TECHNO ECONOMIC FEASIBILITY REPORT

ON

160 KLPD GRAIN BASED DISTILLERY

PROJECT LOCATION

PLOT.NO. C107 -113, SIPCOT, GANGAIKONDAN, TIRUNELVELI DISTRICT, TN

PROJECT BY

M/s. NANDA DEVI BIO ENERGY LLP

CHENNAI

ITCOT
ENABLING ENTERPRISES SINCE 1979

PREPARED BY

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IMPORTANT NOTE

This **TEFR** and its contents are confidential. The report detailed below is based on the data collected from the field, secondary research, details/data and backup documents made available by the officials of M/s.Nanda Devi Bio Energy LLP.

This report is intended for the purpose of ascertaining the viability of setting up of 160 KLPD Grain based distillery/Ethanol plant at plot. No. C107 -113, SIPCOT, Gangaikondan, Tirunelveli Taluk & District, TN considering certain assumptions.

The projected revenue and cost of operations for the proposed project are based on estimations. There may be changes in the revenue and cost estimates depending on the market conditions and change in the assumptions. This report contains **XXX** pages and issued in Triplicate.

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ABBREVIATION USED

TABLE 1 : ABBREVIATIONS

ABBREVIATION	DESCRIPTION
BIS	BUREAU OF INDIA STANDARDS
CTE	CONSENT TO ESTABLISH
CTO	CONSENT TO OPERATE
DER	DEBT EQUITY RATIO
DFPD	DEPARTMENT OF FOOD AND PUBLIC DISTRIBUTION
DSCR	DEBT SERVICE COVERAGE RATIO
E & C	ERECTION AND COMMISSIONING
E10	TEN PERCENT ETHANOL BLENDED PETROL
E20	TWENTY PERCENT ETHANOL BLENDED PETROL
E5	FIVE PERCENT ETHANOL BLENDED PETROL
E85	EIGHTY FIVE PERCENT ETHANOL BLENDED PETROL
EAC	EXPERT APPRAISAL COMMITTEE
EB	ELECTRICITY BOARD
EBP	ETHANOL BLENDED PETROL PROGRAM
EC	ENVIRONMENTAL CLEARANCE
ECASPL	EIGHT CAPITAL ADVISORY SERVICES PRIVATE LIMITED
ED95	FUEL WITH 95% ETHANOL & 5% IGNITION IMPROVER FOR MODIFIED DIESEL ENGINES
EIA	ENVIRONMENTAL IMPACT ASSESSMENT
EMP	ENVIRONMENTAL MANAGEMENT PLAN
EOI	EXPRESSION OF INTEREST
EPC	ENGINEERING, PROCUREMENT AND CONSTRUCTION
ESP	ELECTROSTATIC PRECIPITATORS
ESY	ETHANOL SUPPLY YEAR (DEC TO NOV OF FOLLOWING YEAR)
FCI	FOOD CORPORATION OF INDIA
GDP	GROSS DOMESTIC PRODUCT
GOI	GOVERNMENT OF INDIA
GSR	GENERAL STATUTORY RULES
GST	GOODS AND SERVICES TAX
IDC	INTEREST DURING CONSTRUCTION

ABBREVIATION	DESCRIPTION
IOCL	INDIAN OIL CORPORATION LIMITED
IP67	INGRESS PROTECTION 67 OR INTERNATIONAL PROTECTION 67
IRR	INTERNAL RATE OF RETURN
ITCOT	ITCOT LIMITED, CHENNAI
KL	KILO LITRE
KLD / KLPD	KILOLITRES PER DAY
KVA	KILO VOLT AMPERE
KWH	KILO WATT HOUR
LMT	LAKH METRIC TONNE
MMT	MILLION METRIC TONNES
MOEF&CC	MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE
MoFPI	MINISTRY OF FOOD PROCESSING INDUSTRIES
MOP&NG	MINISTRY OF PETROLEUM & NATURAL GAS
MSP	MINIMUM SUPPORT PRICE
MT	METRIC TONNE
NBCC	NATIONAL BIOFUEL COORDINATION COMMITTEE
NDBEL	NANDA DEVI BIO ENERGY LLP
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NPB	NATIONAL POLICY ON BIOFUELS
O&M	OPERATION & MAINTENANCE
OMC	OIL MARKETING COMPANIES
PCB	POLLUTION CONTROL BOARD
PESO	PETROLEUM & EXPLOSIVES SAFETY ORGANIZATION
ROC	REGISTRAR OF COMPANIES
RS	RUPEES
RS232	RECOMMENDED STANDARD 232
SEIAA	STATE ENVIRONMENT IMPACT ASSESSMENT AUTHORITY
SFT	SQUARE FEET
SO	STATUTORY ORDER
SPCB	STATE POLLUTION CONTROL BOARD
SQM	SQUARE METRE
TAC	TARIFF ADVISORY COMMITTEE

ABBREVIATION	DESCRIPTION
TCD	TONNES CANE CRUSHED PER DAY
TL	TERM LOAN
TOR	TERMS OF REFERENCE
TPH	TONNES PER HOUR
UOM	UNIT OF MEASUREMENT
WC	WORKING CAPITAL
ZLD	ZERO LIQUID DISCHARGE

1.0 EXECUTIVE SUMMARY

1.1.1 **NANDA DEVI BIO ENERGY LLP (NDBEL)** was incorporated on 06th day of September 2021 under Section 23(4) of LLP Act, 2008. The Firm has also obtained Limited Liability Partnership Identification Number (LLPIN) **AAY-4598** from the Registrar of Companies, Chennai.

1.1.2 The Firm is managed by professionals, under the direction and guidance of the Board of Directors. The directors on the Board of the Firm are as follows:

Sl.No.	Name	Designation
1.	Sri Arvind Nandagopal	Designated Partner
2.	Sri. V.S.Natarajan	Designated Partner
3.	Sri Masilamani Nandagopal	Partner
4.	Sri V.R. Meganathan	Partner

1.1.3 NDBEL has planned to set up a 160 KLPD Grain based distillery unit at Plot No. C107-113, SIPCOT, Gangaikondan, Tirunelvi district, Tamil Nadu.

1.1.4 The distillery has been proposed to supply ethanol to the Oil marketing companies and support the ethanol blending programme of the Indian government.

1.1.5 The ethanol distillery is proposed to be setup in a land extent of **21.77 Acres** with a total built up area of **2,08,702 Sq.Ft.**

1.1.6 As indicated by the Firm, the raw material considered is broken rice (68% starch content) and maize (62% starch content). The raw material mix is considered as follows;

Raw Material	Raw Material Mix
Broken Rice (68% starch content)	50%
Maize (62% starch content)	50%

1.1.7 The above is based on the assessment (Grain starch % and alcohol yields) of Vasantdada Sugar Institute, Maharashtra (Premier Research and Development Organization in Sugar and Allied Industry).

1.1.8 **Source of Raw Material:** As per the discussion with NDBEL it is informed that the prospective suppliers of raw materials (Broken Rice and Maize) will be the farmers in the surrounding regions of the neighbouring districts. The present availability of maize in the southern districts of Tamil Nadu is around 6.5 lakh tons and broken rice is around 1.75 lakh tons per annum.

1.1.9 The firm requires annually about 0.69 lakh tons of maize and about 0.62 lakh tons of broken rice at installed capacity level for manufacturing ethanol. The same works out to 10% and 35% of the present availability for maize and broken rice respectively.

1.1.10 Besides the present production, the firm would undertake crop development and production enhancement of these two crops (paddy & maize) in colloboration with reputed seed companies. The firm will also arrange supply of high yielding varieties, provide crop advisory services & buy back guarantee. Hence, the Firm will purchase directly from farmers through its own purchase centres in the project districts. Thus, considering the present grain availability and own initiatives, the firm is confident of ensuring adequate availability of grains for manufacturing the ethanol.

1.1.11 The Product mix details of the proposed distillery plant is shown as follows,

S.No.	Product Mix	Unit	Production per day @ installed capacity level	Production per annum @ installed capacity level
1	Ethanol	KL	160	52800
2	Impure spirit (IS)	KL	1.68	554
3	Fusel Oil	Liters	0	0
4	Dry cake (DDGS)	MT	108	35475
5	Liquid CO_2	MT	80	26400

1.1.12 The details of chemicals requirement, Steam, Fuel & Water requirement are indicated in the chapter on technical chapter.

1.1.13 The commercial proposals for the design, engineering, supply, erection and commissioning of the project have been obtained from Praj Industries Limited. Praj Industries is a globally leading Firm with a bouquet of sustainable solutions for bioenergy, high purity water, critical process equipment, breweries and industrial waste water treatment. It is one of the Technologies cum Project Firm in India having experience of handling all type of 1G feedstock including

Rice/Corn/Bajra/Jawar and designing /delivering large capacity plants more than 500 KLPD.

1.1.14 The LLP has shared turnkey estimate from M/s. Praj Industries Limited, Pune. **Signed Final Turnkey agreement will be submitted by the LLP to Bank directly.**

1.1.15 The following inferences on market are made on the industry and the Firm,

a. Considering the requirement of ethanol and availability of distillery capacity, the Firm may be anticipated to tap the opportunity to supply for ethanol blending programme and achieve the revenue projected in the financials.
b. Further the increase in penetration of Electric Vehicles and CNG Vehicles being promoted by Government policies may significantly impact to reduce the requirement of gasoline and therefore the requirement of ethanol for blending.

c. Hence the Firm may arrange to provide documentary support on preliminary communication with OMC regarding the requirement in Tamil Nadu and supply prospects of the proposed distillery to the lender.

d. The Firm is advised to enter into bilateral agreement with OMCs followed by signing of tripartite agreement with OMCs and bank for providing comfort to the bank based on committed purchase by OMCs.

1.1.16 Considering the limited progress made so far, time line and procedures involved in obtaining approvals, sourcing of the Plant and machinery, construction etc., the entire project could be expected to commence by **01st July 2023.**

1.1.17 The project cost is estimated at **Rs. 21,920.00 Lakh** including interest during construction and WC margin as detailed below. Project cost has been arrived based on the sale deed document for land, civil estimate for buildings, quotation/purchase orders for machinery etc. provided by the LLP.

1.1.18 The term loan to an extent of **Rs. 20220.00 Lakh** has been proposed with a repayment period of 102 monthly instalments and interest Rate of 5% per annum for the first 60 months from 1st disbursement of loan (GoI - Ministry of Consumer Affairs, Food & Public Distribution modified scheme) and for subsequent months, the interest rate is 10.0% per annum.

1.1.19 In order to increase production of Ethanol in the country, the Central Government (Ministry of Consumer Affairs, Food & Public Distribution) notifies modified scheme namely – "Scheme for extending financial assistance to project proponents for enhancement of their ethanol distillation capacity or to set up distilleries for producing 1st Generation (1G) ethanol from feed stocks such as cereals (rice, wheat, barley, corn & sorghum), sugarcane, sugar beet, etc".

1.1.20 As per the scheme Interest subvention @6% per annum or 50% of rate of interest charged by banks whichever is lower, shall be borne by the Central Govt for a period of 5 years for setting up grain based distilleries which will be using dry milling technique to produce Dry Distillers Grain Soluble (DDGS) and which will supply at least 75% of ethanol to Oil Marketing Firm (OMC) for blending with petrol.

1.1.21 The Partners Contribution for the proposed project is **Rs.1700.00 Lakh.** In case of project cost overrun, the Promoters have indicated that they will bring the requiste funds/capital buffers to meet the project cost overrun.

1.1.22 The debt to equity ratio works out of **11.89: 1**. As per the scheme, the requisite margin is 5% of the project cost wherever tripartite agreement amongst the project proponents, the bank and the OMC for purchase of ethanol is executed.

1.1.23 As per scheme guidelines, the LLP has proposed for 5% margin. Hence the term loan component is considered as 95% of project cost (excluding WC margin).

1.1.24 The DSCR for the proposed project works out to be **1.44**, which indicates that the term loan serviceability of the project is good considering that a tripartite agreement is executed and interest subvention is received for the project.

1.1.25 The IRR for the proposed project works out to be **15.10%**, which is considered good.

1.1.26 The BEP on utilised capacity works out to **60.34% (year 3)**, which is considered good. The BEP on installed capacity works out to be **48.27% (year 3)**, which is considered good.

1.1.27 **Compliance with Statutory Approvals/Licenses/Payments** - The Firm has to obtain pending statutory approvals in due course for smooth progress of the implementation and subsequent operation of the Distillery Plant.

1.1.28 Based on the project's location and rationale for establishment of the project and assumptions considered in financial projections, ITCOT is of the opinion that the proposed project is Technically, Commercially and Financially Viable. The project will be able to meet its interest and term loan obligations and the project is Bankable.

2.0 INTRODUCTION

2.1 BACKGROUND TO THE STUDY

2.1.1 **NANDA DEVI BIO ENERGY LLP (NDBEL)** was incorporated on 09th day of September 2021 under Section 23(4) of LLP Act, 2008.

2.1.2 The LLP registered office is located at 69, Sterling Road, Nungambakkam, Chennai, 600034, Tamil Nadu.

2.1.3 The Firm is promoted with an objective to manufacture sustainable clean fuels from sugarcane, beet, sweet sorghum, Jerusalem artichoke, fruits, starch (corn, broken rice, wheat, cassava, sweet potato) and non-food feedstock like jatropha, algae, biomass, waste and other allied Services.

2.1.4 The Firm has assessed that the energy demand in our country is rising due to an expanding economy, growing population, increasing urbanization, evolving lifestyles and rising spending power. About 98% of the fuel requirement in the road transportation sector is currently met by fossil fuels and the remaining 2% by biofuels. As on date India imports 85% of its oil requirement.

2.1.5 Domestic biofuels provide a strategic opportunity to the country, as they reduce the nation's dependence on imported fossil fuels. In addition, when utilized with appropriate care, biofuels can be environmentally friendly, sustainable energy sources. They can also help generate employment, promote Make in India, Swachh Bharat, doubling of farmers' incomes and promote Waste to Wealth generation.

2.1.6 The National Policy on Biofuels 2018, provides an indicative target of 20% ethanol blending under the Ethanol Blended Petrol (EBP) Programme by 2030. Currently petrol with 10% ethanol blend (E10) is being retailed by various Oil Marketing Companies (OMCs) in India, wherever it is available. However, as sufficient quantity of ethanol is not available, therefore, only around 50% of petrol sold is

E10 blended, while remaining is unblended petrol (E0). The current level of average ethanol blending in the country is 5% (Ethanol Supply Year 2019-20). Due to several interventions in the supply side of ethanol, the Ministry of Petroleum aims to achieve 10% ethanol blending levels in the Ethanol Supply Year (ESY) – 2021-22 i.e. April, 2022.

2.1.7 This step along with achieving E20 targets will require emission norms for nationwide standardization and adoption. The MoRT&H has notified BS VI emission norms in Central Motor Vehicle Rules 1989 which are applicable to all vehicles post 1st April 2020. Newer vehicles on E-20 will have to meet BS-VI norms. MoRT&H has notified GSR 156(E) on 8th March 2021 for adoption of E20 fuel as automotive fuel and issued mass emission standards for it. MoRT&H has also notified Safety standards for ethanol blended fuels vide GSR 343(E) dated 25th May, 2021 on the basis of Automotive Industry Standard (AIS 171). It lays down safety requirements for type approval of pure ethanol, flex-fuel & ethanol-gasoline blended vehicles in India.

2.1.8 By taking into consideration the limitation of ethanol production from traditional C-Heavy molasses route and its competitive usage in potable and chemical sectors, the GoI has allowed **grain-based raw materials for ethanol production** in line with the National Policy on Biofuels, 2018.

2.1.9 Forecasting the trend and opportunity in the production of Ethanol, the Firm has proposed to establish **160 KLPD Grain based distillery / Ethanol plant** at SIPCOT, Gangaikondan, Tirunelveli, TN.

2.1.10 The partners of the Firm had approached Bank/FI for availing the financial assistance to establish the aforesaid Grain based distillery / Ethanol plant.

2.1.11 In the above context, the Firm has appointed ITCOT Limited (**ITCOT**), Chennai to prepare the Techno Economic Feasibility Study Report (**TEFR**) for their proposed grain based distillery / Ethanol Project and submit the report.

2.1.12 Accordingly, ITCOT has prepared the (TEFR) of the Proposed **Grain based distillery / Ethanol plant** based on the discussions and input obtained from partners of the Firm, various information/documents shared, clarifications provided by the Firm, industry information available from secondary sources,

discussion with industry sources as well as appropriate assumptions as per norms prevalent in this sector.

2.2 OBJECTIVES OF THE STUDY

2.2.1 The objective of this study is to prepare a Techno Economic Feasibility Study Report (TEFR) for proposed 160 KLPD grain based ethanol plant at SIPCOT, Gangaikondan, Tirunelveli, TN.

2.2.2 The main focus of the study is to assess the project feasibility in respect to the technical, financial and management aspects.

2.2.3 **Objectives**

The TEFR broadly covers the following aspects,

A. Management Aspects

- Profile of the Firm
- Profile of the Partners
- Financial strength of the Partners
- Profile of the Management

B. Technical Aspects

- Assessment of the Location
- Raw Material Availability
- Assessment of the technical specifications of major plant and machinery and utilities
- Statutory approvals and regulatory approvals requirement
- Evaluation of the implementation schedules
- Preparation of SWOT Analysis
- Risk assessment & Mitigation

C. Financial aspects

- Estimation of the project cost and assessment of proposed means of finance based on the prevailing norms of the financial institution/ banks.
- Estimation of revenue and operational expenses.
- Assessing the requirement of the term loan and its disbursement on the basis of overall feasibility.

- Evaluation of the economic viability of the proposed project based on the projected profitability estimates (income and cost), cash flow, balance sheet and debt service coverage ratio.
- Estimation of the Internal Rate of Return, Break-even analysis & Sensitivity analysis.

2.3 METHODOLOGY ADOPTED

The methodology adopted for the TEFR is given below:

2.3.1 ITCOT submitted a detailed checklist to the Firm for preparation of TEFR.

2.3.2 ITCOT's team made desk research and held detailed discussion on the project viz. Technology source / technical parameters, demand assessment, financial investment and viability.

2.3.3 ITCOT Official visited the site on **14th March 2022** for assessment of existing infrastructure of the project site.

2.3.4 ITCOT obtained relevant inputs / data / information on the project and the infrastructure required to establish the project, viz., Land, Buildings, Plant and Machinery, Utilities, Details of Manpower, Statutory Approvals & NOC, Availability and arrangement for raw material, key management staffs etc.

2.3.5 ITCOT assessed the various technical inputs provided by technical consultant of the project namely Avant Garde.

2.3.6 ITCOT assessed the various parameters to arrive at the project cost and the profitability estimates.

2.3.7 ITCOT had several rounds of discussions with the Partners of the Firm. Based on the discussions, supporting documents, information provided by Firm and details gathered from the various sources, the TEFR is prepared.

3.0 GOVERNMENT POLICY AND SCHEME ASSISTANCE

3.1 SCHEME NOTIFICATION BY MINISTRY OF CONSUMER AFFAIRS, FOOD AND PUBLIC DISTRIBUTION

3.1.1 The Central Government with a view to increase production of ethanol and its supply under Ethanol Blended with Petrol (EBP) Programme, especially in the surplus season and thereby to improve the liquidity position of the sugar mills enabling them to clear cane price arrears of the farmers notified the scheme namely "Scheme for extending financial assistance to sugar mills for enhancement and augmentation of ethanol production capacity" vide notification No. S.O. 3523(E), dated 19.07.2018, which was subsequently amended vide notifications No.S.O.3952(E), No.S.O.5219 (E), No.S.O.47 (E), No.S.O.4104(E) and No.S.O.1523(E) dated 09.08.2018, 11.10.2018, 04.01.2019, 14.11.2019 and 20.05.2020 respectively.

3.1.2 Thereafter schemes for extending financial assistance to sugar mills & molasses based standalone distilleries for enhancement and augmentation of ethanol production capacity were notified on 08.03.2019 vide notifications No.S.O.1227(E) & S.O.1228(E). Further vide notifications No.S.O.3135 (E) & S.O.3136(E) dated 15.09.2020, a small window was opened for 30 days for inviting applications under the scheme from molasses based stand alone distilleries and from sugar mills.

3.1.3 Further vide notification No. 148 (E) dated 14th January, 2021, the Central Government, notifies the following modified scheme namely- "Scheme for extending financial assistance to project proponents for enhancement of their ethanol distillation capacity or to set up distilleries for producing 1st Generation (1G) ethanol from feed stocks such as cereals (rice, wheat, barley, corn & sorghum), sugarcane, sugar beet etc."

3.2 GUIDELINES CUM (SOP) FOR EXTENDING FINANCIAL ASSISTANCE

3.3.1 Guidelines cum Standard Operating Procedure (SOP) for Extending Financial Assistance to Project Proponents for Enhancement of Ethanol distillation capacity or to set up distilleries for producing 1st Generation (1G) ethanol from feed stocks are briefly explained as follows,

TABLE 2 : GUIDELINES CUM SOP FOR EXTENDING FINANCIAL ASSISTANCE

S. No.	Parameter	Guideline cum SOP
1.	Eligibility	i. For setting up grain based distilleries / expansion of existing grain based distilleries to produce ethanol. ii. For setting up new molasses based distilleries / expansion of existing distilleries (whether attached to sugar mills or standalone distilleries) to produce ethanol and for installing any method approved by Central Pollution Control Board for achieving Zero Liquid Discharge (ZLD). iii. To set up new dual feed distilleries or to expand existing capacities of dual feed distilleries. iv. To convert existing molasses based distilleries (whether attached to sugar mills or standalone distilleries) to dual feed (molasses and grain / or any other feed stock producing 1G Ethanol) and also to convert grain based distilleries to dual feed. v. To set up new distilleries / expansion of existing distilleries to produce ethanol from other feed stocks producing 1G ethanol such as sugar beet, sorghum, cereals etc. vi. To install Molecular Sieve Dehydration (MSDH) column to convert rectified spirit to ethanol in the existing distilleries.
2.	Assistance under the Scheme (as per GoI guidelines- Interest Subvention)	i. Interest subvention @6% per annum or 50% of rate of interest charged by banks which are eligible for re-finance from NABARD, whichever is lower, on the loans extended by banks which are eligible for re-finance from NABARD, shall be borne by the Government of India for five years (including one-year moratorium). ii. The benefit of interest subvention will be provided by the Government only if the account of applicant sugar mill / distillery account is Standard. The benefit will not be available as long as account is NPA. The sugar mill/distillery will be responsible for repayment of interest including penal interest for the period of default along with the principal. iii. Loan accounts settled by borrowers under One Time

S. No.	Parameter	Guideline cum SOP
		Settlement scheme/ compromise etc. will not be eligible for interest subvention. iv. Interest subvention under the scheme shall be provided on loan amount sanctioned and disbursed in respect of each project based on the proposed capacity, limited to the in-principle approval by Department of Food and Public Distribution (DFPD). v. Interest subvention would be available to only those distilleries which will supply at least 75% of ethanol produced from the added distillation capacity to OMCs for blending with petrol. vi. In case of grain based distilleries, interest subvention would be applicable only if they are using or will be using dry milling technique to produce DDGS. vii. Assistance shall not be available to sugar mills and distilleries which have availed benefits under any other scheme of Central Government for the same project. viii. The DFPD will release the interest subvention amount on quarterly basis in advance to the nodal bank. The interest earned on the interest subvention paid in advance shall be adjusted in the next quarterly instalment.
3.	Submission of Application to appropriate authorityfor seeking in principle approval	Application-cum-proposal on the prescribed Proforma shall be submitted by the borrower for in principle approval to the Director (Sugar), Directorate of Sugar and Vegetable Oils Department of Food & Public Distribution (DFPD), Krishi Bhawan, New Delhi. After getting in principal approval, borrower shall approach to the lending bank for further process.
4.	Assessment / Quantum of Loan / Pricing	As per bank's extant guidelines / instructions applicable for termloans.
5.	Risk Advisories about the sector/industry	As per CRMD guidelines.
6.	Timeline for processing application received	Within 30 days of receipt of all documents / papers.

S. No.	Parameter	Guideline cum SOP
7.	Type of Loan	Term Loan
8.	Tenor of loan	Tenor of loan shall be as per existing bank's norm. However, payment of interest subvention on loan amount under the schemewill be limited to only 5 years including one year moratorium period.
9.	Margin	5% of the project cost wherever tripartite agreement amongst the project proponents, the bank and the OMC for purchase of ethanol is executed.
10.	DSCR	Minimum: 1.10
11.	Security	**Primary Security:** • Term Loan: The project proponents would be required to make available first exclusive charge / first pari passu charge on its Fixed Assets, as primary security purchased out of bank finance. **Collateral Security: 5% of the loan amount** • Extension of 1st/2nd (pari passu) charges on other existing securities or other securities where residual value is available /which are free from encumbrances as the case may be. • Personal guarantees of Promoters / Directors should be obtained for the proposed loan. Waiver may be permitted bythe Sanctioning Authority.
12.	Escrow Agreement	The tripartite agreement shall ensure that the payment from the OMC is routed through a dedicated escrow mechanism whereby it is to be ensured to deduct the amount of instalment for repayment of loan and the interest (after deducting the interest subvention amount to be paid by the Government) after which the balance is to be released to the concerned Project Proponent's account for itsother uses. The exercise will be carried out every month.
13.	Disbursement	i. A tri-partite agreement (TPA) among the producers of ethanol (project proponents), OMCs and the lending bank is to be signed as per proforma before disbursement.

S. No.	Parameter	Guideline cum SOP
		ii. The financed unit shall submit a certificate duly verified by Central Pollution Control Board certifying the zero-liquid discharge will be achieved through the method proposed. iii. Opinion report on the suppliers of equipment/ machinery to be obtained as per extant instructions. iv. Disbursement shall be made direct to the suppliers of equipment/ machinery proposed to be installed.
14.	Modalities of the Scheme	i. Loan to be disbursed which are eligible for re-finance from NABARD, within one year from the date of in principle approval by DFPD, failing which the in-principle approval for the project will stand cancelled. ii. The project should be completed within two years from the date of disbursement of first instalment of loan which are eligible for re-finance from NABARD. iii. The applicant should adhere to the time line as specified by DFPD for various activities viz. arrangement of land for the project, submission of application for seeking approval of environmental clearance in parivesh portal of Ministry of Environment, Forest & Climate Change (http://parivesh.nic.in/) and submission of loan application to the bank which are eligible for re-finance from NABARD, updating progress on the DFPD portal (http://sugarethanol.nic.in/) every month, failing which the in-principle approval for the project shall be cancelled by DFPD. iv. While implementing the respective project, the sugar mills / distilleries shall strive to seek convergence with the Make in India scheme of the Government from capacity addition/up- gradation in ethanol production.
15.	Modalities	i. Payment of interest subvention on loan amount under the scheme will be limited to 5 years only, including one-year moratorium period. ii. NABARD has been appointed as the 'Nodal Agency' for interacting with the DFPD and managing the subsidy funded for onward reimbursement to respective Banks.

S. No.	Parameter	Guideline cum SOP
		iii. Interest subvention will be released by NABARD on quarterly basis, in advance on furnishing details of disbursement of bank loan. Subsequent instalments will be release in three tranches on a quarterly basis on furnishing of utilization certificate. The individual banks shall identify one nodal branch for the purpose of collating the application for claim and submit the consolidated claim request to NABARD within two weeks of end of a quarter. Individual branches of a bank, shall submit their claims to the nodal bank branch within one week of end of the relevant quarter. iv. The Funds released by NABARD, in advance - towards interest subvention, shall be parked in interest bearing account at the Nodal Branch. v. The amount shall be released in advance subject to furnishing of disbursement particulars as well as interest earned by the Bank on the amount released in the previous quarter. Interest earned on subvention advance shall be adjusted in the quarterly instalments from 2nd quarter onwards.
16.	Utilization Certificate	The concerned sugar mills / distilleries / entrepreneurs shall submit utilization certificate for the sanctioned loan amount within three months of the completion of the project, duly verified by the respective Sugar / Cane Commissioners, Excise Commissioner or any other authority designated by the State Government certifying that the loan amount has been utilized for the purpose specified in the scheme. The said authorities shall also monitor the utilization of the loan. Any failure to submit the utilization certificate shall lead to non-reimbursement of interest subvention by the Central Government.
17.	Project Completion Certificate	i. The concerned entrepreneur/ sugar mill / distilleries shall submit a certificate duly verified by Central Pollution Control Board certifying the zero-liquid discharge has been achieved through the method proposed at the time of submitting application for such purpose.

S. No.	Parameter	Guideline cum SOP
		ii. Sugar mills / distilleries/entrepreneurs availing loan to establish new distilleries or expansion of the existing distilleries, shall submit a 'Completion & Commencement Certificate' duly verified by the Excise Commissioner of the State concerned and a Chartered Engineer certifying respectively that the new distillery has been installed and has commenced production or the expansion of the existing distillery has been completed and enhanced production of ethanol has commenced. Any failure to submit such certificates shall lead to non-reimbursement of interest subvention by the Central Government.
18.	Operational Guidelines	i. Purchase agreement executed between the OMCs and Project proponents to be scrutinized and ensured that there is nothing against the interest of the bank. ii. To be ensured that the margin for term loan for ethanol project is brought by the borrower upfront and source of margin ensured. iii. Under no circumstances, the working capital limits sanctioned for manufacturing sugar shall be diverted for ethanol productions. iv. The ethanol manufactured should be sold to Oil Marketing Companies (OMC). v. A tri-partite agreement (TPA) among the producers of ethanol (project proponents), OMCs and the lending bank is to be signed. vi. In case of any exigencies or problems in supplies, because of which the revenue generation is lower than the amount of repayment of loans and interest, the sugar mill / distilleries / entrepreneur has to undertake to service the debt and interest from its other sources of income. vii. All environment clearances to be obtained before disbursement. viii. DSRA to the extent of three months' repayment (of

S. No.	Parameter	Guideline cum SOP
		principal + interest) is to be built up within one year of commencement of commercial production. ix. In case of Consortium / Multiple Banking Arrangement, participating banks will sanction loans under the scheme in the same proportion as their share in the existing working capital limits and remit the amount to the separate account to be opened with the lead bank / lender. The lead bank / lender will disburse the full amount of loan to the borrowing unit and obtain the utilization certificate on behalf of all the lenders. x. While assessing the viability of the project vis-à-vis repayment capacity, any government notification regarding tagging of ethanol prices shall be accounted for. xi. In the event of surplus cash flow with the sugar mills, accelerated payments may be decided and the interest subvention liability of DFPD towards loan account would accordingly get reduced. xii. TEV study to be done as per bank's extant instructions. xiii. A copy of notification dated 14.01.2021 issued by Department of Food and Public Distribution, Ministry of Consumer Affairs, Food and Public Distribution, Government of India (GoI) is attached as per xiv. Letter from Ministry of Consumer Affairs, DFPD dated 08.04.2021.

