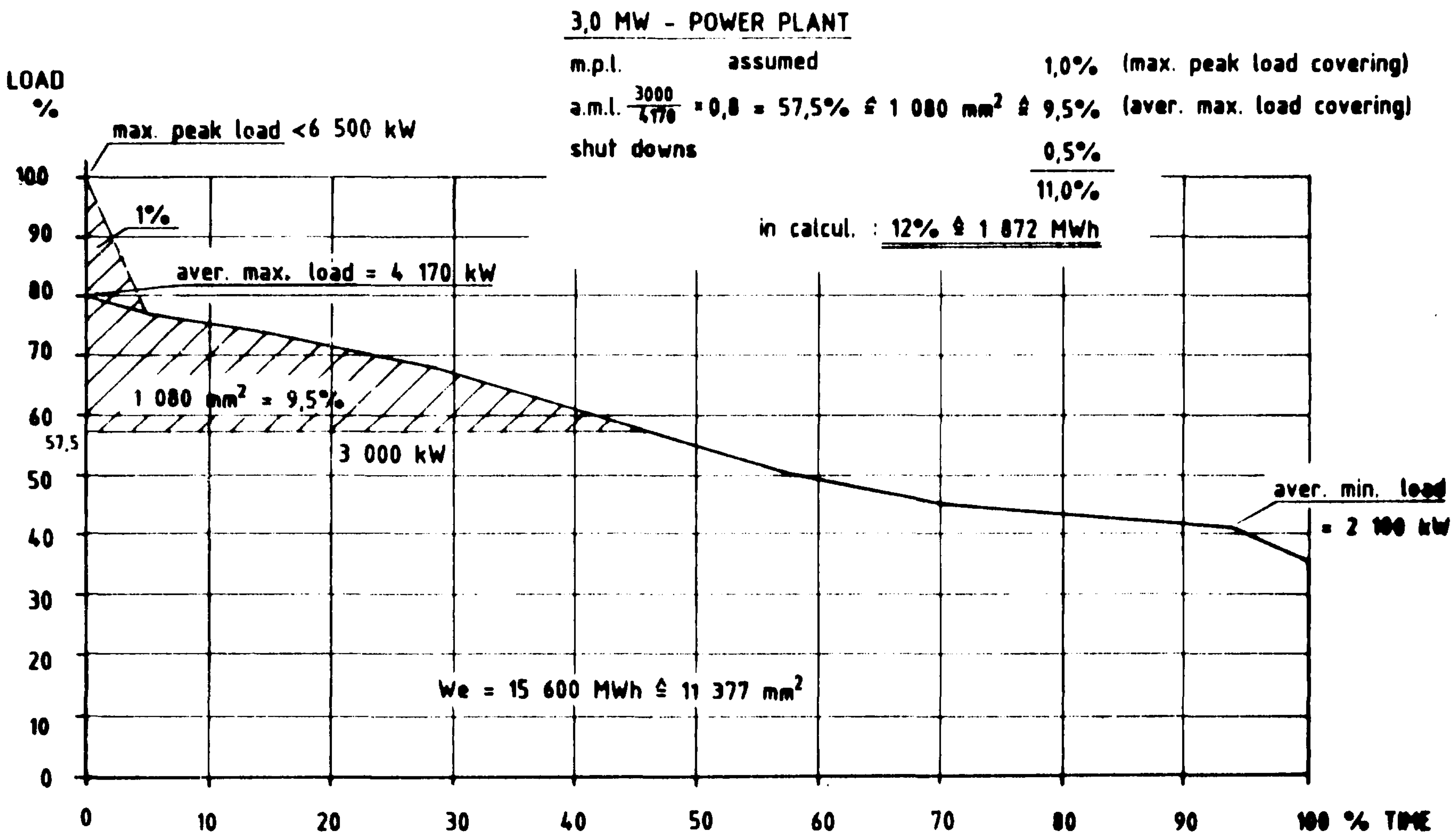
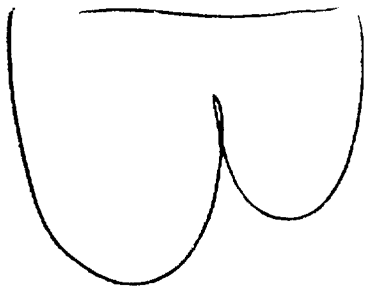
LOAD DURATION CURVE
of FEA LABASA SYSTEM in NCT 2000

(average weekly)





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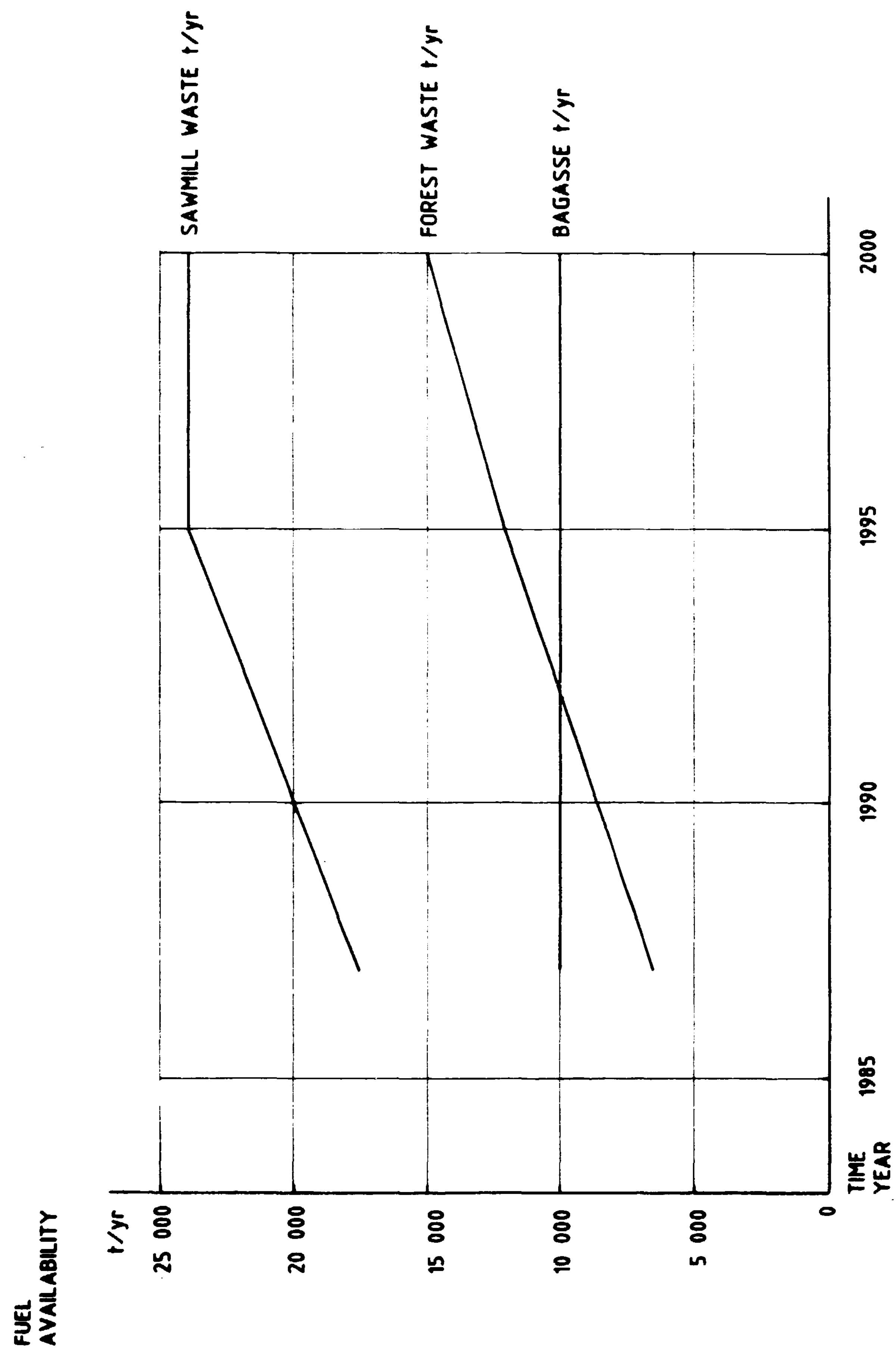

FIJI - LABASA POWER STUDY

AVAILABILITY OF FUEL

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Calorific Value of Bagasse

Moisture content (%)	Net calorific value (kJ/kg)	Weight index of bagasse* (kg)	Comparative energy available **(MJ)
55	6,565	111.1	729.4
50	7,574	100.0	757.4
45	8,582	90.9	780.1
40	9,591	83.3	789.9
35	10,599	76.9	815.1
30	11,608	71.4	828.8
25	12,616	66.7	841.5
20	13,625	62.5	851.6
15	14,633	58.8	860.4
10	15,642	55.6	869.7
5	16,650	52.6	875.8
0	17,659	50.0	883.0

*kg of bagasse per 50 kg of fibre
** MJ per 50 kg of fibre.

Source: 'Electricity Export from Cane Sugar Factories' by Robert Antoine, of Regional Sugar Cane Training Centre for Africa, Reduit, Mauritius.

FSC Sugar Mill Processing Data

During our field mission, the following data were collected from the FSC:

cane crushed	: tonnes of cane crushed each season average of season from 1981-1985 = 981,000 t
intake rate	: tonnes of cane per hour (TCH) at present this is at 250 - 280 TCH FSC however expects the intake rate to increase to 300 TCH in the future
fibre content	: dry cane waste average of season from 1981-1985 was 12.38 % with a net calorific value of 17,660 kJ/kg
bagasse	: wet fibre the average moisture content is 45%-48 %
process steam rate	: total steam consumption for process heating at the low pressure side (1 barg) presently at between 550 - 650 kg/TCH
factory in balance	: this means that the available fibre (bagasse) can generate the heat necessary to produce the required process steam. For example, the plant is in balance, if according the the fibre content, the steam rate is: steam rate = 600 kg/TCH => fibre content 12% steam rate = 550 kg/TCH => fibre content 11% steam rate = 500 kg/TCH => fibre content 10%

On the basis of the above data collected from the FSC, we have used the following figures in our calculations:

cane crushed	: 1,000,000 t per season
intake rate	: 250 TCH => 4,000 operating hours
fibre content	: average 12,3 %
bagasse	: 50 % m. c. => 7574 kJ/kg => 2 x 12,3 = 24,6 %
steam rate (process side)	: 580 kg/TCH (as is the case now) : 550 kg/TCH (this better steam rate can be achieved by improving (ie lowering) the consumption at the evaporators).

Electric Power Demand of FSC Plant

According to figures provided by FSC over the period 1981-1985

average cane crushed:	981,000 t
average power generation:	10,682,396 kWh
average power imported from FEA	591,724 kWh
average power exported to FEA	2,124,248 kWh
average own consumption:	9,149,872 kWh

average length of season: 28.22 weeks

average operating hours: 28 x 24 x 7 - 20 x 10 = 4,500 h
(maintenance shut-downs of 10hrs every 10 days)

average load: 9,149,872 : 4,500 = **2,032 kW**

Specifically, in 1984: 1,136,861 TC

average load:

(11,333,870 + 518,400 - 1,792,080) : (31.8 x 24 x 7 - 22 x 10. =

= 10,060,190 : 5,122 = **1964 kW**

Specific Electric Power:

average: 9,149,872 kWh : 981,000 TC = 9.33 kWh/TC
= 9.33 kW/TCH

In calculating with a 10% safety margin, = **10.4 kW/TCH**

for our assumption of 1,000,000 TC / 250 TCH / 4000 h:

250 x 10.4 kW = **2,600 kW** average for 4000 hours

Important Data on Existing Equipment at FSC

The following data were collected from the FSC, with respect to the existing equipment:

Existing Pressure Stages at FSC

a) Existing high pressure stage at 17.2 barg saturated steam
   Connected to this high pressure line, are:
   - 2 boiler outlets
   - 8 turbine inlets
   - 1 reducing station

b) Existing medium pressure stage at 11 barg saturated steam
   Connected to this medium pressure line, are:
   - 4 drive turbine inlets
   - 1 reducing station

c) Existing low pressure stage at 1.0 barg saturated steam
   Connected to this low pressure line, are:
   - process steam for heating
   - 12 turbine outlets
   - 1 reducing station

Existing Operating Boilers at FSC

a) Yoshimine: 136 t/h - 17.2 barg / saturated steam
designed boiler efficiency at 89%
for calculations, we use 80%

fuel consumption:
80 C => 17.2 barg/sat:
net heat exchange = 2,800 - 350 = 2450 kJ/kg
fuel rate = 2450 kJ/kg : (7574 x 80%)
= 0.404 kg bagasse/kg steam

b) Thompson: 43.5 t/h - 17.2 b / saturated steam
designed boiler e iency at 80%

Existing Main Turbines

steam rate of existing main turbines:

a) Shin Nippon model HD-182, 15.33kg/hph (20.6 kg/kWh)
(leveller and mills)

b) Shin Nippon model B6-R2-R, 14.05kg/hph (18,8 kg/kWh)
(shredder)

c) Shin Nippon model B6-R5-F, 15.9 kg/kWh (generator)

According to the FSC, the steam consumption of the main turbines are as follows:

	Units	Model No.	Output	Normal Steam Consumption	Steam Rate
feeding	2	HO-182R	600hp		15.33kg/hph
feeding	1	B6-R2-R	2400hp		14.05kg/hph
crushing	1	HO-182	558hp		15.33kg/hph
crushing	2	HO-183	465hp		25.00kg/kWh
boiler	1	H-161	230kW	6,850kg/h	
boiler	1	H-162R	550kW	4,500kg/h	
power house	1	B6-R5-R	[illegible]kW		19.90kg/kWh
injection	1	123071	kW	7,460kg/h	

STEAM FLOW - BALANCE (under present existing conditions)

Cane crushed:	1,000,000 t per season
Intake rate:	250 TCH
Steam rate:	600 kg/TCH

Process steam demand:
250 TCH x 600 kg/TCH = 150,000 kg/h saturated steam

Balance:			17.2 bar t/h	11 bar t/h
feeding:	(2 x 600hp x 15.33kg/hph) : 95%	=	19.4	-
	(1 x 2400hp x 14.05kg/hph) : 95%	=	35.5	-
crushing:	(1 x 558hp x 15.33kg/hph) : 95%	=	9.0	-
	(2 x 465hp x 18.8kg/hph) : 93%	=	-	18.7
boiler house:	1 x 6.85 t/h x 80%	=	5.5	-
	1 x 14.5 t/h x 80%	=	11.6	-
power house:	(1 x 2600kw x 15.9kg/kWh) . 94%	=	44.0	-
injection:	1 x 7.46t/h x 85%	=	-	6.3
total steam flow through the turbines		=	125.0	+ 25.0
total to low pressure stage		=	150.0 t/h	

The steam flow is balanced, since the steam consumption at the drive turbines, is identical to the process steam demand at the low pressure stage (steam heat content = 2600 kJ/kg).

The plant is in balance, when the fibre content reaches 12 % which is identical to the steam rate of 600 kg/TCH.

In the previous pages, data on existing equipment and the performance of the equipment has been shown. Our study shows that improvements are possible and recommend a) minor improvements and b) major improvements, the technical implications of which are now considered.

Technical Improvements at FSC Equipemnt

To achieve improvements at the FSC equipment, we are recommending that the minor and major improvements be implemented. Both these improvements are necessary in order to optimise the potential of power generation from the FSC plant.

Minor Improvements (medium pressure stage)

This involves conversion of the two drive turbines to the 17 bar stage (from their present 11 bar stage). This will provide for a higher expansion head which results in an improved steam rate.

Based on FSC's data on the existing mill turbines, this conversion will result in:

According to the FSC, the steam rate at 11 bar = 25.0 kg/kWh
and the steam rate at 17 bar = 20.6 kg/kWh

improvement of steam rate = 4.4 kg/kWh

that is, a 17.5% improved steam rate over the medium pressure stage (where the present steam consumption is 25 t/h).

Major Improvements (high pressure stage)

This involves the installation of superheaters in the existing operating boilers in order to increase the expansion head in the turbines.

According to the FSC, for the present situation,
at 17.2 bar/sat. (208 C), delta ho = 380 kJ/kg
with major improvements,
at 17.2 bar/300 C, delta ho = 430 kJ/kg

resulting increase in head = 50 kJ/kg

that is, a 13% improved steam rate over the present rate in the high pressure stage (where the present steam consumption is 125 t/h).

Note: The internal efficiency of the turbine will be better when operating with superheated steam instead of saturated steam. However, this has been considered as a safety factor and considered in our calculations. As a result of the improved steam rate, the situation at the main turbines will be:

Model	Existing steam rate	Improved steam rate
HO-182	20.6 kg/kWh	17.9 kg/kWh
B6-R2-R	18.8 kg/kWh	16.4 kg/kWh
B6-R5-R	15.9 kg/kWh	13.8 kg/kWh

It must also be stated that in this improvement, additional fuel will be consumed at the superheating.
80 C => 17.2 barg/300 C, delta h = 3030 - 350 = 2680 kJ/kg
assuming an increase of boiler efficiency from 80% to 81%,
fuel rate = 2680 : (7574 x 0.81) = 0.441 kg bagasse/kg steam
(an increase of 9% compared to the present 0.404 kg bagasse per kg steam).

The results at the low pressure stage due to the major improvements are:

the present situation according to the FSC is
process steam rate 580 kg/TCH
based on saturated steam with 5 % water content
= heat content of 2600 kJ/kg

However, with improvements at the evaporators (not a major job), the process steam rate will be 550 kg/TCH

The exhaust steam of the turbine is superheated = average heat content of 2775 kJ/kg.

To avoid a decrease in the efficiency (lower heat transfer) of the heat exchangers on the process side the exhaust steam has to be desuperheated (2700 KJ/kg).

This is done by injecting cooling water (boiler feed water).
The result is:

(2775 - 2700):(2775 - 440) = 3.2 %
for process steam of 137.5 t/h: 137.5 x 0.032 = 4.4 t/h

The exhaust steam needed to cover the demand for process steam, is: 137.5 t/h - 4.4 t/h = 133.1 t/h
and this has to be generated by the boilers.

Note: the heat content of saturated steam 0% water content is 2700 kJ/kg while that of saturated steam 5% water content is 2600 kJ/kg - a difference of 3.8%. Again this will not be included in our calculations and kept as a safety factor.

As a result of implementing the major improvements, the technical implications are:

STEAM FLOW - BALANCE (based on major improvements)

Cane crushed:	1,000,000 t
Intake rate:	250 TCH
Steam rate:	550 kg/TCH

Process steam demand:
250 TCH x 550 kg/TCH = 137,500 kg/h saturated steam

Balance:			17.2 bar t/h
feeding:	19.4 t/h x 87%	=	16.9
	35.5 t/h x 87%	=	30.9
crushing:	9.0 t/h x 87%	=	7.8
	18.7 t/h x 82.5% x 87%	=	13.4
boiler house:	5.5 t/h x 87%	=	4.8
	11.6 t/h x 87%	=	10.1
injection:	turbine will be replaced by an electric motor (250kW)		-
power house:	(2600+250)x(13.8 : 94%)	=	41.8
total steam flow through the turbines		=	125.7 t/h
generated superheated process steam, excluding injection water: 137.5 - 4.4		=	133.1 t/h
by-pass steam available		=	7.4 t/h

Compared to the process steam demand at the low pressure stage, the steam flow through the turbines is not as much. Therefore, the 7.4 t/h by pass steam can pass through a turbine genset for power generation.

The plant is in balance, when the fibre content reaches 11 %, which is identical to the steam rate of 550 kg/TCH.

Excess Bagasse Available from FSC

It is important to identify the quantity of bagasse available from FSC, in excess of their own needs. In view of the minor and major improvements suggested previously, the calcuations must now be made for both of these cases.

With Minor Improvements

- 2 mill turbines to be connected to the high pressure stage
- 1 injection pump will be provided with an electric motor

These improvements are necessary to shorten the steam flow through the turbines.

Assumption: 1,000,000 TC
250 TCH
12.3 % average fibre content
24.6 % bagasse 50 % moisture content
0.404 kg bagasse/kg sat. steam 17 barg
steam rate: 580 kg/TCH => 11.6 % fibre content

process steam demand: 250 x 580 =	145.0 t/h
turbine steam demand: 125 + 18.7x0.825 + 250x15.9 : 94% =	144.7 t/h
steam flow is balanced with	0.3 t/h

bagasse availability:

from crushed cane: 1,000,000 x 24.6%	=	246,000 t
for steam generation 145,000 x 0.404 x 4000	=	234,320 t
surplus bagasse	=	11,680 t

With Major Improvements

- installation of superheaters in existing operating boilers
- additional transformer
- desuperheater

These improvements are necessary in order to shorten the steam flow through the turbines.

Assumption: 1,000,000 TC
250 TCH
12.3 % average fibre content
24.6 % bagasse 50 % moisture content
0.441 kg bag./kg superheated steam 17 barg
steam rate: 550 kg/TCH => 11.0 % fibre content

process steam demand saturated	=	137.5 t/h	
less injection of water of	=	4.4 t/h	
process steam demand superheated	=	133.1 t/h	(from boiler)
turbine steam demand	=	125.7 t/h	
steam for add. power generation	=	7.4 t/h	

bagasse availability:

from crushed cane: 1.000,000 x 0.123 x 2	=	246,000 t
for steam generation 133,100 x 0.441 x 4000	=	234 800 t
surplus bagasse/season	=	11,200 t

Power Generation

1) By using the surplus bagasse from FSC
   in an independent or integrated condensing power plant

   available bagasse: 10,000 t/season

   30 bar/400 C power plant (at load factor of 50%)

   10,000 x 7574 : 3600 x 0.126 = 2,650,900 kWh/yr

2) In FSC-plant with major improvement in equipment

   (a) power generation from by-pass steam (7,400 kg/h) in existing turbine-genset (4 MW)

   7,400 kg/h : 14.0 kg/kWh = 530 kW

   in 4000 h => 2,120,000 kWh/yr

   (b) power generation from available surplus bagasse (10,000 t per season)

   10,000 t bagasse : 0.441 = 22,675 t steam (17 barg / 300 C)

   - in replaced 2.5 MW turbogenset (15 kg/kWh)

   22,675,000 kg : 15 kg/kWh = 1,510,000 kWh/yr

   - in a new installed condensing turbogenset (18.5 kg/kWh) which is connected downstream of the low pressure stage

   22,675,000 kg : 18.5 kg/kWh = 1,225,000 kWh/yr

   total from bagasse = 2,735,000 kWh/yr

   Total in improved plant: = 4,855,000 kWh/yr

Remarks to our Calculation

Major improvements at FSC:

1) The Yoshimine boiler can be operated up to 20 barg!
   To be on the conservative side, we have considered operations at only 17 barg.

2) The internal efficiency of the existing turbines will be improved by about 5 % if superheated steam will pass the turbine instead of saturated steam (of course after small works are carried out to check for proper sealings etc). Again, for conservative calculations, we did not include this improvement factor.

3) In our calculation we assumed that the moisture content of the bagasse is 50 %. The actual moisture content is between 45 and 48 %.
   By drying the bagasse via the hot flue gas or under roof, the total efficiency or power output can be higher.

4) The installation of a condensing turbine genset is useful:

   - to generate power from the surplus steam at the process side and to prevent steam losses by blow-off
   - to regulate the peak load demand

   Design: inlet - 2.0 bara/140 deg C
   exhaust - condensing pressure, 0.2 bara
   power output - 1,000 kW

   delta ho = 2750 - 2400 = 350 kJ/kg
   by intern. eff. = 0.65 => delta h = 227.5 kJ/kg
   mechan. and electr. losses = 8 %
   => design steam rate: 17.2 kg/kWh

   Power output from surplus steam on the process side:

   5 t/h => 225 kW
   10 t/h => 540 kW
   15 t/h => 870 kW
   17.2 t/h => 1000 kW

   Note: According to FSC, at present, there is a large surplus of steam on the process side. There is no bypass steam from the high pressure to the low pressure stage.

5) Additional Surplus Bagasse

by improvement of the steam rate:

present: 550 - 650 kg/TCH

in our calculation: 550 kg/TCH
equivalent to 11 % fibre content

in future: 500 kg/TCH
equivalent to 10 % fibre content

from 1,000,000 t cane crushed:

surplus bagasse:

$$1{,}000{,}000 \times (0.11 - 0.10) \times 2 = 20{,}000 \text{ t/yr}$$

which can be used instead of waste wood or additionally for power generation.

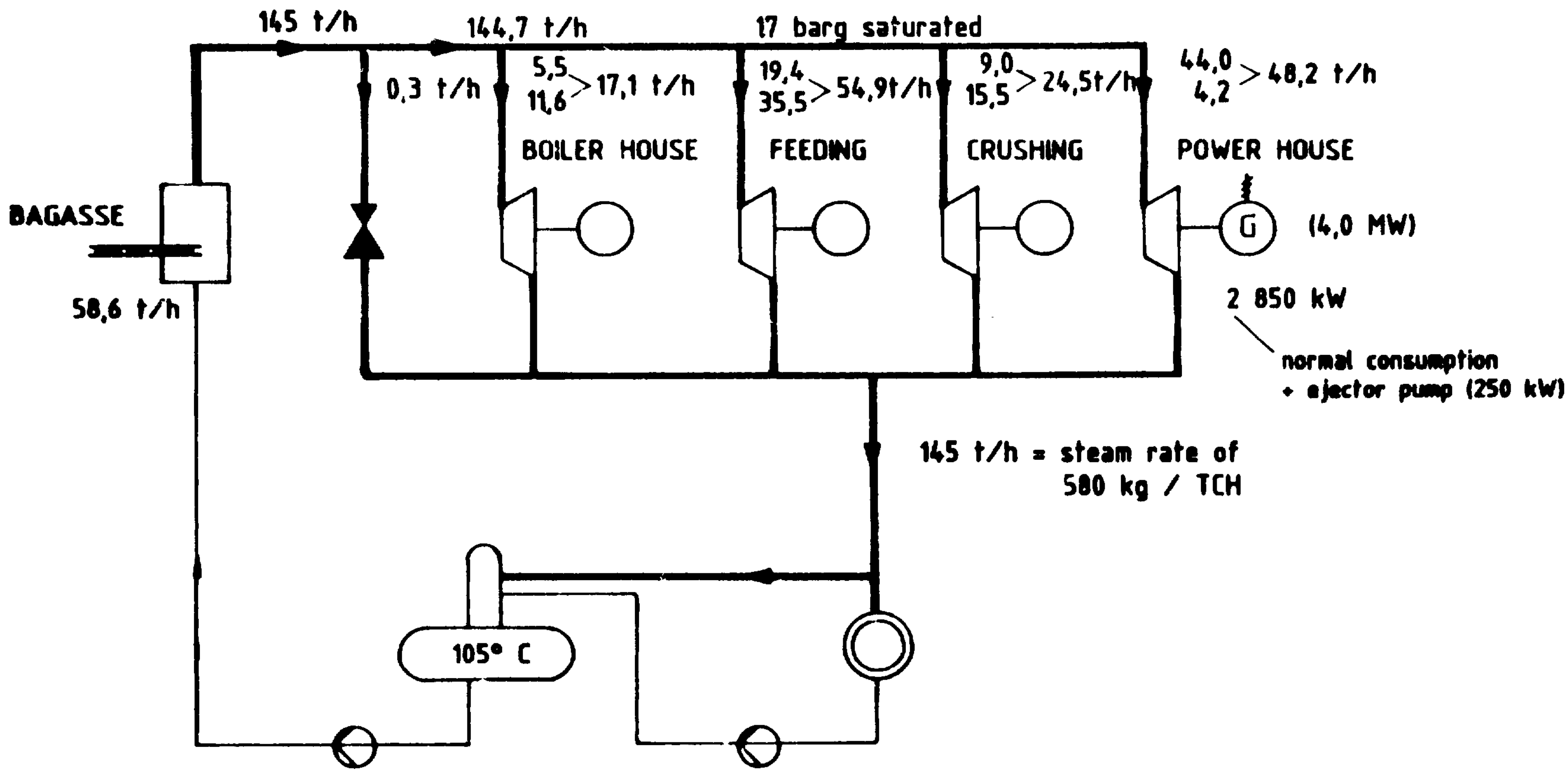
Thus, in our calculations, we have assumed very conservative figures. As a result, even under conditions which may be stringent, it has been shown that improvements as recommended, will show results which will benefit the FSC operations.

FIJI - LABASA POWER STUDY
BALANCE DIAGRAM

HEILBORN
ENGINEERING PTE LTD
1 JALAN SEAVIEW SINGAPORE 1543

MINOR IMPROVEMENTS AT FSC - PLANT

cane crushed	:	1 000 000 t
intake rate	:	250 TCH
operating time	:	4 000 h



no add. power generation, but surplus bagasse in 4 000 h

from crushed cane : 1 000 000 x 0,123 x 2 = 246 000 t
for steam generation : 145 000 x 0,404 x 4 000 = 234 320 t
11 680 t

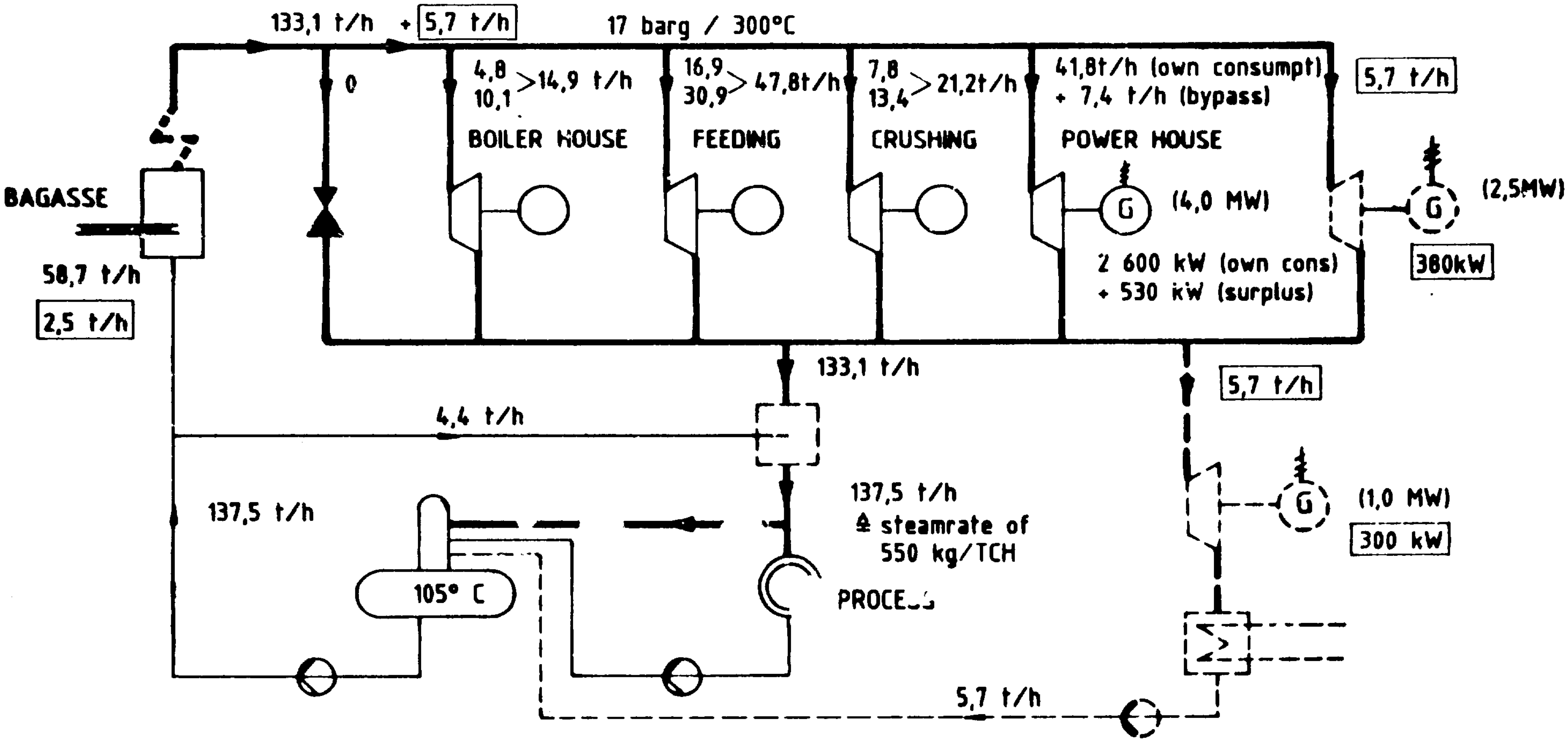
in calculation :
10 000 t available for indep. power plant

FIJI - LABASA POWER STUDY
BALANCE DIAGRAM

HEILBORN
ENGINEERING PTE LTD
1 JALAN SEAVIEW SINGAPORE 1543

MAJOR IMPROVEMENTS OF FSC - PLANT

cane crushed : 1 000 000 t
intake rate : 250 TCH
operating time : 4 000 h



Surplus bagasse : in 4 000 operating hours :
from crushed cane : 1 000 000 x 0,123 x 2 = 246,00 t
for steam generation : 133,1 x 0,441 x 4 000 = 234,800 t
11,200 t
in calculation : 10 000t : 4 000 = 2,5 t/h

Power generation:
for own consumption 2 600 kW
add. for export : 530 + 380 + 300 = 1 210 kW

☐ = consequence of surplus bagasse

ANNEX E
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TABLE OF CONTENTS

Energy Demand, Peak Loads, Possible Supply & Fuel Availability

			1985	1990	1995	2000
1	Total demand	MWh	12,522	16,500	21,000	26,000
2	Average load	kW	1,429	1,883	2,397	2,968
3	Max peak load	kW	3,040	4,125	5,250	6,500
4	Peak load hours	h	4,120	4,000	4,000	4,000
5	Average max load (CT)	kW	1,800	2,380	3,000	3,750
6	Average min load (CT)	kW	800	1,060	1,350	1,700
7	Average max load (NCT)	kW	2,200	2,780	3,400	4,170
8	Average min load (NCT)	kW	1,200	1,460	1,750	2,100
9	Demand in NCT	MWh	7,425	9,900	12,600	15,600
10	Demand in CT	MWh	5,098	6,600	8,400	10,400
11	Operating hours (NCT)	h	5,110	5,110	5,110	5,110
12	Operating hours (CT)	h	3,650	3,650	3,650	3,650
13	Average load in NCT	kW	1,453	1,937	2,465	3,052
14	Average load in CT	kW	1,396	1,808	2,301	2,850
15	FSC max supply (inst)	kW	1,200	3,500	4,000	4,000
16	FSC supply from minor improved plant	kW	2,449	2,500	2,500	2,500
17	FSC average load (4000h)	kW	612	625	625	625
18	FSC minimum load	kW	500	500	500	500
19	FSC max supply from major improved plant	MWh	n.a.	6,955	6,955	6,955
	Min. supply by diesel for improved plant:					
20	in CT	%	n.a.	5.0	5.0	5.0
21	in CT	MWh	n.a.	330	420	572
	Min. supply by diesel for power plants:					
22	3.5MW (indep & NCT	%	n.a.	1.5	1.5	5.0
23	integrated) in NCT	MWh	n.a.	150	189	780
24	(independent) in CT	%	n.a.	12	12	12
25	(independent) in CT	MWh	n.a.	792	1,080	1,248
26	3MW (indep & in NCT	%	n.a.	1.5	3.3	12.0
27	integrated in NCT	MWh	n.a.	150	441	1,872
28	(independent) in CT	%	n.a.	12	12.0	13
29	(independent) in CT	MWh	n.a.	792	1,008	1,352
30	FSC supply from major improved plant in CT	MWh	n.a.	6,220	6,955	6,955
31	FSC av. load (improved)	kW	n.a.	1,570	1,740	1,740
32	Hydropower Gibb) total	MWh	n.a.	8,400	9,380	10,110
33	Hydropower supply (CT)	MWh	n.a.	3,325	3,325	3,325
34	Hydro average load (CT)	kW	n.a.	911	911	911
35	Hydro average load (NCT)	kW	n.a.	993	1,185	1,328
36	FSC major impr. supply if hydro is running	MWh	n.a.	2,945	4,655	6,553
37	Available bagasse	t/yr	2,000	10,000	10,000	10,000
38	Avail. sawmill waste	t/yr	16,000	20,000	24,000	24,000
39	Avail. logging waste	t/yr	5,300	8,750	12,000	15,000

Key: CT = crushing time, NCT = non-crushing time
n.a. = not applicable

Huilborn Engineering Pte. Ltd. Option Ref: LAB7

Year: 1990

Labasa Power Plant Evaluation

FSC Integrated Power Plant, 3.5MW, p=30 bar, t=400 C
FSC supply from plant with minor improvements
FEA diesel supplementary supply

Technical Balance		p=30bar t=400C
power demand	kWhr/yr	16500000
power supply by FSC	kWhr/yr	2500000
power supply by Diesel genset	kWhr/yr	942000
power generation power plant	kWhr/yr	13058000
power peak load output	kW	3500
block efficiency		0.210
own consumption		0.100
plant efficiency		0.189
operating hours per year	hr/yr	8400
load factor		0.444
part load factor		0.620
part load efficiency		0.117
fuel heat demand	kJ/yr	400923738500
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value logging waste	kJ/kg	8372
available bagasse	ton/yr	10000
heat supply bagasse	kJ/yr	75740000000
heat demand other fuel	kJ/yr	325183738500
available sawmill waste	ton/yr	20000
heat supply sawmill waste	kJ/yr	210000000000
heat demand other fuel	kJ/yr	115183738500
available logging waste	ton/yr	8750
heat supply logging waste	kJ/yr	73255000000
heat demand other fuel	kJ/yr	41928738500
demand of forest thinnings	ton/yr	5008

[illegible] Engineering Pte. Ltd.

Option Ref:
LAE7

Year: 1995

Labasa Power Plant Evaluations

FSC Integrated Power Plant, 3.5MW, p=30 bar, t=400 C
FSC suppl. from plant with minor improvements
FEA Diesel supplementary supply

Technical Balance		p=30bar t=400C
power demand	kWhr/yr	21000000
power supply by FSC	kWhr/yr	2500000
power supply by Diesel genset	kWhr/yr	1197000
power generation power plant	kWhr/yr	17303000
power peak load output	kW	3500
block efficiency		0.210
own consumption		0.100
plant efficiency		0.189
operating hours per year	hr/yr	8400
load factor		0.589
part load factor		0.724
part load efficiency		0.137
fuel heat demand	kJ/yr	454933667259
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value logging waste	kJ/kg	8372
available bagasse	ton/yr	10000
heat supply bagasse	kJ/yr	75740000000
heat demand other fuel	kJ/yr	379193667259
available sawmill waste	ton/yr	24000
heat supply sawmill waste	kJ/yr	252000000000
heat demand other fuel	kJ/yr	127193667259
available logging waste	ton/yr	12000
heat supply logging waste	kJ/yr	100464000000
heat demand other fuel	kJ/yr	26729667259
demand of forest thinnings	ton/yr	3193

Heilborn Engineering Pte. Ltd.

Option Ref: L/B7

Year: 2000

Lautoka Power Plant Evaluation

PSL Integrated Power Plant, 3.5MW, p=30 bar, T=400 C
PSL supply from plant with minor improvements
PSL diesel supplementary supply

Technical Balance		p=30bar t=400C
power demand	kWhr/yr	26000000
power supply by FSC	kWhr/yr	2500000
power supply by Diesel genset	kWhr/yr	2048000
power generation power plant	kWhr/yr	21452000
power peak load output	kW	3500
block efficiency		[illegible]
own consumption		0.100
plant efficiency		0.189
operating hours per year	hr/yr	8400
load factor		0.730
part load factor		0.797
part load efficiency		0.151
fuel heat demand	kJ/yr	512568939906
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value forest waste	kJ/kg	8372
available bagasse	ton/yr	10000
heat supply bagasse	kJ/yr	75740000000
heat demand other fuel	kJ/yr	436828939906
available sawmill waste	ton/yr	24000
heat supply sawmill waste	kJ/yr	252000000000
heat demand other fuel	kJ/yr	184828939906
available forest waste	ton/yr	15000
heat supply forest waste	kJ/yr	125580000000
heat demand other fuel	kJ/yr	57248939906
demand of forest thinnings	ton/yr	7077

[illegible] Engineering Pte. Ltd.

Option Ref:
LAB9

Year: 1990

[illegible] Power Plant Evaluations

FSC Integrated Power Plant, 3.5MWE Mu, p=32 bar, t=400 C
FSC supply from plant with major improvements
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	16500000
power supply by FSC	kWhr/yr	6270000
power supply by Diesel genset	kWhr/yr	480000
power generation power plant	kWhr/yr	9750000
power peak load output	kW	3500
block efficiency		0.210
own consumption		0.100
plant efficiency		0.189
operating hours per year	hr/yr	5210
load factor		0.535
part load factor		0.690
part load efficiency		0.130
fuel heat demand	kJ/yr	269162393455
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value logging waste	kJ/kg	8377
available bagasse	ton/yr	0
heat supply bagasse	kJ/yr	0
heat demand other fuel	kJ/yr	269162393455
demand of sawmill waste	ton/yr	20000
heat supply sawmill waste	kJ/yr	210000000000
heat demand other fuel	kJ/yr	59162393455
logging waste demand	ton/yr	7067

Heilborn Engineering Pte. Ltd.

Option Ref:
LAB9

Year: 1995

Labasa Power Plant Evaluations

FSC Integrated Power Plant, 3.5MW, p=31 bar, t=400 C
FSC supply from plant with major improvements
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	21000000
power supply by FSC	kWhr/yr	6955000
power supply by Diesel genset	kWhr/yr	609000
power generation power plant	kWhr/yr	13436000
power peak load output	kW	3500
block efficiency		0.210
own consumption		0.100
plant efficiency		0.189
operating hours per year	hr/yr	5670
load factor		0.677
part load factor		0.773
part load efficiency		0.146
fuel heat demand	kJ/yr	331242978517
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value logging waste	kJ/kg	8372
available bagasse	ton/yr	0
heat supply bagasse	kJ/yr	0
heat demand other fuel	kJ/yr	331242978517
demand of sawmill waste	ton/yr	24000
heat supply sawmill waste	kJ/yr	252000000000
heat demand other fuel	kJ/yr	79242978517
logging waste demand	ton/yr	9465

Lautoka Power Plant Evaluations

FSC Integrated Power Plant, 3.5MWE ML, p=31 bar, t=400 C
FSC supply from plant with major improvements
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	26000000
power supply by FSC	kWhr/yr	6955000
power supply by Diesel genset	kWhr/yr	1352000
power generation power plant	kWhr/yr	17693000
power peak load output	kW	3500
block efficiency		0.210
own consumption		0.100
plant efficiency		0.189
operating hours per year	hr/yr	6230
load factor		0.811
part load factor		0.831
part load efficiency		0.157
fuel heat demand	kJ/yr	405759216909
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value logging waste	kJ/kg	8372
available bagasse	ton/yr	0
heat supply bagasse	kJ/yr	0
heat demand other fuel	kJ/yr	405759216909
available sawmill waste	ton/yr	24000
heat supply sawmill waste	kJ/yr	252000000000
heat demand other fuel	kJ/yr	153759216909
available logging waste	ton/yr	15000
heat supply logging waste	kJ/yr	125580000000
heat demand other fuel	kJ/yr	28179216909
demand of forest thinnings	ton/yr	3366

Heilborn Engineering Pte. Ltd.

