DETAILED PROJECT REPORT (DPR)

ON

GREEN FIELD SUGAR PROJECT OF 3500 TCD ALONGWITH 15 MW COGENERATION

FOR

A SUGAR MILL

MAHARASHATRA

CONTENTS

List of Abbreviations	
APH	Air Pre Heater
CCP	Captive Cogeneration Plant
CPM / PERT	Critical Path Method / Program Evaluation & Review Technique
CPP	Captive Power Plant
DCS	Distributed Control System
DM	De-Mineralised
DPR	Detailed Project Report
EHV	Extra High Voltage
ESP	Electro Static Precipitator
ETP	Effluent Treatment Plant
FIs	Financial Institutions
GSC	Gland Steam Condenser
KPCB	Karnataka Pollution Control Board
HP	High Pressure
HT / LT	High Transmission / Low Transmission
KV	Kilo Volt
KW	Kilo Watt
LP	Low Pressure
MCC	Motor Control centre
MNRE	Ministry of New & Renewable Energy
MP	Medium Pressure
MT	Metric Tonnes
MU	Million Unit
MW	Mega Watt
PLC	Programmable Logic Control
PRDSH	Pressure Reducing & De-Super Heating Station
SA / PA / FD / ID	Secondary Air / Primary Air / Forced Draft / Induced Draft
SJAE	Steam Jet Air Ejector
TCD	Tonnes Crushed Per Day
TCH	Tonnes Crushed Per Hour
TG	Turbine Generator
TPH	Tonnes Per Hour
SDF	Sugar Development Fund
FRP	Fair and Remunerative Price

PROJECT AT A GLANCE

1.	Name and Address	:	ABC Sugar Mill, Maharashtra
2.	Constitution	:	Cooperative
3.	Proposed Project	:	Green field Sugar Project 3500TCD along with 15 MW Co-generation.
4.	Cane crushing capacity	:	3500 TCD
5.	Average bagasse percentage on cane	:	28%
	Available bagasse for use as fuel	:	27.2%
6	Process steam consumption on cane for sugar plant (2.5 ata)	:	42%
7.	Misc. steam consumption on cane for sugar plant (8 ata)	:	2%
8.	No. of days of plant operation :-		
	- Crushing season	:	160
	- Off-season	:	Nil
9.	Proposed boiler	:	One 90 TPH capacity, 87 ata pressure, 515oC
10.	Fuels used for the Boiler:-		
	- Season	:	Bagasse from sugar mill
11.	Proposed Turbo generator set	:	One matching 15 MW Extraction cum Back Pressure type
12.	Gross power generation : -		
	- Crushing season (MW)	:	14.011
13.	Captive power consumption (sugar plant including boiler) :-		
	-Crushing season (MW)	:	4.990
14.	Net exportable power at 33 KV to MSEDCL sub-station at Sarus Village:-		
	-Cane Crushing season (MW)	:	9.021
15.	Net salable energy to grid from third year @ 90% cap. utilization (M KWH)		
	- Cane crushing season	:	31.17

16. Cost of steam to sugar plant (Rs./MT) : Nil
17. Cost of bagasse from sugar mill(Rs./MT): Nil
18. Cost of power to sugar mill (Rs./ KWH) : Nil
19. Saved bagasse during season (T) : 39212.80 (6.96% on cane)
20 Cost of power to MSEDCL in the first year of operation (Rs. / KWH) : 6.27

21. Project cost :

(Rs. lac)

Sl. No	Particulars	Sugar	Co-gen.	Total
1	Land and land Development	100.00	20.00	120.00
2	Civil Works	1046.14	342.14	1388.28
3	Plant & Machinery	6243.60	5055.81	11299.41
4	Miscellaneous Fixed Assets	0.00	135.00	135.00
5	Power Evacuation Arrangement	0.00	454.50	454.50
6	Supervision Charges for Synchronizing	0.00	10.23	10.23
7	Preliminary & Preoperative Expenses	395.36	304.03	699.38
8	Contingencies @ 3%	190.86	143.11	333.98
9	Margin Money	25.00	25.00	50.00
	Total	**8000.96**	**6489.82**	**14490.78**

23. Means of Finance

Sr. No	Particulars	Sugar		Co-gen.		Total	
		%	Amount	%	Amount	%	Amount
1.	EQUITY Own Contribution	35	2800.34	35	2271.44	35	5071.77
	Sub Total	35	2800.34	35	2271.44	35	5071.77
2.	DEBT FIs/Banks	65	5200.62	65	4218.38	65	9419.01
	Sub Total	65	5200.62	35	4218.38	65	9419.01
	Total	100	**8000.96**	**100**	**6489.82**	**100**	**14490.78**

24. Important Financial Parameters of the Project

I) The important financial parameters considered for financial viability of the project for sugar unit and co-generation are given as under:

		Sugar unit	**Co-generation**
a) Internal Rate of Return (IRR) (%)	-	15.42	16.10
b) Break-Even Point (%) (BEP)	-	47.81	51.24
c) Pay-Back Period (PBP)	-	5 years 8 months	5 years 7 months
e) Debt Service Coverage Ratio (DSCR)			
Average	-	1.72	1.63
Maximum	-	1.26	2.94
Minimum	-	2.72	1.24

II) The important financial parameters considered for financial viability of the project of the sugar unit with co-generation are given as under:

		Combined
a) Internal Rate of Return (IRR) (%)	-	15.71
b) Pay-Back Period(PBP)	-	5 years and 8 months
c) Debt Service Coverage Ratio (DSCR)		
Average	**-**	**1.73**
Maximum	-	2.74
Minimum	-	1.31

The above financial parameters for co-generation project as well as sugar unit individually and also combined are favourable. Hence, the project is financially viable and so recommended for financing.