4.0 ABOUT NANDA DEVI BIO ENERGY LLP

4.1 INCORPORATION OF THE FIRM

4.1.1 **NANDA DEVI BIO ENERGY LLP (NDBEL)** was incorporated on 06th day of September 2021 under Section 23(4) of LLP Act, 2008.

4.1.2 The Firm has also obtained Limited Liability Partnership Identification Number (LLPIN) AAY-4598 from the Registrar of Companies, Chennai.

4.1.3 The LLP shall commence from the date of registration of the LLP firm, and shall continue to operate in accordance with the provisions of the LLP Act, 2008 and rule framed the under, until termination of this agreement with majority decision of the partner.

4.2 REGISTERED OFFICE OF THE FIRM

The LLP registered office is located at 69, Sterling Road, Nungambakkam, Chennai, 600034, Tamil Nadu.

4.3 BUSINESS OBJECTIVE OF THE FIRM

A. The main objects to be pursued by Firm on its incorporation are:

a) To manufacture sustainable clean fuels from sugarcane, beet, sweet sorghum, Jerusalem artichoke, fruits, starch (corn, broken rice, wheat, cassava, sweet potato) and non-food feedstock like jatropha, algae, biomass, waste and other allied Services.

b) The partners may change the business or add any new business objects as per the majority decision of the partners of LLP from time to time.

4.4 PARTNERS OF THE FIRM

4.4.1 The details of Partners of the Firm as per Partnership Deed dated 09.09.2021 are as follows.

TABLE 3 : DETAILS OF PARTNERS AS PER PARTNERSHIP DEED

Sl.No.	Name	Designation
1	Sri Arvind Nandagopal	Designated Partner
2	Sri. V.S.Natarajan	Designated Partner
3	Sri Masilamani Nandagopal	Partner
4	Sri V.R. Meganathan	Partner

4.5 CAPITAL CONTRIBUTION BY PARTNERS OF THE FIRM

4.5.1 The Contribution of the Firm is Rs.100,000,000/- (Rupees Ten Crore only) which has been contributed by the partners in the following proportions.

TABLE 4 : DETAILS OF CAPITAL CONTRIBUTION

Sl.No.	Name	Contribution in Rs.	Share %
1.	Sri Arvind Nandagopal	45,000,000.00	45%
2.	Sri. V.S.Natarajan	35,000,000.00	35%
3.	Sri Masilamani Nandagopal	10,000,000.00	10%
4.	Sri V.R. Meganathan	10,000,000.00	10%

Source: Partnership Deed

4.6 PROFILE OF PARTNERS

4.6.1 **Sri. V.S.Natarajan, Designated Partner**

Sri. V.S.Natarajan, aged 62 Years, is the Designated Partner of the Firm. He has started his career as a small scale trader in the 1980s. Later, he became a wholesale trader of used and recycled bottles and has been supplying bottles to various distilleries since 1990. He has more than 40 years' experience in this field. He is the main promoter of Devi Group of Companies.

TABLE 5 : DIRECTORSHIP DETAILS OF SRI.V.S.NATARAJAN

CIN/FCRN	Firm Name
U25200TN2008PTC066748	SNS BOTTLES PRIVATE LIMITED
U15549AP2019PTC111583	MOHAN BREWERIES AND DISTILLERIES (AP) PVT LTD

Source: MCA

TABLE 6 : LIMITED LIABILITY PARTNERSHIP (LLP) DETAILS OF SRI.V.S.NATARAJAN

LLPIN	LLP Name
AAC-5503	DEVI BOTTLES LLP
AAI-5317	DEVI INNOVENTURES LLP
AAC-5502	SUBRAMANIAM BOTTLES LLP
AAD-1373	NTN COLD STORAGE LLP

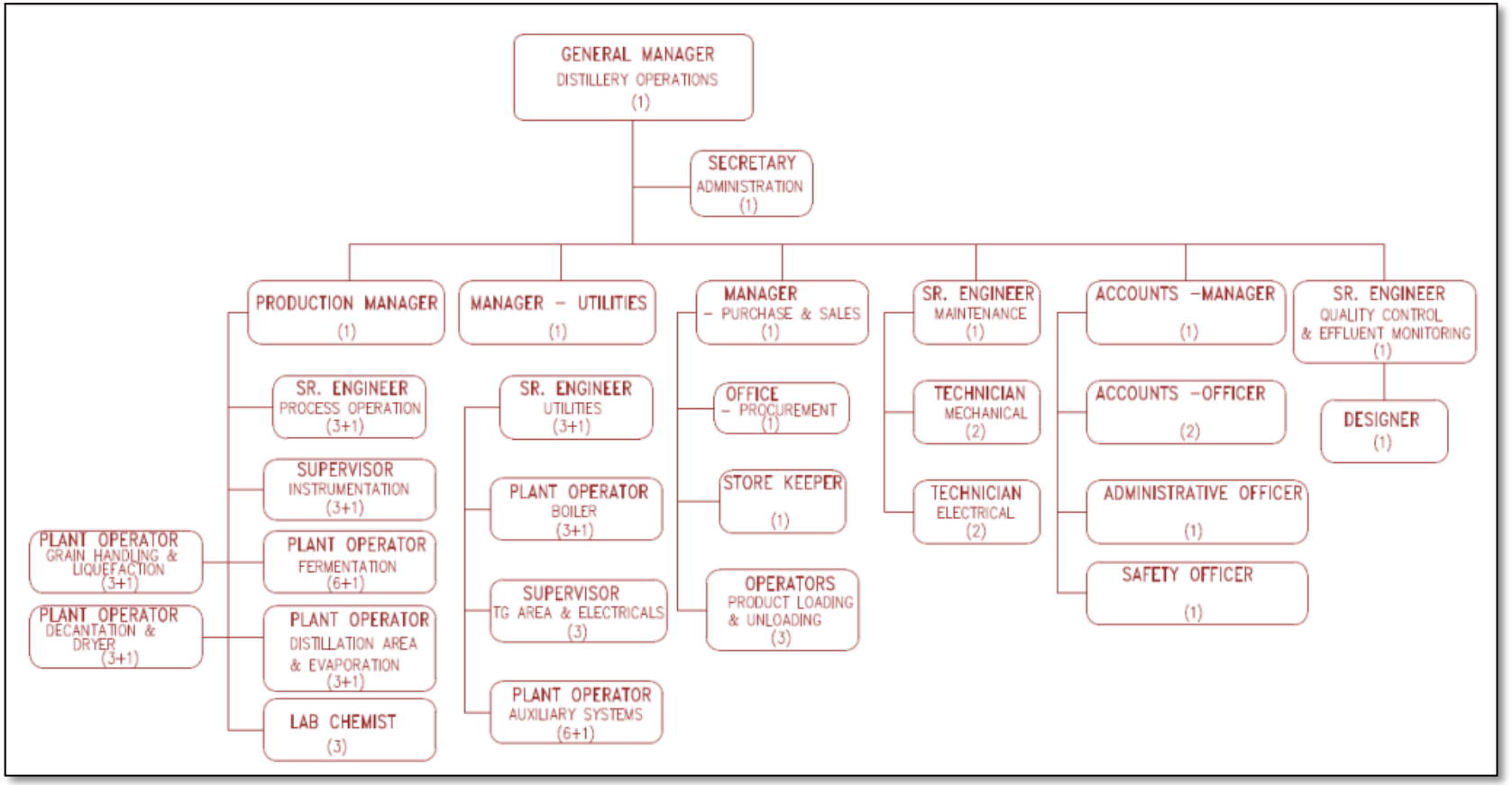
4.7 PROFILE OF KEY MANAGERIAL PERSONNEL

The Partners of the Firm have proposed to appoint experienced technical/ commercial/ managerial personnel for effective implementation and operation of the proposed project. They are in the process of identifying the suitable resources

4.8 PROPOSED OPERATIONAL STRUCTURE OF THE FIRM

4.8.1 The Operational structure is a system that outlines how certain activities are directed in order to achieve the goals of the Firm. These activities will include rules, roles, and responsibilities. The Firm needs to be efficient, flexible, innovative and caring in order to achieve a sustainable competitive advantage. The Firm has proposed to follow the following Operational structure.

FIGURE 1 : PROPOSED ORGANISATION STRUCTURE



Source: Firm

5.0 MARKET ASPECTS OF THE PROJECT

5.1 BUSINESS FOCUS

5.1.1 The Firm is planning to set up an 160 KLPD Grain based Distillery Plant which is expected to yield high quality Ethanol and superior quality by product - Distiller's Dried Grains with Solubles (DDGS).

TABLE 7 : PRODUCT DETAILS

S.No.	Product Mix	Unit	Production per day @ installed capacity level	Production per annum @ installed capacity level
1	Ethanol	KL	160	52800
2	Impure spirit (IS)	KL	1.68	554
3	Fusel Oil	Liters	0	0
4	Dry cake (DDGS)	MT	108	35475
5	Liquid CO_2 *	MT	80	26400

Source: Firm

5.2 ETHANOL APPLICATIONS

5.2.1 Ethanol is one of the principal bio-fuels, which is naturally produced by the fermentation of sugars by yeasts or via petrochemical processes such as ethylene hydration. It has medical applications as an antiseptic and disinfectant. It is used as a chemical solvent and in the synthesis of organic compounds, apart from being an alternative fuel source.

5.3 RATIONALITY FOR ESTABLISHMENT

The rationality of establishment as per the Firm is as follows,

5.3.1 **Inadequate Supply Capacity to meet the requirement of Ethanol Blending programme** - As per the Firm, the requirement of Ethanol for EBP in 2024-25 assuming 20% blend is about 38 Crore litres per annum of ethanol while the existing capacity is only about 5 Crore litres per annum, thereby opening up a substantial opportunity due to the demand supply gap.

5.3.2 **Ethanol most Suitable for Gasoline Blending -** Global transportation sector is facing three major challenges, namely depletion of fossil fuels, volatility in crude oil prices and stringent environmental regulations. Alternative fuels specific to geographies can address these issues. Ethanol is considered to be one of most suitable alternative for blending in transportation fuel due to its better fuel quality (ethanol has a higher octane number) and environmental benefits.

5.3.3 Ethanol blending offers significant advantages such as increase in Research Octane Number (RON) of the blend, fuel embedded oxygen and higher flame speed. These properties of ethanol help in complete combustion and reduce vehicular emissions such as hydrocarbon, carbon monoxide and particulate matter. The calorific value of ethanol is around 2/3rd of gasoline. This indicates that the increase in ethanol content will decrease the heating value of the ethanol-gasoline blend. Hence, more fuel is required to achieve the same engine power output. However, ethanol has a higher octane number and thus the engine can be operated with a high compression ratio without knocking. This increases the efficiency of the engine considerably. This combined with optimal spark timing negates the fuel economy debit due to low calorific value of ethanol. Hence, ethanol is considered as an efficient fuel provided suitable modifications are made in the vehicle.

TABLE 8 : IMPACT ON EMISSIONS

Emissions	Two Wheelers		Four Wheeler	
	E10	E20	E10	E20
Carbon Monoxide	20% lower	50% lower	20% lower	30% lower
Hydrocarbons	20% lower	20% lower	20% lower	20% lower
Oxides of nitrogen	No significant trend	10% higher	No significant trend	Same

5.3.4 Higher reductions in Carbon Monoxide emissions were observed with E20 fuel - 50% lower in two-wheelers and 30% lower in four-wheelers. Hydrocarbon emissions reduced by 20% with ethanol blends compared to normal gasoline. Nitrous Oxide emissions did not show a significant trend as it depended on the vehicle/engine type and engine operating conditions. The unregulated carbonyl emissions, such as acetaldehyde emission were, however, higher with E10 and E20 compared to normal gasoline, due to the presence of hydroxyl groups in ethanol. However, these emissions were relatively minor (in few micrograms) compared to regulated emissions (which were in grams). Evaporative emission test results with E20 fuel were similar to E0. Overall, ethanol blending can help decrease emissions from both two-wheelers and four-wheelers.

5.3.5 **Net Import of Petroleum and Cost Savings:** India's net import of petroleum was 185 Mt at a cost of US $ 55 billion in 2020-21. Most of the petroleum products are used in transportation. Hence, a successful E20 program can save the country US $4 billion per annum, i.e. Rs.30,000 Crore. Besides, ethanol is a less polluting fuel, and offers equivalent efficiency at lower cost than petrol. Availability of large arable land, rising production of food grains and sugarcane

leading to surpluses, availability of technology to produce ethanol from plant based sources, and feasibility of making vehicles compliant to ethanol blended petrol make E20 not only a national imperative, but also an important strategic requirement.

5.4 GLOBAL SCENARIO OF FUEL ETHANOL

5.4.1 The global production of fuel ethanol touched 110 billion litres in 2019 showing an average growth of 4% year per year during the last decade. The United States of America (USA) and Brazil contribute for 92 billion litres (84% of global share) followed by European Union (EU), China, India, Canada and Thailand.

5.4.2 In order to increase the availability of ethanol for transport use, many initiatives have been taken by various countries across the world. Brazil legislated that the ethanol content in gasoline sold in the country should be in the range of 18% to 27.5%, which is currently at 27%. Concurrently, the use of 100% hydrous ethanol by flex-fuel vehicles in Brazil has increased the average share of ethanol in transportation, to 46% in 2019.

TABLE 9 : COUNTRY WISE DETAILS ON FUEL ETHANOL SCENARIO

Country	Roadmap / Mandate for ethanol blends	Program	Implementation by	Vehicle Type
Brazil	National policy of Brazil continues the mandate for blending of 18-27.5% of ethanol in gasoline which originally started from 2015. This is currently at 27%.	National bio fuels policy (Dec 2017)	Ministry of mines and energy (MME)	Mainly flex. Motorbikes and other two wheeler engines use E27
United States	The clean air Act requires EPA to set the Renewable Fuel Standards (RFS) volume requirements annually. EPA updates volume requirements each year based on fuel availability.	Renewable fuel standard (RFS) program	Environmental protection agency (EPA)	Primarily normal; Flex for E30 or E85 only
European Union (EU)	EU aims to have 10% of the transport fuel of every EU country come from renewable sources, such	Renewable energy directive	European commission	Flex and normal

Country	Roadmap / Mandate for ethanol blends	Program	Implementation by	Vehicle Type
	as bio-fuels by 2020			
China	In September 2017, the Chinese government announced legislation proposing the use of ethanol in fuel for all of China with the target of 10% ethanol blending.	Fuel quality standards	National energy administration	Primarily normal
Thailand	Alternative Energy Development Plan (ADEP) targets the share of renewable and alternative energy from bio fuel to increase from 7% of total fuel energy use in 2015 to 25% in 2036	ADEP	Ministry of Energy	Primarily normal

5.4.3 The price of ethanol in various countries is provided below,

TABLE 10 : COUNTRY WISE PRICE DETAILS OF FUEL ETHANOL

Country	Price in USD per Litre
USA	0.613
Brazil	0.606
Thailand	0.684
India	Sugarcane juice / Syrup-0.865 (INR 62.65) B-molasses- 0.795 (INR 57.61) C-molasses- 0.630 (INR 45.69) Damaged food grains- 0.712 (INR 51.55) Surplus Rice with FCI - 0.785 (INR 56.87)

Source: GlobalPetrolPrices.com accessed on 22.02.2021; 1 USD = 72.44 INR

5.4.4 The prices of ethanol produced in India are higher in comparison to global players, since the cost of raw materials viz. sugarcane and food grains are fixed by the government to support the farming community.

5.4.5 Globally, the three major factors drive the production of ethanol and its usage in the transportation sector

- **Demand Enrichment:** Governments' mandate for blending a minimum percentage (%) of ethanol with gasoline fuel & production of ethanol compatible vehicles.

- **Supply Enrichment:** Schemes for ethanol production from different feedstock and encouragement to augment bio-refineries and their capacities
- **Incentives:** Promoting the use of higher ethanol blends through price incentives (tax relief at the retail level) and tax incentives for vehicles compatible with E20 and E85.

5.5 ETHANOL BLENDING IN INDIA

5.5.1 With a view to give a boost to the agriculture sector and to reduce environmental pollution, the government of India had launched pilot projects in 2001 wherein, 5% ethanol blended petrol was supplied to retail outlets. Apart from field trials, R&D studies were also simultaneously conducted. The success of these field trials and studies paved the way for EBP in India. The Government of India vide its resolution dated 3rd September, 2002 decided to launch Ethanol Blended Petrol (EBP) Programme in January, 2003 for sale of 5% ethanol blended Petrol in nine States and four UTs.

5.5.2 The MoP & NG vide its notification dated 20th September, 2006 extended the 5% Ethanol Blended Petrol to twenty States and four UTs of the country with effect from 1st November, 2006. Public Sector Oil Marketing Companies (OMCs) were asked to sell 5% ethanol blended petrol subject to commercial viability as per Bureau of Indian Standards (BIS) specifications in the notified states and UTs.

5.5.3 The Programme showed mixed results with average blending ranging from 0.1% to 1.5% till 2013-14. The further interventions by the government since 2014 are tabulated below.

TABLE 11 : GOVERNMENT INTERVENTIONS

Period	Government Interventions
DEC 2014	Govt. Re-introduced administered price mechanism for ethanol to be procured under the EBP Programme
JAN 2015	Opened alternate route for ethanol production (2nd Generation including Petrochemical). Government has since directed Oil Public Sector Enterprises to set up bio-refineries
ESY 2014-15	Eased tender conditions - Multiple EOIs being floated, transportation slabs and rates
MAY 2016	IDR Act Amendment on 14th May, 2016 to clarify on the roles of Central and State Government for uninterrupted supply of ethanol to be blended with petrol under the EBP Programme.
ESY 2016-17	Regular Interaction with States and all other stake holders to

Period	Government Interventions
	address issues pertaining to EBP Programme. This is a continuous exercise
JUN 2018	Notified forward looking and updated National Policy on Bio fuels - 2018 involving all stakeholders.
JUL 2018	Interest Subvention Scheme for enhancement and augmentation of ethanol production capacity in the Country
ESY 2018-19	Allowed conversion of B heavy molasses, sugarcane juice and damaged food grains to ethanol. Fixed differentiated ex-mill ethanol price and procurement priority based on raw material utilized for ethanol production. Marked beginning of an era of differentiated ethanol pricing, based on raw material utilized for ethanol production.
MAR 2019	Opened a fresh window for inviting applications under interest subvention scheme for ethanol projects based on cane and molasses.
APR 2019	Extension of EBP Programme to whole of India except Island UTs of Andaman Nicobar and Lakshadweep islands
SEP 2019	New sources sugar & sugar syrup introduced for ethanol production and fixed remunerative price.
OCT 2019	Published "Ethanol Procurement Policy on a long-term basis under EBP Programme"
JUN 2020	OMCs have enhanced their ethanol storage capacity from 5.39 Crore litres in November, 2017 to 17.8 Crore litres in December 2020. With the current capacity, about 430 Crore litres of ethanol can be handled annually considering 15 days of coverage period.
AUG 2020	One time registration of ethanol suppliers for long term, including giving them visibility of ethanol demand for 5 years
SEP 2020	OMCs started to provide Off-take guarantee letter and consent to sign tripartite agreement with ethanol suppliers and bankers to support the ethanol capacity expansion projects. Opened fresh window for inviting applications under interest Subvention scheme for ethanol projects based on cane and molasses.
OCT 2020	Further ease of tender conditions by OMCs like one time document submission, quarterly bank guarantees, multiple transportation rate slabs and transportation rates being linked to retail selling price (RSP) of diesel, reduction in security deposit and applicable penalty on non-supplied quantity etc. Approval of National Bio fuel Coordination Committee (NBCC) to

Period	Government Interventions
	utilize surplus stock of rice lying with Food Corporation of India (FCI) to be released to the distillers for ethanol production.
NOV 2020	Approval of NBCC10 to utilize maize for ethanol production
JAN 2021	Interest subvention scheme for enhancement and augmentation of ethanol production capacity extended to grain based distilleries & distilleries producing ethanol from other feed stocks like sorghum, sugar beet etc apart from molasses-based distilleries.

ESY – Ethanol Supply Year

5.5.4 **Modified Interest Scheme to enhance Production Capacity of Ethanol** –The Cabinet Committee on Economic Affairs (CCEA) in its meeting dated 30.12.2020 approved a note of DFPD for extending financial assistance for producing 1G ethanol from feedstock such as cereals (rice, wheat, barley, corn & sorghum), sugarcane, sugar beet etc.

5.5.5 A Concept of Tripartite Agreement between mills/distilleries, banks and OMCs has been introduced which is facilitating mills/distilleries to avail loans for ethanol projects. State Bank of India has also issued Standard Operating Procedure (SOP) for sanction and disbursal of loans to molasses-based distilleries. Similar SOPs are also being issued in respect of grain-based distilleries; and by other banks. DFPD has developed a web portal viz. http://sugarethanol.nic.in to review the progress of upcoming ethanol projects on a real time basis.

5.5.6 In the portal, project proponents can share the bottle-necks, if any, faced by them so that related Ministries like DFS, MoEF & CC, DFPD, MoP & NG and State Governments can sort out the problems by expediting requisite clearances and sanctioning and disbursal of loans.

5.5.7 DFPD has held webinars with the State Governments, Industry Associations, MoP & NG, DFS, MoEF & CC, Banks, OMCs to motivate investors to set up the distilleries and expedite various approvals and clearances. DFPD plans to hold state specific webinars with State Governments, entrepreneurs, DFS, MoEF & CC, MoP & NG to assess the progress of projects and to ensure speedy clearances of projects.

5.6 ETHANOL DEMAND PROJECTION

5.6.1 Demand Scenario

Ethanol (also called ethyl alcohol or alcohol) is an organic chemical compound with chemical formula C2H5OH. Besides the EBP Programme, ethanol finds competitive usage in the potable sector and the chemical & pharmaceutical industry. Demand for ethanol as a fuel is primarily driven by blending mandates, widespread availability of fuel, and compatible vehicles and fulfilment of other infrastructural requirements.

5.6.2 The vehicle population in the country is around 22 crore two and three wheelers and around 3.6 Crore four-wheelers (SIAM). The 2 wheelers account for 74% and passenger cars around 12% of the total vehicle population on the road. The two-three wheelers consume 2/3rd of the gasoline by volume, while 4 wheelers consume balance 1/3rd by volume. The growth rate of vehicles in this segment is pegged at around 8-10% per annum.

TABLE 12 : PROJECTED ADDITION OF GASOLINE VEHICLES (IN LAKHS)

Units in Lakh	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30
Two-wheeler Gasoline	174	139	167	181	195	211	227	246	265	287	309
Passenger Vehicle (gasoline)	20	20	22	24	26	28	30	33	35	38	41

Source: SIAM

TABLE 13 : GASOLINE CONSUMPTION TREND

Year	Consumption
	000' MT
2010-11	14192
2011-12	14993
2012-13	15744
2013-14	17128
2014-15	19075
2015-16	**21847**
2016-17	23765
2017-18	26174
2018-19	28284
2019-20	29975
CAGR	**7.8%**

TABLE 14: GASOLINE DEMAND PROJECTIONS

Units in Lakh	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30
Motor Gasoline (MMTPA)	27.7 (Covid impact)	31	32	33	35	36	37	39	40	41
Motor Gasoline (Cr. Ltr.)	3908	4374	4515	4656	4939	5080	5221	5503	5644	5785

Source: Projections as per the "Report of the Working Group on Enhancing Refining Capacity by FY 2040"

5.6.3 The projected requirement of ethanol based on petrol (gasoline) consumption and estimated average ethanol blending targets for the period ESY 2020-21 to ESY 2025-26 are calculated below,

TABLE 15 : PROJECTED REQUIREMENT OF ETHANOL

Ethanol Supply Year	Projected Petrol Sale (MMT)	Projected Petrol Sale (Cr. litres)	Blending (in %)	Requirement of ethanol for blending in Petrol (Cr. Litres)
A	B	B1=B X 141.1	C	D=B1*C %
2019-20	24.1 (Actual)	3413 (Actual)	5	173
2020-21	27.7	3908	8.5	332
2021-22	31	4374	10	437
2022-23	32	4515	12	542
2023-24	33	4656	15	698
2024-25	35	4939	20	988
2025-26	36	5080	20	1016

Note:

1. The petrol projections may undergo revision due various factors like penetration of EVs, etc.

2. The figures are optimistic, as the E20 fuel will be consumed by new vehicles from April 2023 only. The demand for ethanol will, however, increase due to penetration of E100 two wheelers, which are now being manufactured in the country (e.g. TVS Apache RTR 100 Fi E100).

5.6.4 During the meeting of Committee of Secretaries on 13.11.2020, DFPD informed that the fuel ethanol (20% Blend) requirement by 2025 would be met from sugar as well as grain feedstock.

5.6.5 The following Table provides the Year-wise and Sector-wise Ethanol Production Projections as per increasing Blending Percentages,

TABLE 16 : PRODUCTION OF ETHANOL BY FEEDSTOCK FOR THE PROJECTED REQUIREMENT

ESY	For Blending				For Other Uses			Total		
	Grain	Sugar	Total	Blending %	Grain	Sugar	Total	Grain	Sugar	Total
2019-20	16	157	173	5	150	100	250	166	257	423
2020-21	42	290	332	8.5	150	110	260	192	400	592
2021-22	107	330	437	10	160	110	270	267	440	707
2022-23	123	425	542	12	170	110	280	293	535	828
2023-24	208	490	698	15	180	110	290	388	600	988
2024-25	438	550	988	20	190	110	300	628	660	1288
2025-26	466	550	1016	20	200	134	334	666	684	1350

TABLE 17 : PROJECTED REQUIREMENT OF ETHANOL 2024-25

S.No.	State/UT	Projected MS Sale	Projected Ethanol Requirement
		(in Lakh Litres)	(in Lakh Litres)
1	Andaman & Nicobar	309	62
2	Andhra Pradesh	18896	3779
3	Arunachal Pradesh	767	153
4	Assam	6944	1389
5	Bihar	13585	2717
6	Chandigarh	2140	428
7	Chhattisgarh	9722	1944
8	Dadar & Nagar Haveli	289	58
9	Daman & Diu	275	55
10	Delhi	14712	2942
11	Goa	3104	621
12	Gujarat	25716	5143
13	Haryana	15649	3130
14	Himachal Pradesh	3843	769
15	Jammu & Kashmir	4756	951
16	Jharkhand	8071	1614
17	Karnataka	33022	6604
18	Kerala	24426	4885
19	Ladakh	19	4
20	Madhya Pradesh	21654	4331
21	Maharashtra	52969	10594
22	Manipur	1073	215

S.No.	State/UT	Projected MS Sale	Projected Ethanol Requirement
23	Meghalaya	1635	327
24	Mizoram	493	99
25	Nagaland	594	119
26	Odisha	12517	2503
27	Pondicherry	2105	421
28	Punjab	14167	2833
29	Rajasthan	23790	4758
30	Sikkim	339	68
31	**Tamil Nadu**	**41244**	**8249**
32	Telangana	19366	3873
33	Tripura	927	185
34	Uttar Pradesh	50237	10047
35	Uttarakhand	5039	1008
36	West Bengal	15606	3121
	Total	**450000**	**90000**

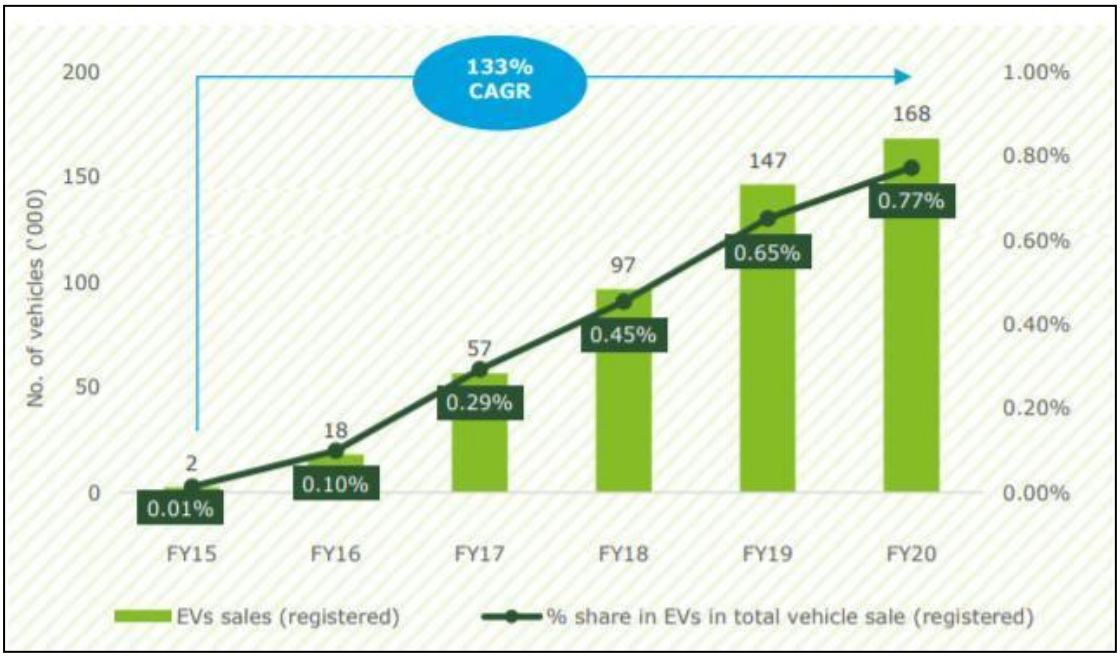
5.6.6 From the above Table, we could observe that the requirement of ethanol for Tamil Nadu is about 82.49 Crore Litres.

