

*Doc No.* : PD/DPR/16-17/076  
*Date* : October 05, 2016  
*Assign No.* : SO/16-17/02631  
*Date* : September 29, 2016

## **DETAILED PROJECT REPORT (DPR)**

# **INTEGRATED SUGAR (3500 TCD) & COGEN POWER PLANT (20 MW)**

Prepared for

**Jai Kisan Agriculture Industries Ltd.**

Village Babhulgaon, Tal. Kandhar, District Nanded, Maharashtra

Prepared by

**MITCON Consultancy & Engineering Services Ltd.**

Kubera Chambers, 1<sup>st</sup> Floor, Shivajinagar, Pune – 411 005

**October, 2016**

## Detailed Project Report (DPR)

### Integrated Sugar (3500 TCD) & Cogen Power Plant (20 MW)

#### Table of Contents

Chapter No.	Title	Page No.
	<b>Executive Summary</b>	<b>I-VII</b>
<b>1.</b>	<b>Introduction</b>	<b>1 - 20</b>
1.1	Project Background	1
1.2	Promoters Background & Experience	2
1.3	Sugar Industry Overview	3
1.4	Power Sector Review	9
1.5	Objectives of the Report	19
1.6	Methodology	19
1.7	Acknowledgements	20
<b>2.</b>	<b>Cane &amp; Bio-Mass Potential In The Command Area, A Review</b>	<b>21 – 27</b>
2.1	Sugarcane Potential in Command Area	21
2.2	Surplus Biomass Availability	24
<b>3.</b>	<b>Project Concept, Design &amp; Key Parameters</b>	<b>28 – 41</b>
3.1	Sugar Plant	28
3.2	Cogen Power Plant	30
3.3	Project Site, Key Features	36
3.4	Effluent Treatment	38
3.5	Raw Materials	38
3.6	Utilities & Consumables	39
3.7	Manpower	40
3.8	Implementation Schedule	40
<b>4.</b>	<b>Technical Specifications</b>	<b>42 -42</b>
4.1	Plant Details and Specifications	42
4.2	Cogen Power Plant	42

## Detailed Project Report (DPR)

### Integrated Sugar (3500 TCD) & Cogen Power Plant (20 MW)

#### TABLE OF CONTENTS (CONTD...)

Chapter No.	Title	Page No.
<b>5.</b>	<b>Plant Layout</b>	<b>43 – 46</b>
5.1	Layout Considerations	43
5.2	Plant Layout	44
5.3	Approach & Internal Roads	46
<b>6.</b>	<b>Environment &amp; Socio-Economic Benefits</b>	<b>47</b>
<b>7.</b>	<b>Project Preparedness</b>	<b>48-49</b>
7.1	NoC's / Approvals / Permissions	48
7.2	Management & Administration	49
7.3	Technical & Financial Tie Ups	49
7.4	Project Management	49
<b>8.</b>	<b>Estimated Capital Expenditure</b>	<b>50 – 54</b>
8.1	Land & Site Development	50
8.2	Civil Works	50
8.3	Equipment	51
8.4	Miscellaneous Fixed Assets	52
8.5	Preliminary & Pre-operative Expenses	53
8.6	Contingencies	53
8.7	Stock Levels & Working Capital Requirement	54
<b>9.</b>	<b>Financial Viability</b>	<b>55 – 60</b>
9.1	Basis & Assumptions	55
9.2	Cost Summary	59
9.3	Means of Finance	59
9.4	Financial Viability Indicators	59
<b>10.</b>	<b>Conclusions &amp; Recommendations</b>	<b>61 - 64</b>
10.1	Project SWOT Analysis	61
10.2	Risk & Mitigates	63
10.3	Key Management Features	63
10.4	Conclusions & Recommendations	64

## Detailed Project Report (DPR)

### Integrated Sugar (3500 TCD) & Cogen Power Plant (20 MW)

#### LIST OF SCHEDULES

Schedule No.	Title
A	Cost of Project & Means of Finance
B	Estimated Cost of Production & Profitability Statement
C	Debt Service Coverage Ratio
D	Cash Flow Statement
E	Balance Sheets Forecast
F	Analytical & Comparative Ratios
G	Breakeven Analysis
H	Sensitivity Analysis
I	Payback Period
J	Internal Rate of Return

## Detailed Project Report (DPR)

### Integrated Sugar (3500 TCD) & Cogen Power Plant (20 MW)

#### LIST OF ANNEXURES

Annexure No.	Title
1	Particulars of Land and Site Development Costs
2	Particulars of Buildings and Civil Works
3	Details of Indigenous Machinery
4	Miscellaneous Fixed Assets
5	Preliminary and Preoperative Expenses
6	Estimates of Contingency Escalation Provision
7	Working Capital Requirements
8	Estimated Annual Production & Sales Value
9	Particulars of Indigenous Raw Materials
10	Particulars of Consumables & Packing Materials
11	Particulars of Utilities
12	Requirement of Direct Labor & Calculation of Wages
13	Particulars of Repair and Maintenance
14	Particulars of Other Manufacturing Expenses
15	Requirement of Administrative Overheads
16	Particulars of Selling & Distribution Overheads
17	Repayment of Term loans & Calculation of Interest
18	Calculation of Depreciation
19	Provisions for Taxation & Dividend (Income tax working)

## Detailed Project Report (DPR)

### Integrated Sugar (3500 TCD) & Cogen Power Plant (20 MW)

#### LIST OF APPENDICES

Appendix No.	Title
I	Certificate of Incorporation & Memorandum of Association & Articles of Association
II	Bio data of CMD & other Directors
III	IEM License for Sugar & Cogen
IV	Aerial Distance Certificate from Survey of India
V	NoC from Gram Panchayat
VI	Land Details
VII	HBDs for Cogen Power Plant, Season & Off-season Operations
VIII	Steam, Water / Condensate, Fuel & Power Balances
IX	Technical specifications of sugar plant with cane diffuser
X	Technical specifications of cogen power plant
XI	Site Location Map
XII	Implementation Schedule
XIII	Single Line Diagram
XIV	Organization chart
XV	Preliminary Plant Layout
XVI	MERC Tariff Order

## 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

## DISCLAIMER

### Important Notice:

- 1) This Detailed Project Report (hereinafter referred to as Report), the business plan/financial projections, if any and its contents are confidential. Accordingly, Report and its contents are on the basis that they will be held in complete confidence.
- 2) By accepting a copy of this Report, the recipient agrees to keep its contents and any other information, which is disclosed to such recipient, confidential and shall not divulge, distribute or disseminate any information contained herein, in part or in full, without the prior approval of MITCON Consultancy & Engineering Services Ltd (MITCON).
- 3) This Report is prepared exclusively for the benefit and for the internal use of the recipient and/or its affiliates and does not carry any right of publication or disclosure to any other party.
- 4) The client has engaged MITCON for preparation of Detailed Project Report for Jai Kisan Agriculture Industries Ltd., Village Babhulgaon, Tal-Kandhar, District- Nanded, Maharashtra, on Integrated 3500 TCD Sugar & 20 MW Cogen Power Project, we have relied upon and assumed, without independent verification, the accuracy and completeness of all information given by the client which has frequently been referred in this report.
- 5) The Report developed by MITCON has used inputs and conclusions drawn out of discussions with the client and reference to project specific studies, and other information/documents obtained by MITCON from various sources/available publicly, which MITCON believes to be reliable. MITCON has not carried out any independent verification for the truthfulness of the same and its accuracy and reliability cannot be guaranteed.
- 6) MITCON and their respective directors, officers, agents, employees and shareholders (collectively referred to as “Relevant Persons”) expressly disclaim any responsibility or liability for any loss, damage or inconvenience caused to anybody whether directly or indirectly due to this Report and the information contained herein. MITCON may be exempted from all errors and omissions in this Report.
- 7) This presentation may include future expectations, projections, or forward looking statements. These forward looking statements involve known and unknown risks, uncertainties and other factors that may cause actual events to be materially different from future events expressed or implied by such forward looking statements.
- 8) This report is not directed or intended for distribution to, or use by, any person or entity who is a citizen or resident of or located in any locality, state, country or other jurisdiction, where such distribution, publication, availability or use would be contrary to law, regulation or which would subject MITCON and its affiliates to any registration or licensing requirement within such jurisdiction. Persons in whose possession this document may come are required to inform them of and to observe such restriction.

- 9) No Liquidated damages shall be entertained/allowed against this report or any part thereof.
- 10) Liability of MITCON or its Subcontractors to the Client for any Losses shall be limited only to the extent of fees paid by the Client to MITCON under this Contract.

**Compiled/prepared by**

**Signature:**

**Name of the Employee: Sawankumar Patil**

**Designation: Project Consultant**

**Checked and verified by:**

**Signature:**

**Name of the Employee: Rajkumar Jadhav**

**Designation: Chief Consultant**

**Approved by:**

**Signature:**

**Name of the HOD: S. C. Natu**

## Executive Summary

### Project at a Glance

Jai Kisan Agriculture Industries Ltd. (JKAIL) is a Company registered in the State of Maharashtra under the Companies Act, 1956.

Jai Kisan Agriculture Industries Ltd., a limited company, proposes to set up an integrated eco-friendly 20 MW capacity cogen power project for decentralized generation of exportable surplus power, mainly from renewable sources of fuel. The project is proposed to be set up co-extensively with a new sugar mill of 3500 TCD (expandable to 5000 TCD) capacity, located near Village Babhulgaon, Tal. Kandhar.

The integrated project comprises of a sugar mill for the manufacture of high quality sugar, thereby making available required bagasse for the cogen power plant and molasses which can be sold in open market. The command area of the proposed sugar mill has adequate irrigation facilities, potential for sustained cane supply to the sugar mill and biomass availability.

The aggregated capital investment for the integrated project has been estimated at **Rs.183.59 Crore.**

### Project Rationale

The promoters have extensively and carefully analyzed the present and future scenario of sugar and power industries. They studied carefully the present irrigation facilities and surplus cane availability in the command area, as well as future potential of irrigation and additional cane availability.

The command area of the proposed sugar factory is expected to fall mainly in command of total six tehsils, Kandhar, Loha & Mukhed from Nanded District, and Jalkot & Ahmadpur from Latur District & Palam from Parbhani District. Major sources for irrigation are wells, ponds, rivers, canals and tube wells. The water is also available through canal from the government irrigation projects. The major rivers in the Nanded district are Godavari, Penganga, Monjura and Mongad, which are perennial source of water. Asna, Sita, Saraswati & Lendi are the mixed rivers with seasonal flow. The district has three major irrigation projects of Purna, Manar & Vishnupuri. Total area under irrigation under canals & wells is 24596 ha & 46451 ha, respectively. The area under minor, medium & major irrigation projects within Nanded district is 4123 ha, 7700 ha & 79590 ha, respectively. Hence, promoters expect the availability of required sugarcane of 4.94 lakh MT with sustainable sugarcane development in future.

The promoters and farmers in the command area, having experience in sugar industry and sugarcane cultivation, were able to foresee the cane potential in the command area.

The current policies in Maharashtra and in India are conducive and backed by favorable regulatory framework for generation of eco-friendly power, as well as regarding support for private investment in such integrated project.

The promoters also have acknowledged in depth, the socio-economic and environmental value addition of this integrated project to the local populace, region, State and the Country, as well as its win-win situation to all the stakeholders involved.

Overall, the entire integrated project is proposed to be set up based on the stand-alone commercial viability of each component of the project, ensuring that the integration effort or synergy would enhance individual commercial viabilities of these stand-alone projects.

### **The Promoters & Project Preparedness**

- **Shri. Jaisinha Shivajirao Pandit, Chairman & Managing Director**

- B.S.C. graduate with a vast experience in agricultural field.
- He was Chairman of Bhavani Urban Co-Op. Bank Ltd., Georai from June 19, 2006 to October 19, 2006
- He is Director of Bhavani Urban Co-Op. Bank Ltd., Georai from May 31, 2001
- He is Director of Maharashtra State Co-Op. Housing Finance Corporation Ltd., Mumbai from May 31, 2006
- He was Joint Secretary of Jai Bhavani Shikshan Prasarak Mandal, Georai from June 30, 2007 to June 25, 2013
- He was Joint Secretary of Jagdamba Shikshan Prasarak Mandal, Beed from November 14, 2004 to June 25, 2015
- He is Secretary of Jai Bhavani Shikshan Prasarak Mandal, Georai from June 30, 2013
- He is Secretary of Jagdamba Shikshan Prasarak Mandal, Beed from June 25, 2015
- He is Chief Managing Director of Pearl Sugar Pvt. Ltd., Chinchpur

- **Shri. Shivajirao Ankushrao Pandit, Director**
  - B.A graduate with a vast experience in agricultural field
  - He also carries out activities in co-operation field as well as runs Educational Institutions.
  - Having a political background, he has been a Minister of State, for Eggs, Water Resources, Employment, Horticulture, agriculture and rural Development
  - He has also been associated with organizations which are created for social work.
  
- **Shri Vijaysinha Shivajirao Pandit, Director**
  - B.S.C, LLB graduate, with a vast experience in politics
  - He is actively involved in social work

JKAIL is in the process of appointing a technical / managerial team of highly qualified engineers, contract & arbitration experts, agricultural officers and managerial personnel for implementation and operation of the captioned integrated project.

To make the venture commercially viable and financially profitable, the capacity of the sugar plant is decided and fixed at 3500 TCD (expandable to 5000 TCD) and a cogeneration plant of 20 MW.

The suitability of the soil, increased irrigation facilities and previous experience of the farmers in cane growing will be helpful in developing the required area for cane plantation

### **Project in Brief**

#### **Sugar Mill (estimated capital investment of Rs. 90.46 crore)**

A sugar mill of 3500 TCD will be installed for manufacture of white sugar of good quality. The sugar market in India is quite up-beat and is expected to continue for a foreseeable future. Command area has sugarcane availability with sugar recovery of about 11.50%.

#### **Cogen Power Plant (estimated capital investment of Rs.93.13 crore)**

The cogen power project of 20 MW capacity will mainly operate on mill bagasse during 160 season days of the sugar mill and on saved bagasse for 27 off-season days. At designed levels, it will generate about 83.16 million kWh and export about 65.62 million kWh through 132 kV substation of MSEDCL to MSETCL or to third party consumers, as per prevailing tariff.

All steam and power requirements of the sugar mill, cogen auxiliaries and colony, both during season and off-season periods, will be met internally from the cogen power plant. It will employ extra high pressure and temperature configuration (87 Kg/cm<sup>2</sup> and 540° C) boiler & steam turbine, as well as ESP for emission control and DCS control system for efficient operation.

The policy for sugar mill cogen plants, both at the Central Government and at the State, Government of Maharashtra are quite conducive. The MNRE has provided several financial incentives in terms of capital grants and interest subsidy till date and the same are likely to continue. The proposed project will be eligible for these incentives as well as other incentives like accelerated depreciation, income tax benefits, reduced import duties for renewable energy projects. Indian Renewable Energy Development Agency (IREDA) Ltd., the lending arm of MNRE, also provides term loan for these projects at soft terms.

The present tariff offered by MERC order is Rs. 6.70/kWh for bagasse based cogeneration plants.