CHAPTER – 1

INTRODUCTION

1. Company Profile

1.1 Project Background

1.1.1 Basically the area of sugar mill is in most economically backward area of Kaij Taluka, Beed District. In general, site for the Sugar Mill is very good and there is an assured supply of sugarcane for the new sugar factory. The soil in this area having ability for cultivation and more availability of water is here. To get better revenue to the farmers, management of sugar mill has decided to set up a sugar mill of 3500 TCD along with 15MW cogeneration at Dhavajyachiwadi Post.Chakarwadi. Tal. & Dist. Beed with the active support of cane growers of village of Kaij, Beed Tahasils of Beed District.

1.1.2 On the basis of completed irrigation scheme and some partial constructed dam, Lake projects in the district, the farmers started growing sugarcane. Present approximately production of sugar cane is 5-6 lakhk MT per in the area of operation.

1.1.3 The management of sugar mill having a very progressive outlook also realized the potential and the benefits of cogeneration in sugar mills for gaining an additional revenue source. Considering the thrust given by the Government of India to this national endeavor and realizing the contribution they can make to the Maharashtra State Grid, the management of sugar mill decided to integrate cogeneration alongwith their new sugar mill of 3500 TCD capacity.

CHAPTER 2
NEED AND JUSTIFICATION

2.1 In the area of the mill, has more potential for production of sugarcane. Water project and conservation of water leads to more availability of water sources for agriculture.

2.2 Climatic condition and fertility of soil will able to produce sugarcane about 5-6 lakhs by proper utilization of these sources.

2.3 Presently the lake /dam project in Beed and Kaij tahasils such as Bindusara, Wanjarwadi, Belora. Sajanpur, Menkarnika, Karvat, Jarud, Shavaji, Mojj, Zuzrass, Eaat, Manwarwadi, Mayda, Khatali, Golangri, Massawadi, Sultanpur, Vadagaon/ Bandarwadi, Dokewada, Wangaon etc. in Tahasil of Beed and Wagababulgaon, Jjanegaon, Karanja, Mulegaon, Hol, Gagarwadi, Chikalbeed, Darur, Liambachiwadi, Awargaon, Kasari, Kannoli, etc in Kaij Tahasil will irrigate approximately 96825.00 Hectare in the operational area of sugar mill. .

2.4 Mostly the need of Green field sugar project is essential for better revenue to farmer in this area. At existing situation farmer are producing around 5-6 lakhs sugarcane and selling to the Sugar Mill outside to this area.

2.5 Power is the most essential input for industrialization and it is indeed the fulcrum on which the future pace of growth and development of our country rests. Demand for energy is rising exponentially all over the India. With increased demand for energy, the existing infrastructure is unable to supply the required quantum and quality of electricity.

2.6 Cogeneration means, by definition, simultaneous generation of heat and electricity. Bagasse based cogeneration of steam and electricity is not new to Indian Sugar Industry and has been practiced for long. The primary objective, in the past, had been to produce steam required for processing and incidentally generating electricity for captive use. Since process steam was required at low pressures, the boilers and matching turbo-generating sets were of low pressure type. As such from the very inception the sugar factories are equipped for

Co-generation for generating the steam and power for their captive consumption.

2.7 India is the second largest producer of sugar in the world having over 500 sugar mills. It is estimated that the potential for the surplus exportable power from these sugar mills is around 6000 MW. The sugar industry in Maharashtra State having about one third share in the total sugar production of India has potential of about 1500 MW of exportable surplus power.

2.8 The power situation in Maharashtra state indicates that there is a shortage during the peak demand. The existing power shortage demands the necessity for the state to tap every possible alternate source of energy from biomass. This is in view of the projections for requirement of power for sustained economic development of the state and shortages of funds in implementing conventional power projects.

2.9 Bagasse based cogeneration as it has the following merits :

- It is environmental friendly as it does not add to the existing pollution level of the environment due to carbon recycling.
- It is a renewable source of energy resulting into reduced dependence on fossil fuels.
- There is no need to transport the fuel to the generating station as the sugarcane in any case is transported to the factories.
- It helps in bridging the gap between the demand and supply in the power sector to some extent.
- It has lower gestation period and lower installation & operating cost compared to the conventional utility thermal plants.
- The transmission and distribution losses are minimized as the plants are located invariably in the rural areas due to which the quality of power is also improved.
- It facilitates the sugar factories with increased viability and profitability to pay remunerative cane price to their cane grower members.

2.10 Policy Environment

Conducive policy and regulatory frame-work both at Central as well as State level have been a key driver for promotion of biomass based power generation. These are briefed as follows:

- Ministry for New and Renewable Energy (MNRE) has taken a number of policy initiatives for furthering commercial exploitation of biomass power/ cogeneration since 1993. According to capital subsidy scheme, announced recently, the Sugar Mill s are eligible to avail Rs.40.00 lakh /MW, Rs.50.00 lakh / MW and Rs.60.00 lakh / MW for the cogeneration projects involving boiler pressure of 40 bar and above, 60 bar & above and 80 bar & above respectively with a ceiling of Rs.8.0 Cr per project. For new sugar mills (which are yet to start production) subsidies shall be one-half of the level mentioned above.
- Recently Sugar Development Fund (SDF) has revised the Normative project cost of bagasse based cogeneration from previous Rs. 265.00 lakh/MW to Rs. 293.00 lakh / MW and Rs.363.00 lakh/ MW for boiler pressure of upto 70 bar and above 70 bar respectively. Further they have increased the SDF loan component of the total normative project cost from previous 30% to 40% at only 7% rate of interest.

CHAPTER 3

SUGARCANE AVAILABILITY AND FUTURE PROCPECTS

3.1 Introduction

The availability of sugar as well as cogeneration unit depends on availability of sugarcane. The required information and data as regards to sugarcane availability in the area of operation of Shri Mauli Sahakari Sakhar Karkhana Ltd. as reported, is described in succeeding paras.

