DETAILED PROJECT REPORT
(DPR)

ON

MODERNIZATION CUM EXPANSION
OF
SUGAR PLANT FROM 2500 TCD TO 5000 TCD
ALONGWITH COGENERATION PLANT OF 25 MW

FOR

A COOPERATIVE SUGAR MILL

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List of Abbreviations	
MCE	Modernisation cum Expansion
Cogen	Cogeneration Plant
BP	Back Pressure
KG/Cm^2	Kilogram per Centimeter Square
DCS	Distributed Control System
DM	De-Mineralised
DPR	Detailed Project Report
DECT	Double Extraction cum Condensing Turbine
ESP	Electro Static Precipitator
ETP	Effluent Treatment Plant
FIs	Financial Institutions
GSV	Gross Calorific Value
PH	Power of Hydrogen Ion Concentration
HP	High Pressure
HT / LT	High Transmission / Low Transmission
KV	Kilo Volt
KW	Kilo Watt
LP	Low Pressure
PCC	Primary Control Center
MCC	Motor Control centre
DG	Diesel Generator
AC VFD	Alternating Current Variable Frequency Drive
MT	Metric Tones
RCC	Reinforced Concrete Cement
MW	Mega Watt
MSETCL	Maharashtra State Electricity Transmission Company Limited
PLC	Programmable Logic Control
PRDSH	Pressure Reducing & De-Super Heating Station
SA / PA / FD / ID	Secondary Air / Primary Air / Forced Draft / Induced Draft
ESP	Electro Static Precipitator
SDF	Sugar Development Fund
JH / RJ / SJ / SK	Juice Heater / Raw Juice Heater / Sulphited Juice Heater/ Semi Kestner
MS / SS	Mild Steel / Stainless Steel
SCADA	Supervisory Control and Data Acquisition
TCD	Tones Crushed Per Day
TCH	Tones Crushed Per Hour
TG	Turbine Generator
TPH	Tones Per Hour
SDF	Sugar Development Fund
FRP	Fair and Remunerative Price

1.0 INTRODUCTION

1.1 XYZ sugar mill, District - Solapur is a cooperative sugar factory situated at Mohol Taluka, Solapur District in Maharashtra State.

1.2 XYZ sugar mill was started as a 1250 TCD factory in the season 1980-81 and subsequently modernized to 2500 TCD in the year 1999-2000. There were two low pressure boilers of 20 TPH capacity & one 35 TPH capacity 21 kg/cm^2. One matching BP type 3 MW T.G. set for 2500 TCD capacity plant.

1.3 XYZ sugar mill has decided to implement the cogeneration project of 25 MW by installing new two nos. TG sets and one nos. new High pressure Boilers of 87 ata pressure and 515^{o}C. The T.G. sets shall be of 17 MW extractions cum condensing T.G. set (DECT) and other 8 MW Back pressure type T.G. set operating on 87 ata boiler pressure.

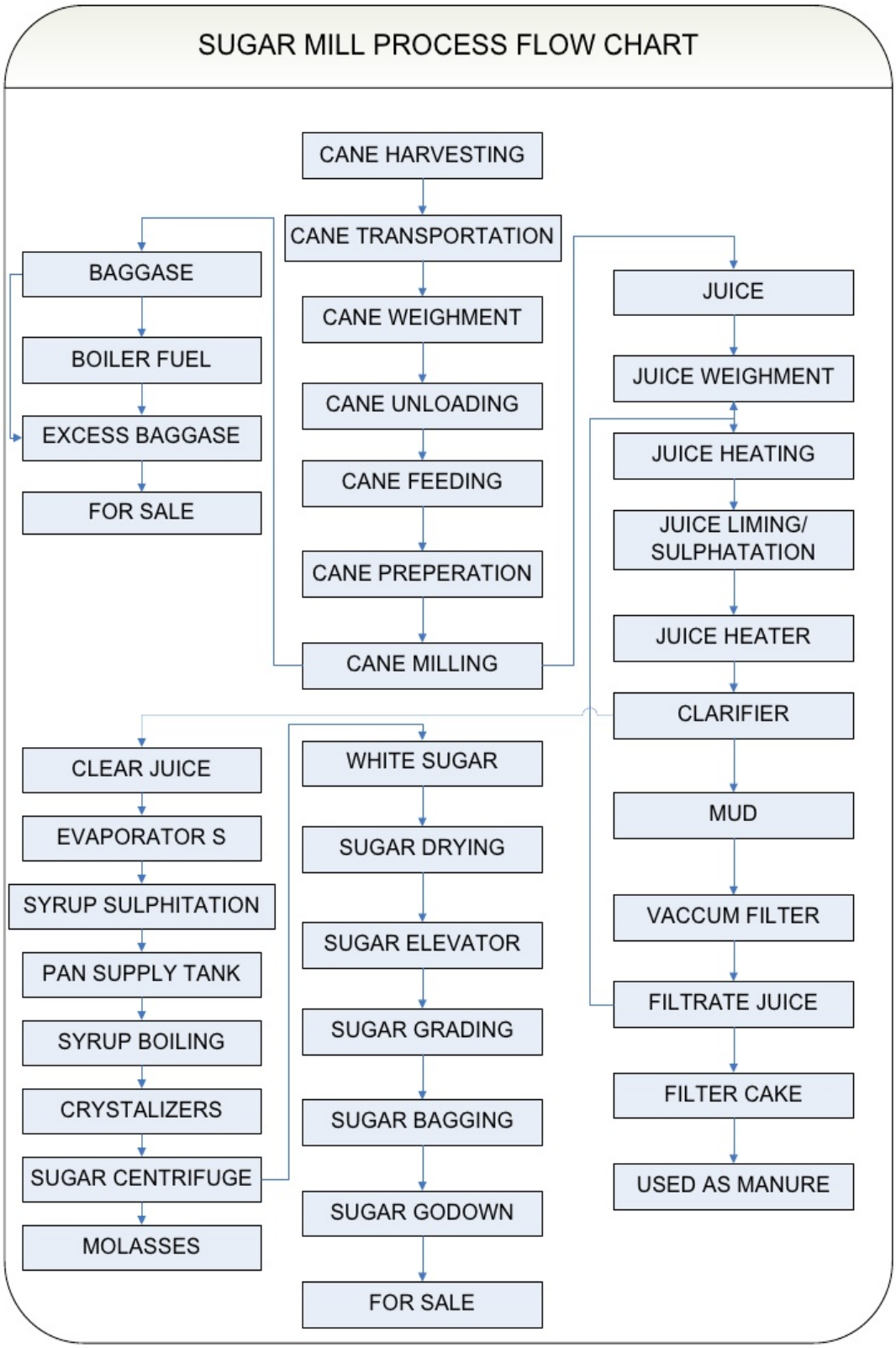
2.0 BRIEF HISTORY AND PRESENT WORKING OPERATION OF THE PLANT

2.1 XYZ cooperative sugar mill, Dist. Solapur, Maharashtra is registered as a co-operative society in the year 1974 with a main objective to process the sugarcane produced by grower members in the command area, to produce sugar. The Sugar mill is located at Dist. Solapur, Maharashtra.

2.2 BSSKL obtained letter of intent (LOI) number IL.No.167(74) dated 20/04/1974 for establishing the 1250 TCD sugar mill. It further expanded the capacity of sugar mill from 1250 TCD to 2500 TCD in 1999-2000.

2.3 In view of sufficient cane availability in the area of operation of XYZ sugar mill, society proposed to carry out expansion cum modernisation of sugar plant from existing capacity of 2500 TCD to 5000 TCD along with 25 MW cogeneration project.