### Highlights of the Project

<b>Name and Address</b>	:	<b>Jai Kisan Agriculture Industries Ltd.</b>
		At post Bhavani Nagar, Kandhar Tal. Kandhar, Dist. Nanded
<b>Factory Site:</b>	:	Village Babhulgaon, Tal. Kandhar, Dist. Nanded, Maharashtra
<b>Constitution &amp; Type</b>	:	Limited company
<b>Products</b>	:	Sugar & Co generated Power
<b>Installed Capacities of the Integrated Project</b>		
<b>Sugar Plant</b>	:	3500 TCD
<b>Cogen Power Plant</b>	:	20 MW installed capacity 14.12 MW (Avg. exportable power, Season 160 days) 17.85 MW (Avg. exportable power, Off Season 27 days)

## Financial Highlights

### Project Cost:

(Rs. In Lakh)

Total Project Cost		Sugar	Cogen	Total
Land & Site Development	:	275	166	441
Civil works & Buildings	:	1188	1071	2259
Indigenous Plant and Machinery	:	6234	6996	13230
Miscellaneous Fixed Assets	:	160	195	355
Prelim & Preoperative Expenses	:	717	659	1376
Contingencies	:	168	180	348
Working Capital Margin	:	304	46	350
<b>Total</b>	:	<b>9046</b>	<b>9313</b>	<b>18359</b>

### Means of Finance:

(Rs. Lakh)

Financing Pattern		Sugar	Cogen	Total
1. Promoter's Equity	:	2650	2725	5375
2. Bridge Loan/SDF	:	0	1768	1768
3. Working Capital Margin by JKAIL	:	304	46	350
4. F. I. Loan(s)	:	6092	4774	10866
<b>Total</b>	:	<b>9046</b>	<b>9313</b>	<b>18359</b>

Parameter		First Year	Fifth Year
Estimated W/C Requirements	Rs. Lakh	2006	4325
Estimated Annual Turnover	Rs. Lakh	8266	21775
Profit Before Tax	Rs. Lakh	1002	3569
Accumulated Cash Surplus	Rs. Lakh	560	1182
Employment Potential	Nos.	275	275
Debt Service Coverage Ratio (DSCR)	Average	1.82	
	Maximum	4.34	
	Minimum	1.59	
Payback Period, Years	5 to 6 years		
Internal Rate of Return on total Investment, %	17.54		

## Strengths of the Project

The main strengths of this integrated project include:

- Background and experience of the promoters
- Project location in potential sugarcane area
- Experienced, willing and committed farmers
- Ensured cane availability
- Demand supply gap in power in Maharashtra
- Conducive policy / regulatory frame work
- Potential for export of branded sugar
- Sustained availability of raw materials
- Substantial socio-economic and environmental benefits
- Latest technology equipment with highest efficiency and
- Sound techno commercial viability

## Risks & Mitigates

Risk	Particular	Mitigates
Performance risk	Ensured sugar cane & fuel availability	Cane development has been in full progress, with experienced senior professionals and staff appointed for the purpose. A full time fuel manager and dedicated staff have been proposed for the cogen power plant. Excellent support from farmers
Marketing risk	Sugar sale / export	Firm marketing tie up in offing. Alternative marketing channels explored. No link with domestic demand. Value added products proposed
Regulatory risk	Conversion / clearances / tariff order	No difficulty envisaged, as various governmental agencies have already expressed their willingness to issue approvals / consents. All the approvals in pipeline. Conducive tariff order from MERC for purchase of power
Financial risk	Financial viability of the project	Satisfactory DSCR. Equity participation arranged.

## **Implementation Schedule**

The entire project will be commissioned by January, 2018, 12 to 13 months after the financial closure. Meticulous planning and strong project management proposed will ensure this schedule.

## **Conclusions**

Over all, the project is well conceived and conceptualized, with sound commercial viability. The expected financial returns are quite satisfactory. The project is being implemented by promoters having requisite background and experience and with proposed employment of experienced professionals, experts and consultants. All perceived risks have adequate safe guards. The project is recommended for equity participation and lending by financial institutions.

## CHAPTER – 1

### INTRODUCTION

#### 1.1 Project Background

This Detailed Project Report (DPR) has been prepared for Jai Kisan Agriculture Industries Ltd. (JKAIL) by MITCON Consultancy & Engineering Services Limited (MITCON), Pune, for setting up an integrated sugar 3500 TCD (expandable to 5000 TCD) capacity and cogeneration power plant of 20 MW at Village Babhulgaon, Tal. Kandhar, Dist. Nanded, in the Maharashtra State.

JKAIL has gone ahead in implementation of an integrated project & has taken the following steps

- 1.1.1 JKAIL is registered under Companies Act, 1956. **Appendix I** gives certificate of incorporation & Memorandum of Association & Articles of Association & **Appendix II** gives bio data of CMD & Other Directors of JKAIL.
- 1.1.2 **Appendix-III** gives the copy of IEM license for 3500 TCD sugar & 20 MW cogeneration.
- 1.1.3 **Appendix-IV** gives copy of Aerial Distance Certificate issued by Survey of India.
- 1.1.4 **Appendix –V** gives NOC from Grampanchayat
- 1.1.5 **Appendix –VI** gives Land Details

## 1.2 Promoter's Background & Experience

1.2.1 Jai Kisan Agriculture Industries Ltd. (JKAIL) is promoted by Shri Jaisinha Shivajirao Pandit, Chairman & Managing Director.

The detailed background of the Promoters of JKAIL is as follows:-

- **Shri. Jaisinha Shivajirao Pandit, Chairman & Managing Director**
  - B.S.C. graduate with a vast experience in agricultural field.
  - He was Chairman of Bhavani Urban Co-Op. Bank Ltd., Georai from June 19, 2006 to October 19, 2006
  - He is Director of Bhavani Urban Co-Op. Bank Ltd., Georai from May 31, 2001
  - He is Director of Maharashtra State Co-Op. Housing Finance Corporation Ltd., Mumbai from May 31, 2006
  - He was Joint Secretary of Jai Bhavani Shikshan Prasarak Mandal, Georai from June 30, 2007 to June 25, 2013
  - He was Joint Secretary of Jagdamba Shikshan Prasarak Mandal, Beed from November 14, 2004 to June 25, 2015
  - He is Secretary of Jai Bhavani Shikshan Prasarak Mandal, Georai from June 30, 2013
  - He is Secretary of Jagdamba Shikshan Prasarak Mandal, Beed from June 25, 2015
  - He is Chief Managing Director of Pearl Sugar Pvt. Ltd., Chinchpur
- **Shri. Shivajirao Ankushrao Pandit, Director**
  - B.A graduate with a vast experience in agricultural field
  - He also carries out activities in co-operation field as well as runs Educational Institutions.
  - Having a political background, he has been a Minister of State, for Eggs, Water Resources, Employment, Horticulture, agriculture and rural Development
  - He has also been associated with organizations which are created for social work.
- **Shri Vijaysinha Shivajirao Pandit, Director**
  - B.S.C, LLB graduate, with a vast experience in politics
  - He is actively involved in social work

**Appendix II** gives Detailed Bio data of Directors of JKAIL

- 1.2.2 JKAIL is in the process of appointing a technical / managerial team of highly qualified engineers, contract & arbitration experts, agricultural officers and managerial personnel for implementation and operation of the captioned integrated project.
- 1.2.3 To make the venture commercially viable and financially profitable, the capacity of the sugar plant is decided and fixed at 3500 TCD (expandable to 5000 TCD) and a cogeneration plant of 20 MW.

The promoters sensed the potential of sugarcane in the region, increasing demand of power as well as the needs of the local farmers; those cultivate sugarcane in the command area.

The integrated project comprises of a sugar mill for the manufacture of high quality sugar, thereby making available required bagasse for the cogen power plant and molasses for sale. The command area of the proposed sugar mill has adequate irrigation facilities, potential for sustained cane supply to the sugar mill.

- 1.2.4 JKAIL has now been fully geared up to implement and commission this integrated project by January, 2018. Latest technologies for sugar and generation of power will be employed in this project to ensure optimum efficiency and operating costs for both the products.

### **1.3 Sugar Industry Overview**

#### **1.3.1 All India**

- i. The origin of Indian sugar industry dates back to 1930, when the first sugar factory was set up in the pre-independence era. Over the last 76 years, the sugar industry has steadily grown and has become the backbone of the agricultural and rural economy in India. Today, sugar is the second largest agro processing industry, next to the textile industry. India is one of the largest producers of sugar in the world, with a production of over 25 million tones. Sugar factories are located mostly in the rural India. They act as centers of development, provide largest direct employment in the rural areas and contribute substantially to the Central and State exchequers. The prospects of earning foreign exchange from export of sugar are also quite high.

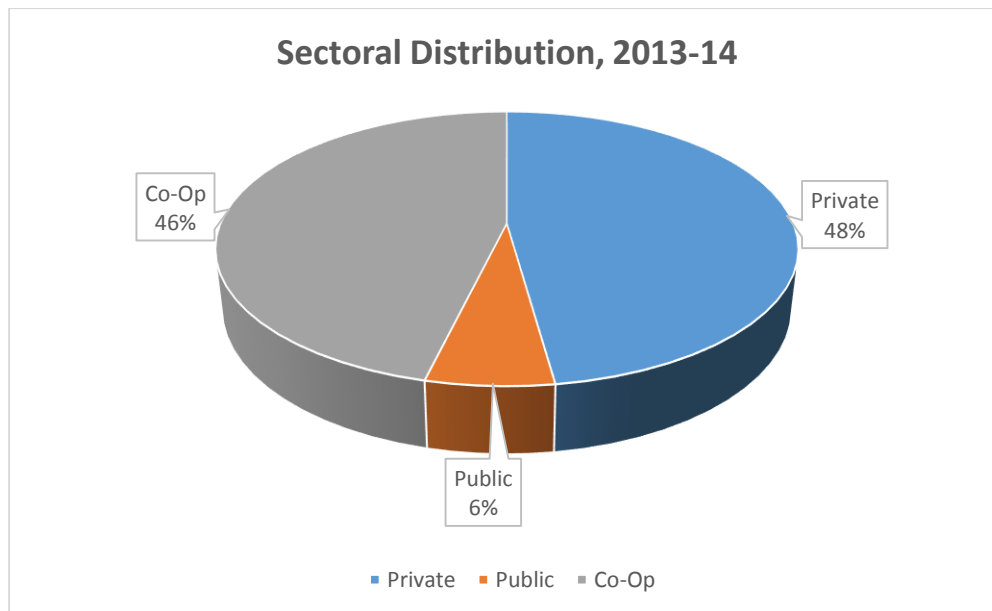
- ii. Sugar factories in India have capacities ranging from 1250 TCD to 10000 TCD. The Indian sugar industry has developed indigenous capabilities for design, manufacture, supply, operation and maintenance, R&D and cane development. The major stakeholders of this industry in India are Ministry of Agriculture, Govt. of India, Ministry of Consumer Affairs, Food and Public Distribution, federations of co-operative and private sector sugar factories at the national and the State levels, sugarcane growing farmers, equipment and technology suppliers, research institutions, consultants and service providers, financial institutions and Central / State Governments.
- iii. A total of 701 sugar factories are in operation today, with additional sugar factories under implementation in different parts of the nation. The area under sugar cane cultivation, sugar cane production, sugar cane crushing in sugar factories, average season days, sugar recovery and sugar production have increased steadily over the years. The crop yield per hectare and recovery has improved, particularly in the last decade.
- iv. Sugar factories in India are spread over the entire country; however 92% of them are located in 9 States viz., Uttar Pradesh, Bihar, Punjab and Haryana in the north, Maharashtra and Gujarat in the west and Karnataka, Andhra Pradesh & Tamil Nadu in the south. More than 80% sugar factories are below 3500 TCD capacity and balance have higher capacities. About 44% of the Indian sugar factories are in the co-operative 9% in Public sectors and balance 47% in the private sector.
- v. Following Table shows the distribution of sugar factories all over India.

**Table: Status of Installed Sugar Factories in India**

<b>States</b>	<b>Private</b>	<b>Public</b>	<b>Co-op</b>	<b>Total</b>
Assam	1	-	2	<b>3</b>
Orissa	4	-	4	<b>8</b>
Bihar	13	15	-	<b>28</b>
Uttar Pradesh	116	14	28	<b>158</b>
Uttarakhand	4	2	4	<b>10</b>
Punjab	8	-	16	<b>24</b>
Haryana	3	-	13	<b>16</b>
Andhra Pradesh	29	1	14	<b>44</b>
Tamil Nadu	27	3	16	<b>46</b>
Maharashtra	59	-	168	<b>227</b>

States	Private	Public	Co-op	Total
Gujarat	4	-	22	<b>26</b>
Madhya Pradesh	15	2	5	<b>22</b>
Kerala	1	-	1	<b>2</b>
Rajasthan	1	1	1	<b>3</b>
Karnataka	47	3	24	<b>74</b>
Puducherry	1	-	1	<b>2</b>
Goa	-	-	1	<b>1</b>
Chhattisgarh	-	-	3	<b>3</b>
Dadra Nagar & Haveli	-	-	1	<b>1</b>
West Bengal	2	1	-	<b>3</b>
<b>All India Total</b>	<b>335</b>	<b>42</b>	<b>324</b>	<b>701</b>

(Source - Sugar India, 2015)



**Source: Sugar India Year Book, 2015**

- vi. The Ministry of Consumer Affairs, Food & Public Distribution, and Government of India revised the standard specifications for sugar plant & equipment, in the year 1987. The special committee finalized specifications for economical capacity of 2500 TCD, expandable to 3500 TCD, employing higher-pressure boiler and turbine configuration and efficient equipment, with a potential to export incidental surplus power to the grid.

- vii. The Indian sugar industry was de-licensed in the year 1998 vide press note No. 12 issued by the Government of India, Ministry of Industry, Department of Industrial Policy and Promotion, on August 31, 1998. The salient features of de-licensing are as follows:
  - viii. The sugar industry stands deleted from the list of industries requiring compulsory licensing under the provisions of Industries Development and Regulation Act, 1951. However, in order to avoid unhealthy competition among sugar factories to procure sugarcane, a minimum distance of 15 km would continue to be observed between an existing sugar factory and a new factory, by exercise of powers under the Sugar Control Order, 1966.
  - ix. The entrepreneurs, who wish to de-license their sugar factory, would require filing an Industrial Entrepreneur Memoranda (IEM) with the secretariat of industrial assistance in the Ministry of Industry, as laid down for all de-licensed industries, in terms of the press note dated August 2, 1991, as amended from time to time.
  - x. Entrepreneurs who have been issued Letter of Intent (LoI) for manufacture of sugar need not file an initial IEM. In such cases, the LoI holder shall only file Part B of the IEM at the time of commencement of commercial production against the LoI issued to them. It is however open to entrepreneurs to file an initial IEM (in lieu of LoI / industrial license held by them) if they so desire, whenever any variation from the conditions and parameters stipulated in the LoI / industrial license is contemplated.
  - xi. The statistics on economic and commercial performance for the industry is quite fluctuating. The changes in the agro climatic conditions and sugarcane crop production, as well as the sugar markets have been mainly responsible for these fluctuations. Efficiency, quality, and integration have become order of the day for this industry. The industry has grown extremely well till today over the last seven decades. The strength and capacity built so far will surely help meet these challenges. The following are major options to meet these challenges:
    - a. Effecting substantial improvement in cane development and management, including cultivation practices, varieties and water management, so as to improve yield and recovery, without affecting the average fibre content.
    - b. Effecting visible improvement in the operational efficiencies and reduction of sugar losses.