Option Ref:
LAB11

Year: 1990

[illegible] Power Plant Evaluations

FSC Integrated Power Plant, 3.0 MW, p=30 bar, t=400 C
FSC supply from plant with major improvements
PEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	16500000
power supply by FSC	kWhr/yr	6270000
power supply by Diesel genset	kWhr/yr	480000
power generation power plant	kWhr/yr	9750000
power peak load output	kW	3000
block efficiency		0.210
own consumption		0.100
plant efficiency		0.189
operating hours per year	hr/yr	5210
load factor		0.624
part load factor		0.745
part load efficiency		0.141
fuel heat demand	kJ/yr	249350322672
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value logging waste	kJ/kg	8372
available bagasse	ton/yr	0
heat supply bagasse	kJ/yr	0
heat demand other fuel	kJ/yr	249350322672
available sawmill waste	ton/yr	20000
heat supply sawmill waste	kJ/yr	210000000000
heat demand other fuel	kJ/yr	39350322672
logging waste demand	ton/yr	4700

Heilborn Engineering Pte. Ltd.

Option Ref:
LAB11

Year: 1995

Labasa Power Plant Evaluations

FSC Integrated Power Plant, .3.0 MW, p=30 bar, t=400 C
FSC supply from plant with major improvements
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	21000000
power supply by FSC	kWhr/yr	6955000
power supply by Diesel genset	kWhr/yr	861000
power generation power plant	kWhr/yr	13184000
power peak load output	kW	3000
block efficiency		0.210
own consumption		0.100
plant efficiency		0.189
operating hours per year	hr/yr	5650
load factor		0.778
part load factor		0.817
part load efficiency		0.155
fuel heat demand	kJ/yr	307192015332
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value logging waste	kJ/kg	8372
available bagasse	ton/yr	0
heat supply bagasse	kJ/yr	0
heat demand other fuel	kJ/yr	307192015332
available sawmill waste	ton/yr	24000
heat supply sawmill waste	kJ/yr	252000000000
heat demand other fuel	kJ/yr	55192015332
logging waste demand	ton/yr	6592

Heliborn Engineering Pte. Ltd.

Option Ref:
LAB11

Year: 2000

Labasa Power Plant Evaluations

FSC Integrated Power Plant, 3.0 MW, p=30 bar, t=400 C
FSC supply from plant with major improvements
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	26000000
power supply by FSC	kWhr/yr	6955000
power supply by Diesel genset	kWhr/yr	2444000
power generation power plant	kWhr/yr	16601000
power peak load output	kW	3000
block efficiency		0.210
own consumption		0.100
plant efficiency		0.189
operating hours per year	hr/yr	6230
load factor		0.888
part load factor		0.858
part load efficiency		0.162
fuel heat demand	kJ/yr	368719365308
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value logging waste	kJ/kg	8372
available bagasse	ton/yr	0
heat supply bagasse	kJ/yr	0
heat demand other fuel	kJ/yr	368719365308
available sawmill waste	ton/yr	24000
heat supply sawmill waste	kJ/yr	252000000000
heat demand other fuel	kJ/yr	116719365308
logging waste demand	ton/yr	13942

Heilborn Engineering Pte. Ltd.

Option Ref:
LAB13

Year: 1990

Labasa Power Plant Evaluations

FSC supply from plant with major improvements
FEA Diesel supplementary supply

Technical Balance

power demand	kWhr/yr	16500000
power supply by FSC	kWhr/yr	6270000
power supply by Diesel genset	kWhr/yr	10230000
power generation power plant	kWhr/yr	0
power peak load output	kW	0
block efficiency		0
own consumption		0
plant efficiency		0
operating hours per year	hr/yr	0
load factor		0
part load factor		0
part load efficiency		0
fuel heat demand	kJ/yr	0
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value forest waste	kJ/kg	8372
available bagasse	ton/yr	0
heat supply bagasse	kJ/yr	0
heat demand other fuel	kJ/yr	0
sawmill waste demand	ton/yr	0
heat supply sawmill waste	kJ/yr	0
heat demand other fuel	kJ/yr	0
forest waste demand	ton/yr	0

Heiloorn Engineering Pte. Ltd.

Option Ref:
LAB13

Year: 1995

Labasa Power Plant Evaluations

FSC supply from plant with major improvements
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	21000000
power supply by FSC	kWhr/yr	6955000
power supply by Diesel genset	kWhr/yr	14045000
power generation power plant	kWhr/yr	0
power peak load output	kW	0
block efficiency		0
own consumption		0
plant efficiency		0
operating hours per year	hr/yr	0
load factor		0
part load factor		0
part load efficiency		0
fuel heat demand	kJ/yr	0
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value forest waste	kJ/kg	8372
available bagasse	ton/yr	0
heat supply bagasse	kJ/yr	0
heat demand other fuel	kJ/yr	0
sawmill waste demand	ton/yr	0
heat supply sawmill waste	kJ/yr	0
heat demand other fuel	kJ/yr	0
forest waste demand	ton/yr	0

Heilborn Engineering Pte. Ltd.

Option Ref:
LAB13

Year 2000

Labasa Power Plant Evaluations

FSC supply from plant with major improvements
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	26000000
power supply by FSC	kWhr/yr	6955000
power supply by Diesel genset	kWhr/yr	19045000
power generation power plant	kWhr/yr	0
power peak load output	kW	0
block efficiency		0
own consumption		0
plant efficiency		0
operating hours per year	hr/yr	0
load factor		0
part load factor		0
part load efficiency		0
fuel heat demand	kJ/yr	0
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value forest waste	kJ/kg	8372
available bagasse	ton/yr	0
heat supply bagasse	kJ/yr	0
heat demand other fuel	kJ/yr	0
sawmill waste demand	ton/yr	0
heat supply sawmill waste	kJ/yr	0
heat demand other fuel	kJ/yr	0
forest waste demand	ton/yr	0

Heilborn Engineering Pte. Ltd.

Option Ref: LAB14

Year: 1990

Labasa Power Plant Evaluations

FEA Hydro-supply throughout the year
FSC supply from plant with major improvements
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	16500000
power supply by hydro	kWhr/yr	8400000
power supply by FSC	kWhr/yr	2710000
power supply by diesel	kWhr/yr	5390000
power peak load output	kW	0
block efficiency		0
own consumption		0
plant efficiency		0
operating hours per year	hr/yr	0
load factor		0
part load factor		0
part load efficiency		0
fuel heat demand	kJ/yr	0
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value forest waste	kJ/kg	8372
available bagasse	ton/yr	0
heat supply bagasse	kJ/yr	0
heat demand other fuel	kJ/yr	0
sawmill waste demand	ton/yr	0
heat supply sawmill waste	kJ/yr	0
heat demand other fuel	kJ/yr	0
forest waste demand	ton/yr	0

Heilborn Engineering Pte. Ltd.

Option Ref: LAB14

Year: 1995

Labasa Power Plant Evaluations

FEA Hydro-supply throughout the year
FSC supply from plant with major improvments
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	21000000
power supply by hydro	kWhr/yr	9380000
power supply by FSC	kWhr/yr	4350000
power supply by diesel	kWhr/yr	7270000
power peak load output	kW	0
block efficiency		0
own consumption		0
plant efficiency		0
operating hours per year	hr/yr	0
load factor		0
part load factor		0
part load efficiency		0
fuel heat demand	kJ/yr	0
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value forest waste	kJ/kg	8372
available bagasse	ton/yr	0
heat supply bagasse	kJ/yr	0
heat demand other fuel	kJ/yr	0
sawmill waste demand	ton/yr	0
heat supply sawmill waste	kJ/yr	0
heat demand other fuel	kJ/yr	0
forest waste demand	ton/yr	0

Heilborn Engineering Pte. Ltd.

Option Ref:
LAB14

Year: 2000

Labasa Power Plant Evaluations

FEA Hydro-supply throughout the ye year
FSC supply from plant with major improvements
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	26000000
power supply by hydro	kWhr/yr	10110000
power supply by FSC	kWhr/yr	4670000
power supply by diesel	kWhr/yr	11220000
power peak load output	kW	0
block efficiency		0
own consumption		0
plant efficiency		0
operating hours per year	hr/yr	0
load factor		0
part load factor		0
part load efficiency		0
fuel heat demand	kJ/yr	0
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value forest waste	kJ/kg	8372
available bagasse	ton/yr	0
heat supply bagasse	kJ/yr	0
heat demand other fuel	kJ/yr	0
sawmill waste demand	ton/yr	0
heat supply sawmill waste	kJ/yr	0
heat demand other fuel	kJ/yr	0
forest waste demand	ton/yr	0

Heilborn Engineering Pte. Ltd.

Option Ref:
LAB15

Year: 1990

Labasa Power Plant Evaluations

FEA Hydro power supply throughoutout the year
FSC supply from plant with minor improvements
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	16500000
power supply by hydro	kWhr/yr	8400000
power supply by FSC	kWhr/yr	2500000
power supply by diesel	kWhr/yr	5600000
power peak load output	kW	0
block efficiency		0
own consumption		0
plant efficiency		0
operating hours per year	hr/yr	0
load factor		0
part load factor		0
part load efficiency		0
fuel heat demand	kJ/yr	0
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value forest waste	kJ/kg	8372
available bagasse	ton/yr	0
heat supply bagasse	kJ/yr	0
heat demand other fuel	kJ/yr	0
sawmill waste demand	ton/yr	0
heat supply sawmill waste	kJ/yr	0
heat demand other fuel	kJ/yr	0
forest waste demand	ton/yr	0

Heilborn Engineering Pte. Ltd.

Option Ref:
LAB15

Year: 1995

Labasa Power Plant Evaluations

FEA Hydro power supply throughoutout the year
FSC supply from plant with minor improvements
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	21000000
power supply by hydro	kWhr/yr	9380000
power supply by FSC	kWhr/yr	2500000
power supply by diesel	kWhr/yr	9120000
power peak load output	kW	0
block efficiency		0
own consumption		0
plant efficiency		0
operating hours per year	hr/yr	0
load factor		0
part load factor		0
part load efficiency		0
fuel heat demand	kJ/yr	0
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value forest waste	kJ/kg	8372
available bagasse	ton/yr	0
heat supply bagasse	kJ/yr	0
heat demand other fuel	kJ/yr	0
sawmill waste demand	ton/yr	0
heat supply sawmill waste	kJ/yr	0
heat demand other fuel	kJ/yr	0
forest waste demand	ton/yr	0

Heilborn Engineering Pte. Ltd.

Option Ref:
LAB15

Year: 2000

Labasa Power Plant Evaluations

FEA Hydro power supply throughoutout the year
FSC supply from plant with minor improvements
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	26000000
power supply by hydro	kWhr/yr	10110000
power supply by FSC	kWhr/yr	2500000
power supply by diesel	kWhr/yr	13390000
power peak load output	kW	0
block efficiency		0
own consumption		0
plant efficiency		0
operating hours per year	hr/yr	0
load factor		0
part load factor		0
part load efficiency		0
fuel heat demand	kJ/yr	0
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value forest waste	kJ/kg	6372
available bagasse	ton/yr	0
heat supply bagasse	kJ/yr	0
heat demand other fuel	kJ/yr	0
sawmill waste demand	ton/yr	0
heat supply sawmill waste	kJ/yr	0
heat demand other fuel	kJ/yr	0
forest waste demand	ton/yr	0

Heilborn Engineering Pte. Ltd.

Option Ref: LAB33

Year: 1990

Labasa Power Plant Evaluations

Independent power plant, 3.5 MW p=30 bar, t=400 C
FSC supply from plant with minor improvements
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	16500000
power supply by FSC	kWhr/yr	2500000
power supply by Diesel genset	kWhr/yr	942000
power generation power plant	kWhr/yr	13058000
power peak load output	kW	3500
block efficiency		0.210
own consumption		0.100
plant efficiency		0.189
operating hours per year	hr/yr	8400
load factor		0.444
part load factor		0.620
part load efficiency		0.117
fuel heat demand	kJ/yr	400923738500
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. logging waste	kJ/kg	8372
available bagasse	ton/yr	10000
heat supply bagasse	kJ/yr	75740000000
heat demand other fuel	kJ/yr	325183738500
available sawmill waste	ton/yr	20000
heat supply sawmill waste	kJ/yr	210000000000
heat demand other fuel	kJ/yr	115183738500
available logging waste	ton/yr	8750
heat supply logging waste	kJ/yr	73255000000
heat demand other fuel	kJ/yr	41928738500
demand of forest thinnings	ton/yr	5008

Heilborn Engineering Pte. Ltd.

Option Ref:
LAB33

Year: 1995

Labasa Power Plant Evaluations

Independent power plant, 3.5 MW W, p=30 bar, t=400 C
FSC supply from plant with minor improvements
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	21000000
power supply by FSC	kWhr/yr	2500000
power supply by Diesel genset	kWhr/yr	1197000
power generation power plant	kWhr/yr	17303000
power peak load output	kW	3500
block efficiency		0.210
own consumption		0.100
plant efficiency		0.189
operating hours per year	hr/yr	8400
load factor		0.589
part load factor		0.724
part load efficiency		0.137
fuel heat demand	kJ/yr	454933667259
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value logging waste	kJ/kg	8372
available bagasse	ton/yr	10000
heat supply bagasse	kJ/yr	75740000000
heat demand other fuel	kJ/yr	379193667259
available sawmill waste	ton/yr	24000
heat supply sawmill waste	kJ/yr	252000000000
heat demand other fuel	kJ/yr	127193667259
available logging waste	ton/yr	12000
heat supply logging waste	kJ/yr	100464000000
heat demand other fuel	kJ/yr	26729667259
demand of forest thinnings	ton/yr	3193

Heilborn Engineering Pte. Ltd.

Option Ref:
LAB33

Year: 2000

Labasa Power Plant Evaluations

Independent power plant, 3.5 MW W, p=30 bar, t=400 C
FSC supply from plant with minor improvements
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	26000000
power supply by FSC	kWhr/yr	2500000
power supply by Diesel genset	kWhr/yr	2048000
power generation power plant	kWhr/yr	21452000
power peak load output	kW	3500
block efficiency		0.210
own consumption		0.100
plant efficiency		0.189
operating hours per year	hr/yr	8400
load factor		0.730
part load factor		0.797
part load efficiency		0.151
fuel heat demand	kJ/yr	512568939906
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value logging waste	kJ/kg	8372
available bagasse	ton/yr	10000
heat supply bagasse	kJ/yr	75740000000
heat demand other fuel	kJ/yr	436828939906
available sawmill waste	ton/yr	24000
heat supply sawmill waste	kJ/yr	252000000000
heat demand other fuel	kJ/yr	184828939906
available logging waste	ton/yr	15000
heat supply logging waste	kJ/yr	125580000000
heat demand other fuel	kJ/yr	59248939906
demand of forest thinnings	ton/yr	7077

Heilborn Engineering Pte. Ltd. Option Ref: LAB36

Year: 1990

Labasa Power Plant Evaluations

Independent Power Plant 3.0 MW, p=30 bar, t=400 C
FSC supply from plant with minor improvements
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	16500000
power supply by FSC	kWhr/yr	2500000
power supply by Diesel genset	kWhr/yr	942000
power generation power plant	kWhr/yr	13058000
power peak load output	kW	3000
block efficiency		0.210
own consumption		0.100
plant efficiency		0.189
operating hours per year	hr/yr	8400
load factor		0.518
part load factor		0.678
part load efficiency		0.128
fuel heat demand	kJ/yr	366602106080
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value logging waste	kJ/kg	8372
available bagasse	ton/yr	10000
heat supply bagasse	kJ/yr	75740000000
heat demand other fuel	kJ/yr	290862106080
available sawmill waste	ton/yr	20000
heat supply sawmill waste	kJ/yr	210000000000
heat demand other fuel	kJ/yr	80862106080
available logging waste	ton/yr	8750
heat supply logging waste	kJ/yr	73255000000
heat demand other fuel	kJ/yr	7607106080
demand of forest thinnings	ton/yr	909

Heilborn Engineering Pte. Ltd. Option Ref: LAB36

Year 1995

Labasa Power Plant Evaluations

Independent Power Plant 3.0 MW, p=30 bar t=400 C
FSC supply from plant with minor improvements
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	21000000
power supply by FSC	kWhr/yr	2500000
power supply by Diesel genset	kWhr/yr	1449000
power generation power plant	kWhr/yr	17051000
power peak load output	kW	3000
block efficiency		0.210
own consumption		0.100
plant efficiency		0.189
operating hours per year	hr/yr	8400
load factor		0.677
part load factor		0.772
part load efficiency		0.146
fuel heat demand	kJ/yr	420477765453
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value logging waste	kJ/kg	8372
available bagasse	ton/yr	10000
heat supply bagasse	kJ/yr	75740000000
heat demand other fuel	kJ/yr	344737765453
available sawmill waste	ton/yr	24000
heat supply sawmill waste	kJ/yr	252000000000
heat demand other fuel	kJ/yr	92737765453
logging waste demand	ton/yr	11077

Heilborn Engineering Pte. Ltd.

Option Ref:
LAB36

Year: 2000

Labasa Power Plant Evaluations

Independent Power Plant 3.0 MW, p=30 bar t=400 C
FSC supply from palnt with minor improvements
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	26000000
power supply by FSC	kWhr/yr	2500000
power supply by Diesel genset	kWhr/yr	3224000
power generation power plant	kWhr/yr	20276000
power peak load output	kW	3000
block efficiency		0.210
own consumption		0.100
plant efficiency		0.189
operating hours per year	hr/yr	8400
load factor		0.805
part load factor		0.828
part load efficiency		0.156
fuel heat demand	kJ/yr	466448915118
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value logging waste	kJ/kg	8372
available bagasse	ton/yr	10000
heat supply bagasse	kJ/yr	75740000000
heat demand other fuel	kJ/yr	390708915118
available sawmill waste	ton/yr	24000
heat supply sawmill waste	kJ/yr	252000000000
heat demand other fuel	kJ/yr	138708915118
available logging waste	ton/yr	15000
heat supply logging waste	kJ/yr	125580000000
heat demand other fuel	kJ/yr	13128915118
demand of forest thinnings	ton/yr	1568

ANNEX F

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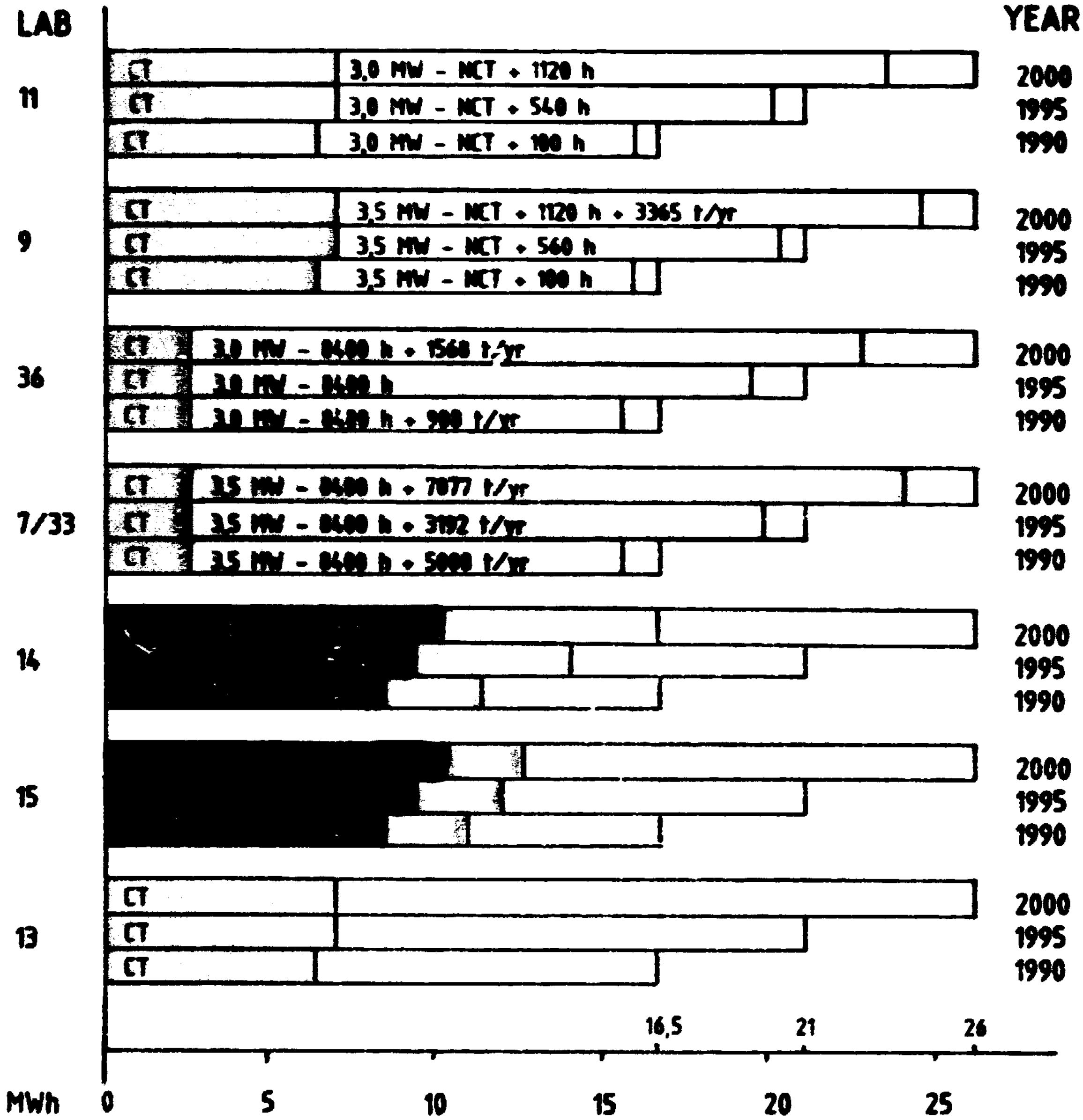


= FEA - diesel supplies

= FSC - supplies minor improved

CT/NCT = crushing / non crushing time

= hydro supplies

= FSC supplies major improved

= power plant independent

= power plant integrated

FIJI - LABASA STUDY Results of generated units	HEILBORN ENGINEERING PTE LTD 1 JALAN SEAVIEW, SINGAPORE 1543

ANNEX C

TABLE OF CONTENTS

Heilborn Engineering Pte. Ltd.

Option Ref: LAB7

Year: 1990

Labasa Power Plant Evaluation

Production Cost Calculation

AT FSC minor improved plant		
operating cost	Fct/kWhr	2.10
generating cost	F$/yr	52500
AT FSC integrated power plant		
fuel cost:		
cost of bagasse	F$/ton	0
cost of sawmill waste	F$/ton	10.82
cost of logging waste	F$/ton	21.45
cost of forest thinnings	F$/ton	32.78
fuel cost of bagasse	F$/yr	0
fuel cost of sawmill waste	F$/yr	216400
fuel cost of logging waste	F$/yr	187688
fuel cost of forest thinnings	F$/yr	164169
total fuel cost	F$/yr	568257
personnel cost		
cost of 1 operator	F$/yr	8180
number of operators		12
cost of operators	F$/yr	98160
cost of 1 unskilled labourer	F$/yr	5460
number of unskilled labourers		4
cost of unskilled labour	F$/yr	21840
cost of 1 loader operator	F$/yr	8100
number of loader operators		2
cost of loader operators	F$/yr	16200
cost of 1 staff	F$/yr	10900
number of staff		2
cost of staff	F$/yr	21800
total personnel cost	F$/yr	158000
overhead cost	F$/yr	31830
maintenance, repairs etc	F$/yr	137710
total production cost at FSC	F$/yr	948497
unit cost FSC production	Fct/kWhr	6.097

Heilborn Engineering Pte. Ltd.

Option Ref:
LAB7

Year: 1990

Labasa Power Plant Evaluation

Investment

Foreign Investment Cost

Plant and Machinery foreign	US$	3848000
installation cost foreign	US$	236000
total foreign investment	US$	4084000
exchange rate	F$/US$	1.10
plant and machinery	F$	4492400
local equipment	F$	247000
installation cost local	F$	236000
inland transport	F$	77000
contingencies	F$	88000
total Plant and Machinery	F$	5140400

Local Investment Cost

land	F$	0
site preparation	F$	25000
civil works	F$	50000
pre-operational cost	F$	25000
total local investment	F$	100000
total investment	F$	5240400

Cost per kWhr

cost per unit generated	Fct/kWhr	6.097
depreciation 20 years	Fct/kWhr	1.684
interest (1/2 value) 11.2%	Fct/kWhr	1.886
total cost per kWhr	Fct/kWhr	9.667

total cost of steam turbo-generated power	F$/yr	1503979
total cost of diesel generation	F$/yr	101105
Total generating cost of system	F$/yr	1605084

Heilborn Engineering Pte. Ltd.

Option Ref: LAB7

Year: 1995

Labasa Power Plant Evaluation

Production Cost Calculation

AT FSC minor improved plant		
operating cost	Fct/kWhr	2.11
generating cost	F$/yr	52750
AT FSC integrated power plant		
fuel cost:		
cost of bagasse	F$/ton	0
cost of sawmill waste	F$/ton	12.54
cost of logging waste	F$/ton	24.87
cost of forest thinnings	F$/ton	38.00
fuel cost of bagasse	F$/yr	0
fuel cost of sawmill waste	F$/yr	300960
fuel cost of logging waste	F$/yr	298440
fuel cost of forest thinnings	F$/yr	121324
total fuel cost	F$/yr	720724
personnel cost		
cost of 1 operator	F$/yr	9480
number of operators		12
cost of operators	F$/yr	113760
cost of 1 unskilled labourer	F$/yr	6330
number of unskilled labourers		4
cost of unskilled labour	F$/yr	25320
cost of 1 loader operator	F$/yr	9390
number of loader operators		2
cost of loader operators	F$/yr	18780
cost of 1 staff	F$/yr	12630
number of staff		2
cost of staff	F$/yr	25260
total personnel cost	F$/yr	183120
overhead cost	F$/yr	36900
maintenance, repairs etc	F$/yr	159890
total production cost at FSC	F$/yr	1153384
unit cost FSC production	Fct/kWhr	5.824

Heilborn Engineering Pte. Ltd.

Option Ref:
LAB7

Year: 1995

Labasa Power Plant Evaluation

Investment

Foreign Investment Cost

Plant and Machinery foreign	US$	3848000
installation cost foreign	US$	236000
total foreign investment	US$	4084000
exchange rate	F$/US$	1.10
plant and machinery	F$	4492400
local equipment	F$	247000
installation cost local	F$	236000
inland transport	F$	77000
contingencies	F$	88000
total Plant and Machinery	F$	5140400

Local Investment Cost

land	F$	0
site preparation	F$	25000
civil works	F$	50000
pre-operational cost	F$	25000
total local investment	F$	100000
total investment	F$	5240400

Cost per kWhr

cost per unit generated	Fct/kWhr	5.824
depreciation 20 years	Fct/kWhr	1.323
interest (1/2 value) 11.2%	Fct/kWhr	1.482
total cost per kWhr	Fct/kWhr	8.629

total cost of steam turbo-generated power	F$/yr	1708867
total cost of diesel generation	F$/yr	128474
total generating cost of system	F$/yr	1837341

Heilborn Engineering Pte. Ltd.

Option Ref: LAB7

Year: 2000

Labasa Power Plant Evaluation

Production Cost Calculation

AT FSC minor improved plant		
operating cost	Fct/kWhr	2.20
generating cost	F$/yr	55000
AT FSC integrated power plant		
fuel cost:		
cost of bagasse	F$/ton	0
cost of sawmill waste	F$/ton	14.54
cost of forest waste	F$/ton	28.83
cost of forest thinnings	F$/ton	45.37
fuel cost of bagasse	F$/yr	0
fuel cost of sawmill waste	F$/yr	348960
fuel cost of forest waste	F$/yr	432450
fuel cost of forest thinnings	F$/yr	321085
total fuel cost	F$/yr	1102495
personnel cost		
cost of 1 operator	F$/yr	10990
number of operators		12
cost of operators	F$/yr	131880
cost of 1 unskilled labourer	F$/yr	7340
number of unskilled laboureres		4
cost of unskilled labour	F$/yr	29360
cost of 1 loader operator	F$/yr	10890
number of loader operators		2
cost of loader operators	F$/yr	21780
cost of 1 staff	F$/yr	14650
number of staff		2
cost of staff	F$/yr	29300
total personnel cost	F$/yr	212320
overhead cost	F$/yr	42780
maintenance, repairs etc	F$/yr	185360
total production cost	F$/yr	1597955
unit cost FSC production	Fct/kWhr	6.671

Heilborn Engineering Pte. Ltd.

Option Ref: LAB7

Year: 2000

Labasa Power Plant Evaluation

Investment

Foreign Investment Cost

Plant and Machinery foreign	US$	3848000
installation cost foreign	US$	236000
total foreign investment	US$	4084000
exchange rate	F$/US$	1.10
plant and machinery	F$	4492400
local equipment	F$	247000
installation cost local	F$	236000
inland transport	F$	77000
contingencies	F$	88000
total Plant and Machinery	F$	5140400

Local Investment Cost

land	F$	0
site preparation	F$	25000
civil works	F$	50000
pre-operational cost	F$	25000
total local investment	F$	100000
total investment	F$	5240400

Cost per kWhr

cost per unit generated	Fct/kWhr	6.671
depreciation 20 years	Fct/kWhr	1.094
interest (1/2 value) 11.2%	Fct/kWhr	1.225
total cost per kWhr	Fct/kWhr	8.991

total cost of steam turbo-generated power	F$/yr	2153437
total cost of diesel generation	F$/yr	219812
Total generating cost of system	F$/yr	2373249

Heilborn Engineering Pte. Ltd.

Option Ref: LAB9

Year: 1990

Labasa Power Plant Evaluation

Production Cost Calculation

AT FSC major improved plant		
operating cost	Fct/kWhr	2.10
generating cost	F$/yr	131670
AT FSC integrated power plant		
fuel cost:		
cost of bagasse	F$/ton	0
cost of sawmill waste	F$/ton	10.82
cost of logging waste	F$/ton	21.45
cost of forest thinnings	F$/ton	32.78
fuel cost of bagasse	F$/yr	0
fuel cost of sawmill waste	F$/yr	216400
fuel cost of logging waste	F$/yr	151581
fuel cost of forest thinnings	F$/yr	0
total fuel cost	F$/yr	367981
personnel cost:		
cost of 1 operator	F$/7mths	4780
number of operators		12
cost of operators	F$/7mths	57360
cost of 1 unskilled labourer	F$/7mths	3180
number of unskilled labourers		4
cost of unskilled labour	F$/7mths	12720
cost of 1 loader operator	F$/7mths	4730
number of loader operators		2
cost of loader operators	F$/7mths	9460
cost of 1 staff	F$/7mths	6370
number of staff		2
cost of staff	F$/7mths	12740
total personnel cost	F$/7mths	92280
overhead cost	F$/7mths	21220
maintenance, repairs etc	F$/7mths	106090
total production cost at FSC	F$/yr	719241
unit cost FSC production	Fct/kWhr	4.490

Heilborn Engineering Pte. Ltd. Option Ref: LAB9

Year: 1990

Labasa Power Plant Evaluation

Investment

Foreign Investment Cost

Plant and Machinery foreign	US$	3848000
installation cost foreign	US$	236000
total foreign investment	US$	4084000
exchange rate	F$/US$	1.10
plant and machinery	F$	4492400
local equipment	F$	247000
installation cost local	F$	236000
inland transport	F$	77000
contingencies	F$	88000
improvements	F$	520000
installation cost	F$	80000
total Plant and Machinery	F$	5740400

Local Investment Cost

land	F$	0
site preparation	F$	35000
civil works	F$	70000
pre-operational cost	F$	25000
total local investment	F$	130000
total investment	F$	5870400

Cost per kWhr

cost per unit generated	Fct/kWhr	4.490
depreciation 20 years	Fct/kWhr	1.832
interest (1/2 value) 11.2%	Fct/kWhr	2.052
total cost per kWhr	Fct/kWhr	8.374
total cost of steam turbo-generated power	F$/yr	1341503
total cost of diesel generation	F$/yr	51518
Total generating cost of system	F$/yr	1393021

Heilborn Engineering Pte. Ltd.

Option Ref: LAB9

Year: 1995

Labasa Power Plant Evaluation

Production Cost Calcualtion

AT FSC major improved plant		
operating cost	Fct/kWhr	2.11
generating cost	F$/yr	146750.5
AT FSC integrated power plant		
fuel cost:		
cost of bagasse	F$/ton	0
cost of sawmill waste	F$/ton	12.54
cost of logging waste	F$/ton	24.87
cost of forest thinnings	F$/ton	38.00
fuel cost of bagasse	F$/yr	0
fuel cost of sawmill waste	F$/yr	300960
fuel cost of logging waste	F$/yr	235400
fuel cost of forest thinnings	F$/yr	0
total fuel cost	F$/yr	536360
personnel cost		
cost of 1 operator	F$/7mths	5540
number of operators		12
cost of operators	F$/7mths	66480
cost of 1 unskilled labourer	F$/7mths	3690
number of unskilled labourers		4
cost of unskilled labour	F$/7mths	14760
cost of 1 loader operator	F$/7mths	5530
number of loader operators		2
cost of loader operators	F$/7mths	11060
cost of 1 staff	F$/7mths	7380
number of staff		2
cost of staff	F$/7mths	14760
total personnel cost	F$/7mths	107060
overhead cost	F$/7mths	24600
maintenance, repairs etc	F$/7mths	122990
total production cost at FSC	F$/yr	937761
unit cost FSC production	Fct/kWhr	4.599

Heilborn Engineering Pte. Ltd.

Option Ref:
LAB9

Year: 1995

Labasa Power Plant Evaluation

Investment

Foreign Investment Cost

Plant and Machinery foreign	US$	3848000
installation cost foreign	US$	236000
total foreign investment	US$	4084000
exchange rate	F$/US$	1.10
plant and machinery	F$	4492400
local equipment	F$	247000
installation cost local	F$	236000
inland transport	F$	77000
indigenous	F$	88000
improvements	F$	520000
installation cost	F$	80000
total Plant and Machinery	F$	5740400

Local Investment Cost

land	F$	0
site preparation	F$	35000
civil works	F$	70000
pre-operational cost	F$	25000
total local investment	F$	130000
total investment	F$	5870400

Cost per kWhr

cost per unit generated	Fct/kWhr	4.599
depreciation 20 years	Fct/kWhr	1.439
interest (1/2 value) 11.2%	Fct/kWhr	1.612
total cost per kWhr	Fct/kWhr	7.651
total cost of steam turbo-generated power	F$/yr	1560023
total cost of diesel generation	F$/yr	65364
Total generating cost of system	F$/yr	1625387

Heilborn Engineering Pte. Ltd.

Option Ref: LAP9

Year: 2000

Labasa Power Plant Evaluation

Production Cost Calculation

AT FSC major improved plant		
operating cost	Fct/kWhr	2.20
generating cost	F$/yr	153010
AT FSC integrated power plant		
fuel cost:		
cost of bagasse	F$/ton	0
cost of sawmill waste	F$/ton	14.54
cost of logging waste	F$/ton	28.83
cost of logging waste	F$/ton	45.37
fuel cost of bagasse	F$/yr	0
fuel cost of sawmill waste	F$/yr	348960
fuel cost of logging waste	F$/yr	432450
fuel cost of forest thinnings	F$/yr	152710
total fuel cost	F$/yr	934120
personnel cost:		
cost of 1 operator	F$/7mths	6420
number of operators		12
cost of operators	F$/7mths	77040
cost of 1 unskilled labourer	F$/7mths	4280
number of unskilled labourers		4
cost of unskilled labour	F$/7mths	17120
cost of 1 loader operator	F$/7mths	6420
number of loader operators		2
cost of loader operators	F$/7mths	12840
cost of 1 staff	F$/7mths	8560
number of staff		2
cost of staff	F$/7mths	17120
total personnel cost	F$/7mths	124120
overhead cost	F$/7mths	28520
maintenance, repairs etc	F$/7mths	142580
total production cost at FSC	F$/yr	1382350
unit cost FSC production	Fct/kWhr	5.608

Heilborn Engineering Pte. Ltd.

Option Ref: LAB9

Year: 2000

Labasa Power Plant Evaluation

Investment

Foreign Investment Cost

Plant and Machinery foreign	US$	3848000
installation cost foreign	US$	236000
total foreign investment	US$	4084000
exchange rate	F$/US$	1.10
plant and machinery	F$	4492400
local equipment	F$	247000
installation cost local	F$	236000
inland transport	F$	77000
indigenous	F$	88000
improvements	F$	520000
installation cost	F$	80000
total Plant and Machinery	F$	5740400

Local Investment Cost

land	F$	0
site preparation	F$	35000
civil works	F$	70000
pre-operational cost	F$	25000
total local investment	F$	130000
total investment	F$	5870400

Cost per kWhr

cost per unit generated	Fct/kWhr	5.608
depreciation 20 years	Fct/kWhr	1.191
interest (1/2 value) 11.2%	Fct/kWhr	1.334
total cost per kWhr	Fct/kWhr	8.133
total cost of steam turbo-generated power	F$/yr	2004613
total cost of diesel generation	F$/yr	145110
Total generating cost of system	F$/yr	2149723

Heilborn Engineering Pte. Ltd.

Option Ref: LAB11

Year: 1990

Labasa Power Plant Evaluation

Production Cost Calculation

AT FSC major improved plant		
operating cost	Fct/kWhr	2.10
generating cost	F$/yr	131670
AT FSC integrated power plant		
fuel cost:		
cost of bagasse	F$/ton	0
cost of sawmill waste	F$/ton	10.82
cost of logging waste	F$/ton	21.45
fuel cost of bagasse	F$/yr	0
fuel cost of sawmill waste	F$/yr	216400
fuel cost of logging waste	F$/yr	100820
total fuel cost	F$/yr	317220
personnel cost:		
cost of 1 operator	F$/7mths	4780
number of operators		12
cost of operators	F$/7mths	57360
cost of 1 unskilled labourer	F$/7mths	3180
number of unskilled labourers		4
cost of unskilled labour	F$/7mths	12720
cost of 1 loader operator	F$/7mths	4730
number of loader operators		2
cost of loader operators	F$/7mths	9460
cost of 1 staff	F$/7mths	6370
number of staff		2
cost of staff	F$/7mths	12740
total personnel cost	F$/7mths	92280
overhead cost	F$/7mths	21220
maintenance, repairs etc	F$/7mths	106090
total production cost at FSC	F$/yr	668480
cost per unit generated	Fct/kWhr	4.173

Heilborn Engineering Pte. Ltd.

Option Ref: LAB11

Year: 1990

Labasa Power Plant Evaluation

Investment

Foreign Investment Cost

Plant and Machinery foreign	US$	3498600
installation cost foreign	US$	225000
total foreign investment	US$	3723600
exchange rate	F$/US$	1.10
plant and machinery	F$	4095960
local equipment	F$	225000
installation cost local	F$	225000
inland transport	F$	70000
contingencies	F$	80000
total power plant	F$	4695960
improvements	F$	520000
installation	F$	80000
total Plant and Machinery	F$	5295960

Local Investment Cost

land	F$	0
site preparation	F$	25000
civil works	F$	50000
pre-operational cost	F$	25000
local investment power plant	F$	100000
local investment improvements	F$	30000
total investment	F$	5425960

Cost per kWhr

cost per unit generated	Fct/kWhr	4.173
depreciation 20 years	Fct/kWhr	1.693
interest (1/2 value) 11.2%	Fct/kWhr	1.897
total cost per kWhr	Fct/kWhr	7.763
total cost of steam turbo-generated power	F$/yr	1243632
total cost of diesel generation	F$/yr	51518
Total generating cost of system	F$/yr	1295150

Heilborn Engineering Pte. Ltd.

Option Ref: LAB11

Year: 1995

Labasa Power Plant Evaluation

Production Cost Calculation

AT FSC major improved plant		
operating cost	Fct/kWhr	2.11
generating cost	F$/yr	146751
AT FSC integrated power plant		
fuel cost:		
cost of bagasse	F$/ton	0
cost of sawmill waste	F$/ton	12.54
cost of logging waste	F$/ton	24.87
fuel cost of bagasse	F$/yr	38.00
fuel cost of sawmill waste	F$/yr	300960
fuel cost of logging waste	F$/yr	163954
total fuel cost	F$/yr	464952
personnel cost:		
cost of 1 operator	F$/7mths	5540
number of operators		12
cost of operators	F$/7mths	66480
cost of 1 unskilled labourer	F$/7mths	3690
number of unskilled labourers		4
cost of unskilled labour	F$/7mths	14760
cost of 1 loader operator	F$/7mths	5530
number of loader operators		2
cost of loader operators	F$/7mths	11060
cost of 1 staff	F$/7mths	7380
number of staff		2
cost of staff	F$/7mths	14760
total personnel cost	F$/7mths	107060
overhead cost	F$/7mths	24600
maintenance, repairs etc	F$/7mths	122990
total production cost at FSC	F$/yr	866353
cost per unit generated	Fct/kWhr	4.302

Heilborn Engineering Pte. Ltd.

Option Ref: LAB11

Year: 1995

Labasa Power Plant Evaluation

Investment

Foreign Investment Cost

Plant and Machinery foreign	US$	3498600
installation cost foreign	US$	225000
total foreign investment	US$	3723600
exchange rate	F$/US$	1.10
plant and machinery	F$	4095960
local equipment	f$	225000
installation cost local	F$	225000
inland transport	F$	70000
indigenous	F$	80000
total power plant investment	F$	4695960
improvements	F$	520000
installation	F$	80000
total Plant and Machinery	F$	5295960

Local Investment Cost

land	F$	0
site preparation	F$	35000
civil works	F$	70000
pre-operational cost	F$	25000
total local investment	F$	130000
total investment	F$	5425960

Cost per kWhr

cost per unit generated	Fct/kWhr	4.302
depreciation 20 years	Fct/kWhr	1.347
interest (1/2 value) 11.2%	Fct/kWhr	1.509
total cost per kWhr	Fct/kWhr	7.158
total cost of steam turbo-generated power	F$/hr	1441505
total cost of diesel generation	F$/yr	92411
Total generating cost of system	F$/yr	1533916

Heilborn Engineering Pte. Ltd.