3.0 SUGAR MANUFACTURING PROCESS FLOW DIAGRAM



3.1 Manufacturing process of sugar

Cane is weighed on the platform weigh-bridge and is dumped into cane carrier. It is prepared by leveller ad cutter and it is crushed/passed through mills for extraction of the juice. Weighed quantity of hot water used on last mill Bagasse to extract maximum quantity of juice. Mills juice from mills is pumped to the boiling house. The mixed juice is weighed on automatic weighing scales. First heating of the juice is done in raw juice heaters upto 65^0 to 70^0C. The juice is then taken into continuous sulphitation tank where it is mixed with proportionate quantity of milk of lime and sulphur dioxide gas. The reaction is controlled by maintaining proper pH. After sulphitation juice is again heated upto 100^0 to 102^0 in sulphur juice heaters and is transferred to Dorr Clarifier for setting. After retention of 21/2 hours clear juice is taken from the top and mud is taken from the bottom. This mud is mixed with fine bagacillo and is filtered through Oliver vacuum filter. The filtrate juice is again taken in weighed raw juice and filter cake is taken out and used as manure. Clear juice is obtained from clarifiers is further concentrated into evaporators and is converted into syrup. This syrup is again sulphited in continuous syrup sulphitation and send to pan section for manufacture of sugar. Sugar is manufactured in the vacuum pans by further concentration of syrup along with the seed as footing. The syrup and seed boiled in the vacuum pan is called as a massecuite. The massecuite after completion of boiling in vacuum pan is dropped in the crystallizer. The massecuite is taken into centrifugal machine for separation of sugar molasses. The sugar separated in the Centrifugal Machine is dropped in hopper. It is dried there by passing hot and cold air and is graded on graders and is bagged, weighted and marked. The molasses sent out from the machine is shifted to the molasses tank through pumps which is being used in distillery for alcohol manufacture. The Bagasse coming from mills is used in boiler as a fuel for production of steam and excess quantity of Bagasse is used for paper making industry. The generated steam is used for driving the turbines and heating and boiling the juice and syrup. XYZ sugar mill Manufacturing Process Flow Sheet A Vacuum pan B Centrifugals C Centrifugals Crystallizer C Vacuum pan B Vacuum pan Rotary Vac. Filters Scale Mill Tendem Cane Bagasse Hot condensate Limed Juice Limed Milk Hydro lime Evaporators Syrup Clear Juice

Muddy Juice Clarifier Juice Heaters Water Wash Water Fertilizer Filter Juice Mud Cake C Magma Massecuite A Centrifugals B sugar By Product Final Mol C sugar Product C Massecuite B Molasses A sugar A Molasses B Massecuite

4.0 VISION/ MISSION

4.1 The modernization cum expansion of sugar plant from 2500 TCD to 5000 TCD and cogeneration power plant of 25 MW capacity having modern equipments, automations, high pressure rating boiler and turbine will provide better quality of sugar crystal with minimum losses and export surplus power to MSETCL as a value addition. The modernization cum expansion of sugar plant will reduce the power / steam consumption and improve the efficiency of the plant.

The visions are

- To provide better services and facilities to cane growers members / farmers, employees and consumers.
- Motivation towards renewal energy source and also reduce the carbon emission.
- To earn trust of our consumers by yielding superior experience and value.
- To step out for reduction of pollution to improve environmental conditions and thereby achieve area development.

5.0 PROJECT SWOT ANALYSIS

5.1 Strengths (S):

- Background and experience of the shareholders, as well as leadership from the promoters.
- Adequate irrigation from rivers 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 MCE & 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.

5.2 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

5.3 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

5.4 Threats (T):

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

6.0 RISK MANAGEMENT

Risk	Particular	Mitigates
Performance Risk	Ensured Raw material / Sugarcane & Fuel availability	Experienced technical, professionals and staff appointed for the purpose. Excellent support from farmers
Marketing Risk	Sugar Sale / Export	Better channel for marketing. Value added products proposed
Regulatory Risk	Conversion / clearance / tariff order	There will not be any 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

7.0 NEED AND JUSTIFICATION OF THE PROJECT

7.1 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. Most of the power supply requirement in India is met through the fossil fuel based thermal power stations. Again the sinking fossil reserves will not able to meet the future power demands.

7.2 Therefore, the use of Non-conventional energy sources has become the ultimate option for sustainable development. From the various Non-conventional energy options, cogeneration in sugar factories is found to be the most viable proposition to meet the existing power shortfall to some extent. The bagasse based cogeneration projects fit very well into our objective of containing the GHG emissions to the atmosphere to achieve a clean sustainable development without damage to the environment.

7.3 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 5000 MW. The sugar industry in Maharashtra State having about one third share in the total sugar production of India has potential of about 1250 MW of exportable surplus power.

8.0 RAW MATERIAL/ SUGARCANE AVAILABILITY AND FUTURE PROSPECTS

8.1 Location Advantage

The site of the sugar factory is at Dist. Solapur posses following advantages. The site is centrally located in the area of operation and is in the heart of sugarcane area. The site of the factory is well interlinked with all the villages of the operational area by pacca roads. The required skilled, semiskilled and unskilled labours are available in the area of operation. All the infrastructure facilities like power, road, communication facilities and banks are available at the site of factory.

8.2 Irrigation facilities

On the basis of information received from the factory, in the area of operation wells lifts, percolations tanks, Bhima River and canal are the major irrigation sources. About 80-90 percent area is under well irrigation. Major area of operation comes under Ujani dam.

8.3 Climatic Conditions

Area of operation of this factory is under southern Maharashtra of medium rainfall zone. Minimum temperature recorded in the area is about 10 to 16°C in winter season while maximum temperature up to 38-40°C in summer. Hot and humid climate during rainy season and dry and cool climate during winter season are quite favorable for vegetative growth of sugarcane and accumulation of sugar, respectively.

8.5 Raw material/ Sugarcane Availability

Details of sugarcane area cultivation, average yield and total cane crushed is presented in following Table:

Sl. No.	Year	Area under cultivation (hac)	Yield tonnes/Hr	Total production	Present consumption/utilization (tons)	Marketable surplus (tons)
1.	2014-15	12300	75	922500	733372	189128
2.	2015-16	12400	76	942400	741312	201088
3.	2016-17	12500	78	975000	637520	337480

Details of area under cultivation, yield and production for the next 3 years are as follows:

Sl. No.	Year	Area under cultivation (Ha)	Yield tonnes/ Hac	Total Production (MT)
1	2017-18	12500	77.00	962500
2	2018-19	12500	78.00	975000
3	2019-20	12500	79.00	987500

9.0 BUSINESS MODEL/ REVENUE MODEL

9.1 For implementing this MCE and Cogen project within the desired time and cost schedules, it is essential to undertake meticulous planning, right from the conceptual stages. Following aspects of the project implementation will be crucial:

i) Intensifying cane development activities by networking and supporting the farmers from the command area.

ii) Effecting timely project development activities, including securing various approvals / NoC's / permissions for each component of the integrated project.

iii) Appointment of pre-investment consultants and experts for preparation of DPRs, approaching select FIs / bankers, rendering required follow up and achieving financial closure, through raising of required equity and providing necessary securities.

iv) Finalization of mode of project implementation, package route and O&M contracts for individual project components, along with strong owner engineering / consultancy team for effective monitoring of the implementation / commissioning of each component as per the schedule, is recommended, considering the complexities of individual projects.

9.2 Benefits

The socio-economic benefits arising out of this project for the local populace will include creation of direct and indirect jobs and consequent rise in the income levels, associated commercial and social infrastructure development in the areas, improved quality and availability of power due to grid benefits (in terms of deemed generation and power factor improvement), better environment and higher returns for the cane crop due to higher yield and cane price.

At the national and the State levels, the benefits include decentralized power generation, reduction in T&D loss, reduced emissions, reduction in the imports of petroleum products, increased tax revenues and reduction in the transportation costs.