- c. Effecting and sustaining improvement in energy efficiency, both in steam and power, for saving of additional bagasse, for both sugar and by-products manufacture.
  - d. Expansion of capacities and diversification into absolute alcohol/ethanol and cogeneration power projects.
  - e. Effecting adequate capacity building within and without.
  - f. Maximizing sugar exports for value addition.
  - g. Effective marketing in the national and international markets.
  - h. Product quality and diversification.
  - i. Commercializing the excess power capacity by exporting to utilities or to other bulk power consumers.
- xii. Ministry of Consumer Affairs, Food & Public Distribution, and Department of Food & Public Distribution Govt. India has issued a revised order dated 10.11.2006, amending Sugarcane (Control) Order, 1966. The key provisions of this order are outlined below:
- a. No new sugar factory shall be set up within a radius of 15 km of any existing sugar factory or another new sugar factory in a State or two or more States.
  - b. Before filing the Industrial Entrepreneur Memorandum (IEM) with a Central Govt., a certificate from the Cane Commissioner or Director Sugar or specified authority of the concerned State Govt. shall be obtained regarding the distance criteria re-defined as above.
  - c. Submission of performance guarantee of Rs. 1 crore to Chief Director, Sugar, Dept. of Food & Public Distribution, within 30 days of filing the IEM, as a surety for implementation of the IEM within the stipulated or extended time.
  - d. The stipulated time for taking effective steps shall be 2 years and commercial production shall commence within 4 years from the date of filing of the IEM, failing which the IEM shall stand de-recognized and performance guarantee shall be forfeited.
  - e. If an IEM remains un-implemented within the stipulated or extended time limits, the performance guarantee shall be forfeited after giving a reasonable opportunity of being heard.
  - f. The above clauses will be applicable for IEM already acknowledged as on the date of this notification, but who have not taken effective steps for its implementation, duly defined, shall furnish a performance guarantee of Rs. 1 crore to the Chief Director, Sugar.

### 1.3.2 Maharashtra

- i The growth of sugar industry in the State started prior to independence in the private sector and in the co-operative sector since 1950 onwards. The co-operative movement in the State has been witnessed mainly in the sugar industry. The growth of this industry in the co-operative sector has certainly helped improve socio-economic life of the rural parts of the State. The State co-operative sugar factories are directly administered by the office of Commissioner of Sugar, Ministry of Co-operation and Government of Maharashtra.
- ii Maharashtra State assumes a leadership position in India related to sugar industry, in terms of area under sugarcane cultivation, number of sugar factories, sugarcane production, sugarcane crushing by sugar factories, yield, recovery and sugar production. There are 209 installed sugar factories as on date and several entrepreneurs, private companies & co-operative societies have been issued Lols / IEMs for production of sugar.
- iii The policy for sugar industry in Maharashtra is in line with the Central Government. The State co-operative sugar factories have faced difficulties in the recent past, due to fluctuations in the monsoon and drop in Sugar prices due to excess indigenous and international sugar production. But recently the Sugar prices have improved and likely to remain so for considerable duration.
- iv Cane Availability, Present & Future  

Sugarcane has been the major cash crop grown in the State due to conducive environmental conditions for sugarcane growing, good quality of soil for cultivation and adequate irrigation facilities. New varieties are developed along with modern cultivation and irrigation practices. This has led to increased crop yield & sugar recovery, as compared to the other States. The highest recovery registered in last season was 11.65%, averaging 11.00% for the State, compared to 10.25 % all India average.
- v Sugar factories are expected to have less cane availability during coming year in areas like Marathwada and Solapur Districts of the State. This shall have bullish market sentiment and help Sugar prices remain higher for reasonable period.

- vi Number of efforts has been initiated by the office of the Commissioner of Sugar for improving the physical and financial position of the co-operative sugar factories. The recent decision of liquidation of badly managed and financially poor sugar factories in the State and offering them for outright sale or operation on lease basis is one of the landmark decisions from this office.

## 1.4 Power Sector Review

### 1.4.1 All India

As per the LGBR Report, 2015-16, during the year 2015-16, there would be anticipated energy shortage of 2.1% and peak shortage of 2.6%. The annual energy requirement and availability and peak demand and peak availability in the country are given in the Table below.

Particulars	Energy (MU)	Peak (MW)
Requirement	1162423	156862
Availability	1138346	152754
Surplus (+) / Shortage (-)	-24077	-4108
Surplus (+) / Shortage (-) %	-2.1	-2.6

Source – Ministry of Power / Central Electricity Authority

### A) Sector wise Total Installed Capacity

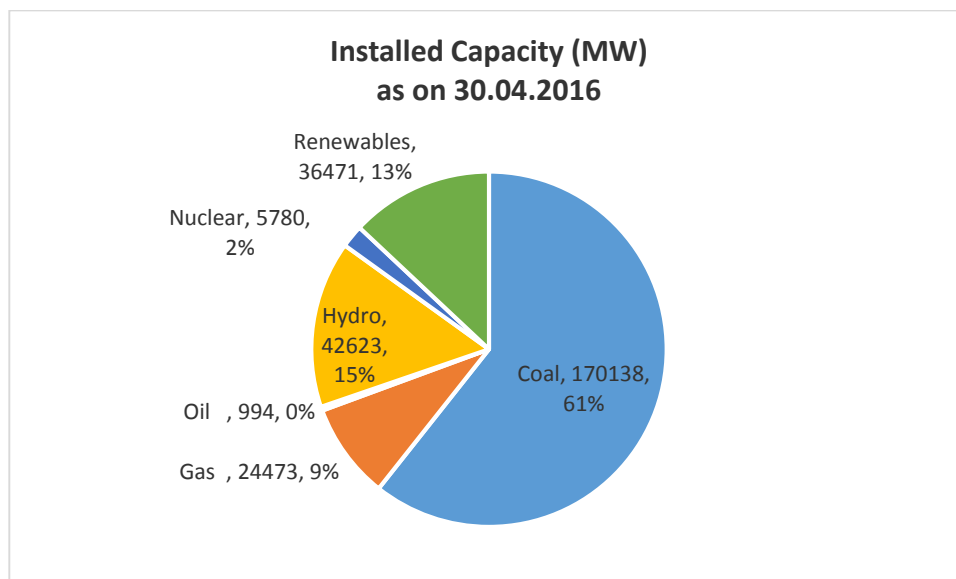
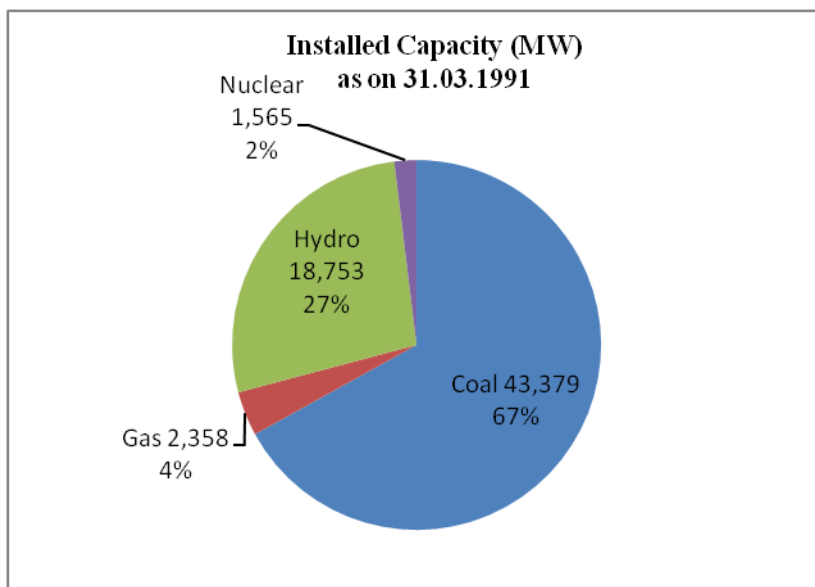
Sector wise total installed capacity in India, as on April 30, 2016, is as given below:

Sector	MW	% age
State Sector	101,276	33.44%
Central Sector	76,297	25.19%
Private Sector	125,261	41.36%
<b>Total</b>	<b>302,833</b>	<b>100.00%</b>

Source – Ministry of Power

## B) Generation

India has been one of the fastest growing markets for new power generation capacity addition since 1990s and is currently the fifth largest power generator in the world. For the last 24 years, the country has shown a cumulative annual growth rate (CAGR) in its annual power generation capacity; from ~66 gigawatt (GW) in 1991 to over 302 GW in 2016. The fuel wise breakup of the installed capacity as on 31<sup>st</sup> March, 1991 and 30<sup>th</sup> April, 2016 (shown below) depicts the shift from hydro to renewable, leaving thermal sources viz. coal and gas, at the same level except for inter-se shift between them.



Power Generation capacity addition (excluding renewables) of 20,623 MW for FY 2012-13 surpassed the set target of 17,956 MW.

### C) Electricity Generation Performance

The electricity generation target for the year 2015-2016 was fixed as 1137.5 Billion Unit (BU). i.e. growth of around 8.47% over actual generation of 1048.673 for the previous year (2014-2015). The generation during (2014-15) was 1048.673 BU as compared to 967.150 BU generated during April- March 2014, representing a growth of about 8.43%.

Target actual achievement and growth in the electricity generation in the country during 2009-10 to 2015-16 is indicated in the following table:

Year	Target	Achievement	% of target	% of growth
2009-10	789.511	771.551	97.73	6.6
2010-11	830.757	811.143	97.64	5.56
2011-12	855.000	876.887	102.56	8.11
2012-13	930.000	912.056	98.07	4.01
2013-14	975.000	967.150	99.19	6.04
2014-15	1023.000	1048.673	102.51	8.43
2015-16 (Upto March 2016)	1137.500	1107.386	97.35	5.60

\* Provisional Source – Ministry of Power

### D) Power Supply Position

The power supply position in the country during 2009-10 to 2015-16, is as given below:

Year	Energy				Peak			
	Requirement	Availability	Surplus(+) / Deficits(-)		Peak Demand	Peak Met	Surplus(+) / Deficits(-)	
	(MU)	(MU)	(MU)	(%)	(MW)	(MW)	(MW)	(%)
2009-10	8,30,594	7,46,644	-83,950	-10.1	1,19,166	1,04,009	-15,157	-12.7
2010-11	8,61,591	7,88,355	-73,236	-8.5	1,22,287	1,10,256	-12,031	-9.8

Year	Energy				Peak			
	Requirement	Availability	Surplus(+) /Deficits(-)		Peak Demand	Peak Met	Surplus(+) / Deficits(-)	
	(MU)	(MU)	(MU)	(%)	(MW)	(MW)	(MW)	(%)
2011-12	9,37,199	8,57,886	-79,313	-8.5	1,30,006	1,16,191	-13,815	-10.6
2012-13	9,95,557	9,08,652	-86,905	-8.7	1,35,453	1,23,294	-12,159	-9.0
2013-14	10,02,257	9,59,829	-42,428	-4.2	1,35,918	1,29,815	-6,103	-4.5
2014-15	10,68,923	10,30,785	-38,138	-3.6	1,48,166	1,41,160	-7,006	-4.7
2015-16*	11,14,235	10,90,713	-23,522	-2.1	1,53,366	1,48,463	-4,903	-3.2

\*Provisional Upto March, 2016 Source – Ministry of Power

### E) Renewable Energy (RE)

The total installed capacity reached 42,850 MW as on April 30, 2016 with Small Hydro Power 4273.47 MW (9.97 %), Wind power at 26,867 MW (62.70%) being the largest component, followed by biomass power / bagasse cogeneration 4831.33 MW (11.28%) and Solar Power at 6,762.85 MW (15.78%).

Wind Power installation registered steep de-growth of 47% (from 3,197 MW in FY 2011-12 to 1,699 MW in FY 2012-13) due to withdrawal of Accelerated Depreciation, expiry of Generation Based Incentive (GBI) and delays associated with project approvals. Hon'ble CERC with a view to strength the REC market, wherein recently supply exceeded demand manifold, has extended the validity of RECs from 365 days to 730 days from the date of its Issuance for RECs issued on or after 1<sup>st</sup> November, 2011.

Factors such as poor financial condition of DISCOMs, absence of vibrant REC market, lack of incentives, high capital investment & low returns and delays in project approvals prevent Wind Power Projects from realizing their true potential.

Solar Power installations registered a steep growth of 81% (from 932 MW in March 2012 to 1,686 MW in March 2013) under various supportive central and state policies. Under the National Solar Mission, GoI has announced the Phase – II of Jawaharlal Nehru Solar Mission with a target of 10,000 MW installations during the 12<sup>th</sup> Plan. Further, Ministry of New and Renewable Energy (MNRE) released draft guidelines for setting up of 750 MW Grid Solar PV power projects under Viability Gap Funding

scheme, wherein 30% of the project cost will be financed by MNRE. Many states have also announced various policy measures to promote solar power generation.

In order to improve the acceptability of Wind and Solar Power in the grid, Hon'ble CERC has issued an order directing implementation of Renewable Regulatory Fund mechanism w.e.f. 1<sup>st</sup> July, 2013, wherein the wind and solar generators shall be responsible for forecasting their generation.

To spur investment in the renewable energy sector, the following were announced in the Union Budget 2013:

1. Re-introduction of the GBI for Wind Power Projects, with allocation of Rs. 800 Core; and
2. Low interest bearing funds from the National Clean Energy Fund to Indian Renewable energy Development Agency to on-lend to viable renewable energy projects.

## **F) Power Trading**

An effective power market is yet to develop in India, where currently just 11% of the total generated electricity in the country is traded in short term power market comprising Bilateral Segment, UI & the Power Exchanges (IEX and PXIL).\*\*

Of the total generation of 912 BUs in FY 2012-13, 99 BUs of power were traded through short term power market, the composition of which is as follows:

Power Exchanges have shown remarkable growth of 55% rising from 14,822 MUs in FY 2011-12 to 23,024 MUs in FY 2012-13. Further, power traded through UI Mechanism has shown a drop of 11% as compared to FY 2011-12 whereby the volume declined from 27,758 MUs in FY 2011-12 to 24,759 MUs in FY 2012-13 due to UI frequency band reduction by Hon'ble CERC. Hon'ble CERC is in the process of introducing the concept of ancillary services for reducing dependence of utilities on UI.\*\*

*\*Source: MNRE*

*\*\*Source: Indian Energy Exchange (IEX), Power Trading Corporation (PTC) & Power Exchange India Ltd. (PXIL).*

The share of trading segment is expected to remain low owing to various constraints including fuel deficit, fuel allocation for long term arrangements only, transmission capacity constraints, limited implementation of open access, poor utility finances and trading margin cap.