Option Ref:
LAB11

Year: 2000

Labasa Power Plant Evaluation

Production Cost Calculation

AT FSC major improved plant		
operating cost	Fct/kWhr	2.20
generating cost	F$/yr	153010
AT FSC integrated power plant		
fuel cost:		
cost of bagasse	F$/ton	0
cost of sawmill waste	F$/ton	14.54
cost of logging waste	F$/ton	28.83
fuel cost of bagasse	F$/yr	0
fuel cost of sawmill waste	F$/yr	348960
fuel cost of logging waste	F$/yr	401937
total fuel cost	F$/yr	750897
personnel cost:		
cost of 1 operator	F$/7mths	6420
number of operators		12
cost of operators	F$/7mths	77040
cost of 1 unskilled labourer	F$/7mths	4280
number of unskilled labourers		4
cost of unskilled labour	F$/7mths	17120
cost of 1 loader operator	F$/7mths	6420
number of loader operators		2
cost of loader operators	F$/7mths	12840
cost of 1 staff	F$/7mths	8560
number of staff		2
cost of staff	F$/7mths	17120
total personnel cost	F$/7mths	124120
overhead cost	F$/7mths	28520
maintenance, repairs etc	F$/7mths	142580
total production cost at FSC	F$/yr	1199127
cost per unit generated	Fct/kWhr	5.091

Heilborn Engineering Pte. Ltd.

Option Ref: LAB11

Year: 2000

Labasa Power Plant Evaluation

Investment

Foreign Investment Cost

Plant and Machinery foreign	US$	3498600
installation cost foreign	US$	225000
total foreign investment	US$	3723600
exchange rate	F$/US$	1.10
plant and machinery	F$	4095960
local equipment	F$	225000
installation cost local	F$	225000
inland transport	F$	70000
indigenous	F$	80000
total power plant invest.	F$	4695960
improvements	F$	520000
installation	F$	80000
total Plant and Machinery	F$	5295960

Local Investment Cost

land	F$	0
site preparation	F$	35000
civil works	F$	70000
pre-operational cost	F$	25000
total local investment	F$	130000
total investment	F$	5425960

Cost per kWhr

cost per unit generated	Fct/kWhr	5.091
depreciation 20 years	Fct/kWhr	1.152
interest (1/2 value) 11.2%	Fct/kWhr	1.290
total cost per kWhr	Fct/kWhr	7.532
total cost of steam turbo-generated power	F$/yr	1774279
total cost of diesel generation	F$/yr	262315
Total generating cost of system	F$/yr	2036594

Heilborn Engineering Pte. Ltd.

Option Ref: LAB33

Year: 1990

Labasa Power Plant Evaluation

Production Cost Calculation

AT Independent Power Plant

fuel cost:		
cost of bagasse	F$/ton	1.00
cost of sawmill waste	F$/ton	10.82
cost of logging waste	F$/ton	21.45
cost of forest thinnings	F$/ton	32.78
fuel cost of bagasse	F$/yr	10000
fuel cost of sawmill waste	F$/yr	216400
fuel cost of logging waste	F$/yr	187688
fuel cost of forest thinnings	F$/yr	164169
total fuel cost	F$/yr	578257
personnel cost:		
cost of 1 operator	F$/yr	8180
number of operators		12
cost of operators	F$/yr	98160
cost of 1 unskilled labourer	F$/yr	5460
number of unskilled labourers		4
cost of unskilled labour	F$/yr	21840
cost of 1 loader operator	F$/yr	8100
number of loader operators		2
cost of cat operators	F$/yr	16200
cost of 1 staff	F$/yr	10900
number of staff		2
cost of staff	F$/yr	21800
total personnel cost	F$/yr	158000
overhead cost	F$/yr	31830
maintenance, repairs etc	F$/yr	137910
total production cost	F$/yr	905997
cost per unit generated	Fct/kWhr	6.938

Heilborn Engineering Pte. Ltd.

Option Ref: LAB33

Year: 1990

Labasa Power Plant Evaluation

Investment

Foreign Investment Cost

Plant and Machinery foreign	US$	4840000
installation cost foreign	US$	820000
total foreign investment	US$	**5660000**
exchange rate	F$/US$	1.10
plant and machinery	F$	6226000
installation cost local	F$	385000
total Plant and Machinery	F$	6611000

Local Investment Cost

land	F$	0
site preparation	F$	50000
civil works	F$	100000
pre-operational cost	F$	50000
total local investment	F$	200000
total investment	F$	6811000

Cost per kWhr

production cost	Fct/kWhr	6.938
depreciation 20 years	Fct/kWhr	2.608
interest (1/2 value) 11.2%	Fct/kWhr	2.921
total cost per kWhr	Fct/kWhr	12.467
total cost of steam turbo-generated power	F$/yr	1939642
total cost of diesel generation	F$/yr	101105
Total generating cost of system	F$/yr	2040747

Heilborn Engineering Pte. Ltd.

Option Ref:
LAB33

Year: 1995

Labasa Power Plant Evaluation

Production Cost Calculation

AT Independent Power Plant

fuel cost:		
cost of bagasse	F$/ton	1.16
cost of sawmill waste	F$/ton	12.54
cost of logging waste	F$/ton	24.87
cost of forest thinnings	F$/ton	38.00
fuel cost of bagasse	F$/yr	11600
fuel cost of sawmill waste	F$/yr	300960
fuel cost of logging waste	F$/yr	298440
fuel cost of forest thinngs	F$/yr	121324
total fuel cost	F$/yr	732324
personnel cost:		
cost of 1 operator	F$/yr	9840
number of operators		12
cost of operators	F$/yr	118080
cost of 1 unskilled labourer	F$/yr	6330
number of unskilled labourers		4
cost of unskilled labour	F$/yr	25320
cost of 1 loader operator	F$/yr	9390
number of loader operators		2
cost of cat operators	F$/yr	18780
cost of 1 staff	F$/yr	12630
number of staff		2
cost of staff	F$/yr	25260
total personnel cost	F$/yr	187440
overhead cost	F$/yr	36900
maintenance, repairs etc	F$/yr	159890
total production cost	F$/yr	1116554
cost per unit generated	Fct/kWhr	6.453

Heilborn Engineering Pte. Ltd.

Option Ref: LAB33

Year: 1995

Labasa Power Plant Evaluation

Investment

Foreign Investment Cost

Plant and Machinery foreign	US$	4840000
installation cost foreign	US$	820000
total foreign investment	US$	5660000
exchange rate	F$/US$	1.10
plant and machinery	F$	6226000
installation cost local	F$	385000
total Plant and Machinery	F$	6611000

Local Investment Cost

land	F$	0
site preparation	F$	50000
civil works	F$	100000
pre-operational cost	F$	50000
total local investment	F$	200000
total investment	F$	6811000

Cost per kWhr

production cost	Fct/kWhr	6.453
depreciation 20 years	Fct/kWhr	1.968
interest (1/2 value) 11.2%	Fct/kWhr	2.204
total cost per kWhr	Fct/kWhr	10.625
total cost of steam turbo-generated power	F$/yr	2104156
total cost of diesel generation	F$/yr	128474
Total generating cost of system	F$/yr	2232630

Heilborn Engineering Pte. Ltd.

Option Ref: LAB33

Year: 2000

Labasa Power Plant Evaluation

Production Cost Calculation

AT Independent Power Plant

fuel cost:		
cost of bagasse	F$/ton	1.35
cost of sawmill waste	F$/ton	14.54
cost of logging waste	F$/ton	28.83
cost of forest thinnings	F$/ton	45.37
fuel cost of bagasse	F$/yr	13500
fuel cost of sawmill waste	F$/yr	348960
fuel cost of logging waste	F$/yr	432450
fuel cost of forest thinnings	F$/yr	321085
total fuel cost	F$/yr	1115995
personnel cost:		
cost of 1 operator	F$/yr	10990
number of operators		12
cost of operators	F$/yr	131880
cost of 1 unskilled labourer	F$/yr	7340
number of unskilled labourers		4
cost of unskilled labour	F$/yr	29360
cost of 1 loader operator	F$/yr	10890
number of loader operators		2
cost of cat operators	F$/yr	21780
cost of 1 staff	F$/yr	14650
number of staff		2
cost of staff	F$/yr	29300
total personnel cost	F$/yr	212320
overhead cost	F$/yr	42780
maintenance, repairs etc	F$/yr	185360
total production cost	F$/yr	1556455
cost per unit generated	Fct/kWhr	7.256

Heilborn Engineering Pte. Ltd.

Option Ref: LAB33

Year: 2000

Labasa Power Plant Evaluation

Investment

Foreign Investment Cost

Plant and Machinery foreign	US$	4840000
installation cost foreign	US$	820000
total foreign investment	US$	5660000
exchange rate	F$/US$	1.10
plant and machinery	F$	6226000
installation cost local	F$	385000
total Plant and Machinery	F$	6611000

Local Investment Cost

land	F$	0
site preparation	F$	50000
civil works	F$	100000
pre-operational cost	F$	50000
total local investment	F$	200000
total investment	F$	6811000

Cost per kWhr

production cost	Fct/kWhr	7.256
depreciation 20 years	Fct/kWhr	1.587
interest (1/2 value) 11.2%	Fct/kWhr	1.778
total cost per kWhr	Fct/kWhr	10.621
total cost of steam turbo-generated power	F$/yr	2543947
total cost of diesel generation	F$/yr	219812
Total generating cost of system	F$/yr	2763758

Heilborn Engineering Pte. Ltd. — Option Ref: LAB36

Year: 1990

Labasa Power Plant Evaluation

Production Cost Calculation

AT Independent Power Plant

fuel cost:		
cost of bagasse	F$/ton	1.00
cost of sawmill waste	F$/ton	10.82
cost of logging waste	F$/ton	21.45
cost of forest thinnings	F$/ton	32.78
fuel cost of bagasse	F$/yr	10000
fuel cost of sawmill waste	F$/yr	216400
fuel cost of logging waste	F$/yr	187688
fuel cost of forest thinnings	F$/yr	29785
total fuel cost	F$/yr	443873
personnel cost:		
cost of 1 operator	F$/yr	8180
number of operators		12
cost of operators	F$/yr	98160
cost of 1 unskilled labourer	F$/yr	5460
number of unskilled labourers		4
cost of unskilled labour	F$/yr	21840
cost of 1 loader operator	F$/yr	8100
number of loader operators		2
cost of cat operators	F$/yr	16200
cost of 1 staff	F$/yr	10900
number of staff		2
cost of staff	F$/yr	21800
total personnel cost	F$/yr	158000
overhead cost	F$/yr	31830
maintenance, repairs etc	F$/yr	137910
total production cost	F$/yr	771613
cost per unit generated	Fct/kWhr	5.909

Heilborn Engineering Pte. Ltd. — Option Ref: LAB36

Year: 1990

Labasa Power Plant Evaluation

Investment

Foreign Investment Cost

Plant and Machinery foreign	US$	4400000
installation cost foreign'	US$	740000
total foreign investment	US$	5140000
exchange rate	F$/US$	1.10
plant and machinery	F$	5654000
installation cost local	F$	352000
total Plant and Machinery	F$	6006000

Local Investment Cost

land	F$	0
site preparation	F$	50000
civil works	F$	100000
pre-operational cost	F$	50000
total local investment	F$	200000
total investment	F$	6206000

Cost per kWhr

production cost	Fct/kWhr	5.909
depreciation 20 years	Fct/kWhr	2.376
interest (1/2 value) 11.2%	Fct/kWhr	2.661
total cost per kWhr	Fct/kWhr	10.947
total cost of steam turbo-generated power	F$/yr	1703122
total cost of diesel generation	F$/yr	101105
Total generating cost of system	F$/yr	1804226

Heilborn Engineering Pte. Ltd.

Option Ref: LAB36

Year: 1995

Labasa Power Plant Evaluation

Production Cost Calculation

AT Independent Power Plant

fuel cost:		
cost of bagasse	F$/ton	1.16
cost of sawmill waste	F$/ton	12.54
cost of logging waste	F$/ton	24.87
cost of forest thinnings	F$/ton	38.00
fuel cost of bagasse	F$/yr	11600
fuel cost of sawmill waste	F$/yr	300960
fuel cost of logging waste	F$/yr	275488
fuel cost of forest thinnings	F$/yr	0
total fuel cost	F$/yr	588048
personnel cost:		
cost of 1 operator	F$/yr	9840
number of operators		12
cost of operators	F$/yr	118080
cost of 1 unskilled labourer	F$/yr	6330
number of unskilled labourers		4
cost of unskilled labour	F$/yr	25320
cost of 1 loader operator	F$/yr	9390
number of loader operators		2
cost of cat operators	F$/yr	18780
cost of 1 staff	F$/yr	12630
number of staff		2
cost of staff	F$/yr	25260
total personnel cost	F$/yr	187440
overhead cost	F$/yr	36900
maintenance, repairs etc	F$/yr	159890
total production cost	F$/yr	972278
cost per unit generated	Fct/kWhr	5.702

Heilborn Engineering Pte. Ltd.

Option Ref: LAB36

Year: 1995

Labasa Power Plant Evaluation

Investment

Foreign Investment Cost

Plant and Machinery foreign	US$	4400000
installation cost foreign	US$	740000
total foreign investment	US$	5140000
exchange rate	F$/US$	1.10
plant and machinery	F$	5654000
installation cost local	F$	352000
total Plant and Machinery	F$	6006000

Local Investment Cost

land	F$	0
site preparation	F$	50000
civil works	F$	100000
pre-operational cost	F$	50000
total local investment	F$	200000
total investment	F$	6206000

Cost per kWhr

production cost	Fct/kWhr	5.702
depreciation 20 years	Fct/kWhr	1.820
interest (1/2 value) 11.2%	Fct/kWhr	2.038
total cost per kWhr	Fct/kWhr	9.560
total cost of steam turbo-generated power	F$/yr	1869120
total cost of diesel generation	F$/yr	155521
Total generating cost of system	F$/yr	2024641

Heilborn Engineering Pte. Ltd.

Option Ref: LAB36

Year: 2000

Labasa Power Plant Evaluation

Production Cost Calculation

AT Independent Power Plant

fuel cost:		
cost of bagasse	F$/ton	1.35
cost of sawmill waste	F$/ton	14.54
cost of logging waste	F$/ton	28.83
cost of forest thinnings	F$/ton	45.37
fuel cost of bagasse	F$/yr	13500
fuel cost of sawmill waste	F$/yr	348960
fuel cost of logging waste	F$/yr	432450
fuel cost of forest thinnings	F$/yr	71149
total fuel cost	F$/yr	866059
personnel cost:		
cost of 1 operator	F$/yr	10990
number of operators		12
cost of operators	F$/yr	131880
cost of 1 unskilled labourer	F$/yr	7340
number of unskilled labourers		4
cost of unskilled labour	F$/yr	29360
cost of 1 loader operator	F$/yr	10890
number of loader operators		2
cost of cat operators	F$/yr	21780
cost of 1 staff	F$/yr	14650
number of staff		2
cost of staff	F$/yr	29300
total personnel cost	F$/yr	212320
overhead cost	F$/yr	42780
maintenance, repairs etc	F$/yr	185360
total production cost	F$/yr	1306519
cost per unit generated	Fct/kWhr	6.444

Heilborn Engineering Pte. Ltd.

Option Ref: LAB36

Year: 2000

Labasa Power Plant Evaluation

Investment

Foreign Investment Cost

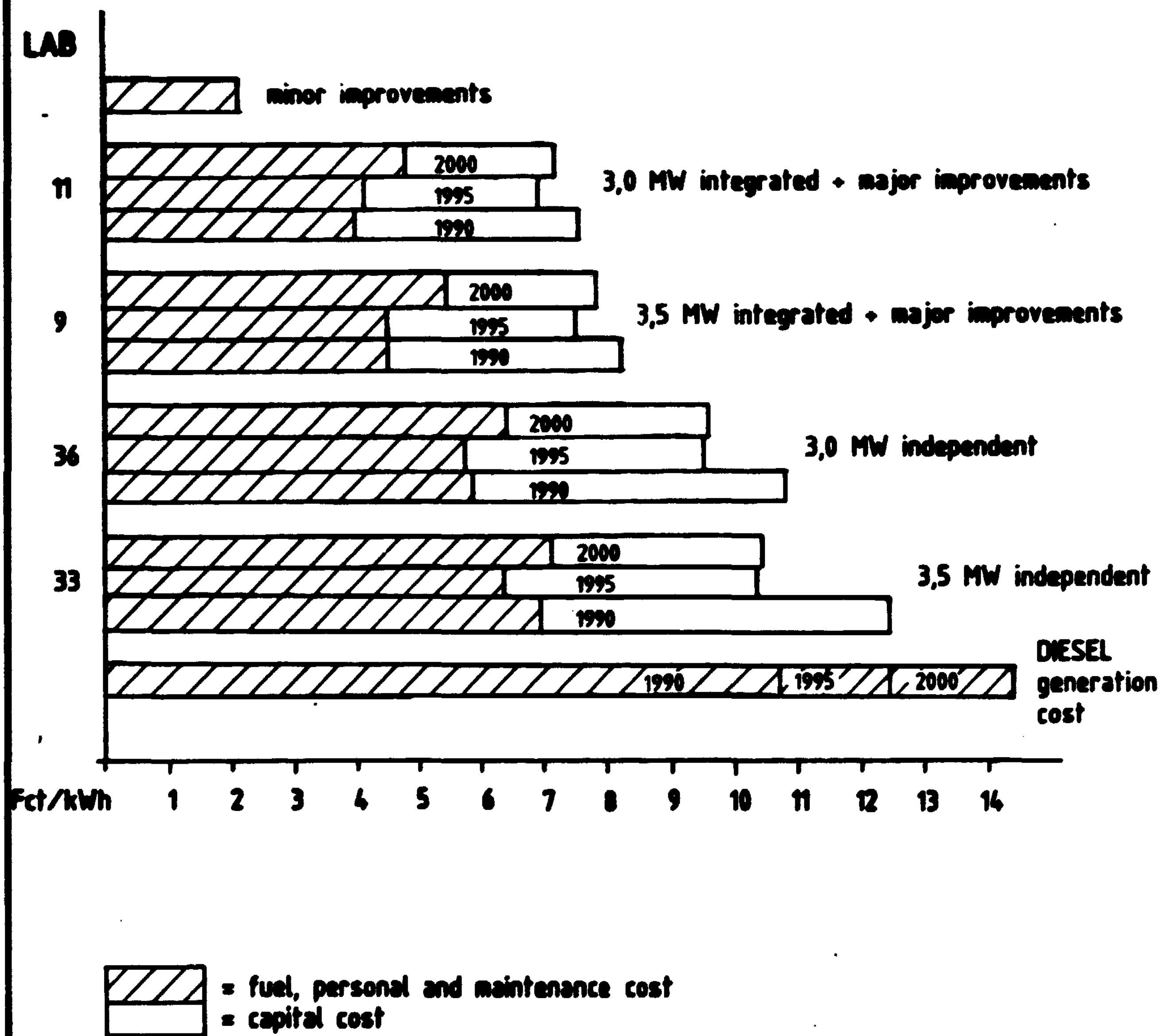
Plant and Machinery foreign	US$	4400000
installation cost foreign	US$	740000
total foreign investment	US$	5140000
exchange rate	F$/US$	1.10
plant and machinery	F$	5654000
installation cost local	F$	352000
total Plant and Machinery	F$	6006000

Local Investment Cost

land	F$	0
site preparation	F$	50000
civil works	F$	100000
pre-operational cost	F$	50000
total local investment	F$	200000
total investment	F$	6206000

Cost per kWhr

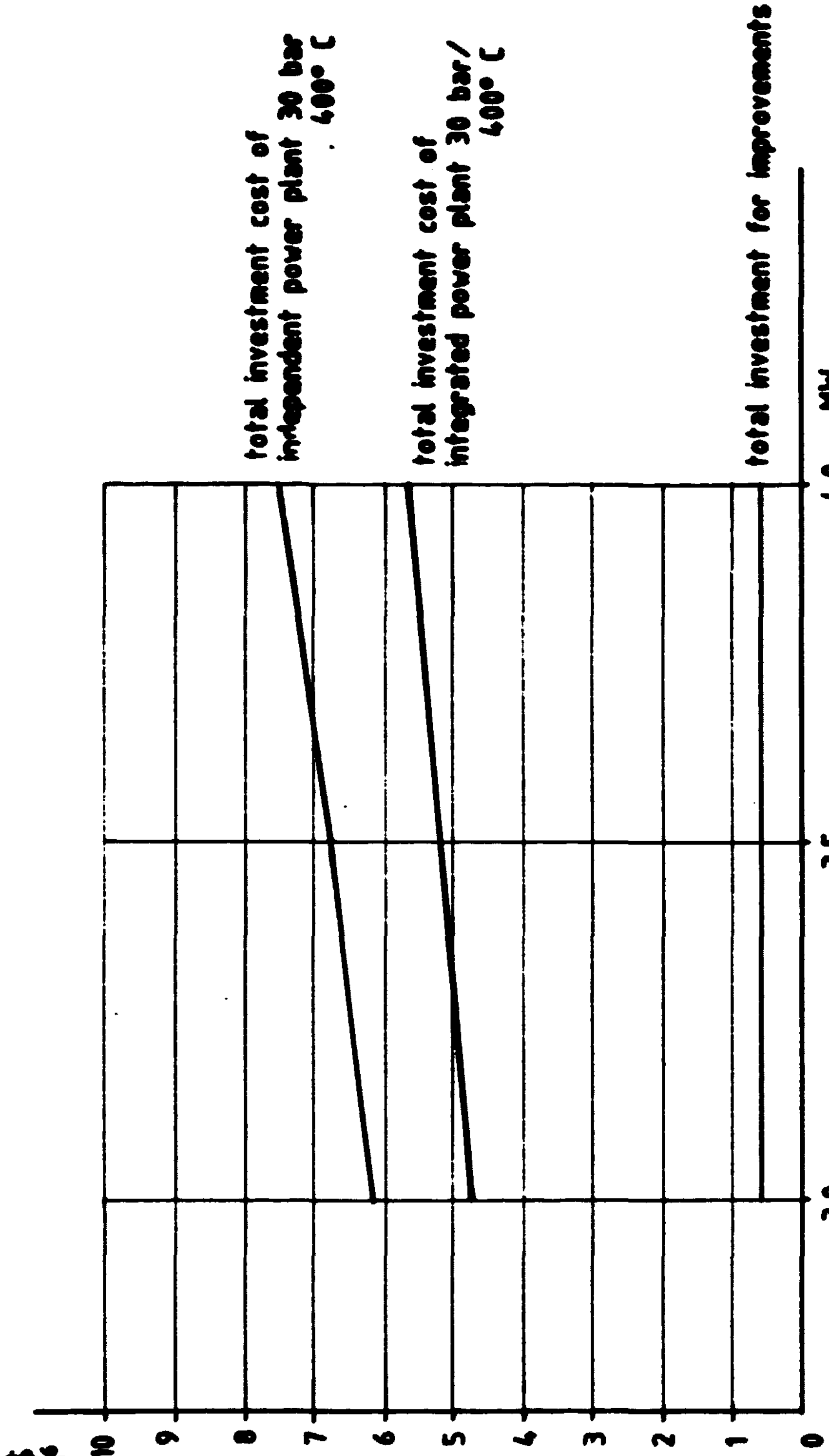
production cost	Fct/kWhr	6.444
depreciation 20 years	Fct/kWhr	1.530
interest (1/2 value) 11.2%	Fct/kWhr	1.714
total cost per kWhr	Fct/kWhr	9.688
total cost of steam turbo-generated power	F$/yr	2206557
total cost of diesel generation	F$/yr	346032
Total generating cost of system	F$/yr	2552589



FIJI - LABASA POWER STUDY
Unit - cost

HEILBORN ENGINEERING PTE LTD
1 JALAN SEAVIEW, SINGAPORE 1543

4.7.86



FIJI - LABASA POWER STUDY

INVESTMENT - COST

HEILBORN
ENGINEERING PTE LTD
1 JALAN SEAVIEW, SINGAPORE 1543

ANNEX H

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Heilborn Engineering Pte. Ltd.	Option Ref: LAB11

Year: 1988

Labasa Power Plant Evaluations

FSC Integrated Power Plant, 3.0 MW, p=30 bar, t=400 C
FSC supply from plant with major improvements
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	14900000
power supply by FSC	kWhr/yr	5996000
power supply by Diesel genset	kWhr/yr	435000
power generation power plant	kWhr/yr	8469000
power peak load output	kW	3000
block efficiency		0.210
own consumption		0.100
plant efficiency		0.189
operating hours per year	hr/yr	5210
load factor		0.542
part load factor		0.695
part load efficiency		0.131
fuel heat demand	kJ/yr	232167976488
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value logging waste	kJ/kg	8372
available bagasse	ton/yr	0
heat supply bagasse	kJ/yr	0
heat demand other fuel	kJ/yr	232167976488
available sawmill waste	ton/yr	18400
heat supply sawmill waste	kJ/yr	193200000000
heat demand other fuel	kJ/yr	38967976488
logging waste demand	ton/yr	4655

Heilborn Engineering Pte. Ltd. | Option Ref: LAB11

Year: 1989

Labasa Power Plant Evaluations

FSC Integrated Power Plant, 3.0 MW, p=30 bar, t=400 C
FSC supply from plant with major improvements
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	15650000
power supply by FSC	kWhr/yr	6133000
power supply by Diesel genset	kWhr/yr	455000
power generation power plant	kWhr/yr	9062000
power peak load output	kW	3000
block efficiency		0.210
own consumption		0.100
plant efficiency		0.189
operating hours per year	hr/yr	5210
load factor		0.580
part load factor		0.719
part load efficiency		0.136
fuel heat demand	kJ/yr	240019024597
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value logging waste	kJ/kg	8372
available bagasse	ton/yr	0
heat supply bagasse	kJ/yr	0
heat demand other fuel	kJ/yr	240019024597
available sawmill waste	ton/yr	19200
heat supply sawmill waste	kJ/yr	201600000000
heat demand other fuel	kJ/yr	38419024597
logging waste demand	ton/yr	4589

Heilborn Engineering Pte. Ltd.

Option Ref:
LAB11

Year: 1990

Labasa Power Plant Evaluations

FSC Integrated Power Plant, 3.0 MW, p=30 bar, t=400 C
FSC supply from plant with major improvements
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	16500000
power supply by FSC	kWhr/yr	6270000
power supply by Diesel genset	kWhr/yr	480000
power generation power plant	kWhr/yr	9750000
power peak load output	kW	3000
block efficiency		0.210
own consumption		0.100
plant efficiency		0.189
operating hours per year	hr/yr	5210
load factor		0.624
part load factor		0.745
part load efficiency		0.141
fuel heat demand	kJ/yr	249350322672
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value logging waste	kJ/kg	8372
available bagasse	ton/yr	0
heat supply bagasse	kJ/yr	0
heat demand other fuel	kJ/yr	249350322672
available sawmill waste	ton/yr	20000
heat supply sawmill waste	kJ/yr	210000000000
heat demand other fuel	kJ/yr	39350322672
logging waste demand	ton/yr	4700

Heilborn Engineering Pte. Ltd.

Option Ref: LAB11

year: 1991

Labasa Power Plant Evaluations

FSC Integrated Power Plant, 3.0 MW, p=30 bar, t=400 C
FSC supply from plant with major improvements
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	17400000
power supply by FSC	kWhr/yr	6407000
power supply by Diesel genset	kWhr/yr	505000
power generation power plant	kWhr/yr	10488000
power peak load output	kW	3000
block efficiency		0.210
own consumption		0.100
plant efficiency		0.189
operating hours per year	hr/yr	5328
load factor		0.656
part load factor		0.762
part load efficiency		0.144
fuel heat demand	kJ/yr	262138536074
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value logging waste	kJ/kg	8372
available bagasse	ton/yr	0
heat supply bagasse	kJ/yr	0
heat demand other fuel	kJ/yr	262138536074
available sawmill waste	ton/yr	20800
heat supply sawmill waste	kJ/yr	218400000000
heat demand other fuel	kJ/yr	43738536074
logging waste demand	ton/yr	5224

Heilborn Engineering Pte. Ltd. | Option Ref: LAB11

Year: 1992

Labasa Power Plant Evaluations

FSC Integrated Power Plant, 3.0 MW, p=30 bar, t=400 C
FSC supply from plant with major improvements
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	18250000
power supply by FSC	kWhr/yr	6544000
power supply by Diesel genset	kWhr/yr	550000
power generation power plant	kWhr/yr	11156000
power peak load output	kW	3000
block efficiency		0.210
own consumption		0.100
plant efficiency		0.189
operating hours per year	hr/yr	5415
load factor		0.687
part load factor		0.777
part load efficiency		0.147
fuel heat demand	kJ/yr	273360715288
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value logging waste	kJ/kg	8372
available bagasse	ton/yr	0
heat supply bagasse	kJ/yr	0
heat demand other fuel	kJ/yr	273360715288
available sawmill waste	ton/yr	21600
heat supply sawmill waste	kJ/yr	226800000000
heat demand other fuel	kJ/yr	46560715288
logging waste demand	ton/yr	5561

Heilborn Engineering Pte. Ltd.

Option Ref: LAB11

Year: 1993

Labasa Power Plant Evaluations

FSC Integrated Power Plant, 3.0 MW, p=30 bar, t=400 C
FSC supply from plant with major improvements
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	19200000
power supply by FSC	kWhr/yr	6681000
power supply by Diesel genset	kWhr/yr	615000
power generation power plant	kWhr/yr	11904000
power peak load output	kW	3000
block efficiency		0.210
own consumption		0.100
plant efficiency		0.189
operating hours per year	hr/yr	5512
load factor		0.720
part load factor		0.793
part load efficiency		0.150
fuel heat demand	kJ/yr	285997286463
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value logging waste	kJ/kg	8372
available bagasse	ton/yr	0
heat supply bagasse	kJ/yr	0
heat demand other fuel	kJ/yr	285997286463
available sawmill waste	ton/yr	22400
heat supply sawmill waste	kJ/yr	235200000000
heat demand other fuel	kJ/yr	50797286463
logging waste demand	ton/yr	6068

Heilborn Engineering Pte. Ltd.

Option Ref:
LAB11

Year: 1994

Labasa Power Plant Evaluations

FSC Integrated Power Plant, 3.0 MW, p=30 bar, t=400 C
FSC supply from plant with major improvements
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	20100000
power supply by FSC	kWhr/yr	6818000
power supply by Diesel genset	kWhr/yr	730000
power generation power plant	kWhr/yr	12552000
power peak load output	kW	3000
block efficiency		0.210
own consumption		0.100
plant efficiency		0.189
operating hours per year	hr/yr	5595
load factor		0.748
part load factor		0.805
part load efficiency		0.152
fuel heat demand	kJ/yr	296978968997
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value logging waste	kJ/kg	8372
available bagasse	ton/yr	0
heat supply bagasse	kJ/yr	0
heat demand other fuel	kJ/yr	296978968997
available sawmill waste	ton/yr	23200
heat supply sawmill waste	kJ/yr	243600000000
heat demand other fuel	kJ/yr	53378968997
logging waste demand	ton/yr	6376

Heilborn Engineering Pte. Ltd.

Option Ref: LAB11

Year: 1995

Labasa Power Plant Evaluations

FSC Integrated Power Plant, 3.0 MW, p=30 bar, t=400 C
FSC supply from plant with major improvements
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	21000000
power supply by FSC	kWhr/yr	6955000
power supply by Diesel genset	kWhr/yr	861000
power generation power plant	kWhr/yr	13184000
power peak load output	kW	3000
block efficiency		0.210
own consumption		0.100
plant efficiency		0.189
operating hours per year	hr/yr	5650
load factor		0.778
part load factor		0.817
part load efficiency		0.155
fuel heat demand	kJ/yr	307192015332
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value logging waste	kJ/kg	8372
available bagasse	ton/yr	0
heat supply bagasse	kJ/yr	0
heat demand other fuel	kJ/yr	307192015332
available sawmill waste	ton/yr	24000
heat supply sawmill waste	kJ/yr	252000000000
heat demand other fuel	kJ/yr	55192015332
logging waste demand	ton/yr	6592

Heilborn Engineering Pte. Ltd.

Option Ref: LAB11

Year: 1996

Labasa Power Plant Evaluations

FSC Integrated Power Plant, 3.0 MW, p=30 bar, t=400 C
FSC supply from plant with major improvements
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	22000000
power supply by FSC	kWhr/yr	6955000
power supply by Diesel genset	kWhr/yr	1050000
power generation power plant	kWhr/yr	13995000
power peak load output	kW	3000
block efficiency		0.210
own consumption		0.100
plant efficiency		0.189
operating hours per year	hr/yr	5805
load factor		0.804
part load factor		0.828
part load efficiency		0.156
fuel heat demand	kJ/yr	322101252605
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value logging waste	kJ/kg	8372
available bagasse	ton/yr	0
heat supply bagasse	kJ/yr	0
heat demand other fuel	kJ/yr	322101252605
available sawmill waste	ton/yr	24000
heat supply sawmill waste	kJ/yr	252000000000
heat demand other fuel	kJ/yr	70101252605
logging waste demand	ton/yr	8373

Heilborn Engineering Pte. Ltd. | Option Ref: LAB11

Year: 1997

Labasa Power Plant Eva.uations

FSC Integrated Power Plant, 3.0 MW, p=30 bar, t=400 C
FSC supply from plant with major improvements
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	23000000
power supply by FSC	kWhr/yr	6955000
power supply by Diesel genset	kWhr/yr	1270000
power generation power plant	kWhr/yr	14775000
power peak load output	kW	3000
block efficiency		0.210
own consumption		0.100
plant efficiency		0.189
operating hours per year	hr/yr	5934
load factor		0.830
part load factor		0.837
part load efficiency		0.158
fuel heat demand	kJ/yr	336058457093
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value logging waste	kJ/kg	8372
available bagasse	ton/yr	0
heat supply bagasse	kJ/yr	0
heat demand other fuel	kJ/yr	336058457093
available sawmill waste	ton/yr	24000
heat supply sawmill waste	kJ/yr	252000000000
heat demand other fuel	kJ/yr	84058457093
logging waste demand	ton/yr	10040

Heilborn Engineering Pte. Ltd.

Option Ref: LAB11

Year: 1998

Labasa Power Plant Evaluations

FSC Integrated Power Plant, 3.0 MW, p=30 bar, t=400 C
FSC supply from plant with major improvements
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	24000000
power supply by FSC	kWhr/yr	6955000
power supply by Diesel genset	kWhr/yr	1560000
power generation power plant	kWhr/yr	15485000
power peak load output	kW	3000
block efficiency		0.210
own consumption		0.100
plant efficiency		0.189
operating hours per year	hr/yr	5973
load factor		0.864
part load factor		0.850
part load efficiency		0.161
fuel heat demand	kJ/yr	347198189732
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value logging waste	kJ/kg	8372
available bagasse	ton/yr	0
heat supply bagasse	kJ/yr	0
heat demand other fuel	kJ/yr	347198189732
available sawmill waste	ton/yr	24000
heat supply sawmill waste	kJ/yr	252000000000
heat demand other fuel	kJ/yr	95198189732
logging waste demand	ton/yr	11371

Heilborn Engineering Pte. Ltd. Option Ref: LAB11

Year: 1999

Labasa Power Plant Evaluations

FSC Integrated Power Plant, 3.0 MW, p=30 bar, t=400 C
FSC supply from plant with major improvements
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	25000000
power supply by FSC	kWhr/yr	6955000
power supply by Diesel genset	kWhr/yr	1930000
power generation power plant	kWhr/yr	16115000
power peak load output	kW	3000
block efficiency		0.210
own consumption		0.100
plant efficiency		0.189
operating hours per year	hr/yr	6158
load factor		0.872
part load factor		0.852
part load efficiency		0.161
fuel heat demand	kJ/yr	360150454829
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value logging waste	kJ/kg	8372
available bagasse	ton/yr	0
heat supply bagasse	kJ/yr	0
heat demand other fuel	kJ/yr	360150454829
available sawmill waste	ton/yr	24000
heat supply sawmill waste	kJ/yr	252000000000
heat demand other fuel	kJ/yr	108150454829
logging waste demand	ton/yr	12918

Heilborn Engineering Pte. Ltd. Option Ref: LAB11

Year: 2000

Labasa Power Plant Evaluations

FSC Integrated Power Plant, 3.0 MW, p=30 bar, t=400 C
FSC supply from plant with major improvements
FEA diesel supplementary supply

Technical Balance

power demand	kWhr/yr	26000000
power supply by FSC	kWhr/yr	6955000
power supply by Diesel genset	kWhr/yr	2444000
power generation power plant	kWhr/yr	16601000
power peak load output	kW	3000
block efficiency		0.210
own consumption		0.100
plant efficiency		0.189
operating hours per year	hr/yr	6230
load factor		0.888
part load factor		0.858
part load efficiency		0.162
fuel heat demand	kJ/yr	368719365308
cal. value bagasse	kJ/kg	7574
cal. value sawmill waste	kJ/kg	10500
cal. value logging waste	kJ/kg	8372
available bagasse	ton/yr	0
heat supply bagasse	kJ/yr	0
heat demand other fuel	kJ/yr	368719365308
available sawmill waste	ton/yr	24000
heat supply sawmill waste	kJ/yr	252000000000
heat demand other fuel	kJ/yr	116719365308
logging waste demand	ton/yr	13942

ANNEX I

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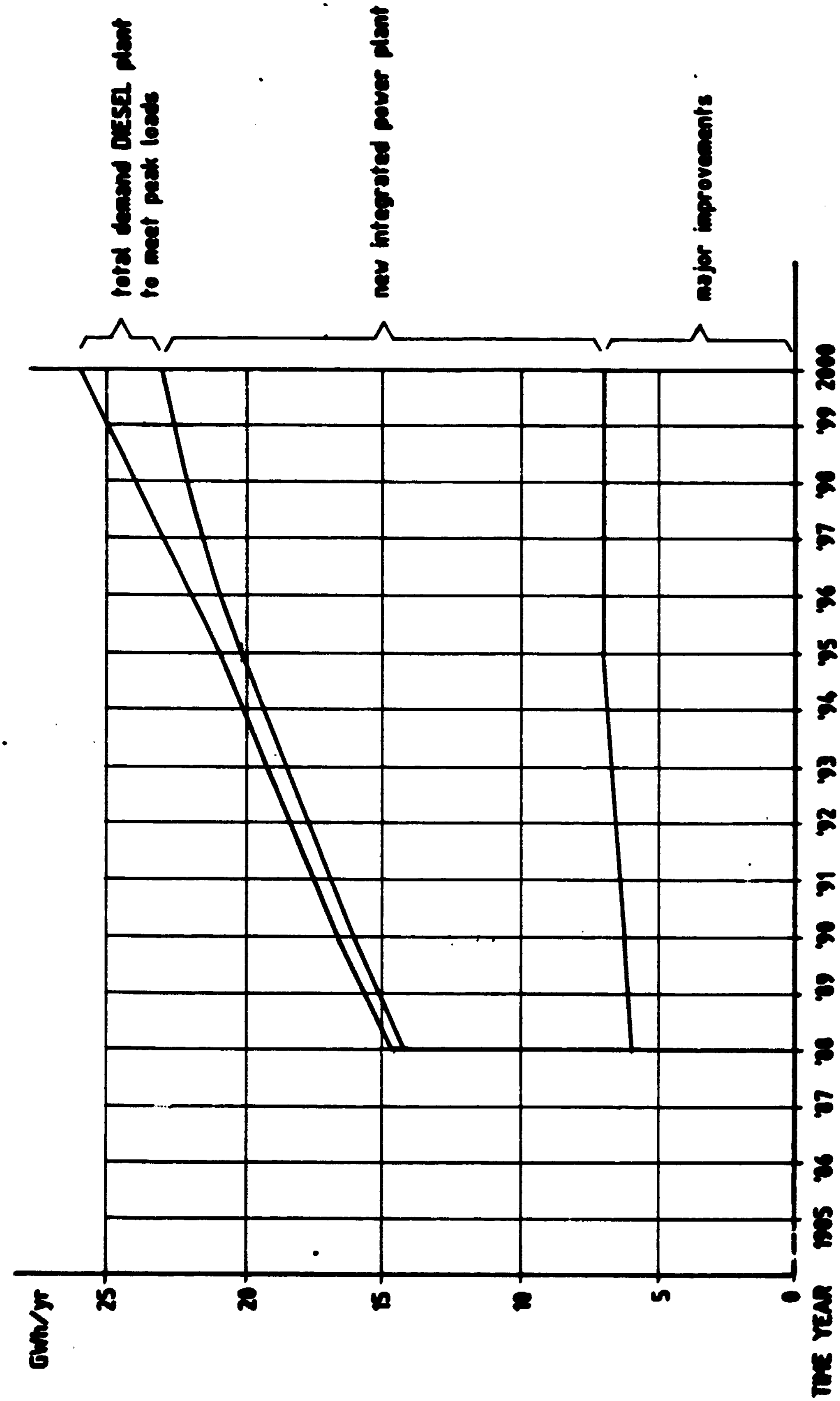

FIJI - LABASA POWER STUDY
DEMAND AND SUPPLIES (LAB 11)

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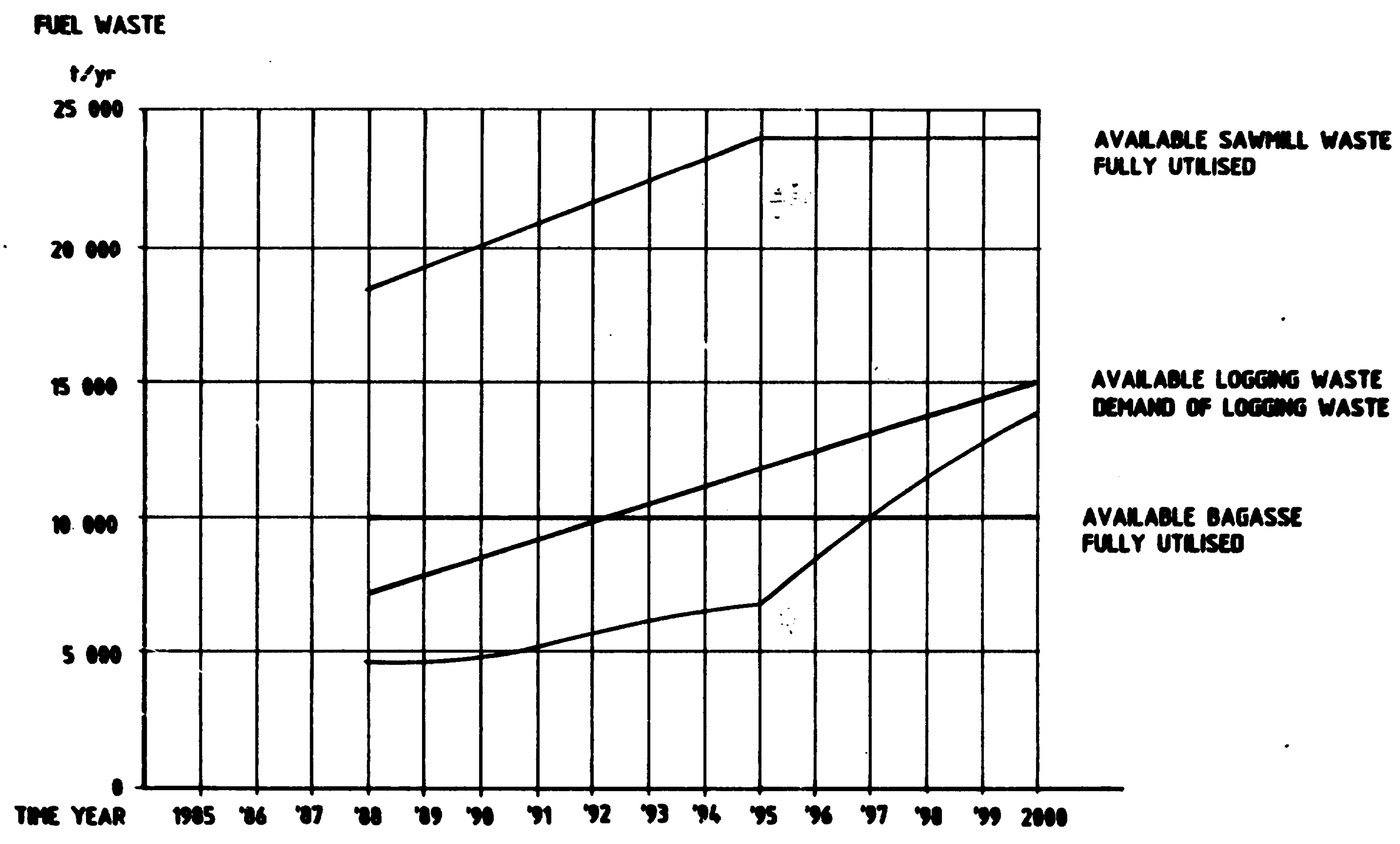
ENGINEERING PTE LTD
1 JALAN SEAVIEW, SINGAPORE 1543