The project will have excellent multiplier effect and will become truly a win-win situation for all the stakeholders. Thus, the proposed project has substantial socio-

economic and environmental benefits at the local, the State, the Regional and the National levels.

10.0 MODERNISATION & EXPANSION OF SUGAR PLANT

10.1 As last expansion of the mill was done in 1999-2000, machinery of the sugar plant have become old and need modernisation. Sugar factory alone is not a viable proposition unless it has value additions along with power export and distillery plant etc. Society is keen to capitalize on these issues and wishes to exploit the sugarcane availability by modernisation cum expansion of its existing sugar plant and installation of cogeneration plant. The cane availability is quite adequate for expansion. The new plant shall be installed having modern technologies and efficient operations.

Modernization cum expansion of sugar plant and new cogeneration plant would result in saving of steam, power, bagasse and improved technical performance which in turn would reduce the cost of production and improve the quality of sugar and also help in generating additional revenue to the factory. Hence, XYZ sugar mill has decided to expand the crushing capacity of the sugar plant from 2500 TCD to 5000 TCD alongwith cogeneration plant of 25 MW.

10.2 Budgetary cost estimates for modernization cum expansion of sugar plant and cogeneration plant of 25 MW

(₹ in lakh)

Sr. No.	Particulars	Project cost for MCE	Project cost for Cogen.	Total
1.	Civil works	625.00	375.00	1000.00
2.	Plant & Machinery	8083.59	10148.00	18231.59
3.	Machinery foundation	495.00	450.00	945.00
4.	Misc. fixed assets	60.00	125.00	185.00
	Total	**9263.59**	**11098.00**	**20361.59**

The budgetary cost of Civil Works for Modernization cum Expansion of sugar plant is given at following table:

CIVIL WORKS

Sr. No.	Particulars	Cost (₹ In lakh)
1.	VFD panel house for mill drive	25.00
2.	Mill house	325.00
3.	Boiling house	225.00
4.	D.G. set and transformers	50.00
	Total	**625.00**

The total budgetary cost of Civil Works is estimated at ₹625.00 lakh

10.3 Machinery Foundation

The budgetary cost of machinery foundation for Expansion cum Modernization of Sugar Plant is given in following table:

Sr. No.	Particulars	Cost (₹ in lakh)
1	Unloader bridge and Feeder table	15.00
2	Preparatory devices	60.00
3	Mill 40”x80” x 4 nos.	200.00
5	Bagasse elevator , ash conveyor	20.00
5	Boiling house (clarifier, column for evaporator station, pans, crystalizer	45.00
6	Multi tray grass hoppers	30.00
7	Columns for SK/ Vacuum filter / Rotary juice screen/ Batch pan / Shifted B & C seed crystallizers / 2 Continuous & 2 Batch centrifugals / Overhead hot water tank	25.00
8	Columns for sugar silo system	10.00
9	Columns for overhead sugar bag belt conveyors	10.00
10	Various juice & syrup pumps	20.00
11	R.C.C. columns for spray nozzles in spray pond	60.00
	Total	**495.00**

The total budgetary cost of machinery foundation is estimated at ₹495.00 lakh.

10.4 Budgetary Cost for Machinery under sugar plant Modernization & Expansion

Sr. No.	Particulars	Cost (₹ in lakh)
1.	Two roller Milling Tandem 40"x 80" - 4 Nos. of mills with cane handling & preparation units suitable for 5000 TCD.	3300.00
2.	Mill House DCS	70.00
3.	Bagasse Elevators (From Mill to Boiler)	150.00
4.	Tubular Juice Hearers - VLIH, H. S. 350 sq. m. - 2 Nos.	40.00
5.	PHE for heating RJ in second stage from 40 to 60 ^{0}c.	10.00
6.	Addition of tubular juice heaters H.S. 450 sq.m. - 3 nos.for SJ1 & SJ2.	70.00
7.	S.K. for 1st body of 2200 sq.m	70.00
8.	Addition of 1000 sq.m. Robert for 2nd body, Addition of 1000 sq.m. Robert as a 3rd body, 4th body and 5th body	120.00
9.	Addition of Clear juice pump 300 M^3/Hr. cap. 2 nos. Suitable for 250 TCH & reqd. head.	8.00
10.	Addition of Sulphured juice 300 M3/Hr. cap. 2 nos. Suitable for 250 TCH & reqd. head.	8.00
11.	Addition of Syrup pump suitable for 250 TCH & reqd. head.	4.00
12.	one new juice sulphitor and syrup sulphitor	35.00
13.	Addition of milk of lime storage tank- 2 nos.	8.00
14.	Addition of 24 ft dia clarifier	45.00
15.	Addition of 14 x 28 size vacuum filter.	55.00
16.	Addition of flash heat recovery system for 1st, 2nd & 3rd effect evaporator condensate, Juice heater condensate and pan condensate.	25.00
17.	Addition of 80 MT vacuum pan - two nos. for A boiling. Eith mechanical circulators	175.00
18.	Addition of 90 MT air cool crystallisers two nos. for A massecuit	160.00
19.	Addition of 360 HL cap. Syrup/melt/AL storage tanks - 5 nos.	12.50
20.	Addition of 500 MT cap. vertical crystalliser (for C/B massecuit.	70.00
21.	Addition of 40 MT/hr. cap. And 25 MT/hr. cap continuous pan for B massecuit boiling and C massecuit boiling resp.	210.00
22.	Staging & Structure for above boiling house equipments (J.H., evap.,pans, cryst.)	200.00
23.	Process pipes & valves for above boiling house equipments (J.H., evap.,pans, cryst.)	120.00
24.	S.S. Tubes required for above boiling house equipments (J.H., evap.,pans)	400.00
25.	Automation for continuous pan.	60.00
26.	Addition of NK-1500 centrifugal machine 2 no. for C.	275.00
27.	Addition of NK-1500 centrifugal machine 2no. for B.	
28.	Addition of 1750 kg/charge batch type machine 2 nos. for A massecuite purging.	

29.	Structure, pugmill, mixture & pumps reqd. for above centrifugal machines.	
30.	Spray pond & condenser modification to suit 250 TCH with atomization of condenser system.	200.00
	a) Segmented auto nozzle cluster fully automation control system for all pans.	
	b) Single entry condensers for batch, continuous pan & evaporator 5 nos.	
	c) Injection pumps 2500 M3/Hr. cap. with piping 2 nos.	
	d) Spray pond modification	
	e) Spray pump 3000 M3/Hr. cap. 1 no.	
31.	Three gross hoppers, Two elevators	65.00
32.	Two graders of 35 MT/Hr. cap.	125.00
33.	One silo of 100 MT cap.	30.00
34.	Addition of final molasses storage tank of cap. 6000 MT 1 no.	90.00
35.	Electrical equipments & cables for B.H. pan & centrifugal section etc.	340.00
36.	Four nos.Distribution Transformer for Sugar Plant and for Mill House	100.00
37.	Others (Pannels for Sugar Plant, HT & LT Cables, Earthing etc.	150.00
38.	DG Set for Sugar Plant	50.00
	TOTAL	**6850.50**
	ADD: Average GST @18%	**1233.09**
	TOTAL	**8083.59**

10.5 Miscellaneous Fixed Assets

The miscellaneous fixed assets for the expansion cum modernization of the sugar plant are given following table:

MISCELLANEOUS FIXED ASSETS

Sr. No.	Particulars	Cost (₹ in lakh)
1.	Cane weigh bridge 50 T capacity	15.00
2.	ETP upgradation	15.00
3.	Foundation for above ETP upgradation	20.00
4.	Furniture etc.	10.00
	Total	**60.00**

The total budgetary cost of miscellaneous fixed assets is estimated at ₹60.00 lakh.