5.6.7 **Ethanol Demand Modelling by CSTEP considering EV Penetration** - In addition, an Ethanol Demand modelling exercise was done by CSTEP (Centre for Study of Science, Technology & Policy) using their long-term simulation model called Sustainable Alternative Futures for India (SAFARI). The SAFARI model estimates India's energy demand and emissions up to 2050 under various scenarios.

5.6.8 It is driven by socioeconomic parameters like population and GDP, as well as development goals like food, housing, healthcare and education infrastructure, transport, and power for all. Given the inherent uncertainties in projections for the future and with electric vehicle revolution on the horizon, different scenarios have been considered.

5.6.9 Penetration of Electric Vehicles and their impact on Ethanol Blending Programme - The Government of India has targeted 30% EV penetration by 2030. The ambitious target of adoption of EVs, if achieved, would result in savings of 474 MTOE of oil (approx. INR 15.21 Tn) annually and would cut down CO2 emission by ~846.3 Mn Tons annually. NITI Aayog and RMI projected EV sales penetration of 80% for two and three-wheelers, 50% for four wheelers, and 40% for buses by 2030.

FIGURE 2 : YEAR WISE EV SALES TREND FROM FY2015 TO FY2020 IN INDIA



Source: Niti Aayog

5.6.10 Although the numbers of EVs are rising in the country, however, the adoption across vehicle categories is uneven. ~79% of the EV addition is from three-wheeler segment, followed by two wheelers (17%); the four-wheeler segment contributes only 3% towards the overall EVs on the road.

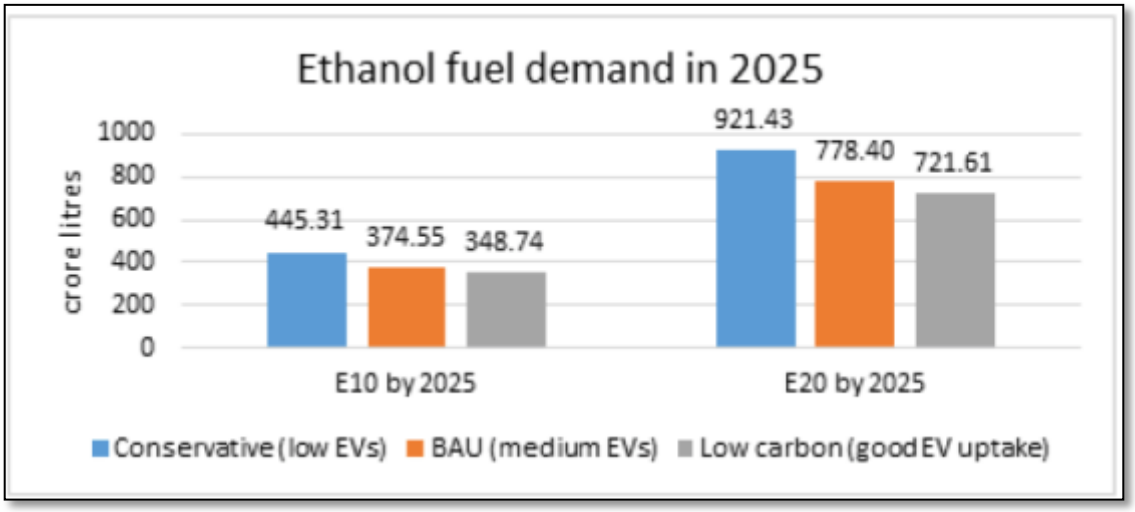
5.6.11 Surveys conducted by Deloitte and various other agencies have also indicated that the huge price difference is acting as a barrier in large scale adoption of electric vehicle over the conventional vehicle.

5.6.12 With the target on achievement of penetration of Electric Vehicles, the gasoline requirement may be expected to reduce substantially. To estimate the demand for petrol and consequently ethanol, three scenarios for electric mobility uptake have been considered:

- Conservative (low EVs) – negligible uptake of electric mobility up to 2030.
- Business-As-Usual (BAU, medium EVs) – medium uptake of electric mobility; around 15% of car passenger-kilometres (pkms) and 30% of two-wheeler and three-wheeler pkms are assumed to be electric by 2030.
- Low Carbon (high EV uptake) – 30% of car pkms and 80% of two-wheeler and three wheeler pkms are assumed to be electric by 2030.

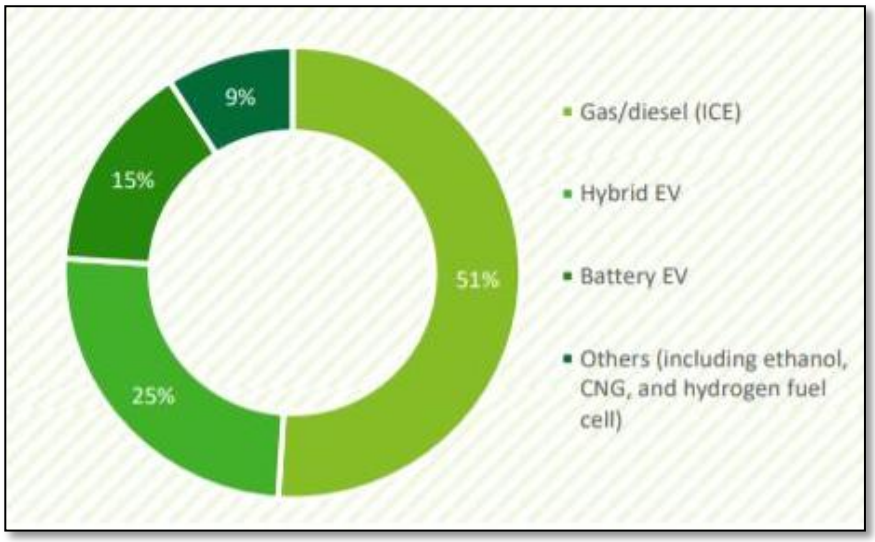
5.6.13 As per this projection, the ethanol demand will be in the range of 722-921 crore litres in 2025 to meet E20 targets.

FIGURE 3 : ETHANOL FUEL DEMAND IN 2025 UNDER VARIOUS SCENARIOS



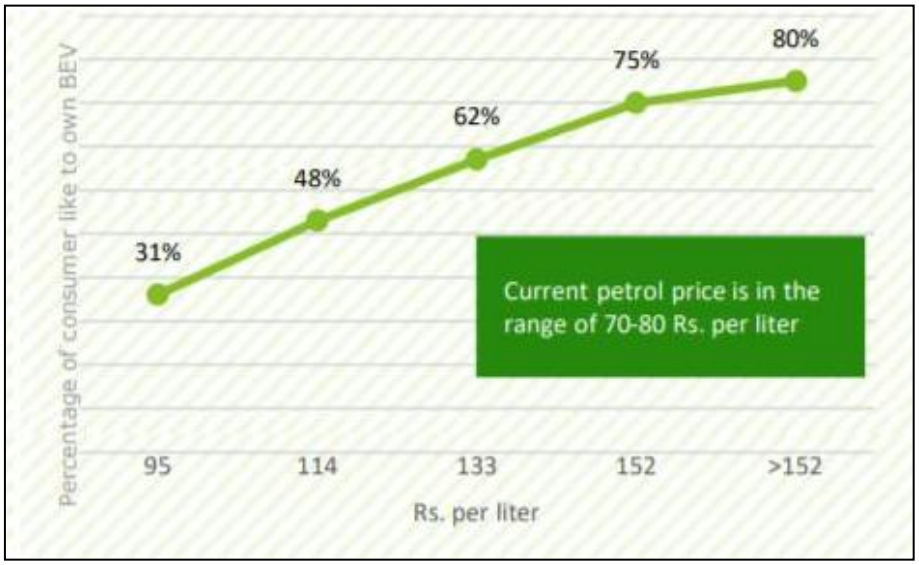
5.6.14 Conventional vehicles are still the preferred choice for the Indian vehicle user – As per 2020 Deloitte Automobile consumer Study, around 40% consumers preferred Electric vehicles (Battery/ hybrid) for their next vehicles. However, decision of buying an EV is dependent upon the price of fuel for ICE vehicle. Only when the fuel prices rise by an additional 40%-50% from the present level, it is expected that majority consumers will prefer electric vehicles over ICE.

FIGURE 4 : CONSUMER PREFERENCE FOR THEIR NEXT VEHICLE PURPOSE



Source: 71 2020 Deloitte Automobile consumer study

FIGURE 5 : CONSUMER PREFERENCE TO OWN BEV'S WITH CHANGE IN PETROL PRICES



Source: 71 2020 Deloitte Automobile consumer study

5.6.15 Similar to the increase in penetration of Electric Vehicles, penetration of CNG vehicles are also increasing. At present, Bangalore has 15 CNG filling stations, of which a majority are on the outskirts. Of the 1,257 CNG vehicles, including cars, taxis, buses, trucks and auto rickshaws plying in Bangalore, 715 are registered in Karnataka.

5.6.16 GAIL Gas has planned to set up 49 CNG Stations in Bangalore of which 31 are operational and the remaining is expected to be ready by September, 2021. Also planned to set up additional 100 CNG stations in the next two-three years in Bangalore Rural and Urban districts. Hence it is observed that substantial increase in CNG Vehicles has not happened. However, with the increase in establishment of CNG stations, the CNG Vehicle population is likely to increase, which would impact the requirement of gasoline resulting in decline in requirement of ethanol for blending.

5.7 ETHANOL PRODUCTION (SUPPLY)

5.7.1 Supply of ethanol under the EBP Programme has increased from 38 Crore litres during ESY 2013-14 to 173 Crore litres during ESY 2019-20 resulting in increase in blend percentage from 1.53% to 5.00% respectively. Further, the allocation for the ongoing ESY (2020-21) has surged to 332 Crore litres, which is 91% more in comparison to the ethanol supplies received during preceding ESY (2019-20)

TABLE 18 : QUANTITY SUPPLIED (ETHANOL) AND % BLENDING TRENDS

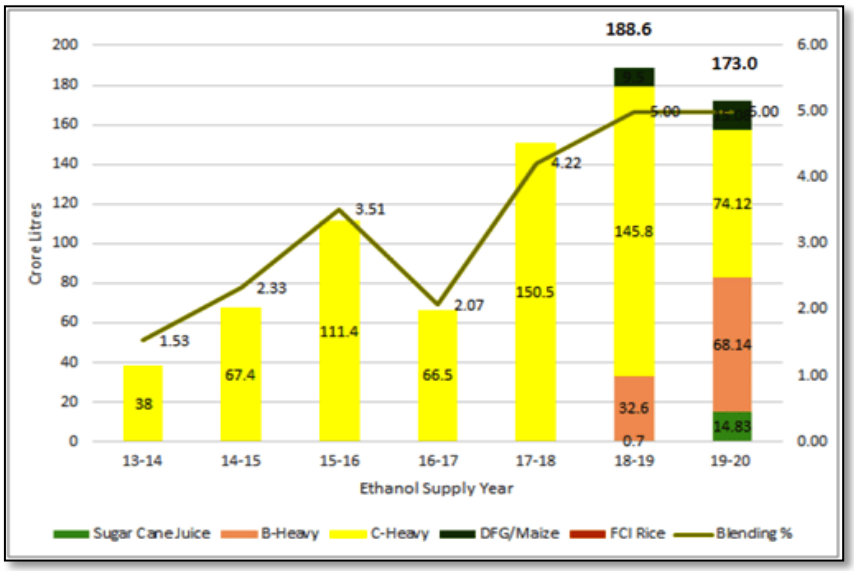
Ethanol Supply Year	Qty Supplied (Crore Litre)	Blending %age PSU OMCs
2013-14	38.0	1.53%
2014-15	67.4	2.33%
2015-16	111.4	3.51%
2016-17	66.5	2.07%
2017-18	150.5	4.22%
2018-19	188.6	5.00%
2019-20	173.0	5.00%
2020-21	332	8.50%

5.7.2 To achieve an 8.5% blending target in ESY 2020-21 (December, 2020 to November, 2021), about 332 crore litres ethanol is required against which about 325 Cr litres have been allocated by OMCs (till 22.02.2021) to sugar mills/distilleries. Also, in the next ESY 2021-22, OMCs need to procure 437 crore litres of ethanol to achieve 10 % blending.

5.7.3 In the year 2017-18, installed capacity of molasses-based distilleries was around 278 Crore litres. With a view to enhance ethanol production capacity in the country, the government in July, 2018 & March, 2019 notified two interest subvention schemes for molasses-based distilleries.

5.7.4 Under the aforesaid scheme of DFPD, interest subvention at the rate of 6% per annum or 50% of rate of interest charged, whichever is lower on the loan sanctioned was borne by the central government for a period of 5 years. DFPD approved 368 projects for setting up of new distilleries / expansion of existing distilleries.

FIGURE 6 : EBP PROGRAMME PERFORMANCE



Source: OMCs

5.7.5 Loans amounting to about Rs.3600 crore have been sanctioned by banks to 70 sugar mills so far i.e. 2021; 31 projects have been completed creating a capacity of 102 crore litres as a result. The capacity of molasses-based distilleries has reached to 426 crore litres. 39 more projects with capacity of 93 crore litres are likely to be completed by March, 2022 which will bring cumulative capacities to about 519 crore litres.

5.7.6 With a view to achieve blending targets, DFPD is making concerted efforts to enhance the ethanol distillation capacity in the country. For this, the government had invited applications from the entrepreneurs under the ethanol interest subvention schemes in September, 2020 during a window of 30 days. About 238 projects for a capacity enhancement of 583 Cr litres with a loan amount of about Rs.16,000/- crore have been approved by DFPD. It is expected that at least 400 Cr litres capacity would be added from these projects by 2024.

5.7.7 With the approval of CCEA, DFPD has notified modified interest subvention scheme on 14.01.2021 for setting up new grain-based distilleries/ expansion of existing grain-based distilleries to produce ethanol & production of ethanol from other 1G feed stock.

5.7.8 About 418 applications received for capacity addition of 1670 Cr litres have been recommended for in-principle approval. It is expected that at least ethanol capacity of about 500 Cr litres (of molasses and grain-based) would be added from these upcoming projects. Further applications are expected to be invited by DFPD as and when required.

5.7.9 It is expected that capacity of molasses-based distilleries would increase from current levels of 426 Crore litres to 760 Crore litres by 2025-26 respectively. The capacity of grain based distilleries is expected to increase in future years.

TABLE 19 : ETHANOL CAPACITY EXISTING AND AUGMENTATION (20% BLENDING BY 2025-26)

Ethanol Supply Requirement – 2025-26			
Ethanol Supply Requirement (in Cr. Lt.)	**Fuel ethanol**	**Other uses**	**Total**
(A) From sugar sector	550	134	684
(B) From grain/ maize etc	466	200	666
Total	1016	334	1350

Ethanol Supply Requirement – 2025-26			
Ethanol Capacity (in Cr. Lt.)	**Molasses based**	**Grain based**	**Total**
Existing ethanol/alcohol capacity – 2019-20	426 (231 distilleries)	258 (113 distilleries)	684 (344 distilleries)
Capacity addition from sanctioned projects	93 (will be added by March, 2022)	0	93
New capacity to be added	241	482	723
Total Capacity required by Nov 2026 to reach 1350 Cr litres supply	760	740	1500

TABLE 20 : YEAR WISE CAPACITY AUGMENTATION (IN CR LT)

Year	Capacity Requirement		Total
	Grain	Molasses	
2019-20	258	426	684
2020-21	260	450	710
2021-22	300	519	819
2022-23	350	625	975
2023-24	450	725	1175
2024-25	700	730	1430
2025-26	740	760	1500

- Additional capacity (90 % of 1500 = 1350) has been taken to account operational efficiency, raw material availability in various parts of the country due to natural calamity etc., increase in demand in ethanol due to economic factors and anticipated demand of ethanol in flex-fuel vehicles

- Molasses based distilleries can produce 20% additional ethanol if sugar rich feed stocks like B- heavy molasses are used as the same capacity can cater the higher demand of ethanol

- Total planned capacity is 1500 crore litres per annum, distribution between grain and molasses may change depending on various factors.

- It is relevant to mention that earlier on the inputs obtained from MoP & NG, 900 Cr litres ethanol was estimated to achieve 20% blending and 300 Cr litres was the requirement of other sectors, thus total requirement was assessed to be 1200 cr litres by 2024-25.

- However, as per the revised estimates of gasoline consumption obtained from MoP & NG, about 988 Cr litres is required to achieve 20% blending by 2024-25 and total requirement of alcohol including other sectors would be 1288Cr litres. For 2025-26, ethanol requirements is 1016 Cr litres to achieve 20% blending and total requirement of alcohol including other sectors would be 1350 Cr litres.

5.7.10 As per Indian Sugar Manufacturer Association (ISMA), 361 projects have received principle approval by Department of Food & Public Distribution (DFPD) and these projects are expected to add 13,464 kilo litres of ethanol per day (KL/day) which implies addition of 444 Crore litres of ethanol per year. It is to be noted that capacity addition details of all projects is unknown.

TABLE 21 : YEAR WISE CAPACITY AUGMENTATION (IN CR LT)

	In principle approval by DFPD		Sanctioned and disbursed	
	No of Projects	Addl. Capacity No. of projects	No of Projects	Addl. Capacity No. of projects
		(KL/day)		(KL/day)
Uttar Pradesh	60	4,300	20	890
Maharashtra	182	7,280	19	775
Karnataka	64	-	5	-
Tamil Nadu	**3**	**154**	**-**	**-**
Bihar	6	330	3	170
Gujarat	7	-	-	-
Andhra Pradesh	7	595	1	0
Punjab	8	465	-	-
Telangana	2	75	1	30
Uttarakhand	10	-	3	-
Madhya Pradesh	7	-	1	-
Haryana	S	265	-	-
Total	**361**	**13,464**	**53**	**1,865**
Capacity (Crore liters per year)		**444***		**62***

5.7.11 The count of 361 projects includes all projects for which scheme is sanctioned and disbursed, scheme is sanctioned but not disbursed, companies approached to banks but details are pending, companies which have not approached to banks and projects for which information is not received by the government. Also, the approvals are subject to cancellation if significant progress is not made and no information is given by companies.

5.7.12 Therefore, details on number of projects for which scheme is sanctioned and disbursed is considered to understand progress of these projects. It can be seen from the table that schemes for 53 projects and 1,865 kilo litres of ethanol per day (62 Crore litres of ethanol per year) have been sanctioned and disbursed. It is to be noted that details for all projects under sanctioned and disbursed section is unknown.

5.7.13 Under PM-JIVAN scheme, 12 commercial plants and 10 demonstration plants of Second Generation (2G) Bio-Refineries (using ligno-cellulosic biomass as feedstock) are planned to be set up in areas having sufficient availability of biomass so that ethanol is available for blending throughout the country. Already Rs. 1969.50 Crores have been earmarked for this scheme. These plants can use feed stocks such as rice straw, wheat straw, corn cobs, corn stover, bagasse, bamboo and woody biomass, etc.

5.8 DEMAND SUPPLY GAP FOR FUEL ETHANOL IN INDIA

5.8.1 As per the Indian Sugar Mills Association (ISMA), the total Letter of Intent (LOIs) were issued for 183 crore litres of ethanol supplies during the ESY 2019-20 at all-India level with major contribution from Uttar Pradesh of 106 crore litres of ethanol supply followed by Maharashtra and Karnataka with ethanol supplies of 28 crore litres and 21 crore litres, respectively. Last year, the LOIs were issued for 85 crore litres of ethanol supply from Maharashtra.

5.8.2 It can be seen from table below that Uttar Pradesh (150 crore litres), Maharashtra (128 crore litres) and Karnataka (78 crore litres) are the top 3 states accounting for about 83% of the total ethanol production capacity of 427 crore litres during ESY 2019-20 with other states contributing for only around 17% of the total ethanol output capacity in India.

TABLE 22 : STATE WISE ETHANOL SUPPLY, CAPACITY AND TARGET

(Crore liters per year)	State-wise ethanol supply LOIs	State-wise	State-wise target by GOI
	(ESY 2019-20)	(ESY 2019-20)	(ESY 2020-21)
Uttar Pradesh	106	150	127
Maharashtra	28	128	108
Karnataka	21	78	67
Tamil Nadu	**1**	**20**	**17**
Bihar	9	12	10
Gujarat	4	11	10
Andhra Pradesh	2	8	7

(Crore liters per year)	State-wise ethanol supply LOIs	State-wise	State-wise target by GOI
	(ESY 2019-20)	(ESY 2019-20)	(ESY 2020-21)
Punjab	5	5	4
Telangana	1	5	4
Uttarakhand	4	4	3
Madhya Pradesh	2	3	3
Haryana	0	2	2
Total	**183**	**427**	**363**

Source: ISMA

5.8.3 For the ESY 2020-21, the government of India has fixed state-wise targets of ethanol production which advises each state's sugar mills/distilleries to utilise at least 85% of their existing installed capacities to produce ethanol. Resultantly, the target fixed for ethanol supplies at all-India level is around 363 crore litres which is 85% utilisation of the existing capacities of 427 crore litres.

5.9 NODAL AGENCY FOR ETHANOL PRODUCTION

5.9.1 Department of Food and Public Distribution (DFPD) is the nodal department for promotion of fuel grade ethanol producing distilleries in the country. Government has allowed ethanol production/ procurement from sugarcane-based raw materials viz. C & B heavy molasses, sugarcane juice / sugar / sugar syrup, surplus rice with Food Corporation of India (FCI) and Maize.

5.10 IMPACT OF ETHANOL BLENDING

5.10.1 The impact of ethanol blending as per the Ethanol blending road map report of Niti Aayog is provided as follows,

5.10.2 **Central Government:** While petrol is subject to excise duty, GST is levied on ethanol. While GST would be in the range of Rs.2.28/litre to Rs.3.13 per litre of ethanol based on an ex-mill price in the range of Rs.45.69/litre to Rs.62.65/litre, excise duty on petrol is Rs.32.98/litre. Considering total national ethanol blending volumes of 332 Crore litre, revenue loss to the central government due to replacement of petrol by ethanol amounts to Rs.10,950 Crore per annum.

5.10.3 **Oil PSUs:** OMCs pass on to the consumers any change in the price of fuel due to blending of ethanol and are therefore not impacted by the pricing of ethanol. At present, excise duty on landed cost of petrol at oil depots is higher than GST on the landed cost of ethanol and the benefit is being passed on to the retail consumers. However, in the future, should the price of ethanol increase beyond

that of petrol, consumers may have to pay more for ethanol blended fuel. In such a scenario, tax (GST) breaks on Ethanol may become necessary.

5.10.4 **Environmental Cost**: Sugarcane is a water intensive crop. On an average, one tonne of sugarcane can produce 100 kg of sugar, and 70 litres of ethanol. Cultivation of each kg of sugar requires 1600 to 2000 litres of water. Hence, one litre of ethanol from sugar requires about 2860 litres of water. It is estimated that sugarcane and paddy combined use 70% of irrigation water of the country.

5.10.5 Keeping in view the need for water conservation, it is advisable to shift some of the area under sugarcane to less water intensive crops by providing suitable incentives to farmers. The Task Force on Sugarcane and Sugar Industry of Niti Aayog has suggested ways to minimize water consumption through various means to encourage farm diversification.

5.10.6 **Ethanol production from non-sugar sources:** Share of production of ethanol from non-sugar sources like damaged food grains and FCI rice is relatively small. The net returns from sugarcane are much higher than those from food crops; for example, in Karnataka it was about Rs.1,13,590 per hectare as compared to Rs.33,877 per hectare from paddy and Rs.22,931 per hectare from maize during FY 2018-19. The situation is similar in other states also. A high price of sugarcane leads to a higher price of sugar and its by-products like molasses, ethanol.

5.10.7 **Environmental impact of choice of feedstock:** In the interest of environmental sustainability, making ethanol available on a pan-India basis and sharing the benefits of EBP widely, measures to promote production from non-sugarcane sources, food grains, especially maize and second generation sources may be promoted through suitable pricing mechanisms.

5.11 CHALLENGES FOR ETHANOL PRODUCTION AND BLENDING

5.11.1 **Availability of sufficient feedstock –** The availability of sufficient feedstock on a sustainable basis viz., sugarcane, and food grains may pose a challenge: Current regulations in the country allow production of ethanol from sugarcane, sugar, molasses, maize and damaged food grains unfit for human consumption. Further, surplus rice with FCI is also allowed. States like Chhattisgarh have raised the issue of permitting rice procured by the state government to be allowed for production of ethanol.

5.11.2 **Production of Ethanol Blended Petrol Compatible Vehicles**

Vehicles made in India since 2008 are material compatible with E10 and fuel-efficient compliant with E5. At the next stage when E10 is made available across the country, new vehicles can be made fuel efficient compliant by engine modification with E10.

5.11.3 Shift to E20 fuel is a logical, direct progression from E10 rather than going through intermediate steps of E12 and E15. However, following concerns needs to be taken care.

- E20 should be made available on a pan India basis.
- E10 should be made available on a pan India basis as protection grade fuel for existing pool of vehicles.

5.11.4 Currently produced two-wheeler and passenger vehicles in the country are designed optimally for E5, with rubber and plastic components compatible with E10 fuel; their engine can be calibrated for E10 for better performance. As the EBP rolls out in the country, vehicles need to be produced with rubberized parts, plastic components and elastomers compatible with E20 and engines optimally designed for use of E20 fuel. SIAM has assured the Expert Committee on Roadmap for Ethanol Blending, that once a road-map for making E10 and E20 available in the country is notified by MoPNG, they would gear up to supply compatible vehicles in line with the roadmap.

5.11.5 It is possible to roll out E20 material compliant vehicles by April 2022 and E20 Engine compatible vehicles by April 2023. However, considering the supply of Ethanol Blended Fuel, it is recommended that E20 material compliant and E10 engine tuned vehicles may be rolled out all across the country from April 2023. These vehicles can tolerate 10% to 20% of ethanol blended gasoline and also give optimal performance with E10 fuel. Vehicles with E20 tuned engines can be rolled out all across the country from April 2025. These vehicles would run on E20 only and will provide high performance.

5.11.6 The cost of E20 compatible vehicles is expected to be higher in the range of Rs.3000 to Rs.5000 for four-wheelers and Rs.1000 to Rs.2000 for two-wheelers, over and above the cost of ordinary vehicles tailored to run on 100% gasoline.

5.11.7 **Inter-state movement of ethanol** –There are some states which produce ethanol more than the requirement for blending within the State. This has to be transported to other states where the availability of ethanol is less. While amendment has been made to the IDR Act which legislates exclusive control of denatured ethanol by the central government for smooth movement of ethanol across the country, the same has not been implemented by states thereby restricting this movement of ethanol.

5.11.8 **Making ethanol available across the country**

- Ethanol is not produced or available in some states for blending with gasoline.
- About 50% of total pump nozzles in India are supplying only E0.
- Ethanol blending has not been taken up in North-East states due to non-availability of feedstock or industries.
- Transport of ethanol to different places for blending will increase the cost of logistics and transport related emissions.

5.11.9 **Other Issues**

- Weather related issues – floods / drought thereby affecting the crop.
- Augmentation of ethanol production facilities as planned.
- Prices of feed-stock and ethanol.
- Need for additional storage tanks for ethanol at marketing terminals / depots.
- Need for ethanol compliant dispensing units.
- Changes in nozzle calibration & legal metrology.
- Need for an additional underground tank, pipes/hoses and dispensing units for ethanol blended gasoline supply at retail outlets. Dispensing infrastructure for E100 will be required for E100 two-wheelers introduced in the country. Due to this, there would be space constraint at various retail outlets for setting up of such extra infrastructural facilities.
- Policy guidelines for differential pricing and labelling of various ethanols blended motor spirit.
- Manufacturers of Vehicles need to handhold vendors to develop ethanol compatible parts, optimize engine for higher ethanol blends, conduct of durability studies on engines and field trials before introducing E20 compliant vehicles.

5.12 GOVERNMENT INITIATIVES

5.12.1 **The National Policy on Bio fuels** - 2018, provides an indicative target of 20% ethanol blending under the Ethanol Blended Petrol (EBP) Programme by 2030. Currently petrol with 10% ethanol blend (E10) is being retailed by various Oil Marketing Companies (OMCs) in India, wherever it is available. However, as sufficient quantity of ethanol is not available, therefore, only around 50% of petrol sold is E10 blended, while remaining is unblended petrol (E0).

5.12.2 Interest subvention scheme for molasses and grain-based distilleries (DFPD).

5.12.3 Setting of standards for E5 (Ethanol 5%, Petrol 95%), E10 and E20 blends of Ethanol blended petrol (Bureau of India Standards, BIS).