FIJI - LABASA POWER STUDY
AVAILABILITY AND DEMAND OF FUEL WASTE

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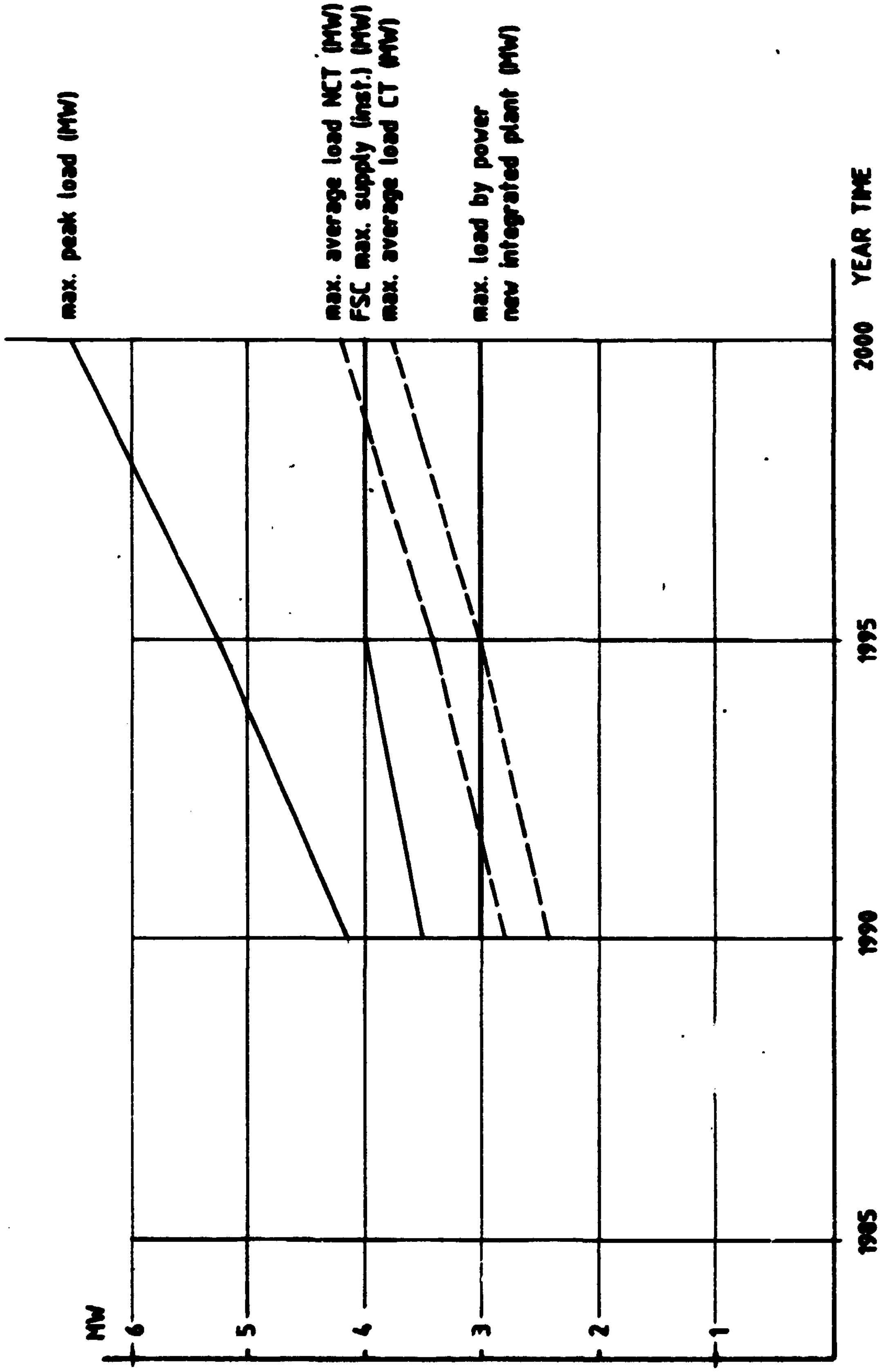

FIJI - LABASA POWER STUDY
LAB 11 / 3,0 MW POWER PLANT
AND IMPROVEMENTS IN FSC

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FIJI - LABASA POWER STUDY
MINIMUM SUPPLY BY DIESEL POWER PLANT

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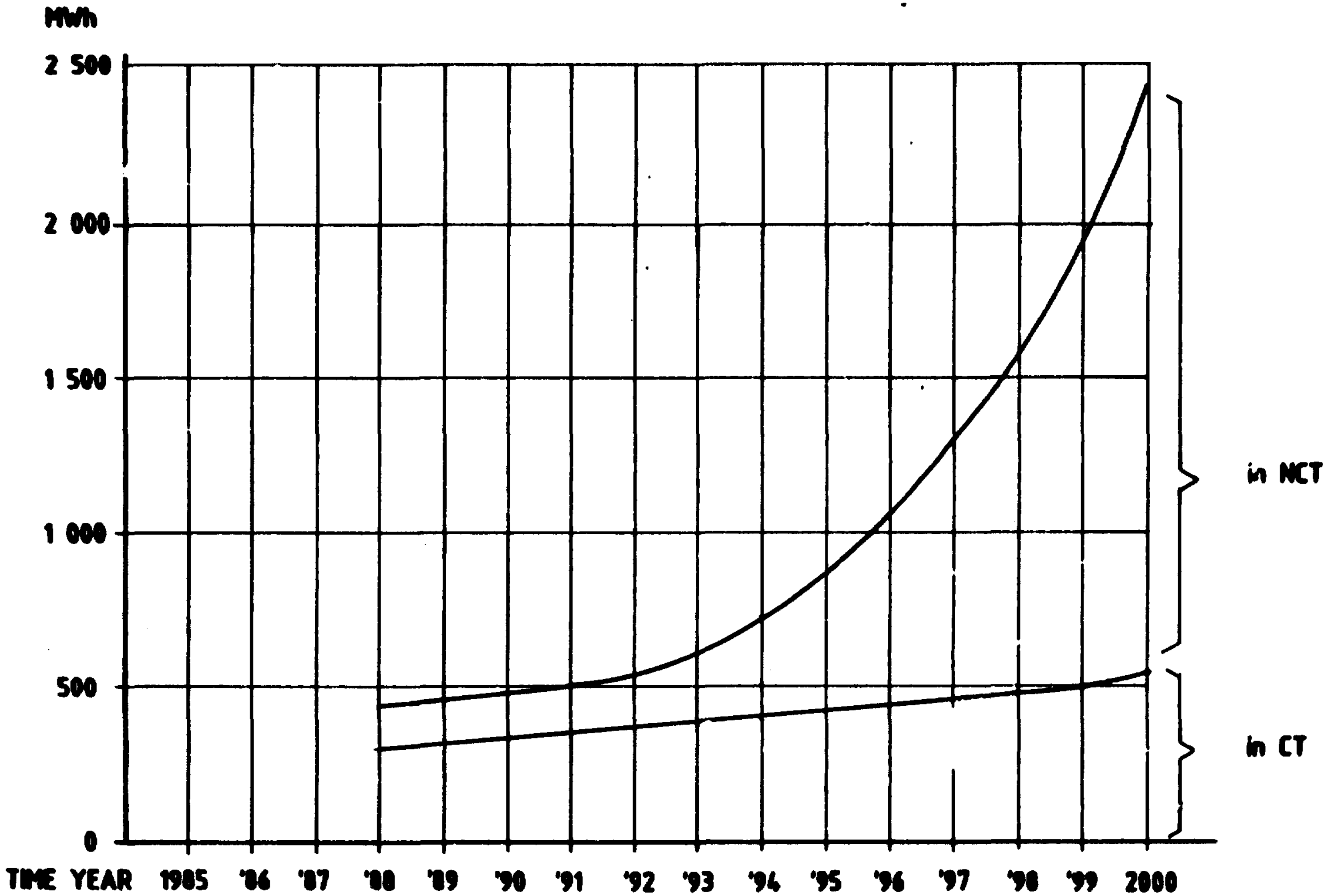

MINIMUM SUPPLY BY DIESEL POWER PLANT
(for covering the peak loads and shut downs)

ALTERNATIVE LAB 11

FIJI - LABASA POWER STUDY
SINGLE LINE DIAGRAM

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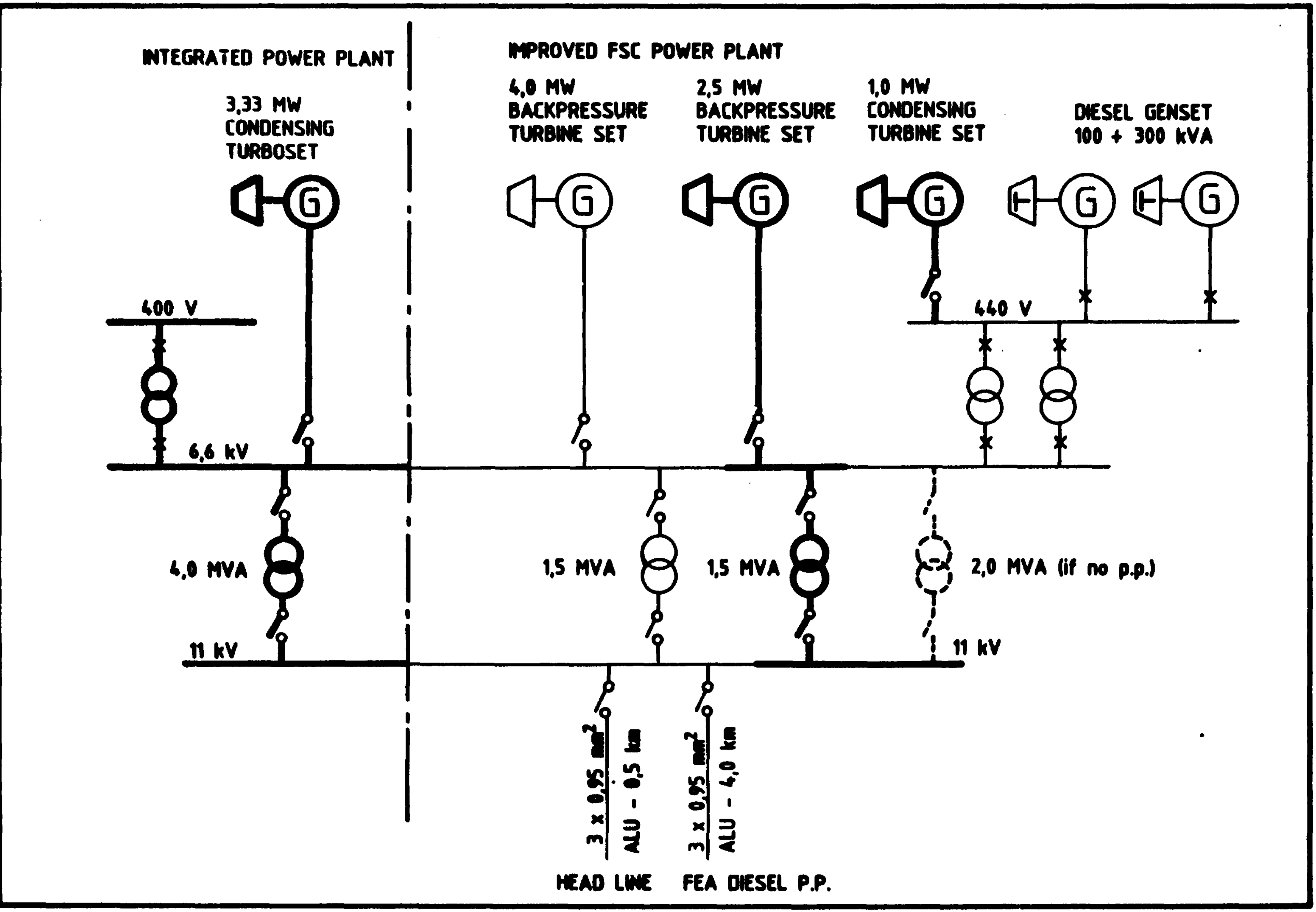

ANNEX J

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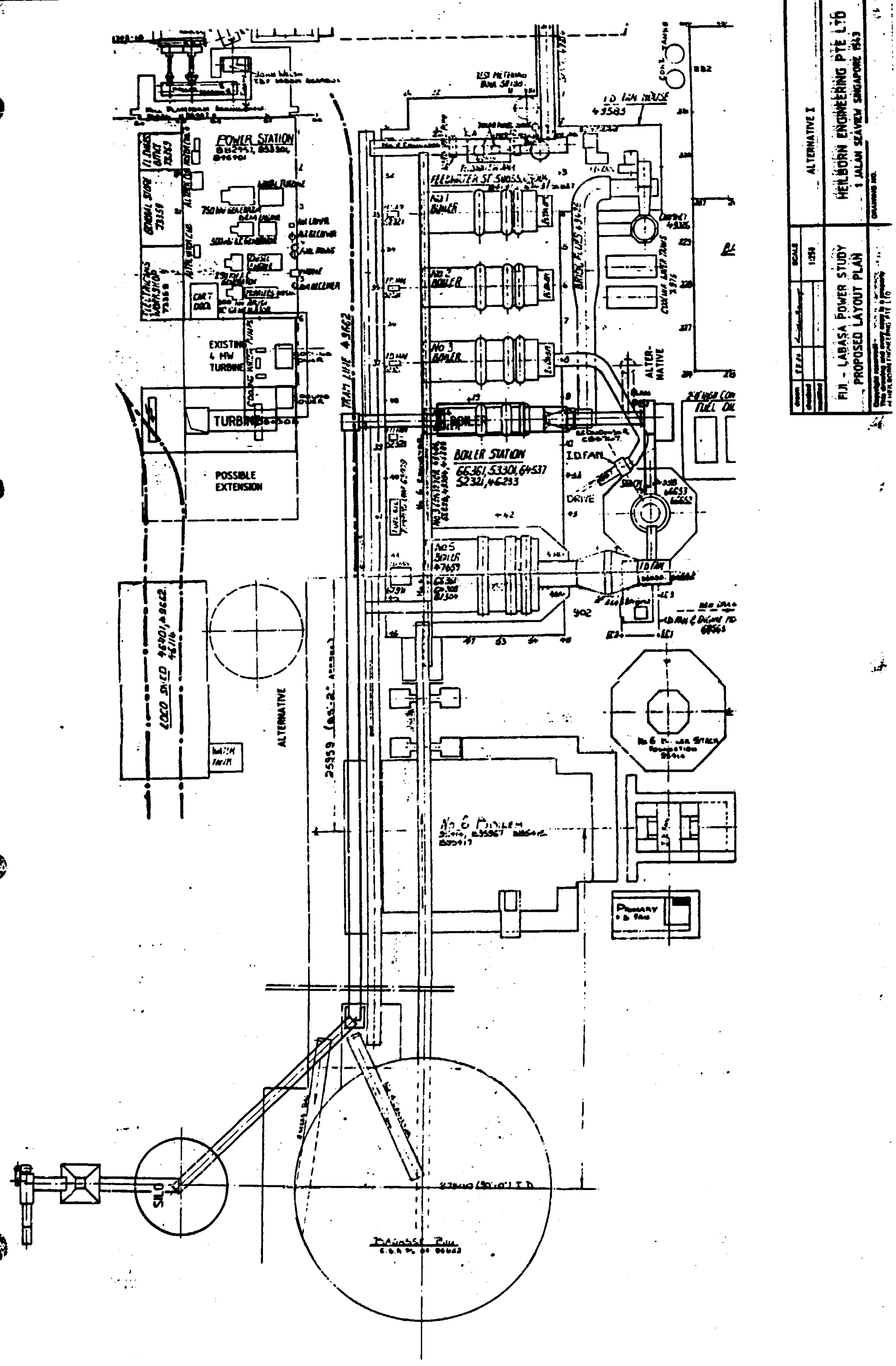
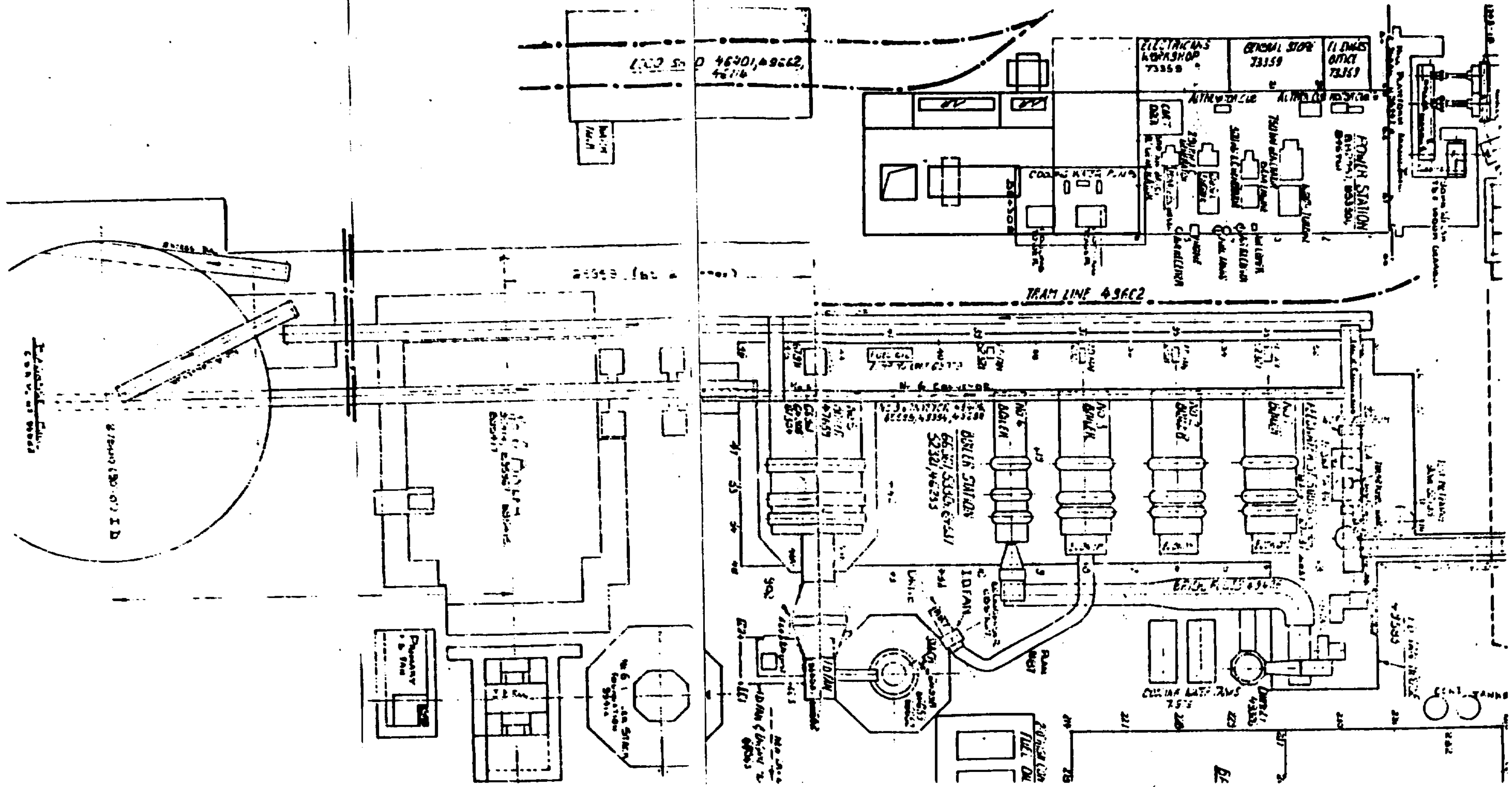


POWER STATION
EXISTING 4 MW TURBINE
TURBINE
POSSIBLE EXTENSION
BOILER STATION
ALTERNATIVE
ALTER-NATIVE
I.D.FAN
DRIVE
SILO
LOCO SHED
No 6 BOILER
BAGASSE BIN
TRAM LINE
ALTERNATIVE I
HEILBORN ENGINEERING PTE LTD
1 JALAN SEAVIEW SINGAPORE 1543
FIJI - LABASA POWER STUDY
PROPOSED LAYOUT PLAN



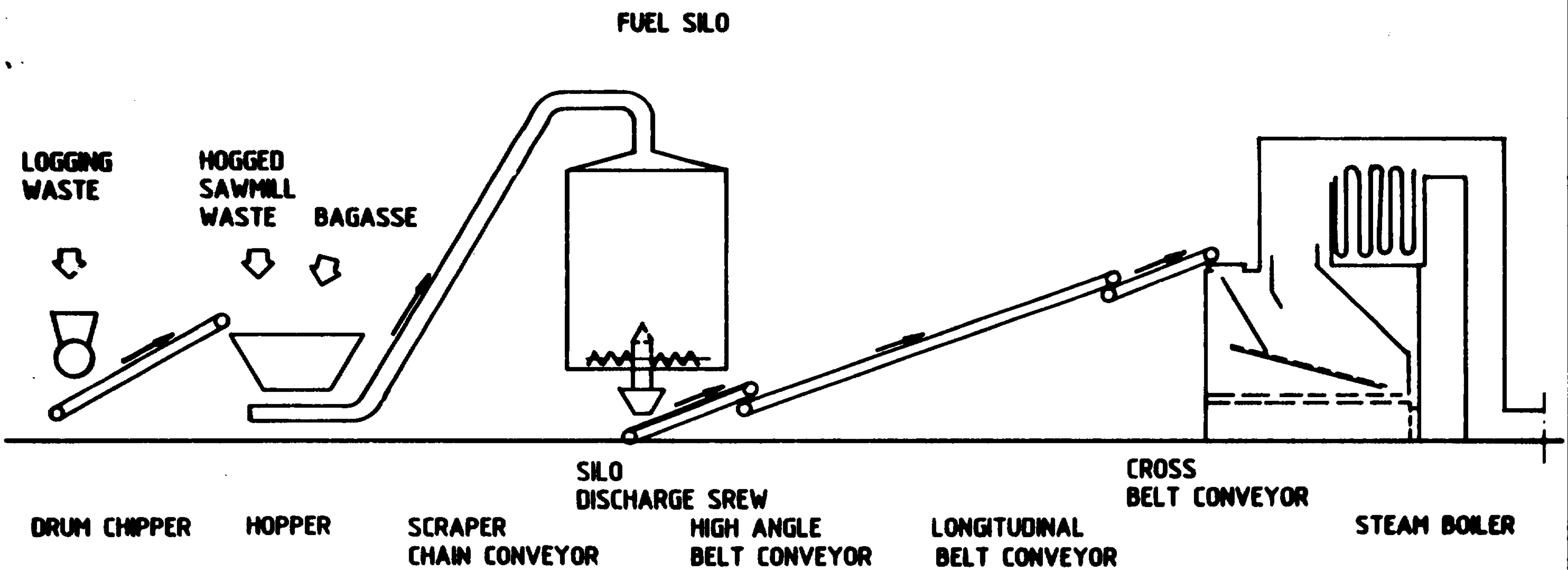
drawn	4.2.86		SCALE	ALTERNATIVE II
checked			1:250	
modified				

FIJI - LABASA POWER STUDY
PROPOSED LAYOUT PLAN

HEILBORN ENGINEERING PTE LTD
1 JALAN SEAVIEW, SINGAPORE 1543

DRAWING NO.

FIJI - LABASA POWER STUDY
FUEL HANDLING DIAGRAM



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1 JALAN SEAVIEW, SINGAPORE 1543

ANNEX K

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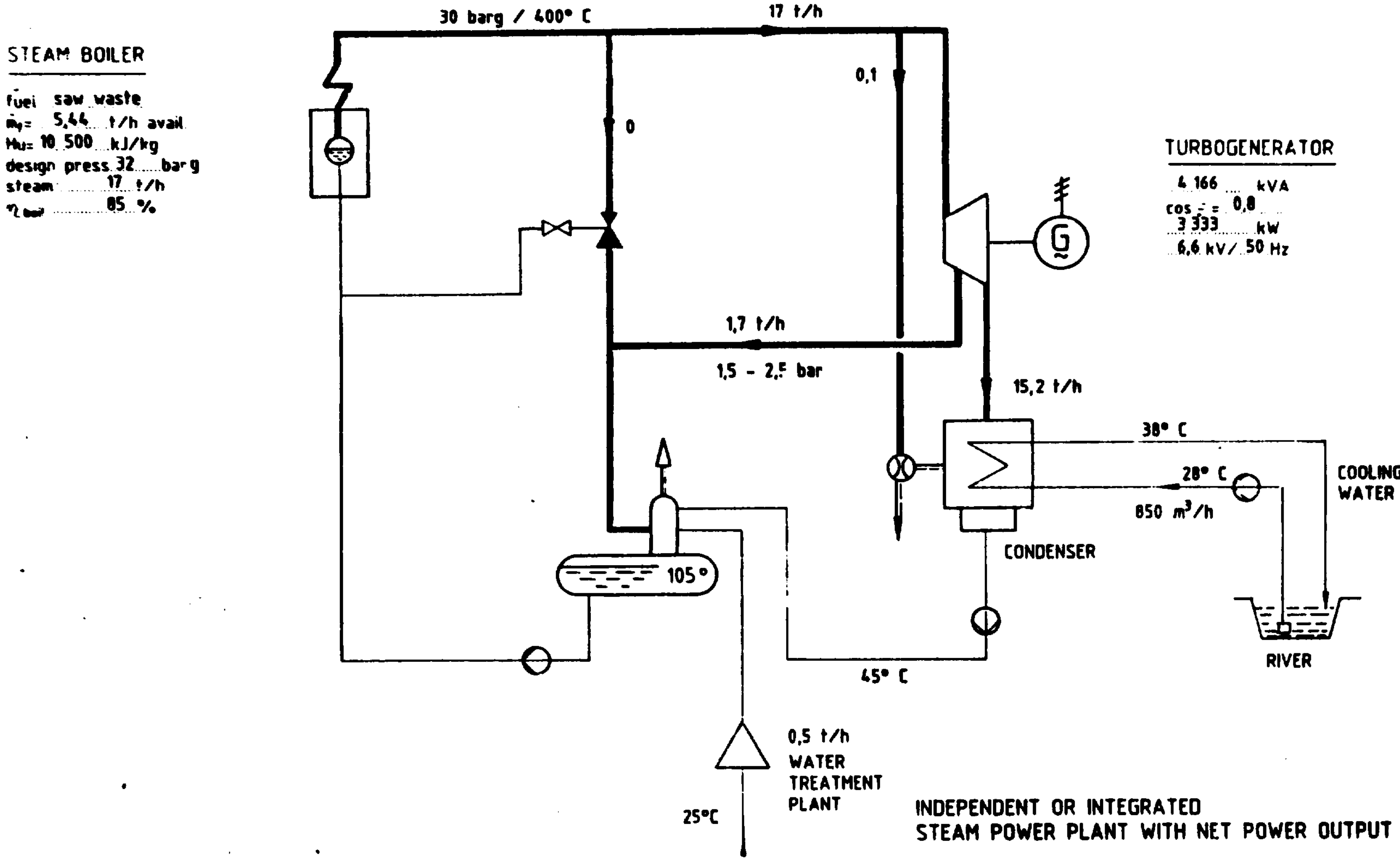

INDEPENDENT OR INTEGRATED
STEAM POWER PLANT WITH NET POWER OUTPUT OF 3 MW

bloc eff: η_b = 21 %
plant eff: η_{pl} = 18,9 %

gez: 3.7.86	HEILBORN ENGINEERING PTE LTD 1 JALAN SEAVIEW, SINGAPORE 1543
BALANCE DIAGRAM	FIJI - LABASA POWER STUDY
	Zeichnungs-Nr

ANNEX L

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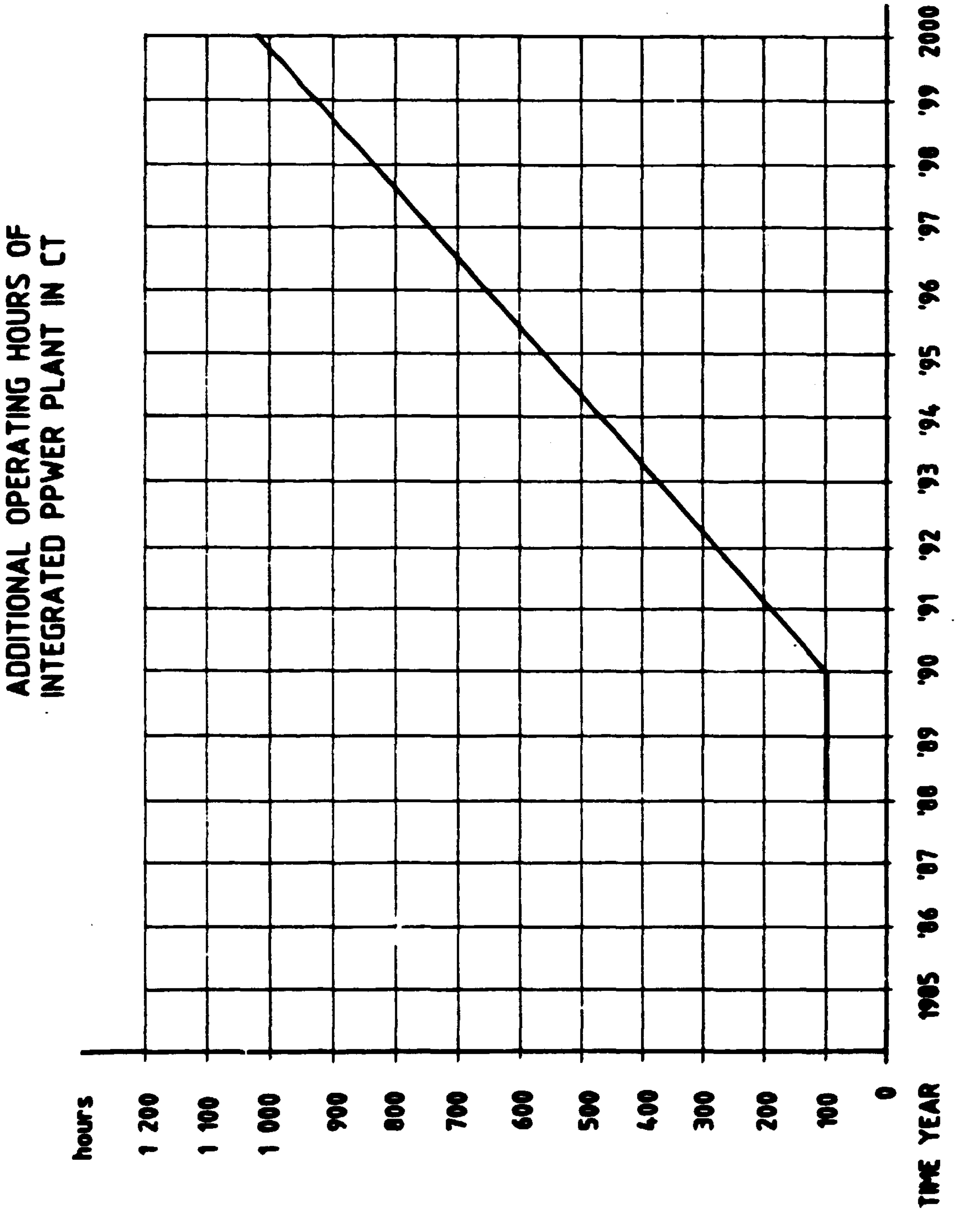

FIJI - LABASA POWER STUDY OPERATING HOURS OF POWER PLANT DURING CT	HEILBORN ENGINEERING PTE LTD 1 JALAN SEAVIEW, SINGAPORE 1543

ANNEX M

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The basic specifications provided in the following pages, have been prepared as a possible basis for tendering.

To provide for a fair tender, these specifications have been prepared such that no techniralities included, are favouring any particular manufacturer(s).

The specifications have been drawn up after close study of the technical parameters of several manufacturers, and relating these to the project. We list below, names of several manufacturers whom we had consulted, in order to arrive at our budgetary machinery prices and technical specifications:

1. Steam boiler	Gebrueder Weiss Standard Kessel Yoshimine Takuma
2. Turbo-set with condenser	Bloem & Voess AEG Kanis Siemens
3. Cooling water supply system	Dango & Dienenthal Allweiker Sulser Weise
4. Piping and insulation	Kraftanlagen Krupp
5. Fuel chipper	Kloeckner Maier Weiss
6. Bridge crane	Mannesman Demag
7. Demineralisation plant	Hager & Elsaesser Aqua Chem
8. Electrical plant	Elnic Westinghouse AEG Merlin Gerin

Basic Data for a Steam Power Plant
with Net Power Output of 3,000 KW

1.0 BOILER PLANT

The following specified boiler is understood to be an integral part of a power plant run by steam turbine. Furnace, appropriate purity of steam and the control characteristic of the 3 components load, pressure and temperature have to meet all requirements of a steam turbine driven power plant.

Design:

water tube compact boiler with steam superheater, economiser, airheater and moving grate for burning of bagasse, sawmill waste and logging waste

Technical Data:

capacity of superheated steam	17.0 t/h
temperature of superheated steam	400 deg C
operating steam pressure	30 bar abs
design pressure	32 barg
feed water temperature	105 deg C
flue gas temp. after air heater	180 deg C

Fuel:

bagasse at 45 - 50 % moisture content,
calorific value of 8,500 - 7,500 kJ/kg

sawmill waste consisting of 82.5% chipped slabs and 17.5% sawdust
average moisture content at 70 %
total calorific value at 10,500 kJ/kg

logging waste consists of chipped material (at plant site)
moisture content at 100 %
calorific value at 8372 kJ/kg

Fuel Ratio:
bagasse : sawmill waste : logging waste (t/h in %)
under normal operating conditions, 0% : 80%-60% : 20%-40%
(bagasse will normally be fired in the existing plant after major improvements have been implemented. However, the new boiler should be able to also burn bagasse if needed)

designed for bagasse	50 %
sawmill waste	100 %
logging waste	50 %

Basic Data for a Steam Power Plant
with Net Power Output of 3,000 KW

1.0 BOILER PLANT (continoued)

Stack height: 32 m

2.0 CONDENSING TURBINE GENERATOR SET

2.1 Condensing turbine

Construction:	multi-stage impulse turbine oil-hydraulic speed regulated	
Design data:	inlet steam at	29.0 bar abs./395 deg C 17.0 t/h
	extraction at	2.5 bar abs at 100 % load 1.7 t/h
	exhaust steam	0.1 bar abs. /15.2 t/h
	speed aprox.	8,000 rpm
	gear ratio	8,000:1,500

2.2 Synchronous alternator

Construction:	self-regulated brushless three-phase alternator with electronic voltage regulation, water cooled	
Design data:	rated output at	3,330 kW
	rated voltage at	6.6 kV
	frequency	50 Hz
	speed	1,500 rpm

2.3 Water cooled condenser

Construction:	tube-bundle heat-exchanger with hotwell and steam ejector for evacuating	
Design data:	condensation pressure at	0.1 bar abs.
	cooling water inlet temp.	28 deg C
	cooling water outlet temp.	38 deg C
	cooling water consumption	850 m3/h
	source of cooling water	river water

Basic Data for a Steam Power Plant
with Net Power Output of 3,000 KW

3.0 COOLING WATER SUPPLY SYSTEM

Design:

cooling water consumption at

- condenser	850 m3/h
- turbine oil cooler	25 m3/h
- generator	25 m3/h
- total	900 m3/h

Medium: water from nearby river at FSC plant
(water analysis available at FSC)
temperature at max. 28 deg C

System: using the existing infeed system of FSC
2 separate suction pipes
2 suction baskets
2 cooling water pumps (specified in 4.3)
1 filter with automatical washing equipment
1 delievery pipe DN 400 in plastic or steel

Basic Data for a Steam Power Plant
with Net Power Output of 3,000 KW

4.0 PUMPS

4.1 Boiler feed pumps

construction: multistage centrifugal type

number: 1 operating pump with electric motor
1 standby pump with steam turbine

medium: demineralized and degasified boiler feedwater
temperature a. 105 deg C

head: 400 m
capacity: 22 m3/h

4.2 Condensate pumps

construction: single stage centrifugal type

number: 1 operating pump electric driven
1 standby pump electric driven

medium: condensate from turbine
temperature at 45 deg C

head: 30 m
capacity: 16 m3/h

4.3 Cooling water pumps

construction: single stage centrifugal type

number: 1 operating pump electric driven
1 standby pump elctric driven

medium: river water, max. 28 deg C

head: 12 m
capacity 900 m3/h

Basic Data for a Steam Power Plant
with Net Power Output of 3,000 KW

5.0 PIPING SYSTEM

Data of layout

Our Balance-Diagram dated 3.7.86
is attached to show basic figures.

The main basic parameters of pressure, temperature
are as shown therein.

The piping system is calculated on useful power
house design.

hp-steam pipe fittings	St. 35.8 PN 40 13CrMo44 or PN 64 GS-C25/C22
lp-steam pipe fittings	St. 35 (process line) PN 10 GS-C25/C22
feedwater pipe fittings	St. 35 PN 40 GS-C25/C22
condensate pipe fittings	St. 35 PN 10 GS-45
raw water pipe fittings	PVC PN 10
make-up water pipe	stainless steel
cooling water pipe fittings	plastic or St 35 PN 2.5

INSULATION:

Insulation material:	mineral wool mats with galvanized wire netting (cloth)
Cladding:	both side galvanized iron sheets

Basic Data for a Steam Power Plant
with Net Power Output of 3,000 KW

6.0 FEEDWATER TANK AND DEGASIFIER

Design:

Single-stage cascade degasifier with following operating data:

capacity:	turbine condensate	15.2 t/h - 45 deg C
	make-up water	0.5 t/h - 25 deg C (max. 2.0 t/h)
excess pressure:		1.3 bar abs
excess temperature:		105 deg C
rest oxigen content:		0.02 mg/kg

Feedwater storage tank:

capacity: 8.0 m3

with preheating device and

2 chemical dosing nozzles

water sample cooler

make-up water level controller

over-flow device

safety valve

vacuum breaker

Basic Data for a Steam Power Plant
with Net Power Output of 3,000 KW

7.0 FUEL HANDLING SYSTEM

7.1 FUEL SILO

Design:

cylindrical steel plate silo

gross capacity of silo : 1,000 m3

7.2 SILO DISCHARGING SCREW

milling discharge screw designed for discharging wet wood chips with variable speed drive motor

capacity max.:	7,500 kg/h
capacity min.:	2,500 kg/h
bulk weight of chips:	approx. 250 kg/m3

7.3 DRUM CHIPPER with horizontal feeding:

chipping width:	450 mm
chipping height:	220 mm
infeed capacity at chip length of 18-22 mm approx.:	20 m3/h
length of infeed conveyor:	2 m

7.4 SCRAPER CHAIN CONVEYOR

designed for transport of wet chips and sawdust from waste wood feeding hopper and drum chipper to the silo

capacity approx.: 30 m3/h

length of conveyor: from - 2.0 m to + 20 m (top of silo)

7.5 BELT CONVEYOR

designed for transport of fuel from silo to the boiler

capacity approx.: 30 m3/h

length of conveyor approx.: 130 m

Basic Data for a Steam Power Plant
with Net Power Output OF 3,000 KW

7.6 BELT CONVEYOR

designed for transport of bagasse from bagasse silo to feeding hopper of scraper chain conveyor

capacity approx.:	15 m3/h
length of conveyor approx.:	30 m

8.0 BRIDGE CRANE

for installation and maintenance of turboset

installed in machine hall

lifting capacity:	12,500 kg
span:	10 m
lifting speed:	6 m/min and 0.6 m/min
traveling speed of hoist:	4.2 m/min und 8 m/min
traveling speed of crane bridge:	6 m/min and 24 m/min

Basic Data for a Steam Power Plant
with Net Power Output OF 3,000 KW

9.0 DEMINERALISATION PLANT

designed as double with the following operating data per line:

max. capacity:	2.0 m3/h
min. capacity:	0.7 m3/h
rest conductivity:	5 micro S/cm
operating capacity between two regenerations:	100 m3

(raw water analysis was not available during the preparation of this study. This may however be obtained from the FSC)

consists of:

2 cation exchanger
2 anion exchanger
1 regeneration plant
1 flow meter
1 conductivity meter
1 circulating pump
1 neutralisation plant
2 dosing plants
1 set of test equipment

Basic Data for a Steam Power Plant
with Net Power Output of 3,000 KW

10.0 ELECTRICAL PLANT

DESIGN DATA:

Power supply by generator:	4,167 kVA
power factor of generator:	0.8
voltage of generator:	6.6 kV
step-up transformer for FEA-connection:	6.6 kV/11 kV
step-down transformer for l.v. main distribution:	400 V
auxiliary consumption:	330 kW
control voltage:	230 V

MV MAIN DISTRIBUTION BOARD for:

- infeed from generator
- outgoing to step-up transformer
- outgoing to step-down transformer
- outgoing to factory 6.6 kV busbar
- star point connection of generator

rated surge current	63 kA
rated short-time current	25 kA
busbar rated current	630 kA
ambient temperature max.	40 deg C
relative humidity up to	95 %

STEP-UP TRANSFORMER:

rated output:	4,200 kVA
ratio:	6.6/11 kV
rated frequency:	50 cycles
rated impedance:	6 %
insulation class:	B/F tropical

STEP-DOWN TRANSFORMER:

rated output:	1,000 kVA
ratio:	6.6/0.4 kV

Basic Data for a Steam Power Plant
with Net Power Output of 3.000 KW

10.0 ELECTRICAL PLANT (continued)

GENERATOR CONTROL, PROTECTION AND SYNCHRONIZING

control voltage:	230 V A.C.
control voltage for breaker:	110 V D.C.