11.0 THE COGENERATION SCHEME

11.1 As maintained in the chapter of Introduction, XYZ proposes to implement of Cogeneration project of 25 MW by addition of suitable boiler and extraction cum condensing T.G. set and backpressure type T.G. set. The existing 3 MW and 1.5 MW and 21 ata pressure boilers of 3 nos. will be discarded/retired after commissioning of cogeneration project.

11.2 Selection of Pressure and Temperature for the proposed Cogeneration Power Cycle.

The following pressure and temperature for the proposed cogeneration power cycle are considered:

* Boiler of 87 ata pressure, 515^{o}C temperature.
* Matching two nos. T.G. sets of one BP type and other extraction cum condensing T.G. sets suitable to 85 ata pressure, 505^{o}C.

11.3 Design Parameters for the proposed cogeneration scheme

Following design parameters for the proposed cogeneration scheme are taken into account:

i) Actual crushing capacity of the sugar plant will be 5000 TCD on 22 hrs. basis (230 TCH).

ii) Average production of bagasse will be 32.20 % on cane.

iii) Bagasse used for vacuum filter will be 0.8 % on cane and reserved for start-up, stoppages and windage losses will be 0.4 % on cane. Thus the bagasse available for the steam generation will be 31.00 %.

iv) The gross season will be of 160 days.

v) Existing three low pressure boilers of 21 ata pressure and matching 3.0 MW &1.5 MW T.G. sets will be retired/discarded.

vi) The new tandem of 40”x80” is adopted for the expansion and therefore, existing milling tandem will be kept idle. The new drive will be 630 KWx4 nos AC VFD.

vii) Captive steam consumption;

- Sugar factory process (2.5 ata) : 41.3% on cane.
- Sugar factory misc. (8.0 ata) : 4.0TPH.
- 30 KLPD proposed distillery in season: 5.0TPH

& off-season (8.0 ata)

viii) Captive power consumption :

- Sugar factory : 25.0 KW/ TCH
- Distillery (Season & Off-season) : 230 KW
- Workshop (Season & Off-season) : 40 KW
- Office & Lighting (Season & Off-season): 30 KW
- Colony (Season & Off-season) : 80 KW
- ETP (Season & Off-season) : 50 KW
- New (130) TPH, 87 ata pr. Boilers &co-gen auxiliaries (Season / Off-season) : 1763 KW / 1700KW
- Total season / Off season electrical load: **7943 /2159 KW**

ix) Installation of a new boilers of 130 TPH capacity, 87 ata. pressure, 515^{o}C temperature and two new matching T. G. sets of 8 MW BP type one no. and other 17 MW extraction cum condensing T.G. set with necessary auxiliary equipments and systems.

x) Surplus power will be exported during season (160 days) and during off-season (90 days) to MSETCL grid of 132 KV level sub-station,

xi) During off-season, the cogeneration plant will run on the bagasse saved in the season and purchased trash. Bought out bagasse / any other fuel is not considered.

xiii) GCV of mill wet bagasse : 2270 Kcal / Kg.

xiv) Thermal efficiency of boiler on GCV of bagasse (130 TPH, 87 ata) : 70.0 %

xv) Steam to bagasse ratio (130 TPH 87 ata boiler) : 2.45

xvi) Actual steam rating (ASR):

* New 17 MW, DEC T.G. set (85 ata pr.)
  - @ 8 ata extraction : 7.79 kg/KWH
  - @ 2.5 ata extraction : 5.75 kg/KWH
  - @ 0.1 ata condensing stage : 3.75 kg/KWH
* New 8 MW BP T.G. sets (85 ata. pr.)
  - @ 2.5 ata. back pressure : 5.75 kg/KWH

11.4 Operation of the Cogeneration Plant during Crushing Season

The new boiler of capacity 130 TPH, 87 ata with matching two nos. new T. G. sets of rating 8 MW BP type and 17 MW DEC T.G. set will work during season operation.

The new boiler will be operated on bagasse generated during season working. The steam balance, Bagasse balance and Power balance during the season operation of the cogeneration plant are described as below:

i) **Steam Balance**

New Boiler of capacity 130TPH and 87 ata.:

- The total steam generated from 130 TPH, 87 ata boiler is 128.4 TPH and is passed through two TG sets of 8 MW BP TG set and 17 MW DEC TG set. From the 17 MW (DEC) TG set 18.5 TPH is extracted at 8 ata., 58 TPH is extracted at 2.5 ata and 10 TPH is led to condensing stage thus totaling 86.50 TPH steam and in 8 MW BP TG set, 42 TPH, 87 ata. is passed to get exhaust of 2.5 ata of 42 only. Thus, grand total of steam is 128.5 TPH.

ii) Bagasse Balance

* Bagasse production (32.20% cane) : 74.06TPH.
* Bagasse used for vacuum filter and reserved for start up & stoppages : 2.76 TPH
* Bagasse available for boilers : 71.30 TPH
* Bagasse utilization
- 130TPH, 87 ata boiler having 128.5 TPH load (@steam to bagasse ratio having 2.45) : 52.44 TPH
* Saved bagasse : 71.30 – 52.44
= 18.85 TPH

Thus the total bagasse saved will be about 77384 MT during the season, which will be used for operating the cogeneration plant in off-season.

11.5 Operation of the Cogeneration Plant during Off-season

Only new 130 TPH, 87 ata boiler with matching new 17 MW DEC T G set will be in operation.

The Steam balance, Bagasse balance and Power balance during off-season operation of the cogeneration plant are outlined as below:

i) Steam Balance

- Steam generated from130 TPH, 87 ata boiler is 74.2 TPH and is passed through 17 MW DEC T G set from which 15.00TPH is extracted at 8 ata, 5.0 TPH is extracted at 2.5 ata and balance 54 TPH is led to condensing stage thus totaling 74.0 TPH Steam.

Steam Consumption:

Considering the steam consumption is 4.35 TPH.

The 74 TPH steam is passed to the condensing stage of 17 MW DEC TG set.

ii) Bagasse Balance

During off-season, 130 TPH boiler will be operated on the saved bagasse during season (77384T) Bagasse required per day to generate steam of 74.00 TPH is 724.89 MT.

* Available bagasse saved in season : 77384 T
* Bagasse used for 130 TPH, 87 ata boiler : 74 ton per hour @ 2.45 Steam raising

The cogeneration plant will be in operation for 95 days during the off-season period and remaining bagasse 8500 MT will be reserved for trial.

iii) Power Balance

* **Power generation:**

- Total : 17000 KW

the total captive power consumption will be 2000 KW.

* **Power Export**

- Total power generation : 17,000 KW
- Total power consumption : 2,000 KW
- Surplus exportable power : 15000 KW

Thus the cogeneration plant will export the power of 15000 KW per hour during the off-season.

NOTE: 1) The feed water inlet temp. to boiler is increased to 165^{o}C with a HP heater. There is also a deaerator for removing oxygen from the boiler feed water.

11.6 Budgetary cost for cogeneration plant

The budgetary cost of civil works for Cogeneration plant is given at following table:

CIVIL WORKS

Sr. No.	Particulars	Cost (₹ in lakh)
1.	Power house building for 25 MW TG sets	250.00
2.	Bagasse handling system	30.00
3.	Water treatment plant	25.00
4.	Clarifier and clear water storage tank	10.00
5.	Cooling tower with pumps & piping	20.00
6.	RCC chain for metering room (3m x 3m) and control room (10m x 15m) in switch yard	10.00
7.	Cable trenches	15.00
8.	Concrete flooring for bagasse yard	15.00
	Total	**375.00**

The total budgetary cost of civil works is estimated at ₹375.00 lakh.