5.12.4 BS-VI Emission norms in effect since 1st April 2020 are applicable for E-20 Vehicles.

5.13 REGULATORY STATUS OF ETHANOL AS A FUEL

5.13.1 The regulatory status and implementation details are as follows:

- E5 [blending 5% Ethanol with 95% gasoline] was notified in 2015 by MoRT&H. The rubber and plastic components used in gasoline vehicles produced since 2008 are compatible with E10 fuel.
- E10 [blending 10% Ethanol with 90% gasoline] was notified in 2019 by MoRT&H. The rubber and plastic components used in gasoline vehicles are currently compatible with E10 fuel.
- The use of E-85 fuel (85% ethanol by volume) was notified in 2016 for 4 wheeled vehicles, 3 wheelers and 2 wheelers E10.
- 0 [pure ethanol] for use in gasoline vehicles and ED95 [95% ethanol and 5% additives (co-solvent, corrosion inhibitors and ignition improvers)] for diesel vehicles have also been included in the same notification. The emission standards of E 85 and E 100 fuels have also been notified.
- The specifications of E20 as a commercial fuel have been indicated in IS: 17021: 2018 by BIS.
- The Ministry has notified GSR 156(E) on 8th March 2021 for adoption of mass emission standards for E20 fuel. The compatibility of a vehicle with the level of ethanol blend of E20 or E85 or E100 or ED95 is required to be defined by

the vehicle manufacturer, and the same is required to be displayed on the vehicle by putting a clearly visible sticker.

- MoRT&H has also notified Safety standards for ethanol blended fuels vide GSR 343(E) dated 25th May, 2021 on the basis of Automotive Industry Standard (AIS 171). It lays down safety requirements for type approval of pure ethanol, flex-fuel & ethanol-gasoline blended vehicles in India.

5.14 ETHANOL DEFICIT SCENARIOS IN INDIAN STATES/UNION TERRITORY

5.14.1 Ethanol distillation capacity of molasses based distilleries was only 215 cr litre prior to 2014. However, in past 7 years due to the policy changes made by the Centre, the capacity of molasses based distilleries have increased by one and a half times and are currently at 569 cr litre. Capacity of grain based distilleries which were 206 cr litres in 2013 increased to 280 cr litres. Thus, the total ethanol production capacity in the country has reached to 849 cr litre. However, ethanol production capacities are required to be enhanced to about 1700 cr litre to achieve 20% blending by 2025. Opening of window would help in augmentation of ethanol production capacities.

5.14.2 Till year 2013, supply of ethanol to OMCs was only 38 cr litre with blending levels of only 1.53 % in ethanol supply year (ESY) 2013-14. Production of fuel grade ethanol and its supply to OMCs has increased by 8 times from 2013-14 to 2020-21. In ESY 2020-21, the country touched a historically high figure of about 302.30 cr litre thereby achieving 8.10% blending. In the current ESY 2021-22, about 158 cr litre ethanol have been blended with petrol till 17.04.2022 thereby achieving 9.77% blending. It is expected that in current ethanol supply year 2021-22, we will be achieving 10% blending target.

5.14.3 The following table represents the Ethanol deficit states for supply of denatured anhydrous ethanol to Oil Marketing Companies.

TABLE 23 : LIST OF ETHANOL DEFICIT STATES FOR SUPPLY OF DENATURED ANHYDROUS ETHANOL TO OMCS

State/Union Territory (UT)	Estimated Ethanol Quantity (Cr Litre/ESY*)	Ethanol Depicit % of Total Qty. Requirement of Ethanol
Tamil Nadu	97	20.31%
Kerala	55	11.52%
Rajasthan	54	11.31%

State/Union Territory (UT)	Estimated Ethanol Quantity (Cr Litre/ESY*)	Ethanol Depicit % of Total Qty. Requirement of Ethanol
Gujarat & UT of Dadra & Nagar Haveli and Daman & Diu	54.5	11.41%
Telangana	9	1.88%
Madhya Pradesh	10	2.09%
West Bengal	35	7.33%
Haryana	19	3.98%
Jharkhand	18	3.77%
Bihar	14	2.93%
UTs of Jammu & Kashmir & Ladakh	11	2.30%
Karnataka	18	3.77%
Punjab & UT of Chandigarh	6	1.26%
Himachal Pradesh	3.5	0.73%
Mmaharastra	2	0.42%
Goa	7	1.47%
Uttarkhand	7.5	1.57%
Delhi NCT	33	6.91%
Assam	10	2.09%
Meghalaya	4	0.84%
Manipur	2.5	0.52%
Tripura	2	0.42%
Arunachal Pradesh	2	0.42%
Nagaland	1.5	0.31%
Mizoram	1	0.21%
Sikkim	1	0.21%
Total	**477.5**	**100.00%**

Source: Tender Reference No. 1000377311 (c-5)

***ESY** - Ethanol Supply Year (From 1st December of a year to 30th November of the next year.

Note: From the above table it is observed that Tamil Nadu being the top ethanol deficit state, the entire production of the Firm can be sold to Tamil Nadu itself.

5.14.4 Incentives in terms of bonus on supplies shall be extended to suppliers, which shall be supplying quantities to deficit states (i.e. Arunachal Pradesh, Chhattisgarh, J&K, Tamil Nadu, Jharkhand, Odisha, Assam and West Bengal only).

S.No.	Ethanol Supplies to OMCs in deficit states	Additional Incentive
1	Supply of 200 KL & more	Rs.0.5 per Litre (Inc. of applicable taxes)

S.No.	Ethanol Supplies to OMCs in deficit states	Additional Incentive
2	Supply of 400 KL & more	Rs.0.75 per Litre (Inc. of applicable taxes)
3	Supply of 1000 KL & more	Rs.1.00 per Litre (Inc. of applicable taxes)
4	Supply of 2000 KL & more	Rs.2.00 per Litre (Inc. of applicable taxes)

Source: Tender Reference No. 1000377311 (c-5)

5.14.5 **Tie-up with OMCs:** Recently DFPD (Department of Food & Public Distribution) issued a notification No.1 (11)/2021-(BP&E) (Part) dated 02.05.2022 to impress upon all the banks/financial institutions to consider extending loans to those PPs who have been issued in principal approval by DFPD as per standard Industrial Financing norms but do not having LTOA with OMCs, after ascertaining their financial credibility, as there is enough demand for ethanol in the country.

5.14.6 As indicated by the firm, with reference to the Ethanol Supply Agreement with OMCs, the firm would enter into a Tri-Partite agreement with BPCL in the presence of Bank at the time of loan process as per the DFPD's (Department of Food & Public Distribution) SOP guidelines.

5.15 AVAILABILITY OF FEED-STOCKS FOR PRODUCTION OF ETHANOL

5.15.1 To produce 684 Crore litres of ethanol by the sugar industry by 2025-26, sugarcane equivalent to 60 LMT of surplus sugar would be diverted to ethanol. In the current sugar season 2020-21 more than 20 LMT of sugar is estimated to be diverted. To produce 666 crore litres of ethanol/ alcohol from food grains by 2025-26, about 165 LMT of food grains would be utilized.

5.15.2 At present damaged food grain availability is around 40 lakh ton in the country. In 2020-21 approximately 20 lakh ton maize is surplus; FCI Rice is also sufficient in stock (266 LMT) and it will continue to remain robust as procurement of paddy/rice at minimum support prices (MSP) continues at expected levels.

5.15.3 Molasses-based distilleries have also been offered interest subvention to convert them to dual feed, to convert both food-grains & molasses into ethanol. Thus, it is expected that there would be sufficient ethanol distillation capacity to achieve blending targets.

5.15.4 The country is producing sufficient food grains and sugar to meet the requirement for ethanol,

TABLE 24 : ANNUAL PRODUCTION AND SURPLUS OF FEEDSTOCK -2020

Feed-stock	Annual production	Annual Consumption	Surplus
	Lakh MT	Lakh MT	Lakh MT
Sugar	320	260	60
FCI rice	520	350	309 (Stock in Central Pool as on 31.3.2020)
Maize	285	165	103

Source: Report on Ethanol Blending Road map by Niti Aayog

5.15.5 **Rice Production Scenario in Tamil Nadu**

- The total geographical area of Tamil Nadu is 130.33 Lakh Ha, which constitutes 4 percent of the National geographical area and falls in Semi and Dry sub humid climate.

- Tamil Nadu Agriculture is the most overriding sector in the economy of the State and it is one of the major means of livelihood. Government of Tamil Nadu leads all the other States in introducing Special and Innovative Agriculture Technological initiatives to augment area, production and productivity of major crops.

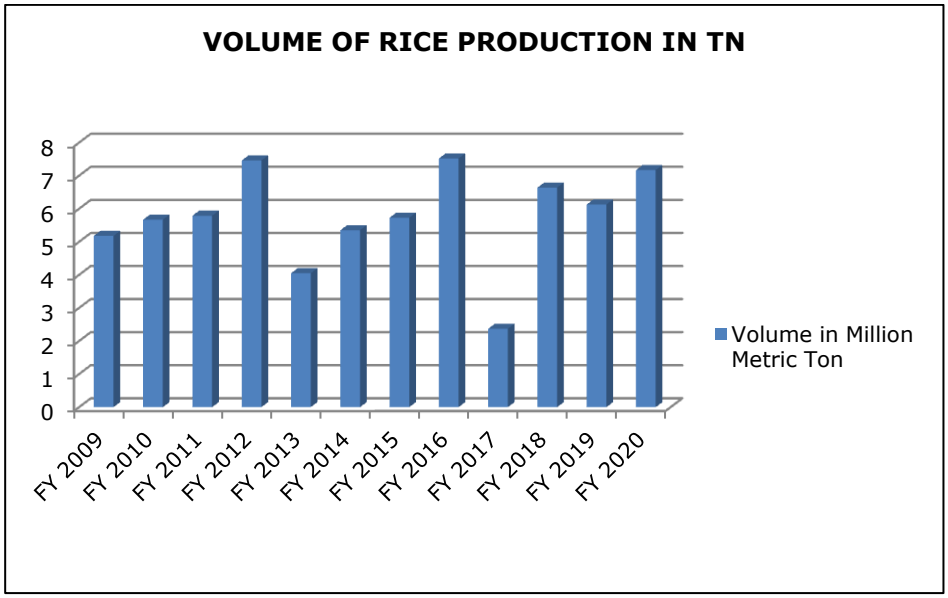
- Among the Food Grains, Rice plays a vital role in ensuring food security, as rice is the staple food of the people of Tamil Nadu. Paddy occupies 30% of the gross sown area. In the gross area irrigated of the State, 50% of the area is occupied by paddy.

- Paddy is cultivated in a normal area of 17.58 Lakh hectare with 35 normal production of 63.30 Lakh metric tonne under 3 major seasons viz., Kar / Kuruvai / Sornavari (April to July), Samba / Thaladi / Pishanam (August to November) and Navarai / Kodai (December to March). About 36% of the paddy area is cultivated in the delta districts comprising of Thanjavur, Nagapattinam, Tiruvarur, Trichy, Pudukkottai, Karur, Ariyalur and Cuddalore.

- In 2020, rice production for Tamil Nadu was 7.18 million tonnes. Though Tamil Nadu rice production fluctuated substantially in recent years, it tended to increase through 2017 - 2020 period ending at 7.18 million tonnes in 2020.

- Tamil Nadu has achieved a record coverage of paddy this financial year (2021-22) as the total area stands at 21.65 lakh hectares.

FIGURE 7 : VOLUME OF RICE PRODUCTION IN TAMIL NADU



Source: Statista 2022

- In financial year 2020, rice production across the southern state of Tamil Nadu in India amounted to over seven million metric tons. West Bengal was the largest producer of rice in the country that year.

5.15.6 **Maize Production Scenario in Tamil Nadu**

- Maize is one of the most versatile emerging crops having wider adaptability under varied agro-climatic conditions. Globally, maize is known as queen of cereals because it has the highest genetic yield potential among the cereals.

- In 2020, maize production for Tamil Nadu was 2.35 million tonnes. Maize production of Tamil Nadu increased from 0.95 million tonnes in 2017 to 2.35 million tonnes in 2020 growing at an average annual rate of 54.98%.

- A special scheme was announced by the Hon'ble Chief Minister of Tamil Nadu viz., "Mass Ground Spraying" for the management of Fall Army Worm in Maize with a financial sanction of Rs.47.66 Crore to undertake two sprays to control Fall Armyworm namely Spray of Neem based bio pesticides for 15 to 20 days old maize crop and Spray of chemicals for 40 to 45 days old Maize crop to manage the Fall Armyworm effectively.

- Due to the initiatives of the Government, Tamil Nadu stood first at all India level in the productivity of Maize, Bajra, Ragi, total coarse cereals and production of flowers and plantation crops.

TABLE 25 : PRODUCTION DETAILS OF RICE & MAIZE IN TAMIL NADU

S.No.	Production of Principal	Unit	2018-19	2019-20
1	Rice	Lakh Tones	61	73
2	Maize	Lakh Tones	28	26

Source: https://aps.dac.gov.in/APY/Public_Report1.aspx

5.15.7 **Minimum Support Prices of Crops 2021-22**

- Government has increased the MSP of Kharif crops for marketing season 2021-22 to ensure remunerative prices to the growers for their produce. The highest absolute increase in MSP over the previous year has been recommended for sesamum (Rs.452 per quintal) followed by tur and urad (Rs.300 per quintal each). In case of groundnut and nigerseed, there has been an increase of Rs.275 per quintal and Rs.235 per quintal respectively in comparison to last year. The differential remuneration is aimed at encouraging crop diversification.

- Minimum Support Prices for all Kharif crops for marketing season 2021-22 are as follows:

TABLE 26 : MSP FOR ALL KHARIF CROPS, 2021-22

Crop	MSP 2020-21	MSP 2021-22	Cost of production 2021-22	Increase in MSP	Return over cost
			Rs./Quintal	Absolute	in per cent
Paddy (Common)	**1868**	**1940**	**1293**	**72**	**50**
Paddy (Grade A)	**1888**	**1960**	**-**	**72**	**-**
Jowar (Hybrid)	**2620**	**2738**	**1825**	**118**	**50**
Jowar (Maldandi)	**2640**	**2758**	**-**	**118**	**-**
Bajra	**2150**	**2250**	**1213**	**100**	**85**
Ragi	**3295**	**3377**	**2251**	**82**	**50**
Maize	**1850**	**1870**	**1246**	**20**	**50**
Tur (Arhar)	6000	6300	3886	300	62
Moong	7196	7275	4850	79	50
Urad	6000	6300	3816	300	65
Groundnut	5275	5550	3699	275	50

Crop	MSP 2020-21	MSP 2021-22	Cost of production 2021-22	Increase in MSP	Return over cost
			Rs./Quintal	Absolute	in per cent
Sunflower Seed	5885	6015	4010	130	50
Soyabean (Yellow)	3880	3950	2633	70	50
Sesamum	6855	7307	4871	452	50
Nigerseed	6695	6930	4620	235	50
Cotton (Medium Staple)	5515	5726	3817	211	50
Cotton (Long Staple)	5825	6025	-	200	-

Source: Cabinet Committee on Economic Affairs (CCEA)

5.15.8 The increase in MSP for Kharif Crops for marketing season 2021-22 is in line with the Union Budget 2018-19 announcement of fixing the MSPs at a level of at least 1.5 times of the All-India weighted average Cost of Production (CoP), aiming at reasonably fair remuneration for the farmers. The expected returns to farmers over their cost of production are estimated to be highest in case of Bajra (85%) followed by urad (65%) and tur (62%). For rest of the crops, return to farmers over their cost of production is estimated to be at least 50%.

5.15.9 Similarly for Oilseeds, the Government of India has approved an ambitious plan for distribution of high-yielding varieties of seeds to the farmers for the Kharif season 2021 in the form of mini-knits. The special Kharif program will bring an additional 6.37 lakhs hectare area under oilseeds and is likely to produce 120.26 lakh quintals of oilseeds and edible oil amounting to 24.36 lakh quintals.

5.16 DDGS FOR CATTLE FEED

5.16.1 DDGS is a by product of alcohol manufacturing process. Distillers extract the starch in grains to process into alcohol and the nutrients that are left over largely comprise of essential proteins that are in favour of Cattle / Poultry feed. DDGS is used as a substitution for Soybean meal in the feed. The typical DDGS content is as follows,

TABLE 27 : TYPICAL DDGS CONTENT

Test/Parameter	Method	Result	Unit
Crude Protein (N*6.25)	IS:7874(Part-I): 1975	46.3	g/100g
Crude Fat	IS:7874(Part-I): 1975	3.2	g/100g
Crude Fiber	IS:7874(Part-I): 1975	3.1	g/100g
Moisture	IS:7874(Part-I): 1975	10	g/100g
Phosphorus (as P)	AOAC 965:17	0.6	g/100g

Test/Parameter	Method	Result	Unit
Salt (as NaCl)	IS:7874(Part-II): 1975	0.15	g/100g
Total Ash	IS:7874(Part-I): 1975	2.1	g/100g

5.16.2 **Animal Feed Market in India**

The segmental share of Indian animal compound feed industry is as follows

TABLE 28 : INDIAN ANIMAL COMPOUND FEED MARKET – MAJOR SEGMENTS

Feed Segment	Industry Size – Million MT (CRISIL)		
	2016-17	2019-20 Estimated	% Share
Poultry Feed	16-17	20-21	63%
Cattle Feed	7.5-8.5	9-10	30%
Aqua Feed	1.6-1.8	2.1-2.3	7%
Total	**25.1-27.3**	**31.1-33.3**	**100%**

Source: https://www.investmentbank.kotak.com/downloads/godrej-agrovet-limited-DRHP.pdf

TABLE 29 : ANIMAL COMPOUND FEED MARKET - INDIA – 2019 VS 2020 (MILLION MT)

S.No.	Country	2019	2020	Growth
		Million MT	Million MT	
1	China	228.9	240	5%
2	USA	214.4	215.9	1%
3	Brazil	70.4	77.6	10%
4	**India**	**41.4**	**39.3**	**-5%**
5	Mexico	36.5	37.9	4%

5.16.3 From the above Table, it is observed that the actual Indian market size reached in 2019-20 is much higher than the projection made as provided in the earlier Table.

5.16.4 **Cattle Feed - Increase in Demand for Milk and Milk Products**

Due to a number of factors like growing population, rising incomes, increasing urbanization demand for milk and milk products is steadily rising in our country. By 2050, India is expected to become the world's most populous country – about 1.7 billion and about 600 million in middle income class. Changing lifestyles and rising per capita incomes in India have resulted in a shift in the dietary habits in the country. This has resulted in an increase in the consumption of milk and meat, leading to a growing demand for animal feed.

5.16.5 In India, the world's largest milk producer, there are around 70 million small-scale producers. India produced 198.4 Million Tonnes in 2019-20,

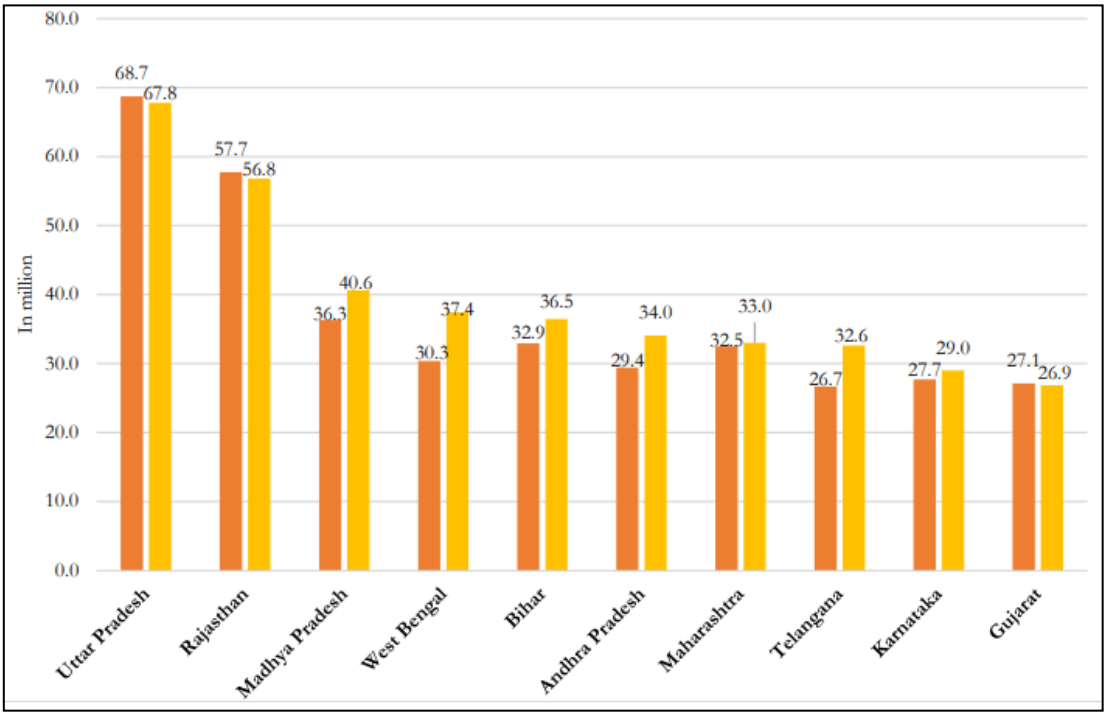
TABLE 30 : YEAR WISE MILK PRODUCTION TREND

Year	All India Production of Milk
	(000 Tonnes)
2010-11	121,848.00
2011-12	127,904.00
2012-13	132,431.00
2013-14	137,685.00
2014-15	146,314.00
2015-16	155,491.00
2016-17	165,404.00
2017-18	176,347.00
2018-19	187,749.50
2019-20	198,400.00

Source: CMIE, Economic Times

5.16.6 The Population of Cattle and Buffalo is shown as follows,

FIGURE 8 : LIVESTOCK POPULATION, 2012 & 2019 OF MAJOR STATES



Source: https://vikaspedia.in/agriculture/agri-directory/reports-and-policy-briefs/20th-livestock-census

TABLE 31 : LIVESTOCK POPULATION

Category	Population 2019	Population 2012	Growth%
	(in millions)	(in millions)	
Cattle	192.49	190.9	0.83
Buffalo	109.85	108.7	1.06

5.17 MARKET INFERENCE

5.17.1 The following inferences are made on the industry and the Firm,

a. A huge capacity augmentation is required to meet out the demand for ethanol as per the projection of Ministry of Petroleum and Natural Gas (MoPNG). However, there will be some challenges in achieving the projected demand of ethanol as per the ethanol blending roadmap of Ministry of Petroleum and Natural Gas, as migration from E10 to E12/E15/E20 blending would pose a significant challenge. As per SIAM, discontinuation of E10 fuel in Ethanol surplus areas while implementing E12/E15/E20, as proposed by MoPNG is a critical concern, as this will cause the major population of vehicles available to become un-usable, as they may neither have material compatibility nor efficiency / performance optimized. This may cause material degradation, which could lead to fuel seepage/leakage and hence would create safety issue besides fuel efficiency loss and poor drivability. Hence SIAM has recommended continuing E10 fuel availability as protection grade fuel for existing vehicles even after deployment of E20 fuel. In Brazil transition to higher blends was spread over 30 or more years. Even today E0 fuel is available to customers as a choice in Brazil.

b. With liberalized feedstock policy, incentives, sufficient capacity for ethanol production is likely to be built in the country to meet demand till 2025.

c. Considering the requirement of ethanol and availability of distillery capacity, the Firm may be anticipated to tap the opportunity to supply for ethanol blending programme and achieve the revenue projected in the financials.

d. Further the increase in penetration of Electric Vehicles and CNG Vehicles being promoted by Government policies may significantly impact to reduce the requirement of gasoline and therefore the requirement of ethanol for blending.

e. Hence the Firm may arrange to provide documentary support on preliminary communication with OMC regarding the requirement in Tamil Nadu and supply prospects of the proposed distillery to the lender.

f. The Firm is advised to enter into bilateral agreement with OMCs followed by signing of tripartite agreement with OMCs and bank for providing comfort to the bank based on committed purchase by OMCs.

6.0 TECHNICAL ASPECTS OF THE PROJECT

6.1 THE PROJECT

6.1.1 Forecasting the trend and opportunity in the production of Ethanol, NDBEL has planned to set up a 160 KLPD Grain based distillery unit at Plot No. C107-113, SIPCOT, Gangaikondan, Tirunelvi district, Tamil Nadu.

6.1.2 Technical aspects of the proposed project includes product description & features, manufacturing process, proposed facilities, installed capacity, project location & location related advantages, requirement & arrangement needed for procurement of major raw materials & additives, manpower requirement & cost, availability of utilities such as power, water, compressed air etc.

6.2 LOCATION DETAILS AND ITS ADVANTAGES

6.2.1 **Location Advantages:** The site is selected for the proposed Distillery/Ethanol project, due to following reasons:

- Availability of adequate space for locating the Distillery and associated plants and adequate space for the construction activities.
- Suitability of the site from topographical and geological considerations.
- Availability of rail and road connections for material movements.
- Availability of adequate quantity of water for meeting the plant's water requirements.
- Availability of adequate fuel and its transport.
- Availability of Raw materials.

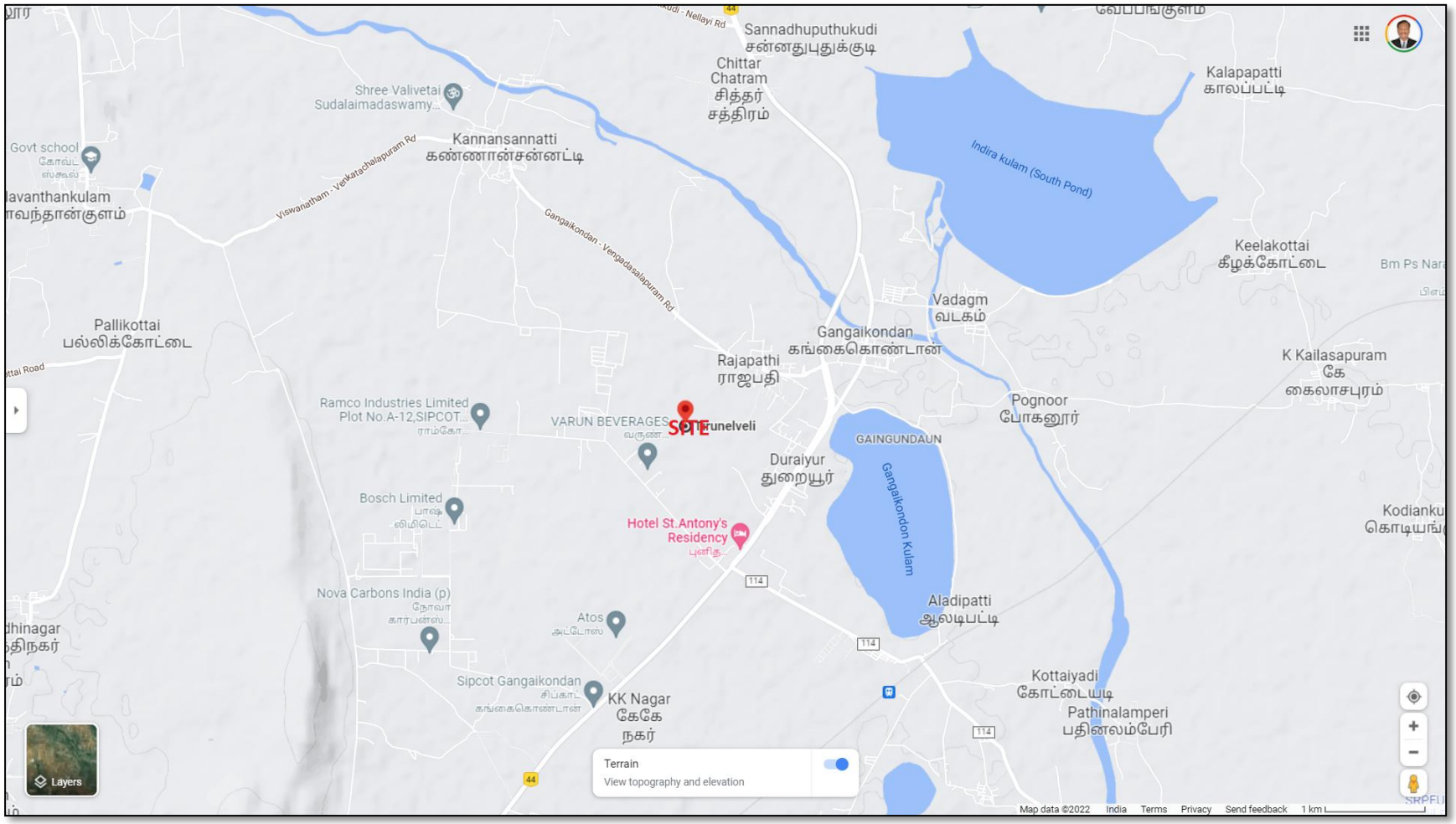
6.2.2 The table below depicts the location assessment of the project site,