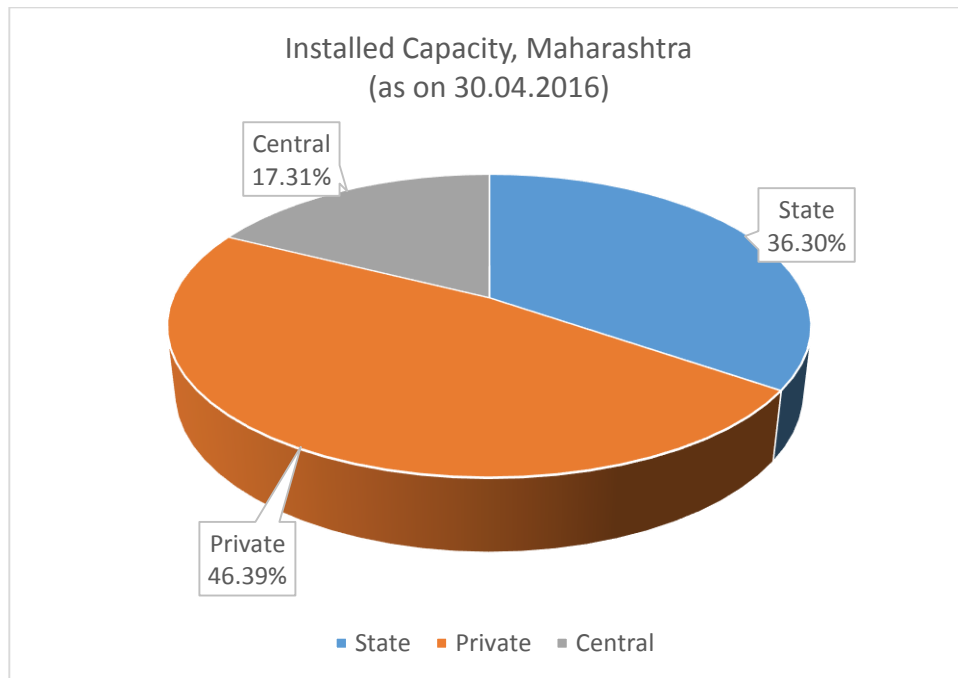
#### 1.4.2 Power Sector Review in Maharashtra

1. Maharashtra State has the largest power system (power generation and distribution) in India, with 100% rural electrification (as per the earlier definition of rural electrification with at least one light connection per village) and access to electricity for 78% households. Power situation in Maharashtra is better than many of the other States, but still suffers huge demand and energy shortages.
2. As of May 30, 2014, the power generation capacity in Maharashtra was 35,167 MW, 35% contributed from the State sector, 46 % contributed by the private sector and balance 19 % from the Central sector.
3. Maharashtra faces a power shortfall of 1500-2000 MW. The peak demand increased from 13697 MW in 2002-03 to 19276 MW in 2013-14 registering rise of 41%, due to increase in industrial & commercial activities.
4. The Government of Maharashtra recently has taken several steps to improve power situation in the State. Expansion of existing capacities, setting up new projects including private sector, promoting captive power plants, promoting energy efficiency and of course promoting renewable energy based power generation, have been the major areas.
5. The Government of Maharashtra had drawn plans of creating a situation of surplus power by 2011-12. In order to increase power supply, MSEDCL plans to obtain 750 MW from projects under construction, 2872 MW from projects tied up with National Thermal Power Corporation (NTPC) and inter-State projects and 2144 MW from Dabhol project (now known as Ratnagiri Gas & Power Pvt. Ltd.). MAHAGENCO will supply 7500 MW through various planned projects as above and additional 4000 MW will be purchased through competitive tenders from Independent Power Producers (IPPs). The total additions of 11500 MW are expected to come on stream between next 3-8 years. Apart from these initiatives, Govt. of Maharashtra has signed MoU's with private sector for 12500 MW generation capacity, which are expected to come on stream between next 5-10 years.
6. With above scenario, the power shortage is expected to last for a foreseeable future. The implementation of Cogen Projects with cumulative exportable capacity of 1000 MW in next three years will help the State to reduce the shortfall in power demand and energy requirements up to certain extent.

## MAHARASHTRA POWER PROFILE

(Source: Central Electricity Authority)

Maharashtra -Installed Capacity as on April 30, 2016 (MW)								
Ownership Sector	Thermal				Nuclear	Hydro	RES (MNRE)	Grand Total
	Coal	Gas	Diesel	Total				
<b>State</b>	10970	627	0	11642	0	288.84	208.13	14734.97
<b>Private</b>	11976	180	0	11976	0	447	6405.16	18828.16
<b>Central</b>	3712.26	2623.93	0	6336.19	690.14	0	0	7026.33
<b>Sub-Total</b>	<b>26478.26</b>	<b>3475.93</b>	<b>0</b>	<b>29954.19</b>	<b>690.14</b>	<b>3331.84</b>	<b>6613.29</b>	<b>40589.46</b>



**ACTUAL POWER SUPPLY POSITION-(Source CEA- LGBR - 2014-15)**

Period	Peak Demand (MW)	Peak Met (MW)	Peak Deficit/ Surpluses (MW)	Peak Deficit/ Surpluses (%)	Energy Requirement (MU)	Energy Availability (MU)	Energy Deficit/ Surplus (MU)	Energy Deficit/ Surplus (%)
9th Plan	12265	10726	-1539	-12.5	80489	73438	-7051	-8.8
2002-03	13697	10984	-2713	-19.8	87152	75472	-11680	-13.4
2003-04	14503	11868	-2635	-18.2	87933	78966	-8967	-10.2
2004-05	14986	12464	-2522	-16.8	92715	81541	-11174	-12.1
2005-06	16069	12360	-3709	-23.1	102765	84117	-18648	-18.1
2006-07	17455	12679	-4776	-27.4	110005	89138	-20867	-19
2007-08	18441	13575	-4866	-26.4	114885	93846	-21039	-18.3
2008-09	18049	13767	-4282	-23.7	121890	95750	-26140	-21.4
2012-13	17934	16765	-1169	-6.5	123984	119972	-4012	-3.2
2013-14	19276	17621	-1655	-8.6	126288	123672	-2616	-2.1
2014-15	21414	22459	1045	4.9	115373	100802	-14571	-12.6
2015-16	21250	22411	1161	5.5	149773	155004	5230	3.5

**1.4.3 Status of Bagasse Cogeneration at Sugar Factories, India & Maharashtra**

Bagasse cogeneration at sugar factories in India is one of the major renewable energy subsector, with proven socio-economic-environmental benefits to all stakeholders. The potential was initially identified at 3500 MW from 440 sugar factories in the year 1998-99. The potential was further revised to 7000 MW from 550 sugar factories in the year 2008-09.

The cogeneration potential as of March 31, 2015 from 553 operating & 161 upcoming sugar factories in India stands at 16404 MW of installed capacity (10846 MW exportable surplus capacity in season), through deployment of extra high pressure / temperature configurations (87,110 & 125 kg/cm<sup>2</sup>) & improved energy efficiency of sugar process (32-35% steam consumption on cane & 20- 22 kWh /TCH for electrified mill / fibrizor drives), excluding additional potential from expansion of existing sugar factories / cogen power plants, as well as from revival of 141 closed sugar factories.

Out of this, about 300 projects have been commissioned till March 31, 2016, with about 5700 MW installed capacity (3700 MW exportable surplus during season), representing only 35% penetration of the potential.

The performance or achievements of this subsector have been realized in past 2 decades and is considered quite remarkable. This is considering the precarious financial performance of the sugar industry, as well as associated complexities and barriers related to mindsets, policy & regulatory framework, technology, financing and manpower capacity. The achievements till date certainly have removed most of the barriers related to mindsets, technology and to some extent related to financing & manpower capacity. It will be essential to make a co-ordinated effort from all the stakeholders for quickly removing the barriers related to equity and debt financing, policy & regulatory framework mainly at the State levels and manpower capacity, to enable harness most of the balance potential of about 10979 MW of installed capacity (7307 MW of exportable surplus during season) by the end of the 13<sup>th</sup> Five Year Plan.

88% of the balance potential is available only from 6 States viz., Uttar Pradesh, Maharashtra, Karnataka, Bihar, Andhra Pradesh & Gujarat. Further State & sugar factory specific analysis for these States indicates that this potential will be realized from 512 cogen power plants, at 156 co-operative / public sector sugar factories in operation and 356 private sector sugar factories in operation or under implementation. The major co-op / public sector sugar factories where cogen power plants have balance potential are from Maharashtra (95), UP (22), Gujarat (23) & Karnataka (8). The private sector sugar factories are mainly from Maharashtra (127), UP (99), Karnataka (74), Andhra Pradesh (33) and Bihar (22).

A target of 40% of the balance potential or 4392 MW of installed capacity (2923 MW exportable surplus in season) can be achieved till the end of the 12<sup>th</sup> Five Year Plan, should the identified barriers get removed by March 31, 2015. The maximum of the balance revised potential can be achieved during the 13<sup>th</sup> Five Year Plan.

The Indian sugar industry today is at a very critical juncture and needs investments for expansion, modernization, as well as for implementation of cogeneration power plants and ethanol plants. Considering the paucity of funds and precarious financial situation, the industry direly needs funding, both in terms of equity and debt, with innovative financial terms. This exactly is also the golden opportunity for foreign direct investments in both equity and debt, given the conducive investment environment emerging in India.

The key barriers, particularly related to technology and mindsets of the stakeholders, have been removed over this long period of almost 2 decades. Extra high pressure and temperature configurations up to 110 kg/cm<sup>2</sup> and 540 deg C have been technically and commercially established, as well as operation & maintenance of key equipment like boiler, turbine, water treatment plant, DCS, etc. have also been established. The totally negative mindsets & fear amongst the sugar factory technocrats and personnel have more or less become positive for implementing cogen power plants.

The economic benefits available to the sugar factories from sale of exportable surplus and improvement in the operations, have been certainly acknowledged. The need for setting up of these projects for integrating sugar factory operations, in view of highly fluctuating sugar prices and ever increasing cane prices, has also been acknowledged and appreciated by this industry.

Both the own investment and BOOT models have been techno-commercially established and need for promotion of BOOT models, in view of precarious financial situation particularly of the co-op and State sector sugar factories, has also been acknowledged and appreciated by sugar factories, as well as the key decision makers.

The State Govt. of Maharashtra supported bagasse based cogeneration power projects through a supportive policy in the year 2008, in terms of identification of 55 sugar factories for implementing bagasse cogen projects, preferential remunerative tariff from MERC, waiver of cane purchase tax, subsidy from MEDA for power evacuation sub-station, 50% reimbursement of tie line cost by MSEDCL, strong co-ordination & monitoring from the office of the Commissioner of Sugar, appointment of VSI, National Federation & MITCON as consultants etc. This resulted into excellent growth of this dormant sector in the State till 2007. During a span of 7 to 8 years, about 100 sugar factories implemented bagasse cogen power projects with installed capacity of 1500 MW & exportable surplus exceeding 1000 MW.

Additional potential of 2500 MW (1800 MW exportable surplus) from implementation of these projects from balance sugar factories, as well as from a large no. of up-coming / under implementation sugar factories & expansion of existing sugar factories / cogen power projects, has been identified.

Recently, the Govt. of Maharashtra has announced its policy, with additional 1000 MW exportable power from bagasse cogen power plants at sugar factories in Maharashtra. The following table illustrates the status & potential of bagasse cogen power projects in the State of Maharashtra as follows, indicating 45% achievement against National 33% from this sector:

<b>Bagasse Cogen Power Projects</b>	<b>No. of Projects</b>	<b>Installed Capacity (MW)</b>	<b>Exportable in Season (MW)</b>
Commissioned	85	1510	980
Balance	129	1815	1216
<b>Total</b>	<b>214</b>	<b>3325</b>	<b>2196</b>

The Govt. of Maharashtra vide its GR dated July 20, 2015 has recommended an addition of 14,400 MW, out of which 1000 MW shall be by the way of bagasse & biomass based power projects.

The MERC has recently announced favorable & preferential tariff order for existing & up-coming cogen power plants in the State. (refer **Appendix-XVI** for latest MERC Tariff Order, applicable for the proposed project at JKIL).

## **1.5 Objectives of the Report**

The objective of this assignment is to prepare a bankable Detailed Project Report (DPR) for 3500 TCD Sugar Plant and 20 MW capacity Cogen Power Plant, based on the pre-feasibility evaluation and selected option for implementing this project. The scope of work is detailed in the work order issued by JKAIL to MITCON for the purpose.

## **1.6 Methodology**

For preparing this Detailed Project Report, MITCON deputed a task team of in-house coordinators and expert associates. MITCON submitted list of data / information / documents required for preparation of DPR. MITCON's task team undertook several visits to factory site and surrounding areas for collection of data / information / documents, nearby 132 kV substation, sugarcane/ biomass assessment, etc., as well as to hold detailed discussions with JKAIL management. The budgetary estimates for this DPR, for major plant and equipment, were procured from competent suppliers.

## 1.7 Acknowledgements

We wish to record deep sense of gratitude to JKAIL management, for entrusting this challenging assignment. In particular, we are thankful to Shri. Jaisinha Shivajirao Pandit, Chairman & Managing Director, Mr. D. K. Tekale and all other concerned staff of JKAIL, for providing required guidance and data support.

## CHAPTER – 2

# CANE & BIO-MASS POTENTIAL IN THE COMMAND AREA, A REVIEW

### 2.1 Sugarcane Potential in Command Area

- Primary fuel for the proposed power plant will be bagasse that will be generated from the sugar plant. The generation of bagasse is entirely depending on the cane crushing of the sugar factory. Hence, sufficient availability of sugarcane in the command area has prime importance. To assess the cane availability and potential in the command area JKAIL appointed MITCON.
- In the light of the new sugar policy, with almost total decontrol, the cane command area of the proposed sugar factory is expected to fall in tehsils of Kandhar, Loha, Mukhed of Nanded district, Jalkot & Ahmadpur of Latur district, Palam of Parbhani district. However, JKAIL needs to consider economics of the sugarcane transport if they want to procure cane beyond 30 km from neighbouring districts. Hence, the study has been restricted to the cane command area falling under areas of Nanded & surrounding districts in general.
- The proposed sugar factory site is at a distance of 8 Km from Kandhar, a Tehsil headquarter.
- The average rainfall in the district is 942.56 mm. The average maximum temperature recorded at Nanded is 40 °C, while the minimum temperature recorded is 9 °C. The rainy season ranges from middle of June to October.
- Major sources for irrigation are wells, ponds, rivers, canals and tube wells. The water is also available through canal from the government irrigation projects. The major rivers in the Nanded district are Godavari, Penganga, Monjura & Mongad, which are perennial source of water. Asna, Sita, Saraswati & Lendi are the mixed rivers with seasonal flow.

The district has three major irrigation projects of Purna, Manar & Vishnupuri.

- Total area under irrigation under canals & wells is 24596 ha & 46451 ha, respectively. The area under minor, medium & major irrigation projects within Nanded district is 4123 ha, 7700 ha & 79590 ha, respectively.

