BHARAT PETROLEUM CORPORATION LTD.
KOCHI REFINERY

INTEGRATED REFINERY EXPANSION PROJECT (IREP)
AT
KOCHI, KERALA, INDIA

BIDDING DOCUMENT
FOR
SUPPLY OF LICENSE, BASIC DESIGN ENGINEERING PACKAGE AND OTHER RELATED SERVICES
FOR
FLUID CATALYTIC CRACKING UNIT (FCCU)

(BIDDING DOCUMENT NO.: A166/T-046/11-12/SM/03)

PREPARED AND ISSUED BY:

1, BHIKAIJI CAMA PLACE R. K. PURAM NEW DELHI – 110066 INDIA

इंजीनियर्स इंडिया लिमिटेड
(भारत सरकार का उपक्रम)
ENGINEERS INDIA LIMITED
(A Govt. of India Undertaking)

SUPPLY OF LICENSE, BASIC DESIGN ENGINEERING PACKAGE AND OTHER RELATED SERVICES FOR FLUID CATALYTIC CRACKING UNIT (FCCU)

(BIDDING DOCUMENT NO. A166/T-046/11-12/SM/03)

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GLOBAL NOTICE FOR INVITATION FOR BIDS (IFB) FOR SUPPLY OF LICENSE, BASIC DESIGN ENGINEERING PACKAGE AND OTHER RELATED SERVICES FOR FLUID CATALYTIC CRACKING UNIT (FCCU) FOR INTEGRATED REFINERY EXPANSION PROJECT (IREP) OF M/S BHARAT PETROLEUM CORPORATION LTD. (BPCL) KOCHI REFINERY, KOCHI, KERALA (INDIA)

(BIDDING DOCUMENT NO. A166/T-046/11-12/SM/03)

(INTERNATIONAL COMPETITIVE BIDDING)

1.0 PROJECT DETAILS

1.1 Bharat Petroleum Corporation Ltd. (BPCL) Kochi Refinery located at Ambalamugal, Kochi, Kerala, India (hereinafter referred to as "BPCL-KR") is expanding its processing capacity from 9.5 MMTPA to 15.5 MMTPA under Integrated Refinery Expansion Project (IREP) for production of Euro-IV/V Products.

1.2 As a part of Integrated Refinery Expansion Project (IREP), BPCL (also referred hereafter as `Licensee' or "Owner") will be setting up a FLUID CATALYTIC CRACKING UNIT (FCCU) along with other units in the Refinery.

Based on the License, Basic Design Engineering Packages (BDEP) and other related services supplied/provided by Licensor(s), Licensee intends to go for detailed engineering, procurement, construction and operation of FLUID CATALYTIC CRACKING UNIT (FCCU).

1.3 BPCL has appointed Engineers India Limited (EIL) as their Consultant for implementation of the Project. EIL on behalf of BPCL, invites bids on International Competitive Bidding basis for **SUPPLY OF LICENSE, BASIC DESIGN ENGINEERING PACKAGE AND OTHER RELATED SERVICES FOR FLUID CATALYTIC CRACKING UNIT (FCCU)** for BPCL Integrated Refinery Expansion Project (IREP), Kochi, Kerala, India under single stage two envelopes system bidding from competent Agencies with sound technical and financial capabilities and meeting the Bidder Evaluation Criteria as stated under para 4.0 below.

2.0 BRIEF SCOPE OF WORK

2.1 Scope of Work for supply of license, basic design engineering package and other related services for Fluid Catalytic Cracking Unit (FCCU) shall include supply of Technology Know-How/ License, Supply of BDEP, identification and design of special equipment, review and approval of engineering documents, related services, supply of proprietary items/ catalysts, chemicals, if any, etc. as detailed in the Bidding Document.