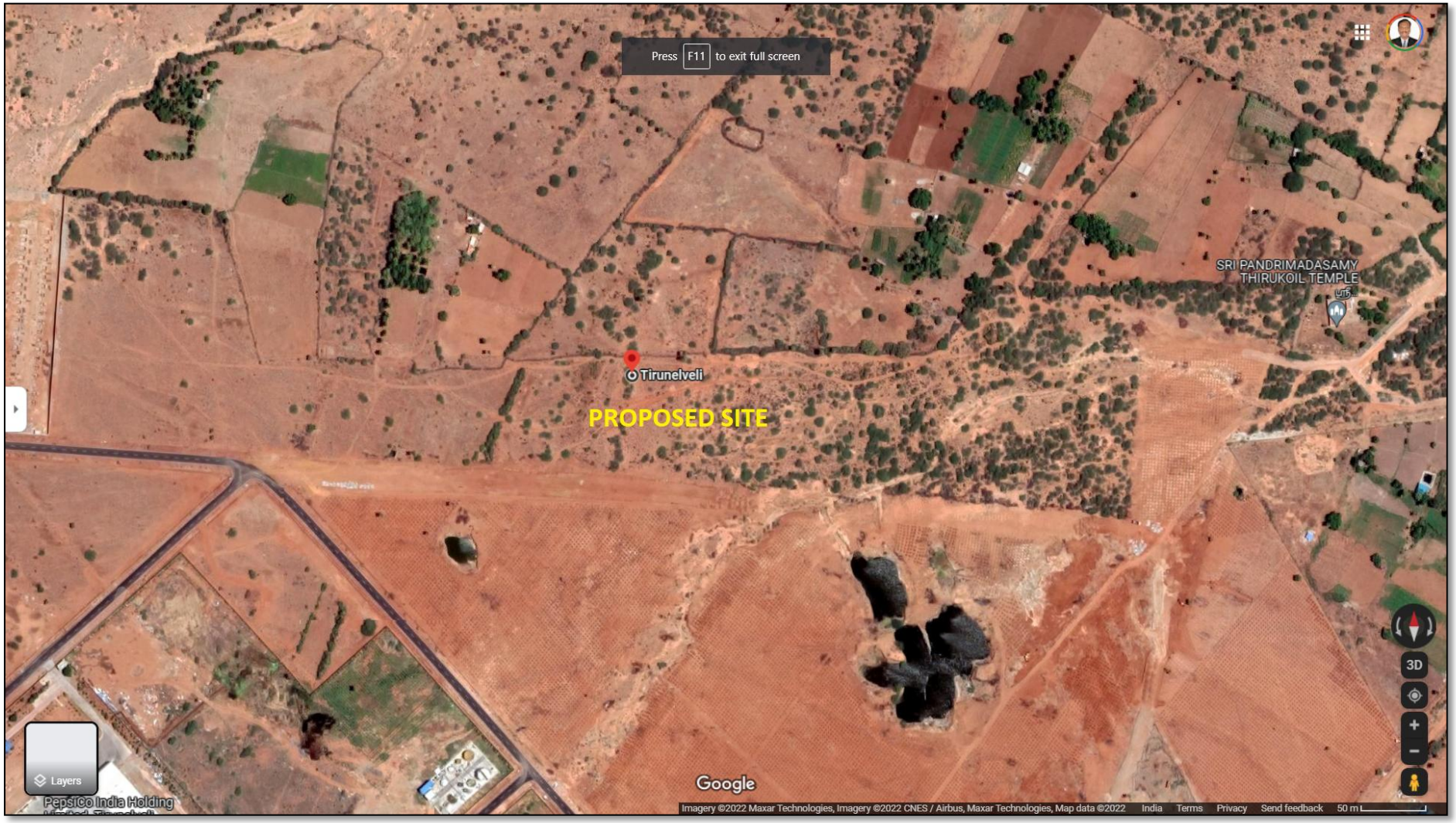
Particulars	Details
Village/Taluka	Gangaikondan, Tirunelveli
District	Tirunelveli
Nearest Highway	2Kms from NH-44 (Srinagar-Kanyakumari)
Nearest Railway Station	23 Kms from Tirunelveli Railway Station
Nearest Airport	55 Kms from Tuticorin Airport
Nearest Port	69 Kms from Tuticorin Port

6.3 LOCATION OF THE PROPOSED DISTILLERY PLANT

6.3.1 The Google images showing the location of the proposed distillery plant are provided in the ensuing pages.

FIGURE 9 : GOOGLE MAP SHOWING THE LOCATION OF THE PROPOSED DISTILLERY PLANT

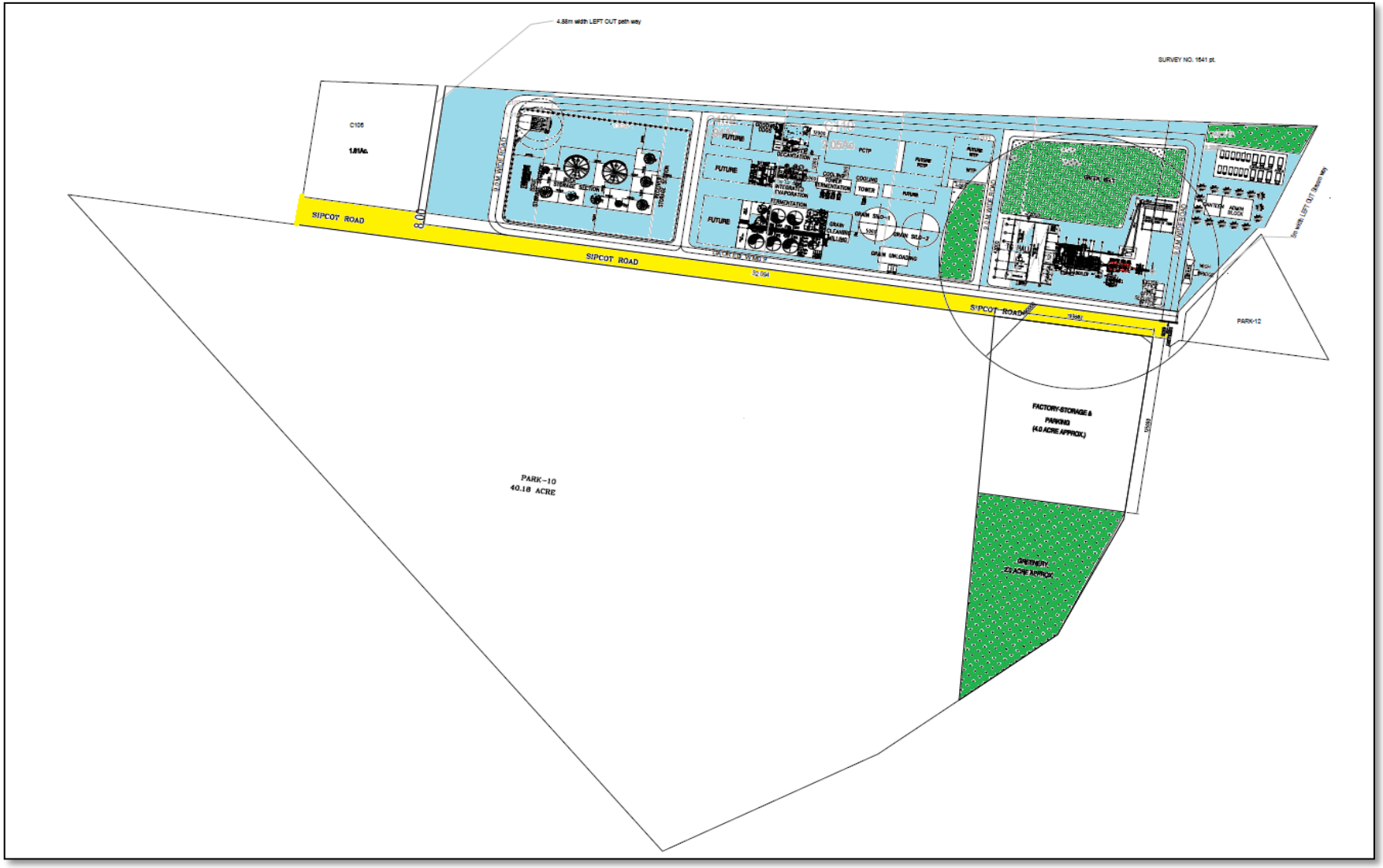



Press F11 to exit full screen
SRI PANDRIMADASAMY THIRUKOIL TEMPLE
Tirunelveli
PROPOSED SITE
Layers
PepsiCo India Holding
Google
Imagery ©2022 Maxar Technologies, Imagery ©2022 CNES / Airbus, Maxar Technologies, Map data ©2022 India Terms Privacy Send feedback 50 m
3D


NETHAJI NAGAR
நேதாஜி நகர்
Gangaikondan
கங்கைகொண்டான்
Rajapathi
ராஜபதி
Ganagekonddayan
கனகேகோண்டட்டயன்
Ramco Industries Limited
Plot No.A-12,SIPCOT...
SITE
VARUN BEVERAGES
GAINGUNDAUN
Duraiyur
துறையூர்
Gangaikondan Kulam
Bosch Limited
Hotel St.Antony's
Residency
Aladipatti
ஆலடிப்பட்டி
Atos
Google
Layers
3D
Imagery ©2022 Maxar Technologies, Imagery ©2022 CNES / Airbus, Maxar Technologies, Map data ©2022 India Terms Privacy Send feedback 500 m

FIGURE 10 : SIPCOT LAYOUT SHOWING THE PLOTS ALLOTTED FOR THE PROJECT C-107 TO C112

FIGURE 11 : PROPOSED PLANT LAYOUT



6.4 SITE VISIT OBSERVATION

6.4.1 ITCOT Team has visited the proposed site on 14th March 202 accompanied by Shri Sugumar and Shri.Subramaniam, representatives from M/s.Nanda Devi Bio Energy LLP. ITCOT's observation on land is provided as follows:

- SIPCOT has allocated land for M/s. Nanda Bio energy LLP to the total extent of 21.77 acres, out of 21.77 acres around 6 acres of land was towards the greenery development and balance 15.77 acres of the land will be utilized for factory purpose.

- Filling of GSB for the construction of approach road to the proposed site is under progress by SIPCOT. However approach road to other factories was already laid by SIPCOT.

- Some of the nearby industry observed at SIPCOT industrial estate is provided below,

  - ✓ Varun beverages private limited
  - ✓ Hindustan cocacola beverage private limited
  - ✓ Ramco Industries Limited
  - ✓ Bosch
  - ✓ Suguna foods private limited

- The site is located approximately at a distance of 2.5 KM from the Gangaikondan Spotted Deer Sanctuary.

- HPCL & BPCL depot is located at a distance of 22-25 KM from the proposed site i.e near Tirunelveli Junction. IOCL depot is located at Kappalur, Madurai which is located at a distance of 150 KM from the proposed site.

- Power supply for the proposed unit can be sourced from the TANGEDCO sub-station located inside the SIPCOT premises.

- **Environmental Clearance:**
  As per MOEF, S.O 1533 dated August 2015, Any project or activity specified in Category 'B' will be appraised at the Central Level as Category 'A', if located in whole or in part within 5 km from the boundary of: (i) Protected Areas notified under the Wild Life (Protection) Act, 1972 (53 of 1972).

Ministry of Environment, Forest and Climate Change Notification, New Delhi, dated 16th June 2021, has notified that the Grain based distilleries producing ethanol projects falls under Category B2 due to Zero Liquid Discharge (ZLD). For projects who file application for grant of EC up to 31st March 2024 or till further notification whichever is earlier provided that any subsequent amendment or expansion or change in product mix after 31st March 2024, shall be considered as per the provisions inforce at that time.

- As per the site observation the spotted dear sanctuary is located at a distance of approximately 2.5 KM from the site, the project may be appraised in central level as category B2 for environmental clearance.

- Hence after obtaining EC clearance firm can start work regarding further approval such as PCB clearance, building approval etc.

- As per the discussion the firm has appointed Enviro Care India Private Limited as environmental consultant for EC clearance. M/s. Avant garde will be appointed as design consultant.

6.5 SITE VISIT PHOTOGRAPHS

6.5.1 The photographs recorded during the site visit are provided in the ensuing pages.

FIGURE 12 : APPROACH ROAD FORMED BY SIPCOT

FIGURE 13 : GREENERY AREA PART OF PLOT NO.113

FIGURE 14 : PARTIAL VIEW OF LAND PROPOSED FOR THE PROJECT

6.6 LAND FOR THE PROPOSED DISTILLERY PLANT

6.6.1 Total area of land acquired for setting up of this project is 21.77 Acre. The land parcel for the proposed project is located at Plot Nos. C-107, C-108, C-109, C-110, C-111, C-112 & C-113, SIPCOT Industrial Park, Gangaikondan Village, Tirunelveli District, Tamil Nadu - 627352.

6.6.2 The list of survey numbers along with the land area is provided in the table given below

TABLE 32 : LAND DETAILS

Document No. and Lease deed execution date	Plot Nos.	Land Extent	Description
		in acres	
4017/2021 & 30-12-2021	C-107	1.75	Land bought from SIPCOT Industrial Park, Gangaikondan
4017/2021 & 30-12-2021	C-108	1.98	
4017/2021 & 30-12-2021	C-109	2.09	
4017/2021 & 30-12-2021	C-110	2.20	
4017/2021 & 30-12-2021	C-111	2.65	
4017/2021 & 30-12-2021	C-112	5.10	
4017/2021 & 30-12-2021	C-113	6.00	
Sub total		**21.77**	

Source: Lease Deed

6.6.3 The details as per the Schedule of Property of the Land Lease Deed is shown as follows:

- The Memorandum of Lease Deed has been executed at Gangaikondan on 30th December 2021 between State Industries Promotion Corporation of Tamil Nadu (SIPCOT) hereinafter referred to as the Lessor and M/s. Nanda Devi Bio Energy LLP represented by Thiru.V.S. Natarajan hereinafter referred to as the Lessee for the purpose of setting up the project for the Manufacture of Fuel Ethanol.

- SIPCOT allotted the Plot on Lease bearing Plot Nos. C-107, C-108, C-109, C-110, C-111, C-112 & C-113 to an extent of 21.77 acres for a period of 99 years by the Order of Allotment Ref. No. P-III/SIP-GKN/Nanda Devi/2021 dated 22.11.2021 and amendment to allotment order Ref. No. P-III/SIP-GKN/Nanda Devi/2021 dated 20.12.2021 subject to the terms and conditions therein.

- NDBEL have to commence construction of buildings within six months from the date of allotment order and complete within 30 months from the date of allotment order. Failure will entail cancellation and resumption of the allotted plots as per the condition of the deed.

- All that piece and parcel of land known as Pot Nos. C-107, C-108, C-109, C-110, C-111 & C-112 of 15.77 Acres in the SIPCOT's Industrial Park at Gangaikondan within th village limits of Gangaikondan, Taluk of Tirunelveli, certified by Registration & Stamps Department of Tamil Nadu, Document Number: 4017/2021 dated on 30.12.2021. The same is bounded as under,

To the East	Private Land & Stream Way
To the West	Pathway
To the North	Private Land
To the South	SIPCOT Road

- All that piece and parcel of land known as Pot Nos. C-113 of 6.00 Acres in the SIPCOT's Industrial Park at Gangaikondan within the village limits of Gangaikondan, Taluk of Tirunelveli, certified by Registration & Stamps Department of Tamil Nadu, Document Number: 4017/2021 dated on 30.12.2021. The same is bounded as under,

To the East	SIPCOT Road
To the West	Park
To the North	SIPCOT Road
To the South	SIPCOT Road

6.7 BUILDING FOR THE PROPOSED DISTILLERY PLANT

6.7.1 The total built-up area of the factory buildings for the proposed grain based distillery plant is about **2,08,702 Sq.Ft**.

6.7.2 The list of sections along with the proposed structure / building and built up area as per the Tentative Plant Layout is provided in the table given below.

TABLE 33 : BUILT-UP AREA DETAILS

S.No.	Description of Construction works	Builtup area (In Sq.Ft.)
1	Grain Unloading	2,413.00
2	Grain Silo (5000 MT)	9,730.00
3	Grain Cleaning & Milling	3,443.00
4	Fermentation Section	19,755.00
5	Distillation + MSDH	3,551.00
6	Integrated Evaporation	2,712.00
7	Dryer & Decantation Section	4,702.00
8	DDGS Godown	3,228.00
9	Product Storage Section (PESO)	73,835.00

S.No.	Description of Construction works	Builtup area (In Sq.Ft.)
10	Cooling Tower Fermentation	1,614.00
11	Cooling Tower DISTI+MSDH+EVAP	2,130.00
12	PCTP	11,836.00
13	Water Treatment Plant	4,035.00
14	Boiler House	53,800.00
15	Admin Block	3,228.00
16	Canteen	1,614.00
17	Weigh Bridge	269.00
18	Security Office	269.00
19	Time Office	269.00
20	Excise Office	269.00
21	Parking Area	6,000.00
22	Compound Wall	
	Total	**2,08,702.00**

Note: The built up area might change at the time of finalisation.

6.8 GRAIN BASED DISTILLERY PROCESS

6.8.1 Products

The proposed distillery will undertake manufacturing of the following products:

- Ethanol (160 KLPD capacity)
- Distillers Dried Grain Soluble (DDGS), as by-product (108 MT/Day)

6.8.2 Grain Based Process

The process envisages use of cereal grains from nearby district of Belgavi for manufacture of Ethanol and Cattle feed as a by-product. The brief manufacturing processes for project component are given below:

- Grain milling and Slurry preparation
- Fermentation system
- Distillation
- Effluent treatment system for slop handling

6.8.3 Grain Milling, Slurry Preparation & Liquefaction System

- Grains unloaded by truck / rail are initially received by grain receiving hopper. From receiving hopper, grains are transferred to storage silo through conveyor and elevator. Grains will be available from various adjacent district of Belgavi, and part of Bagalkote, Vijaypur, Koppal, Uttar Kannada & Gadag district.

- In milling operation the grains are broken down into small particles (flour) of uniformly distributed size. Flour from Hopper Bin is mixed with recycled streams in pre-masher for pre-wetting of flour. Slurry is then transferred to liquefaction tank and transferred to pre- saccharification tank.

- The Alcohol yield from broken rice is around 424 lit/ton and maize is around 380 lit/ton. For 160 KL of alcohol production per day, requirement of grain will be 188.68 MT (Broken Rice) and 210.53 MT (Maize) i.e. a total of 399.21 MT per day or 1,31,737.83 MT for 330 days. This subjects to availability and rate of raw material i.e. Maize and Broken rice.

Note: The above is based on the assessment (Grain starch % and alcohol yields) of Vasantdada Sugar Institute, Maharashtra (Premier Research and Development Organization in Sugar and Allied Industry).

6.8.4 Pre-Fermentation & Fermentation

- This process initiates the formation of alcohol. The mash is then cooled and transferred for fermentation where it will be diluted partly by water and partly by the effluent (slops) produced by the distillery and then fermented in a continuous/batch/fed batch fermentation reaction.

6.8.5 Distillation

- The fermented mash will be then fed to the distillation column. Here the mash will be distilled to generate the rectified spirit, which will be sent to the further distillation where rectified spirit will be converted to Neutral spirit.

6.8.6 Effluent Treatment System

Handling of thin slop to DDGS & process condensate by decantation & evaporation. Its volume from continuous/batch/fed batch fermentation plant is as large as for a distillery of 160 KL/day capacity. It varies depending upon the distillation technology. Multi pressure distillation with integrated evaporator system has been used for minimum effluents over to different technologies.

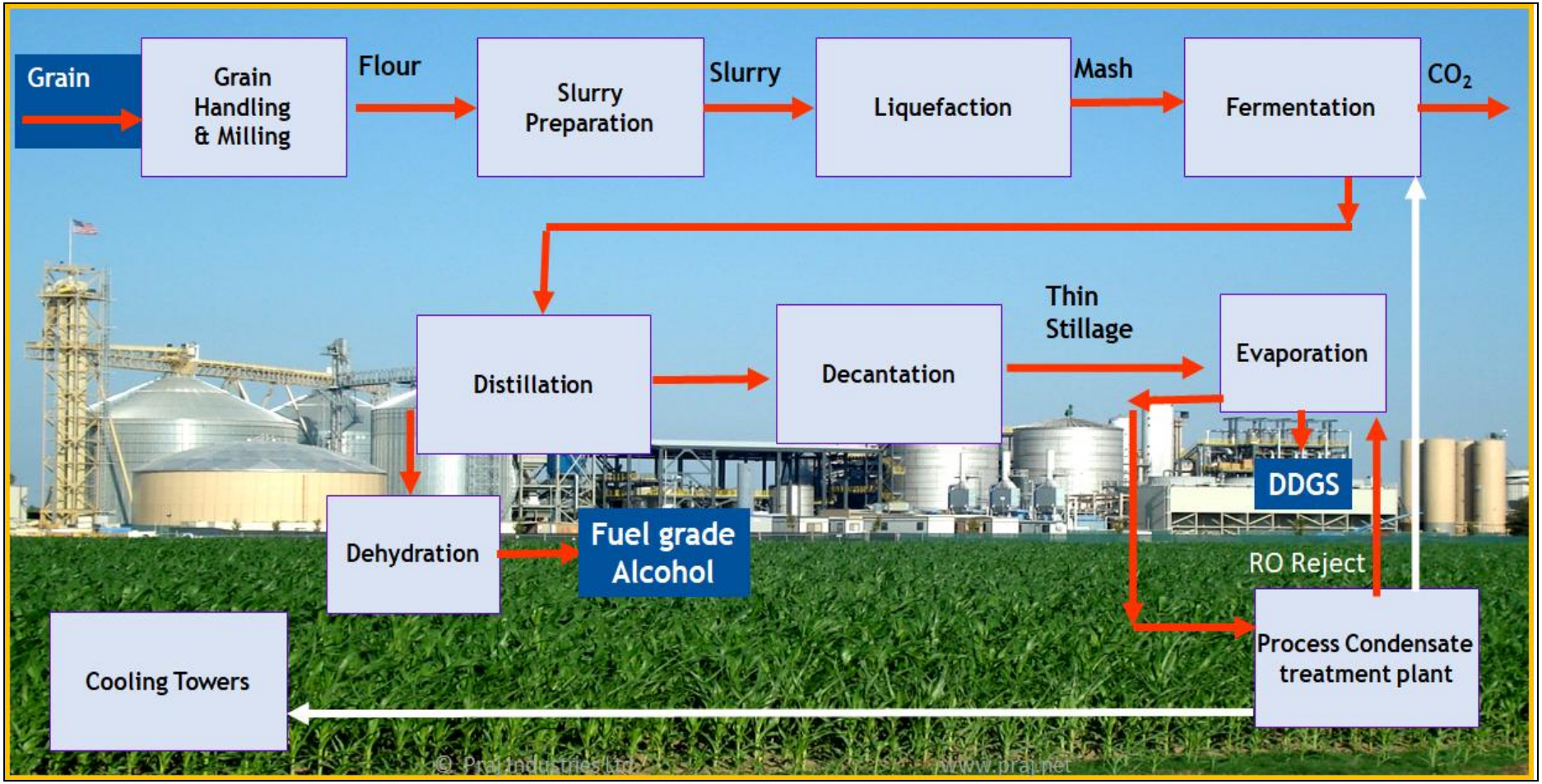
- **Multi pressure distillation**

In this process, steam is utilized in direct way for heating. Hence, spent mash/slops quantity generated is less as compared to traditional distillation technology.

- **Dehydration**

Molecular sieves are nothing but synthetic Zeolite typically 3A Zeolite. Zeolites are synthetic crystalline Alumino-silicates. This material has strong affinity for water. They adsorb the water when heated (and pressurized) and desorbs the water under vacuum. This principle is used to dehydrate ethanol.

FIGURE 15 : PROCESS DESCRIPTION OF THE TYPICAL DISTILLERY PLANT



- **Decantation**

  After distillation, spent mash/ slops/stillage are feed to Decantation system wherein all suspended solid will be separated in form of wet cake. Thin slops come out of decantation system and it is collected in tank. Part of thin slops can be recycled to fermentation and slurry preparation and balance is feed to evaporation system.

- **Multi Effect Evaporation**

  The thin slops evaporation technology is a multiple effect evaporator system in which heat recovered from one effect is used to concentrate spent mash in second effect evaporator with continuous recirculation of concentrated thin slop within the system until desired concentration is obtained.

  This entire concentration process is carried out under vacuum leading to less consumption of steam and maximum concentration of thin slop with in less period of time. This is the 3rd stage of effluent treatment wherein spent mash after decantation is concentrated.

- **Condensate Polishing Unit**

  Process condensate from evaporation plant and spent lees from distillation, water treatment rejection is collected, neutralized and treated in condensate polishing unit. After various treatments in the unit, treated condensate is recycled to cooling tower as make up in the process. Due to which is every day fresh water is reduced at large extent.

- **Dryer: Cattle Feed or DDGS**

  The mixing of concentrated syrup from evaporation plant and wet cake from Decantation (50-70% moisture) is being carried out in masher /screw conveyer and feed to dryer. With the help of steam or like heated media the moisture from this mixture is removed to get Distilled Dried Grains soluble. This DDGS will be sold as cattle feed which is having high protein content proven as good cattle feed and fetch good price.

  With effective utilization of such a technology, challenge of thin slop treatment & disposal will be solved and distilleries will become zero effluent discharging (ZLD) units to be established as **"Green Fuel/Energy sources Refineries".**

6.9 PROFILE OF THE EPC CONTRACTOR

6.9.1 The Commercial proposals for the design, engineering, supply, erection and commissioning of the project have been obtained from Praj Industries Limited.

6.9.2 The LLP has shared turnkey estimate from M/s. Praj Industries Limited, Pune. Signed Final Turnkey agreement will be submitted by the LLP to Bank directly.

6.9.3 Details of the Profile & Credentials of the prospective EPC Contractor for the proposed project by NDBEL are explained below.

- Praj Industries is a globally leading Firm with a bouquet of sustainable solutions for bioenergy, high purity water, critical process equipment, breweries and industrial waste water treatment.

- Headquartered in Pune, India, Praj has spread its presence across the globe with 1000++ References in 100+ countries across all 5 continents.

- Proven track record of more than 35 years in building Ethanol Plants across the globe.

- It is one of the Technologies cum Project Firm in India having experience of handling all type of 1G feedstock including Rice/Corn/Bajra/Jawar and designing /delivering large capacity plants more than 500 KLPD.

- Out of present 160 Cr liters of alcohol produced from Grain based feedstock in India, almost 70% comes from PRAJ built plants.

- Praj Industries ranks as 2nd in the list of world's 50 Hottest Companies in global bioeconomy for 2021 by US based Biofuels Digest in Low Carbon Fuels and Renewable Chemicals category.

- Praj grabs CII 3rd Award 2020 for Excellence in Design, Innovation and Developing Product Generating Minimum/Zero Waste at user end.

- Praj's Design and Project Management experience of over 750 installations in more than 75 countries will be key for a smooth project implementation.

6.10 LIST OF OMC DEPOTS IN INDIA

6.10.1 The list of depots of Oil Manufacturing Companies (OMCs) located in PAN India along the latitude and longitude is provided in the following table.