- The major projects like Shankarrao Chahan Vishnupuri, Manar & Lendi Project & medium projects like Kundrala Project, Pethavadaj, Mahalingi, UrdhwaManar & Digrasare also available within the command area.
- Lower Manar Project is major source of irrigation within the command area, which is at a distance of 3 Km from the site location. Rest of the irrigation is made from the open well and tube wells. In command area, around 124086 Ha of area is under irrigation from various sources.
- Traditionally this region has been a cotton, jowar, soyabean, tur, moong, urad, wheat & gram growing belt. Soyabean, cotton, jowar, tur, moong&urad the main kharif crops along with sugarcane while jowar, wheat, and gram (Harbara) are grown in the rabbi season. The climatic conditions and rainfall in this area are ideally suited for their growth and hence these crops have a high yield of growth in the region. Additionally, the rainfall and irrigation are also adequate for the growth of these crops.
- From climatic data of the region, it is observed that the maximum and minimum temperatures and relative humidity are quite favourable for growing of sugarcane and for higher recovery.

The yields of the different varieties of the cane vary, depending on agro-climatic conditions and water availability, from year to year. On an average the yield is expected to be around 75 - 85 MT/Ha.

- The command area comprises of total six tehsils, Kandhar, Loha&Mukhed from Nanded District, Jalkot & Ahmadpur from Latur District & Palam from Parbhani District. The total average area for last three years under sugarcane cultivation of these six tehsils is 9851 ha, with total sugarcane production of 734370 MT.
- The command area of JKAIL comprises of one sugar mill i.e. Siddhi Sugar & Allied Industries Ltd. The total crushing capacity of Siddhi Sugar mill is 2500 TCD average crushing of 4.00 lakh. Out of which the sugar mill share only 2.40 lakh MT from the command area. Hence, surplus sugarcane available in the command area is 4.94 Lakh MT.

- It is always advisable for the promoters of the proposed sugar factory to have their own cane fields. Also friends and supporters should also be made to grow cane. This will induce confidence in other farmers for cane growing, as it will show that the management can prove that cane growing is commercially more viable than other crops and that it will fetch the farmers a good price.
- To ensure that the farmers who grow cane get the right type of seed, it is recommended that the proposed sugar factory have a nursery of their own. Apart from providing seeds, the nursery can be used for growing newer and better varieties of cane and then the seed of these newer varieties can be provided to the farmers.
- Farmers will be encouraged to cultivate the Sugarcane in the command area, once the proposed sugar factory of JKAIL is commissioned and hence there sugarcane will improve to a great extent.
- Shri. Jaisinha Shivajirao Pandit, Chairman & Managing Director is working with the farmer's organization for last 23 years and hence will encourage the farmers to cultivate sugarcane in the command area.
- To encourage farmers and assure continuous and assured supply of cane from them, it is recommended that JKAIL should distribute seeds to the nearby farmers.
- It is recommended that JKAIL should also sponsor cane development schemes on its own and / or with the help the farmers in its command area, for availing financial assistance. This will help JKAIL in ensuring assured availability of cane, on a long-term basis.
- With setting up of this proposed sugar factory, JKAIL envisages the availability of sugarcane of about 10 lakh MT in next 5-6 years.

**The cane requirement for 3500 TCD, for maximum 160 days & with 75% capacity utilization for the first year will be 4.20 lakh. The present surplus sugarcane of 4.94 lakh MT, can easily fulfil the requirement.**

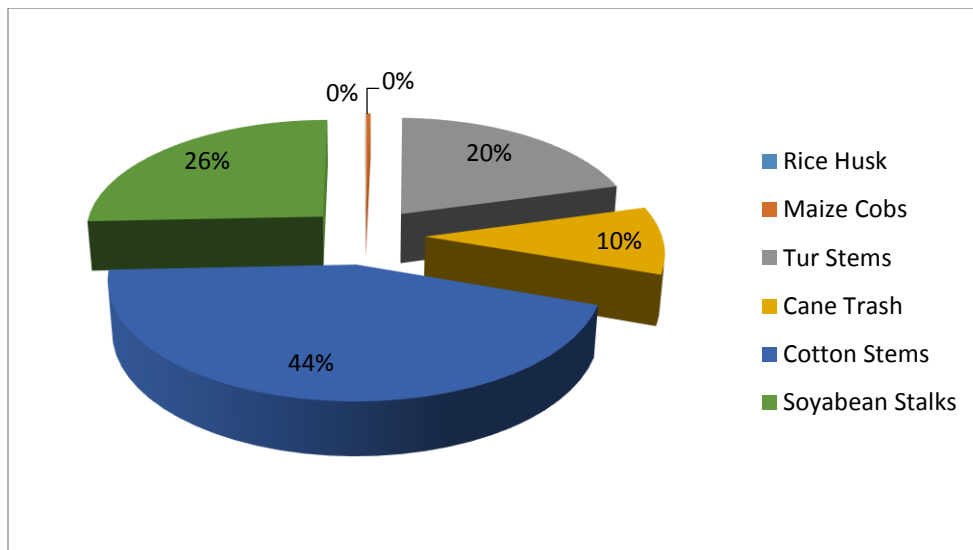
## 2.2 Surplus Biomass Availability

- Proposed plant will run on bagasse generated from the sugar mill during 160 days of sugar mill operation. For off-season plant will use saved bagasse for around 27 days. Days of off season operation can be increases by using biomass as a fuel.
- Considering the surplus biomass and after taking into account 75% collection efficiency, JKAIL can collect following quantities of surplus biomass from the command area.

Table 1. Availability of Each Source in Surplus Biomass Collection after Considering a Collection Efficiency of 75 %

Sr. No.	Tehsil	Rice Husk MTPA	Maize Cobs MTPA	Tur Stems MTPA	Cane Trash MTPA	Cotton Stems MTPA	Soyabean Stalks MTPA	Total MTPA
	<b>0-15 Km</b>							
1	Kandhar	6	20	4740	2694	41367	9936	58764
2	Loha	9	95	6921	3206	45868	12811	68909
	<b>Sub Total</b>	<b>14</b>	<b>115</b>	<b>11661</b>	<b>5900</b>	<b>87235</b>	<b>22747</b>	<b>127673</b>
	<b>15-25 Km</b>							
3	Ahmadpur	35	653	37002	13210	9064	29868	89832
4	Jalkot	15	88	13543	1384	1486	11491	28006
5	Palam	19	101	4909	3459	39374	9063	56925
	<b>Sub Total</b>	<b>69</b>	<b>842</b>	<b>55454</b>	<b>18053</b>	<b>49923</b>	<b>50422</b>	<b>174764</b>
	<b>25-50 Km</b>							
6	Nanded	0	127	1428	8443	8688	8333	27019
7	Ardhapur	0	1	756	8111	8981	4584	22433
8	Mukhed	8	44	9223	3592	22326	16214	51406
9	Mudkhed	1	9	1487	3333	9223	4312	18364
10	Umari	2	25	1868	2887	28369	5870	39021
11	Naygaon	10	212	2011	0	28717	11005	41954
12	Udgir	18	460	33445	3492	92	24673	62179
13	Chakur	27	534	31031	5023	301	28702	65618
14	Gangakhed	4	88	5647	4100	31836	8714	50389
15	Purna	5	48	5756	10528	42389	11387	70113
16	Vasmat	11	449	10001	6033	49608	17266	83369
	<b>Sub Total</b>	<b>85</b>	<b>1997</b>	<b>102652</b>	<b>55541</b>	<b>230530</b>	<b>141059</b>	<b>531864</b>
	<b>Total</b>	<b>168</b>	<b>2954</b>	<b>169768</b>	<b>79493</b>	<b>367689</b>	<b>214228</b>	<b>834300</b>

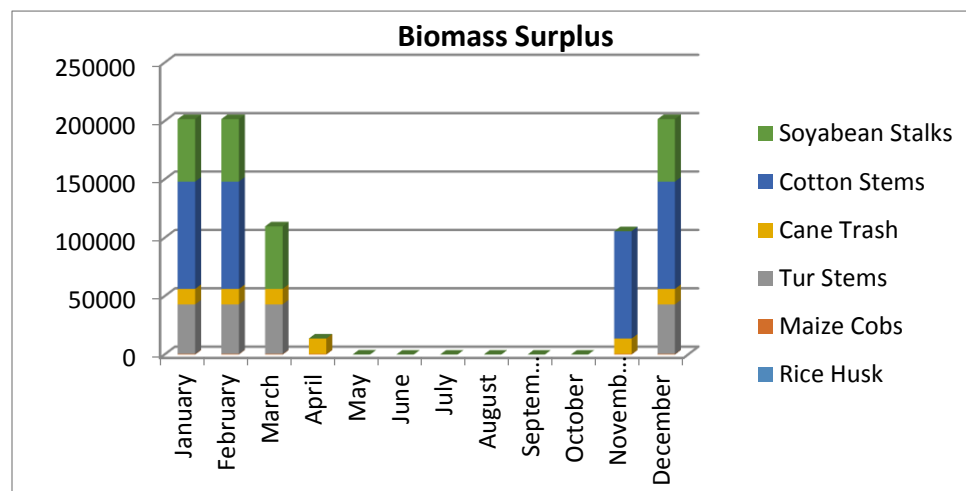
- The average landed price for the various agro-fuels given in Table 1 for the 3 different regions will vary from :
  - Rice Husk Rs. 4550/MT to Rs. 4850/MT
  - Maize Cobs Rs. 1550/MT to Rs. 1850/MT
  - Tur / Cotton Stems /Soyabean stalks Rs. 1350/MT to Rs. 1650/MT
  - Cane Trash Rs. 1100/MT to Rs. 1400/MT
  - Bagasse Rs. 2000/MT to Rs. 2300/MT



**The contribution of each source of biomass to the total surplus biomass available in the command area**

- While conducting the primary survey of the command area, prima facie, we have noted considerable enthusiasm in the local people for supplying surplus biomass to JKAIL.
- As JKAIL has to use the agro-fuels that is agro waste and biomass, it will be most essential to establish a strong fuel linkage with individual farmers and organizations such as co-operative societies or NGOs with a network in the rural areas of the command area, which can collect, bale, store and supply the biomass to the cogen plant of JKAIL. Location of depots (biomass banks) in towns or large villages will also be necessary so that these depots can store the biomass and supply it to JKAIL on a regular basis. This fuel linkage will have to be done on a priority basis as all the surplus biomass is coming from agricultural fields only and there is no industrial biomass in the region.

- The available biomass is sufficient to meet the present needs of the local population for their fuel and other requirements. The biomass which is identified as surplus is that biomass which is available to JKAIL after meeting the needs of the local people.
- At present there are no biomass consuming industries in the command area. In case any biomass consuming industries come up in the region, then the available biomass will be reduced.
- The approximate monthly availability of biomass for the cogen plant will vary roughly as given in the figure below.



Indicative Monthly Availability of Biomass (at 75 % Collection Efficiency)

- In computing the landed price of biomass, all transportation has been considered by road. Any fluctuations in the diesel prices will affect the landed price of the biomass.
- Harvesting, transportation, sizing and drying are some of the important operations to be carried out before the fuel is made ready for use. Depending on the size of operation and relative cost of labour and capital, varying degrees of automation could be adopted for each of the above operations. To carry out these fuel preparation operations successfully and efficiently it is imperative that a consortium is formed and their work content is established.
- The location of biomass banks can initially be at the tehsil levels and in some big villages in the command area. Once these banks become operational and the biomass linkage mechanism gets well established, then other villages can be selected for setting up further banks.

- JKAIL has to make special arrangements for collection, preparation, processing and transport of surplus biomass available in the command area. In this connection agency like NGOs can be contacted, who have an established program of self help groups for the poor and needy rural youths / women in various villages. Under this program rural youths / women are identified and they can be trained for biomass collection, preparation, processing and transport. Through some special schemes of Central and State Governments heavily subsidized biomass processing equipment can be made available to such self-help groups. JKAIL can also enter into an agreement for a reasonable period with such groups for purchase of biomass from them at a fixed /negotiated price.
- It is also recommended that JKAIL should consider the option of briquetting so as to be able to make maximum utilization of agro-residues in the region. Apart from providing a fuel with uniform characteristics, briquetting will lower transportation and handling costs. The storage space required for briquetted fuel is also less than that required for loose biomass
- The social aspect of encouraging briquetting is that it will generate employment for un-employed youth in the region. Or it will be an additional activity for income generation to the farmers and their families in the region. As JKAIL will also benefit by having a more uniform fuel for combustion, briquetting, if encouraged, can be a successful solution to using diverse agro-fuels.
- It is recommended that JKAIL generate a part of its own fuel through energy plantations. Such a step will ensure that the cogen plant of JKAIL is not entirely dependant on bought out fuel.
- **With the above study, it is concluded that JKAIL can collect approximately 834300 MT per annum of biomass mainly consist of soyabean stalks, tur / cotton stems, cane trash, maize cobs & rice husk from crop residues.**

**Additionally, it is estimated that around 39400 MT of bagasse from five out of nine available sugar mills, within command area can be made available. The quantity may reduce subsequently, if cogen plants are set up in future in respective sugar mills, within the command area.**

## CHAPTER – 3

# PROJECT CONCEPT, DESIGN & KEY PARAMETERS

### 3.1 Sugar Plant

3.1.1 The objectives of the sugar plant of the proposed integrated project are mainly to manufacture quality sugar for national & international markets at optimum operating and energy efficiencies, as well as provide raw materials for cogen power plant. The integrated project will push the product, which has highest realization in the market. The design of the sugar mill would match the latest and modern technologies, being employed for the cogen power plant. At the same time, the flexibility of operation, expansion and diversification, also will be available.

3.1.2 To meet the objectives indicated above, the sugar plant of the integrated agro energy project will have special emphasis on following:

- Highest mill with diffuser extraction efficiency (more than 96.5%), at low investment and power consumption
- Lowest steam consumption for the boiling house (less than 40 %), lowest boiling house losses and reduction in capital cost
- Lowest power consumption (less than 25 kWh / TCH for electrified fibrizor and De-watering mill with diffuser)
- Lowest raw water consumption (practically nil)
- Lowest effluent discharge (practically nil)
- Lowest labor cost and chemical consumptions
- Highest sugar recovery (more than 11.5% on cane) and sugar quality.