3.0 SALIENT FEATURES OF BIDDING DOCUMENT

a)	Bidding Document No.	:	A166/T-046/11-12/SM/03
b)	Issue period of Bidding Document / Bidding Document on Website	:	From **17.06.2011 to 01.08.2011**
c)	Pre-Bid Conference	:	1100 Hrs. IST on **07.07.2011** at Engineers India Ltd., 1, Bhikaiji Cama Place, New Delhi- 110066, India
d)	Last date of Receipt of Bidder's Queries for Pre-Bid Conference	:	**04.07.2011**
e)	Last Date and time of submission of Bids	:	**1200 Hrs. IST on 02.08.2011**
f)	Opening of Unpriced Bids	:	**1400 Hrs. IST on 02.08.2011** In presence of authorised representative of attending bidders.
g)	Place of Submission of Bid	:	AGM (C&P) ENGINEERS INDIA LIMITED, EI ANNEXE, DAK RECEIPT SECTION, 1, BHIKAIJI CAMA PLACE, R. K. PURAM, NEW DELHI-110 066 (INDIA). Attn. : Mr. Subhendu Mondal
h)	Contact Persons for any query / clarification for this Tender	:	Mr. Subhendu Mondal, AGM (C&P)/ Dr. A.K.Rastogi, Manager (C&P), EIL, New Delhi Tel.No.: 91-11-26762021/ 26762055 Fax No.: 91-11-26191714/ 26167664

3.1 The Bid shall be submitted in the following manner in separately sealed envelopes duly superscribed :-

a) PART – I : TECHNICAL AND UNPRICED COMMERCIAL PART

b) PART – II : PRICE PART

3.2 PART – I (Original + 5 copies) of the bid shall contain the following:

a) Bid/ offer in hard copy as per the requirement of Bidding Document duly signed and stamped on each page, complete in all respects as per para 2.6.2.1 of Instruction to Bidders.

3.3 PART – II (Original + 1 copy) of the bid shall contain the following:

a) PRICED COMMERCIAL PART as per para 2.6.2.2 of Instructions to Bidders. Bidders are advised to quote their prices strictly as per the Price Schedule Formats without altering the content of it.

b) Bidder shall fill price in Schedule of Prices. In this part of bid, the bidder shall not stipulate any conditions. There shall not be any overwriting.

3.4 A CUT OUT SLIP IS ENCLOSED WITH INSTRUCTION TO BIDDERS FOR PASTING IT ON THE OUTER ENVELOPE AND INNER ENVELOPES. INCASE OF EXTENSION OF DEADLINE OF BID SUBMISSION, THE DATE SPECIFIED ON THE CUTOUT SLIP SHALL BE CHANGED BY THE BIDDER ACCORDINGLY. BIDDER SHALL NOT CHANGE ANY OTHER DETAILS.

3.5 EIL/BPCL takes no responsibility for delay, loss or non-receipt of Bidding Document/bid sent by post/courier. Bids sent through Telex/Telephone/Fax/E-mail will not be accepted.

4.0 BIDDER'S QUALIFICATION CRITERIA (BQC)

4.1 TECHNICAL CRITERIA

4.1.1 Following prequalification criteria will be adopted for short-listing licensors:

Licensor must have successfully licensed and designed at least one FCC unit (this should not be a revamp) with minimum qualifying capacity and specifications as detailed below during the last 10 years.

Feed Composition and Objective
a) To process Vacuum Gas Oil with minimum propylene yield (polymer grade) of 10 wt% on fresh feed ex-unit. **Minimum Qualifying capacity criteria 0.9 MMTPA**
b) **Catalyst:** The catalyst employed in the reference unit given by the bidder for FCC shall have completed minimum one year of satisfactory operation.
c) The reference unit shall be for a client other than licensor himself.
d) The reference unit must be in operation for at least one year before the due date of the offer and should have delivered guaranteed performance.

4.1.2 Documents to be submitted by Bidder

Bidder to submit documentary evidence to support the references provided herein. The following are minimum documents required.

a) Details of reference unit including the details of the contact person.
b) Relevant documents as a proof of License agreement with the licensee for the reference unit.
c) End users certificates from the licensee to support claim for:
    i. Date of commissioning.
    ii. Performance Guarantee Test Run.
    iii. Commercial operational for one year.

4.2 FINANCIAL CRITERIA

4.2.1 ANNUAL TURNOVER

The annual turnover of the Bidder shall be equal to or more than **US Dollar 8.25 Million for Foreign Bidders OR Indian Rupees 371 Million for Indian Bidders** as per the financial results in any one of the three immediate preceding financial years upto the due date of submission of bids.