TABLE 34 : OMC DEPOTS IN INDIA

S.No.	OMC	Depot name	State	Latitude	Longitude
1	HPCL	Kadapa	Andhra Pradesh	14.417442	78.942474
2	IOCL	Guntakal Depot	Andhra Pradesh	15.156486	77.455522
3	IOCL	Chittoor Terminal	Andhra Pradesh	13.165425	79.038411
4	IOCL	Ongole Depot	Andhra Pradesh	15.400978	80.039438
5	BPCL	Ongole Depot	Andhra Pradesh	15.398283	80.040551
6	IOCL	Rajahmundry Terminal	Andhra Pradesh	17.199848	81.842302
7	HPCL	Rajahmundry	Andhra Pradesh	17.202068	81.844974
8	HPCL	Gooty	Andhra Pradesh	15.141476	77.6509159
9	BPCL	Gooty	Andhra Pradesh	15.141476	77.6509159
10	IOCL	Vijayawada Terminal	Andhra Pradesh	16.657226	80.553092
11	HPCL	Vijayawada	Andhra Pradesh	16.65638	80.56018
12	BPCL	Kondapalli	Andhra Pradesh	16.659722	80.563513
13	IOCL	Vizag Terminal	Andhra Pradesh	17.693004	83.255782
14	HPCL	Visakhapatnam	Andhra Pradesh	17.717866	83.243907
15	BPCL	Vizag Installation	Andhra Pradesh	17.7056389	83.2516667
16	BPCL	Tada	Andhra Pradesh	13.58046	80.04032
17	BPCL	Numaligarh	Assam	26.576248	93.7972
18	IOCL	Betkuchi (Guwahati)	Assam	26.116667	91.730833
19	HPCL	Guwahati	Assam	26.116469	91.729599
20	IOCL	Barauni Terminal	Bihar	25.436996	86.051212
21	HPCL	Barauni	Bihar	25.4439	86.04853
22	BPCL	Barauni Top	Bihar	25.44045	86.04679
23	IOCL	Patna Terminal	Bihar	25.579494	85.123226
24	HPCL	Patna	Bihar	25.557852	84.858964
25	BPCL	Patna Top	Bihar	25.576771	85.121191
26	IOCL	Raxaul Depot	Bihar	26.986805	84.853217
27	IOCL	Motihari	Bihar	26.72	84.8
28	BPCL	Muzaffarpur Depot	Bihar	26.086156	85.408157
29	IOCL	Lakholi Terminal	Chhattisgarh	21.190414	81.878503
30	HPCL	Raipur	Chhattisgarh	21.2256	81.78318
31	BPCL	Raipur (Common User Terminal)	Chhattisgarh	21.190114	81.880376

S.No.	OMC	Depot name	State	Latitude	Longitude
32	IOCL	Korba Terminal	Chhattisgarh	22.450705	82.64659
33	IOCL	Tikari Kalan	Delhi	28.686405	76.98632
34	HPCL	Delhi	Delhi	28.688211	76.974367
35	BPCL	Bijwasan	Delhi	28.5444379	77.060964
36	IOCL	Ziotl	Goa	15.39856	73.808074
37	HPCL	Ziotl	Goa	15.39856	73.808074
38	BPCL	Ziotl	Goa	15.39856	73.808074
39	IOCL	Hazira Terminal	Gujarat	21.177675	72.7182
40	HPCL	Hazira	Gujarat	21.183448	72.718234
41	BPCL	Hazira	Gujarat	21.187279	72.716665
42	IOCL	Kandla Main	Gujarat	23.079596	70.156159
43	HPCL	Kandla	Gujarat	23.0717849	70.1612116
44	BPCL	Kandla	Gujarat	23.074811	70.158422
45	IOCL	Vadodara Wot	Gujarat	22.395011	73.197396
46	HPCL	Vadodara	Gujarat	22.407645	73.090403
47	BPCL	Koyali	Gujarat	22.380758	73.128684
48	IOCL	Navegaon	Gujarat	22.823587	72.60133
49	BPCL	Navegam	Gujarat	22.823553	72.609018
50	IOCL	Sidhpur Terminal	Gujarat	23.950974	72.367
51	BPCL	Sidhpur	Gujarat	23.954641	72.368925
52	HPCL	Palanpur	Gujarat	24.215266	72.301782
53	IOCL	Eolvadinar	Gujarat	22.343554	69.761472
54	HPCL	Eolvadinar	Gujarat	22.343554	69.761472
55	BPCL	Eolvadinar	Gujarat	22.343554	69.761472
56	HPCL	Rlliamnagar	Gujarat	22.353729	69.871923
57	IOCL	Panipat Top	Haryana	29.479768	76.89032
58	BPCL	Panipat	Haryana	29.486461	76.8891
59	IOCL	Rewari Terminal	Haryana	28.141812	76.59969
60	HPCL	Rewari	Haryana	28.13871	76.60148
61	BPCL	Rewari Top	Haryana	28.140534	76.603578
62	HPCL	Bahadurgarh	Haryana	28.734841	76.851693
63	BPCL	Piyala	Haryana	28.275051	77.309454
64	IOCL	Una Terminal	Himachal Pradesh	31.407144	76.280425
65	HPCL	Nalgarh	Himachal Pradesh	31.02017	76.71753
66	HPCL	Jammu	J&K	32.703149	74.883695

S.No.	OMC	Depot name	State	Latitude	Longitude
67	HPCL	Leh	Ladakh	34.14834	77.46873
68	IOCL	Srinagar	J&K	34.036544	74.911858
69	BPCL	Srinagar Depot	J&K	34.0359508	74.9089104
70	IOCL	Jasidih Terminal	Jharkhand	24.512302	86.637789
71	HPCL	Bokaro	Jharkhand	23.686529	86.067184
72	IOCL	Khunti Terminal	Jharkhand	23.034453	85.289215
73	BPCL	Ranchi	Jharkhand	23.350961	85.337034
74	BPCL	Tatanagar Depot	Jharkhand	22.771253	86.202791
75	BPCL	Dhanbad Depot	Jharkhand	23.787876	86.431124
76	IOCL	Bijapur	Karnataka	16.83495	75.741808
77	IOCL	Belgaum (Desur)	Karnataka	15.751829	74.494296
78	BPCL	Desur Depot	Karnataka	15.755797	74.496317
79	IOCL	Gulbarga	Karnataka	17.268935	76.873462
80	HPCL	Gulbarga	Karnataka	17.27092	76.87315
81	IOCL	Hassan	Karnataka	12.9836	76.1187
82	HPCL	Hassan	Karnataka	12.9836	76.1187
83	BPCL	Hassan	Karnataka	12.9836	76.1187
84	MRPL	Hassan	Karnataka	12.9836	76.1187
85	IOCL	Mangalore	Karnataka	12.914373	74.813308
86	HPCL	Mangalore	Karnataka	12.975957	74.838175
87	BPCL	Mci	Karnataka	12.959509	74.812629
88	MRPL	Mangalore	Karnataka		
89	IOCL	Mysore	Karnataka	12.341814	76.640285
90	BPCL	Mysore	Karnataka	12.342605	76.638852
91	IOCL	Navalur(Hubli)	Karnataka	15.408236	75.064085
92	HPCL	Hubli	Karnataka	15.41378	75.06767
93	IOCL	Devanagonthi	Karnataka	12.987038	77.83696
94	HPCL	Bangalore	Karnataka	12.98702	77.84745
95	BPCL	Devangunthi	Karnataka	12.986353	77.844206
96	IOCL	Kozhikode	Kerala	11.1722222	75.8330556
97	HPCL	Kozhikode	Kerala	11.34815	75.7405583
98	IOCL	Irumpanam	Kerala	9.97972222	76.3530556
99	HPCL	Irumpanam	Kerala	9.9860533	76.3541716
100	BPCL	Irimpanam Installation	Kerala	9.978528	76.350397
101	IOCL	Jabalpur Depot	Madhya Pradesh	23.143415	79.690542
102	HPCL	Jabalpur	Madhya Pradesh	23.1441625	79.6927636

S.No.	OMC	Depot name	State	Latitude	Longitude
103	BPCL	Bhitcni	Madhya Pradesh	23.144546	79.689502
104	IOCL	Gwalior Depot	Madhya Pradesh	26.312384	78.123955
105	HPCL	Gwalior	Madhya Pradesh	26.307783	78.127171
106	BPCL	Rairu	Madhya Pradesh	26.309487	78.125635
107	IOCL	Indore Terminal	Madhya Pradesh	22.813583	75.922455
108	HPCL	Indore	Madhya Pradesh	22.81812	75.92268
109	BPCL	Manglia	Madhya Pradesh	22.813841	75.920059
110	IOCL	Ril Bakariia	Madhya Pradesh	23.274379	77.270823
111	HPCL	Ril Bakania	Madhya Pradesh	23.274379	77.270823
112	BPCL	Bakania	Madhya Pradesh	23.26539	77.268756
113	IOCL	Ratlam Terminal	Madhya Pradesh	23.402004	75.12322
114	IOCL	Itarsi Depot	Madhya Pradesh	22.595437	77.759615
115	BPCL	Bina	Madhya Pradesh	24.256161	78.180732
116	IOCL	Sagar Depot	Madhya Pradesh	23.88449	78.603775
117	HPCL	Sagar	Madhya Pradesh	23.88146	78.60588
118	IOCL	Akola Depot	Maharashtra	20.722439	76.897393
119	HPCL	Akola	Maharashtra	20.721842	76.8998872
120	BPCL	Gaigaon	Maharashtra	20.720648	76.904942
121	IOCL	Ahmednagar Depot	Maharashtra	18.993136	74.667183
122	BPCL	Akolner	Maharashtra	18.991722	74.668758
123	IOCL	Borkhedi Terminal	Maharashtra	20.858121	78.969385
124	HPCL	Borkhedi	Maharashtra	20.858931	78.969122
125	BPCL	Borkhedi	Maharashtra	20.857715	78.969364
126	IOCL	Pune Terminal	Maharashtra	18.491907	74.00977
127	HPCL	Loni	Maharashtra	18.49161	74.01543
128	BPCL	Haweli	Maharashtra	18.459407	74.09188
129	IOCL	Manmad Terminal	Maharashtra	20.266582	74.484722
130	HPCL	Manmad	Maharashtra	20.27335	74.50025
131	BPCL	Manmad	Maharashtra	20.269226	74.493234
132	IOCL	Miraj Depot	Maharashtra	16.832705	74.634104
133	HPCL	Miraj	Maharashtra	17.006366	74.52319
134	BPCL	Miraj	Maharashtra	16.827753	74.636758
135	IOCL	Solapur Terminal	Maharashtra	17.726506	75.783073
136	HPCL	Sholapur	Maharashtra	17.7294444	75.7805556
137	BPCL	Pakni	Maharashtra	17.730542	75.783844
138	IOCLL	Dhule Depot	Maharashtra	20.736384	74.87391
139	IOCL	Chandrapur Depot	Maharashtra	20.02148	79.187814

S.No.	OMC	Depot name	State	Latitude	Longitude
140	IOCL	Vashi Terminal	Maharashtra	19.05414	73.026543
141	HPCL	Vashi Terminal	Maharashtra	19.05807	73.03071
142	IOCL	Sewree-I Terminal	Maharashtra	18.999361	72.8556338
143	HPCL	Wadala	Maharashtra	19.011509	72.862809
144	BPCL	Sewree	Maharashtra	19.006498	72.860446
145	IOCL	JNPT terminal	Maharashtra	18.89822	72.98199
146	IOCL	Wardha	Maharashtra	20.728487	78.477356
147	HPCL	Wardha	Maharashtra	20.728487	78.477356
148	IOCL	Bhubaneswar Depot	Odisha	20.176176	85.727443
149	IOCL	Paradeep Terminal	Odisha	20.285074	86.626861
150	HPCL	Paradip	Odisha	20.28258	86.62244
151	BPCL	Paradeep Installation	Odisha	20.284489	86.630478
152	IOCL	Balasore Depot	Odisha	21.495 191	86.846079
153	HPCL	Balasore	Odisha	21.496095	86.848667
154	BPCL	Balasore Depot	Odisha	21.496967	86.845569
155	IOCL	Jharsuguda Terminal	Odisha	21.889272	84.065334
156	BPCL	Jharsuguda	Odisha	21.889272	84.065334
157	IOCL	Bhatinda Terminal	Punjab	30.161572	74.981835
158	HPCL	Bhatinda	Punjab	30.15943	74.97974
159	BPCL	Bathinda	Punjab	30.165211	74.979047
160	IOCL	Jalandhar Terminal	Punjab	31.335655	75.613855
161	HPCL	Jalandhar	Punjab	31.34525	75.61833
162	BPCL	Jalandhar Depot	Punjab	31.344676	75.615803
163	IOCLL	Sangrur Terminal	Punjab	30.214429	75.861574
164	HPCL	Sangrur	Punjab	30.2132	75.864
165	BPCL	Sangrur	Punjab	30.2137134	75.8688066
166	BPCL	Lalru	Punjab	30.467958	76.787957
167	HPCL	Ajmer	Rajasthan	26.333023	74.564622
168	IOCL	Chittorgarh Terminal	Rajasthan	24.81947	74.63164
169	IOCL	Jaipur Terminal	Rajasthan	26.66258	75.68735
170	HPCL	Jaipur	Rajasthan	26.786394	75.506758
171	BPCL	Jobner	Rajasthan	26.896453	75.432813
172	IOCL	Jodhpur Terminal	Rajasthan	26.14053	73.01778
173	HPCL	Jodhpur	Rajasthan	26.141399	73.021815
174	BPCL	Salawas	Rajasthan	26.140721	73.023181
175	IOCL	Bharatpur Depot	Rajasthan	27.28495	77.52918
176	HPCL	Bharatpur	Rajasthan	27.290376	77.528291

S.No.	OMC	Depot name	State	Latitude	Longitude
177	BPCL	Bharatpur	Rajasthan	27.287124	77.530656
178	BPCL	Kota Top	Rajasthan	25.192346	75.973679
179	IOCL	Rangpo Depot	Sikkim	27.1948	88.4929
180	**IOCL**	**Coimbatore**	**Tamil Nadu**	**11.031376**	**77.079762**
181	**HPCL**	**Coimbatore**	**Tamil Nadu**	**11.030765**	**77.081881**
182	**BPCL**	**Irugur Top**	**Tamil Nadu**	**11.024901**	**77.083837**
183	**IOCL**	**Sankari**	**Tamil Nadu**	**11.438745**	**77.87192**
184	**IOCL**	**Trichy**	**Tamil Nadu**	**10.776313**	**78.836796**
185	**IOCL**	**Ennore**	**Tamil Nadu**	**13.287789**	**80.330789**
186	**HPCL**	**Chennai New**	**Tamil Nadu**	**13.242361**	**80.311467**
187	**BPCL**	**Ennore Coastal Installation**	**Tamil Nadu**	**13.243603**	**80.308667**
188	**HPCL**	**Tirunelveli**	**Tamil Nadu**	**8.740559**	**77.707506**
189	**BPCL**	**Tirunelveli Depot**	**Tamil Nadu**	**8.738261**	**77.707214**
190	**HPCL**	**Karur**	**Tamil Nadu**	**10.9896**	**78.0394**
191	**BPCL**	**Karur**	**Tamil Nadu**	**10.9896**	**78.0394**
192	**IOCL**	**Madurai**	**Tamil Nadu**	**9.849898**	**78.029136**
193	**HPCL**	**Madurai**	**Tamil Nadu**	**9.85107281**	**78.0322571**
194	IOCL	Hyderabad Terminal	Telangana	17.451743	78.600973
195	HPCL	Secunderabad	Telangana	17.45895	78.71622
196	BPCL	Cherlapally Installation	Telangana	17.452406	78.60327
197	HPCL	Suriyapet	Telangana	17.0861	79.66452
198	BPCL	Warangal	Telangana	17.97316	79.611476
199	IOCL	Ramagundam Depot	Telangana	18.746927	79.433503
200	HPCL	Ramagundam	Telangana	18.74406	79.431768
178	IOCL	Haldwani Depot	Uttarakhand	29.089565	79.520592
179	IOCL	Roorkee Top	Uttarakhand	29.79629	77.94179
180	HPCL	Roorkee	Uttarakhand	29.79482	77.94594
204	IOCL	Malda Depot	West Bengal	25.010569	88.162681
205	BPCL	Malda Depot	West Bengal	25.010494	88.162092
206	IOCL	Rajbandh Terminal	West Bengal	23.478578	87.399008
207	HPCL	Durgapur	West Bengal	23.4862	87.384202
208	BPCL	Rajbandh Top	West Bengal	23.48336	87.389419
209	IOCL	Siliguri Terminal	West Bengal	26.690482	88.443749
210	IOCL	Mourigram Terminal	West Bengal	22.569886	88.262609
211	HPCL	Kolkata	West Bengal	22.4849523	88.1785578

S.No.	OMC	Depot name	State	Latitude	Longitude
212	BPCL	Bgb Installation	West Bengal	22.485745	88.179899
213	HPCL	Rangapani	West Bengal	26.660714	88.3710997

Source: Corrigendum 3 of tender no. 1000374174; System Id - 86996

6.10.2 Proximity distance of the proposed plant from OMC Depots within Tamil Nadu is as follows.

TABLE 35 : PROXIMITY OF THE PROPOSED PLANT FROM OMC DEPOTS IN TAMIL NADU

S.No.	OMC	Depot Name	State	Distance in Km
1	IOCL	Coimbatore	Tamil Nadu	330
2	HPCL	Coimbatore	Tamil Nadu	353
3	BPCL	Irugur Top	Tamil Nadu	332
4	IOCL	Sankari	Tamil Nadu	362
5	IOCL	Trichy	Tamil Nadu	312
6	IOCL	Ennore	Tamil Nadu	635
7	HPCL	Chennai New	Tamil Nadu	637
8	BPCL	Ennore Coastal Installation	Tamil Nadu	637
9	HPCL	Tirunelveli	Tamil Nadu	17
10	BPCL	Tirunelveli Depot	Tamil Nadu	18.2
11	HPCL	Karur	Tamil Nadu	270
12	BPCL	Karur	Tamil Nadu	319
13	IOCL	Madurai	Tamil Nadu	154
14	HPCL	Madurai	Tamil Nadu	141

6.11 INSTALLED CAPACITY OF THE PLANT

6.11.1 The installed capacity of the plant is calculated as provided in the table given below.

Number of shifts per day	3	
Installed capacity per day	168	KL of total spirits
Number of working days per annum	330	
Installed capacity per annum	55440	KL of total spirits
Installed capacity per month	4620	KL of total spirits

6.11.2 **Conversion Ratio's of Spirits**

As informed by LLP, the technical ethanol will further be processed to form the absolute alcohol. Hence, the final product will be Absolute alcohol/ethanol only. The conversion options as per the technical specifications provided are as follows:

Installed capacity as per machinery quotation is	168	KL per day of total spirits production
Alcohol content of total spirits -95% v/v (as per machinery quotation)	95%	
Installed capacity as per machinery quotation is	160	KL per day of Ethanol/absolute alcohol production

The Management of the Firm is opting for ethanol production. Based on the above table, total spirits to ethanol conversion factor is 0.95. Based on the assumptions and conversion ratios as per machinery quotation received, the installed capacity is summarised as follows:

- 168 KL per day of total spirits/160 KL per day of ethanol.
- 55,440 KL per annum of total spirits/52,800 KL per annum of ethanol.

6.11.3 Production Mix at installed level

The Product mix for the ethanol production and their consumption & production details are listed below:

TABLE 36 : PRODUCT MIXES FOR ETHANOL PRODUCTION DETAILS

S.No.	Product Mix	Unit	Production per day @ installed capacity level	Production per annum @ installed capacity level
1	Ethanol	KL	160	52800
2	Impure spirit (IS)	KL	1.68	554
3	Fusel Oil	Liters	0	0
4	Dry cake (DDGS)	MT	108	35475
5	Liquid CO_2 *	MT	80	26400

Note: *The capacity of Liquid CO_2 plant is derived as follows:

Raw CO_2 Output of distillery plant	124.50	MT per day
Recoverable Raw CO_2 Output of distillery plant	87.00	MT per day
Recoverable Raw CO_2 is the input material for CO_2 plant. The output of the same is Liquid CO_2.		
Conversion ratio's of recoverable raw CO_2 is as follows:		
Liquid CO2	80.00	MT per day
Waste water	7.00	MT per day

6.12 RAW MATERIAL REQUIREMENT AND INPUT-OUTPUT RATIO

6.12.1 As indicated by the Firm, the raw material considered is broken rice (68% starch content) and maize (62% starch content). The raw material mix is considered as follows;

TABLE 37 : RAW MATERIAL MIX

Raw Material	Raw Material Mix
Broken Rice (68% starch content)	50%
Maize (62% starch content)	50%

6.12.2 The Corresponding yield levels are as follows,

TABLE 38 : ESTIMATION OF YIELD LEVEL

Particulars	Liters per MT of Raw Material
The spirits yield in terms of Liters per MT of broken rice	446
Subsequent absolute alcohol - ethanol yield (0.95 conversion factor)	424
The spirits yield in terms of Liters per MT of maize	400
Subsequent absolute alcohol - ethanol yield (0.95 conversion factor)	380

The above is based on the assessment (Grain starch % and alcohol yields) of Vasantdada Sugar Institute, Maharashtra (Premier Research and Development Organization in Sugar and Allied Industry).

6.12.3 **Source of Raw Material:** As per the discussion with NDBEL it is informed that the prospective suppliers of raw materials (Broken Rice and Maize) will be the farmers in the surrounding regions of the neighbouring districts. The present availability of maize in the southern districts of Tamil Nadu is around 6.5 lakh tons and broken rice is around 1.75 lakh tons per annum.

6.12.4 The firm requires annually about 0.69 lakh tons of maize and about 0.62 lakh tons of broken rice at installed capacity level for manufacturing ethanol. The same works out to 10% and 35% of the present availability for maize and broken rice respectively.

6.12.5 Besides the present production, the firm would undertake crop development and production enhancement of these two crops (paddy & maize) in colloboration with reputed seed companies. The firm will also arrange supply of high yielding

varieties, provide crop advisory services & buy back guarantee. Hence, the Firm will purchase directly from farmers through its own purchase centres in the project districts. Thus, considering the present grain availability and own initiatives, the firm is confident of ensuring adequate availability of grains for manufacturing the ethanol.

6.12.6 The Input-Output ratio for the ethanol production is explained as below,

TABLE 39 : INPUT-OUTPUT RATIO

Particulars	RM - Broken rice	Output of spirits
	Input quantity in MT	Output quantity in KL
Input output ratio for main products	2.24	1

Particulars	RM - Maize	Output of spirits
	Input quantity in MT	Output quantity in KL
Input output ratio for main products	2.50	1

6.12.7 Based on the above, per day raw material requirement (MT) for the operation of the proposed 160 KLPD grain based distillery plant is estimated as follows.

TABLE 40 : RAW MATERIAL REQUIREMENT DETAILS

Output breakup	Per day total spirits production (KL)	Per day alcohol production (KL)	Raw material mix considered for the output	Per day Raw material requirement (MT)
50% of output	84.21	80	broken rice input is considered	188.68
50% of output	84.21	80	maize input is considered	210.53
Sub total		**160**		**399.21**

6.13 STEAM, FUEL AND WATER REQUIREMENT

6.13.1 As per the quotation submitted and options indicated by the Firm, the details of utilities requirement are estimated as follows:

TABLE 41 : UTILITIES REQUIREMENT

Particulars	Values	Unit
Steam requirement	3.65	MT per KL of total spirits
Fuel Coal	50%	of steam requirement

Particulars	Values	Unit
Fuel Husk	50%	of steam requirement
Coal requirement	0.24	MT per ton of steam
Husk requirement	0.31	MT per ton of steam
Water requirement	4.11	Kilo litre per KL of total spirits

6.13.2 **Source of Water Requirement**

- The water requirements of the distillery plant are proposed to be met by the water drawn from Bore wells. The water drawn from the bore wells will be stored in a water reservoir for meeting the various uses of the distillery. The water is required for the distillery process in the fermentation section, cooling tower make up for the distillery cooling towers.
- The total raw water requirement for the plant will be 2800 Cu.m/day. This quantity is the fresh raw water without considering any recycling. However with the usable water recovered from the condensate and spent lees polishing plant, the raw water required will be reduced to 1600 cu.m/day.
- The DM water requirement for the distillery and for the boiler is approximately 400 cu.m per day. The DM water requirement will be met from a new Membrane based water treatment plant to be installed in the distillery.
- The Firm has signed an agreement with SIPCOT of **Agreement No.** AY740632 **dated:** 30.12.2021 for the supply of 11,00,000 LPD of water on a 16 hours daily basis from the OHT(Over Head Tank) of SIPCOT Gangaikondan and the same has been approved.

6.13.3 **Source of Fuel Requirement**

- As stated by NDBEL, the source of fuel will be 50% rice husk and 50% imported coal.
- The Total Rice Husk requirement at installed capacity level is estimated to be 0.3 MT per tonne of steam and the total coal requirement is estimated to be 0.24 MT per tonne of steam.
- The details of Rice Husk availability in the southern districts of Tamil Nadu are listed as follows,

TABLE 42 : RICE HUSK AVAILABILITY IN SOUTHERN DISTRICTS OF TAMIL NADU

S.No.	District	Production in Tons Season-wise				Estimated Broken Rice Availability @ 15% (Tons)	Rice Husk Availability (Tons)	
		Kar/Kuruvai/Sornavari	Samba/Thaladi/Pishanam	Navarai/Kodai	Total		Annum	Day
1	Tirunelveli	4,116	76,591	87,356	1,68,063	25209.45	33,613	92
2	Tenkasi	5,346	97,842	44,117	1,47,305	22095.75	29,461	81
3	Thoothukudi	2,041	15,207	40,259	57,507	8626.05	11,501	32
4	Kanyakumari	19,580	24,012	212	43,804	6570.6	8,761	24
5	Virudhunagar	618	64,568	17,595	82,781	12417.15	16,556	45
6	Sivagangai	537	1,84,267	3,512	1,88,316	28247.4	37,663	103
7	Madurai	2,699	1,34,887	28,330	1,65,916	24887.4	33,183	91
8	Theni	2,633	26,844	7,191	36,668	5500.2	7,334	20
				Total	8,90,360	1,33,554	1,78,072	488

Source: Agricultural Statistics 2019-2020 Datasheet Table Submitted by the Firm

6.14 POWER REQUIREMENT

- The Indicative power requirement for the proposed grain based distillery project is provided as per the table given below,

TABLE 43 : POWER REQUIREMENT DETAILS

Power requirement	Operating in kwh	Connected in kwh
Liquefaction Section	160	290
Fermentation Section	500	580
Distillation Section (RS)	130	270
MSDH Section	60	120
Integrated Evaporation Section and DCC	350	450
DWGS Dryer	610	620
Decantation (including Decanter centrifuge)	180	245
Alcohol Storage	45	90
Evaporation Condensate Treatment Plant	180	310
Utilities: Cooling Towers, Air Compressor	700	1000
Grain Storage, Handling & Milling Section	790	890
Total Power	3705	4865
Total Consumed Power requirement (KWH)	~ 2480- 2580	
For above scope - for motor on continuous operation		

- As per the quotation submitted the power requirement will be 4865 KW and will be met from own captive power generation (40 TPH boiler which will run T.G set of 4.6 MW capacity) and the same has been taken for ITCOT's assumption.

- Proposed unit will have 1250 kVA x 2 nos. DG sets will be used only as standby during power failures.

6.15 CHEMICALS REQUIREMENT

6.15.1 Based on the quotation submitted, the chemicals requirement is estimated as follows:

TABLE 44 : CHEMICALS REQUIREMENT

Chemicals	Number of Kgs per KL of total spirits
Sulphuric Acid	0.25
Urea	0.50
Diammonium Phosphate (DAP)	0.50
Antifoam	0.25
Alpha Amylase	0.50

Chemicals	Number of Kgs per KL of total spirits
AMG 300L	0.50
Yeast	1.00

6.16 PLANT & MACHINERY DETAILS

6.16.1 The list of Plant and Machineries as per the quotations/purchase orders submitted by the Firm are as follows,

TABLE 45 : PLANT AND MACHINERY DETAILS

S.No.	Description	Capacity	Qty.
1	EOT Crane	10 Ton	1 No.
2	DG Set	1250 KVA	2 Nos.
3	Global Series Screw Air Compressor, Refrigerant air dryer, Vertical air receiver, Pre filter	-	1 Set
4	Fire Protection & Detection System for 160 KLPD Grain Distillery	-	1 Set
5	Supply of Coal & Rice Husk Handling System for 160 KLPD Grain based ethanol plant	-	1 Set
6	Water Treatment Plant (WTP)	-	1 Set
7	Sewage Treatment Plant (STP)	20 KLD	1 Set
8	Steam Turbine Generator set along with associated Auxiliaries	4.6 MW	1 Set
9	AFBC Boiler	40 TPH	1 Set
10	Precast Concrete Eco Chimney	50m	1 No.
11	Cooling tower	800 CMH	1 No.
12	Weigh Bridge BMI with guide rails & stamping	60 Ton	1 No.
13	CO_2 Plant	80 MT/Day	1 No.
14	**Electricals works and equipments**	-	Full Set
a	Design, Engineering, Supply & Commissioning of Electrical System for 160 KLPD Ethanol Plant		
b	HT Switch Boards		
c	Transformers		
d	LT Busducts		
e	LT Switch Boards		
f	Lighting & Earthing System		

6.17 DATA, ASSUMPTION AND DESIGN PARAMETERS

6.17.1 The Data, Assumptions and design basis for the distillery/ethanol plant from grain based project is explained as follows,

TABLE 46 : DESIGN BASIS FOR THE DISTILLERY PLANT

Parameter	Details
Grain Flour	Enzymatically Convertible Starch Content

Parameter	Details
Pre-Cleaned Grain Flour (One raw material at a time)	100% Broken Rice Flour with Enzymatically convertible starch content of min. 68 % w/w Or
	100% Corn/Maize Flour with enzymatically convertible starch content of min. 60 % w/w.
Thin slop recycle to Liquefaction section	Min. 20% Recycle
Alcohol Concentration in Fermented Wash - Corn flour	Min 13 % v/v
Alcohol Concentration in Fermented Wash - B. Rice flour	Min 14 % v/v
Product	
Absolute Alcohol (AA) / Ethanol	160 Kilo Liters per Day (KLPD) with min. 99.8% v/v Alcohol concentration
Yield	
Liter of Total Spirit Alcohol (95% v/v) per MT Broken Rice Grain Flour with 68% w/w Enzymatically convertible starch	466 Lit / MT
Or	
Liter of Total Spirit Alcohol (95% v/v) per MT Maize/Corn Flour with 60% w/w Enzymatically convertible starch	411 Lit / MT

Note: The above is based on technical data of EPC. However for ITCOT's TEV study, the yield of ethanol and rectified spirits is considered based on assessments/analysis (Grain starch % and alcohol yields) of Vasantdada Sugar Institute, Maharastra.

Note:

- ✓ Starch content in Grain Flour shall be estimated with Enzymatic Hydrolysis method and the efficiencies given above are based on such convertible starch content in the Flour.
- ✓ Plant and products capacity, yield, overall plant efficiency is subject to input quantity and specifications as specified in respective section, any variation in the same will affect plant overall performance.

6.18 INPUT REQUIREMENTS

6.18.1 **Feed Stock** - Grain Flour

TABLE 47 : INPUT REQUIREMENT DETAILS

Input Material	Basis	Quantity
Clean Grain Flour	Convertible Starch Content % w/w	TPD
100% Broken Rice as Flour Feed	68% w/w (Min)	~366-367 MT Flour
Or		
100% Maize/Corn as Flour Feed	60% w/w (Min)	~415-416 MT Flour
Steam requirement	Broken Rice Flour @ 68% w/w Starch as Feed	Maize/Corn Flour @ 60% w/w Starch as Feed
AA Case - Liquefaction + MPR Distillation + MSDH Section (Wash to AA) + Integrated Thin Slops Evaporation +Dryer	3.5 kg/Lit of TS	3.8 kg/lit of TS
Water requirement	Treated water requirement Without recycle of stream in m3/day	Treated water requirement With recycle of stream (at steady state plant operation) m3/day
Process water	1090 - 1100	210 - 220
Soft water for Cooling Tower makeup, Pump sealing, FO Decanter	950 - 960	460 - 470
TOTAL	**2040 - 2060**	**670 - 690**
Cooling water requirement		Rated Heat duty Mega Cals / hr
Fermentation		2000
Liquefaction, Distillation (Wash to RS) & Evaporation, MSDH		12800
Chemicals requirement		kg/day
Concentrated Sulphuric Acid		As per process requirement
Caustic (Lye - 48 %w/w)		
Urea (46 % w/w Nitrogen)		
Chemicals required for Evaporation CIP		
Chemicals for Process condensate treatment		
Enzyme requirement		kg/day
Liquefying Enzyme		As per Process Requirement
(240 KNU or other enzyme with equivalent strength)		
Saccharifying Enzyme		
(750 AGU KNU or other enzyme with equivalent strength)		
Yeast requirement		kg/day
Active Dry Yeast (ADY) (Lallemand, Fali)		As per Process Requirement

Note: The above is based on technical data of EPC. However, For ITCOT's TEV study, the raw material requirement is assessed based on (Grain starch % and alcohol yields) of Vasantdada Sugar Institute, Maharastra.