3.1.3 The main parameters of cane crushed from 3<sup>rd</sup> year onwards will be as follows:

- Pol % cane, average 14.5%
- Recovery, average 11.2 % on cane
- Fibre, average 14.5 % on cane
- Bagasse generation, average 30 % on cane
- Bagasse moisture, average 50 %
- Molasses, 4% on cane

3.1.4 The design parameters of the proposed modern sugar plant have been indicated in the following table:

Capacity / hr, TCH	:	159
Capacity / day, on 22 hrs basis, TCD	:	3500
Average season days, nos.	:	160
Bagasse generation (30% on cane), TPH, @ 50% moisture	:	47.73
Bagasse available as fuel (29.2% on cane), TPH	:	46.46
Sugar produced (avg. 11.5% recovery), MT	:	64400 (at designed capacity level)
Sugar quality	:	ICUMSA color at 420 nm, <100, moisture max.0.01 %
Cane preparatory index	:	90 +
Imbibition water % fibre	:	300%
Maceration % cane	:	30.00
Mixed juice % cane	:	100
Primary pol extraction, %	:	75
Mill extraction, %	:	95
Reduced mill extraction, %	:	97.50+
Reduced boiling house extraction, %	:	91.00+
Total sugar loss, % cane	:	Max 2.0
Downtime % available hours, including cleaning	:	Max 4
Downtime % available hours, excluding cleaning	:	Max 2.5
Process steam required, TPH		
LP steam at 2.5 kg/cm <sup>2</sup> (40% on cane)	:	63.64
Process power consumption at 25 kWh / TCH, MW (with electrified fibrizor & mill drives)	:	3.98
Molasses production (4% on cane), MT	:	22400 (@ designed capacity level)
Utilization level, %	:	75 in 1 <sup>st</sup> year, 75 in 2 <sup>nd</sup> year, 85 from 3 <sup>rd</sup> year onwards

### 3.2 Cogen Power Plant

- 3.2.1 The cogen power plant will have installed capacity of 20 MW of Double extraction – cum condensing type turbine and will employ 87 kg/cm<sup>2</sup> and 540°C configurations.
- 3.2.2 Bagasse generated from cane crushing, excluding handling losses and bagacillo requirements will be available for operation of the high-pressure boiler during season for 160 days. Saved bagasse will be used during the off-season period of about 27 days.
- 3.2.3 The auxiliary steam consumption for the power plant will be for soot blowing and other auxiliary consumptions like Steam Jet Air Ejector (SJAE) & Gland Steam Condenser (GSC) at high pressure, for HP heater at medium pressure and for de-aerator at low pressure. The auxiliary power consumption for the power plant will be about 9% & 9.5% of generation during season and off-season period respectively.
- 3.2.4 The colony power requirement will be met by the cogen power plant, both during season and off season periods.
- 3.2.5 The brief design parameters for the cogen power plant will be as follows:

Boiler capacity, TPH	:	1 x 120
Pressure, kg/cm <sup>2</sup>	:	87
Temperature, °C	:	540
Turbine capacity, MW	:	20.00
Turbine type	:	Double extraction – cum condensing type
Season operation, days	:	160
Off season operation, days	:	27
Fuel used for season operation	:	Bagasse
Fuel used for off season operation	:	Saved bagasse
Boiler efficiency, %		
- On bagasse / bio-mass / cane trash	:	70.00, ±1
Feed water temperature, °C	:	165
Turbo-generator efficiency, %	:	96.00
Utilization level, %	:	75 in 1 <sup>st</sup> year, 75 in 2 <sup>nd</sup> year, 85 from 3 <sup>rd</sup> year onwards

3.2.6 While, the steam and power cycle design has been worked out as follows, the heat and mass balances during crushing and non-crushing days, balances of steam, water & condensate, fuel & power have been given in the enclosed **Appendix – VIII**

Sr. No.	Item	Unit	Value	
	<b>Season Operation</b>			
1	Avg. cane crushing	TCD		<b>3500</b>
2	Net season days	nos.		160
3	Hrs. / day	nos.		22
4	Normal cane crushing	TCH		159.09
5	Cane crushed	Lakh MT		5.60
6	Bagasse generation	% cane		30
7	Bagasse generation	TPH		47.73
8	Bagasse for bagacillo / handling loss	% cane		0.80
		TPH		1.27
9	Bagasse available for new boilers	TPH		46.46
10	Total equivalent bagasse available for new boilers	TPH		46.46
11	Bagasse saved for off season	MT		19136
12	Bagasse used by new boilers	Kg steam / kg		2.50
13	Bagasse used by new boilers	TPH		37.60
		MT		144384
14	Steam generation	TPH		94.00
15	Steam consumption	TPH		
15.1	HP steam @ for SJAE & GSC		0.50	0.47
	Sub-total			0.47
15.2	MP steam @ 8 kg/cm <sup>2</sup>			
	HP heater I		9.50	8.93
	D/s water addition		2.00	0.18
	Sub-total			8.75
15.3	LP steam @ 2.5 kg/cm <sup>2</sup>			
	Sugar process	% cane	40.00	63.64
	De-aerator		5.00	4.70
	D/s water addition		2.00	1.37
	Sub-total			66.97
15.4	Condensing steam			17.81
15.5	Total			<b>94.00</b>

Sr. No.	Item	Unit	Value	
16	Power generation	MW	<b>4.70</b>	<b>20.00</b>
17	Power consumption	MW		
	- Sugar process	kWh/TCH	25.00	3.98
	- Colony			0.10
	- Cogen auxiliaries		9.00	1.80
	- Total			5.88
18	Power export			
	MW			<b>14.12</b>
	MUs			<b>54.23</b>
19	Total no. of days / year	nos.		187
	<b>Off Season Operation</b>			
20	Off-season fuel requirement		TPH	30.00
21	Total no. of off season days	nos.		27
22	No. of hrs / day	nos.		24
23	Steam generation	TPH		75.00
24	Steam consumption	TPH		
24.1	HP steam @ for SJAE & GSC		0.50	0.38
	Sub-total			0.38
24.2	MP steam @ 8 kg/cm <sup>2</sup>			
	- HP heater I		10.00	7.50
	- D/s water		2.00	0.15
	- Total			7.35
24.3	LP steam @ 3 kg/cm <sup>2</sup>			
	- De-aerator		7.00	5.25
	- D/s water		2.00	0.11
	- Total			5.15
24.4	Condensing steam			62.13
24.5	Total			75.00
25	Power generation	MW	3.75	<b>20.00</b>
26	Power consumption	MW		
	- Cogen auxiliaries		9.50	1.90
	- Sugar process			0.10
	- Colony			0.15
	- Total			2.15
27	Power export			
	- MW			<b>17.85</b>
	- MUs			<b>11.39</b>
28	Boiler size (87 kg/cm <sup>2</sup> & 540 deg C)	TPH	1	<b>120</b>
29	TG size (85 kg/cm <sup>2</sup> & 538 deg C)	MW	1	<b>20</b>

**Appendix- VII** gives the heat balance diagrams for season and off-season operations.

### 3.2.7 Water & Condensate Balances

While steam, power and bagasse balances both for season and off season operations of the cogen power plant have been indicated in section 3.2.6, the water and condensate balances are given in the following table:

Item	Value, TPH	
	Season	Off season
Condensate return from sugar process	60.45	0
Condensate from Steam to de-aerator	4.70	5.25
Blow down flash recovery	0.47	0.38
Condensate from condenser	17.81	62.13
Make up water from DM plant	4.1	0.75
Condensate from HP heater	8.93	7.50
<b>Flow from de-aerator</b>	<b>96.49</b>	<b>76.01</b>

### 3.2.8 Bagasse / Fuel Balance

The bagasse and fuel balances are indicated in the following table:

Sr. No.	Item	Value	
		Season	Off season
1.	Crushing rate, TCH	159	
2.	Bagasse generation at 30.0% on cane, TPH	47.73	
3.	Bagacillo/handling loss at 0.8% on cane, TPH	1.27	
4.	Bagasse available as fuel at 29.2% on cane, TPH	46.46	
5.	Bagasse consumed by boiler, TPH (MT)	37.60 (144384)	30.00 ( 17827)
6.	Bagasse saved / available for off-season operation, MT		17827

### 3.2.9 Power Balance

Following table gives the power balance for the season and off-season:

Sr. No.	Item	Value, MW	
		Season	Off season
1.	Power generation, MW	20.00	20.00
2.	Power consumption, MW		
	- Sugar process (@ 25 kWh / TCH after mill / fibrizor drives electrification)	3.98	0.10
	- Cogeneration auxiliaries	1.80	1.90
	- Colony	0.10	0.15
	- Total	5.88	2.15
3.	Power export, MW	14.12	17.85
4.	Power export at design capacity level, MU	54.23	11.39
5.	<b>Total, season + off season MU at design levels</b>	<b>65.62</b>	

**Appendix – VIII** gives diagrams for steam, water/condensate, fuel and power balance for season & off season.

### 3.2.10 Eligibility of the proposed project

Based on the qualification criteria of the topping cycle under the MERC tariff order, the eligibility of the proposed project in season has been worked out as under:

Sr. No.	Item	Value
1.	Net Energy Input (A), M Kcal/hr	84.60 (37.60 TPH x 2250 kcal/kg)
2.	Electrical power output (B), M Kcal/hr	17.20 (20 MW x 860 kcal/kWh)
3.	Useful thermal output I (energy in the process), M Kcal/hr	41.94 (63.64 TPH x 659 kcal/kg)
4.	Total energy output (B+ C), M kcal/hr	59.14
5.	20% of total energy output (D), M kcal/hr	11.83
6.	Evaluation condition (C>D)	Yes
7.	Efficiency, % (B+C/2 / A)	<b>45.12</b>

**Note: Hence, the proposed project is eligible under the MERC tariff order and qualifies under the same.**

### 3.2.11 Key performance parameters

The key performance parameters for the cogen power plant are given below:

Sr. No.	Description	Value
1	Steam Generator efficiency, %	: 70±1 on bagasse / cane trash
2	Steam to Fuel Ratio, kg bagasse / kg	: 2.50
3	DEC Turbine efficiency, %	: +90%
4	Average Steam to Power Ratio, kg / kW Season Off-Season	: 4.70 : 3.75
5	Auxiliary Power consumption, MW (%) Season Off-Season	: 1.80 (9.00) : 1.90 (9.50)
6	Utilization Level, %	: 75 in 1 <sup>st</sup> year, 75 in 2 <sup>nd</sup> year and 85% from 3 <sup>rd</sup> year onwards
7	Power Generation / Export	:
	<u>Season–MW/MU's</u> Generation Export	: 20.00/70.40 : 14.12/54.23
	<u>Off-season–MW/MU's</u> Generation Export	: 20.00/12.76 : 17.85/11.39
	<b>Annual Total - MU's</b> Generation Export	: 83.16 : 65.62
8	<b>Exportable Surplus power</b> (% Generation)	
	Season	: 77.03
	Off-season	: 89.26
	Total	: 78.91

### 3.3 Project Site, Key Features

#### 3.3.1 Site Location (Refer **Appendix – XI** for site location)

Site location	:	Babhulgaon
Distance from nearest town / city	:	Kandhar, 8 km
Distance from nearest airport	:	Nanded, 60 Km
Distance from nearest Railway Station	:	Nanded, 60 Km
Distance from nearest water source	:	Lower Manar Project, 3 km
Distance from nearest MSEDCL EHV substation	:	132 kV, located at Kandhar, 4 km from site

The proposed site is ideal for the proposed integrated sugar & cogen power project, due to following reasons:

- About 95 Acres of land is already acquired and is owned by JKAIL.
- The site is easily accessible by road.
- The command area has huge potential for the sugar cane because of the huge irrigation potential in the command area and the farmers have intensive experience in sugar cane cultivation.
- The site is 3 km from the Lower Manar Project.
- The cane potential and irrigation facilities in the command area are adequate for sustained cane availability for the proposed project.
- The site is located at about 8 km away from the nearest major habitat Kandhar. Hence the operation will not pose any pollution hazards.
- The evacuation of exportable surplus power from the cogen plant to MSETCL will be made through 132 kV substation of MSEDCL at Kandhar, which is 4 km away from the site.

### 3.3.2 Infrastructure

The site has access to latest communication and other social infrastructure facilities, including telecommunication, schools and colleges, medical & health facilities, commercial infrastructure, etc. at Kandhar, which is a Tehsil Headquarter.

The average annual rainfall in Kandhar Tehsil is 692.8 mm, while that up to September 2016 was 714.7 mm. The rainy season ranges between middle of June to October.

The temperatures in the command area are conducive to sugarcane cultivation and have been proved by existing yield, as well as recovery of sugarcane. The maximum and minimum temperatures respectively are 40°C in summer and 9°C in winter. The construction power can be easily made available from MSEDCL.

The process steam required at 8 kg/cm<sup>2</sup> for the cogen plant and 2.5 kg/cm<sup>2</sup> for the sugar plant during season will be supplied by the cogen power plant. The high pressure, medium pressure and low-pressure steam required for cogen auxiliaries will also be met. The power requirement for sugar process during season, for cogen auxiliaries and colony will have to be met from the cogen plant. The steam and power cycle has been designed accordingly.

The cogeneration plant requires compressed air, both for instrumentation and for servicing, which is generated by installing the air compressors of the required capacity, as part of the cogen power plant.

### 3.3.3 Manpower

The skilled manpower required for operation of sugar and cogen power plants will be easily available from Kandhar and also from Nanded. JKAIL will require about 275 people for operation of proposed integrated project. JKAIL is in a process of appointing required manpower and has already appointed key top management positions for the purpose.

### **3.4 Effluent Treatment**

#### **3.4.1 Sugar Plant**

The sugar plant effluents will be treated in a separate effluent treatment plant & the discharges will be maintained as per the latest norms of the MPCB & CPCB. The liquid effluents from the sugar process will be mainly waste water from various process equipment in the milling & boiling house sections & the treated water will be used for gardening purposes. The air emissions in the sugar bagging sections will be limited to the acceptable limits due to deployment of dust catchers.

#### **3.4.2 Cogen Power Plant**

The cogen power plant effluents will also be treated in a separate effluent treatment plant & the discharges will be maintained as per the latest norms of the MPCB & CPCB. The liquid effluents generated from the cogen power plant will be mainly from boiler blow down, cooling tower and water treatment plant blow downs, wash water and other sewage effluents.

The treated water will be used for gardening purposes. The air emissions will be maintained well within the norms due to deployment of the latest design electro static precipitator & the ash generated will be either be sold to brick manufacturer or used in the composting process as a filler material.

### **3.5 Raw Materials**

#### **3.5.1 Sugar Plant**

- The proposed sugar plant of 3500 TCD will require about 5.6 lakh MT of sugarcane for 160 days crushing season, including sugarcane required for seeding purposes. A detailed cane availability & potential survey was undertaken & the results are summarized in Chapter 2. Around 4.94 lakh MT of surplus sugarcane is available in the command area. The irrigation & climatic conditions are quite favourable for sugarcane cultivation. Thus by implementing the Cane development program in next two years, the sugarcane requirement for the proposed sugar factory can be easily achieved.

### 3.5.2 Cogen Power Plant

- As indicated in the steam / power cycle design, the total bagasse available from the sugar mill, from cane crushing of 5.6 lakh MT, as fuel, will be 163520 MT. Out of this, 144384 MT (37.60 TPH x 24 x 160) will be utilized by the cogen plant boiler during season, leaving saved bagasse of about 17827 MT for the off season operation of 27 days.
- Procurement of raw materials for off-season operation of the cogen power plant must become a line function of cogen plant operation with appointment of Fuel Manager and competent field staff for the purpose.
- The detailed biomass assessment survey was carried out & results have been indicated in Chapter 2. It is seen that sufficient quantity of biomass the tune of 8.34 lakh MT can be easily procured & made available for off-season operation of the proposed cogen power plant. Considering the requirement & availability, JKAIL will not have any difficulty in procuring the biomass materials.
- Energy plantation on wasteland in the command area will also be evaluated and implemented for long-term fuel linkage for the proposed cogen power plant.
- Therefore no difficulty envisaged in getting fuel for cogen plant for 187 days of operation.

### 3.6 Utilities & Consumables

3.6.1 Water and power are the main utilities required for operating the integrated project.

- Water will be easily available from Lower Manar Project which is located at a distance of 3 km., proposed canals nearby, ponds and tube wells. The water required for season & off-season operation. Therefore no difficulty envisaged in terms of availability of water required for the proposed sugar complex.
- Power required for construction and in case of shut down of plant will be drawn from the MSEDCL grid.