L. V. POWER PLANT DISTRIBUTION for:

- auxiliary equipment
- start-up
- emergency supply
- control equipment

line voltage:	400/230 V
frequency:	50 cycles
control voltage:	230 V
rated current busbars:	2000 A

BATTERY DEVICE:

Nickel-Cadmium Battery	110 V DC
number of cells:	92
capacity:	90 Ah at 3-hours discharge

EARTHING:

max. earthing resistance 2 ohms

H. V. POWER DISTRIBUTION TO TRANSMISSION LINE

- infeed from step-up transformer
- outgoing to existing transmission lines

rated voltage:	11 kV
rated surge current	63 kA
rated short-time current	25 kA
busbar rated current	630 A

Basic Data for a Steam Power Plant
with Net Power Output of 3,000 KW

11.0 MEASURING AND CONTROL EQUIPMENT

Process Measurements:

- feed water flow:	dial, digital counter
- condensate flow:	dial, digital counter
- steam flow:	dial, digital and recording counter
- steam pressure:	dial and recording counter
- steam temp.:	dial and recording counter
- turbine output:	dial, digital counter
- power plant net output:	dial, digital and recording counter

Process Controls:

- boiler drum level
- steam pressure
- steam temperature
- excess steam pressure
- feed water tank level
- condenser level

ANNEX N

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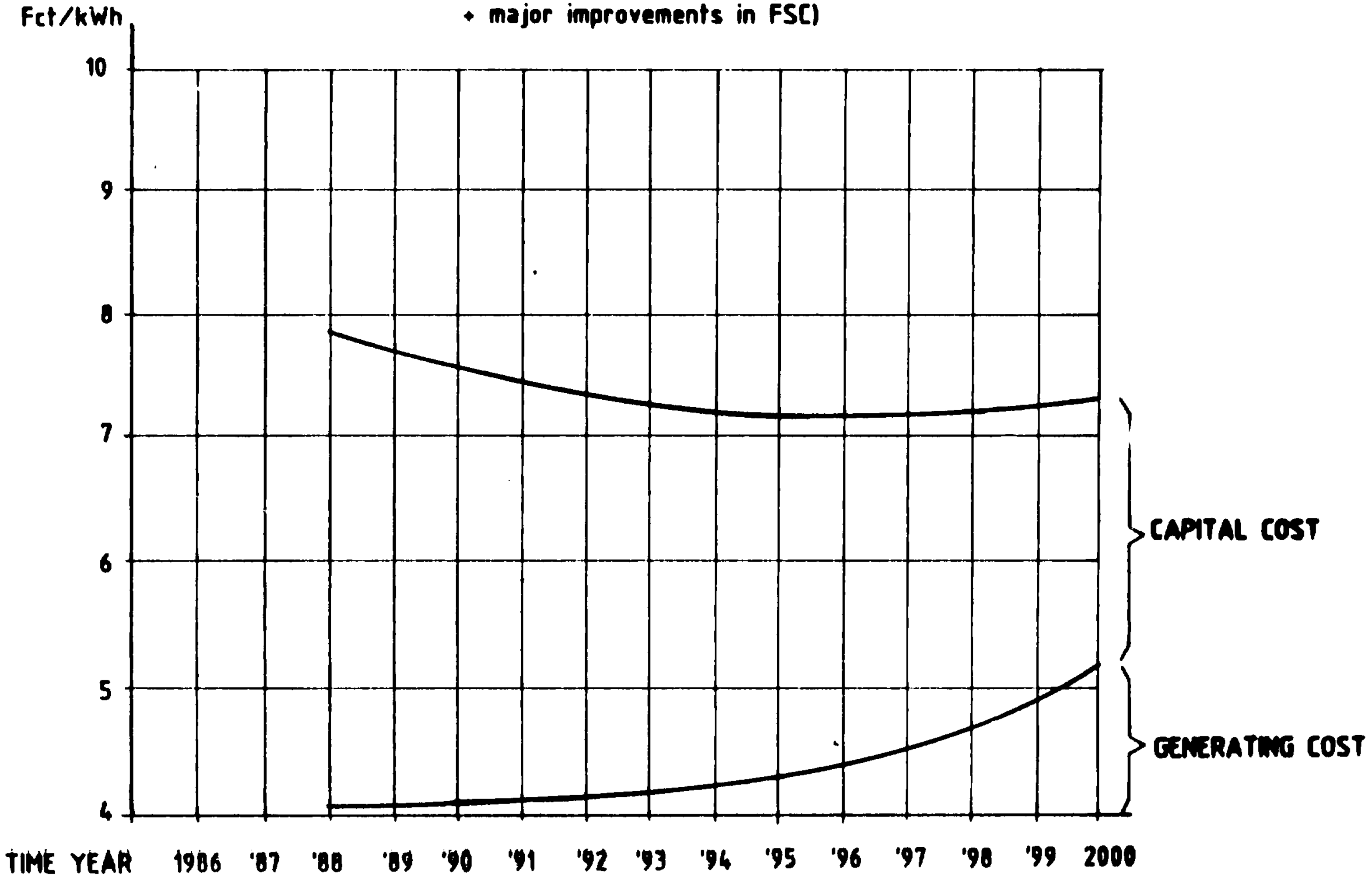
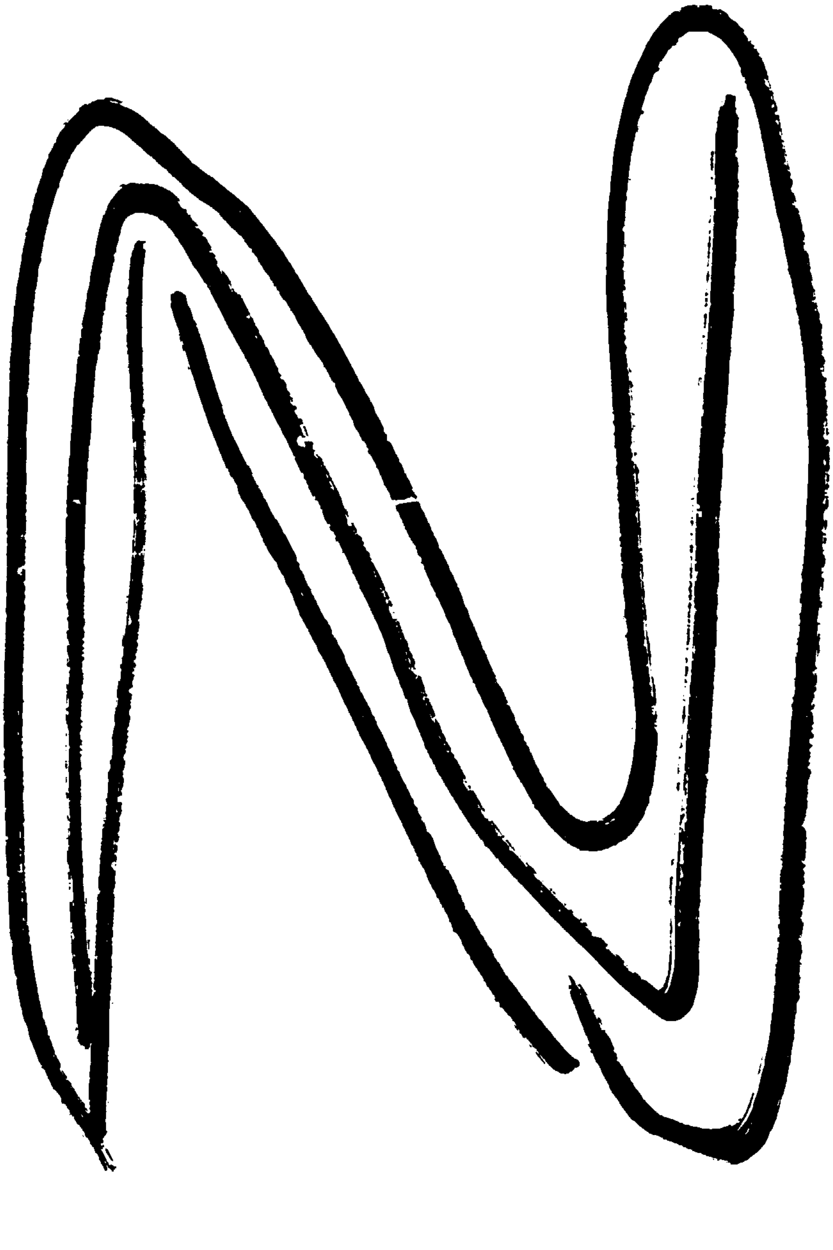
FIJI - LABASA POWER STUDY
UNIT PRICES

HEILBORN
ENGINEERING PTE LTD
1 JALAN SEAVIEW, SINGAPORE 1543

UNIT - PRICES of OPTION REF. LAB 11

(3,0 MW power plant integrated
+ major improvements in FSC)





ANNEX D

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HEILBORN ENGINEERING PTE LTD
1 JALAN SEAVIEW, SINGAPORE 1543

TIME-SCHEDULE of

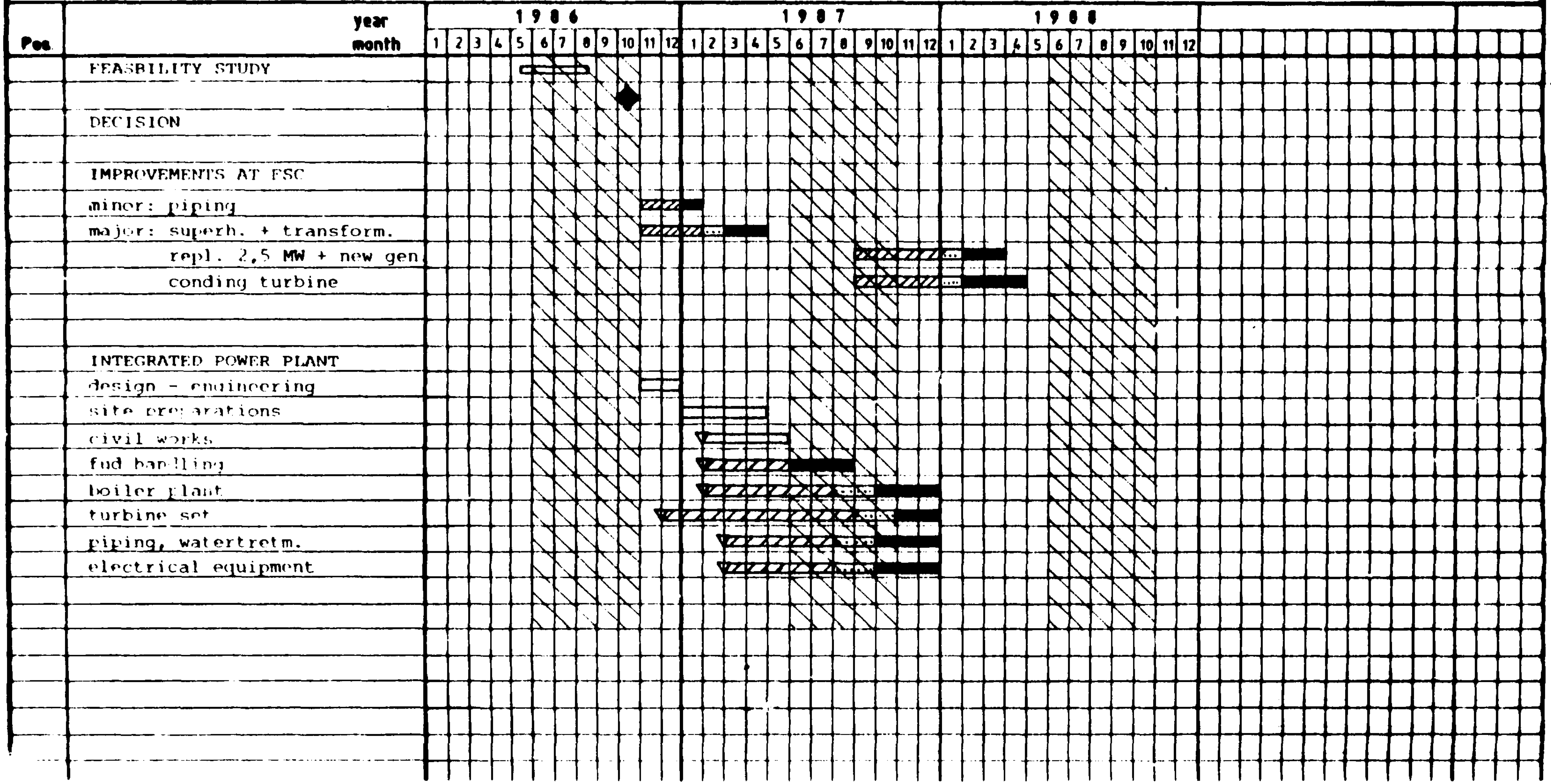
Project : FIJI - STUDY
Drwg.No. : Page : 1
Date : 8.7.86

time of delivery
transport (shipping)
erraction

order
transport beginning-end
erraction beginning-end

commissioning beginning-end
test run beginning-end
commercial handing over

= main cruhing time



ANNEX P

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FINANCIAL ANALYSIS - Sales Price based

on 100% of FEA's diesel generation costs

LABASA STEAM TURBO-POWER PLANT
19th July 1986
Sales at FEA's generating price

1 year(s) of construction, 15 years of production
currency conversion rates:
foreign currency 1 unit = 1.1000 units accounting currency
local currency 1 unit = 1.0000 units accounting currency
accounting currency: F$ (Fiji Dollars)

Total initial investment during construction phase

fixed assets:	5639608.00	74.286 % foreign
current assets:	0.00	0.000 % foreign
total assets:	5639608.00	74.286 % foreign

Source of funds during construction phase

equity & grants:	2743000.00	0.000 % foreign
foreign loans :	0.00	
local loans :	2743000.00	
total funds :	5486000.00	0.000 % foreign

Cashflow from operations

Year:	1	2	3
operating costs:	538810.00	562040.00	589780.00
depreciation :	281980.40	281980.40	281980.40
interest :	307216.00	276494.40	245772.80
production costs	1128006.00	1120515.00	1117533.00
thereof foreign	18.57 %	18.69 %	18.74 %
total sales :	1651903.00	1786932.00	1941624.00
gross income :	523896.50	666417.00	824090.50
net income :	327435.30	416510.60	515056.60
cash balance :	273476.40	421[illegible]2.90	519848.00
net cashflow :	854992.30	972507.30	1039921.00

Net Present Value at: 8.00 % = 6118681.00
Internal Rate of Return: 20.39 %
Return on equity1: 23.83 %
Return on equity2: 24.53 %

Index of Schedules produced by COMFAR

Total initial investment	Cashflow Tables
Total investment during production	Projected Balance
Total production costs	Net income statement
Working Capital requirements	Source of finance

Total Initial Investment in F$ (Fiji Dollars)

Year	1987
Fixed investment costs	
Land, site preparation, development	35000.00
Buildings and civil works	70000.00
Auxiliary and service facilities .	0.00
Incorporated fixed assets	0.00
Plant machinery and equipment . . .	5356000.00
Total fixed investment costs	5461000.00
Pre-production capital expenditures.	178608.00
Net working capital	0.00
Total initial investment costs . . .	5639608.00
Of it foreign, in %	74.29

Total Current Investment in F$ (Fiji Dollars)

Year	1988	1989	1990	1991	1992	199
Fixed investment costs						
Land, site preparation, development	0.00	0.00	0.00	0.00	0.00	0.0
Buildings and civil works	0.00	0.00	0.00	0.00	0.00	0.0
Auxiliary and service facilities	0.00	0.00	0.00	0.00	0.00	0.0
Incorporated fixed assets	0.00	0.00	0.00	0.00	0.00	0.0
Plant, machinery and equipment	0.00	0.00	0.00	0.00	0.00	0.0
Total fixed investment costs	0.00	0.00	0.00	0.00	0.00	0.0
Preproduction capitals expenditures.	0.00	0.00	0.00	0.00	0.00	0.0
Working capital	61639.22	2478.05	2889.01	3848.06	3620.38	4125.1
Total current investment costs	61639.22	2478.05	2889.01	3848.06	3620.38	4125.1
Of it foreign, %	0.00	0.00	0.00	0.00	0.00	0.0

Total Current Investment in F$ (Fiji Dollars)

Year	1994	1995	1996	1997	1998	199
Fixed investment costs						
Land, site preparation, development	0.00	0.00	0.00	0.00	0.00	0.0
Buildings and civil works	0.00	0.00	0.00	0.00	0.00	0.0
Auxiliary and service facilities	0.00	0.00	0.00	0.00	0.00	0.0
Incorporated fixed assets	0.00	0.00	0.00	0.00	0.00	0.0
Plant, machinery and equipment	0.00	0.00	0.00	0.00	0.00	0.0
Total fixed investment costs	0.00	0.00	0.00	0.00	0.00	0.0
Preproduction capitals expenditures.	0.00	0.00	0.00	0.00	0.00	0.0
Working capital	3900.38	3828.38	6647.85	6705.37	6206.56	7016.2
Total current investment costs	3900.38	3828.38	6647.85	6705.37	6206.56	7016.2
Of it foreign, %	0.00	0.00	0.00	0.00	0.00	0.0

Total Current Investment in F$ (Fiji Dollars)

Year	2000	2001	2002
Fixed investment costs			
Land, site preparation, development	0.00	0.00	0.00
Buildings and civil works	0.00	0.00	0.00
Auxiliary and service facilities	0.00	0.00	0.00
Incorporated fixed assets	0.00	0.00	0.00
Plant, machinery and equipment	0.00	0.00	0.00
Total fixed investment costs	0.00	0.00	0.00
Preproduction capitals expenditures.	0.00	0.00	0.00
Working capital	6015.09	3567.77	3675.79
Total current investment costs	6015.09	3567.77	3675.79
Of it foreign, %	0.00	0.00	0.00

Total Production Costs in F$ (Fiji Dollars)

Year	1988	1989	1990	1991	1992	19
% of nom. capacity (single product).	43.52	45.72	48.20	50.83	53.26	55.[illegible]
Raw material 1	187680.00	201790.00	216400.00	231920.00	247970.00	264770.0
Other raw materials	94130.00	95540.00	100820.00	115400.00	126570.00	142240.0
Utilities	3400.00	3500.00	3610.00	3720.00	3830.00	3940.0
Energy	6800.00	7000.00	7220.00	7440.00	7660.00	7880.0
Labour, direct	75000.00	77250.00	79470.00	81960.00	84420.00	86960.0
Repair, maintenance	54400.00	56030.00	57720.00	59440.00	61230.00	63060.0
Spares	81600.00	84050.00	86570.00	89160.00	91840.00	94600.0
Factory overheads	23800.00	24520.00	25240.00	26000.00	26780.00	27600.[illegible]
Factory costs	526810.00	549680.00	577050.00	615040.00	650300.00	691050.0
Administrative overheads	12000.00	12360.00	12730.00	13120.00	13510.00	13920.0
Indir. costs, sales and distribution	0.00	0.00	0.00	0.00	0.00	0.0
Direct costs, sales and distribution	0.00	0.00	0.00	0.00	0.00	0.0
Depreciation	281980.40	281980.40	281980.40	281980.40	281980.40	281980.4
Financial costs	307216.00	276494.40	245772.80	215051.20	184329.60	153608.0
Total production costs	1128006.00	1120515.00	1117533.00	1125192.00	1130120.00	1140558.0
Costs per unit (single product)	0.08	0.07	0.07	0.07	0.06	0.0
Of it foreign, %	18.57	18.69	18.74	18.62	18.54	18.[illegible]
Of it variable,%	0.00	0.00	0.00	0.00	0.00	0.0
Total labour	75000.00	77250.00	79470.00	81960.00	84420.00	86960.0

Total Production Costs in F$ (Fiji Dollars)

Year	1994	1995	1996	1997	1998	199
% of nom. capacity (single product)	58.28	60.60	63.04	65.38	67.52	69.4
Raw material 1	282580.00	300960.00	310080.00	319440.00	329040.00	338880.0
Other raw materials	153980.00	163950.00	214430.00	264860.00	308950.00	361450.0
Utilities	4060.00	4180.00	4310.00	4440.00	4570.00	4710.0
Energy	8120.00	8360.00	8620.00	8880.00	9140.00	9420.0
Labour, direct	89570.00	92260.00	95020.00	97870.00	100820.00	103840.0
Repair, maintenance	64960.00	66910.00	68920.00	70980.00	73110.00	75310.0
Spares	97440.00	100360.00	103370.00	106480.00	109670.00	112960.0
Factory overheads	28420.00	29270.00	30140.00	31040.00	31990.00	32930.0
Factory costs	729130.00	766250.00	834890.00	903990.00	967290.00	1039500.0
Administrative overheads	14340.00	14760.00	15210.00	15660.00	16130.00	16620.0
Indir. costs, sales and distribution	0.00	0.00	0.00	0.00	0.00	0.0
Direct costs, sales and distribution	0.00	0.00	0.00	0.00	0.00	0.0
Depreciation	281980.40	281980.40	281980.40	281980.40	281980.40	281980.4
Financial costs	122886.40	92164.80	61443.20	0.00	0.00	0.0
Total production costs	1148337.00	1155155.00	1193524.00	1201630.00	1265400.00	1338100.0
Costs per unit (single product)	0.06	0.06	0.06	0.06	0.06	0.0
Of it foreign, %	18.24	18.13	17.55	17.43	16.55	15.6
Of it variable,%	0.00	0.00	0.00	0.00	0.00	0.0
Total labour	89570.00	92260.00	95020.00	97870.00	100820.00	103840.0

Total Production Costs in F$ (Fiji Dollars)

Year	2000	2001	2002
% of nom. capacity (single product)	70.88	72.06	72.81
Raw material 1	348960.00	359430.00	370210.00
Other raw materials	401950.00	414010.00	426430.00
Utilities	4850.00	5000.00	5150.00
Energy	9700.00	9990.00	10290.00
Labour, direct	106960.00	110170.00	113480.00
Repair, maintenance	77560.00	79890.00	82280.00
Spares	116340.00	119830.00	123430.00
Factory overheads	33940.00	34960.00	36010.00
Factory costs	1100260.00	1133280.00	1167280.00
Administrative overheads	17120.00	17630.00	18160.00
Indir. costs, sales and distribution	0.00	0.00	0.00
Direct costs, sales and distribution	0.00	0.00	0.00
Depreciation	281980.40	281980.40	281980.40
Financial costs	0.00	0.00	0.00
Total production costs	1399360.00	1432890.00	1467420.00
Costs per unit (single product)	0.06	0.06	0.06
Of it foreign, %	14.97	14.62	14.27
Of it variable,%	0.00	0.00	0.00
Total labour	106960.00	110170.00	113480.00

Net Working Capital in F$ (Fiji Dollars)

Year	mdc	coto	1988	1989	1990	1991	1992
Coverage	mdc	coto					
Current assets &							
Accounts receivable	30	12.0	44900.83	46836.67	49148.33	52346.67	55317.50
Inventory and materials	30	12.1	23493.61	24787.22	26445.03	28953.67	31222.30
Energy	1	360.0	18.89	19.44	20.06	20.67	21.28
Spares	60	6.0	13600.00	14008.33	14428.33	14860.00	15306.67
Work in progress	1	360.0	1463.36	1526.89	1602.92	1706.44	1806.39
Finished products	1	360.0	1496.69	1561.22	1638.28	1744.89	1843.92
Cash in hand	30	12.0	20566.67	21184.17	21810.83	22473.33	23148.33
Total current assets			105540.10	109923.90	115093.80	122107.70	128666.40
Current liabilities and							
Accounts payable	30	12.0	43900.83	45806.67	48087.50	51253.33	54191.67
Net working capital			61639.22	64117.28	67006.28	70854.34	74474.72
Increase in working capital			61639.22	2478.05	2889.00	3848.06	3620.38
Net working capital, local			61639.22	64117.27	67006.28	70854.34	74474.72
Net working capital, foreign			0.00	0.00	0.00	0.00	0.00

Note: mdc = minimum days of coverage ; coto = coefficient of turnover .

COMFAR 2.0 - Heilborn GmbH & Ass. Comp., Rosenheim, FRG

Net Working Capital in F$ (Fiji Dollars)

Year	mdc	coto	1993	1994	1995	1996	1997
Coverage	mdc	coto					
Current assets &							
Accounts receivable	30	12.0	58747.50	61955.83	65084.17	70841.66	76637.50
Inventory and materials	30	12.1	33928.45	36391.28	38754.11	43721.14	48704.00
Energy	1	360.0	21.89	22.56	23.22	23.94	24.67
Spares	60	6.0	15766.67	16240.00	16726.67	17228.33	17746.67
Work in progress	1	360.0	1919.58	2025.36	2128.47	2319.14	2511.08
Finished products	1	360.0	1958.25	2065.19	2169.47	2361.39	2554.58
Cash in hand	30	12.0	23845.00	24560.83	25296.67	26055.00	26835.83
Total current assets			136187.30	143261.00	150182.80	162550.60	175014.30
Current liabilities and							
Accounts payable	30	12.0	57587.50	60760.83	63854.17	69574.16	75332.50
Net working capital			78599.84	82500.22	86328.59	92976.45	99681.81
Increase in working capital			4125.13	3900.38	3828.38	6647.85	6705.37
Net working capital, local			78599.84	82500.22	86328.59	92976.45	99681.81
Net working capital, foreign			0.00	0.00	0.00	0.00	0.00

Note: mdc = minimum days of coverage ; coto = coefficient of turnover .

Net Working Capital in F$ (Fiji Dollars)

Year	mdc	coto	1998	1999	2000	2001	2002
Coverage	mdc	coto					
Current assets &							
Accounts receivable	30	12.0	81951.66	88010.00	93115.00	95909.16	98786.69
Inventory and materials	30	12.1	53178.53	58373.92	62589.30	64467.22	66400.97
Energy	1	360.0	25.39	26.17	26.94	27.75	28.58
Spares	60	6.0	18278.33	18826.67	19390.00	19971.67	20571.67
Work in progress	1	360.0	2686.92	2887.50	3056.28	3148.00	3242.44
Finished products	1	360.0	2731.72	2933.67	3103.83	3196.97	3292.89
Cash in hand	30	12.0	27643.33	28471.67	29326.67	30206.67	31113.33
Total current assets			186495.90	199529.60	210608.00	216927.50	223436.60
Current liabilities and Accounts payable	30	12.0	80607.50	86625.00	91688.34	94440.00	97273.34
Net working capital			105888.40	112904.60	118919.70	122487.50	126163.20
Increase in working capital			6206.56	7016.23	6015.09	3567.76	3675.77
Net working capital, local			105888.40	112904.60	118919.70	122487.50	126163.20
Net working capital, foreign			0.00	0.00	0.00	0.00	0.00

Note: mdc = minimum days of coverage ; coto = coefficient of turnover .

Source of Finance, construction in F$ (Fiji Dollars)

Year	1987
Equity, ordinary ..	2743000.00
Equity, preference.	0.00
Subsidies, grants .	0.00
Loan A, foreign .	0.00
Loan B, foreign..	0.00
Loan C, foreign .	0.00
Loan A, local....	2743000.00
Loan B, local....	0.00
Loan C, local....	0.00
Total loan	2743000.00
Current liabilities	0.00
Bank overdraft	153608.00
Total funds	5639608.00

Source of Finance, production in F$ (Fiji Dollars)

Year	1988	1989	1990	1991	1992	1993	1994
Equity, ordinary ..	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Equity, preference.	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Subsidies, grants .	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loan A, foreign .	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loan B, foreign..	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loan C, foreign .	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loan A, local....	-274300.00	-274300.00	-274300.00	-274300.00	-274300.00	-274300.00	-274300.00
Loan B, local....	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loan C, local....	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total loan	-274300.00	-274300.00	-274300.00	-274300.00	-274300.00	-274300.00	-274300.00
Current liabilities	43900.83	1905.84	2280.83	3165.83	2938.34	3395.83	3173.33
Bank overdraft	-153608.00	0.00	0.00	0.00	0.00	0.00	0.00
Total funds	-384007.20	-272394.20	-272019.20	-271134.20	-271361.70	-270904.20	-271126.70

Source of Finance, production in F$ (Fiji Dollars)

Year	1995	1996	1997	1998	1999	2000	2001
Equity, ordinary ..	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Equity, preference.	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Subsidies, grants .	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loan A, foreign .	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loan B, foreign..	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loan C, foreign .	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loan A, local....	-274300.00	-274300.00	-274300.00	0.00	0.00	0.00	0.00
Loan B, local....	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loan C, local....	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total loan	-274300.00	-274300.00	-274300.00	0.00	0.00	0.00	0.00
Current liabilities	3093.34	5720.00	5758.34	5275.00	6017.50	5063.34	2751.66
Bank overdraft	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total funds	-271206.70	-268580.00	-268541.70	5275.00	6017.50	5063.34	2751.66

Source of Finance, production in F$ (Fiji Dollars)

Year	2002
Equity, ordinary ..	0.00
Equity, preference.	0.00
Subsidies, grants .	0.00
Loan A, foreign .	0.00
Loan B, foreign..	0.00
Loan C, foreign .	0.00
Loan A, local....	0.00
Loan B, local....	0.00
Loan C, local....	0.00
Total loan	0.00
Current liabilities	2833.34
Bank overdraft	0.00
Total funds	2833.34

Cashflow Tables, construction in F$ (Fiji Dollars)

Year	1987
Total cash inflow . .	5486000.00
Financial resources .	5486000.00
Sales, net of tax . .	0.00
Total cash outflow . .	5639608.00
Total assets	5486000.00
Operating costs . . .	0.00
Cost of finance . . .	153608.00
Repayment	0.00
Corporate tax . . .	0.00
Dividends paid . . .	0.00
Surplus (deficit) .	-153608.00
Cumulated cash balance	-153608.00
Inflow, local	5486000.00
Outflow, local	1450148.00
Surplus (deficit) .	4035852.00
Inflow, foreign . . .	0.00
Outflow, foreign . . .	4189460.00
Surplus (deficit) .	-4189460.00
Net cashflow	-5486000.00
Cumulated net cashflow	-5486000.00

Cashflow tables, production in F$ (Fiji Dollars)

Year	1988	1989	1990	1991	1992	1993
Total cash inflow . .	1695804.00	1788838.00	1943905.00	2111662.00	2277388.00	2462191.00
Financial resources .	43900.83	1905.84	2280.83	3165.83	2938.34	3395.83
Sales, net of tax . .	1651903.00	1786932.00	1941624.00	2108496.00	2274450.00	2458795.00
Total cash outflow . .	1422328.00	1367125.00	1424057.00	1493264.00	1558122.00	1634738.00
Total assets	105540.10	4383.89	5169.83	7013.89	6558.72	7520.94
Operating costs . . .	538810.10	562040.00	589780.00	628160.00	663810.00	704970.00
Cost of finance . . .	307216.00	276494.40	245772.80	215051.20	184329.60	153608.00
Repayment	274300.00	274300.00	274300.00	274300.00	274300.00	274300.00
Corporate tax . . .	196461.20	249906.40	309033.90	368739.10	429123.60	494338.80
Dividends paid . . .	0.00	0.00	0.00	0.00	0.00	0.00
Surplus (deficit) .	273476.30	421713.00	519848.10	618397.40	719266.00	827453.10
Cumulated cash balance	119868.30	541581.30	1061429.00	1679827.00	2399093.00	3226546.00
Inflow, local	1695804.00	1788838.00	1943905.00	2111662.00	2277388.00	2462191.00
Outflow, local	1422328.00	1367125.00	1424057.00	1493264.00	1558122.00	1634738.00
Surplus (deficit) .	273476.30	421713.00	519848.10	618397.30	719266.00	827453.10
Inflow, foreign . . .	0.00	0.00	0.00	0.00	0.00	0.00
Outflow, foreign . . .	0.00	0.00	0.00	0.00	0.00	0.00
Surplus (deficit) .	0.00	0.00	0.00	0.00	0.00	0.00
Net cashflow	854992.40	972507.30	1039921.00	1107749.00	1177896.00	1255361.00
Cumulated net cashflow	-4631008.00	-3658500.00	-2618580.00	-1510831.00	-332935.30	922426.00

Cashflow tables, production in F$ (Fiji Dollars)

Year	1994	1995	1996	1997	1998	1999
Total cash inflow	2643304.00	2828595.00	3035090.00	3241355.00	3447571.00	3648770.00
Financial resources	3173.33	3093.34	5720.00	5758.34	5275.00	6017.50
Sales, net of tax	2640131.00	2825502.00	3029370.00	3235597.00	3442296.00	3642753.00
Total cash outflow	1707153.00	1780776.00	1886653.00	1969151.00	1811238.00	1933399.00
Total assets	7073.72	6921.72	12367.83	12463.72	11481.56	13033.69
Operating costs	743470.00	781010.00	850100.00	919650.00	983420.30	1056120.00
Cost of finance	122886.40	92164.80	61443.20	0.00	0.00	0.00
Repayment	274300.00	274300.00	274300.00	274300.00	0.00	0.00
Corporate tax	559422.80	626379.80	688442.30	762737.40	816335.80	864244.80
Dividends paid	0.00	0.00	0.00	0.00	0.00	0.00
Surplus (deficit)	936151.10	1047819.00	1148437.00	1272204.00	1636333.00	1715372.00
Cumulated cash balance	4162697.00	5210516.00	6358952.00	7631156.00	9267489.00	10982860.00
Inflow, local	2643304.00	2828595.00	3035090.00	3241355.00	3447571.00	3648770.00
Outflow, local	1707153.00	1780776.00	1886654.00	1969151.00	1811238.00	1933399.00
Surplus (deficit)	936151.10	1047819.00	1148436.00	1272204.00	1636333.00	1715372.00
Inflow, foreign	0.00	0.00	0.00	0.00	0.00	0.00
Outflow, foreign	0.00	0.00	0.00	0.00	0.00	0.00
Surplus (deficit)	0.00	0.00	0.00	0.00	0.00	0.00
Net cashflow	1333338.00	1414283.00	1484180.00	1546504.00	1636333.00	1715372.00
Cumulated net cashflow	2255764.00	3670047.00	5154227.00	6700731.00	8337064.00	10052440.00

Cashflow tables, production in F$ (Fiji Dollars)

Year	2000	2001	2002
Total cash inflow . .	3837624.00	4014377.00	4179753.00
Financial resources .	5063.34	2751.66	2833.34
Sales, net of tax . .	3832561.00	4011625.00	4176920.00
Total cash outflow . .	2040909.00	2124255.00	2208012.00
Total assets	11078.44	6319.41	6509.13
Operating costs . . .	1117380.00	1150910.00	1185440.00
Cost of finance . . .	0.00	0.00	0.00
Repayment	0.00	0.00	0.00
Corporate tax . . .	912450.20	967025.40	1016062.00
Dividends paid . . .	0.00	0.00	0.00
Surplus (deficit) .	1796715.00	1890122.00	1971741.00
Cumulated cash balance	12779580.00	14669700.00	16641440.00
Inflow, local	3837624.00	4014377.00	4179753.00
Outflow, local	2040909.00	2124255.00	2208012.00
Surplus (deficit) .	1796715.00	1890122.00	1971741.00
Inflow, foreign . . .	0.00	0.00	0.00
Outflow, foreign . . .	0.00	0.00	0.00
Surplus (deficit) .	0.00	0.00	0.00
Net cashflow	1796715.00	1890121.00	1971741.00
Cumulated net cashflow	11849150.00	13739270.00	15711010.00

Cashflow Discounting:

a) Return on Equity 1:
Net present value ....4851951.00 at 8.00 %
Internal Rate of Return (IRRE1) .. 23.83 %

b) Return on Equity 2:
Net present value ....5771940.00 at 8.00 %
Internal Rate of Return (IRRE2) .. 24.53 %

c) Internal Rate of Return on total investment:
Net present value ....6118681.00 at 8.00 %
Internal Rate of Return (IRR) .. 20.39 %

Equity 1 = Total equity paid : Net income
Equity 2 = Initial equity paid : Net cash return

Net Income Statement in F$ (Fiji Dollars)

Year	1988	1989	1990	1991	1992
Total sales, incl. sales tax	1651903.00	1786932.00	1941624.00	2108496.00	2274450.00
Less: variable costs, incl. sales tax.	0.00	0.00	0.00	0.00	0.00
Variable margin	1651903.00	1786932.00	1941624.00	2108496.00	2274450.00
As % of total sales	100.00	100.00	100.00	100.00	100.00
Non-variable costs, incl. depreciation	820790.40	844020.40	871760.40	910140.30	945790.40
Operational margin	831112.50	942911.40	1069863.00	1198356.00	1328659.00
As % of total sales	50.31	52.77	55.10	56.83	58.42
Cost of finance	307216.00	276494.40	245772.80	215051.20	184329.60
Gross profit	523896.50	666417.00	824090.50	983304.30	1144330.00
Allowances	0.00	0.00	0.00	0.00	0.00
Taxable profit	523896.50	666417.00	824090.50	983304.30	1144330.00
Tax	196461.20	249906.40	309033.90	368739.10	429123.60
Net profit	327435.30	416510.60	515056.60	614565.10	715206.10
Dividends paid	0.00	0.00	0.00	0.00	0.00
Undistributed profit	327435.30	416510.60	515056.60	614565.10	715206.10
Accumulated undistributed profit	327435.30	743945.90	1259003.00	1873568.00	2588774.00
Gross profit, % of total sales	31.71	37.29	42.44	46.64	50.31
Net profit, % of total sales	19.82	23.31	26.53	29.15	31.45
ROE, Net profit, % of equity	11.94	15.18	18.78	22.40	26.07
ROI, Net profit+interest, % of invest.	11.44	12.49	13.70	14.93	16.18

Net Income Statement in F$ (Fiji Dollars)

Year	1993	1994	1995	1996	1997
Total sales, incl. sales tax	2458795.00	2640131.00	2825502.00	3029370.00	3235597.00
Less: variable costs, incl. sales tax.	0.00	0.00	0.00	0.00	0.00
Variable margin	2458795.00	2640131.00	2825502.00	3029370.00	3235597.00
As % of total sales	100.00	100.00	100.00	100.00	100.00
Non-variable costs, incl. depreciation	986950.40	1025450.00	1062991.00	1132080.00	1201630.00
Operational margin	1471845.00	1614680.00	1762511.00	1897290.00	2033966.00
As % of total sales	59.86	61.16	62.38	62.63	62.86
Cost of finance	153608.00	122886.40	92164.80	61443.20	0.00
Gross profit	1318237.00	1491794.00	1670346.00	1835846.00	2033966.00
Allowances	0.00	0.00	0.00	0.00	0.00
Taxable profit	1318237.00	1491794.00	1670346.00	1835846.00	2033966.00
Tax	494338.80	559422.80	626379.80	688442.30	762737.40
Net profit	823898.00	932371.30	1043966.00	1147404.00	1271229.00
Dividends paid	0.00	0.00	0.00	0.00	0.00
Undistributed profit	823898.00	932371.30	1043966.00	1147404.00	1271229.00
Accumulated undistributed profit	3412672.00	4345043.00	5389010.00	6536414.00	7807643.00
Gross profit, % of total sales	53.61	56.50	59.12	60.60	62.86
Net profit, % of total sales	33.51	35.32	36.95	37.88	39.29
ROE, Net profit, % of equity	30.04	33.99	38.06	41.83	46.34
ROI, Net profit+interest, % of invest.	17.57	18.95	20.39	21.67	22.76

Net Income Statement in F$ (Fiji Dollars)

Year	1998	1999	2000	2001	2002
Total sales, incl. sales tax	3442296.00	3642753.00	3832561.00	4011625.00	4176920.00
Less: variable costs, incl. sales tax.	0.00	0.00	0.00	0.00	0.00
Variable margin	3442296.00	3642753.00	3832561.00	4011625.00	4176920.00
As % of total sales	100.00	100.00	100.00	100.00	100.00
Non-variable costs, incl. depreciation	1265400.00	1338100.00	1399360.00	1432890.00	1467420.00
Operational margin	2176896.00	2304653.00	2433201.00	2578735.00	2709500.00
As % of total sales	63.24	63.27	63.49	64.28	64.87
Cost of finance	0.00	0.00	0.00	0.00	0.00
Gross profit	2176896.00	2304653.00	2433201.00	2578735.00	2709500.00
Allowances	0.00	0.00	0.00	0.00	0.00
Taxable profit	2176896.00	2304653.00	2433201.00	2578735.00	2709500.00
Tax	816335.80	864244.80	912450.20	967025.40	1016062.00
Net profit	1360560.00	1440408.00	1520750.00	1611709.00	1693437.00
Dividends paid	0.00	0.00	0.00	0.00	0.00
Undistributed profit	1360560.00	1440408.00	1520750.00	1611709.00	1693437.00
Accumulated undistributed profit	9168202.00	10608610.00	12129360.00	13741070.00	15434510.00
Gross profit, % of total sales	63.24	63.27	63.49	64.28	64.87
Net profit, % of total sales	39.52	39.54	39.68	40.18	40.54
ROE, Net profit, % of equity	49.60	52.51	55.44	58.76	61.74
ROI, Net profit+interest, % of invest.	24.33	25.73	27.13	28.74	30.17

Projected Balance Sheets, construction in F$ (Fiji Dollars)

Year	1987
Total assets	5639608.00
Fixed assets, net of depreciation	0.00
Construction in progress	5639608.00
Current assets	0.00
Cash, bank	0.00
Cash surplus, finance available	0.00
Loss carried forward	0.00
Loss	0.00
Total liabilities	5639608.00
Equity capital	2743000.00
Reserves, retained profit	0.00
Profit	0.00
Long and medium term debt	2743000.00
Current liabilities	0.00
Bank overdraft, finance required	153608.00
Total debt	2896608.00
Equity, % of liabilities	48.64

Projected Balance Sheets, Production in F$ (Fiji Dollars)

Year	1988	1989	1990	1991	1992	1993
Total assets	5583036.00	5727153.00	5970190.00	6313621.00	6757465.00	7310460.00
Fixed assets, net of depreciation	5357628.00	5075647.00	4793667.00	4511686.00	4229706.00	3947725.00
Construction in progress	0.00	0.00	0.00	0.00	0.00	0.00
Current assets	84973.39	88739.78	93282.95	99634.34	105518.10	112342.30
Cash, bank	20566.67	21184.17	21810.83	22473.33	23148.33	23845.00
Cash surplus, finance available	119868.50	541581.50	1061430.00	1679827.00	2399093.00	3226547.00
Loss carried forward	0.00	0.00	0.00	0.00	0.00	0.00
Loss	0.00	0.00	0.00	0.00	0.00	0.00
Total liabilities	5583036.00	5727153.00	5970190.00	6313621.00	6757465.00	7310460.00
Equity capital	2743000.00	2743000.00	2743000.00	2743000.00	2743000.00	2743000.00
Reserves, retained profit	0.00	327435.30	743945.90	1259003.00	1873568.00	2588774.00
Profit	327435.30	416510.60	515056.60	614565.10	715206.10	823898.00
Long and medium term debt	2468700.00	2194400.00	1920100.00	1645800.00	1371500.00	1097200.00
Current liabilities	43900.83	45806.67	48087.50	51253.33	54191.67	57587.50
Bank overdraft, finance required.	0.00	0.00	0.00	0.00	0.00	0.00
Total debt	2512601.00	2240207.00	1968188.00	1697053.00	1425692.00	1154788.00
Equity, % of liabilities	49.13	47.89	45.94	43.45	40.59	37.52