11.7 Machinery Foundation

The budgetary cost of machinery foundation for Cogeneration plant is given in following table:

MACHINERY FOUNDATION

Sr. No.	Particulars	Cost (₹ in lakh)
1.	80 TPH boiler foundation	60.00
2.	Main columns of 130 TPH boiler	15.00
3.	Auxiliaries of 130 TPH boiler	50.00
4.	TG sets foundation	100.00
5.	Bagasse & ash handling System	50.0
6.	Electrical Switch yard	50.0
7.	DM plant and RO plant	25.0
8.	Cooling tower	100.0
	Total	**450.00**

The total budgetary cost of machinery foundation is estimated at ₹450.00 lakh

11.8 Plant & Machinery

The budgetary cost of plant & machinery for Cogeneration plant is given in following table:

PLANT & MACHINERY

Sr. No.	Particulars	Cost (₹ in lakh)
A)	**Mechanical Systems**	
1.	Boiler, 130 TPH, 87 ata, 515^{o}C with auxiliaries	4500.00
2.	Matching T.G. set, 17 MW, DEC and 8 MW BP type, 84 ata, 510^{o}C with auxiliaries	2000.00
3.	D C S for boiler, TG set and balance of plant	125.00
4.	Bagasse handling system	400.00
5.	LP and HP piping	110.00
6.	Ash handling system	125.00
7.	Water treatment plant	250.00
8.	Cooling tower assembly	225.00
9.	pumps & piping	200.00
10.	Power house EOT crane	75.00
11.	Water cooled AC system for control room	30.00
12.	Pair ventilation system for VFD/ PCC / MCC room	60.00
13.	Miscellaneous items	10.00
	Total (A) :	**8110.00**
B)	**Electrical System**	
1.	**Distribution transformers -** 2 no. for Cogen Boiler **Earthing transformer** – Earthing transformer - 1 no.	60.00
2.	**HT VCB Panel** 4 Nos. 11 KV, HT, LT Cable	75.00
3.	**Lightening** New power house	05.00
4.	**Earthing material** for 25 MW (17+8) MW T.G. set, 1 no. distribution & earthing transformer each & Cogen PCC, MCC panels.	15.00
5.	**Miscellaneous** Cable trays, MS angles & support etc.	10.00
6.	**Cogeneration switch yard**	250.00
7.	**D G set, 500 KVA with synchronizing panel – 1 no. with synchronizing panel**	75.00
	Total (B) :	**490.00**
	Total (A+B) :	**8600.00**
	ADD: Average GST @18%	**1548.00**
	TOTAL	**10148.00**

The total budgetary cost of Plant & Machinery is estimated at Rs. 6600.00 lac

11.9 Miscellaneous Fixed Assets

Miscellaneous fixed assets for the Cogeneration plant are given in following table:

MISCELLANEOUS FIXED ASSETS

Sr. No.	Particulars	Cost (₹ in lakh)
1.	R.C.C. Chimney for boiler	75.00
2.	Fire protection system	50.00
	Total	**125.00**

The total budgetary cost of miscellaneous fixed assets is estimated at Rs.125.00 lakh.

11.10 Power Evacuation Arrangement

The budgetary cost of power evacuation arrangement for Cogeneration plant is given in following table:

POWER EVACUATION ARRANGEMENT

Sr. No.	Particulars	Cost (₹ in lakh)
1.	Metering bay	50.00
2.	MSETCL bay at cogen plant and PLCC & SCADA	350.00
3.	MSETCL bay at sub-station	100.00
	Total (1 to 3) :	**500.00**
	ADD: Average GST @18%	**90.00**
4.	Transmission line, 132 KV, 1.5 KM from cogen plant to nearing sub-station	**100.00**
	Total (1 to 4) :	**690.00**

The total budgetary cost of power evacuation arrangement is estimated at ₹690.00 lakh.

12.0 TECHINCAL SPECIFICATIONS

The Major Mechanical Systems comprise of Mill, Boiling house equipments, Boiler, T. G. set, etc. The Technical specifications of these items are outlined, in brief, below:

12.1 BOILERS: One No.

- Maximum Continuous rating (MCR) : 130 TPH
- Super heater outlet pressure : 87 ata
- Super heater outlet Temperature : $515^{o} \pm 5^{0}C$
- G.C.V. of bagasse : 2270 kcal /kg
- Boiler thermal efficiency : 70-71.0% (on G.C.V.)

Instrumentation and control system based on DCS.

12.2 TURBO-GENRATOR SETS: Two Nos.

- Type & Rating : 8 MW Back Pressure turbine (BPT) and 17 MW Double Extraction Condensing Turbine (DECT)
- Inlet steam pressure & temp. : 85 ata, $505^{o}C$ for both.
  - * 8 MW BP turbine:
    - Exhaust extraction : 2.5 ata, $140^{o}C$
  - * 17 MW DEC Turbine
    - First extraction : Uncontrolled, 8 ata, $270^{o}C$
    - Second extraction : Controlled, 2.5 ata, $140^{o}C$
    - Exhaust : 0.1 ata.
  - Both the turbines shall be of horizontal, BP & DECT type.

12.3 Technical specifications of Major machineries for expansion programme

- Cane Unloader: 3 nos, 5 Tons each
- Main Cane Carrier: 1No. :2300 mm wide 40 mtrs.
- Cane Chopper:, Cane Leveller, Fibrizer: 1 No.:2200 mm Swing Dia., 144 hammers of 18Kgs each with 2 Nos. 1250 Kw drive motors.
- Mills- 4 nos. size 40”x80” alongwith Drive of 630 KW each.
- VLJH – 350 m^2 HS
- 444 Clarifier – 24 feet /7200 mm dia.

- Rotary Vacuum Filter and Accessories.
- Specification for 2200 m^2 HS Semikestner
- Specification for 1200/1000 m^2 HS Robert body
- 80 MT capacity batch type pan
- 40 TPH capacity continuous pan
- 90 MT capacity Air cooled crystallisers
- 500 MT capacity twin type vertical crystalliser with suitable liquidation pumps for C M/c:
- 1750 kg/charge batch type centrifugal machines with minimum 18 cycles/Hr for raw massecuit- 2 nos.
- 1500 mm basket dia continuous centrifugals - 4 nos.
- Electrical System suitable Proposed cogeneration plant.
- Alternators-
- Fuel and ash handling system
- DM Water System (RO type) of 40 m.cube/hr
- Complete automation with control system

13.0 MANPOWER AND TRAINING

The fast growth of industrial activity in the country in general and in particular in the power generation industry, has brought about an acute shortage of skilled and trained manpower. Hence, it is essential that the manpower requirement for the boiler and T.G. plants is well planned and a proper programme of recruitment and training is thought of. 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 T.G. operation.

13.1 Considering the above, following manpower is required additionally for operation of the cogeneration plant.

Manager	-	1
Instrumentation Engineer	-	1
Mechanical Engineer	-	4
Electrical Engineer	-	3
Instrumentation Technicians	-	4
Electrical supervisor	-	4
Fuel / Ash handling supervisor	-	4

14.0 ENVIRONMENT PROTECTION AND WASTE MANAGEMENT

Environmental protection and the control of solid, liquid and gaseous effluents or emissions of the plant shall have to be effected as per the norms of the State and Central pollution control board. It is to be noted that it has been endorsed that bagasse based co-gen project is environmental friendly as compared to fossil fuel based power generation station in the sense that bagasse being a bio-mass renewable fuel does not add any net Carbon-di-Oxide to the atmosphere, because of the carbon recycling during the growth of cane.