3.6.2 The consumables required for operation of sugar plant include sugar bags, laboratory and ETP chemicals, oils / lubricants and other chemicals for the machinery and processing, etc.

The consumables indicated above will be available in substantial quantities from nearby Kandhar city, and no difficulty will be envisaged.

### **3.7 Manpower**

The total direct manpower required for the integrated project has been estimated at 275. It is most essential for JKAIL to define the organization structure individually for the sugar mill and the cogen power plant.

It is most essential that the experienced and well-qualified manpower is employed right from the project development / implementation period, through advertisement or through head hunting exercise, particularly for the top and key positions. Manpower training and skill up-gradation must become an integral part of the HRD policy.

### **3.8 Implementation Schedule**

#### **3.8.1 Project Implementation**

For implementing this mega and complex 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:

- Intensifying cane development activities by networking and supporting the farmers from the command area.
- Effecting timely project development activities, including securing various approvals / NoC's / permissions for each component of the integrated project.
- 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.
- 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.

- JKAIL proposes to appoint experienced project engineering management consultancy firm, as well as experienced in-house project team for the purpose.
- Manpower and resource mobilization at required time and effectively.
- Interface between the sugar mill & cogen power plant.

### 3.8.2 Project Schedule

The zero date of the project starts from the date of achieving financial closure, expected to be completed by November, 2016. The cogen project will start commercial production by January, 2018. The project schedule will have main components as follows:

Activities	Expected Completion Date
Project development activities up to financial closure	November, 2016
Sugar plant	January, 2018
Cogen power plant	January, 2018
Entire integrated project	January, 2018
Stabilization & development of MIS	January, 2018

The bar chart for implementation of the above components is enclosed as **Appendix – XII**. The detailed PERT / CPM networks for individual components and overall project will have to be prepared by the time of achieving the financial closure. The major activities after the financial closure for each component will include,

- Appointment of owner engineer / consultant, in-house project team and project architect
- Basic engineering & finalizing outline specifications
- Detailed design engineering and specifications
- Preparation of package bids, bidding, bid evaluation, recommendations and contracting for civil, mechanical, electrical and instrumentation components, as well as BoPs
- Kick off meetings with individual vendors / contractors
- Vendor drawing review and approvals, inspection and expediting and delivery at site
- Site supervision for erection, testing & commissioning
- Bidding, contracting and signing of O&M contracts
- Plant stabilization and development of MIS

## CHAPTER – 4

# TECHNICAL SPECIFICATIONS

### 4.1 Sugar Plant

The state of the art technology modern sugar plant and energy efficient continuous operating type boiling house will include Cane handling & feeding section, Cane conveying section, Cane preparation, Bagasse conveying system, cane diffuser, de-watering mill, Boiling House equipment etc.

**Appendix – IX** gives the detailed specifications of the above sugar plant with cane diffuser process.

### 4.2 Cogen Power Plant

The high efficiency cogen power plant will include steam generator, Electro Static precipitator (ESP), Draft system, Steam and water analysis system, Fuel handling system, Ash handling system, Steam turbine & its auxiliaries, Alternator, Governing system, Lubrication system, Electricals, Control & Instrumentation, DG set, EOT crane, Interface HP, MP & LP steam & water piping, Compressed air system, Fire fighting system, DM Plant etc.

**Appendix – X** gives the detailed specifications of the above cogen power plant equipment.

## CHAPTER – 5

# PLANT LAYOUT

### 5.1 Layout Considerations

#### 5.1.1 Layout design issues

Major layout design issues, which have been considered while developing the proposed plant layout, are as follows:

- About 95 acres of land already acquired for the integrated project at site location
- Topography of the land being acquired and contour limitations
- Area requirements for various plant buildings, storage areas, colony, admin building, miscellaneous areas, etc.
- Direction / velocities of wind.
- Likely ingress of bagasse / bio-mass / Indian coal on to cooling tower, transformers etc. and precautions to be taken to mitigate
- Optimum men and material movement
- Minimum length of high pressure piping
- Minimum lengths of interface systems between the power plant and sugar mill
- Disposal of ash / press mud
- Routing of overhead EHV transmission line
- Vastu Shastra

#### 5.1.2 Area requirement & Layout

The total area requirement for the Integrated project is worked out at around 2,00,000 m<sup>2</sup>. The area statement of each component is as follows:

Item	Area Required (m <sup>2</sup> )
Sugar Plant (including cane yard, sugar silos & go-downs)	70,000
Cogen power plant (including bagasse / storage)	75,000
Miscellaneous (expansion, staff quarters, admin office, guest house, internal roads, open spaces, rain water harvesting, gardening, forestry, etc.)	55,000
<b>Total</b>	<b>2,00,000</b>

Based on the above considerations and the area requirement, the final layout will be frozen based on the detailed discussions with the chosen vendors / contractors.

### 5.1.3 Ash, Effluent & Sewage Disposal

Ash - At 100% capacity utilization of the proposed power plant, around 1.63 lakh MT of bagasse will be burnt during season and off-season operations. Annual ash generation from this quantity of bagasse will be about 7563 MT. This ash will be mixed with the press mud, being distributed free to the farmers during season & during off-season.

Effluent - Wastewater from a power plant does not have any significant BOD / COD level. All wastewater will be neutralized prior to discharging in the existing sugar plant ETP.

Sewage - All sewage will be collected in a common septic tank and discharges as per accepted norms.

## 5.2 Plant Layout

### 5.2.1 General

The proposed sugar and cogeneration power plants will be located adjacent to each other. The sugar mill layout will be as shown in the enclosed layout drawing.

The cogen plant will be conveniently located within close proximity to the sugar mill and bagasse storage area and allows optimal arrangement of piping, switchyard, bagasse conveyors, other cogen plant facilities, and access roads. All above ground pipe rack will support steam and feed water piping and cables for instrumentation and control, for the boiler and between the cogen plant building and the sugar mill. All other piping and cables for other outdoor equipment such as tanks, pumps and the cooling tower will be under ground.

## 5.2.2 Layout of Major Outdoor Equipment

The boiler will be designed for outdoor operation. The boiler will include a electro-static-precipitator and a RCC chimney. The self-supporting chimney will satisfy the environmental norms and will be RCC. The height of stack will be around 82 mtr.

The bagasse will be fed to the boilers via the conveyor system from the milling section of the sugar plant. The conveyor system will also transport excess bagasse between the boilers and the bagasse storage yard, through RBC.

During the crushing season excess bagasse, if any from the mill will go directly to the storage yard after feeding the boilers. During the non-crushing season stored bagasse and equivalent cane trash or other fuels will be fed to the boilers from the bagasse storage yard/cane trash yard.

Ash handling will be accomplished by the use of hoppers and screw and belt conveyors. The type, location and number of conveyors will be decided during the detailed engineering stage of the project.

All water and storage tanks will be located outdoors. The tanks will be field erected and constructed of carbon steel typically with an exception of DM tank, which will be stainless steel or epoxy coated carbon steel. The tanks will be located to allow for optimal arrangements of piping and will be accessible by road.

The cooling towers and the circulating water pump house will be located outdoors.

The 132 kV switchyard will be located adjacent to the main co-generation building close to the switch gear area. The switchyard will include the power transformer, insulators, tower structure, circuit breakers, isolators, meters etc.

### 5.2.3 Co-generation Plant Layout

Cogeneration power plant will house the steam turbine generator and its auxiliaries, the condenser and its auxiliaries, the control room; the boiler feed pumps, the electrical equipment room (distribution transformers, switchgear, and motor control centers), battery room, etc.

The steam turbine generator will be supported on a reinforced concrete pedestal. The building superstructure will be RCC construction. Pitched roof will be provided to facilitate drainage.

Control room will be in brick wall construction and the walls will be plastered. The building structure will also be used to support piping, cable trays, conduits, etc. Suitable coating materials will be used for interior and exterior surfaces. A special coating will be provided in the acid/caustic soda storage area and battery room.

Proper air conditioning will be provided for the control room. For all other areas adequate ventilation system will be provided as per the State regulations. Special precautions will be taken for air intake and exhaust for the emergency diesel area and for the battery room.

An overhead crane with suitable capacity auxiliary hook will be provided over the turbine generator bay. Its capacity will be adequate to provide lifting capability to meet the needs of all steam turbine generator components including erection. Roll up doors will be located in the steam turbine area and the condenser area, to provide access for maintenance. Single and double doors will also be provided throughout the building for personnel access and maintenance of smaller equipment.

## 5.3 Approach & Internal Roads

The site is located near to the National Highway No. 222, Nanded-Parbhani, with approach road already existing and thereby not requiring any additional approach road. Required internal roads for movement of men and material will have to be constructed within the plant area.

## CHAPTER – 6

### ENVIRONMENT & SOCIO-ECONOMIC BENEFITS

- 6.1 The proposed integrated project is utilizing the cane crop in the most efficient manner for eco-friendly products like sugar and renewable and decentralized power generation. The optimum production of conventional but quality sugar will cater to value added domestic and international markets. The sound techno-economic and commercial viability of this project, coupled with highest efficiency in all aspects of product manufacture, will pave the way for integration of sugar industry in the country.

Establishment of the latest and most efficient technologies adopted for cane crop development, sugar manufacture, cogen power generation and cane trash fuel linkage will also help the Indian sugar industry and equipment manufacturers to grow leaps and bounds, at the national and the international levels.

- 6.2 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 mofussil 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.
- 6.3 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.
- 6.4 At the project and promoter levels, the captioned project offers excellent opportunities for expansion, flexibility of operations depending on the market situation for each product and improved returns from trade of emission reductions from the upcoming international emissions trade market, under the Kyoto Protocol, popularly known as Carbon Credit.
- 6.5 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.

## CHAPTER – 7

### PROJECT PREPAREDNESS

#### 7.1 NoC's / Approvals / Permissions

List of NoC's / Approvals / Permissions required & their status as of September, 2016 is indicated in the following table:

Project Component / Item of NoC / Approval	Status		
	Completed	Under Process	Yet to start
<b>General</b>			
▪ Registration of JKAIL	✓		
▪ Excise, sales tax, professional tax & income tax registrations			✓
▪ PF / ESI registrations			✓
▪ Shop act licenses			✓
▪ Import / export licenses			✓
▪ NoC from local gram Panchayat	✓		
▪ Factory Inspector approval			✓
▪ Electrical inspector approval			✓
<b>Sugar Plant</b>			
▪ IEM license	✓		
▪ Consent to Establish from MPCB for 2500 TCD	✓		
▪ Amendment to Consent to establish & operate from 2500 TCD to 3500 TCD		✓	
<b>Cogen Power Plant</b>			
▪ IEM license	✓		
▪ PPA with MSEDCL/Third party			✓
▪ Consent to establish & consent to operate			✓
▪ Chimney height clearance from AAI			✓
▪ Boiler inspector approval			✓

## **7.2 Management & Administration**

JKAIL has already deputed a competent Project Team for developing and implementing this project at the site. The JKAIL Board will take a review of progress of work on a monthly basis, to ensure speedy and successful implementation of this project.

## **7.3 Technical & Financial Tie Ups**

JKAIL has the experience and knowhow for adopting the latest technologies in both the components of the integrated project. Consultants and experts will be appointed, as and when required, during the development and implementation of this project. JKAIL is in the process of appointing experts for sugar plants and has appointed MITCON as Consultant, for preparation of DPR for the integrated project.

JKAIL will bring in the required equity, as well as provide the negotiated securities to the bankers and financial institutions. The term loan and working capital loan for integrated project will be taken through nationalized banks / SDF.

JKAIL will not face any difficulty for arranging technical and financial tie ups required for the captioned project.

## **7.4 Project Management**

The project management for the integrated project will be under able leadership of promoters/directors, assisted by experienced technical team. The appointed experts, consultants and site office staff will together work in tandem and develop / implement this project.

Required top-level manpower will be appointed shortly. Project monitoring / management will be almost on daily basis and as per the final bar chart / implementation schedule, developed after ordering of main plant and equipment.

## CHAPTER – 8

### ESTIMATED CAPITAL EXPENDITURE

#### 8.1 Land & Site Development (Refer Annexure – 1)

JKAIL has already acquired 95 acres of land at Babhulgaon, Kandhar Tehsil, Nanded. The land is sufficient for housing sugar and cogen power plant for the proposed capacities.

The cost of land cumulates to **Rs. 315 lakh** considering the book value of the land. Out of this, Rs. 200 lakh has been allocated to sugar plant and balance Rs. 115 lakh to the cogen power plant

The site development expenses include leveling and site grading, cane yard leveling & grading, fencing, gates, roads & culverts, sewerage & drains. The preliminary estimate for site development comes about **Rs. 126 lakh** (Rs. 75 lakh for sugar plant and Rs. 51 lakh for the cogen power project).

The total land and site development cost is estimated at **Rs.441 lakh** (Rs.275 lakh for sugar and Rs. 166 lakh for cogen project).

#### 8.2 Civil Works (Refer Annexure – 2)

The main civil works & their estimated costs as provided by JKAIL's Architect for entire project are indicated below

##### 8.2.1 Sugar Project

	(Rs. Lakh)
Item	Amount
1. Sugar factory main buildings	500
2. Sugar machinery foundations	225
3. Spray Pond, Hot & Cold Water Channels	70
4. Sugar & general store & lime & sulphur Godowns	150
5. Admin Building	45
6. Residential quarters	70
7. Raw Water Tank & Water Supply Scheme	30
8. Shed & open bagasse storage yard	15
9. Miscellaneous buildings & civil works	60
10. Architect fees	23
<b>Total</b>	<b>1188</b>

### 8.2.2 Cogen power project

(Rs. Lakh)

Item	Amount
1. Power House building, TG, Boiler and Auxiliary Foundation	325
2. Boiler & Auxiliary Foundations	225
3. Switchyard / MSETCL substation Foundations	75
4. Water Treatment Plant	70
5. Raw Water Tank & Water Supply Scheme	80
6. RCC Chimney	110
7. RCC Cooling Tower	50
8. Miscellaneous buildings & civil works	115
9. Architect fees	21
<b>Total</b>	<b>1071</b>

Based on the actual civil costs incurred for similar capacity cogen power plants and preliminary estimates from the project architect, the civil estimates have been worked out at **Rs. 2259 lakh**, including Architect's fees. The appointed architect for the project will work out detailed estimates and civil drawings (based on the inputs received by the equipment suppliers and labour / material rates at the site location).

### 8.3 Equipment (Refer Annexure 3)

8.3.1 The specifications for main plant and machinery required for 3500 TCD capacity sugar mill, are elaborated in Chapter 3, section 3.1. The erected cost of plant and machinery for sugar plant is estimated at **Rs. 6234 lakh** based on the discussions with vendors & possible negotiation margins along with the electrical distribution cost, DCS & plant automation.