Projected Balance Sheets, Production in F$ (Fiji Dollars)

Year	1994	1995	1996	1997	1998	1999
Total assets	7971704.00	8744464.00	9623288.00	10625980.00	11991810.00	13438240.00
Fixed assets, net of depreciation	3665745.00	3383764.00	3101784.00	2819803.00	2537823.00	2255842.00
Construction in progress	0.00	0.00	0.00	0.00	0.00	0.00
Current assets	118700.20	124886.10	136495.60	148178.50	158852.60	171057.90
Cash, bank	24560.83	25296.67	26055.00	26835.83	27643.33	28471.67
Cash surplus, finance available	4162699.00	5210517.00	6358954.00	7631159.00	9267492.00	10982860.00
Loss carried forward	0.00	0.00	0.00	0.00	0.00	0.00
Loss	0.00	0.00	0.00	0.00	0.00	0.00
Total liabilities	7971704.00	8744464.00	9623288.00	10625980.00	11991810.00	13438240.00
Equity capital	2743000.00	2743000.00	2743000.00	2743000.00	2743000.00	2743000.00
Reserves, retained profit	3412672.00	4345043.00	5389010.00	6536414.00	7807643.00	9168202.00
Profit	932371.30	1043966.00	1147404.00	1271229.00	1360560.00	1440408.00
Long and medium term debt	822900.00	548600.00	274300.00	0.00	0.00	0.00
Current liabilities	60760.83	63854.17	69574.16	75332.50	80607.50	86625.00
Bank overdraft, finance required.	0.00	0.00	0.00	0.00	0.00	0.00
Total debt	883660.80	612454.20	343874.20	75332.50	80607.50	86625.00
Equity, % of liabilities	34.41	31.37	28.50	25.81	22.87	20.41

Projected Balance Sheets, Production in F$ (Fiji Dollars)

Year	2000	2001	2002
Total assets	14964050.00	16578510.00	18274780.00
Fixed assets, net of depreciation	1973862.00	1691881.00	1409901.00
Construction in progress	0.00	0.00	0.00
Current assets	181281.40	186720.80	192323.30
Cash, bank	29326.67	30206.67	31113.33
Cash surplus, finance available	12779580.00	14669700.00	16641440.00
Loss carried forward	0.00	0.00	0.00
Loss	0.00	0.00	0.00
Total liabilities	14964050.00	16578510.00	18274780.00
Equity capital	2743000.00	2743000.00	2743000.00
Reserves, retained profit	10608610.00	12129360.00	13741070.00
Profit	1520750.00	1611709.00	1693437.00
Long and medium term debt	0.00	0.00	0.00
Current liabilities	91688.34	94440.00	97273.34
Bank overdraft, finance required.	0.00	0.00	0.00
Total debt	91688.34	94440.00	97273.34
Equity, % of liabilities	18.33	16.55	15.01

FINANCIAL ANALYSIS - Sales Price based on 90% of FEA's diesel generation costs

LABASA STEAM TURBO-POWER PLANT
19th July 1986
Sales at 90% of FEA's generating price

1 year(s) of construction, 15 years of production
currency conversion rates:
foreign currency 1 unit = 1.1000 units accounting currency
local currency 1 unit = 1.0000 units accounting currency
accounting currency: F$ (Fiji Dollars)

Total initial investment during construction phase

fixed assets:	5639608.00	74.286 % foreign
current assets:	0.00	0.000 % foreign
total assets:	5639608.00	74.286 % foreign

Source of funds during construction phase

equity & grants:	2743000.00	0.000 % foreign
foreign loans :	0.00	
local loans :	2743000.00	
total funds :	5486000.00	0.000 % foreign

Cashflow from operations

Year:	1	2	3
operating costs:	538810.00	562040.00	589780.00
depreciation :	281980.40	281980.40	281980.40
interest :	307216.00	276494.40	245772.80
production costs	1128006.00	1120515.00	1117533.00
thereof foreign	18.57 %	18.69 %	18.74 %
total sales :	1487002.00	1607631.00	1747782.00
gross income :	358995.50	487116.10	630248.60
net income :	224372.20	304447.60	393905.40
cash balance :	170413.40	309649.80	398696.80
net cashflow :	751929.30	860444.10	918769.50

Net Present Value at: 8.00 % = 4720026.00
Internal Rate of Return: 17.87 %
Return on equity1: 19.71 %
Return on equity2: 20.77 %

Index of Schedules produced by COMFAR

Total initial investment	Cashflow Tables
Total investment during production	Projected Balance
Total production costs	Net income statement
Working Capital requirements	Source of finance

Total Initial Investment in F$ (Fiji Dollars)

Year	1987
Fixed investment costs	
Land, site preparation, development	35000.00
Buildings and civil works	70000.00
Auxiliary and service facilities	0.00
Incorporated fixed assets	0.00
Plant machinery and equipment	5356000.00
Total fixed investment costs	5461000.00
Pre-production capital expenditures.	178608.00
Net working capital	0.00
Total initial investment costs	5639608.00
Of it foreign, in %	74.29

Total Current Investment in F$ (Fiji Dollars)

Year	1988	1989	1990	1991	1992	19
Fixed investment costs						
Land, site preparation, development	0.00	0.00	0.00	0.00	0.00	0.
Buildings and civil works	0.00	0.00	0.00	0.00	0.00	0.0
Auxiliary and service facilities	0.00	0.00	0.00	0.00	0.00	0.0
Incorporated fixed assets	0.00	0.00	0.00	0.00	0.00	0.
Plant, machinery and equipment	0.00	0.00	0.00	0.00	0.00	0.
Total fixed investment costs	0.00	0.00	0.00	0.00	0.00	0.
Preproduction capitals expenditures.	0.00	0.00	0.00	0.00	0.00	0.0
Working capital	61639.22	2478.05	2889.01	3848.06	3620.38	4125.
Total current investment costs	61639.22	2478.05	2889.01	3848.06	3620.38	4125.
Of it foreign, %	0.00	0.00	0.00	0.00	0.00	0.

Total Current Investment in F$ (Fiji Dollars)

Year	1994	1995	1996	1997	1998	19
Fixed investment costs						
Land, site preparation, development	0.00	0.00	0.00	0.00	0.00	0.
Buildings and civil works	0.00	0.00	0.00	0.00	0.00	0.
Auxiliary and service facilities	0.00	0.00	0.00	0.00	0.00	0.
Incorporated fixed assets	0.00	0.00	0.00	0.00	0.00	0.
Plant, machinery and equipment	0.00	0.00	0.00	0.00	0.00	0.
Total fixed investment costs	0.00	0.00	0.00	0.00	0.00	0.
Preproduction capitals expenditures.	0.00	0.00	0.00	0.00	0.00	0.
Working capital	3900.38	3828.38	6647.85	6705.37	6206.56	7016.
Total current investment costs	3900.38	3828.38	6647.85	6705.37	6206.56	7016.
Of it foreign, %	0.00	0.00	0.00	0.00	0.00	0.

Total Current Investment in F$ (Fiji Dollars)

Year	2000	2001	2002
Fixed investment costs			
Land, site preparation, development	0.00	0.00	0.00
Buildings and civil works	0.00	0.00	0.00
Auxiliary and service facilities	0.00	0.00	0.00
Incorporated fixed assets	0.00	0.00	0.00
Plant, machinery and equipment	0.00	0.00	0.00
Total fixed investment costs	0.00	0.00	0.00
Preproduction capitals expenditures.	0.00	0.00	0.00
Working capital	6015.09	3567.77	3675.76
Total current investment costs	6015.09	3567.77	3675.76
Of it foreign, %	0.00	0.00	0.00

Total Production Costs in F$ (Fiji Dollars)

Year	1988	1989	1990	1991	1992	199
% of nom. capacity (single product).	43.52	45.72	48.20	50.83	53.26	55.5
Raw material 1	187680.00	201790.00	216400.00	231920.00	247970.00	264770.0
Other raw materials	94130.00	95540.00	100820.00	115400.00	126570.00	142240.0
Utilities	3400.00	3500.00	3610.00	3720.00	3830.00	3940.0
Energy	6800.00	7000.00	7220.00	7440.00	7660.00	7880.0
Labour, direct	75000.00	77250.00	79470.00	81960.00	84420.00	86960.0
Repair, maintenance	54400.00	56030.00	57720.00	59440.00	61230.00	63060.0
Spares	81600.00	84050.00	86570.00	89160.00	91840.00	94600.0
Factory overheads	23800.00	24520.00	25240.00	26000.00	26780.00	27600.0
Factory costs	526810.00	549680.00	577050.00	615040.00	650300.00	691050.0
Administrative overheads	12000.00	12360.00	12730.00	13120.00	13510.00	13920.0
Indir. costs, sales and distribution	0.00	0.00	0.00	0.00	0.00	0.0
Direct costs, sales and distribution	0.00	0.00	0.00	0.00	0.00	0.0
Depreciation	281980.40	281980.40	281980.40	281980.40	281980.40	281980.4
Financial costs	307216.00	276494.40	245772.80	215051.20	184329.60	153608.0
Total production costs	1128006.00	1120515.00	1117533.00	1125192.00	1130120.00	1140558.0
Costs per unit (single product)	0.08	0.07	0.07	0.07	0.06	0.0
Of it foreign, %	18.57	18.69	18.74	18.62	18.54	18.3
Of it variable,%	0.00	0.00	0.00	0.00	0.00	0.0
Total labour	75000.00	77250.00	79470.00	81960.00	84420.00	86960.0

Total Production Costs in F$ (Fiji Dollars)

Year	1994	1995	1996	1997	1998	19
% of nom. capacity (single product).	58.28	60.60	63.04	65.38	67.52	69.
Raw material 1	282580.00	300960.00	310080.00	319440.00	329040.00	338880.
Other raw materials	153980.00	163950.00	214430.00	264860.00	308950.00	361450.
Utilities	4060.00	4180.00	4310.00	4440.00	4570.00	4710.
Energy	8120.00	8360.00	8620.00	8880.00	9140.00	9420.
Labour, direct	89570.00	92260.00	95020.00	97870.00	100820.00	103840.
Repair, maintenance	64960.00	66910.00	68920.00	70980.00	73110.00	75310.
Spares	97440.00	100360.00	103370.00	106480.00	109670.00	112960.
Factory overheads	28420.00	29270.00	30140.00	31040.00	31990.00	32930.
Factory costs	729130.00	766250.00	834890.00	903990.00	967290.00	1039500.
Administrative overheads	14340.00	14760.00	15210.00	15660.00	16130.00	16620.
Indir. costs, sales and distribution	0.00	0.00	0.00	0.00	0.00	0.
Direct costs, sales and distribution	0.00	0.00	0.00	0.00	0.00	0.
Depreciation	281980.40	281980.40	281980.40	281980.40	281980.40	281980.
Financial costs	122886.40	92164.80	61443.20	0.00	0.00	0.
Total production costs	1148337.00	1155155.00	1193524.00	1201630.00	1265400.00	1338100.
Costs per unit (single product)	0.06	0.06	0.06	0.06	0.06	0.
Of it foreign, %	18.24	18.13	17.55	17.43	16.55	15.
Of it variable,%	0.00	0.00	0.00	0.00	0.00	0.
Total labour	89570.00	92260.00	95020.00	97870.00	100820.00	103840.

Total Production Costs in F$ (Fiji Dollars)

Year	2000	2001	2002
% of nom. capacity (single product).	70.88	72.06	72.81
Raw material 1	348960.00	359430.00	370210.00
Other raw materials	401950.00	414010.00	426430.00
Utilities	4850.00	5000.00	5150.00
Energy	9700.00	9990.00	10290.00
Labour, direct	106960.00	110170.00	113480.00
Repair, maintenance	77560.00	79890.00	82280.00
Spares	116340.00	119830.00	123430.00
Factory overheads	33940.00	34960.00	36010.00
Factory costs	1100260.00	1133280.00	1167280.00
Administrative overheads	17120.00	17630.00	18160.00
Indir. costs, sales and distribution	0.00	0.00	0.00
Direct costs, sales and distribution	0.00	0.00	0.00
Depreciation	281980.40	281980.40	281980.40
Financial costs	0.00	0.00	0.00
Total production costs	1399360.00	1432890.00	1467420.00
Costs per unit (single product)	0.06	0.06	0.06
Of it foreign, %	14.97	14.62	14.27
Of it variable,%	0.00	0.00	0.00
Total labour	106960.00	110170.00	113480.00

Net Working Capital in F$ (Fiji Dollars)

Year	mdc	coto	1988	1989	1990	1991	1992
Coverage	mdc	coto					
Current assets &							
Accounts receivable	30	12.0	44900.83	46836.67	49148.33	52346.67	55317.50
Inventory and materials	30	12.1	23493.61	24787.22	26445.03	28953.67	31222.30
Energy	1	360.0	18.89	19.44	20.06	20.67	21.28
Spares	60	6.0	13600.00	14008.33	14428.33	14860.00	15306.67
Work in progress	1	360.0	1463.36	1526.89	1602.92	1708.44	1806.39
Finished products	1	360.0	1496.69	1561.22	1638.28	1744.89	1843.92
Cash in hand	30	12.0	20566.67	21184.17	21810.83	22473.33	23148.33
Total current assets			105540.10	109923.90	115093.80	122107.70	128666.40
Current liabilities and							
Accounts payable	30	12.0	43900.83	45806.67	48087.50	51253.33	54191.67
Net working capital			61639.22	64117.28	67006.28	70854.34	74474.72
Increase in working capital			61639.22	2478.05	2889.00	3848.06	3620.38
Net working capital, local			61639.22	64117.27	67006.28	70854.34	74474.72
Net working capital, foreign			0.00	0.00	0.00	0.00	0.00

Note: mdc = minimum days of coverage ; coto = coefficient of turnover .

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Net Working Capital in F$ (Fiji Dollars)

Year	mdc	coto	1993	1994	1995	1996	1997
Coverage	mdc	coto					
Current assets &							
Accounts receivable	30	12.0	58747.50	61955.83	65084.17	70841.66	76637.50
Inventory and materials	30	12.1	33928.45	36391.28	38754.11	43721.14	48704.00
Energy	1	360.0	21.89	22.56	23.22	23.94	24.67
Spares	60	6.0	15766.67	16240.00	16726.67	17228.33	17746.67
Work in progress	1	360.0	1919.58	2025.36	2128.47	2319.14	2511.08
Finished products	1	360.0	1958.25	2065.19	2169.47	2361.39	2554.58
Cash in hand	30	12.0	23845.00	24560.83	25296.67	26055.00	26835.83
Total current assets			136187.30	143261.00	150182.80	162550.60	175014.30
Current liabilities and							
Accounts payable	30	12.0	57587.50	60760.83	63854.17	69574.16	75332.50
Net working capital			78599.84	82500.22	86328.59	92976.45	99681.81
Increase in working capital			4125.13	3900.38	3828.38	6647.85	6705.37
Net working capital, local			78599.84	82500.22	86328.59	92976.45	99681.81
Net working capital, foreign			0.00	0.00	0.00	0.00	0.00

Note: mdc = minimum days of coverage ; coto = coefficient of turnover .

Net Working Capital in F$ (Fiji Dollars)

Year	mdc	coto	1998	1999	2000	2001	2002
Coverage	mdc	coto					
Current assets &							
Accounts receivable	30	12.0	81951.66	88010.00	93115.00	95909.16	98786.66
Inventory and materials	30	12.1	53178.53	58373.92	62589.30	64467.22	66400.97
Energy	1	360.0	25.39	26.17	26.94	27.75	28.58
Spares	60	6.0	18278.33	18826.67	19390.00	19971.67	20571.67
Work in progress	1	360.0	2686.92	2887.50	3056.28	3148.00	3242.44
Finished products	1	360.0	2731.72	2933.67	3103.83	3196.97	3292.89
Cash in hand	30	12.0	27643.33	28471.67	29326.67	30206.67	31113.33
Total current assets			186495.90	199529.60	210608.00	216927.50	223436.50
Current liabilities and							
Accounts payable	30	12.0	80607.50	86625.00	91688.34	94440.00	97273.34
Net working capital			105888.40	112904.60	118919.70	122487.50	126163.20
Increase in working capital			6206.56	7016.23	6015.09	3567.76	3675.74
Net working capital, local			105888.40	112904.60	118919.70	122487.50	126163.20
Net working capital, foreign			0.00	0.00	0.00	0.00	0.00

Note: mdc = minimum days of coverage ; coto = coefficient of turnover .

Source of Finance, construction in F$ (Fiji Dollars)

Year	1987
Equity, ordinary ..	2743000.00
Equity, preference.	0.00
Subsidies, grants .	0.00
Loan A, foreign .	0.00
Loan B, foreign..	0.00
Loan C, foreign .	0.00
Loan A, local....	2743000.00
Loan B, local....	0.00
Loan C, local....	0.00
Total loan	2743000.00
Current liabilities	0.00
Bank overdraft	153608.00
Total funds	5639608.00

Source of Finance, production in F$ (Fiji Dollars)

Year	1988	1989	1990	1991	1992	1993	199
Equity, ordinary ..	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Equity, preference.	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Subsidies, grants .	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Loan A, foreign .	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Loan B, foreign..	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Loan C, foreign .	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Loan A, local....	-274300.00	-274300.00	-274300.00	-274300.00	-274300.00	-274300.00	-274300.0
Loan B, local....	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Loan C, local....	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Total loan	-274300.00	-274300.00	-274300.00	-274300.00	-274300.00	-274300.00	-274300.0
Current liabilities	43900.83	1905.84	2280.83	3165.83	2938.34	3395.83	3173.3
Bank overdraft	-153608.00	0.00	0.00	0.00	0.00	0.00	0.0
Total funds	-384007.20	-272394.20	-272019.20	-271134.20	-271361.70	-270904.20	-271126.7

Source of Finance, production in F$ (Fiji Dollars)

Year	1995	1996	[illegible]	1998	1999	2000	200
Equity, ordinary ..	0.00	0.00	0.	0.00	0.00	0.00	0.0
Equity, preference.	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Subsidies, grants .	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Loan A, foreign .	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Loan B, foreign..	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Loan C, foreign .	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Loan A, local....	-274300.00	-274300.00	-274300.00	0.00	0.00	0.00	0.0
Loan B, local....	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Loan C, local....	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Total loan	-274300.00	-274300.00	-274300.00	0.00	0.00	0.00	0.0
Current liabilities	3093.34	5720.00	5758.34	5275.00	6017.50	5063.34	2751.6
Bank overdraft	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Total funds	-271206.70	-268580.00	-268541.70	5275.00	6017.50	5063.34	2751.6

Source of Finance, production in F$ (Fiji Dollars)

Year	2002
Equity, ordinary ..	0.00
Equity, preference.	0.00
Subsidies, grants .	0.00
Loan A, foreign .	0.00
Loan B, foreign..	0.00
Loan C, foreign .	0.00
Loan A, local....	0.00
Loan B, local....	0.00
Loan C, local....	0.00
Total loan	0.00
Current liabilities	2833.34
Bank overdraft	0.00
Total funds	2833.34

Cashflow Tables, construction in F$ (Fiji Dollars)

Year	1987
Total cash inflow . .	5486000.00
Financial resources .	5486000.00
Sales, net of tax . .	0.00
Total cash outflow . .	5639608.00
Total assets	5486000.00
Operating costs . . .	0.00
Cost of finance . . .	153608.00
Repayment	0.00
Corporate tax . . .	0.00
Dividends paid . . .	0.00
Surplus (deficit) .	-153608.00
Cumulated cash balance	-153608.00
Inflow, local	5486000.00
Outflow, local	1450148.00
Surplus (deficit) .	4035852.00
Inflow, foreign . . .	0.00
Outflow, foreign . . .	4189460.00
Surplus (deficit) .	-4189460.00
Net cashflow	-5486000.00
Cumulated net cashflow	-5486000.00

Cashflow tables, production in F$ (Fiji Dollars)

Year	1988	1989	1990	1991	1992	1993
Total cash inflow . .	1530903.00	1609537.00	1750063.00	1900474.00	2049058.00	2216869.00
Financial resources .	43900.83	1905.84	2290.83	3165.83	2938.34	3395.83
Sales, net of tax . .	1487002.00	1607631.00	1747782.00	1897308.00	2046120.00	2213473.00
Total cash outflow . .	1360489.00	1299887.00	1351366.00	1414069.00	1472499.00	1542742.00
Total assets	105540.10	4383.89	5169.83	7013.89	6558.72	7520.94
Operating costs . . .	538810.00	562040.10	589780.10	628160.00	663810.10	704970.00
Cost of finance . . .	307216.00	276494.40	245772.80	215051.20	184329.60	153608.00
Repayment	274300.00	274300.00	274300.00	274300.00	274300.00	274300.00
Corporate tax . . .	134623.30	182668.50	236343.20	289543.80	343500.00	402343.10
Dividends paid . . .	0.00	0.00	0.00	0.00	0.00	0.00
Surplus (deficit) .	170413.50	309649.90	398696.80	486405.40	576559.80	674126.90
Cumulated cash balance	16805.50	326455.40	725152.10	1211558.00	1788117.00	24[illegible]44.00
Inflow, local	1530903.00	1609537.00	1750063.00	1900474.00	2049058.00	2216869.00
Outflow, local	1360489.00	1299887.00	1351366.00	1414069.00	1472499.00	1542742.00
Surplus (deficit) .	170413.50	309649.90	398696.80	486405.30	576559.80	674126.90
Inflow, foreign . . .	0.00	0.00	0.00	0.00	0.00	0.00
Outflow, foreign . . .	0.00	0.00	0.00	0.00	0.00	0.00
Surplus (deficit) .	0.00	0.00	0.00	0.00	0.00	0.00
Net cashflow	751929.40	860444.10	918769.40	975756.40	1035189.00	1102035.00
Cumulated net cashflow	-4734071.00	-3873627.00	-2954857.00	-1979101.00	-943911.20	158123.80

Cashflow tables, production in F$ (Fiji Dollars)

Year	1994	1995	1996	1997	1998	1999
Total cash inflow . .	2377935.00	2544635.00	2731315.00	2917578.00	3104239.00	3284264.00
Financial resources .	3173.33	3093.34	5720.00	5758.34	5275.00	6017.50
Sales, net of tax . .	2374762.00	2541542.00	2725595.00	2911820.00	3098964.00	3278247.00
Total cash outflow . .	1607640.00	1674291.00	1772738.00	1847735.00	1682488.00	1796709.00
Total assets	7073.72	6921.72	12367.83	12463.72	11481.56	13033.69
Operating costs . . .	743470.00	781010.00	850100.00	919650.00	983420.00	1056120.00
Cost of finance . . .	122886.40	92164.80	61443.20	0.00	0.00	0.00
Repayment	274300.00	274300.00	274300.00	274300.00	0.00	0.00
Corporate tax . . .	459909.40	519894.80	574526.60	641321.00	687586.30	727554.90
Dividends paid . . .	0.00	0.00	0.00	0.00	0.00	0.00
Surplus (deficit) .	770295.50	870343.40	958576.90	1069843.00	1421751.00	1487555.00
Cumulated cash balance	3232540.00	4102883.00	5061460.00	6131303.00	7553054.00	9040609.00
Inflow, local	2377935.00	2544635.00	2731315.00	2917578.00	3104239.00	3284264.00
Outflow, local	1607640.00	1674291.00	1772738.00	1847735.00	1682488.00	1796709.00
Surplus (deficit) .	770295.50	870343.40	958576.80	1069843.00	1421751.00	1487555.00
Inflow, foreign . . .	0.00	0.00	0.00	0.00	0.00	0.00
Outflow, foreign . . .	0.00	0.00	0.00	0.00	0.00	0.00
Surplus (deficit) .	0.00	0.00	0.00	0.00	0.00	0.00
Net cashflow	1167482.00	1236808.00	1294320.00	1344143.00	1421751.00	1487555.00
Cumulated net cashflow	1325606.00	2562414.00	3856734.00	5200878.00	6622629.00	8110184.00

Cashflow tables, production in F$ (Fiji Dollars)

Year	2000	2001	2002
Total cash inflow . .	3453662.00	3612017.00	3761093.00
Financial resources .	5063.34	2751.66	2833.34
Sales, net of tax . .	3448598.00	3609265.00	3758260.00
Total cash outflow . .	1896923.00	1973370.00	2051014.00
Total assets	11078.44	6319.41	6509.11
Operating costs . . .	1117380.00	1150910.00	1185440.00
Cost of finance . . .	0.00	0.00	0.00
Repayment	0.00	0.00	0.00
Corporate tax . . .	768464.30	816140.40	859064.80
Dividends paid . . .	0.00	0.00	0.00
Surplus (deficit) .	1556739.00	1638647.00	1710079.00
Cumulated cash balance	1059732[illegible].00	12235990.00	13946070.00
Inflow, local	3453662.00	3612017.00	3761093.00
Outflow, local	1896923.00	1973370.00	2051014.00
Surplus (deficit) .	1556739.00	1638647.00	1710079.00
Inflow, foreign . . .	0.00	0.00	0.00
Outflow, foreign . . .	0.00	0.00	0.00
Surplus (deficit) .	0.00	0.00	0.00
Net cashflow	1556739.00	1638646.00	1710079.00
Cumulated net cashflow	9666923.00	11305570.00	13015650.00

Cashflow Discounting:

a) Return on Equity 1:
Net present value ....3453296.00 at 8.00 %
Internal Rate of Return (IRRE1) .. 19.71 %

b) Return on Equity 2:
Net present value ....4373287.00 at 8.00 %
Internal Rate of Return (IRRE2) .. 20.77 %

c) Internal Rate of Return on total investment:
Net present value ....4720026.00 at 8.00 %
Internal Rate of Return (IRR)... 17.87 %

Equity 1 = Total equity paid : Net income
Equity 2 = Initial equity paid : Net cash return

Net Income Statement in F$ (Fiji Dollars)

Year	1988	1989	1990	1991	1992
Total sales, incl. sales tax	1487002.00	1607631.00	1747782.00	1897308.00	2046120.00
Less: variable costs, incl. sales tax.	0.00	0.00	0.00	0.00	0.00
Variable margin	1487002.00	1607631.00	1747782.00	1897308.00	2046120.00
As % of total sales	100.00	100.00	100.00	100.00	100.00
Non-variable costs, incl. depreciation	820790.40	844020.40	871760.40	910140.30	945790.40
Operational margin	666211.50	763610.50	876021.50	987168.00	1100330.00
As % of total sales	44.80	47.50	50.12	52.03	53.78
Cost of finance	307216.00	276494.40	245772.80	215051.20	184329.60
Gross profit	358995.50	487116.10	630248.60	772116.80	915999.90
Allowances	0.00	0.00	0.00	0.00	0.00
Taxable profit	358995.50	487116.10	630248.60	772116.80	915999.90
Tax	134623.30	182668.50	236343.20	289543.80	343500.00
Net profit	224372.20	304447.60	393905.40	482573.00	572499.90
Dividends paid	0.00	0.00	0.00	0.00	0.00
Undistributed profit	224372.20	304447.60	393905.40	482573.00	572499.90
Accumulated undistributed profit . . .	224372.20	528819.80	922725.10	1405298.00	1977798.00
Gross profit, % of total sales	24.14	30.30	36.06	40.70	44.77
Net profit, % of total sales	15.09	18.94	22.54	25.43	27.98
ROE, Net profit, % of equity	8.18	11.10	14.36	17.59	20.87
ROI, Net profit+interest, % of invest.	9.58	10.47	11.52	12.55	13.61

Net Income Statement in F$ (Fiji Dollars)

Year	1993	1994	1995	1996	1997
Total sales, incl. sales tax	2213473.00	2374762.00	2541542.00	2725595.00	2911820.00
Less: variable costs, incl. sales tax.	0.00	0.00	0.00	0.00	0.00
Variable margin	2213473.00	2374762.00	2541542.00	2725595.00	2911820.00
As % of total sales	100.00	100.00	100.00	100.00	100.00
Non-variable costs, incl. depreciation	986950.40	1025450.00	1062991.00	1132080.00	1201630.00
Operational margin	1226523.00	1349311.00	1478551.00	1593514.00	1710189.00
As % of total sales	55.41	56.82	58.18	58.46	58.73
Cost of finance	1536[illegible]8.[illegible]	122886.40	92164.80	61443.20	0.00
Gross profit	1072915.00	1226425.00	1386386.00	1532071.00	1710189.00
Allowances	0.00	0.00	0.00	0.00	0.00
Taxable profit	1072915.00	1226425.00	1386386.00	1532071.00	1710189.00
Tax	402343.10	459909.40	519894.80	574526.60	641321.00
Net profit	670571.80	766515.60	866491.40	957544.40	1068868.00
Dividends paid	0.00	0.00	0.00	0.00	0.00
Undistributed profit	670571.80	766515.60	866491.40	957544.40	1068868.00
Accumulated undistributed profit . . .	2648370.00	3414886.00	4281377.00	5238922.00	6307790.00
Gross profit, % of total sales	48.47	51.64	54.55	56.21	58.73
Net profit, % of total sales	30.30	32.28	34.09	35.13	36.71
ROE, Net profit, % of equity	24.45	27.94	31.59	34.91	38.97
ROI, Net profit+interest, % of invest.	14.81	15.97	17.20	18.26	19.14

Net Income Statement in F$ (Fiji Dollars)

Year	1998	1999	2000	2001	2002
Total sales, incl. sales tax	3098964.00	3278247.00	3448598.00	3609265.00	3758260.00
Less: variable costs, incl. sales tax.	0.00	0.00	0.00	0.00	0.00
Variable margin	3098964.00	3278247.00	3448598.00	3609265.00	3758260.00
As % of total sales	100.00	100.00	100.00	100.00	100.00
Non-variable costs, incl. depreciation	1265400.00	1338100.00	1399360.00	1432890.00	1467420.00
Operational margin	1833563.00	1940146.00	2049238.00	2176375.00	2290840.00
As % of total sales	59.17	59.18	59.42	60.30	60.95
Cost of finance	0.00	0.00	0.00	0.00	0.00
Gross profit	1833563.00	1940146.00	2049238.00	2176375.00	2290840.00
Allowances	0.00	0.00	0.00	0.00	0.00
Taxable profit	1833563.00	1940146.00	2049238.00	2176375.00	2290840.00
Tax	687586.30	727554.90	768464.30	816140.40	859064.80
Net profit	1145977.00	1212592.00	1280774.00	1360234.00	1431775.00
Dividends paid	0.00	0.00	0.00	0.00	0.00
Undistributed profit	1145977.00	1212592.00	1280774.00	1360234.00	1431775.00
Accumulated undistributed profit	7453767.00	8666358.00	9947132.00	11307370.00	12739140.00
Gross profit, % of total sales	59.17	59.18	59.42	60.30	60.95
Net profit, % of total sales	36.98	36.99	37.14	37.69	38.10
ROE, Net profit, % of equity	41.78	44.21	46.69	49.59	52.20
ROI, Net profit+interest, % of invest.	20.49	21.66	22.85	24.25	25.51

Projected Balance Sheets, construction in F$ (Fiji Dollars)

Year	1987
Total assets	5639608.00
Fixed assets, net of depreciation	0.00
Construction in progress	5639608.00
Current assets	0.00
Cash, bank	0.00
Cash surplus, finance available	0.00
Loss carried forward	0.00
Loss	0.00
Total liabilities	5639608.00
Equity capital	2743000.00
Reserves, retained profit	0.00
Profit	0.00
Long and medium term debt	2743000.00
Current liabilities	0.00
Bank overdraft, finance required.	153608.00
Total debt	2896608.00
Equity, % of liabilities	48.64

Projected Balance Sheets, Production in F$ (Fiji Dollars)

Year	1988	1989	1990	1991	1992	1993
Total assets	5479973.00	5512027.00	5633913.00	5845352.00	6146490.00	6546158.00
Fixed assets, net of depreciation	5357628.00	5075647.00	4793667.00	4511686.00	4229706.00	3947725.00
Construction in progress	0.00	0.00	0.00	0.00	0.00	0.00
Current assets	84973.39	88739.78	93282.95	99634.34	105518.10	112342.30
Cash, bank	20566.67	21184.17	21810.83	22473.33	23148.33	23845.00
Cash surplus, finance available	16805.50	326455.50	725152.00	1211558.00	1788118.00	2462245.00
Loss carried forward	0.00	0.00	0.00	0.00	0.00	0.00
Loss	0.00	0.00	0.00	0.00	0.00	0.00
Total liabilities	5479973.00	5512027.00	5633913.00	5845352.00	6146490.00	6546158.00
Equity capital	2743000.00	2743000.00	2743000.00	2743000.00	2743000.00	2743000.00
Reserves, retained profit	0.00	224372.20	528819.80	922725.10	1405298.00	1977798.00
Profit	224372.20	304447.60	393905.40	482573.00	572499.90	670571.90
Long and medium term debt	2468700.00	2194400.00	1920100.00	1645800.00	1371500.00	1097200.00
Current liabilities	43900.83	45806.67	48087.50	51253.33	54191.67	57587.50
Bank overdraft, finance required.	0.00	0.00	0.00	0.00	0.00	0.00
Total debt	2512601.00	2240207.00	1968188.00	1697053.00	1425692.00	1154788.00
Equity, % of liabilities	50.05	49.76	48.69	46.93	44.63	41.90

Projected Balance Sheets, Production in F$ (Fiji Dollars)

Year	1994	1995	1996	1997	1998	1999
Total assets	7041547.00	7636831.00	8325796.00	9126122.00	10277370.00	11495980.00
Fixed assets, net of depreciation	3665745.00	3383764.00	3101784.00	2819803.00	2537823.00	2255842.00
Construction in progress	0.00	0.00	0.00	0.00	0.00	0.00
Current assets	118700.20	124886.10	136495.60	148179.50	158852.60	171057.90
Cash, bank	24560.83	25296.67	26055.00	26835.83	27643.33	28471.67
Cash surplus, finance available	3232541.00	4102884.00	5061462.00	6131305.00	7553056.00	9040611.00
Loss carried forward	0.00	0.00	0.00	0.00	0.00	0.00
Loss	0.00	0.00	0.00	0.00	0.00	0.00
Total liabilities	7041547.00	7636831.00	8325796.00	9126122.00	10277370.00	11495980.00
Equity capital	2743000.00	2743000.00	2743000.00	2743000.00	2743000.00	2743000.00
Reserves, retained profit	2648370.00	3414886.00	4281377.00	5238922.00	6307790.00	7453767.00
Profit	766515.60	866491.40	957544.40	1068868.00	1145977.00	1212592.00
Long and medium term debt	822900.00	548600.00	274300.00	0.00	0.00	0.00
Current liabilities	60760.83	63854.17	69574.16	75332.50	80607.50	86625.00
Bank overdraft, finance required.	0.00	0.00	0.00	0.00	0.00	0.00
Total debt	883660.80	612454.20	343874.20	75332.50	80607.50	86625.00
Equity, % of liabilities	38.95	35.92	32.95	30.06	26.69	23.86

Projected Balance Sheets, Production in F$ (Fiji Dollars)

Year	2000	2001	2002
Total assets	12781820.00	14144810.00	15579410.00
Fixed assets, net of depreciation	1973862.00	1691881.00	1409901.00
Construction in progress	0.00	0.00	0.00
Current assets	181281.40	186720.80	192323.20
Cash, bank	29326.67	30206.67	31113.33
Cash surplus, finance available	10597350.00	12236000.00	13946080.00
Loss carried forward	0.00	0.00	0.00
Loss	0.00	0.00	0.00
Total liabilities	12781820.00	14144810.00	15579410.00
Equity capital	2743000.00	2743000.00	2743000.00
Reserves, retained profit	8666358.00	9947132.00	11307370.00
Profit	1280774.00	1360234.00	1431775.00
Long and medium term debt	0.00	0.00	0.00
Current liabilities	91688.34	94440.00	97273.34
Bank overdraft, finance required.	0.00	0.00	0.00
Total debt	91688.34	94440.00	97273.34
Equity, % of liabilities	21.46	19.39	17.61

FINANCIAL ANALYSIS - Sales Price based

on 85% of FEA's diesel generation costs

LABASA STEAM TURBO-POWER PLANT
19th July 1986
Sales at 85% of FEA's generating pr:

1 year(s) of construction, 15 years of production
currency conversion rates:
foreign currency 1 unit = 1.1000 units accounting currency
local currency 1 unit = 1.0000 units accounting currency
accounting currency: F$ (Fiji Dollars)

Total initial investment during construction phase

fixed assets:	5639608.00	74.286 % foreign
current assets:	0.00	0.000 % foreign
total assets:	5639608.00	74.286 % foreign

Source of funds during construction phase

equity & grants:	2743000.00	0.000 % foreign
foreign loans :	0.00	
local loans :	2743000.00	
total funds :	5486000.00	0.000 % foreign

Cashflow from operations

Year:	1	2	3
operating costs:	538810.00	562040.00	589780.00
depreciation :	281980.40	281980.40	281980.40
interest :	307216.00	276494.40	245772.80
production costs	1128006.00	1120515.00	1117533.00
thereof foreign	18.57 %	18.69 %	18.74 %
total sales :	1404551.00	1517980.00	1650060.00
gross income :	276545.00	397465.60	532526.60
net income :	172840.60	248416.00	332829.10
cash balance :	118881.80	253618.30	337620.50
net cashflow :	700397.80	804412.70	857693.30

Net Present Value at: 8.00 % = 4022492.00
Internal Rate of Return: 16.56 %
Return on equity1: 17.56 %
Return on equity2: 18.85 %

Index of Schedules produced by COMFAR

Total initial investment
Total investment during production
Total production costs
Working Capital requirements
Cashflow Tables
Projected Balance
Net income statement
Source of finance

Total Initial Investment in F$ (Fiji Dollars)

Year	1987
Fixed investment costs	
Land, site preparation, development	35000.00
Buildings and civil works	70000.00
Auxiliary and service facilities .	0.00
Incorporated fixed assets	0.00
Plant machinery and equipment . . .	5356000.00
Total fixed investment costs	5461000.00
Pre-production capital expenditures.	178608.00
Net working capital	0.00
Total initial investment costs . . .	5639608.00
Of it foreign, in %	74.29

Total Current Investment in F$ (Fiji Dollars)

Year	1988	1989	1990	1991	1992	19
Fixed investment costs						
Land, site preparation, development	0.00	0.00	0.00	0.00	0.00	0.
Buildings and civil works	0.00	0.00	0.00	0.00	0.00	0.
Auxiliary and service facilities	0.00	0.00	0.00	0.00	0.00	0.
Incorporated fixed assets	0.00	0.00	0.00	0.00	0.00	0.
Plant, machinery and equipment	0.00	0.00	0.00	0.00	0.00	0.
Total fixed investment costs	0.00	0.00	0.00	0.00	0.00	0.
Preproduction capitals expenditures.	0.00	0.00	0.00	0.00	0.00	0.
Working capital	61639.22	2478.05	2889.01	3848.06	3620.38	4125.
Total current investment costs	61639.22	2478.05	2889.01	3848.06	3620.38	4125.
Of it foreign, %	0.00	0.00	0.00	0.00	0.00	0.

Total Current Investment in F$ (Fiji Dollars)

Year	1994	1995	1996	1997	1998	19
Fixed investment costs						
Land, site preparation, development	0.00	0.00	0.00	0.00	0.00	0.
Buildings and civil works	0.00	0.00	0.00	0.00	0.00	0.
Auxiliary and service facilities	0.00	0.00	0.00	0.00	0.00	0.
Incorporated fixed assets	0.00	0.00	0.00	0.00	0.00	0.
Plant, machinery and equipment	0.00	0.00	0.00	0.00	0.00	0.
Total fixed investment costs	0.00	0.00	0.00	0.00	0.00	0.
Preproduction capitals expenditures.	0.00	0.00	0.00	0.00	0.00	0.
Working capital	3900.38	3828.38	6647.85	6705.37	6206.56	7016.
Total current investment costs	3900.38	3828.38	6647.85	6705.37	6206.56	7016.
Of it foreign, %	0.00	0.00	0.00	0.00	0.00	0.

Total Current Investment in F$ (Fiji Dollars)

Year	2000	2001	2002
Fixed investment costs			
Land, site preparation, development	0.00	0.00	0.00
Buildings and civil works	0.00	0.00	0.00
Auxiliary and service facilities	0.00	0.00	0.00
Incorporated fixed assets	0.00	0.00	0.00
Plant, machinery and equipment	0.00	0.00	0.00
Total fixed investment costs	0.00	0.00	0.00
Preproduction capitals expenditures.	0.00	0.00	0.00
Working capital	6015.09	3567.77	3675.76
Total current investment costs	6015.09	3567.77	3675.76
Of it foreign, %	0.00	0.00	0.00

Total Production Costs in F$ (Fiji Dollars)

Year	1988	1989	1990	1991	1992	19
% of nom. capacity (single product).	43.52	45.72	48.20	50.83	53.26	55.
Raw material 1	187680.00	201790.00	216400.00	231920.00	247970.00	264770.
Other raw materials	94130.00	95540.00	100820.00	115400.00	126570.00	142240.
Utilities	3400.00	3500.00	3610.00	3720.00	3830.00	3940.
Energy	6800.00	7000.00	7220.00	7440.00	7660.00	7880.
Labour, direct	75000.00	77250.00	79470.00	81960.00	84420.00	86960.
Repair, maintenance	54400.00	56030.00	57720.00	59440.00	61230.00	63060.
Spares	81600.00	84050.00	86570.00	89160.00	91840.00	94600.
Factory overheads	23800.00	24520.00	25240.00	26000.00	26780.00	27600.
Factory costs	526810.00	549680.00	577050.00	615040.00	650300.00	691050.
Administrative overheads	12000.00	12360.00	12730.00	13120.00	13510.00	13920.
Indir. costs, sales and distribution	0.00	0.00	0.00	0.00	0.00	0.0
Direct costs, sales and distribution	0.00	0.00	0.00	0.00	0.00	0.0
Depreciation	281980.40	281980.40	281980.40	281980.40	281980.40	281980.
Financial costs	307216.00	276494.40	245772.80	215051.20	184329.60	153608.
Total production costs	1128006.00	1120515.00	1117533.00	1125192.00	1130120.00	1140555.
Costs per unit (single product)	0.08	0.07	0.07	0.07	0.06	0.0
Of it foreign, %	18.57	18.69	18.74	18.62	18.54	18.
Of it variable,%	0.00	0.00	0.00	0.00	0.00	0.
Total labour	75000.00	77250.00	79470.00	81960.00	84420.00	86960.