3.2 Location Advantage

The distance of water supply scheme from well near at Wagebabulgaon Lake 4.5 Kms from the site. The required skilled & unskilled labour is easily available in nearby villages. All infrastructure facilities like power, roads, banks, telephone etc. are available near the site of factory.

3.3 Other Data

3.3.1 Soil

The majority of the soil is suitable for sugarcane cultivation.

3.3.2 Rainfall

The productivity of sugarcane & yield depends on water supply. The intensity of water supply depends on irrigation projects & supporting average rainfall in this area is 709 mm.

3.4 Existing Sugarcane Area

The availability of sugarcane for last 5 years is indicated by following statements.

Year	Sugarcane area in Hects.	Yield/ Hect.	Sugarcane productions Lakh MT
2014-15	11720	95	561400
2015-16	10482	100	524100
2016-17	8971	110	492905

As indicated above the existing sugarcane area in the area of operation of Shri Mauli Sahakari Sakhar Karkhana Ltd. is adequate for full capacity utilization.

3.5 Sugarcane Varieties

The mill proposes to balance varietal composition & increase the cultivation of high yielding & high sucrose varieties like CO 671, CO 94012, & CO 86032.

3.6 Conclusion

From above it can easily concluded that

- The Sugar MIll will be self sufficient from sugarcane point of view & can run to its fullest capacity from the optimum year
- The existing irrigation sources are adequate enough to support required sugarcane area.
- The existing sugarcane is adequate for its requirement of its fullest capacity.

CHAPTER 4

BRIEF TECHNICAL SPECIFICATIONS FOR 3500 TCD CAPACITY CANE MILLING PLANT, BOILING HOUSE

4.1 CANE UNLOADING AND FEEDING

4.1.1 Cane Unloader : Three no. of 12.5 T

4.1.2 Feeder Table - Two Nos.

4.2 CANE CONVEYING AND CANE PREPARATION

4.2.1 Cane Carrier – One No.

4.2.2 Cane Carrier Drive – One No.

4.2.3 Cane Rake Elevator – One No.

4.2.4 Belt Conveyor – One No.

4.2.5 Cane Chopper – One No.

4.2.6 Swing Hammer Type Fibrizer– One No.

4.2.7 Cane Fibrizor Drive – Two Nos.

4.3 AUTOMATIC CANE FEEDING DEVICES

4.4 CANE MILLS

4.4.1 Headstocks

4.4.2 Top Caps

4.4.3 Side Caps

4.4.4 Bearings

4.4.5 Mill Rollers

4.4.6 Crown Pinions

4.4.7 Turn Beam & Trash Plate

4.4.8 Scrapers

4.4.9 Hydraulic Pressure System 9 nos.

4.4.10 Lubrication

4.4.11 Material of Construction

4.4.12 Mill Gangway

4.4.13 Donnelly Chutes – Four Nos.

4.4.14 Juice Tray – Four Nos.

4.4.15 TRPF System for 36” X 78” Mills

4.4.16 Mill Drives – Four Nos.

4.4.17 Rake Type Intermediate Carrier – Three Nos.

4.5 IMBIBITION EQUIPMENTS AND MIXED JUICE PUMPS

4.5.1 Rotary Type Juice Screen – One No.

4.6 <u>BAGASSE ELEVATOR AND CONVEYOR</u>

4.6.1 Bagasse Belt Conveyor

Bagasse Belt With Load Cell Type Bagasse Weighment :

4.6.2 Bagasse Elevator – One No.

4.6.3 Main Bagasse Carrier – One No.

4.6.4 Air Compressors – Three Nos.

4.6.5 Milk of Lime Preparation Unit - One Set

4.6.6 Juice Clarifier - One No.

CHAPTER – 5

TECHNICAL SPECIFICATIONS OF MAJOR MECHANICAL SYSTEMS FOR COGENARATION

The Major Mechanical Systems comprise of Boiler, T. G. set, EOT crane for power house, Compressed air system, Ventilation system, Fire protection system etc.

The Technical specifications of these items are outlined, in brief, below:

5.1. Boiler :

- Installation : Semi outdoor type
- Maximum Continuous rating (MCR) : 90 TPH
- Super heater outlet pressure : 87ata
- Super heater outlet Temperature : $515^{o} \pm 5^{0}C$
-

5.1.1 Pressure Parts

5.1.2 Feed Water system

5.1.3 Steam piping

5.1.4 Drain and vent & others piping

5.1.5 Valves, mountings and Motorized Valve List

5.2 Fire Protection System

The fire protection system shall comprise of :

- **Hydrant system for all areas in the plant.**
- **High velocity water spray system for transformer.**
- **Automatic fire detection and alarm system.**
- **Portable fire extinguishers.**

CHAPTER – 6
MANPOWER AND TRAINING

6.1.1 The plant operating and maintenance personnel must be trained and should be available before the plant commissioning commences and therefore, it is essential that appointments are made well before the programmed plant commissioning date. The staffing and the organizational structure should be decided considering the specific requirement of the high pressure boiler and TG operation.

6.1.2 The cogeneration plant is based on BP route and is integrated with the sugar plant. Hence the Chief Engineer of the sugar plant will also head the O & M of Cogeneration Plant.

6.1.3 The plant operation team will work in three shifts per day. Each shift will be controlled by a shift charge engineer.

6.1.4 Considering the above, following manpower is proportionate / required additionally for operation of the green field sugar project.