Note:

- ✓ Quantities mentioned above are with the consideration of steady state operations at rated capacity and any process disturbance will impact consumption figures.
- ✓ Requirement of power indicated above is subject to variation and will be confirmed after detailed engineering.
- ✓ Quantities of Process water & soft water requirement with recycle stream mentioned are considering spent lees, thin slop & Process Condensate recycle.
- ✓ Steam for sterilization of fermentation section is required during start-up, as and when required. Steam consumption is net without any heat losses and CIP Margin.
- ✓ Requirement of various chemicals will be confirmed after basic and detailed engineering.

6.19 INPUT SPECIFICATIONS

6.19.1 **Feedstock** – Grain Flour

Clean grain should be free from Fermentation Inhibiting substance and micro-organism producing side products, sand and other foreign particles. The raw material should be of quality as mentioned below:

TABLE 48 : INPUT SPECIFICATION DETAILS

Parameter	Unit	Broken Rice	Maize
Convertible Starch	% w/w	68	62
Moisture Content	% w/w	10	12
Other Solids	% w/w	22	28
Total Solids	% w/w	90	88

6.19.2 Utility Specifications

i. Steam Specifications:

- Dry, Saturated, De-superheated & Regulated Steam should be available at the inlet of steam header as per details given below with respect to battery limits.

- **Liquefaction Section:** Steam pressure should be 3.5 kg/cm2 g +/- 0.05 at temperature of 1480C at the inlet of steam header in Liquefaction section.
- **MPR Distillation Section:** Steam pressure should be 3.5 kg/cm2 g +/- 0.05 at temperature of 1480C the inlet of steam header in distillation section.

- **DDGS Dryer Section:** Steam pressure should be 3.5 kg/cm2 g +/- 0.05 at temperature of 1480C the inlet of steam header in Dryer section.

ii. Electricity:

- Supply condition - 3 phase/ 4 wires

- Voltage - 11 KVA / 415 V AC

- For control system: 230 V, 50 Hz (3), 1-phase, 2-wire supply

iii. Water Specifications:

- **Process water:** (Dilution water in Fermentation / Liquefaction, CO2 Scrubber water, Air blower sealing water etc.)

TABLE 49 : PROCESS WATER SPECIFICATION DETAILS

S.No.	Parameter	Unit	Value
1	pH	-	06-Sep
2	Chloride (Cl-) (Expressed as NaCl)	mg/lit	< 250
3	H2S	mg/lit	Nil
4	Residual free chlorine	mg/lit	< 1
5	Silica (SiO2)	mg/lit	<30
6	Turbidity	NTU	<5
7	Total germs	Nos./ml	<60 CFU
8	Coliform Bacteria	Nos./ml	Nil
9	E. Coil	Nos./ml	Nil

- **Soft water:** For Cooling tower make up, Dilution water for fusel oil decanter, Alcohol scrubber water, & pump sealing etc.

TABLE 50 : SOFT WATER SPECIFICATION DETAILS

S.No.	Parameter	Unit	Value
1	pH	-	06-Sep
2	Chloride (Cl-) (Expressed as NaCl)	mg/lit	< 10
3	H2S	mg/lit	Nil
4	Residual free chlorine	mg/lit	< 1
5	Silica (SiO2)	mg/lit	< 10
6	Total Hardness (Expressed as CaCO3)	mg/lit	< 2
7	Turbidity	NTU	< 3
8	Total Dissolved Solids	mg/lit	<300

6.19.3 Chemical Specifications

The Specification and Consumption Details for Auxiliary and Chemicals required are as below:

a. Urea:

- Urea is used as nutrient to supplement Nitrogen source to maintain desired level of FAN (Free Amino Nitrogen) content in the Fermented Mash.

- The consumption of Nutrient depends on the FAN (Free Amino Nitrogen) content in Feed Stock.

TABLE 51 : UREA SPECIFICATION DETAILS

S.No.	Parameter	Unit	Value
1	Nitrogen	% w/w (Min)	46
2	Moisture	% w/w (Max)	0.5
3	Arsenic	% w/w (Max)	0.0001
4	Iron	% w/w (Max)	0.01
5	Lead	% w/w (Max)	0.001

b. Sodium Hydroxide (Caustic Lye):

- Sodium Hydroxide is used in CIP solution for CIP of Yeast Propagator, Pre-fermentation vessels, Fermenters and beer well.

- Consumption of Sodium Hydroxide Lye depends on the Frequency of Cleaning.

TABLE 52 : SODIUM HYDROXIDE SPECIFICATION DETAILS

S.No.	Composition	Unit	Concentration
1	Sodium carbonate (as Na2CO3)	% w/w (Max)	2
2	Sodium Hydroxide (as NaOH)	% w/w (Min)	50

c. Active Dry Yeast (ADY):

- **Make:** Lallemand, Fali

6.20 OUTPUT GENERATION

TABLE 53 : OUTPUT GENERATION DETAILS

Output	Unit	Quantity
Main Product		
Absolute Alcohol (AA) - Ethanol	KLPD	160
Impure Spirit		
Wash To A.A. Mode	% of TS	1% (Max.)
DDGS Generation		
DDGS Generation for Broken Rice @ 10% w/w Moisture (Theoretical)	MT/Day	88 - 90 MT @ 88-90 % w/w Solids
Or		
DDGS Generation Corn @ 12% w/w Moisture (Theoretical)	MT/Day	127-129 MT @ 88-90 % w/w Solids
Bi-product generation		
CO2 (Theoretical)	MT/Day	124 - 125
Steam condensate	Return from Distillation Plant	80 % of Total Steam Consumption will be available as Steam Condensate @ min. 55 Deg. C
Dryer Vapor Vent Qty.		As Applicable

Note:

- ✓ Above mentioned DDGS quantities are theoretical. Actual quantities & solids content will be confirmed after detailed engineering.
- ✓ Depending on the feedstock quality, the desired final product quality may vary slightly.
- ✓ The Generation mentioned above of CO2 and DDGS is theoretical & may vary depending upon input feed characteristics, operating conditions etc.

6.21 PERFORMANCE PARAMETERS

6.21.1 The following are the performance parameters that are expected from the plant.

TABLE 54 : EXPECTED PERFORMANCE PARAMETERS OF THE PLANT

Parameter	Details
Product capacity	
Absolute Alcohol (A.A.) with 99.8% v/v conc.	160 Kilo Liters per day (KLPD)
Steam consumption	
Liquefaction, Distillation, MSDH (Wash to AA mode) Integrated Evaporation, DWGS Dryer (Broken Rice)	3.5 Kg/Lit Of Total Spirit ~25 TPH
Or	
Liquefaction, Distillation, MSDH (Wash to AA mode) Integrated Evaporation, DWGS Dryer (Maize / Corn)	3.8 Kg/Lit Of Total Spirit ~27 TPH
Yield	
Liter of Total Spirit (95% v/v)/MT Broken Rice Flour with 68% w/w Enzymatically convertible starch	466 Liters / MT Flour
Or	
Liter of Total Spirit (95% v/v)/ MT Maize/Corn Flour with 60% w/w Enzymatically convertible starch	411 Liters / MT Flour

Note: The above is based on technical data of EPC. However for ITCOT's TEV study, the raw material requirement and alcohol yield levels are considered based on (Grain starch % and alcohol yields) assessments/analysis of Vasantdada Sugar Institute, Maharastra.

Note:

- ✓ All rated capacities are expected under steady state condition of the plant and utilities and un-interrupted supply of utilities.
- ✓ The steam consumption is net, without any heat loss & without any CIP Effluent.
- ✓ Convertible starch is calculated by enzymatic hydrolysis method.
- ✓ Performance also depends on operating conditions, such as temperature, pressure and suspended solids level in the effluent.
- ✓ During commissioning of the plant / stabilization of the process, the client shall ensure continuous supply of power, all utilities such as chemicals, water, skilled manpower and qualified supervisors.

6.21.2 **Absolute Alcohol (AA)**

TABLE 55 : DETAILS OF ABSOLUTE ALCOHOL

S.No.	Parameter	Unit	Value
1	Relative Density at 15.6 deg C	% v/v	Max. 0.7961
2	Ethanol content including congeners/impurities at 15.6 deg C		Min. 99.80

Note: Constant Availability of inputs like feed and utilities at desired specifications are essential for the consistent quality of alcohol.

6.22 TECHNICAL SPECIFICATIONS OF BOILER

6.22.1 Parameters mentioned below are based on performance guarantee fuel / design fuel firing.

TABLE 56 : STEAM BOILERS DESIGN DETAILS

S.No.	Parameters	Units	Values
1	**Boiler Type**		**AFBC**
	Number of Boilers	Nos	1
	Capacity		
1.1	Boiler Maximum Continuous Rating [BMCR] at Main steam stop valve.		
	(Gross Capacity)	TPH	40
1.2	Maximum steam flow for half hour in an eight hour shift	% BMCR	110
2	**Pressure**		
	Steam Pressure at main steam Stop valve outlet at BMCR Load		
2.1		Kg/cm2 (g)	45
3	**Temperature**		
3.1	Steam temperature at main steam Stop valve outlet at BMCR Load	Deg C	445 ± 5
3.4	Steam temperature control range	% BMCR Load	60 – 100
3.5	Feed water temperature at Deaerator outlet at BMCR Load	Deg C	105
3.6	Feed water temperature at economizer inlet at BMCR Load	Deg C	105
3.7	Flue gas temp. leaving Air pre heater while firing performance guarantee fuel at BMCR Load	Deg C	< 150

S.No.	Parameters	Unit	Values
1	**Site location**		Gangaikondan, Tirunelveli
2	**Temperatures**		
	Maximum	°C	45
	Minimum	°C	20
	For Performance	°C	35

S.No.	Parameters	Unit	Values
	For electrical design	°C	50
3	Insulation		Max. Ambient + 20 Deg C subject to considering the wind velocity as 1 m/s for indoor and 5 m/s for outdoor
4	**Relative humidity**		
	For Performance	%	60
	Maximum	%	CTS
	Minimum	%	CTS
5	**Rainfall**		
	Average intensity of rainfall per year	Mm	CTS
6	**Seismic design**		As per IS 1893
7	Site Altitude above mean sea level	MSL	CTS
8	**Wind data**		
	Wind Velocity (Max.)	M/S	As per IS 875
	Wind Direction		CTS
	Design wind pressure	daN/Sq.m	CTS
9	**Soil Data**		
	General nature		CTS
	Bearing capacity and depth	T/m2	CTS
	Soil Foundation Factor		CTS
10	**Ground water table from ground level**		CTS
	Minimum	Mtrs	
	Maximum	Mtrs	
11	**Snow load**	KN/m2	CTS
12	Area classification		Safe & Non Hazardous
13	Environment		Non Corrosive
14	Boiler location		Semi Out door
15	**Major codes**		
	Design		IBR
	Pressure parts		IBR
	Piping		IBR
	Fans		As per vendor
	Process valves		IBR
	Boiler performance testing		According to guidelines of ASME] PTC 4.0, Energy balance method.
			Radiation and surface convection loss shall be as per ABMA chart
	Structural design code		Seismic and wind load as per IS , design as per IS808 and rolled section as per IS808
	FANS		Indian/ international standards as per TBWES approved vendor
	PUMPS		Indian/ international standards as per TBWES approved vendor
	Process Valves		IBR
	Safety Valves		IBR
16	**Inspection**		
	Pressure parts		IBR
	Stage wise inspection		As per TBWES QAP

S.No.	Parameters	Unit	Values
	Final dispatch inspection		TBWES
	Non pressure parts & Bought out equipment		As per agreed QAP
	Stage wise inspection		TBWES
	Final dispatch inspection		TBWES

6.23 TECHNICAL SPECIFICATIONS OF TURBINE

TABLE 57 : TECHNICAL SPECIFICATIONS OF TURBINE

Particulars	Specification Details
Nominal Capacity	4.6 MW
Speed	8000 Rpm
Inlet Steam Parameters	65 ata & 480°C
Power Generation with Boiler Generating 31.36 TPH of steam for Broken Rice	3.38 MW
Power Generation with Boiler Generating 33.0 TPH of steam for Maize	3.55 MW
Generation Voltage	11,000 V

6.24 TECHNICAL SPECIFICATIONS OF DG SET

6.24.1 Diesel engine with PC3.3 Controller developing 1470 BHP at 1500 RPM, complete standard accessories coupled to "STAMFORD" Alternator rated at 1000 KW/1250 KVA at 415V mounted on with Channel iron Base Frame complete with Fuel tank of 990 Litres Capacity and 12V Batteries, Acoustic Enclosure and Manual Panel.

TABLE 58 : DG SET SPECIFICATION

S.No.	Generator set specifications	
1	Power Rating KVA	1250
2	Output Voltage and Frequency	415 Volts, 50 Hz
3	Power Factor	0.8 (lag)
4	No. of phases	3 phase
5	Quantity	2

6.25 MAN POWER

6.25.1 The estimated nos. of manpower (skilled & unskilled) required for the operation of the proposed project is listed as follows,

TABLE 59 : MAN POWER DETAILS

Description	Nos.
General Manager (Distillery Operations)	1
Production Manager	1
Manager Utilities	1
Manager Purchase & Sales	1
Sr. Engineer Maintenance	1
Accounts Manager	1
Sr.Engineer (Quality Control)	1
Sr.Engineer (Process Operation)	4
Sr.Engineer (Utilities)	4
Officer - Procurement	1
Technician Mechanical	2
Technician Electrical	2
Accounts Officer	2
Administrative Officer	1
Designer	1
Safety Officer	1
Supervisor - Instrumentation	4
Supervisor - TG area & Electricals	3
Plant Operator - Boiler	4
Plant Operator - Grain Handling & Liquifaction	4
Plant Operator - Fermentation	7
Plant Operator - Distllation & Evaporation	4
Plant Operator - Decantation & Dryer	4
Plant Operator - Auxilary Systems	7
Operator - Product Loading & Unloading	3
Lab Chemist	3
Store Keeper	1
Total	**69**

7.0 STATUTORY APPROVALS AND COMPLIANCES

7.1.1 Every organisation has to abide by certain rules and regulations set forth by various statutory agencies in the country. The status of various registrations, approvals/clearances as per the information gathered from the Firm is tabulated as below:

TABLE 60 : LIST AND STATUS OF STATUTORY APPROVALS

S.No	Regulation	Authority	Remarks
A	**FIRM**		
1.	Certificate of incorporation	Registrar of Companies, Chennai	**LLP Identification Number:** AAY-4598
2.	Permanent Account Number	Income Tax Department, GOI, India	**PAN:** AATFN1197L
3.	GSTIN	GoI	**GST:** 33AATFN1197L1ZO
4.	Importer Exporter Code (IEC)	Ministry of Commerce and Industry, GoI	To be obtained before import of goods
5.	Industrial Entrepreneur Memorandum (IEM) for distillery	Department for Promotion of Industry and internal trade, Ministry of Commerce and Industry, Government of India	**Ref No:** IEM/A/ACK/1552/2021, Dated **13.10.2021**
6.	Registration with Employees' State Insurance Corporation for Firm's employees	Regional Office, Employees State Insurance Corporation, Tamil Nadu	To be obtained when 10 or more persons employed in such establishment and the beneficiaries monthly wage does not exceed Rs.21,000 are covered under the scheme.
7.	Registration with Employees Provident Fund Organization for Firm's employees	Regional Provident Fund Commissioner, Employees' Provident Fund Organization, GoTN	The Firm has to obtain, if the establishment engages 20 or more persons with monthly salary less than Rs.15,000.

S.No	Regulation	Authority	Remarks
B	**PROJECT APPROVALS**	**PRE CONSTRUCTION**	
1.	NOC for establishment of factory	Gram Panchayat	To be obtained before commencement of construction work
2.	Environmental clearance	Ministry of Environment, Forests & Climate Change and State Level Environment Impact Assessment Authority (SEIAA)	To be obtained before commencement of construction work
3.	Approval to establish Grain based Distillery Plant (Single Window Clearance)	Commissioner for Industrial Development and Director of Industries & Commerce	To be obtained before commencement of construction work
4.	Expression of Interest for signing long term bipartite agreement with OMC*	Procurement Leader - Bio fuels & MIS, CPO (Marketing), Bharat Petroleum Corporation Limited	To be obtained before commencement of financial closure (Bank sanction for term loan)
5.	Signing long term bipartite agreement with OMC*	Procurement Leader - Bio fuels & MIS, CPO (Marketing), Bharat Petroleum Corporation Limited	To be obtained before commencement of financial closure (Bank sanction for term loan)
6.	Building Approval for distillery	Local Authority and Chief Inspector of Factories, Tamil Nadu	To be obtained before commencement of construction work
7.	Approval for Water Supply by SIPCOT	SIPCOT Project Officer, Gangaikondan	**Agreement No.** AY740632 **dated:** 30.12.2021, Approval for supply of 11,00,000 LPD on a 16 hours daily basis from the OHT of SIPCOT Gangaikondan.

S.No	Regulation	Authority	Remarks
8.	Certificate of Registration under contract Labour Act	Assistant Commissioner of Labour, department of Labour, GoTS	To be obtained when 20 or more workmen are employed on any day of the preceding 12 months as contract labour.
9.	Consent for establishment from pollution control u/s Section 21 of the Air (Prevention and Control of Pollution) Act, 1981 for distillery project	Tamil Nadu State pollution control Board	To be obtained before commencement of construction work
10.	Consent for establishment from pollution control u/s Section 25 of the Water (Prevention and Control of Pollution) Act, 1974	Tamil Nadu State pollution control Board	To be obtained before commencement of construction work
11.	NOC from Fire and Rescue Services	Tamil Nadu State Fire & Emergency Services	To be obtained before commencement of construction work
12.	Height clearance for Chimney	Airports Authority of India	To be obtained before commencement of construction work
C	**PROJECT APPROVALS**	**PRE CONSTRUCTION**	
13.	Consent to operate from pollution control u/s Section 21 of the Air (Prevention and Control of Pollution) Act, 1981	Tamil Nadu State pollution control Board	Will be obtained before the commencement of commercial production
14.	Consent to operate from pollution control u/s Section 25 of the Water (Prevention	Tamil Nadu State pollution control Board	Will be obtained before the commencement of commercial production

S.No	Regulation	Authority	Remarks
	and Control of Pollution) Act, 1974		
15.	Factories license	Inspector of Factories	Will be obtained before the commencement of commercial production
16.	Fire license for distillery unit	Director of Fire & Rescue Services	Will be obtained before the commencement of commercial production
17.	Boiler License	Inspectorate of Boiler, Government of Tamil Nadu	Will be obtained before the commencement of commercial production
18.	Power supplying electricity to the unit	Tamil Nadu State Power Generation Corporation Limited	To be obtained before commencement of construction work
19.	Calibration of all Storage Tanks	Department of legal metrology, Tamil Nadu	To be obtained before commercial production
20.	Stamping of Weighbridges	Department of legal metrology, Tamil Nadu	Will be obtained before the commencement of commercial production
21.	Approval for proposed petroleum storage	Petroleum & Explosives Safety Organisation (PESO), Nagpur	Will be obtained before the commencement of commercial production
22.	Approvals of electrical installations	CEIG, GoTN	Will be obtained before the commencement of commercial production

7.1.2 The Firm/project promoters have to obtain all such clearances/ approvals/ licenses as may be required from time to time for establish the project.

8.0 TENTATIVE IMPLEMENTATION SCHEDULE

8.1 TIMELY IMPLEMENTATION

8.1.1 A proper planning perceived from the initial stages of implementation and an implementation schedule based on progress over timeline at every stage of execution, are rendered imperative to reduce the bottlenecks and time taken for implementation.

8.1.2 The timely implementation of project requires meticulous planning, scheduling, monitoring of various activities to realize the project goals within the budgeted time and cost. Financial arrangements for timely disbursements will also be an important element in achieving the goals.

8.1.3 After an investment decision has been taken and necessary statutory clearances are obtained, project development activities should be taken up concurrently.

8.2 STRATEGY FOR TIMELY PROJECT EXECUTION

8.2.1 It is important to commission a team of experienced personnel for project execution and select external agencies with due care for rendering the services and supply of equipment for the project. The project activities must be identified, planned and scheduled and the progress is monitored for timely project implementation. All the inputs to the project including financial resources must be identified and their inflow needs to be planned and arranged in time. The project must be managed professionally with necessary coordination among the various agencies and requisite decisions need to be taken promptly.

8.2.2 In short, the following key factors would constitute the strategy for timely execution of all activities in the pre-determined manner.

- Early selection of an effective in-house technical team by the Firm, headed by a Project Manager for planning and executing the project
- Proper choice of external agencies such as material suppliers, Construction Agencies etc., keeping in view their reputation/past performance and working experience in their fields
- Adequate use of modern techniques for project planning, scheduling and monitoring
- Establishment of an effective monitoring and reporting procedure for progress review and coordination

- Computer based monitoring of cash outflow scheduling and cost accounting / control.

8.3 TENTATIVE IMPLEMENTATION SCHEDULE

8.3.1 Major activities and the timelines for the proposed **Grain based distillery / Ethanol plant with an installed capacity of 160 KL per day** are detailed in the table below:

TABLE 61 : TENTATIVE IMPLEMENTATION SCHEDULE

Component/Activity	Month	Remarks
Land Procurement	Already Acquired on 24.12.2021	21.77 acres at SIPCOT Industrial Estate, Gangaikondan, Tirunelveli District
Submission of application to DFPD	Already applied	Status approved by DFPD
In-principle approval from DFPD	Status approved & Distillery code issued (TN2730) by DFPD for 160 KLPD	On line application to be submitted to DFPD after Environmental Clearance to avail Interest subvention scheme as Per notification of Ministry of Consumer affairs, Food and Public Distribution dated 22.04.22.
Financial closure		3 months from in-principle approval from DFPD
Completion of EIA study & apply for Enivironmental Clearance	April'22	Pre- Feasibility Study has been conducted by Enviro Care India Ltd. The EIA report has been uploaded in Parvesh Portal in April' 22 month for approval.
Receipt of Environmental Clearance	June'22	This project Being a Zero discharge Grain Based Fuel ethanol project falls under Category B. Also MOEF has given special priority and speedy approval for this project as per the MOEF notification dated 16th June'2021.
Submission of application to OMCs	June'22	Towards Tri-partite Agreement
Execution of Tri-partite Agreement	July'22	Project Proponent + Bank + OMC before disbursement of sanctioned loan.
First disbursal of loan	July'22	After availing In principle letter from DFPD & Environmental clearnce and Tri-partite agreement
Start date of civil works	June'22	Civil Contractor has already been finalised
Placement of order for	April'22 - June'22	- Already Placed order with Thermax &

Component/Activity	Month	Remarks
Plant & Machinery		Siemens for Boiler & Turbine in the April'22. - Negotiation is in process with Praj Industries for Distillery plant and will be finalised during April'22 and Order will be placed. - An interim advance of Rs1.0 Crorepaid to Praj to provide detailed Engineering drawing for preparing Civil works.
Completion date of civil works	March'23	
Receipt of Plant & Machinery at site	July'22 - March'23	- Distillery machineries supply will commence from July'22. - Boiler & turbine related machineries will commence from September'22 onwards.
Erection & commissioning of Plant & Machinery	September'22 - May'23	
Trial run and training of staff	June'23	
Commencement of Commercial Operations	July'23	**12 months from first disbursal of loan (July 2022)**

Note:

Ministry of Environment, Forest and Climate Change Notification, New Delhi, dated 16th June 2021, has notified that the Grain based distilleries producing ethanol projects falls under **Category B2** due to **Zero Liquid Discharge (ZLD)**. For projects who file application for grant of EC upto 31st March 2024 or till further notification whichever is earlier provided that any subsequent amendment or expansion or change in product mix after 31st March 2024, shall be considered as per the provisions inforce at that time.

8.3.2 Considering the progress made so far, time line and procedures involved in obtaining approvals, sourcing of the Plant and machinery, construction etc., ITCOT is of the opinion that the commercial productions could be expected to commence on or before **01st July 2023.**

8.3.3 The Firm has to work on strict timeline and to speed up the activities to avoid any cost and time-over run considering Covid Pandemic limitations. Bank may appoint Lenders Independent Engineer (LIE) to monitor the progress of the project and to ensure that there is no cost and time overrun.

9.0 SWOT ANALYSIS

The study of SWOT analysis shows that the 'strengths' and 'opportunities' far outweigh 'weaknesses' and 'threats'. Strengths and opportunities are fundamental and weaknesses and threats are transitory.

9.1 STRENGTHS

9.1.1 The partners of the Firm are having adequate business acumen to establish and run the project.

9.1.2 The firm has long-term leased land for the proposed project located within in Industrial area developed by Govt. of Tamil Nadu in the backward area.

9.1.3 Financial Assistance scheme support from Govt of India for establishing Ethanol plant.

9.1.4 The distilleries based on grain will emit no pollutants, can run for 300 to 350 days in a year and there is adequate grain availability in the area of operation proposed.

9.1.5 The Firm has proposed to engage Praj Industries Limited, Pune as their EPC contractor for Engineering, Supply, Erection & Commissioning of the proposed 160 KLPD grain based distillery project. Praj Industries has proven track record of more than 35 years in building Ethanol Plants across the globe. It is one of the Technologies cum Project Firm in India having experience of handling all type of 1G feedstock including Rice/Corn/Bajra/Jawar and designing /delivering large capacity plants more than 500 KLPD.

9.1.6 Favourable policy regime for ethanol / ENA. The National Policy on Biofuels 2018, provides an indicative target of 20% ethanol blending under the **Ethanol Blended Petrol (EBP) Programme by 2030**. Currently petrol with 10% ethanol blend (E10) is being retailed by various Oil Marketing Companies (OMCs) in India, wherever it is available. However, as sufficient quantity of ethanol is not available, therefore, only around 50% of petrol sold is E10 blended, while remaining is unblended petrol (E0). The current level of average ethanol blending in the country is 5% (Ethanol Supply Year 2019-20). Due to several interventions in the supply side of ethanol, the Ministry of Petroleum aims to achieve 10% ethanol blending levels in the Ethanol Supply Year (ESY) – 2021-22 i.e. April, 2022.

9.1.7 Forecasting the demand, even Bharat Petroleum Corporation (BPCL) has expressed interest in setting up an ethanol production plant in the state of Telangana. The proposed a plant of 5,00,000 ltr per day capacity to be set up with an outlay of approximately Rs 1,000 crore. BPCL is planning to set up a 500 kld capacity grain-based 1G Ethanol plant in Telangana which will not only facilitate the production of 1G Ethanol and contribute revenue to the state but also generate huge direct and indirect employment in the state.

9.1.8 Incentives in terms of bonus on supplies shall be extended to suppliers, which shall be supplying quantities to deficit states (i.e. Arunachal Pradesh, Chhattisgarh, J&K, Tamil Nadu, Jharkhand, Odisha, Assam and West Bengal only). Tamil Nadu being the top ethanol deficit states is highly benefited.

9.2 WEAKNESSES

9.2.1 During a failed monsoon, there will be decreased grain availability.

9.2.2 The promoter of the Firm is entering into the manufacturing ethanol business for the first time. They need to appoint technical professionals at all the important departments so that operational issues can be eliminated.

9.2.3 The Firm is yet to sign expression of interest (EOI) with oil marketing companies (OMCs).

9.3 OPPORTUNITIES

9.3.1 National Policy on Biofuels has laid out indicative targets of achieving 20% blending of ethanol in petrol in the whole country by 2025. Increase in ethanol blending further will boost the requirement of fuel ethanol.

9.3.2 The Indirect employment generation includes companies - vendors, suppliers, transporters, raw material procurement agencies, drivers, cattle feed (by-product) manufacturers, CO2 (by-product) users, security personnel, employment agencies, etc.

9.4 THREATS

9.4.1 Changes in Government policies at Centre & State levels.

9.4.2 **OMCs reluctant to sign EOI with ethanol manufacturers**: Reluctance of the oil marketing companies (OMCs) to sign expression of interest (EOI) with ethanol

manufacturers might put a spanner on the Centre's ambitious plan for achieving 20 per cent fuel blending by 2020. The reluctance has stopped ethanol manufacturers – both sugar mills and grain-based – in accessing bank loans in time to start their project.

9.4.3 For banks to sign the tripartite agreements the OMCs should sign bilateral agreements with ethanol manufacturers and the reluctance of the former threatens to derail the whole process.

9.4.4 Delay in Project implementation may increase capital cost (tight monitoring on all project activities will be essential).

10.0 SOCIO-ECONOMIC AND ENVIRONMENTAL BENEFITS

10.1.1 The proposed project will be truly become a role model of zero liquid discharge (ZLD) in the most efficient manner for eco-friendly products like fuel ethanol and ENA. 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 The National Policy on Biofuels 2018, provides an indicative target of 20% ethanol blending under the Ethanol Blended Petrol (EBP) Programme by 2030.

10.1.2 With the implementation of the proposed project, the socio-economic status of the local people will improve substantially.

10.1.3 The following are the other benefits to the area due to the proposed project.

- Educational status will improve in the area
- Medical standards will improve due to the proposed project.
- Overall economic upliftment of socio-economic status of people in the area.
- Ancillary developmental activities like CO2 plant, Cattle feed plants will be created due to the establishment of the proposed unit.

10.1.4 At the National and the State levels, the benefits include reduced emissions, increased tax revenues.

10.1.5 The proposed project offers to achieve improved emission reductions as per target set by Government of India.

10.1.6 The production of ethanol from grains is the best alternative from molasses based ethanol.

- The ZLD (Zero Liquid Discharge) technology is indigenously available.
- Manufacturing of ethanol from grains will also help the farmers to get good prices for their produce in the form of grains.

10.1.7 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.

11.0 MAJOR RISK AND MITIGATION

11.1.1 Risk mitigation planning is the process of developing options and actions to enhance opportunities and reduce threats to project objectives. Risk mitigation implementation is the process of executing risk mitigation actions. Risk mitigation progress monitoring includes tracking identified risks, identifying new risks, and evaluating risk process effectiveness throughout the project.