Total Production Costs in F$ (Fiji Dollars)

Year	1994	1995	1996	1997	1998	19
% of nom. capacity (single product).	58.28	60.60	63.04	65.38	67.52	69.
Raw material 1	282580.00	300960.00	310080.00	319440.00	329040.00	338830.
Other raw materials	153980.00	163950.00	214430.00	264860.00	308950.00	361450.
Utilities	4060.00	4180.00	4310.00	4440.00	4570.00	4710.
Energy	8120.00	8360.00	8620.00	8880.00	9140.00	9420.
Labour, direct	89570.00	92260.00	95020.00	97870.00	100820.00	103840.
Repair, maintenance	64960.00	66910.00	68920.00	70980.00	73110.00	75310.
Spares	97440.00	100360.00	103370.00	106480.00	109670.00	112960.
Factory overheads	28420.00	29270.00	30140.00	31040.00	31990.00	32930.
Factory costs	729130.00	766250.00	834890.00	903990.00	967290.00	1039500.
Administrative overheads	14340.00	14760.00	15210.00	15660.00	16130.00	16620.
Indir. costs, sales and distribution	0.00	0.00	0.00	0.00	0.00	0.
Direct costs, sales and distribution	0.00	0.00	0.00	0.00	0.00	0.
Depreciation	281980.40	281980.40	281980.40	281980.40	281980.40	281930.
Financial costs	122886.40	92164.80	61443.20	0.00	0.00	0.
Total production costs	1148337.00	1155155.00	1193524.00	1201630.00	1265400.00	1338100.
Costs per unit (single product)	0.06	0.06	0.06	0.06	0.06	0.
Of it foreign, %	18.24	18.13	17.55	17.43	16.55	15.
Of it variable,%	0.00	0.00	0.00	0.00	0.00	0.
Total labour	89570.00	92260.00	95020.00	97870.00	100820.00	103840.

Total Production Costs in F$ (Fiji Dollars)

Year	2000	2001	2002
% of nom. capacity (single product).	70.88	72.05	72.81
Raw material 1	348960.00	359430.00	370210.00
Other raw materials	401950.00	414010.00	426430.00
Utilities	4850.00	5000.00	5150.00
Energy	9700.00	9990.00	10290.00
Labour, direct	106960.00	110170.00	113480.00
Repair, maintenance	77560.00	79890.00	82290.00
Spares	116340.00	119830.00	123430.00
Factory overheads	33940.00	34960.00	36010.00
Factory costs	1100260.00	1133280.00	1167280.00
Administrative overheads	17120.00	17630.00	18160.00
Indir. costs, sales and distribution	0.00	0.00	0.00
Direct costs, sales and distribution	0.00	0.00	0.00
Depreciation	281980.40	281980.40	281980.40
Financial costs	0.00	0.00	0.00
Total production costs	1399360.00	1432890.00	1467420.00
Costs per unit (single product)	0.06	0.05	0.06
Of it foreign, %	14.97	14.62	14.27
Of it variable,%	0.00	0.00	0.00
Total labour	106960.00	110170.00	113480.00

Net Working Capital in F$ (Fiji Dollars)

Year	mdc	coto	1988	1989	1990	1991	1992
Coverage							
Current assets &							
Accounts receivable	30	12.0	44900.83	46936.67	49148.33	52346.67	55317.50
Inventory and materials	30	12.1	23493.61	24787.22	26445.03	28953.67	31222.30
Energy	1	360.0	18.89	19.44	20.06	20.67	21.28
Spares	60	6.0	13600.00	14008.33	14428.33	14860.00	15306.67
Work in progress	1	360.0	1463.36	1526.89	1602.92	1708.44	1806.39
Finished products	1	360.0	1496.69	1561.22	1638.28	1744.89	1843.92
Cash in hand	30	12.0	20566.67	21184.17	21810.83	22473.33	23148.33
Total current assets			10[illegible]40.10	109923.90	115093.80	122107.70	128666.40
Current liabilities and							
Accounts payable	30	12.0	43900.83	45806.67	48087.50	51253.33	54191.67
Net working capital			61639.22	64117.28	67006.28	70854.34	74474.72
Increase in working capital			61639.22	2478.05	2889.00	3848.06	3620.38
Net working capital, local			61639.22	64117.27	67006.28	70854.34	74474.72
Net working capital, foreign			0.00	0.00	0.00	0.00	0.00

Note: mdc = minimum days of coverage ; coto = coefficient of turnover .

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Net Working Capital in F$ (Fiji Dollars)

Year	mdc	coto	1993	1994	1995	1996	1997
Coverage							
Current assets &							
Accounts receivable	30	12.0	58747.50	61955.83	65094.17	70841.66	76637.50
Inventory and materials	30	12.1	33928.45	36391.28	38754.11	43721.14	48704.00
Energy	1	360.0	21.89	[illegible]	23.22	23.94	24.67
Spares	60	6.0	15766.67	[illegible]	16726.67	17228.33	17746.67
Work in progress	1	360.0	1919.58	202[illegible]	2128.47	2319.14	2511.08
Finished products	1	360.0	1958.25	2065.19	2169.47	[illegible]	2554.58
Cash in hand	30	12.0	23845.00	24560.83	25296.[illegible]	[illegible]	26835.83
Total current assets			136187.30	143261.0[illegible]	150182.9[illegible]	[illegible]	175014.30
Current liabilities and							
Accounts payable	30	12.0	57587.50	60760.[illegible]	63854.17	69574.16	75332.50
Net working capital			78599.84	82500.22	86328.59	92976.45	99681.81
Increase in working capital			4125.13	3900.38	3828.38	6647.85	6705.37
Net working capital, local			78599.84	82500.22	86328.59	92976.45	99681.81
Net working capital, foreign			0.00	0.00	0.00	0.00	0.00

Note: mdc = minimum days of coverage ; coto = coefficient of turnover .

Net Working Capital in F$ (Fiji Dollars)

Year	mdc	coto	1998	1999	2000	2001	2002
Coverage	mdc	coto					
Current assets &							
Accounts receivable	30	12.0	81951.66	88010.00	93115.00	95909.16	98786.66
Inventory and materials	30	12.1	53178.53	58373.92	62589.30	64467.22	66400.97
Energy	1	360.0	25.39	26.17	26.94	27.75	28.58
Spares	60	6.0	18278.33	18826.67	19390.00	19971.67	20571.67
Work in progress	1	360.0	2686.92	2887.50	3056.28	3148.00	3242.44
Finished products	1	360.0	2731.72	2933.67	3103.83	3196.97	3292.89
Cash in hand	30	12.0	27643.33	29471.67	29326.67	30206.67	31113.33
Total current assets			186495.90	199529.60	210608.00	216927.50	223436.50
Current liabilities and							
Accounts payable	30	12.0	80607.50	86625.00	91688.34	94440.00	97273.34
Net working capital			105888.40	112904.60	118919.70	122487.50	126163.20
Increase in working capital			6206.56	7016.23	6015.09	3567.76	3675.74
Net working capital, local			105888.40	112904.60	118919.70	122487.50	126163.20
Net working capital, foreign			0.00	0.00	0.00	0.00	0.00

Note: mdc = minimum days of coverage ; coto = coefficient of turnover .

Source of Finance, construction in F$ (Fiji Dollars)

Year	1987
Equity, ordinary ..	2743000.00
Equity, preference.	0.00
Subsidies, grants .	0.00
Loan A, foreign .	0.00
Loan B, foreign..	0.00
Loan C, foreign .	0.00
Loan A, local....	2743000.00
Loan B, local....	0.00
Loan C, local....	0.00
Total loan	2743000.00
Current liabilities	0.00
Bank overdraft	153608.00
Total funds	5639608.00

Source of Finance, production in F$ (Fiji Dollars)

Year	1988	1989	1990	1991	1992	1993	1994
Equity, ordinary ..	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Equity, preference.	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Subsidies, grants .	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loan A, foreign .	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loan B, foreign..	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loan C, foreign .	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loan A, local....	-274300.00	-274300.00	-274300.00	-274300.00	-274300.00	-274300.00	-274300.00
Loan B, local....	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loan C, local....	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total loan	-274300.00	-274300.00	-274300.00	-274300.00	-274300.00	-274300.00	-274300.00
Current liabilities	43900.83	1905.84	2280.83	3165.83	2938.34	3395.83	3173.33
Bank overdraft	-118882.00	-34726.00	0.00	0.00	0.00	0.00	0.00
Total funds	-349281.20	-307120.20	-272019.20	-271134.20	-271361.70	-270904.20	-271126.70

Source of Finance, production in F$ (Fiji Dollars)

Year	1995	1996	1997	1998	1999	2000	2001
Equity, ordinary ..	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Equity, preference.	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Subsidies, grants .	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loan A, foreign .	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loan B, foreign..	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loan C, foreign .	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loan A, local....	-274300.00	-274300.00	-274300.00	0.00	0.00	0.00	0.00
Loan B, local....	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loan C, local....	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total loan	-274300.00	-274300.00	-274300.00	0.00	0.00	0.00	0.00
Current liabilities	3093.34	5720.00	5758.34	5275.00	6017.50	5063.34	2751.66
Bank overdraft	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total funds	-271206.70	-268580.00	-268541.70	5275.00	6017.50	5063.34	2751.66

Source of Finance, production in F$ (Fiji Dollars)

Year	2002
Equity, ordinary ..	0.00
Equity, preference.	0.00
Subsidies, grants .	0.00
Loan A, foreign .	0.00
Loan B, foreign..	0.00
Loan C, foreign .	0.00
Loan A, local....	0.00
Loan B, local....	0.00
Loan C, local....	0.00
Total loan	0.00
Current liabilities	2833.34
Bank overdraft	0.00
Total funds	2833.34

Cashflow Tables, construction in F$ (Fiji Dollars)

Year	1987
Total cash inflow	5486000.00
Financial resources	5486000.00
Sales, net of tax	0.00
Total cash outflow	5639608.00
Total assets	5486000.00
Operating costs	0.00
Cost of finance	153608.00
Repayment	0.00
Corporate tax	0.00
Dividends paid	0.00
Surplus (deficit)	-153608.00
Cumulated cash balance	-153608.00
Inflow, local	5486000.00
Outflow, local	1450148.00
Surplus (deficit)	4035852.00
Inflow, foreign	0.00
Outflow, foreign	4189460.00
Surplus (deficit)	-4189460.00
Net cashflow	-5486000.00
Cumulated net cashflow	-5486000.00

Cashflow tables, production in F$ (Fiji Dollars)

Year	1988	1989	1990	1991	1992	1993
Total cash inflow . .	1448452.00	1519886.00	1652341.00	1795725.00	1935778.00	2094208.00
Financial resources .	43900.83	1905.84	2280.83	3165.83	2938.34	3395.83
Sales, net of tax . .	1404551.00	1517980.00	1650060.00	1792559.00	1932840.00	2090812.00
Total cash outflow . .	1329570.00	1266268.00	1314720.00	1374788.00	1430018.00	1496744.00
Total assets	105540.10	4383.89	5169.83	7013.89	6558.72	7520.94
Operating costs . . .	538810.00	562040.00	589780.10	628160.10	663810.00	704970.00
Cost of finance . . .	307216.00	276494.40	245772.80	215051.20	184329.60	153608.00
Repayment	274300.00	274300.00	274300.00	274300.00	274300.00	274300.00
Corporate tax . . .	103704.40	149049.60	199697.50	250263.00	301019.90	356345.20
Dividends paid . . .	0.00	0.00	0.00	0.00	0.00	0.00
Surplus (deficit) .	118881.90	253618.40	337620.50	420937.00	505759.90	597463.90
Cumulated cash balance	-34726.13	218892.30	556512.80	977449.80	1483210.00	2080674.00
Inflow, local	1448452.00	1519886.00	1652341.00	1795725.00	1935778.00	2094208.00
Outflow, local	1329570.00	1266268.00	1314720.00	1374788.00	1430018.00	1496744.00
Surplus (deficit) .	118881.90	253618.40	337620.50	420937.00	505759.90	597463.90
Inflow, foreign . . .	0.00	0.00	0.00	0.00	0.00	0.00
Outflow, foreign . . .	0.00	0.00	0.00	0.00	0.00	0.00
Surplus (deficit) .	0.00	0.00	0.00	0.00	0.00	0.00
Net cashflow	700397.80	804412.70	857693.20	910289.30	964389.40	1025372.00
Cumulated net cashflow	-4785602.00	-3981189.00	-3123496.00	-2213208.00	-1248818.00	-223446.40

Cashflow tables, production in F$ (Fiji Dollars)

Year	1994	1995	1996	1997	1998	1999
Total cash inflow . .	2246219.00	2403662.00	2580475.00	2754603.00	2931451.00	3102011.00
Financial resources .	3173.33	3093.34	5720.00	5758.34	5275.00	6017.50
Sales, net of tax . .	2243046.00	2400569.00	2574755.00	2748845.00	2926176.00	3095994.00
Total cash outflow . .	1558246.00	1621427.00	1716173.00	1786619.00	1617692.00	1728364.00
Total assets	7073.72	6921.72	12367.83	12463.72	11481.56	13033.69
Operating costs . . .	743470.00	781010.00	850100.00	919650.00	983420.00	1056120.00
Cost of finance . . .	122886.40	92164.80	61443.20	0.00	0.00	0.00
Repayment	274300.00	274300.00	274300.00	274300.00	0.00	0.00
Corporate tax . . .	410515.90	467030.00	517961.70	580205.30	622790.80	659210.00
Dividends paid . . .	0.00	0.00	0.00	0.00	0.00	0.00
Surplus (deficit) .	687973.00	782235.30	864302.00	967983.80	1313759.00	1373648.00
Cumulated cash balance	2768647.00	3550882.00	4415184.00	5383168.00	6696927.00	8070574.00
Inflow, local	2246219.00	2403662.00	2580475.00	2754603.00	2931451.00	3102011.00
Outflow, local	1558246.00	1621427.00	1716173.00	1786619.00	1617692.00	1728364.00
Surplus (deficit) .	687973.00	782235.30	864301.90	967983.80	1313759.00	1373648.00
Inflow, foreign . . .	0.00	0.00	0.00	0.00	0.00	0.00
Outflow, foreign . . .	0.00	0.00	0.00	0.00	0.00	0.00
Surplus (deficit) .	0.00	0.00	0.00	0.00	0.00	0.00
Net cashflow	1085160.00	1148700.00	1200045.00	1242284.00	1313759.00	1373648.00
Cumulated net cashflow	861713.10	2010413.00	3210459.00	4452743.00	5766501.00	7140149.00

Cashflow tables, production in F$ (Fiji Dollars)

Year	2000	2001	2002
Total cash inflow . .	3262858.00	3413231.00	3552973.00
Financial resources .	5063.34	2751.66	2833.34
Sales, net of tax . .	3257795.00	3410480.00	3550140.00
Total cash outflow . .	1825371.00	1898825.00	1972969.00
Total assets	11078.44	6319.41	6509.11
Operating costs . . .	1117380.00	1150910.00	1185440.00
Cost of finance . . .	0.00	0.00	0.00
Repayment	0.00	0.00	0.00
Corporate tax . . .	696912.80	741595.90	781019.70
Dividends paid . . .	0.00	0.00	0.00
Surplus (deficit) .	1437487.00	1514406.00	1580004.00
Cumulated cash balance	9508060.00	11022470.00	12602470.00
Inflow, local	3262858.00	3413231.00	3552973.00
Outflow, local	1825371.00	1898825.00	1972969.00
Surplus (deficit) .	1437487.00	1514406.00	1580004.00
Inflow, foreign . . .	0.00	0.00	0.00
Outflow, foreign . . .	0.00	0.00	0.00
Surplus (deficit) .	0.00	0.00	0.00
Net cashflow	1437487.00	1514406.00	1580004.00
Cumulated net cashflow	8577635.00	10092040.00	11672050.00

Cashflow Discounting:

a) Return on Equity 1:
    Net present value ....2755761.00 at 8.00 %
    Internal Rate of Return (IRRE1) .. 17.56 %
b) Return on Equity 2:
    Net present value ....3675752.00 at 8.00 %
    Internal Rate of Return (IRRE2) .. 18.85 %
c) Internal Rate of Return on total investment:
    Net present value ....4022492.00 at 8.00 %
    Internal Rate of Return (IRR) .. 16.56 %
Equity 1 = Total equity paid : Net income
Equity 2 = Initial equity paid : Net cash return

Net Income Statement in F$ (Fiji Dollars)

Year	1988	1989	1990	1991	1992
Total sales, incl. sales tax	1404551.00	1517980.00	1650060.00	1792559.00	1932840.00
Less: variable costs, incl. sales tax.	0.00	0.00	0.00	0.00	0.00
Variable margin	1404551.00	1517980.00	1650060.00	1792559.00	1932840.00
As % of total sales	100.00	100.00	100.00	100.00	100.00
Non-variable costs, incl. depreciation	820790.40	844020.40	871760.40	910140.30	945790.40
Operational margin	583761.00	673960.00	778299.50	882419.10	987049.40
As % of total sales	41.56	44.40	47.17	49.23	51.07
Cost of finance	307216.00	276494.40	245772.80	215051.20	184329.60
Gross profit	276545.00	397465.60	532526.60	667367.90	802719.80
Allowances	0.00	0.00	0.00	0.00	0.00
Taxable profit	276545.00	397465.60	532526.60	667367.90	802719.80
Tax	103704.40	149049.60	199697.50	250263.00	301019.90
Net profit	172840.60	248416.00	332829.10	417104.90	501699.80
Dividends paid	0.00	0.00	0.00	0.00	0.00
Undistributed profit	172840.60	248416.00	332829.10	417104.90	501699.80
Accumulated undistributed profit	172840.60	421256.60	[illegible]74085.80	1171191.00	1672891.00
Gross profit, % of total sales	19.69	26.18	32.27	37.23	41.53
Net profit, % of total sales	12.31	16.36	20.17	23.27	25.96
ROE, Net profit, % of equity	6.30	9.06	12.13	15.21	18.29
ROI, Net profit+interest, % of invest.	8.65	9.46	10.42	11.38	12.34

Net Income Statement in F$ (Fiji Dol[illegible])

Year	1993	1994	1995	1996	1997
Total sales, incl. sales tax	2090812.00	2243046.00	2400569.00	2574755.00	2748845.00
Less: variable costs, incl. sales tax.	0.00	0.00	0.00	0.00	0.00
Variable margin	2090812.00	2243046.00	2400569.00	2574755.00	2748845.00
As % of total sales	100.00	100.00	100.00	100.00	100.00
Non-variable costs, incl. depreciation	986950.40	1025450.00	1062991.00	1132080.00	1201630.00
Operational margin	1103862.00	1217595.00	1337578.00	1442675.00	1547214.00
As % of total sales	52.80	54.28	55.72	56.03	56.29
Cost of finance	153608.00	122886.40	92164.80	61443.20	0.00
Gross profit	950253.90	1094709.00	1245413.00	1381231.00	1547214.00
Allowances	0.00	0.00	0.00	0.00	0.00
Taxable profit	950253.90	1094709.00	1245413.00	1381231.00	1547214.00
Tax	356345.20	410515.90	467030.00	517961.70	580205.30
Net profit	593908.70	684193.10	778383.30	863269.50	967008.90
Dividends paid	0.00	0.00	0.00	0.00	0.00
Undistributed profit	593908.70	684193.10	778383.30	863269.50	967008.90
Accumulated undistributed profit	2266799.00	2950993.00	3729376.00	4592645.00	5559654.00
Gross profit, % of total sales	45.45	48.80	51.88	53.[illegible]	56.29
Net profit, % of total sales	28.41	30.50	32.42	33.53	35.18
ROE, Net profit, % of equity	21.65	24.94	28.38	31.47	35.25
ROI, Net profit+interest, % of invest.	13.43	14.49	15.62	16.57	17.31

Net Income Statement in F$ (Fiji Dollars)

Year	1998	1999	2000	2001	2002
Total sales, incl. sales tax	2926176.00	3095994.00	3257795.00	3410480.00	3550140.00
Less: variable costs, incl. sales tax.	0.00	0.00	0.00	0.00	0.00
Variable margin	2926176.00	3095994.00	3257795.00	3410480.00	3550140.00
As % of total sales	100.00	100.00	100.00	100.00	100.00
Non-variable costs, incl. depreciation	1265400.00	1338100.00	1399360.00	1432890.00	1467420.00
Operational margin	1660775.00	1757893.00	1858434.00	1977589.00	2082719.00
As % of total sales	56.76	56.78	57.05	57.99	58.67
Cost of finance	0.00	0.00	0.00	0.00	0.00
Gross profit	1660775.00	1757893.00	1858434.00	1977589.00	2082719.00
Allowances	0.00	0.00	0.00	0.00	0.00
Taxable profit	1660775.00	1757893.00	1858434.00	1977589.00	20827[illegible]
Tax	622790.80	659210.00	696912.80	741595.90	781019.[illegible]
Net profit	1037985.00	1098683.00	1161521.00	1235993.00	1301700.0
Dividends paid	0.00	0.00	0.00	0.00	[illegible]
Undistributed profit	1037985.00	1098683.00	1161521.00	1235993.00	130170[illegible]
Accumulated undistributed profit	6597639.00	7696322.00	8857843.00	10093840.00	11395540.00
Gross profit, % of total sales	56.76	56.78	57.05	57.99	58.67
Net profit, % of total sales	35.47	35.49	35.65	36.24	36.67
ROE, Net profit, % of equity	37.84	40.05	42.34	45.06	47.46
ROI, Net profit+interest, % of invest.	18.56	19.62	20.72	22.04	23.19

Projected Balance Sheets, construction in F$ (Fiji Dollars)

Year	1987
Total assets	5639608.00
Fixed assets, net of depreciation	0.00
Construction in progress	5639608.00
Current assets	0.00
Cash, bank	0.00
Cash surplus, finance available .	0.00
Loss carried forward	0.00
Loss	0.00
Total liabilities	5639608.00
Equity capital	2743000.00
Reserves, retained profit	0.00
Profit	0.00
Long and medium term debt	2743000.00
Current liabilities	0.00
Bank overdraft, finance required.	153608.00
Total debt	2896608.00
Equity, % of liabilities	48.64

Projected Balance Sheets, Production in F$ (Fiji Dollars)

Year	1988	1989	1990	1991	1992	1993
Total assets	5463168.00	5404463.00	5465273.00	5611245.00	5841582.00	6164587.00
Fixed assets, net of depreciation	5357628.00	5075647.00	4793667.00	4511686.00	4229706.00	3947725.00
Construction in progress	0.00	0.00	0.00	0.00	0.00	0.00
Current assets	84973.39	88739.76	93282.95	79634.34	105518.10	112342.30
Cash, bank	20566.67	21184.17	21810.83	22473.33	23148.33	23845.00
Cash surplus, finance available	0.00	218892.00	556512.50	977450.50	1483210.00	2080674.00
Loss carried forward	0.00	0.00	0.00	0.00	0.00	0.00
Loss	0.00	0.00	0.00	0.00	0.00	0.00
Total liabilities	5463168.00	5404463.00	5465273.00	5611245.00	5841582.00	6164587.00
Equity capital	2743000.00	2743000.00	2743000.00	2743000.00	2743000.00	2743000.00
Reserves, retained profit	0.00	172840.60	421256.60	754085.80	1171191.00	1672891.00
Profit	172840.60	248416.00	332829.10	417104.90	501699.80	593906.70
Long and medium term debt	2468700.00	2194400.00	1920100.00	1645800.00	1371500.00	1097200.00
Current liabilities	43900.83	45806.67	48087.50	51253.33	54191.67	57587.50
Bank overdraft, finance required.	34726.00	0.00	0.00	0.00	0.00	0.00
Total debt	2547327.00	2240207.00	1968188.00	1697053.00	1425692.00	1154788.00
Equity, % of liabilities	50.21	50.75	50.19	48.88	46.96	44.50

Projected Balance Sheets, Production in F$ (Fiji Dollars)

Year	1994	1995	1996	1997	1998	1999
Total assets	6577653.00	7084830.00	7679520.00	8377986.00	9421246.00	10525950.00
Fixed assets, net of depreciation	3665745.00	3383764.00	3101784.00	2819803.00	2537823.00	2255842.00
Construction in progress	0.00	0.00	0.00	0.00	0.00	0.00
Current assets	118700.20	124886.10	136495.60	148178.50	158852.60	171057.90
Cash, bank	24560.83	25296.67	26055.00	26835.83	27643.33	28471.67
Cash surplus, finance available	2768648.00	3550883.00	4415186.00	5383169.00	6696928.00	8070574.00
Loss carried forward	0.00	0.00	0.00	0.00	0.00	0.00
Loss	0.00	0.00	0.00	0.00	0.00	0.00
Total liabilities	6577653.00	7084830.00	7679520.00	8377987.00	9421246.00	10525950.00
Equity capital	2743000.00	2743000.00	2743000.00	2743000.00	2743000.00	2743000.00
Reserves, retained profit	2266799.00	2950993.00	3729376.00	4592645.00	5559654.00	6597639.00
Profit	684193.10	778383.30	863269.50	967008.90	1037985.00	1098683.00
Long and medium term debt	822900.00	548600.00	274300.00	0.00	0.00	0.00
Current liabilities	60760.83	63854.17	69574.16	75332.50	80607.50	86625.00
Bank overdraft, finance required.	0.00	0.00	0.00	0.00	0.00	0.00
Total debt	883660.80	612454.20	343874.20	75332.50	80607.50	86625.00
Equity, % of liabilities	41.70	38.72	35.72	32.74	29.12	26.06

Projected Balance Sheets, Production in F$ (Fiji Dollars)

Year	2000	2001	2002
Total assets	11692530.00	12931280.00	14235810.00
Fixed assets, net of depreciation	1973862.00	1691881.00	1409901.00
Construction in progress	0.00	0.00	0.00
Current assets	181281.40	186720.80	192323.70
Cash, bank	29326.67	30206.67	31113.33
Cash surplus, finance available	9508061.00	11022470.00	12602470.00
Loss carried forward	0.00	0.00	0.00
Loss	0.00	0.00	0.00
Total liabilities	11692530.00	12931280.00	14235810.00
Equity capital	2743000.00	2743000.00	2743000.00
Reserves, retained profit	7696322.00	8857843.00	10093840.00
Profit	1161521.00	1235993.00	1301700.00
Long and medium term debt	0.00	0.00	0.00
Current liabilities	91688.34	94440.00	97273.34
Bank overdraft, finance required.	0.00	0.00	0.00
Total debt	91688.34	94440.00	97273.34
Equity, % of liabilities	23.46	21.21	19.27

ANNEX Q

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LABASA STEAM TURBO-POWER PLANT
19th July 1986
Sales at FEA's generating price

1 year(s) of construction, 15 years of production
currency conversion rates:
foreign currency 1 unit = 1.1000 units accounting currency
local currency 1 unit = 1.0000 units accounting currency
accounting currency: F$ (Fiji Dollars)

Total initial investment during construction phase

fixed assets:	5639608.00	74.286 % foreign
current assets:	0.00	0.000 % foreign
total assets:	5639608.00	74.286 % foreign

Source of funds during construction phase

equity & grants:	2743000.00	0.000 % foreign
foreign loans :	0.00	
local loans :	2743000.00	
total funds :	5486000.00	0.000 % foreign

Cashflow from operations

Year:	4	5	6
operating costs:	628160.00	663810.00	704970.00
depreciation :	281980.40	281980.40	281980.40
interest :	215051.20	184329.60	153608.00
production costs	1125192.00	1130120.00	1140558.00
thereof foreign	18.62 %	18.54 %	18.37 %
total sales :	2108496.00	2274450.00	2458795.00
gross income :	983304.30	1144330.00	1318237.00
net income :	614565.10	715206.10	823898.00
cash balance :	618397.30	719266.10	827453.30
net cashflow :	1107749.00	1177896.00	1255361.00

Net Present Value at: 8.00 % = 6118681.00
Internal Rate of Return: 20.39 %
Return on equity1: 23.83 %
Return on equity2: 24.53 %

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LABASA STEAM TURBO-POWER PLANT
19th July 1986
Sales at FEA's generating price

1 year(s) of construction, 15 years of production
currency conversion rates:
foreign currency 1 unit = 1.1000 units accounting currency
local currency 1 unit = 1.0000 units accounting currency
accounting currency: F$ (Fiji Dollars)

Total initial investment during construction phase

fixed assets:	5639608.00	74.286 % foreign
current assets:	0.00	0.000 % foreign
total assets:	5639608.00	74.286 % foreign

Source of funds during construction phase

equity & grants:	2743000.00	0.000 % foreign
foreign loans :	0.00	
local loans :	2743000.00	
total funds :	5486000.00	0.000 % foreign

Cashflow from operations

Year:	7	8	9
operating costs:	743470.00	781010.00	850100.00
depreciation :	281980.40	281980.40	281980.40
interest :	122886.40	92164.80	61443.20
production costs	1148337.00	1155155.00	1193524.00
thereof foreign	18.24 %	18.13 %	17.55 %
total sales :	2640131.00	2825502.00	3029370.00
gross income :	1491794.00	1670346.00	1835846.00
net income :	932371.30	1043966.00	1147404.00
cash balance :	936151.30	1047819.00	1148436.00
net cashflow :	1333338.00	1414283.00	1484180.00

Net Present Value at: 8.00 % = 6113681.00
Internal Rate of Return: 20.39 %
Return on equity1: 23.83 %
Return on equity2: 24.53 %

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LABASA STEAM TURBO-POWER PLANT
19th July 1986
Sales at FEA's generating price

1 year(s) of construction, 15 years of production
currency conversion rates:
foreign currency 1 unit = 1.1000 units accounting currency
local currency 1 unit = 1.0000 units accounting currency
accounting currency: F$ (Fiji Dollars)

Total initial investment during construction phase

fixed assets:	5639608.00	74.286 % foreign
current assets:	0.00	0.000 % foreign
total assets:	5639608.00	74.286 % foreign

Source of funds during construction phase

equity & grants:	2743000.00	0.000 % foreign
foreign loans :	0.00	
local loans :	2743000.00	
total funds :	5486000.00	0.000 % foreign

Cashflow from operations

Year:	10	11	12
operating costs:	919650.00	983420.00	1056120.00
depreciation :	281980.40	281980.40	281980.40
interest :	0.00	0.00	0.00
production costs	1201630.00	1265400.00	1338100.00
thereof foreign	17.43 %	16.55 %	15.65 %
total sales :	3235597.00	3442296.00	3642753.00
gross income :	2033966.00	2176896.00	2304653.00
net income :	1271229.00	1360560.00	1440408.00
cash balance :	1272204.00	1636333.00	1715372.00
net cashflow :	1546504.00	1636333.00	1715372.00

Net Present Value at: 8.00 % = 6118681.00
Internal Rate of Return: 20.39 %
Return on equity1: 23.83 %
Return on equity2: 24.53 %

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Total initial investment	Cashflow Tables
Total investment during production	Projected Balance
Total production costs	Net income statement
Working Capital requirements	Source of finance

LABASA STEAM TURBO-POWER PLANT
19th July 1986
Sales at FEA's generating price

1 year(s) of construction, 15 years of production
currency conversion rates:
foreign currency 1 unit = 1.1000 units accounting currency
local currency 1 unit = 1.0000 units accounting currency
accounting currency: F$ (Fiji Dollars)

Total initial investment during construction phase

fixed assets:	5639608.00	74.286 % foreign
current assets:	0.00	0.000 % foreign
total assets:	5639608.00	74.286 % foreign

Source of funds during construction phase

equity & grants:	2743000.00	0.000 % foreign
foreign loans :	0.00	
local loans :	2743000.00	
total funds :	5486000.00	0.000 % foreign

Cashflow from operations

Year:	13	14	15
operating costs:	1117380.00	1150910.00	1185440.00
depreciation :	281980.40	281980.40	281980.40
interest :	0.00	0.00	0.00
production costs	1399360.00	1432890.00	1467420.00
thereof foreign	14.97 %	14.62 %	14.27 %
total sales :	3832561.00	4011625.00	4176920.00
gross income :	2433201.00	2578735.00	2709500.00
net income :	1520750.00	1611709.00	1693437.00
cash balance :	1796715.00	1890121.00	1971742.00
net cashflow :	1796715.00	1890121.00	1971742.00

Net Present Value at: 8.00 % = 6118681.00
Internal Rate of Return: 20.39 %
Return on equity1: 23.83 %
Return on equity2: 24.53 %

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Total initial investment	Cashflow Tables
Total investment during production	Projected Balance
Total production costs	Net income statement
Working Capital requirements	Source of finance

LABASA STEAM TURBO-POWER PLANT
19th July 1986
Sales at 90% of FEA's generating price

1 year(s) of construction, 15 years of production
currency conversion rates:
foreign currency 1 unit = 1.1000 units accounting currency
local currency 1 unit = 1.0000 units accounting currency
accounting currency: F$ (Fiji Dollars)

Total initial investment during construction phase

fixed assets:	5639608.00	74.286 % foreign
current assets:	0.00	0.000 % foreign
total assets:	5639608.00	74.286 % foreign

Source of funds during construction phase

equity & grants:	2743000.00	0.000 % foreign
foreign loans :	0.00	
local loans :	2743000.00	
total funds :	5486000.00	0.000 % foreign

Cashflow from operations

Year:	4	5	6
operating costs:	628160.00	663810.00	704970.00
depreciation :	281980.40	281980.40	281980.40
interest :	215051.20	184329.60	153608.00
production costs	1125192.00	1130120.00	1140558.00
thereof foreign	18.62 %	18.54 %	18.37 %
total sales :	1897308.00	2046120.00	2213473.00
gross income :	772116.80	915999.90	1072915.00
net income :	482573.00	572499.90	670571.80
cash balance :	486405.30	576559.80	674127.00
net cashflow :	975756.40	1035189.00	1102035.00

Net Present Value at: 8.00 % = 4720026.00
Internal Rate of Return: 17.87 %
Return on equity1: 19.71 %
Return on equity2: 20.77 %

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Total initial investment	Cashflow Tables
Total investment during production	Projected Balance
Total production costs	Net income statement
Working Capital requirements	Source of finance

LABASA STEAM TURBO-POWER PLANT
19th July 1986
Sales at 90% of FEA's generating price

1 year(s) of construction, 15 years of production
currency conversion rates:
foreign currency 1 unit = 1.1000 units accounting currency
local currency 1 unit = 1.0000 units accounting currency
accounting currency: F$ (Fiji Dollars)

Total initial investment during construction phase

fixed assets:	5639608.00	74.286 % foreign
current assets:	0.00	0.000 % foreign
total assets:	5639608.00	74.286 % foreign

Source of funds during construction phase

equity & grants:	2743000.00	0.000 % foreign
foreign loans :	0.00	
local loans :	2743000.00	
total funds :	5486000.00	0.000 % foreign

Cashflow from operations

Year:	7	8	9
operating costs:	743470.00	781010.00	850100.00
depreciation :	281980.40	281980.40	281980.40
interest :	122886.40	92164.80	61443.20
production costs	1148337.00	1155155.00	1193524.00
thereof foreign	18.24 %	18.13 %	17.55 %
total sales :	2374762.00	2541542.00	2725595.00
gross income :	1226425.00	1386386.00	1532071.00
net income :	766515.60	866491.40	957544.40
cash balance :	770295.60	870343.50	958576.80
net cashflow :	1167482.00	1236808.00	1294320.00

Net Present Value at: 8.00 % = 4720026.00
Internal Rate of Return: 17.87 %
Return on equity1: 19.71 %
Return on equity2: 20.77 %

Index of Schedules produced by COMFAR

Total initial investment	Cashflow Tables
Total investment during production	Projected Balance
Total production costs	Net income statement
Working Capital requirements	Source of finance

LABASA STEAM TURBO-POWER PLANT
19th July 1986
Sales at 90% of FEA's generating price

1 year(s) of construction, 15 years of production
currency conversion rates:
foreign currency 1 unit = 1.1000 units accounting currency
local currency 1 unit = 1.0000 units accounting currency
accounting currency: F$ (Fiji Dollars)

Total initial investment during construction phase

fixed assets:	5639608.00	74.286 % foreign
current assets:	0.00	0.000 % foreign
total assets:	5639608.00	74.286 % foreign

Source of funds during construction phase

equity & grants:	2743000.00	0.000 % foreign
foreign loans :	0.00	
local loans :	2743000.00	
total funds :	5486000.00	0.000 % foreign

Cashflow from operations

Year:	10	11	12
operating costs:	919650.00	983420.00	1056120.00
depreciation :	281980.40	281980.40	281980.40
interest :	0.00	0.00	0.00
production costs	1201630.00	1265400.00	1338100.00
thereof foreign	17.43 %	16.55 %	15.65 %
total sales :	2911820.00	3098964.00	3278247.00
gross income :	1710189.00	1833563.00	1940146.00
net income :	1068868.00	1145977.00	1212592.00
cash balance :	1069843.00	1421751.00	1487555.00
net cashflow :	1344143.00	1421751.00	1487555.00

Net Present Value at: 8.00 % = 4720026.00
Internal Rate of Return: 17.87 %
Return on equity1: 19.71 %
Return on equity2: 20.77 %

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Total initial investment	Cashflow Tables
Total investment during production	Projected Balance
Total production costs	Net income statement
Working Capital requirements	Source of finance

LABASA STEAM TURBO-POWER PLANT
19th July 1986
Sales at 90% of FEA's generating price

1 year(s) of construction, 15 years of production
currency conversion rates:
foreign currency 1 unit = 1.1000 units accounting currency
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Total initial investment during construction phase

fixed assets:	5639608.00	74.286 % foreign
current assets:	0.00	0.000 % foreign
total assets:	5639608.00	74.286 % foreign

Source of funds during construction phase

equity & grants:	2743000.00	0.000 % foreign
foreign loans :	0.00	
local loans :	2743000.00	
total funds :	5486000.00	0.000 % foreign

Cashflow from operations

Year:	13	14	15
operating costs:	1117380.00	1150910.00	1185440.00
depreciation :	281980.40	281980.40	281980.40
interest :	0.00	0.00	0.00
production costs	1399360.00	1432890.00	1467420.00
thereof foreign	14.57 %	14.62 %	14.27 %
total sales :	3448598.00	3609265.00	3758260.00
gross income :	2049238.00	2176375.00	2290840.00
net income :	1280774.00	1360234.00	1431775.00
cash balance :	1556739.00	1638646.00	1710079.00
net cashflow :	1556739.00	1638646.00	1710079.00

Net Present Value at: 8.00 % = 4720026.00
Internal Rate of Return: 17.87 %
Return on equity1: 19.71 %
Return on equity2: 20.77 %

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LABASA STEAM TURBO-POWER PLANT
19th July 1986
Sales at 85% of FEA's generating price

1 year(s) of construction, 15 years of production
currency conversion rates:
foreign currency 1 unit = 1.1000 units accounting currency
local currency 1 unit = 1.0000 units accounting currency
accounting currency: F$ (Fiji Dollars)

Total initial investment during construction phase

fixed assets:	5639608.00	74.286 % foreign
current assets:	0.00	0.000 % foreign
total assets:	5639608.00	74.286 % foreign

Source of funds during construction phase

equity & grants:	2743000.00	0.000 % foreign
foreign loans :	0.00	
local loans :	2743000.00	
total funds :	5486000.00	0.000 % foreign

Cashflow from operations

Year:	4	5	6
operating costs:	628160.00	663810.00	704970.00
depreciation :	281980.40	281980.40	281980.40
interest :	215051.20	184329.60	153608.00
production costs	1125192.00	1130120.00	1140558.00
thereof foreign	18.62 %	18.54 %	18.37 %
total sales :	1792559.00	1932840.00	2090812.00
gross income :	667367.90	802719.80	950253.90
net income :	417104.90	501699.80	593908.70
cash balance :	420937.00	505759.90	597463.90
net cashflow :	910298.30	964389.50	1025372.00

Net Present Value at: 8.00 % = 4022492.00
Internal Rate of Return: 16.56 %
Return on equity1: 17.56 %
Return on equity2: 18.85 %

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LABASA STEAM TURBO-POWER PLANT
19th July 1986
Sales at 85% of FEA's generating price

1 year(s) of construction, 15 years of production
currency conversion rates:
foreign currency 1 unit = 1.1000 units accounting currency
local currency 1 unit = 1.0000 units accounting currency
accounting currency: F$ (Fiji Dollars)

Total initial investment during construction phase

fixed assets:	5639608.00	74.286 % foreign
current assets:	0.00	0.000 % foreign
total assets:	5639608.00	74.286 % foreign

Source of funds during construction phase

equity & grants:	2743000.00	0.000 % foreign
foreign loans :	0.00	
local loans :	2743000.00	
total funds :	5486000.00	0.000 % foreign

Cashflow from operations

Year:	7	8	9
operating costs:	743470.00	781010.00	850100.00
depreciation :	281980.40	281980.40	281980.40
interest :	122886.40	92164.80	61443.20
production costs	1148337.00	1155155.00	1193524.00
thereof foreign	18.24 %	18.13 %	17.55 %
total sales :	2243046.00	2400569.00	2574755.00
gross income :	1094709.00	1245413.00	1381231.00
net income :	684193.10	778383.30	863269.50
cash balance :	687973.10	782235.40	864301.90
net cashflow :	1085160.00	1148700.00	1200045.00

Net Present Value at: 8.00 % = 4022492.00
Internal Rate of Return: 16.56 %
Return on equity1: 17.56 %
Return on equity2: 18.85 %

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Total initial investment	Cashflow Tables
Total investment during production	Projected Balance
Total production costs	Net income statement
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LABASA STEAM TURBO-POWER PLANT
19th July 1986
Sales at 85% of FEA's generating price

1 year(s) of construction, 15 years of production
currency conversion rates:
foreign currency 1 unit = 1.1000 units accounting currency
local currency 1 unit = 1.0000 units accounting currency
accounting currency: F$ (Fiji Dollars)

Total initial investment during construction phase

fixed assets:	5639608.00	74.286 % foreign
current assets:	0.00	0.000 % foreign
total assets:	5639608.00	74.286 % foreign

Source of funds during construction phase

equity & grants:	2743000.00	0.000 % foreign
foreign loans :	0.00	
local loans :	2743000.00	
total funds :	5486000.00	0.000 % foreign

Cashflow from operations

Year:	10	11	12
operating costs:	919650.00	983420.00	1056120.00
depreciation :	281980.40	281980.40	281980.40
interest :	0.00	0.00	0.00
production costs	1201630.00	1265400.00	1338100.00
thereof foreign	17.43 %	16.55 %	15.65 %
total sales :	2748845.00	2926176.00	3095994.00
gross income :	1547214.00	1660775.00	1757893.00
net income :	967008.90	1037985.00	1098683.00
cash balance :	967983.90	1313759.00	1373648.00
net cashflow :	1242284.00	1313759.00	1373648.00

Net Present Value at: 8.00 % = 4022492.00
Internal Rate of Return: 16.56 %
Return on equity1: 17.56 %
Return on equity2: 18.85 %

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Total initial investment	Cashflow Tables
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LABASA STEAM TURBO-POWER PLANT
19th July 1986
Sales at 85% of FEA's generating price

1 year(s) of construction, 15 years of production
currency conversion rates:
foreign currency 1 unit = 1.1000 units accounting currency
local currency 1 unit = 1.0000 units accounting currency
accounting currency: F$ (Fiji Dollars)

Total initial investment during construction phase

fixed assets:	5639608.00	74.286 % foreign
current assets:	0.00	0.000 % foreign
total assets:	5639608.00	74.286 % foreign

Source of funds during construction phase

equity & grants:	2743000.00	0.000 % foreign
foreign loans :	0.00	
local loans :	2743000.00	
total funds :	5486000.00	0.000 % foreign

Cashflow from operations

Year:	13	14	15
operating costs:	1117380.00	1150910.00	1185440.00
depreciation :	281980.40	281980.40	281980.40
interest :	0.00	0.00	0.00
production costs	1399360.00	1432890.00	1467420.00
thereof foreign	14.97 %	14.62 %	14.27 %
total sales :	3257795.00	3410480.00	3550140.00
gross income :	1858434.00	1977589.00	2082719.00
net income :	1161521.00	1235993.00	1301700.00
cash balance :	1437487.00	1514406.00	1580004.00
net cashflow :	1437487.00	1514406.00	1580004.00

Net Present Value at: 8.00 % = 4022492.00
Internal Rate of Return: 16.56 %
Return on equity1: 17.56 %
Return on equity2: 18.85 %

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FIJI FOREST INDUSTRIES LIMITED

SAWMILLERS AND TIMBER MERCHANTS

VENEER AND PLYWOOD MANUFACTURERS

TELEGRAMS "FORTIM"
TELEX : 8264 FIJI

P. O. Box 69, Labasa, Fiji

Telephone: Labasa 81088

18 April 1986

The Permanent Secretary for Lands, Energy
and Mineral Resources
Private Mail Bag
SUVA

Attention: Mrs S Siwatibau
Director of Energy

Dear Mrs Siwatibau,

re: Supply of Hogged Wood Waste for Seaqaqa Gasifier

Mr Evans is currently on leave and your letter has been passed to me for reply.