Sr.No	Post	Permanent	Seasonal	Total
GENERAL OFFICE:		05	03	08
1.	Personnel Department	02	03	05
2.	Civil Department:	02	03	05
3.	Security Officer	05	06	11
4.	Store Department:	04	08	12
5.	Agriculture Department- Farm	18	45	63
6.	Account & Computer Department	07	00	07
7.	Sugar Godown & Marketing	03	03	06
SUGAR FACTORY MANPOWER				
8.	Manufacturing	10	13	23
9.	Juice Section	08	19	27
10.	Pan Section	12	17	29
11.	Centrifugal Section	01	25	26
12.	Engineering Section	12	0	12
13.	Electrical Section	12	14	26
14.	Mill House	12	38	50
15.	Boiler & Turbine Section	15	19	34
16.	Boiling House	05	11	16
17.	Centrifugal Section	05	11	16
18.	Workshop Section	10	14	24
Total		148	252	400

CHAPTER – 7

COST ESTIMATE OF PROPOSED GREEN FIELD SUGAR PROJECT ALONG WITH COGENERATION AND PROJECT IMPLEMENTATION

7.0 General

The cost of the Green Field Sugar plant along with Cogeneration covers all the costs associated with the construction of the plant and includes various costs towards Civil works, Machinery foundation, Plant and Machinery, Auxiliaries, Utilities and Transmission line.

7.1 Green Field Sugar plant

7.2. It is to be noted that 3500 TCD Green Field Sugar plant along with 15 MW cogeneration plant of the sugar mill. Hence most of the plant & machinery viz. Sugar mill plant & machinery, Boiler, T.G. set, WTP, D.G. set, Distribution, converter transformers etc. are shared commonly by both sugar plant and cogeneration.

7.3 The cost of plant & machinery for the Green Field Sugar plant along with Cogeneration is computed based on the Sugar Mill capacity and exportable power to the total power generation as follows:

- Sugar mill : 3500 TCD
- Total power generation : 14.011 MW
- Total captive power consumption : 4.990 MW
- Total exportable power : 9.021 MW

7.4 Based on the above assumptions the cost of the Green Field Sugar plant is estimated as follows.

Total Basic Prices For Green field sugar plant		
Sr. No.	**Particulars**	**Basic Prices (Rs. In lakh)**
1.	Land and Site Development	100.00
2.	Civil works	1020.00
3.	Sugar plant and machinery foundation	287.00
4.	Sugar Plant and machinery	5222.00
	Total cost (Rs. In lakh)	**6629.00**
Total Basic Prices For cogeneration plant		
5	Land and Site Development	20.00
6	Civil works	332.00
7	Cogeneration plant and machinery foundation	130.00
8	Cogeneration Plant and machinery cost (Mechanical systems)	3785.00
9	Cogeneration Plant and machinery cost (Electrical systems)	513.00
10	Miscellaneous Fixed Assets	135.00
11	Power Evacuation Arrangement	370.00
	Total cost (Rs. In lakh)	**5285.00**
	Total Cost for the Green field sugar with Co-generation project (Rs. In lakhs)	**11914.00**

7.5 Project Implementation

The Green field sugar plant with cogeneration of the sugar mill will be commissioned as a trial season 2018-19, if finances for supply are made in time.

7.6 Necessary NOC and permission from MSEDCL & MSETCL, IBR, and MPCB etc are to be taken from concerned authority while implementation of the project. In general following schedule has to be considered for major equipments of the project.

Sr. No.	Name of equipment	Approximate time delivery and erection
1.	DPR, tender preparation and order finalization	02 month
2.	90 TPH boiler with all auxiliaries	13 months
3.	15 MW BP type TG sets with all auxiliaries	12 months
4.	Cogeneration accessories and automation	6 months
5.	Green field 3500 TCD sugar project	12 months
6.	Project erection and commissioning	15 months

CHAPTER 8 FINANCIAL ANALYSIS

8. 1 General

The financial viability of the proposed new sugar unit along-with 15 MW co-generation project from which 9.021 MW power during season will be exported has been examined in the following paras.

The financial analysis is based on the detailed survey made regarding the availability of Cane, Bagasse, Water, Manpower, Policies of the Maharashtra Electricity Regulatory Commission (MERC) pertaining to co-generation and projected demand of power in Maharashtra.

8. 2 Project Cost Estimates

The project cost includes the cost associated with the installation of the plant and equipments for sugar unit and power generation. The cost of the plant and machinery also includes basic cost, taxes and duties, insurance, transportation etc. Adding pre-operative expenses, start up expenses, interest during construction period and margin money to meet the working capital requirement, the project cost is arrived at.

The project cost estimates have been prepared on the assumptions that the plant and machinery as per standard specifications shall be purchased from the approved machinery suppliers in India, whereas the civil construction of various buildings and machinery foundation shall be carried out by local contractors using locally available construction materials.

On the basis of present market price and anticipated escalations up to the scheduled date of commissioning, the capital cost of the proposed scheme of sugar unit with co-generation will be **Rs.14490.78 lakh** approximately.

The detailed project cost estimate including civil, plant and machinery, electrical works cost, pre-operative expenses, interest during construction period, start up expenses, contingencies, margin money etc. are as under:

(Rs. lakh)

Sl. No	Particulars	Sugar	Co-gen.	Total
1	Land and land Development	100.00	20.00	120.00
2	Civil Works	1046.14	342.14	1388.28
3	Plant & Machinery	6243.60	5055.81	11299.41
4	Miscellaneous Fixed Assets	0.00	135.00	135.00
5	Power Evacuation Arrangement	0.00	454.50	454.50
6	Supervision Charges for Synchronizing	0.00	10.23	10.23
7	Preliminary & Preoperative Expenses	395.36	304.03	699.38
8	Contingencies @ 3%	190.86	143.11	333.98
9	Margin Money	25.00	25.00	50.00
	Total	**8000.96**	**6489.82**	**14490.78**

8.2.1 Land and site development

The cost for land is not considered for this project and the cost of site development is considered as under.