14.1 Effluent from water treatment plant

Hydrochloric acid and sodium hydroxide will be used as regenerates in the proposed demineralising water plant. The acid and alkali effluents generated during the regeneration process of the ion-exchangers would be drained into an epoxy lined underground neutralising pit. Generally these effluents are self neutralising. However provisions will be made such that the effluents will be neutralised by addition of either acid or alkali to achieve the required pH of about 7.0. The effluent will then be pumped into the effluent treatment ponds which form part of the sugar plant's effluent disposal system.

14.2 Dry fly Ash and Furnace Bottom Ash :

Fly ash collected from the ESP hoppers and the airheater hoppers and theash collected from the furnace bottom hoppers can be used as landfill. The ash content in bagasse is less than two percent (2%). The total fly ash collected could be used as a landfill. The high potash content in the bagasse ash makes the ash a good manure**.**

14.3 Considering the above, it is stated that there will be no adverse impact on the environment in and around the plant site on account of the installation of proposed co-generation plant.

15.0 COST ESTIMATE OF THE PLANT & MACHINERY

PROJECT COST

The estimated project cost of ₹ **21891.59** lakh is as detailed below:

(₹ in lakh)

Sr. No.	Particulars	Modernization -cum- expansion	Co-generation	Total
1	Land and Site Development	0.00	10.00	10.00
2	Civil Works	625.00	375.00	1000.00
3	Plant & Machinery	8083.59	10148.00	18231.59
4	Preliminary & Pre-operative exp.	500.00	600.00	1100.00
5	Miscellaneous fixed assets	60.00	125.00	185.00
8	Power Evacuation Arrangement	0.00	690.00	690.00
9	Contingencies	250.00	275.00	525.00
10	Margin money	100.00	50.00	150.00
	Total	**9618.59**	**12273.00**	**21891.59**

16.0 PROJECT IMPLEMENTATION, MONITORING AND EVALUATION

16.1 Project Implementation

For implementing this modernisation cum expansion cogeneration project within the desired time and cost schedules, it is essential to undertake meticulous planning, right from the conceptual stages. Following aspects of the project implementation will be crucial:

a) Intensifying cane development activities by networking and supporting the farmers from the command area.
b) Effecting timely project development activities, including securing various approvals / NoC's / permissions for each component of the integrated project.
c) Appointment of pre-investment consultants and experts for preparation of DPRs, approaching select FIs / bankers, rendering required follow up and achieving financial closure, through raising of required equity and providing necessary securities.
d) Finalization of mode of project implementation, package route and O&M contracts for individual project components, along with strong owner engineering / consultancy team for effective monitoring of the implementation / commissioning of each component as per the schedule, is recommended, considering the complexities of individual projects.
e) ABC proposes to appoint experienced project engineering management consultancy firm, as well as experienced in-house project team for the purpose.
f) Manpower and resource mobilization at required time and effectively.
g) Interface between the sugar mill & cogeneration power plant.

16.2 Project Schedule

The modernisation cum expansion alongwith cogeneration project starts from the date of achieving financial closure, expected to be completed by September, 2019. The cogeneration project will start commercial production by November, 2019.

16.3 Monitoring & Evaluation

The society will provide its financial and operational results on yearly basis for monitoring the performance of the society.

17.0 MEANS OF FINANCE:

The existing capacity of the mill is 2500 TCD and is going to be expanded to 5000 TCD along with 25.0 MW co-generation of power project. In such, both the cases i.e. in modernization-cum-expansion and 25.0 MW co-generation power project, the debt equity ratio is 50:50 i.e. 50% is to be financed by the Financial Institution / Banks/ 40% is to be financed by the Sugar Development Fund., Govt. of India and balance 10% is to be invested by the factory by its own generation of funds or by any other alternative method.

17.1 Funding Pattern:

The Funding/financial pattern has been envisaged as under:

(₹ in lakh)

Sr. No.	Particulars	Modernization-cum-Expansion		Co-generation		Total
		(%)	Amount	(%)	Amount	Amount
1	Equity a) Equity Share Capital	10.00	961.85	10.00	1227.30	2188.15
	b) SDF loan against equity participation	40.00	3847.44	40.00	4990.20	8837.64
		50.00	4809.29	50.00	6136.50	11025.80
2	Debt a) NCDC/FIs/Banks	50.00	4809.29	50.00	6136.50	10945.79
	TOTAL	100.00	9618.58	100.00	12273.00	21891.59

The Society has to collect the own contribution for modernization-cum-expansion scheme and co-generation project of ₹2188.15 lac only. The Society has accumulated profit of ₹578.35 lac and the rest of the amount will be collected by its grower members.

18.0 FINANCIAL ANALYSIS / PERFORMANCES

18.1 Analysis of the Balance sheet of XYZ sugar mill, Dist. Solapur, Maharashtra

Analysis of profit and loss accounts and balance sheets of the last three years is placed at **Annexure-I.** The society has earned profit of ₹388.78 lakh, ₹13.07 lakh and ₹214.02 lakh during the years 2014-15 and 2015-16 and 2016-17 respectively. As per annual accounts, as on 31.03.2017, society had net worth of ₹2024.94 lakh against the paid up share capital of ₹1330.02 lakh.

A	**Summarised balance sheet of last 3 years**			**(₹ in lakh)**
Sr. No.	**Particulars**	**2014-15**	**2015-16**	**2016-17**
1	Business Turnover	19498.37	22373.85	23865.82
2	Gross Profit before Interest, depreciation and Tax	1284.28	732.94	1295.13
3	Interest	748.34	530.02	911.69
4	Cash Profit (2-3)	535.94	202.92	383.44
5	Depreciation	147.16	189.85	169.42
6	Profit before tax (4-5)	388.78	13.07	214.02
7	Income Tax	0.00	0.00	0.00
8	Net Profit	388.78	13.07	214.02
B	**Summarised balance sheet of last 3 years**			
Sr. No.	**Particulars**	**2014-15**	**2015-16**	**2016-17**
1	Gross Block	3584.15	4008.40	4063.59
2	Less: Depreciation	2587.02	2776.87	2946.29
3	Net Block (1-2)	997.13	1231.53	1117.30
4	Work in progress	0.00	0.00	12.04
5	Investments	193.99	196.50	384.83
6	Total Fixed Assets (3+4+5)	1191.12	1428.03	1514.17
7	CURRENT ASSETS			
	i) Cash and Bank balances	650.91	217.49	129.40
	ii) Inventory	11029.44	13804.27	17263.40
	iii) Sundry Debtors	1385.40	1721.87	1665.90
	iv) Loans, Advances and Prepaid expenses	301.68	244.82	203.18
	TOTAL (7)	**13367.43**	**15988.45**	**19261.88**
8	CURRENT LIABILITIES			
	i) Working Capital loan	5448.87	6839.13	10354.15
	ii) Sundry Creditors	3926.24	5065.07	5407.55
	iii) Interest payable	52.05	31.22	8.07
	iv).Other provisions & liabilities	1289.85	2197.56	2040.38
	TOTAL (8)	**10717.01**	**14132.98**	**17810.15**
9	Net Working Capital (7-8)	2650.42	1855.47	1451.73

10	Long Term Loan			
i.	Excise Duty Loan	947.26	430.06	0.00
ii.	Refundable Deposits	583.92	583.92	583.93
iii.	State Government SMP Loan	510.62	459.15	357.03
iv.	Interest free loan from Govt. of Maharashtra	17.00	8.50	0.00
	TOTAL (10)	**2058.80**	**1481.63**	**940.96**
11	i. Equity Share Capital	1228.47	1234.23	1241.21
	ii. Share Anamat	0.73	0.67	2.36
	iii. Other Deposits	86.45	86.45	86.45
	TOTAL (11)	**1315.65**	**1321.35**	**1330.02**
12	Reserves	115.80	116.18	116.57
	TOTAL (11 + 12)	**1431.45**	**1437.53**	**1446.59**
13	Un-distributed profit /(-) Accumulated Losses	351.27	364.33	578.35
14	Net Worth (11+12+13) or (6+9-10)	1782.72	1801.86	2024.94

From the above analysis, it is apparent that the factory is working well and showing profit for the last three years of the working.