I have discussed the matter with the Manager of Fiji Forest Industries Mill at Malau and we confirm our willingness to supply hogged wood waste from our Malau Mill.

Provided that the hogged wood waste currently being produced is suitable without any further processing we estimate the cost to be $5 per cubic metre on a solid wood basis. As some capital expenditure would be required for additional discharge conveyors, storage bin loading clock etc. the proposal will need Board approval and a commitment to purchase over a period of several years to justify the expenditure.

As all our transport of logs etc is carried out by contractors and we are not sure of the weight to volume ratio of the hogged fuel we cannot accurately assess the transport cost but we assume it could be as low as $5 per cubic metre (solid basis) .

The quantity of 8 tonnes per day is no problem.

Malau Mill uses all commercial species of Indigenous species as well as quantities of Mahogany and some carribea Pine ex Seaqaqa.

Details as to densities etc can be obtained from the Ministry of Forests publication "Timbers of Fiji".

Moisture contents vary from Green to 12% m/c but should be assumed to be Green.

Yours faithfully,
FIJI FOREST INDUSTRIES LTD

J W Vale

LABASA STEAM TURBO-POWER PLANT
19th July 1986
Diesel price & rawmaterial plus 20%

1 year(s) of construction, 15 years of production
currency conversion rates:
foreign currency 1 unit = 1.1000 units accounting currency
local currency 1 unit = 1.0000 units accounting currency
accounting currency: F$ (Fiji Dollars)

Total initial investment during construction phase

fixed assets:	5639608.00	74.286 % foreign
current assets:	0.00	0.000 % foreign
total assets:	5639608.00	74.286 % foreign

Source of funds during construction phase

equity & grants:	2743000.00	0.000 % foreign
foreign loans :	0.00	
local loans :	2743000.00	
total funds :	5486000.00	0.000 % foreign

Cashflow from operations

Year:	1	2	3
operating costs:	595146.00	621310.00	652890.00
depreciation :	281980.40	281980.40	281980.40
interest :	307216.00	276494.40	245772.80
production costs	1184342.00	1179785.00	1180643.00
thereof foreign	17.69 %	17.76 %	17.74 %
total sales :	1651903.00	1786932.00	1941624.00
gross income :	467560.50	607147.00	760980.50
net income :	292225.30	379466.90	475612.80
cash balance :	233258.60	384408.40	480063.00
net cashflow :	814774.70	935202.80	1000136.00

Net Present Value at: 8.00 % = 5562822.00
Internal Rate of Return: 19.47 %
Return on equity1: 22.38 %
Return on equity2: 23.17 %

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Total initial investment	Cashflow Tables
Total investment during production	Projected Balance
Total production costs	Net income statement
Working Capital requirements	Source of finance

Net Income Statement in F$ (Fiji Dollars)

Year	1988	1989	1990	1991	1992
Total sales, incl. sales tax	1651903.00	1786932.00	1941624.00	2108496.00	2274450.00
Less: variable costs, incl. sales tax.	0.00	0.00	0.00	0.00	0.00
Variable margin	1651903.00	1786932.00	1941624.00	2108496.00	2274450.00
As % of total sales	100.00	100.00	100.00	100.00	100.00
Non-variable costs, incl. depreciation	877126.40	903290.40	934870.40	979188.30	1020286.00
Operational margin	774776.50	883641.40	1006753.00	1129308.00	1254163.00
As % of total sales	46.90	49.45	51.85	53.56	55.14
Cost of finance	307216.00	276494.40	245772.80	215051.20	184329.60
Gross profit	467560.50	607147.00	760980.50	914256.30	1069834.00
Allowances	0.00	0.00	0.00	0.00	0.00
Taxable profit	467560.50	607147.00	760980.50	914256.30	1069834.00
Tax	175335.20	227680.10	285367.70	342846.10	401187.60
Net profit	292225.30	379466.90	475612.80	571410.10	668646.10
Dividends paid	0.00	0.00	0.00	0.00	0.00
Undistributed profit	292225.30	379466.90	475612.80	571410.10	668646.10
Accumulated undistributed profit	292225.30	671692.20	1147305.00	1718715.00	2387361.00
Gross profit, % of total sales	28.30	33.98	39.19	43.36	47.04
Net profit, % of total sales	17.69	21.24	24.50	27.10	29.40
ROE, Net profit, % of equity	10.65	13.83	17.34	20.83	24.38
ROI, Net profit+interest, % of invest.	10.80	11.81	12.98	14.14	15.32

Net Income Statement in F$ (Fiji Dollars)

Year	1993	1994	1995	1996	1997
Total sales, incl. sales tax	2458795.00	2640131.00	2825502.00	3029370.00	3235597.00
Less: variable costs, incl. sales tax.	0.00	0.00	0.00	0.00	0.00
Variable margin	2458795.00	2640131.00	2825502.00	3029370.00	3235597.00
As % of total sales	100.00	100.00	100.00	100.00	100.00
Non-variable costs, incl. depreciation	1068202.00	1112320.00	1155681.00	1236630.00	1318140.00
Operational margin	1390593.00	1527810.00	1669821.00	1792739.00	1917456.00
As % of total sales	56.56	57.87	59.10	59.18	59.26
Cost of finance	153608.00	122886.40	92164.80	61443.20	0.00
Gross profit	1236985.00	1404924.00	1577656.00	1731296.00	1917456.00
Allowances	0.00	0.00	0.00	0.00	0.00
Taxable profit	1236985.00	1404924.00	1577656.00	1731296.00	1917456.00
Tax	463869.30	526846.50	591621.10	649236.10	719046.20
Net profit	773115.60	878077.50	986035.20	1082060.00	1198410.00
Dividends paid	0.00	0.00	0.00	0.00	0.00
Undistributed profit	773115.60	878077.50	986035.20	1082060.00	1198410.00
Accumulated undistributed profit	3160477.00	4038554.00	5024590.00	6106650.00	7305060.00
Gross profit, % of total sales	50.31	53.21	55.84	57.15	59.26
Net profit, % of total sales	31.44	33.26	34.90	35.72	37.04
ROE, Net profit, % of equity	28.19	32.01	35.95	39.45	43.69
ROI, Net profit+interest, % of invest.	16.63	17.95	19.32	20.46	21.42

Net Income Statement in F$ (Fiji Dollars)

Year	1998	1999	2000	2001	2002
Total sales, incl. sales tax	3442296.00	3642753.00	3832561.00	3906245.00	4065600.00
Less: variable costs, incl. sales tax.	0.00	0.00	0.00	0.00	0.00
Variable margin	3442296.00	3642753.00	3832561.00	3906245.00	4065600.00
As % of total sales	100.00	100.00	100.00	100.00	100.00
Non-variable costs, incl. depreciation	1392670.00	1477880.00	1549270.00	1620230.00	1683480.00
Operational margin	2049625.00	2164873.00	2283291.00	2286015.00	2382119.00
As % of total sales	59.54	59.43	59.58	58.52	58.59
Cost of finance	0.00	0.00	0.00	0.00	0.00
Gross profit	2049625.00	2164873.00	2283291.00	2286015.00	2382119.00
Allowances	0.00	0.00	0.00	0.00	0.00
Taxable profit	2049625.00	2164873.00	2283291.00	2286015.00	2382119.00
Tax	768609.50	811827.20	856233.90	857255.40	893294.60
Net profit	1281016.00	1353045.00	1427057.00	1428759.00	1488824.00
Dividends paid	0.00	0.00	0.00	0.00	0.00
Undistributed profit	1281016.00	1353045.00	1427057.00	1428759.00	1488824.00
Accumulated undistributed profit	8586076.00	9939121.00	11366180.00	12794940.00	14283760.00
Gross profit, % of total sales	59.54	59.43	59.56	58.52	58.59
Net profit, % of total sales	37.21	37.14	37.24	36.58	36.62
ROE, Net profit, % of equity	46.70	49.33	52.03	52.09	54.28
ROI, Net profit+interest, % of invest.	22.86	24.11	25.40	25.40	26.44

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local currency 1 unit = 1.0000 units accounting currency
accounting currency: F$ (Fiji Dollars)

Total initial investment during construction phase

fixed assets:	5639608.00	74.286 % foreign
current assets:	0.00	0.000 % foreign
total assets:	5639608.00	74.286 % foreign

Source of funds during construction phase

equity & grants:	2743000.00	0.000 % foreign
foreign loans :	0.00	
local loans :	2743000.00	
total funds :	5486000.00	0.000 % foreign

Cashflow from operations

Year:	1	2	3
operating costs:	623310.00	651010.00	684800.00
depreciation :	281980.40	281980.40	281980.40
interest :	307216.00	276494.40	245772.80
production costs	1212506.00	1209485.00	1212553.00
thereof foreign	17.28 %	17.32 %	17.28 %
total sales :	1651903.00	1786932.00	1941624.00
gross income :	439396.50	577447.00	729070.50
net income :	274622.80	360904.40	455669.10
cash balance :	213152.80	365709.40	459922.80
net cashflow :	794668.80	916503.80	979995.50

Net Present Value at: 8.00 % = 5357705.00
Internal Rate of Return: 19.07 %
Return on equity1: 21.72 %
Return on equity2: 22.55 %

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Total initial investment	Cashflow Tables
Total investment during production	Projected Balance
Total production costs	Net income statement
Working Capital requirements	Source of finance

Net Income Statement in F$ (Fiji Dollars)

Year	1988	1989	1990	1991	1992
Total sales, incl. sales tax	1651903.00	1786932.00	1941624.00	2108496.00	2274450.00
Less: variable costs, incl. sales tax.	0.00	0.00	0.00	0.00	0.00
Variable margin	1651903.00	1786932.00	1941624.00	2108496.00	2274450.00
As % of total sales	100.00	100.00	100.00	100.00	100.00
Non-variable costs, incl. depreciation	905290.40	932990.40	966780.40	1014040.00	1058030.00
Operational margin	746612.50	853941.40	974843.40	1094456.00	1216419.00
As % of total sales	45.20	47.79	50.21	51.91	53.48
Cost of finance	307216.00	276494.40	245772.80	215051.20	184329.60
Gross profit	439396.50	577447.00	729070.50	879404.30	1032090.00
Allowances	0.00	0.00	0.00	0.00	0.00
Taxable profit	439396.50	577447.00	729070.50	879404.30	1032090.00
Tax	164773.70	216542.60	273401.40	329776.60	387033.60
Net profit	274622.80	360904.40	455669.10	549627.60	645056.10
Dividends paid	0.00	0.00	0.00	0.00	0.00
Undistributed profit	274622.80	360904.40	455669.10	549627.60	645056.10
Accumulated undistributed profit	274622.80	635527.20	1091196.00	1640824.00	2285880.00
Gross profit, % of total sales	26.60	32.31	37.55	41.71	45.38
Net profit, % of total sales	16.62	20.20	23.47	26.07	28.36
ROE, Net profit, % of equity	10.01	13.16	16.61	20.04	23.52
ROI, Net profit+interest, % of invest.	10.47	11.47	12.61	13.74	14.99

Net Income Statement in F$ (Fiji Dollars)

Year	1993	1994	1995	1996	1997
Total sales, incl. sales tax	2458795.00	2640131.00	2825502.00	3029370.00	3235597.00
Less: variable costs, incl. sales tax.	0.00	0.00	0.00	0.00	0.00
Variable margin	2458795.00	2640131.00	2825502.00	3029370.00	3235597.00
As % of total sales	100.00	100.00	100.00	100.00	100.00
Non-variable costs, incl. depreciation	1109120.00	1156230.00	1202330.00	1289270.00	1376800.00
Operational margin	1349675.00	1483900.00	1623171.00	1740099.00	1858796.00
As % of total sales	54.89	56.21	57.45	57.44	57.45
Cost of finance	153608.00	122886.40	92164.80	61443.20	0.00
Gross profit	1196067.00	1361014.00	1531006.00	1678656.00	1858796.00
Allowances	0.00	0.00	0.00	0.00	0.00
Taxable profit	1196067.00	1361014.00	1531006.00	1678656.00	1858796.00
Tax	448525.10	510380.30	574127.40	629496.10	697048.60
Net profit	747541.80	850633.80	956879.00	1049160.00	1161748.00
Dividends paid	0.00	0.00	0.00	0.00	0.00
Undistributed profit	747541.80	850633.80	956879.00	1049160.00	1161748.00
Accumulated undistributed profit	3033422.00	3884056.00	4840935.00	5890095.00	7051842.00
Gross profit, % of total sales	48.64	51.55	54.19	55.41	57.45
Net profit, % of total sales	30.40	32.22	33.87	34.63	35.91
ROE, Net profit, % of equity	27.25	31.01	34.88	38.25	42.35
ROI, Net profit+interest, % of invest.	16.16	17.45	18.78	19.86	20.74

Net Income Statement in F$ (Fiji Dollars)

Year	1998	1999	2000	2001	2002
Total sales, incl. sales tax	3442296.00	3642753.00	3832561.00	4011625.00	4176920.00
Less: variable costs, incl. sales tax.	0.00	0.00	0.00	0.00	0.00
Variable margin	3442296.00	3642753.00	3832561.00	4011625.00	4176920.00
As % of total sales	100.00	100.00	100.00	100.00	100.00
Non-variable costs, incl. depreciation	1456710.00	1547100.00	1624450.00	1700790.00	1768110.00
Operational margin	1985585.00	2095652.00	2208111.00	2310835.00	2408810.00
As % of total sales	57.68	57.53	57.61	57.60	57.67
Cost of finance	0.00	0.00	0.00	0.00	0.00
Gross profit	1985585.00	2095652.00	2208111.00	2310835.00	2408810.00
Allowances	0.00	0.00	0.00	0.00	0.00
Taxable profit	1985585.00	2095652.00	2208111.00	2310835.00	2408810.00
Tax	744594.50	785869.70	828041.40	866562.90	903303.60
Net profit	1240991.00	1309783.00	1380069.00	1444272.00	1505506.00
Dividends paid	0.00	0.00	0.00	0.00	0.00
Undistributed profit	1240991.00	1309783.00	1380069.00	1444272.00	1505506.00
Accumulated undistributed profit	8292833.00	9602616.00	10982690.00	12426960.00	13932460.00
Gross profit, % of total sales	57.68	57.53	57.61	57.60	57.67
Net profit, % of total sales	36.05	35.96	36.01	36.00	36.04
ROE, Net profit, % of equity	45.24	47.75	50.31	52.65	54.89
ROI, Net profit+interest, % of invest.	22.13	23.32	24.53	25.64	26.70

LABASA STEAM TURBO-POWER PLANT
19th July 1986
90% diesel price & rawmaterial plus 20%

1 year(s) of construction, 15 years of production
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foreign currency 1 unit = 1.1000 units accounting currency
local currency 1 unit = 1.0000 units accounting currency
accounting currency: F$ (Fiji Dollars)

Total initial investment during construction phase

fixed assets:	5639608.00	74.286 % foreign
current assets:	0.00	0.000 % foreign
total assets:	5639608.00	74.286 % foreign

Source of funds during construction phase

equity & grants:	2743000.00	0.000 % foreign
foreign loans :	0.00	
local loans :	2743000.00	
total funds :	5486000.00	0.000 % foreign

Cashflow from operations

Year:	1	2	3
operating costs:	595146.00	621310.00	651200.00
depreciation :	281980.40	281980.40	281980.40
interest :	307216.00	276494.40	245772.80
production costs	1184342.00	1179785.00	1178953.00
thereof foreign	17.69 %	17.76 %	17.77 %
total sales :	1487002.00	1607631.00	1747782.00
gross income :	302659.50	427846.10	568828.60
net income :	189162.20	267403.80	355517.90
cash balance :	130195.60	272345.30	360118.10
net cashflow :	711711.70	823139.60	880190.90

Net Present Value at: 8.00 % = 4209376.00
Internal Rate of Return: 16.94 %
Return on equity1: 18.22 %
Return on equity2: 19.41 %

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Total initial investment	Cashflow Tables
Total investment during production	Projected Balance
Total production costs	Net income statement
Working Capital requirements	Source of finance

Net Income Statement in F$ (Fiji Dollars)

Year	1988	1989	1990	1991	1992
Total sales, incl. sales tax	1487002.00	1607631.00	1747782.00	1897308.00	2046120.00
Less: variable costs, incl. sales tax.	0.00	0.00	0.00	0.00	0.00
Variable margin	1487002.00	1607631.00	1747782.00	1897308.00	2046120.00
As % of total sales	100.00	100.00	100.00	100.00	100.00
Non-variable costs, incl. depreciation	877126.40	903290.40	933180.40	979190.30	1020280.00
Operational margin	609875.50	704340.50	814601.50	918118.00	1025840.00
As % of total sales	41.01	43.81	46.61	48.39	50.14
Cost of finance	307216.00	276494.40	245772.80	215051.20	184329.60
Gross profit	302659.50	427846.10	568828.60	703066.80	841509.90
Allowances	0.00	0.00	0.00	0.00	0.00
Taxable profit	302659.50	427846.10	568828.60	703066.80	841509.90
Tax	113497.30	160442.30	213310.70	263650.00	315566.20
Net profit	189162.20	267403.80	355517.90	439416.70	525943.70
Dividends paid	0.00	0.00	0.00	0.00	0.00
Undistributed profit	189162.20	267403.80	355517.90	439416.70	525943.70
Accumulated undistributed profit	189162.20	456566.00	812083.90	1251501.00	1777444.00
Gross profit, % of total sales	20.35	26.61	32.55	37.06	41.13
Net profit, % of total sales	12.72	16.63	20.34	23.16	25.70
ROE, Net profit, % of equity	6.90	9.75	12.96	16.02	19.17
ROI, Net profit+interest, % of invest.	8.94	9.79	10.82	11.76	12.76

Net Income Statement in F$ (Fiji Dollars)

Year	1993	1994	1995	1996	1997
Total sales, incl. sales tax	2213473.00	2374762.00	2541542.00	2725595.00	2911820.00
Less: variable costs, incl. sales tax.	0.00	0.00	0.00	0.00	0.00
Variable margin	2213473.00	2374762.00	2541542.00	2725595.00	2911820.00
As % of total sales	100.00	100.00	100.00	100.00	100.00
Non-variable costs, incl. depreciation	1068202.00	1112322.00	1155681.00	1236630.00	1318140.00
Operational margin	1145271.00	1262439.00	1385861.00	1488964.00	1593679.00
As % of total sales	51.74	53.16	54.53	54.63	54.73
Cost of finance	153608.00	122886.40	92164.80	61443.20	0.00
Gross profit	991662.90	1139553.00	1293696.00	1427521.00	1593679.00
Allowances	0.00	0.00	0.00	0.00	0.00
Taxable profit	991662.90	1139553.00	1293696.00	1427521.00	1593679.00
Tax	371873.60	427332.40	485136.10	535320.30	597629.80
Net profit	619789.30	712220.60	808560.10	892200.60	996049.60
Dividends paid	0.00	0.00	0.00	0.00	0.00
Undistributed profit	619789.30	712220.60	808560.10	892200.60	996049.60
Accumulated undistributed profit	2397234.00	3109454.00	3918014.00	4810215.00	5806264.00
Gross profit, % of total sales	44.80	47.99	50.90	52.37	54.73
Net profit, % of total sales	28.00	29.99	31.81	32.73	34.21
ROE, Net profit, % of equity	22.60	25.97	29.48	32.53	36.31
ROI, Net profit+interest, % of invest.	13.88	14.98	16.14	17.07	17.80

Net Income Statement in F$ (Fiji Dollars)

Year	1998	1999	2000	2001	2002
Total sales, incl. sales tax	3098964.00	3278247.00	3448598.00	3609265.00	3758260.00
Less: variable costs, incl. sales tax.	0.00	0.00	0.00	0.00	0.00
Variable margin	3098964.00	3278247.00	3448598.00	3609265.00	3758260.00
As % of total sales	100.00	100.00	100.00	100.00	100.00
Non-variable costs, incl. depreciation	1392670.00	1477880.00	1549260.00	1620230.00	1683480.00
Operational margin	1706293.00	1800366.00	1899338.00	1989034.00	2074779.00
As % of total sales	55.06	54.92	55.08	55.11	55.21
Cost of finance	0.00	0.00	0.00	0.00	0.00
Gross profit	1706293.00	1800366.00	1899338.00	1989034.00	2074779.00
Allowances	0.00	0.00	0.00	0.00	0.00
Taxable profit	1706293.00	1800366.00	1899338.00	1989034.00	2074779.00
Tax	639860.00	675137.40	712251.70	745887.90	778042.30
Net profit	1066433.00	1125229.00	1187086.00	1243147.00	1296737.00
Dividends paid	0.00	0.00	0.00	0.00	0.00
Undistributed profit	1066433.00	1125229.00	1187086.00	1243147.00	1296737.00
Accumulated undistributed profit	6872698.00	7997927.00	9185013.00	10428160.00	11724900.00
Gross profit, % of total sales	55.06	54.92	55.08	55.11	55.21
Net profit, % of total sales	34.41	34.32	34.42	34.44	34.50
ROE, Net profit, % of equity	38.88	41.02	43.28	45.32	47.27
ROI, Net profit+interest, % of invest.	19.03	20.05	21.13	22.10	23.03

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current assets:	0.00	0.000 % foreign
total assets:	5639608.00	74.286 % foreign

Source of funds during construction phase

equity & grants:	2743000.00	0.000 % foreign
foreign loans :	0.00	
local loans :	2743000.00	
total funds :	5486000.00	0.000 % foreign

Cashflow from operations

Year:	1	2	3
operating costs:	623310.00	651010.00	684800.00
depreciation :	281980.40	281980.40	281980.40
interest :	307216.00	276494.40	245772.80
production costs	1212506.00	1209485.00	1212553.00
thereof foreign	17.28 %	17.32 %	17.28 %
total sales :	1487002.00	1607631.00	1747782.00
gross income :	274495.50	398146.10	535228.60
net income :	171559.70	248841.30	334517.90
cash balance :	110089.60	253646.30	338771.50
net cashflow :	691605.60	804440.60	858844.30

Net Present Value at: 8.00 % = 3959053.00
Internal Rate of Return: 16.47 %
Return on equity1: 17.46 %
Return on equity2: 18.72 %

Index of Schedules produced by COMFAR

Total initial investment	Cashflow Tables
Total investment during production	Projected Balance
Total production costs	Net income statement
Working Capital requirements	Source of finance

Net Income Statement in F$ (Fiji Dollars)

Year	1988	1989	1990	1991	1992
Total sales, incl. sales tax	1487002.00	1607631.00	1747782.00	1897308.00	2046120.00
Less: variable costs, incl. sales tax.	0.00	0.00	0.00	0.00	0.00
Variable margin	1487002.00	1607631.00	1747782.00	1897308.00	2046120.00
As % of total sales	100.00	100.00	100.00	100.00	100.00
Non-variable costs, incl. depreciation	905290.40	932990.40	966780.40	1014040.00	1058030.00
Operational margin	581711.50	674640.50	781001.50	883268.00	988089.50
As % of total sales	39.12	41.96	44.69	46.55	48.29
Cost of finance	307216.00	276494.40	245772.80	215051.20	184329.60
Gross profit	274495.50	398146.10	535228.60	668216.80	803759.90
Allowances	0.00	0.00	0.00	0.00	0.00
Taxable profit	274495.50	398146.10	535228.60	668216.80	803759.90
Tax	102935.80	149304.80	200710.70	250581.30	301410.00
Net profit	171559.70	248841.30	334517.90	417635.50	502349.90
Dividends paid	0.00	0.00	0.00	0.00	0.00
Undistributed profit	171559.70	248841.30	334517.90	417635.50	502349.90
Accumulated undistributed profit	171559.70	420401.00	754918.90	1172554.00	1674904.00
Gross profit, % of total sales	18.46	24.77	30.62	35.22	39.28
Net profit, % of total sales	11.54	15.48	19.14	22.01	24.55
ROE, Net profit, % of equity	6.25	9.07	12.20	15.23	18.31
ROI, Net profit+interest, % of invest.	8.62	9.45	10.43	11.37	12.33

Net Income Statement in F$ (Fiji Dollars)

Year	1993	1994	1995	1996	1997
Total sales, incl. sales tax	2213473.00	2374762.00	2541542.00	2725595.00	2911820.00
Less: variable costs, incl. sales tax.	0.00	0.00	0.00	0.00	0.00
Variable margin	2213473.00	2374762.00	2541542.00	2725595.00	2911820.00
As % of total sales	100.00	100.00	100.00	100.00	100.00
Non-variable costs, incl. depreciation	1109120.00	1156230.00	1202330.00	1289270.00	1376800.00
Operational margin	1104353.00	1218531.00	1339211.00	1436324.00	1535019.00
As % of total sales	49.89	51.31	52.69	52.70	52.72
Cost of finance	153608.00	122886.40	92164.80	61443.20	0.00
Gross profit	950744.90	1095645.00	1247046.00	1374881.00	153501[illegible]
Allowances	0.00	0.00	0.00	0.00	0.00
Taxable profit	950744.90	1095645.00	1247046.00	1374881.00	1535019.00
Tax	356529.30	410366.90	467642.40	515580.30	575632.30
Net profit	594215.60	684776.10	779404.00	859300.60	959387.10
Dividends paid	0.00	0.00	0.00	0.00	0.00
Undistributed profit	594215.60	684778.10	779404.00	859300.60	959387.10
Accumulated undistributed profit	2269120.00	2953898.00	3733302.00	4592603.00	5551990.00
Gross profit, % of total sales	42.95	46.14	49.07	50.44	52.72
Net profit, % of total sales	26.85	28.84	30.67	31.53	32.95
ROE, Net profit, % of equity	21.66	24.96	28.41	31.33	34.93
ROI, Net profit+interest, % of invest.	13.41	14.47	15.61	16.46	17.13

Net Income Statement in F$ (Fiji Dollars)

Year	1998	1999	2000	2001	2002
Total sales, incl. sales tax	3098964.00	3278247.00	3448598.00	3609265.00	3758260.00
Less: variable costs, incl. sales tax.	0.00	0.00	0.00	0.00	0.00
Variable margin	3098964.00	3278247.00	3448598.00	3609265.00	3758260.00
As % of total sales	100.00	100.00	100.00	100.00	100.00
Non-variable costs, incl. depreciation	1456710.00	1547100.00	1624450.00	1700790.00	1768110.00
Operational margin	1642253.00	1731146.00	1824148.00	1908474.00	1990149.00
As % of total sales	52.99	52.81	52.90	52.88	52.95
Cost of finance	0.00	0.00	0.00	0.00	0.00
Gross profit	1642253.00	1731146.00	1824148.00	1908474.00	1990149.00
Allowances	0.00	0.00	0.00	0.00	0.00
Taxable profit	1642253.00	1731146.00	1824148.00	1908474.00	1990149.00
Tax	615845.00	649179.90	684055.40	715677.90	746306.00
Net profit	1026408.00	1081967.00	1140093.00	1192797.00	1243843.00
Dividends paid	0.00	0.00	0.00	0.00	0.00
Undistributed profit	1026408.00	1081967.00	1140093.00	1192797.00	1243843.00
Accumulated undistributed profit	6578398.00	[illegible]660365.00	8800457.00	9993254.00	11237100.00
Gross profit, % of total sales	52.99	52.81	52.90	52.88	52.95
Net profit, % of total sales	33.12	33.00	33.06	33.05	33.10
ROE, Net profit, % of equity	37.42	39.44	41.56	43.49	45.35
ROI, Net profit+interest, % of invest.	18.30	19.26	20.27	21.18	22.06

LABASA STEAM TURBO-POWER PLANT
19th July 1986
85% diesel price & rawmaterial plus 20%

1 year(s) of construction, 15 years of production
currency conversion rates:
foreign currency 1 unit = 1.1000 units accounting currency
local currency 1 unit = 1.0000 units accounting currency
accounting currency: F$ (Fiji Dollars)

Total initial investment during construction phase

fixed assets:	5639608.00	74.286 % foreign
current assets:	0.00	0.000 % foreign
total assets:	5639608.00	74.286 % foreign

Source of funds during construction phase

equity & grants:	2743000.00	0.000 % foreign
foreign loans :	0.00	
local loans :	2743000.00	
total funds :	5486000.00	0.000 % foreign

Cashflow from operations

Year:	1	2	3
operating costs:	595146.00	621310.00	652890.00
depreciation :	281980.40	281980.40	281980.40
interest :	307216.00	276494.40	245772.80
production costs	1184342.00	1179785.00	1180643.00
thereof foreign	17.69 %	17.76 %	17.74 %
total sales :	1404551.00	1517980.00	1650060.00
gross income :	220209.00	338195.60	469416.60
net income :	137630.60	211372.30	293385.40
cash balance :	78664.13	216313.60	297835.40
net cashflow :	660180.10	767108.00	817908.10

Net Present Value at: 8.00 % = 3510988.00
Internal Rate of Return: 15.60 %
Return on equity1: 16.00 %
Return on equity2: 17.46 %

Index of Schedules produced by COMFAR

Total initial investment	Cashflow Tables
Total investment during production	Projected Balance
Total production costs	Net income statement
Working Capital requirements	Source of finance

Net Income Statement in F$ (Fiji Dollars)

Year	1988	1989	1990	1991	1992
Total sales, incl. sales tax	1404551.00	1517980.00	1650060.00	1792559.00	1932840.00
Less: variable costs, incl. sales tax.	0.00	0.00	0.00	0.00	0.00
Variable margin	1404551.00	1517980.00	1650060.00	1792559.00	1932840.00
As % of total sales	100.00	100.00	100.00	100.00	100.00
Non-variable costs, incl. depreciation	877126.40	903290.40	934870.40	979188.30	1020286.00
Operational margin	527425.00	614690.00	715189.50	813371.10	912553.40
As % of total sales	37.55	40.49	43.34	45.37	47.21
Cost of finance	307216.00	276494.40	245772.80	215051.20	184329.60
Gross profit	220209.00	338195.60	469416.60	598319.90	728223.80
Allowances	0.00	0.00	0.00	0.00	0.00
Taxable profit	220209.00	338195.60	469416.60	598319.90	728223.80
Tax	82578.38	126823.40	176031.20	224370.00	273083.90
Net profit	137630.60	211372.30	293385.40	373949.90	455139.80
Dividends paid	0.00	0.00	0.00	0.00	0.00
Undistributed profit	137630.60	211372.30	293385.40	373949.90	455139.80
Accumulated undistributed profit	137630.60	349002.90	642388.30	1016338.00	1471478.00
Gross profit, % of total sales	15.68	22.28	28.45	33.38	37.68
Net profit, % of total sales	9.80	13.92	17.78	20.86	23.55
ROE, Net profit, % of equity	5.02	7.71	10.70	13.63	16.59
ROI, Net profit+interest, % of invest.	8.01	8.78	9.70	10.59	11.49

Net Income Statement in F$ (Fiji Dollars)

Year	1993	1994	1995	1996	1997
Total sales, incl. sales tax	2090812.00	2243046.00	2400569.00	2574755.00	2748845.00
Less: variable costs, incl. sales tax.	0.00	0.00	0.00	0.00	0.00
Variable margin	2090812.00	2243046.00	2400569.00	2574755.00	2748845.00
As % of total sales	100.00	100.00	100.00	100.00	100.00
Non-variable costs, incl. depreciation	1068202.00	1112320.00	1155681.00	1236630.00	1318140.00
Operational margin	1022610.00	1130725.00	1244888.00	1338124.00	1430704.00
As % of total sales	48.91	50.41	51.86	51.97	52.05
Cost of finance	153608.00	122886.40	92164.80	61443.20	0.00
Gross profit	869001.90	1007839.00	1152723.00	1276681.00	1430704.00
Allowances	0.00	0.00	0.00	0.00	0.00
Taxable profit	869001.90	1007839.00	1152723.00	1276681.00	1430704.00
Tax	325875.70	377939.60	432271.20	478755.40	536514.10
Net profit	543126.20	629899.40	720452.10	797925.70	894190.10
Dividends paid	0.00	0.00	0.00	0.00	0.00
Undistributed profit	543126.20	629899.40	720452.10	797925.70	894190.10
Accumulated undistributed profit	2014604.00	2644504.00	3364956.00	4162881.00	5057072.00
Gross profit, % of total sales	41.56	44.93	48.02	49.58	52.05
Net profit, % of total sales	25.98	28.08	30.01	30.99	32.53
ROE, Net profit, % of equity	19.80	22.96	26.27	29.09	32.60
ROI, Net profit+interest, % of invest.	12.50	13.50	14.56	15.38	15.98

Net Income Statement in F$ (Fiji Dollars)

Year	1998	1999	2000	2001	2002
Total sales, incl. sales tax	2926176.00	3095994.00	3257795.00	3410480.00	3550140.00
Less: variable costs, incl. sales tax.	0.00	0.00	0.00	0.00	0.00
Variable margin	2926176.00	3095994.00	3257795.00	3410480.00	3550140.00
As % of total sales	100.00	100.00	100.00	100.00	100.00
Non-variable costs, incl. depreciation	1392670.00	1477880.00	1549270.00	1620230.00	1683480.00
Operational margin	1533505.00	1618113.00	1708524.00	1790249.00	1866659.00
As % of total sales	52.41	52.26	52.44	52.49	52.58
Cost of finance	0.00	0.00	0.00	0.00	0.00
Gross profit	1533505.00	1618113.00	1708524.00	1790249.00	1866659.00
Allowances	0.00	0.00	0.00	0.00	0.00
Taxable profit	1533505.00	1618113.00	1708524.00	1790249.00	1866659.00
Tax	575064.50	606792.50	640696.60	671343.40	699997.20
Net profit	958440.90	1011321.00	1067828.00	1118906.00	1166662.00
Dividends paid	0.00	0.00	0.00	0.00	0.00
Undistributed profit	958440.90	1011321.00	1067828.00	1118906.00	1166662.00
Accumulated undistributed profit	6015513.00	7026834.00	8094661.00	9213567.00	10380230.00
Gross profit, % of total sales	52.41	52.26	52.44	52.49	52.58
Net profit, % of total sales	32.75	32.67	32.78	32.81	32.86
ROE, Net profit, % of equity	34.94	36.87	38.93	40.79	42.53
ROI, Net profit+interest, % of invest.	17.11	18.02	19.01	19.89	20.72

LABASA STEAM TURBO-POWER PLANT
19th July 1986
85% diesel price & rawmaterial plus 30%

1 year(s) of construction, 15 years of production
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foreign currency 1 unit = 1.1000 units accounting currency
local currency 1 unit = 1.0000 units accounting currency
accounting currency: F$ (Fiji Dollars)

Total initial investment during construction phase

fixed assets:	5639608.00	74.286 % foreign
current assets:	0.00	0.000 % foreign
total assets:	5639608.00	74.286 % foreign

Source of funds during construction phase

equity & grants:	2743000.00	0.000 % foreign
foreign loans :	0.00	
local loans :	2743000.00	
total funds :	5486000.00	0.000 % foreign

Cashflow from operations

Year:	1	2	3
operating costs:	623310.00	651010.00	684800.00
depreciation :	281980.40	281980.40	281980.40
interest :	307216.00	276494.40	245772.80
production costs	1212506.00	1209485.00	1212553.00
thereof foreign	17.28 %	17.32 %	17.28 %
total sales :	1404551.00	1517980.00	1650060.00
gross income :	192045.00	308495.60	437506.60
net income :	120028.10	192809.80	273441.60
cash balance :	58558.13	197614.60	277695.30
net cashflow :	640074.20	748409.00	797768.00

Net Present Value at: 8.00 % = 3261515.00
Internal Rate of Return: 15.11 %
Return on equity1: 15.21 %
Return on equity2: 16.76 %

Index of Schedules produced by COMFAR

Net Income Statement in F$ (Fiji Dollars)

Year	1988	1989	1990	1991	1992
Total sales, incl. sales tax	1404551.00	1517980.00	1650060.00	1792559.00	1932840.00
Less: variable costs, incl. sales tax.	0.00	0.00	0.00	0.00	0.00
Variable margin	1404551.00	1517980.00	1650060.00	1792559.00	1932840.00
As % of total sales	100.00	100.00	100.00	100.00	100.00
Non-variable costs, incl. depreciation	905290.40	932990.40	966780.40	1014040.00	1058030.00
Operational margin	499261.00	584990.00	683279.50	778519.10	874809.40
As % of total sales	35.55	38.54	41.41	43.43	45.26
Cost of finance	307216.00	276494.40	245772.80	215051.20	184329.60
Gross profit	192045.00	308495.60	437506.60	563467.90	690479.80
Allowances	0.00	0.00	0.00	0.00	0.00
Taxable profit	192045.00	308495.60	437506.60	563467.90	690479.80
Tax	72016.88	115685.90	164065.00	211300.50	258929.90
Net profit	120028.10	192809.80	273441.60	352167.40	431549.80
Dividends paid	0.00	0.00	0.00	0.00	0.00
Undistributed profit	120028.10	192809.80	273441.60	352167.40	431549.80
Accumulated undistributed profit	120028.10	312837.90	586279.50	938446.90	1369997.00
Gross profit, % of total sales	13.67	20.32	26.51	31.43	35.72
Net profit, % of total sales	8.55	12.70	16.57	19.65	22.33
ROE, Net profit, % of equity	4.38	7.03	9.97	12.84	15.73
ROI, Net profit+interest, % of invest.	7.69	8.44	9.34	10.19	11.06

Net Income Statement in F$ (Fiji Dollars)

Year	1993	1994	1995	1996	1997
Total sales, incl. sales tax	2090812.00	2243046.00	2400569.00	2574755.00	2748845.00
Less: variable costs, incl. sales tax.	0.00	0.00	0.00	0.00	0.00
Variable margin	2090812.00	2243046.00	2400569.00	2574755.00	2748845.00
As % of total sales	100.00	100.00	100.00	100.00	100.00
Non-variable costs, incl. depreciation	1109120.00	1156230.00	1202330.00	1289270.00	1376800.00
Operational margin	981691.90	1086815.00	1198238.00	1285484.00	1372044.00
As % of total sales	46.95	48.45	49.91	49.93	49.91
Cost of finance	153608.00	122886.40	92164.80	61443.20	0.00
Gross profit	828083.90	963929.00	1106073.00	1224041.00	1372044.00
Allowances	0.00	0.00	0.00	0.00	0.00
Taxable profit	828083.90	963929.00	1106073.00	1224041.00	1372044.00
Tax	310531.50	361473.40	414777.50	459015.40	514516.50
Net profit	517552.40	602455.60	691295.90	765025.70	857527.60
Dividends paid	0.00	0.00	0.00	0.00	0.00
Undistributed profit	517552.40	602455.60	691295.90	765025.70	857527.60
Accumulated undistributed profit	1887549.00	2490005.00	3181301.00	3946326.00	4803854.00
Gross profit, % of total sales	39.61	42.97	46.08	47.54	49.91
Net profit, % of total sales	24.75	26.86	28.80	29.71	31.20
ROE, Net profit, % of equity	18.87	21.96	25.20	27.89	31.26
ROI, Net profit+interest, % of invest.	12.04	13.00	14.03	14.78	15.31

Net Income Statement in F$ (Fiji Dollars)

Year	1998	1999	2000	2001	2002
Total sales, incl. sales tax	2926176.00	3095994.00	3257795.00	3410480.00	3550140.00
Less: variable costs, incl. sales tax.	0.00	0.00	0.00	0.00	0.00
Variable margin	2926176.00	3095994.00	3257795.00	3410480.00	3550140.00
As % of total sales	100.00	100.00	100.00	100.00	100.00
Non-variable costs, incl. depreciation	1456710.00	1547100.00	1624450.00	1700790.00	1768110.00
Operational margin	1469465.00	1548893.00	1633344.00	1709689.00	1782029.00
As % of total sales	50.22	50.03	50.14	50.13	50.20
Cost of finance	0.00	0.00	0.00	0.00	0.00
Gross profit	1469465.00	1548893.00	1633344.00	1709689.00	1782029.00
Allowances	0.00	0.00	0.00	0.00	0.00
Taxable profit	1469465.00	1548893.00	1633344.00	1709689.00	1782029.00
Tax	551049.50	580835.00	612504.10	641133.40	668260.90
Net profit	918415.90	968058.40	1020840.00	1068556.00	1113768.00
Dividends paid	0.00	0.00	0.00	0.00	0.00
Undistributed profit	918415.90	968058.40	1020840.00	1068556.00	1113768.00
Accumulated undistributed profit	5722270.00	6690329.00	7711169.00	8779724.00	9893492.00
Gross profit, % of total sales	50.22	50.03	50.14	50.13	50.20
Net profit, % of total sales	31.39	31.27	31.34	31.33	31.37
ROE, Net profit, % of equity	33.48	35.29	37.22	38.96	40.60
ROI, Net profit+interest, % of invest.	16.37	17.23	18.15	18.97	19.75