Sl. No.	Particulars	Amount (Rs.lakh)	
		Sugar	Co-gen.
1	**Land and site development**	**100.00**	**20.00**
	Total	100.00	20.00

8.2.2 Civil Works

The cost of civil works including architect's fee for sugar and co-generation is estimated as follows.

Sl. No.	Particulars	Amount (Rs. lakh)
A)	Sugar	
1	**Civil works**	**1020.00**
2	**Architect's fee**	**26.14**
	Total (A)	1046.14
B)	Co-generation	
	Civil works	**332.00**
	Architect's Fees	**10.14**
	Total (B)	342.14

The details of civil works are given in chapter 15.

8.2.3 Plant and Machinery

The estimates of capital cost for machinery and main equipments of the sugar

unit and co-generation have been prepared on the assumptions that the plant and machinery is as per standard specifications.
The details of cost of plant and machinery, taxes and duties and other elements of expenses are as detailed below

Plant and Machinery for Sugar unit

Sl. No.	Particulars	Amount (Rs. lakh)
1	Basic cost of pant & machinery	**5029.00**
2	**Erection and Commissioning**	193.00
3	Machinery Foundation	287.00
4	Excise Duty @ 12.36%	621.59
5	Sale Tax @ 2%	113.01
	Total	**6243.60**

Plant and Machinery for Co-generation

Sl. No.	**Particulars**	**Amount (Rs. lakh)**
1	Basic cost of plant & machinery	**4298.00**
2	Machinery Foundation	130.00
3	Excise Duty @ 12.36%	531.23
4	Sale Tax @ 2%	96.58
	Total	**5055.81**

Details of plant and machinery are given in chapter 15.

8.2.4 Miscellaneous Fixed Assets

Sl. No.	**Particulars**	**Amount (Rs. lakh)**	
		Sugar	Co-gen.
1	**Fire protection system**	**0.00**	**45.00**
2	**Chimney**	**0.00**	**90.00**
	Total	0.00	135.00

8.2.5 Preliminary and Pre-operative expenses

The interest during construction period is calculated on average period of drawls of loan from financial institutions. The gestation period of installation plant is chalked out for twelve months and the interest during construction period is calculated for six months average period @ 12.5%.

The DPR charges, Bank charges, Technical know-how and Start-up

expenses during trial period have been shown in detailed below.

Sl. No.	Particulars	Amount (Rs. lakh)	
		Sugar	Co-gen.
1	Interest on Term Loan of Financial Institutions / Banks and SDF Loan	332.30	269.55
2	Insurance during construction period	6.29	5.37
3	Start up expenses	10.00	5.00
4	DPR Charges	2.11	2.11
4	Bank charges	10.00	5.00
5	Technical Consultancy Charges	24.66	17.00
6	Preliminary expenses	10.00	0.00
	Total	**395.36**	**304.03**

8.2.6 Contingencies

The provision for contingencies @ 3% has been made on cost of civil works and plant & machinery during the construction period.

Particulars	Amount (Rs. lakh)	
	Sugar	Co-gen.
Provision for contingencies @ 3% on buildings and civil works plus machinery foundations and plant and machinery	190.86	143.11
Total	**190.86**	**143.11**

8.2.7 Power Evacuation Arrangement

As per the resolution no. 59/23 passed at the meeting of Board of Directors of Maharashtra State Electricity Transmission Co. Ltd. (MSETCL), Mumbai held on 30/12/2010; 100% cost of power evacuation arrangement viz. Metering bay at co-generation plant, transmission line and switchyard at sub-station end is to be borne by the developers/promoters of co-generation project. This amount is to be treated as interest free advance to MSETCL to be recovered in five equal installments commencing from one year after the commissioning of the project.

Sr. No.	Particulars	Amount (Rs. lakh)
1	MSETCL bay at co-generation plant and PLCC and SCADA	320.00
2	Add : taxes and duties	84.50
	Subtotal	**404.50**
3	Cost of 1 km transmission line of 132 KV	50.00
	TOTAL	**454.50**

8.2.8 Supervision Charges

As per the guideline mentioned in clause 2.23 of Maharashtra Electricity Regulatory Commission's order, an amount equivalent to 15% of the labour charges of the value of switchyard, synchronizing arrangement and power evacuation arrangement towards supervision charges is to be paid to MSEDCL/ MSETCL by developers/promoters.

Particulars	Amount (Rs. lakh)
Supervision charges @ 15% of labour charges on synchronizing arrangement and power evacuation system.	10.23
Total	**10.23**

8.2.9 Margin Money

The working capital is required to meet the expenses of salary and wages, procurement of consumables, maintenance. For financial analysis interest rate on working capital is considered @ 11.50%.

Particulars	**Amount (Rs. lakh)**	
	Sugar	**Co-gen.**
Margin money for working capital	25.00	25.00
Total	**25.00**	**25.00**

8.3 Means of Finance

The proposed scheme is for the new sugar unit of 3500 TCD with co-generation of 15 MW. The financing pattern of Co-generation project is 65:35 i.e. debt: equity ratio. 65% of the project cost is to be financed by the Financial

Institutions/ Banks providing loan capital to the factories, balance 35% is to be invested by the Promoters as equity funds or by any other alternative method.

For the scheme of new sugar unit, the financing pattern is 65:35 i.e. debt: equity ratio. 65% of the project cost is to be financed by the Financial Institutions/ Banks providing loan capital to the factory and balance 35% is to be invested by the factory out of its own generation of funds or by any other alternative method. The financing pattern has been envisaged as under:

(Rs.lakh)

Sr. No	Particulars	Sugar		Co-gen.		Total	
		%	Amount	%	Amount	%	Amount
1.	EQUITY Own Contribution	35	2800.34	35	2271.44	35	5071.77
	Sub Total	35	2800.34	35	2271.44	35	5071.77
2.	DEBT FIs/Banks	65	5200.62	65	4218.38	65	9419.01
	Sub Total	65	5200.62	35	4218.38	65	9419.01
	Total	100	**8000.96**	**100**	**6489.82**	**100**	**14490.78**

The Company has to contribute Rs.2800.34 lakh i.e. 35% of the project cost for sugar unit towards own contribution and Rs.2271.44 lakh i.e 35% of the project cost towards own contribution for the co-generation project totaling to Rs.5071.77 lakh.