19.0 FINANCIAL VIABILITY

After making a study of infrastructure with regard to availability of sugarcane track record of past performance, it is considered desirable to undertake Expansion- cum-Modernization of XYZ sugar mill, Dist. Solapur from crushing capacity of 2500 TCD to 5000 TCD along with 25.00 MW co-generation power project.

19.1 Projected Cash Flow & Debt Service coverage Ratio

The projected cash flow statement placed in Annexure-II, it is apparent that the factory will start repayment of term loan instalments from the third year with two years of moratorium period on principal amount for modernization-cum-expansion project and co-generation project. However, there will be no moratorium payment of interest. The total amount of term loan including interest thereon of both the project will be repaid fully by the end of eighth year of the operation. Salient features of the cash flow projections are as under:

Modernisation cum expansion of Sugar mill with cogen project-

Sl.No.	Particulars	Years							
		1	2	3	4	5	6	7	8
i.	Capacity (TCD)	2500	2500	2500	2500	2500	2500	2500	2500
ii.	Cane crushed (lakh tones)	3.38	4.00	4.00	4.00	4.00	4.00	4.00	4.00
iii.	Recovery (%)	12.00	12.25	12.25	12.25	12.25	12.25	12.25	12.25
iv.	Total Revenue	19552.38	22884.00	22884.00	22884.00	22884.00	22884.00	22884.00	22884.00
v.	Total Expenditure	18108.44	19929.14	19719.10	19331.50	18925.57	18540.03	18172.95	17822.58
vi.	Profit	1443.93	2954.86	3164.90	3552.50	3958.43	4343.97	4711.05	5061.42
vii.	Funds available for Debt service	5658.17	6748.79	6717.29	6685.00	6651.91	6617.98	6583.21	6547.57
viii.	Debt to be Serviced	1378.50	1378.50	3202.80	3962.16	3718.79	3475.41	3232.03	2988.66
ix.	DSCR	4.10	4.90	2.10	1.69	1.79	1.90	2.04	2.19
x.	Average DSCR (8 yrs)	2.24							
xi.	IRR (%)	24.21							
xii.	Pay Back Period	3 years 2 months							

From the above it may please be seen that average Debt Service Coverage Ratio (DSCR) for the modn. cum expn. of sugar mill works out to 2.24. Internal Rate of

Return (IRR) for the modn. cum expn. of sugar mill works out to 24.21. Cash generations from the projects would be adequate to service existing loans as well as proposed term loans from NCDC.

i) The average D.S.C.R. is shown in statement for modernization cum expansion with cogen plant is 2.24.

ii) The average IRR is shown in statement for modernization cum expansion with cogen plant is 24.21 %.

19.2 Basic Assumptions of Projected Profitability

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

A.	Sugar Price	Rs.3500 per QTL
B.	Sale of Molasses	Rs.3000.00 per MT
C.	Cane price	as per Fair & renumerative price (FRP)
D.	Cane Harvesting &Transport	Rs.550 per MT for competitive price
E.	Packing material	Rs.50.00 per quintal of sugar
F.	Depreciation	as per accounting norms
G.	Interest on working capital	10.50 % per annum
H.	Interest on term loan	
	i) SDF Loan	@ 4.25.00% per annum
	ii) Loan from FIs/Banks/NCDC	@ 11.10%

19.3 Sale of Power:

The projected income is based on the power supplied to the MSETCL during the crushing season and selling price per unit has been considered @ ₹5.00 per unit.

19.4 Salary and Wages:

The requirement of additional manpower has been considered & estimated based on the equipment facilities to be operated. From second year onwards 5% increase on salary has been taken per year on previous year balance.

19.5 Repair & Maintenance (R&M):

The R&M charges for the first year is taken ₹750.00 lac and same is continued for next remaining years.

19.6 Depreciation:

The depreciation has been calculated 15.00 % for plant and machinery and 10.00% for civil.

19.7 Administrative and other Manufacturing Expenses:

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

19.8 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.

19.9 Interest on Working Capital

Interest on working capital requirements has been calculated @ 11%.

19.10 Interest on Term Loan

It has been assumed in the projections that the loan amount for modernization cum expansion alongwith co-generation project of Rs. 10945.79 lakh will be repaid in 12 equal installments. Interest rate has been assumed @11% per annum for the project as mentioned in loan repayment scheduled.

20.0 CONCLUSION AND RECOMMENDATIONS

The earlier discussions on technical configuration and financial parameters in foregoing chapters reveal that the project is technically feasible and financially viable. The financial projections indicate sufficient cash generations to repay the loan with interest. All the financial parameters normally considered for financing the project are quite favourable. We conclude that the proposal in the present form is technically feasible, financially viable and so can be considered favourably for financing.

23.0 ANNEXURES

ANNEXURE-I

Analysis of the Balance sheet of XYZ sugar mill, Dist. Solapur, Maharashtra

A	Summarised balance sheet of last 3 years			(₹ in lakh)
Sr. No.	**Particulars**	**2014-15**	**2015-16**	**2016-17**
1	Business Turnover	19498.37	22373.85	23865.82
2	Gross Profit before Interest, depreciation and Tax	1284.28	732.94	1295.13
3	Interest	748.34	530.02	911.69
4	Cash Profit (2-3)	535.94	202.92	383.44
5	Depreciation	147.16	189.85	169.42
6	Profit before tax (4-5)	388.78	13.07	214.02
7	Income Tax	0.00	0.00	0.00
8	Net Profit	388.78	13.07	214.02
B	**Summarised balance sheet of last 3 years**			
Sr. No.	**Particulars**	**2014-15**	**2015-16**	**2016-17**
1	Gross Block	3584.15	4008.40	4063.59
2	Less: Depreciation	2587.02	2776.87	2946.29
3	Net Block (1-2)	997.13	1231.53	1117.30
4	Work in progress	0.00	0.00	12.04
5	Investments	193.99	196.50	384.83
6	Total Fixed Assets (3+4+5)	1191.12	1428.03	1514.17
7	CURRENT ASSETS			
	i) Cash and Bank balances	650.91	217.49	129.40
	ii) Inventory	11029.44	13804.27	17263.40
	iii) Sundry Debtors	1385.40	1721.87	1665.90
	iv) Loans, Advances and Prepaid expenses	301.68	244.82	203.18
	TOTAL (7)	**13367.43**	**15988.45**	**19261.88**
8	CURRENT LIABILITIES			
	i) Working Capital loan	5448.87	6839.13	10354.15
	ii) Sundry Creditors	3926.24	5065.07	5407.55
	iii) Interest payable	52.05	31.22	8.07
	iv).Other provisions & liabilities	1289.85	2197.56	2040.38
	TOTAL (8)	**10717.01**	**14132.98**	**17810.15**
9	Net Working Capital (7-8)	2650.42	1855.47	1451.73
10	Long Term Loan			
i.	Excise Duty Loan	947.26	430.06	0.00
ii.	Refundable Deposits	583.92	583.92	583.93
iii.	State Government SMP Loan	510.62	459.15	357.03
iv.	Interest free loan from Govt. of Maharashtra	17.00	8.50	0.00
	TOTAL (10)	**2058.80**	**1481.63**	**940.96**
11	i. Equity Share Capital	1228.47	1234.23	1241.21
	ii. Share Anamat	0.73	0.67	2.36
	iii. Other Deposits	86.45	86.45	86.45
	TOTAL (11)	**1315.65**	**1321.35**	**1330.02**
12	Reserves	115.80	116.18	116.57
	TOTAL (11 + 12)	**1431.45**	**1437.53**	**1446.59**