8.3.2 The main items of equipment for the cogen power plant and their estimated erected costs are given in the following table:

(Rs. Lakh)

Item and brief specifications	Estimated Erected Cost
1. Boiler & auxiliaries 1x 120 TPH (87 kg/cm <sup>2</sup> , 540 deg C)	2640
2. Steam turbine and generator and auxiliaries (1 x 20 MW DEC type, 85 kg/cm <sup>2</sup> , 538 deg C )	1400
3. Electrical distribution, switch yard & bay at MSETCL Sub-station	500
4. Piping, valves, PRDSH, fittings, etc.	175
5. Tie Line cost, 4 Km	240
6. DCS & plant automation	125
7. Bagasse, Coal & Ash handling Equipment	400
8. Cooling towers and auxiliaries excluding civil works	150
9. DM plant including raw water pump house, piping, pre-treatment, softening system, instruments & electrical	200
Taxes & Duties at 20%	1166
<b>Total</b>	<b>6996</b>

Based on the preliminary discussions with reputed machinery suppliers and possible negotiation margins, the estimated erected cost of plant and equipment for the cogen power plant has been worked out at **Rs. 6996 lakh**.

8.3.3 The total erected cost of equipment for the integrated project has been estimates at **Rs. 13230 lakh**.

#### 8.4 Miscellaneous Fixed Assets (Refer Annexure – 4)

The total miscellaneous fixed assets for the integrated project have been worked out at **Rs. 355 lakh**, (Rs. 160 lakh for the sugar project and Rs. 195 lakh for the cogen power plant)

(Rs. Lakh)

Item	Sugar Project	Cogen Project	Total
A. Office equipment	10	10	20
B. Other Assets			
B.1 Spares, Tools & Tackles	10	10	20
B.2 Chemical lab equipment	10	0	10
B.3 Lab Equipment	10	10	20
B.4. Workshop Equipment	20	0	20
B.5 Vehicles	25	20	45
B.6 Walkies / Talkies	10	15	25
B.7 Compressed Air System	20	40	60
B.8 AC & ventilation system	10	40	50
B.9 Fire fighting system	15	50	65
B.10 Weigh bridges	20	0	20
<b>Total</b>	<b>160</b>	<b>195</b>	<b>355</b>

#### 8.5 Preliminary & Pre-operative Expenses (Refer Annexure – 5)

The preliminary expenses include expenses for preparation of DPRs, appraisal and Bank upfront, legal / administrative expenses.

The pre-operative expenses include establishment charges, rent / rates / taxes, traveling expenses, start up expenses including wages / salaries / raw material expenses, cane development expenses, project management charges including supervision, project insurance during construction, interest charges during construction, mortgage expenses, banker's charges, stamp duty expenses, other miscellaneous expenses, etc.

The total preliminary and pre-operative expenses for the integrated project have been estimated at **Rs. 1376 lakh**, Rs. 717 lakh for sugar project and Rs. 659 lakh for the cogen power plant.

#### 8.6 Contingencies

The contingencies have been worked out at 2.0% of the non-firm items of land, site development, civil structures, plant & machinery, miscellaneous fixed assets & preoperative expenses. They accumulate to **Rs. 348 lakh**, (Rs. 168 lakh for sugar plant and Rs.180 lakh for cogen power).

## 8.7 Stock Levels & Working Capital Requirement (Refer Annexure – 7)

The estimated stock levels for different components of the integrated project have been tabulated below:

Item	Stocking level, days / project component	
	Sugar	Cogen power
Raw material	-	30
Consumables & packing materials	30	30
Finished goods	30	-
WIP	4	-
Debtors		30
Creditors	15	

Based on above stock levels, the margin money has been considered at **Rs.350 lakh**, allocated as Rs. 315 lakh for sugar plant and Rs. 35 lakh for cogen power. This allocation depends on the estimated stock levels and their values, for each project component.

## CHAPTER – 9

### FINANCIAL VIABILITY

#### 9.1 Basis & Assumptions

9.1.1 The entire financial analysis of the project has been worked out on a computer, using specific project feasibility software developed for the purpose.

Annexures-1 to 19 gives the basis and details of various items of project, along with item wise costs. Schedules-A to I represent results of the analysis in terms of cost of project and means of finance (Schedule-A), project profitability and cost of production (Schedule-B), Debt Service Coverage Ratio (DSCR) (Schedule-C), Cash Flow Statements (Schedule-D), Balance Sheet Forecasts (Schedule-E), Analytical and Comparative ratios (Schedule F), Break-even analysis (Schedule-G) & Sensitivity Analysis (Schedule-H), Payback period (Schedule-I), Internal rate of Return (Schedule-J).

9.1.2 Each item of capital cost is based on the estimated erected costs for various equipment contractors. Annexures-1 to 6 respectively give land and site development costs, civil works, erected costs of equipment, erected costs of miscellaneous fixed assets and preliminary and pre-operative expenses. While calculating the cost of site development and civil works, the prevailing rates for labor, material, etc have been assumed.

9.1.3 The contingency provision has been made on all non-firm items of the project cost and has been considered at 2.0% for each component of the project, including pre-operative expenses (Refer annexure 6).

9.1.4 The installed capacities and capacity utilization levels for sugar and cogen power plants and respective annual productions have been shown in the following table:

Item	Year				
	1	2	3	4	5
<b>Sugar</b>					
▪ No. of days	75	160	160	160	160
▪ No. of hrs.	22	22	22	22	22
▪ Crushing rate, TCH	159	159	159	159	159
▪ Annual installed crushing capacity, MT	262500	560000	560000	560000	560000
▪ Utilization	75	75	85	85	85
▪ Annual cane crushing, MT	196875	420000	476000	476000	476000
▪ Total sugar recovery, % cane	11.20	11.30	11.40	11.50	11.50
<b>Total Sugar production, MT</b>	<b>22050</b>	<b>47460</b>	<b>54264</b>	<b>54740</b>	<b>54740</b>
<b>Cogen</b>					
<u>Season</u>					
▪ No. of days	75	160	160	160	160
▪ No. of hrs.	24	24	24	24	24
▪ Export capacity, MW	14.12	14.12	14.12	14.12	14.12
▪ Export capacity, MU	25.42	54.23	54.23	54.23	54.23
<u>Off season</u>					
▪ No. of days	0	27	27	27	27
▪ No. of hrs.	24	24	24	24	24
▪ Export capacity, MW	17.85	17.85	17.85	17.85	17.85
▪ Export capacity, MU	0	11.39	11.39	11.39	11.39
Capacity utilization, %	75	75	85	85	85
<b>Exportable surplus, MU's</b>					
Season	19.06	40.67	46.09	46.09	46.09
Off season	0.00	8.68	9.83	9.83	9.83
<b>Total</b>	<b>19.06</b>	<b>49.34</b>	<b>55.92</b>	<b>55.92</b>	<b>55.92</b>

9.1.5 The stock levels for various items of working capital for each component of the project have been elaborated in section 7.7 (Refer Annexure-7). The margin money has been considered at 25% of total requirement of the first year and c/c facility at 75% of total requirement. The interest rate on c/c facility is taken at 13%, prevailing banking rate for that level of c/c limit.

9.1.6 Project income is based on the quantities of power exported through MSETCL grid to, sale of sugar and molasses.

In view of the prevailing rate provided by MSEDCL, the sale of power has been assumed at Rs. 6.70 / kWh.

The avg. sale of free sugar has been taken at Rs. 30000 / MT, based on the prevailing rates with 1% increase up to 5<sup>th</sup> year & 2-3% increase during 6 to 10 year respectively.

The sale of molasses has been taken at Rs. 4500 / MT, based on the prevailing rate.

Refer Annexure – 8 for estimated annual production and sales value for all the product streams.

9.1.7 The net cane price as per FRP has been taken at Rs. 2712 / MT including harvesting and transportation charges with 3% increase from 5<sup>th</sup> year onwards.

Refer Annexure 9 for particulars of indigenous raw materials explained above.

9.1.8 The consumables for cogen power and sugar respectively have been taken at Rs 70/1000 kWh units and Rs. 30 / MT cane crushed with escalation of 5 % from 4th year. The packing materials are estimated to cost at Rs. 50 / quintal. (Refer Annexure-10 for details).

9.1.9 The requirement of direct manpower has been estimated based on the equipment / facilities to be operated in each section of the integrated project. Total manpower requirement has been estimated at 243 for sugar and 32 for cogen power plant (total 275). Every year 12% increment and 15% benefits have been provided (Refer Annexure-12).

- 9.1.10 Repairs and maintenance costs have been estimated at 2.0% on civil works & on miscellaneous fixed assets while 2.5% on plant equipment (Refer Annexure-13), with 5.0% increase every year.
- 9.1.11 Other manufacturing expenses include rent, rates and taxes, electricity charges, insurance charges for fixed assets and stocks, miscellaneous expenses and contingencies (Refer Annexure-14).
- 9.1.12 Administrative overheads include administrative staff salary and expenses like printing and stationery, postage and telephone, traveling and conveyance, legal and other expenses (Annexure 15). Selling and distribution overheads (Annexure –16) have been estimated as detailed in respective Annexure.
- 9.1.13 The repayment of interests and term loans for each component of the project have been considered based on the means of finance and the terms for debts for each. The term loans for integrated sugar & cogen power plants will be at 13.5% rate, payable within 9 years including 2 year moratorium from date of disbursement. The Bridge Loan/SDF for cogen project will be at the rate of 13.50%/7% and payable in eight years with 3 years as moratorium.
- 9.1.14 Depreciation has been calculated by following methods and rates (Refer Annexure-18 for details).

<b>Item of capital cost</b>	<b>WDV</b>	<b>SLM</b>
Site development and civil structure	9.50	3.17
Plant & Machinery	18.10	6.33
Miscellaneous assets	18.10	6.33

- 9.1.15 Annexure-19 gives income tax calculation as per relevant tax laws applicable.
- 9.1.16 Preliminary expenses have been written off equally in 10 years.
- 9.1.17 Based on above assumptions, the detailed project financial analysis for a period of 10 years have been worked out and are presented in Schedules-A to J.

## 9.2 Cost Summary

Based on the capital cost break up worked out in Chapter 8, the project cost summary for the entire integrated project is given in the following table (Also refer Schedule A):

(Rs. Lakh)

<b>Total Project Cost</b>		<b>Sugar</b>	<b>Cogen</b>	<b>Total</b>
Land & Site Development	:	275	166	441
Civil works & Buildings	:	1188	1071	2259
Indigenous Plant and Machinery	:	6234	6996	13230
Miscellaneous Fixed Assets	:	160	195	355
Prelim & Preoperative Expenses	:	717	659	1376
Contingencies	:	168	180	348
Working Capital Margin	:	304	46	350
<b>Total</b>	:	<b>9046</b>	<b>9313</b>	<b>18359</b>

## 9.3 Means of Finance

The proposed means of finance is indicated below. (Refer Schedule – A).

(Rs. Lakh)

<b>Financing Pattern</b>		<b>Sugar</b>	<b>Cogen</b>	<b>Total</b>
1. Promoter's Equity	:	2650	2725	5375
2. Bridge Loan/SDF	:	0	1768	1768
3. Working Capital Margin by JKAIL	:	304	46	350
4. F. I. Loan(s)	:	6092	4774	10866
<b>Total</b>	:	<b>9046</b>	<b>9313</b>	<b>18359</b>

## 9.4 Financial Viability Indicators

9.4.1 Schedules A to J establish results of the project financial analysis, in terms of total project cost and means of finance, project profitability, debt service coverage ratio, cash flow statement, balance sheet forecast, analytical and comparative ratio, sensitivity analysis, internal rate of return, payback period, etc. supported by Annexure 1-19.

9.4.2 The above ratios establish sound financial viability of the project for this funding pattern and project income from sale of exportable power to third party / power trader through MSETCL grid, sugar & molasses, as indicated.

9.4.3 The financial viability ratios have been tabulated as below:

Particulars	Operating Years									
	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26
1. EBIT to Capital Employed	9.02	27.03	31.02	30.58	28.44	26.51	25.41	24.27	22.48	20.83
2. Return on Investment										
i) PBT to Capital Employed	5.33	11.05	16.16	17.21	16.54	15.97	16.09	16.11	15.52	14.70
ii) PAT to Capital Employed	4.26	8.84	12.67	12.76	11.83	11.06	10.81	10.55	9.89	9.28
iii) PBT to Net Worth	16.22	27.58	32.32	28.52	23.66	20.21	18.31	16.69	15.52	14.70
iv) PAT to Net Worth	12.97	22.06	25.35	21.16	16.92	14.00	12.30	10.93	9.89	9.28
3. PBT to Sales	18.61	11.66	15.92	16.90	16.47	15.97	16.01	15.93	15.93	16.02
4. Raw Materials Cost to Sales	99.19	61.32	62.82	61.47	62.97	64.31	65.19	66.08	66.67	66.78
5. Operating Ratio	64.38	70.21	68.24	68.75	70.41	72.15	73.34	74.58	75.47	75.83
6. Interest Coverage Ratio	3.44	2.39	2.93	3.22	3.49	3.89	4.62	5.86	8.18	8.73
7. Fixed Assets Turnover Ratio	0.31	1.08	1.18	1.21	1.22	1.25	1.28	1.30	1.27	1.28
8. Ratio of N/W + L/T Liabilities to Fixed Assets	0.98	1.04	1.07	1.11	1.16	1.21	1.25	1.28	1.30	1.40
9. Debt Equity Ratio	1.76	1.27	0.83	0.55	0.36	0.22	0.12	0.04	0.00	0.00
10. TOL / TNW	2.00	1.63	1.14	0.80	0.58	0.42	0.29	0.19	0.15	0.14
11. Current Ratio	1.53	1.62	1.66	1.76	1.85	1.94	1.99	1.94	2.02	2.46

9.4.4 The financial viability analysis does not include the sale of carbon credits in the international market.

## CHAPTER – 10

# CONCLUSIONS & RECOMMENDATIONS

### 10.1 Project SWOT Analysis

#### 10.1.1 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 trash in the command area to ensure off season operation of the power plant as envisaged.
- Sound financial viability and technical feasibility of the integrated 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 and sugar plants
- 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.

#### 10.1.2 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

#### 10.1.3 Opportunities (O):

- Excellent opportunity for expansion of individual plants and wheeling and banking of exportable power to third party consumers, for maximizing returns
- Setting up of ethanol plant
- Potential for trade of carbon credits from the project in the international market and increased returns

#### 10.1.4 Threats (T):

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

## 10.2 Risks & Mitigates

Risk	Particular	Mitigates
Performance risk	Ensured sugar cane & fuel availability	Cane development has been in full progress, with experienced senior professionals and staff appointed for the purpose. Cane trash depots, trash bailers and entrepreneurship development / contracts with cane trash traders proposed. A full time fuel manager and dedicated staff has been proposed for the cogen power plant
Marketing risk	Sugar sale / export	Firm marketing tie up in offing. Alternative marketing channels explored. No link with domestic demand. Value added products proposed
Regulatory risk	Conversion / clearances / tariff order	No difficulty envisaged, as various governmental agencies have already expressed their willingness to issue approvals / consents. All the approvals in pipeline. Conducive tariff order from MERC for purchase of power
Financial risk	Financial viability of the project	Satisfactory DSCR. Equity participation arranged.

## 10.3 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

## 10.4 Conclusions & Recommendations

The captioned integrated sugar and cogen power project is technically feasible and commercially viable, without taking into consideration likely benefits from trade of carbon credits in the international market. The integrated project is recommended to financial institutions for financing term and working capital loans. The sale of carbon credits will improve the financial viability further, to a sizeable extent.

The backward and forward linkages of this project / as well as socio-economic and environment benefits to the local populace make this a win-win project to all the stakeholders.