As reported by the Management the factory will collect share capital for the project to meet their own contribution.

8.4 Financial Assumptions of Projected Profitability

8.4.1 Basic Assumptions

I) For sugar

While preparing the projected profitability the following financial parameters have been assumed.

a) Sugar sales realization

Free 100%		@ Rs.2730.00 per quintal
b)	Sale of Molasses	@ Rs.4800.00 per tonne
c)	Sale of Bagasse	@ Rs.1800.00 per tonne
d)	Cane price	As per FRP (including H & T)
e)	Cane Purchase Tax	NIL
f)	Electricity and Fuel	@ Rs.12.13 per tonne of cane
g)	Manufacturing Stores and Chemicals	@ Rs.28.07 per tonne of cane
h)	Packing material	@ Rs.49.32 per quintal of sugar
i)	Salary	@ Rs.100.00 per tonne of cane
i)	Repairs & Maintenance	@ 0.5% on plant & machinery for first year and 5% escalation from 2nd year
j)	Overheads	@ Rs.72.21 per tonne of cane
k)	Depreciation	Depreciation has been calculated on SLM as per Companies Act, 1956 and depreciation on old assets is also considered.
l)	Interest on working capital	@ 11.50%p.a
m)	Interest on term loan from FI / Bank	@ 12.50% p.a

The revenue expenditure has been estimated on the basis of average selling price of the nearby factory for the season 2014-15.

II) For co-generation

The assumptions regarding co-generation of power have been taken as under.

Sr. No.	Particulars	- YEAR -		
		I	II	III
1.	Installed Capacity (MW)	15	15	15
2.	Capacity Utilization (%)	80	85	90
3.	Power Generation – Season Days	160	160	160
4.	Power Generation - Season	14.01	14.01	14.01
5.	Captive Power - Season	4.99	4.99	4.99
6.	Power to Grid - Season	9.02	9.02	9.02

8.4.2 Sale of Power

The projected income is based on the power supplied to the MSEDCL during the crushing season and off-season and selling price per unit has been considered @ Rs. 6.27 paise per unit from date of operation as per the prevailing price of MERC.

8.4.3 Bagasse Cost

The project is based on Back-Pressure route and will generate power during crushing season only. Therefore, bagasse cost is not considered.

8.4.4 Salary and Wages

The requirement of additional manpower for co-generation plant has been considered and estimated based on the equipment facilities to be operated. From second year onwards, 5% increase on salary has been taken per year on previous years balance.

8.4.5 Operation & Maintenance (O & M)

The operation and maintenance (O & M) charges for the first year is taken @ 2.5% on project cost along with escalation @ 5% from second year onwards as per MERC guidelines.

8.4.6 Depreciation

The depreciation has been calculated as per provisions of the Companies Act, 1956 on straight-line method on total plant cost.

8.4.7 Income Tax

Income Tax and Education cess provision has been made as prevailing rate of Income Tax Act, 1961 for the sale of sugar only.

8.4.8 Administrative and other Manufacturing Expenses

Administrative expenses like Administrative staff salary, stationery, printing, Telephone etc. are considered.

8.4.9 Interest on Working Capital

Interest on working capital requirements has been calculated @ 11.5%.

8.4.10 Interest on Term Loan

It has been assumed in the projections that the loan amount for co-generation project of Rs. 4218.38 lakh will be repaid in 24 equal (quarterly) installments with one year moratorium period after completion of the project For the project of new sugar unit the loan amount of Rs. 5200.62 lakh will be repaid in 24 equal (quarterly) installments with one year moratorium period after completion of the project. Interest rate has been assumed @12.50% per annum for both co-generation and sugar.

8.5 Physical Targets

The financial viability and profitability projections and funds flow statement for the next ten years at a crushing capacity of 3500 TCD and co-generation plant capacity of 15 MW are based on the following physical targets.

Sl. No.	Particulars	Unit	Parameters
1	Capacity utilization	%	100
2	Gross season days	Days	160
3	Crushing per season day	TCD	3500
4	Estimated cane crushing	Lakh tonnes	5.60
5	Sugar recovery	% cane	10.50
6	Sugar production	Lakh quintal	5.88
7	Production of molasses	% cane	4
8	Bagasse saving	% cane	6.96

8.6 Financial Projections

The projected financial forecast for ten years after completion of sugar unit with co-generation has been worked out on the above physical targets.

The summarized results of the above-mentioned period for the project of sugar unit are as under:

Sl. No	Particulars			Amount (Rs. lakh)
1	Net Sales			170571.68
2	Total cash cost of production without depreciation and interest			
	Cane cost	-	129742.82	
	Variable Cost	-	15173.28	144916.10
3	Profit & loss before depreciation and interest			25655.58
4	Less:			
	a) Depreciation	-	3939.24	
	b) Interest on Working Capital	-	3268.61	
	c) Interest on term loan	-	2062.49	10357.93
5	Profit after depreciation and interest			15297.64
6	Less:			
	Income Tax	-	4405.06	4405.06
7	Profit after Income tax			10892.59
8	Add back depreciation			3939.24
9	Total Cash Accruals (Sugar unit)			**14831.82**
10	Total Cash Accruals (Cogeneration) (10 years)			**13328.59**
11	Total Cash Accruals (10 years)			**28160.41**

8.7 The Projected Cash flow and Debt Service Ratio (DSCR)

From the projected funds flow statement placed, it is apparent that the factory will start repayment of term loan installments of expansion project of sugar and co-generation from the first year after commissioning of the project. The total amount of term loan including interest thereon will be repaid fully in seventh year after completion of both the schemes.