11.1.2 The major risk factors involved in this distillery project and their mitigation are described below:

TABLE 62 : MAJOR RISK AND MITIGATION

Risk Factors	Remarks
Implementation Risk	The Firm is in the process of identifying key executives with relevant experience in various operational aspects of the proposed Distillery project.
	Since the distillery & ethanol project being implemented on turnkey basis, will reasonably assure completion of the project within the envisaged cost and time.
Operating Risk	The distillery and ethanol project is being implemented on a turnkey basis and will be backed by suitable clauses in terms of warranty and guarantee. As such it is felt that the operating risks would be mitigated to a considerable extent.
	Since the availability of grain is mainly dependent on the supplies from neighboring villages, the Firm has to enter into long term agreements with established traders for continuous supply of requisite quantity of raw material to enable smooth operation of the plant.
Financial Risk	This risk is avoided as the implementation stage starts only after the Financial Closure, which ensures the availability of sufficient funds for the project at all stage of implementation.
OMCs reluctant to sign EOI	The State Bank of India (SBI) issued guidelines-cum-

Risk Factors	Remarks
with ethanol manufacturers: Reluctance of the oil marketing companies (OMCs) to sign expression of interest (EOI) with ethanol manufacturers might put a spanner on the Centre's ambitious plan for achieving 20 per cent fuel blending by 2020. The reluctance has stopped ethanol manufacturers – both sugar mills and grain-based – in accessing bank loans in time to start their project. Industry sources said refusal of the OMCs to sign agreements has caused banks not to finance the projects. Banks have made purchase agreement mandatory for sanction and subsequent disbursement of the loans.	SOP for banks to finance the ethanol projects. During subsequent meetings, SBI had stressed the importance of bilateral agreements between the ethanol manufacturers and the OMCs, which would assure procurement for the entire loan period before the tripartite agreements are signed. However, despite meetings between banks, OMCs and various government departments, the OMCs are yet to sign the agreements with ethanol manufacturers. The Indian Sugar Mills Association (ISMA) has also written to the secretary, ministry of petroleum and natural gas for its intervention in the process.
Natural Calamities	Complete plant needs to be insured and also care has been considered while designing and construction of the plant to minimize the impact.

12.0 FINANCIAL ASPECTS OF THE PROJECT

12.1 COST OF THE PROJECT

12.1.1 The project cost is estimated at Rs. 21,920.00 Lakh including interest during construction and WC margin as detailed below. Project cost has been arrived based on the sale deed document for land, civil estimate for buildings, quotation/purchase orders for machinery etc. provided by the LLP.

TABLE 63 : PROJECT COST DETAILS

Project Cost	Amount
	Rs.lakh
Land cost	344.60
Building & Civil works	3,946.87
Plant & Machinery	14,227.52
Electricals	1,486.80
Other Assets	40.00
Vehicles	15.00
Deposits	50.00
Pre operative expenses incl IDC	771.33
Preliminary expenses	5.00
Contingencies	394.32
Working Capital Margin	638.55
Total	**21920.00**

12.1.2 The LLP has submitted supporting documents (sale deed documents for land, civil estimate for buildings, Quotations/Purchase Orders for machinery etc.) for 96.43% of the hard cost.

12.1.3 In case of project cost overrun, the Promoters have indicated that they will bring the requisite funds/capital buffers to meet the project cost overrun.

12.1.4 The project costs of some of the other Greenfield distillery projects (grain based) are given in the following table:

TABLE 64 : PROJECT COST OF OTHER DISTILLERY PROJECTS

Firm	Installed Capacity	Product Mix	Project location	Year of execution	Project cost excluding land cost	
	(KL of alcohol per day)				Rs.Cr	Rs.Cr per KL
RDS Biofuels Pvt Ltd	100	Ethanol, DDGS (Dry	East Champaran (Motihari), Bihar	2021-22	171.71*	1.71

Firm	Installed Capacity	Product Mix	Project location	Year of execution	Project cost excluding land cost	
	(KL of alcohol per day)				Rs.Cr	Rs.Cr per KL
		cake) & Carbon Dioxide				
Sathish Sugars Ltd	60	Ethanol, Impure spirit, DDGS (Dry cake)	Belagavi, Karnataka	2020-21	83.70**	1.4

*100 KLPD Grain Based Ethanol Plant & 3.0 MW Co-generation Power Plant.

**This distillery project is executed in the existing vacant land of sugar mill premises. Cogen plant of the existing sugar mill will be utilized for the new distillery also. Hence this project cost doesn't include cost of land and cogen plant.

12.1.5 Considering the above table, the proposed project cost (excluding land cost) of Rs. 21,575.40 lakh (@ Rs.1.35 Cr per KL) for the installed capacity of 160 KLD of ethanol is reasonable.

12.2 LAND

12.2.1 Total area of land acquired for setting up of this project is **21.77 Acre**. The land parcel for the proposed project is located at Plot Nos. C-107, C-108, C-109, C-110, C-111, C-112 & C-113, SIPCOT Industrial Park, Gangaikondan Village, Tirunelveli District, Tamil Nadu - 627352.

12.2.2 The LLP has shared (99 years long term period) lease deed documents for the entire land already acquired. As per lease deed documents, the plot cost is Rs.217.70 lakh. The summary of estimation of land cost is as follows:

TABLE 65 : LAND COST DETAILS

Land Cost	Total Cost Rs.lakh
Total land cost for entire extent of land	217.70
Registration , stamp duty charges	13.06
Add: Expenditure incurred by SIPCOT for road formation, box culvert, plants & fencing done at the park and road	22.54
Sub Total	**253.30**
Land Development Works (including GST)	91.30

Land Cost	Total Cost Rs.lakh
Land and Land development cost	**344.60**

12.2.3 The LLP has shared the civil estimate dated 25.04.2022 for the land development cost from R Karunanidhe Constructions P Ltd, Coimbatore. Based on the above, the total land (including registration & stamp duty charges) and land development cost is estimated as **Rs. 344.60 Lakh**.

12.3 BUILDING & CIVIL WORKS

12.3.1 The total cost of building & civil works is estimated at **Rs. 3,946.87 Lakh**. The LLP has shared the civil estimate dated 25.04.2022 for the same from R Karunanidhe Constructions P Ltd, Coimbatore.

12.3.2 The cost of construction per sqft works out to **Rs. 1,891.15 per sqft**. The built up area of factory building is 208702 sq.ft. The breakup of the cost of building & civil works is given in the financial annexure.

12.4 PLANT AND MACHINERY

12.4.1 The Main Plant and Machinery for this project will be Grain Milling Section, Liquefaction, Fermentation Section, Multi Pressure Vacuum Distillation, DDGS Dryer, Condensate Polishing Unit, Normal AFBC Boiler 1x40 TPH Pressure, Extraction cum Condensing Steam Turbine – 4.6 MW along with condenser and controls, Weigh bridge, etc.

12.4.2 The total cost of Plant & Machinery for main distillery sections (including packing, forwarding & transportation, transit Insurance, supervision, erection and commissioning etc) is estimated at **Rs.8496.00 lakh**. The LLP has shared turnkey estimate from M/s. Praj Industries Limited, Pune. **Signed Final Turnkey agreement will be submitted by the LLP to Bank directly.**

12.4.3 The cost of balance of plant is estimated as Rs. 5,671.52 lakh. The LLP has submitted the requisite quotations/purchase orders for the same. The LLP has issued purchase orders for boiler and turbine. The total cost of plant & machinery for main distillery sections and also balance of plant is estimated as **Rs. 14,227.52 Lakh**. The breakup of the plant and machinery cost is given in the financial annexure.

12.5 ELECTRICALS

12.5.1 The total cost of electricals (Electrical equipment & installation, DG Set etc.) is estimated at **Rs.1,486.80 Lakh**. The LLP has shared the requisite quotation from Siemens, Chennai.

12.6 PRE-OPERATIVE EXPENSES

12.6.1 From the project inception to commissioning stage, various expenditures are incurred like interest during construction, statutory approvals fees, consultancy fees, administrative expenses, etc., as per the requirement of the project. The Pre-operative expenses are estimated at **Rs.771.33 Lakh** as in below table.

TABLE 66 : PRE-OPERATIVE EXPENSES

Particulars	Rs.lakh
Establishment expenses	60.00
Admin expenses during execution period	23.58
Other statutory clearances	40.00
Consultancy fees	20.00
Interest during construction period	627.75
Total	**771.33**

12.6.2 For calculating interest during construction period, the time period is considered from July 2022 to June 2023 (i.e. from the 1st disbursement till commencement of COD). As per interest subvention scheme for ethanol blending programmes, the rate of interest on term loan for the first 60 months is envisaged at 5% per annum and for subsequent months 10.0% per annum.

12.7 PRELIMINARY EXPENSES

12.7.1 A provision for preliminary expanses has been made and the same works out to **Rs.5.00 Lakh**.

12.8 CONTINGENCY PROVISION

12.8.1 The cost is yet to be firmed up for building & civil works, plant and machinery, electricals etc. Hence, 2% contingency provision is provided in the estimated project cost. Accordingly, contingency provision works out to **Rs. 394.32 Lakh**.

12.9 MARGIN MONEY FOR WORKING CAPITAL

12.9.1 The working capital margin money for the project is estimated at **Rs.638.55 Lakh**. The detailed computation of working capital is provided in Annexure-H. The stock (inventory) period, debtor's collection period and creditor's payment period assumed for calculating working capital requirement are given as below:

TABLE 67 : MARGIN MONEY FOR WORKING CAPITAL

Sl.No.	Particulars	UOM	Time Period
1	Raw Material	Days	30
2	Chemicals, Consumables, spares, fuel coal & husk	Days	15
3	WIP	Day	1
4	Finished Goods	Days	7
5	Receivables	Days	20
6	Sundry Creditors Raw Material	Days	15
7	Sundry Creditors Chemicals, Consumables, spares, fuel coal & husk	Days	15

12.9.2 Based on the above WC holding levels, the WC loan for FY 2023-24 is **Rs. 1915.66 Lakh**.

12.9.3 The LLP proposes to make prompt cash payments (15 days) for procurement of raw material - broken rice and maize. Besides discounts, the LLP will have the benefit of continuous availability of raw material for smooth operation of the distillery unit.

12.9.4 The holding levels for inventories, debtors are based on tentative estimation only. There will be modifications to the same based on the actual terms of the bilateral agreement between LLP and OMC. After execution of requisite bilateral agreement, the LLP shall submit the same directly to the Bank.

12.10 MEANS OF FINANCE

12.10.1 The total project cost including interest during construction is estimated at **Rs. 21,920.00 Lakh** as detailed in an earlier paragraph.

12.10.2 The Partners Contribution for the proposed project is **Rs.1700.00 Lakh**.

12.10.3 The term loan to an extent of **Rs.20220.00 Lakh** has been proposed with a repayment period of 102 monthly instalments and interest Rate of 5% per annum

for the first 60 months from 1st disbursement of loan (GoI - Ministry of Consumer Affairs, Food & Public Distribution modified scheme) and for subsequent months, the interest rate is 10.0% per annum.

12.10.4 In order to increase production of Ethanol in the country, the Central Government (Ministry of Consumer Affairs, Food & Public Distribution) notifies modified scheme namely – "Scheme for extending financial assistance to project proponents for enhancement of their ethanol distillation capacity or to set up distilleries for producing 1st Generation (1G) ethanol from feed stocks such as cereals (rice, wheat, barley, corn & sorghum), sugarcane, sugar beet, etc".

12.10.5 As per the scheme Interest subvention @6% per annum or 50% of rate of interest charged by banks whichever is lower, shall be borne by the Central Govt for a period of 5 years for setting up grain based distilleries which will be using dry milling technique to produce Dry Distillers Grain Soluble (DDGS) and which will supply at least 75% of ethanol to Oil Marketing Firm (OMC) for blending with petrol.

12.11 DEBT EQUITY RATIO

12.11.1 The debt to equity ratio works out of **11.89:1**. As per the scheme, the requisite margin is 5% of the project cost wherever tripartite agreement amongst the project proponents, the bank and the OMC for purchase of ethanol is executed.

12.11.2 However the LLP has proposed for 5% margin. Hence the term loan component is considered as 95% of project cost (excluding WC margin).

12.12 TERM LOAN

12.12.1 The repayment terms are as follows;

Total term loan amount (Rs.lakh)	20220.00	Rs.lakh
Term loan 1st disbursement	July - 22	
COD	Jul-23	
Moratorium period	1.5	years from first disbursement
Repayment period	8.5	years after moratorium period
Door to door tenure	10	years from first disbursement
Term loan repayment start date	Jan-24	
Term loan repayment end date	Jun-32	

Number of monthly installments	102	
Step up method is envisaged for repayment		
Interest rate (first 60 months)	5.00%	
Interest rate (subsequent months)	10.00%	

12.12.2 The project is envisaged to be **commissioned on or before 01.07.2023 (COD)**.

13.0 FINANCIAL VIABILITY

13.1.1 The assumptions underlying the projected Profitability Statement for future years of operations are as given below:

13.2 PRODUCT COMPOSITION MIX AT INSTALLED CAPACITY LEVEL

13.2.1 The estimation of installed capacity and conversion ratios of spirits has already been discussed in the technical aspects chapter. The product mix at installed capacity is presented as follows:

TABLE 68 : PRODUCT MIX AT INSTALLED CAPACITY LEVEL

Sl.No	Product Mix	Unit	Production per day	Production per annum
			@ installed capacity level	@ installed capacity level
	Main Products			
1	Ethanol	KL	160	52800
	By-products			
2	Impure Spirit (IS)	KL	1.68	554
3	Fusel Oil	Litres	0	0
4	Dry cake (DDGS)	MT	108	35475
5	Liquid CO_2	MT	80	26400

13.2.2 The proposed capacity utilisation levels are as follows;

COD	July-2023
Number of operating months for FY 2023-24	9
Capacity utilization in FY 2023-24	60%
Capacity utilization in FY 2024-25	70%
Annual increase	10%
Maximum capacity utilization frozen at	90%

13.3 SELLING PRICES OF MAIN PRODUCTS AND BY-PRODUCTS

TABLE 69 : SELLING PRICES OF PRODUCTS

Product Mix	Unit considered	Present Ex Factory Basic Selling Price
		Rs./unit
Main Products		
Ethanol	KL	52920
By products		
Impure Spirit (IS)	KL	25000
Fusel Oil	Liters	0
Dry cake (DDGS)	MT	28000
Liquid CO_2	MT	3500

13.3.1 The selling price of ethanol is based on the tender documents (dated 25-03-2022) issued by OMC's (Oil marketing companies - IOCL, BPCL, HPCL). As per such documents, Ethanol price for ESY (ethanol supply year) 2021-2022 with respect to ethanol production from damaged food grains/maize is fixed as Rs.52.92 per litre.

13.4 RAW MATERIALS COST

13.4.1 As indicated by the LLP, the raw material considered is broken rice (68% starch content) for 50% production of ethanol. The corresponding yield levels are as follows:

The spirits yield in terms of Liters per MT of broken rice is	446	liters
Subsequent absolute alcohol yield (0.95 conversion factor) is	424	liters

13.4.2 As indicated by the LLP, the raw material considered is maize (62% starch content) for balance 50% production of ethanol. The corresponding yield levels are as follows,

The spirits yield in terms of Liters per MT of maize is	400	liters
Subsequent absolute alcohol yield (0.95 conversion factor) is	380	liters

13.4.3 The above is based on the assessment (Grain starch % and alcohol yields) of Vasantdada Sugar Institute, Maharashtra (Premier Research and Development Organization in Sugar and Allied Industry).

13.4.4 The raw material requirement and cost are estimated as follows;

TABLE 70 : RAW MATERIAL REQUIREMENT & COST DETAILS

Raw Material	Raw Material Mix	Number of MT per KL of total spirits	Raw Material Cost domestic
			Rs./MT of input
Broken Rice	50%	2.24	20000.00
Maize	50%	2.50	18700.00

13.4.5 The cost of broken rice is based on prevailing rates in the market. The cost of maize is based on minimum support price (MSP) for the marketing season 2021-2022.

13.4.6 The prices of raw materials and finished products are kept constant during the projected profitability period. The detailed workings are as per Annexure E and Annexure F.

13.5 CHEMICALS COST

13.5.1 The chemicals requirement and cost are estimated as follows;

TABLE 71 : CHEMICALS COST DETAILS

Chemicals	Number of kgs per KL of total spirits	Chemicals Cost - domestic
		Rs./kg of input
Sulphuric Acid	0.25	18.00
Urea	0.50	48.00
Diammonium Phosphate (DAP)	0.50	125.00
Antifoam	0.25	100.00
Alpha Amylase	0.50	425.00
AMG 300L	0.50	400.00
Yeast	1.00	400.00

13.5.2 The above is comparable to the prevailing rates.

13.6 OTHER OPERATING EXPENSES

13.6.1 The assumptions for the other operating expenses are as follows;

Steam requirement	3.65	MT per KL of total spirits
Fuel Coal	50%	of steam requirement
Fuel Husk	50%	of steam requirement
Coal requirement	0.24	MT per tonne of steam
Husk requirement	0.31	MT per tonne of steam
Coal cost (imported)	6500	Rs./MT
Husk cost	5000	Rs./MT
Salaries annual escalation	5%	every year
Water requirement	4.11	KiloLitre per KL of total spirits
Water cost	25.00	Rs./kilo litre
Consumables, stores and spares Cost	2.00%	of sales

Carriage outwards (one way OMC's to factory)	800	Rs. per KL of ethanol
Other manufacturing expenses (including CO2 plant) & overheads	2.00%	of total sales

Repairs & maintenance	2.50%	on fixed assets
Repairs & maintenance escalation	5%	Annual increase
Insurance	0.50%	of fixed assets
Admin & general expenses	40.00	Rs.lakhs per annum
Admin & general expenses Escalation	5%	every year
Selling & marketing expenses	0.25%	of sales

13.7 DEPRECIATION

13.7.1 Depreciation rates as per companies act are not applicable for the LLP. Hence depreciation is charged as per IT Act. The computation of depreciation is as per **Annexure-I.**

13.8 INCOME TAX

13.8.1 The provision for Income Tax is calculated as applicable to LLP (base tax rate of 30% and MAT is not applicable) and tax calculations are provided in the **Annexure-J.**

13.9 PROJECTED PROFIT AND LOSS STATEMENT

13.9.1 The projected Profit and Loss statement for establishing the proposed Grain based distillery / Ethanol plant is given in Statement-3. The sales and the net profit predominantly show increasing trends in the future years.

13.9.2 The total income increases from Rs. 17,390.94 lakh in FY 2023-24 to Rs. 35,044.79 in FY 2033-34. The net profit increases from (-) Rs.1032.46 Lakh in FY 2023-24 to Rs. 3,058.66 lakh in FY 2033-34.

13.9.3 **EBITDA level of other players in the sector (Grain based distillery)**

TABLE 72 : EBITDA OF OTHER DISTILLERY UNITS

Particulars	Uttam Sugar Mills Limited	RSL Distilleries Private Limited	Grainotech Industries Limited	Boudh Distillery Private Limited
Installed Capacity, KLPD	200	120	70	60
Total Operating Income in Rs.Crore	1824.78	157.88	122.23	111.34
EBITDA in Rs.Crore	223.83	23.79	21.82	39.17
EBITDA %	**12.27%**	**15.07%**	**17.85%**	**35.18%**
Applicable FY	FY 2020-21	FY 2019-20	FY 2020-21	FY 2020-21

13.9.4 For Nanda Devi (52800 KL of alcohol per annum), projected years' EBITDA average % is around 16.72%.

13.10 PROJECTED FUND FLOW STATEMENT

13.10.1 The projected funds flow Statement is as per Statement-5. The grain based ethanol unit is envisaged to have adequate funds to service the interest on term loan and working capital finance and Term Loan instalments. The cumulative cash balance after settlement of debt obligations is Rs. 13,921.32 Lakh (FY 2032-33).

13.10.2 Considering the nature of the sector, the machinery normal capex for the future years is as follows;

TABLE 73 : PROJECTED FUND FLOW STATEMENT

Financial Year	Machinery normal capex
	Rs. Lakh
2024-25	0
2025-26	0
2026-27	30
2027-28	40
2028-29	50
2029-30	0
2030-31	50
2031-32	50
2032-33	50
2033-34	50
Total	**320**

13.10.3 The source of funding for the above is internal accruals.

13.11 PROJECTED BALANCE SHEET

13.11.1 Projected Balance Sheet is as per Statement-4. The reserves and surplus for the period ending 31.03.2024 will be (-) Rs.1032.46 Lakh and the same will amount to Rs. 18,772.86 Lakh by end of 31.03.2033.

13.12 DEBT SERVICE COVERAGE RATIO (DSCR)

13.12.1 The DSCR for the proposed project works out to be 1.44, which indicates that the term loan serviceability of the project is good considering that a tripartite agreement is executed and interest subvention is received for the project. Details are given in **Statement-6**.

13.13 INTERNAL RATE OF RETURN (IRR)

13.13.1 The IRR for the proposed project works out to be 15.10%, which is considered good. Details are given in **Statement-7**.

13.14 BREAK EVEN POINT (BEP)

13.14.1 The BEP on utilised capacity works out to 60.34% (year 3), which is considered good. The BEP on installed capacity works out to be 48.27% (year 3), which is considered good. Details are given in **Statement-8**.

13.15 SENSITIVITY ANALYSIS

13.15.1 The financial indicators under various scenarios are as per **Statement-9**.

TABLE 74 : SENSITIVITY ANALYSIS

Sensitivity Analysis	DSCR	BEP	IRR
Decrease in selling price of finished products			
Base Case	1.44	60.34%	15.10%
5% decrease in prices of main product - ethanol	1.19	75.38%	11.27%
Base Case	1.44	60.34%	15.10%
10% decrease in prices of by-products - Dry cake, CO_2	1.25	71.35%	12.18%
Base case	1.44	60.34%	15.10%
3% decrease in prices of both main products and by-products	1.22	73.10%	11.76%
Increase in raw material cost, chemicals, consumables & spares cost, fuel and water cost			
Base case	1.44	60.34%	15.10%
2.50% increase in raw material cost	1.32	66.68%	13.30%

Sensitivity Analysis	DSCR	BEP	IRR
5% increase in raw material cost	1.20	74.52%	11.44%
Base case	1.44	60.34%	15.10%
5% increase in Chemicals, Consumables & spares Cost, fuel cost & water cost	1.40	62.44%	14.47%
Base case	1.44	60.34%	15.10%
4% increase in raw material, Chemicals, Consumables & spares Cost, fuel cost & water cost	1.22	73.49%	11.67%

13.15.2 It is seen that the financial indicators are fairly sensitive under various adverse scenarios.

14.0 CONCLUSION

14.1.1 The Firm is promoted with an objective to manufacture sustainable clean fuels from sugarcane, beet, sweet sorghum, Jerusalem artichoke, fruits, starch (corn, broken rice, wheat, cassava, sweet potato) and non-food feedstock like jatropha, algae, biomass, waste and other allied Services.

14.1.2 Forecasting the trend and opportunity in the production of Ethanol, the firm has proposed to establish **160 KLPD Grain based distillery / Ethanol plant** at Plot Nos. C-107, C-108, C-109, C-110, C-111, C-112 & C-113, SIPCOT Industrial Park, Gangaikondan Village, Tirunelveli District, Tamil Nadu - 627352.

14.1.3 The Firm has around **21.77 Acres** of land from SIPCOT industrial estate on long term lease basis for establishing the proposed Ethanol project.

14.1.4 The Firm has proposed to engage Praj Industries Limited, Pune as their EPC contractor for Engineering, Supply, Erection & Commissioning of the proposed 160 KLPD grain based distillery project. Praj Industries has more than 3.5 decades of experience in providing technology solutions with cumulative team for the field of distillery, BioFuel, Sugar, Cogeneration, Water, Waste Water and Renewable energy industry. It is one of the Technologies cum Project Firm in India having experience of handling all type of 1G feedstock including Rice/Corn/Bajra/Jawar and designing /delivering large capacity plants more than 500 KLPD.

14.1.5 Considering the limited progress made so far, time line and procedures involved in obtaining approvals, sourcing of the Plant and machinery, construction etc., ITCOT of the opinion that the commercial productions could be expected to commence on or before **01st July 2023**.

14.1.6 The project cost is estimated at **Rs. 21,920.00 Lakh** including interest during construction and WC margin as detailed below. Project cost has been arrived based on the sale deed document for land, civil estimate for buildings, quotation/purchase orders for machinery etc. provided by the LLP.

14.1.7 The term loan to an extent of **Rs. 20220.00 Lakh** has been proposed with a repayment period of 102 monthly instalments and interest Rate of 5% per annum for the first 60 months from 1st disbursement of loan (GoI - Ministry of Consumer

Affairs, Food & Public Distribution modified scheme) and for subsequent months, the interest rate is 10.0% per annum.

14.1.8 The Partners Contribution for the proposed project is **Rs.1700.00 Lakh.** In case of project cost overrun, the Promoters have indicated that they will bring the requiste funds/capital buffers to meet the project cost overrun.

14.1.9 The debt to equity ratio works out of **11.89: 1**. As per the scheme, the requisite margin is 5% of the project cost wherever tripartite agreement amongst the project proponents, the bank and the OMC for purchase of ethanol is executed.

14.1.10 As per the scheme guidelines, the LLP has proposed for 5% margin. Hence the term loan component is considered as 95% of project cost (excluding WC margin).

14.1.11 The DSCR for the proposed project works out to be **1.44**, which indicates that the term loan serviceability of the project is good considering that a tripartite agreement is executed and interest subvention is received for the project.

14.1.12 The IRR for the proposed project works out to be **15.10%,** which is considered good.

14.1.13 The BEP on utilised capacity works out to **60.34% (year3),** which is considered good. The BEP on installed capacity works out to be **48.27% (year3),** which is considered good.

14.1.14 The financial ratios of the project, worked out based on the assumptions as enumerated, indicates that the project is financially feasible.

14.1.15 Based on the project's location and rationale for establishment of the project and assumptions considered in financial projections, ITCOT is of the opinion that the proposed project is Technically, Commercially and Financially Viable. The project will be able to meet its interest and term loan obligations and the project is Bankable.

15.0 ABOUT ITCOT

15.1 INCORPORATION

15.1.1 Industrial and Technical Consultancy Organisation of Tamilnadu Limited (ITCOT), was incorporated as a Firm under the Companies Act, 1956, on 17th July 1979 as a joint venture of leading financial institutions, State Development Corporations, and Commercial Banks.

15.1.2 The Registered Office of the Firm is located at 50-A, Greams Road, Chennai, 600006. The name of the Firm was changed to **ITCOT Limited** (formerly ITCOT Consultancy and Services Limited) with effect from October 2020. The Firm still continues to be known by its popular name, ITCOT.

15.2 PROMOTERS OF ITCOT

15.2.1 **Commercial Banks**

- Bank of Baroda
- Canara Bank
- Central Bank of India
- Indian Bank
- State Bank of India
- The Karur Vysya Bank Ltd
- Union Bank of India

15.2.2 **State Development Institutions**

- State Industries Promotion Corporation of Tamilnadu Ltd. (SIPCOT)
- Tamilnadu Industrial Investment Corporation Ltd. (TIIC)
- Tamilnadu Small Industries Development Corporation Ltd. (SIDCO)

15.2.3 **All India Financial Institutions**

- IFCI Ltd

15.3 BOUQUET OF SERVICES

15.3.1 ITCOT offers a wide range of consultancy services such as techno-economic feasibility studies, Strategic Plans, detailed project reports, market survey and research, project management, Lenders Independent Engineer, Valuation, project appraisals, project evaluation restructuring, skill up gradation programmes. We organize seminars, training programs and industry meets on current topics of interest to disseminate knowledge to enterprises and entrepreneurs. ITCOT's services are offered to corporate, small and medium enterprises, individual

entrepreneurs, public sector undertakings, banks, financial institutions, cooperatives and governments.

15.3.2 ITCOT has carried out over 5000 assignments on behalf of institutions, entrepreneurs; and large, medium, and small enterprises in and outside Tamil Nadu. The assignments undertaken by us include market surveys, feasibility studies, detailed project reports, asset valuation, technology sourcing, project appraisals, opinion reports, Lenders Independent Engineer, energy audits; implementation of solar, wind mill and power projects, entrepreneur training programmes, and so on.

15.3.3 The organization has a team of competent professionals from various disciplines with experience in a wide range of functional areas and industries. ITCOT maintains a panel of experts in specific fields of activity whose services are sought as and when required.

15.3.4 With an in-house team of consultants, we have the expertise to handle all major sectors Viz. Aviation, Agro, Manufacturing, Infrastructure, Services, Education, Healthcare, Hospitality, Power and Renewable energy etc. With offices at Chennai, Erode, Salem, Mumbai, Bangalore, Kolkata, New Delhi, Pune, Bhubaneswar, Ahmedabad & Hyderabad and with highly committed team of consultants, ITCOT will provide competent and timely service.

15.4 APPROVALS/EMPANELMENT

15.4.1 ITCOT is also in the panel of major banks for conducting TEV / TEFR, Lenders Independent Engineer, Valuation and ASM etc.

- Several Banks/GOI Ministries
- Bureau of Energy Efficiency
- Technology Development Board-Asset Manager
- Power Finance Corporation -Business Development Associates
- Modular employment Skill Programme, DGET, GOI
- "Üdyami Mitra" under Rajiv Gandhi Udyami Mitra Yogana
- Receiver / Valuers for High Courts / DRT / Banks / FI
- Lender Independent Engineer for Bank /FI
- UNDP Sectoral programmes
- Kfw – Carbon Credit Programme
- Empanelled with IBA for Agency for Specialised Monitoring (ASM)

16.0 FINANCIAL ANNEXURE

16.1 PROJECT COST

TABLE 75 : PROJECT COST

END OF THE REPORT