13	Un-distributed profit /(-) Accumulated Losses	351.27	364.33	578.35
14	Net Worth (11+12+13) or (6+9-10)	1782.72	1801.86	2024.94
15	Current Ratio	1.25	1.13	1.08
16	Debt Equity Ratio	1.15	0.82	0.46

Profitability projections of XYZ Cooperative Sugar Mill

ANNEXURE II

Rs. in lakh

Sl. No.	Particulars	Unit	Assumptions	1	2	3	4	5	6	7	8	9	10
1	Capacity	TCD		2500	2500	2500	2500	2500	2500	2500	2500	2500	2500
2	Days	No.		150	160	160	160	160	160	160	160	160	160
3	Utilisation	%		90	100	100	100	100	100	100	100	100	100
4	Crushing	Lakh tonnes		3.38	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
5	Recovery	%		12.00	12.25	12.25	12.25	12.25	12.25	12.25	12.25	12.25	12.25
6	Sugar Prod.	Lakh tonnes		4.05	4.90	4.90	4.90	4.90	4.90	4.90	4.90	4.90	4.90
7	Mollases Prod.	Lakh tonnes	@ 4.5%	0.15	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
8	Power Export-season	MW		18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
9	Energy export-season		Lakh units	561.60	604.80	604.80	604.80	604.80	604.80	604.80	604.80	604.80	604.80
10	Power Export - Off season	MW		15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
11	Energy export-off season		Lakh units	342.00	342.00	342.00	342.00	342.00	342.00	342.00	342.00	342.00	342.00
	INCOME												
12	Sugar	Rs. (Lakh)	3500.00/qtl	14175.00	17150.00	17150.00	17150.00	17150.00	17150.00	17150.00	17150.00	17150.00	17150.00
13	Co Gen - season	Rs. (Lakh)	5.00/ unit	2808.00	3024.00	3024.00	3024.00	3024.00	3024.00	3024.00	3024.00	3024.00	3024.00
14	Co Gen - off-season	Rs. (Lakh)	5.00/ unit	1710.00	1710.00	1710.00	1710.00	1710.00	1710.00	1710.00	1710.00	1710.00	1710.00
15	Mollases	Rs. (Lakh)	Rs.3000/MT	759.38	900.00	900.00	900.00	900.00	900.00	900.00	900.00	900.00	900.00
16	Other income	Rs. (Lakh)		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
	Total	**Rs. (Lakh)**		**19552.38**	**22884.00**	**22884.00**	**22884.00**	**22884.00**	**22884.00**	**22884.00**	**22884.00**	**22884.00**	**22884.00**
	EXPENDITURE												
17	Sugar cane	Rs. (Lakh)	Rs.2670/MT	9011.25	10680.00	10680.00	10680.00	10680.00	10680.00	10680.00	10680.00	10680.00	10680.00
18	Harvesting and	Rs. (Lakh)	Rs.550/MT	1856.25	2200.00	2200.00	2200.00	2200.00	2200.00	2200.00	2200.00	2200.00	2200.00

	Transport												
19	Manfg. Exp.	Rs. (Lakh)	Rs.60/MT	202.50	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00
20	Repair & main.	Rs. (Lakh)		750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
21	Packing material	Rs. (Lakh)	Rs.500/MT	202.50	245.00	245.00	245.00	245.00	245.00	245.00	245.00	245.00	245.00
22	Salary&wages	Rs. (Lakh)		1200.00	1260.00	1291.50	1323.79	1356.88	1390.80	1425.57	1461.21	1497.74	1535.19
23	Power&fuel	Rs. (Lakh)		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
24	Administartion exp.			150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00	150.00
	Total	**Rs. (Lakh)**		**13472.50**	**15625.00**	**15656.50**	**15688.79**	**15721.88**	**15755.80**	**15790.57**	**15826.21**	**15862.74**	**15900.19**
25	Intt. on working capital	Rs. in lakh	10.50%	421.71	510.21	510.21	510.21	510.21	510.21	510.21	510.21	510.21	510.21
26	Intt. on Pro. NCDC term loan	Rs. in lakh	11.10%	1214.98	1214.98	1214.98	1012.49	809.99	607.49	404.99	202.50	0.00	0.00
27	Intt. On SDF loan for MCE	Rs. in lakh	4.25%	163.52	163.52	163.52	163.52	122.64	81.76	40.88	0.00	0.00	0.00
28	Intt. On SDF loan for Cogen	Rs. in lakh	4.25%	0.00	212.08	159.06	106.04	53.02	0.00	0.00	0.00	0.00	0.00
	Total Interest			**1800.21**	**1888.71**	**1888.71**	**1686.22**	**1442.84**	**1199.46**	**956.09**	**712.71**	**510.21**	**510.21**
29	Depreciation-P&M-New	18231.59	15%	2734.74	2324.53	2092.07	1882.87	1694.58	1525.12	1372.61	1235.35	1111.81	1000.63
30	Depreciation-Civil-New	1010.00	10%	101.00	90.90	81.81	73.63	66.27	59.64	53.68	48.31	43.48	39.13
	Total Dep.			2835.74	2415.43	2173.88	1956.50	1760.85	1584.76	1426.29	1283.66	1155.29	1039.76
	Total Expenditure			**18108.44**	**19929.14**	**19719.10**	**19331.50**	**18925.57**	**18540.03**	**18172.95**	**17822.58**	**17528.25**	**17450.16**
31	Profit			1443.93	2954.86	3164.90	3552.50	3958.43	4343.97	4711.05	5061.42	5355.75	5433.84
	CASH availability												
32	Profit			1443.93	2954.86	3164.90	3552.50	3958.43	4343.97	4711.05	5061.42	5355.75	5433.84
33	Depreciation			2835.74	2415.43	2173.88	1956.50	1760.85	1584.76	1426.29	1283.66	1155.29	1039.76
34	Intt. on loans			1378.50	1378.50	1378.50	1176.00	932.63	689.25	445.87	202.50	0.00	0.00
	Total			**5658.17**	**6748.79**	**6717.29**	**6685.00**	**6651.91**	**6617.98**	**6583.21**	**6547.57**	**6511.04**	**6473.60**

	Debt service obligation												
35	Intt. on loans			1378.50	1378.50	1378.50	1176.00	932.63	689.25	445.87	202.50	0.00	0.00
36	Inst. of Proposed NCDC T L			0.00	0.00	1824.30	1824.30	1824.30	1824.30	1824.30	1824.30	0.00	0.00
37	Inst. of SDF loan for MCE			0.00	0.00	0.00	961.86	961.86	961.86	961.86	961.86	0.00	0.00
38	Inst. of SDF loan for Cogen			0.00	212.08	159.06	106.04	53.02	0.00	0.00	0.00	0.00	0.00
	Total			**1378.50**	**1378.50**	**3202.80**	**3962.16**	**3718.79**	**3475.41**	**3232.03**	**2988.66**	**0.00**	**0.00**
39	DSCR			4.10	4.90	2.10	1.69	1.79	1.90	2.04	2.19	#DIV/0!	#DIV/0!
40	Average DSCR					**2.24**							
41	**Cash availability**		**-21891.59**	**5658.17**	**6748.79**	**6717.29**	**6685.00**	**6651.91**	**6617.98**	**6583.21**	**6547.57**	**6511.04**	**6473.60**
42	**IRR**						**24.21%**						
43	**Cumulative Cash Accruals**			**4279.67**	**11028.46**	**17745.74**	**24430.74**	**31082.65**	**37700.63**	**44283.85**	**50831.42**	**57342.46**	**63816.06**
44	**Pay Back Period**			**3 years 2 month**									