The average DSCR as shown in statement for sugar unit is **1.72**

The average DSCR for co-generation is calculate separately and it comes to **1.63**

The average DSCR as shown in statement for sugar unit with co-generation is **1.73**

8.8 Important Financial Parameters of the Project

I) The important financial parameters considered for financial viability of the project for sugar unit and co-generation are given as under:

		Sugar unit	**Co-generation**
a) Internal Rate of Return (IRR) (%)	-	15.42	16.10
b) Break-Even Point (%) (BEP)	-	47.81	51.24
c) Pay-Back Period (PBP)	-	5 years 8 months	5 years 7 months
e) Debt Service Coverage Ratio (DSCR)			
Average	-	1.72	1.63
Maximum	-	1.26	2.94
Minimum	-	2.72	1.24

II) The important financial parameters considered for financial viability of the project of the sugar unit with co-generation are given as under:

		Combined
a) Internal Rate of Return (IRR) (%)	-	15.71
b) Pay-Back Period(PBP)	-	5 years and 8 months
c) Debt Service Coverage Ratio (DSCR)		
Average	**-**	**1.73**
Maximum	-	2.74
Minimum	-	1.31

The above financial parameters for co-generation project as well as sugar unit individually and also combined are favourable. Hence, the project is financially viable and so recommended for financing.

Analysis of Balance Sheet of ABC Sugar Mill

Sl. No	Particulars	2014-15	2015-16	2016-17
1	Business turnover	12688.54	12453.87	15720.94
2	Gross profit before intt., Depr.& Tax	827.57	1120.92	1912.17
3	Interest	609.05	726.64	1163.92
4	Cash profit (2-3)	218.52	394.28	748.25
5	Depreciation	81.21	251.18	230.02
6	Net profit (4-5)	137.31	143.10	518.23
B.	**Summarized Balance Sheet For Last 3 Years**			
1	Gross Block	4222.55	4257.11	4309.89
2	Depreciation	1400.87	1637.83	1867.85
3	Net Block (1-2)	2821.68	2619.28	2442.04
4	Investments	162.65	200.00	624.83
5	**Total fixed assets (3+4)**	**2984.33**	**2819.28**	**3066.87**
6	**Current Assets**			
i	Cash, Bank balance & Deposits	153.01	24.89	39.10
ii	Inventory	11004.77	13681.77	12215.41
iii.	Advances & Receivables	857.35	1291.86	828.28
iv	Prepaid expenses	29.78	33.36	35.41
	Total	**12044.91**	**15031.88**	**13118.20**
7	**Current Liabilities**			
i	Working capital loan	6131.71	8741.15	10026.53
ii	Govt. Dues	36.16	69.81	42.54
iii	Cane Payment	3786.42	2817.41	933.81
iv	Other payable	856.76	1397.32	580.14
v	Provisions	1004.89	555.95	480.19
	Total	**11815.94**	**13581.64**	**12063.21**
8	Net Working capital (6-7)	228.97	1450.24	1054.99
9	Long term loans & deposits	2167.35	3039.77	2378.26
10	Paid up share capital	1398.58	1439.81	1469.31
11	Debenture (Convertible)	530.03	529.34	495.23
12	Reserves (excluding depreciation & CR Fund)	148.66	148.82	149.06
13	Accumulated Profit	1031.34	888.24	370.01
14	**Networth**	3108.61	3006.21	2483.61

Projected Cash Flows

Sl. No.	Particulars	Unit	Assum-ptions	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
1	Capacity	TCD		3500	3500	3500	3500	3500	3500	3500
2	Days	Nos.		160	160	160	160	160	160	160
3	Utilisation	%		100	100	100	100	100	100	100
4	Crushing	LT		5.60	5.60	5.60	5.60	5.60	5.60	5.60
5	Recovery	%		11.50	11.50	11.50	11.50	11.50	11.50	11.50
6	Sugar Production	LQ		6.44	6.44	6.44	6.44	6.44	6.44	6.44
7	Mollases Production	LT	4.00%	0.22	0.22	0.22	0.22	0.22	0.22	0.22
8	Power Export season	MW		10.00	10.00	10.00	10.00	10.00	10.00	10.00
9	Energy Export season	Lakh units		336.00	336.00	336.00	336.00	336.00	336.00	336.00
10	Power Export off-season	MW		6.00	6.00	6.00	6.00	6.00	6.00	6.00
11	Energy Export off-season	Lakh units		108.00	108.00	108.00	108.00	108.00	108.00	108.00
A	**INCOME**									
12	Sugar	Rs. (Lakh)	3000	19320.00	19320.00	19320.00	19320.00	19320.00	19320.00	19320.00
13	Molasses	Rs. (Lakh)	4000	896.00	896.00	896.00	896.00	896.00	896.00	896.00
14	Cogen Income -season	Rs. (Lakh)	6.24	2096.64	2096.64	2096.64	2096.64	2096.64	2096.64	2096.64
15	Cogen Income - off-season	Rs. (Lakh)	6.24	673.92	673.92	673.92	673.92	673.92	673.92	673.92
16	Other Income	Rs. (Lakh)		400.00	640.00	1550.00	1550.00	1500.00	1420.00	1100.00
	Total Income (A)	**Rs. (Lakh)**		**23386.56**	**23626.56**	**24536.56**	**24536.56**	**24486.56**	**24406.56**	**24086.56**
B	**EXPENDITURE**									
17	Sugar cane	Rs. (Lakh)	2500	14000.00	14000.00	14000.00	14000.00	14000.00	14000.00	14000.00
18	H&T Exp.	Rs. (Lakh)	585	3276.00	3276.00	3276.00	3276.00	3276.00	3276.00	3276.00
19	Manfg. Exp.	Rs. (Lakh)	50	280.00	280.00	280.00	280.00	280.00	280.00	280.00
20	Repair & main.	Rs. (Lakh)		0.00	100.00	110.00	165.00	247.50	371.25	556.88
21	Packing material	Rs. (Lakh)	50	322.00	322.00	322.00	322.00	322.00	322.00	322.00
22	Salary&wages	Rs. (Lakh)		1100.00	1155.00	1212.75	1273.39	1337.06	1403.91	1474.11

Sl. No.	Particulars	Unit	Assum-ptions	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
23	Statutory Exps	Rs. (Lakh)		300.00	300.00	300.00	300.00	300.00	300.00	300.00
24	Admin Exps	Rs. (Lakh)		300.00	300.00	300.00	300.00	300.00	300.00	300.00
25	Other expenses	Rs. (Lakh)		300.00	300.00	300.00	300.00	300.00	300.00	300.00
	Total Expenditure (B)	**Rs. (Lakh)**		**19878.00**	**19433.00**	**19500.75**	**19616.39**	**19762.56**	**19953.16**	**20208.98**
C										
26	Interest on working capital	Rs. in lakh	9.00%	738.99	738.99	738.99	738.99	738.99	738.99	738.99
27	Interest on Proposed Loan NCDC	9419.01	11.25%	542.53	998.67	941.07	883.47	825.87	768.27	0.00
28	Depreciation			1050.00	945.00	850.50	765.45	688.91	620.01	558.01
	Total (C)			**2331.52**	**2682.66**	**2530.56**	**2387.91**	**2253.76**	**2127.27**	**1297.00**
	Total Expenditure			**22209.52**	**22115.66**	**22031.31**	**22004.30**	**22016.32**	**22080.43**	**21505.98**
29	Profit			1177.04	1510.90	2505.25	2532.26	2470.24	2326.13	2580.58
D	**CASH AVAILABILITY**									
30	Profit			1177.04	1510.90	2505.25	2532.26	2470.24	2326.13	2580.58
31	Depreciation			1050.00	945.00	850.50	765.45	688.91	620.01	558.01
32	Interest on loans			1281.52	1737.66	1680.06	1622.46	1564.86	1507.26	738.99
	Total (D)			**3508.56**	**4193.56**	**5035.81**	**4920.17**	**4724.00**	**4453.40**	**3877.58**
E	**Debt Service Obligation**									
33	Installment of NCDC proposed loan	9419.01		0.00	0.00	1883.80	1883.80	1883.80	1883.80	1883.80
34	Total Interest			1281.52	1737.66	1680.06	1622.46	1564.86	1507.26	738.99
35	**Total Debt Service Obligation (E)**			**1281.52**	**1737.66**	**3563.86**	**3506.26**	**3448.66**	**3391.06**	**2622.79**
36	**DSCR**			**2.74**	**2.41**	**1.41**	**1.40**	**1.37**	**1.31**	**1.48**
37	**Average DSCR for 6 years**			**1.73**						
38	**IRR**			**15.71%**						

CHAPTER – 9

Project SWOT Analysis

9.1 Strengths(S):

- Background and experience of the shareholders, as well as leadership from the promoters.
- Adequate irrigation from three major irrigation projects of Purna, Manar & Vishnupuri projects and canals on these projects as well as wells, ponds and tube wells, ensuring sustainable cane cultivation and availability on a long term basis.
- Favorable policy regime for Cogen power & sugar at the Central Govt. and in Maharashtra.
- Innovation, commitment and vision of the promoters, with backward and forward integration planned right from beginning.
- Professional and business like approach of the promoters, with meticulous planning for speedy and successful implementation and operation.
- Excellent response to project, at the local farmer level, State Government., national and international financial institutions, and equity partners.
- Availability of sugar cane bagasse in the command area to ensure off season operation of the power plant as envisaged.
- Sound financial viability and technical feasibility of the project at the estimated project capital cost and prevailing selling prices of sugar, power and molasses, as well as landed prices of various raw materials and inputs.
- Deployment of latest technologies and equipment for cogen power.
- A very high order of socio-economic and environmental value to the local populace, Maharashtra State and the country, which not only uses renewable raw material (sugar cane) and fuels (bagasse, cane trash), without any impact on the socio-ecological balance.

9.2 Weaknesses (W):

- Complexities and higher investment levels of the integrated project. Employment of experienced and professional teams and consultants, as well as project and equity partners, directors on board will reduce this weakness.
- Fluctuating prices of procured Bagasse and may be cane trash.
- Changes in the Govt. policies related to sugar & cogen power.

- Delay in project implementation may affect the overall momentum and support

9.3 Opportunities (O):

- Excellent opportunity for expansion of individual plants and wheeling and banking of exportable power to third party consumers, for maximizing returns.

- Potential for trade of carbon credits from the project in the international market and increased returns

9.4 Threats (T):

- Adverse changes in Govt. policies, particularly related to sugar prices and prices of exportable power

Chapter – 10: Risk Management

Risk	Particular	Mitigates
Performance Risk	Ensured Sugarcane & Fuel availability	Experienced senior professionals and staff appointed for the purpose. Excellent support from Farmers
Marketing Risk	Sugar Sale / Export	Good marketing channel. Value added products proposed
Regulatory Risk	Conversion / clearance / tariff order	No problem as various governmental agencies have already expressed their willingness for purchase of power
Financial Risk	Financial viability of the project	Satisfactory DSCR. Equity Participation.

Key Management Features

- Appointment of Project Team, required experts and consultants, as well as top level staff - right from the beginning.
- Securing all required balance permissions / NoC's / approvals quickly and achieving the financial closure at the earliest.
- Selection of right technology and equipment suppliers for both sugar and cogen power plants.
- Effective project management for timely execution
- Cane development in the command area