4.2.2 NETWORTH

The Networth of the bidder in the latest financial year should be positive.

4.3 Experience of only the bidding entity shall be considered. In-house work experience (where for the past experience referred for qualification, the Licensor and the Owner

belonging to the same Organisation) shall not be considered as valid experience for the purpose of qualification.

4.4 **Documentation**

Bidder shall furnish documentary proof of fulfilling the Bidder Qualification Criteria. The documentation shall include but not be limited to copies of work order(s), license agreement(s), contract agreement(s)/ relevant pages of contract document, completion certificate(s), certificate(s) of satisfactory operation of commissioned plant(s) from the owners of the referenced plants/ process Units specifying details of the capacity, location and contact person of/ at the referenced plants, annual reports containing balance sheets and profit & loss accounts statement etc.

4.5 BPCL/EIL reserve the right to complete the evaluation based on the details furnished without seeking any additional information.

5.0 PRE-BID CONFERENCE / MEETING

5.1 Pre-bid Conference / Meeting shall be held at EIL, EIL Bhawan, 1, Bhikaiji Cama Place, New Delhi-110 066. Bidders or their authorized representatives are requested to attend the Pre-Bid Meeting so that their queries, if any, related to the Bidding document and Scope of Work can be addressed during the meeting.

5.2 The bidders are requested to send queries/clarifications, if any, as per Format (provided under Annexure-IIH of ITB) by courier or by fax or by e-mail to reach EIL at least four days before the pre-bid meeting. The clarifications shall be provided during the pre-bid meeting.

5.3 Non-attendance of the pre-bid meeting shall not be a cause of disqualification of the bidder.

6.0 **GENERAL**

6.1 Bidding document (non-transferable) in CD may be obtained on any working day (Monday to Friday) from 2.00 PM to 4.00 PM during the issue period from Sale Counter, Engineers India Limited, EI Annexe Building, 1, Bhikaiji Cama Place, R.K. Puram, New Delhi-110066, on written request. Request for sending bidding document by post, courier or any other mode shall not be entertained. Accredited Representatives of Foreign Bidders in India are also permitted to obtain the Bidding Document on behalf of Foreign Bidders, with specific authorisation.

6.2 The Bidding Document can also be viewed and downloaded from Engineers India Limited website http://www.indianprocessplants.com or Bharat Petroleum Corporation Limited website http://www.bharatpetroleum.com. Corrigenda/Addenda, if any, shall also be available on the referred web site. Further, bidder shall give an undertaking on their letter head that the content of the bidding document have not been altered or modified.

6.3 Bidder shall obtain or download the Bidding Document in his own name and submit the bid directly. The Bidding Document is non-transferable.

6.4 Sealed bids will be received in the Receipt Section, Engineers India Limited, EI-Annexe Building, 1, Bhikaiji Cama Place, R.K. Puram, New Delhi-110066.

6.5 No extension in the bid due date / time shall be considered on account of delay in receipt of any document by mail/e-mail/fax.

7.0 Bids received after stipulated last date and time, due to any reasons what-so-ever, including postal delays, will not be considered. Such bids shall be returned to Bidders and representative of such Bidders shall not be allowed to attend the Bid opening.

8.0 BPCL / EIL shall not be responsible for any costs or expenses incurred by Bidder in connection with the preparation or delivery of Bids, including costs and expenses related with visits to the site, if any.

9.0 BPCL/EIL reserves the right to assess bidder's capability to execute this work by using in-house information and taking into account various aspects such as past performance during evaluation of bids.

10.0 Bidder submitting his bid should not be under liquidation, court receivership or similar proceedings.

11.0 Bids sent through Fax / E-Mail / Computer floppy shall not be accepted.

12.0 BPCL/ EIL reserve the right to reject any or all Bids received without assigning any reason.

13.0 Consortium/Joint venture bids shall not be accepted.

14.0 Bid submitted by any agency who is on holiday list of BPCL/EIL shall not be considered for opening and further evaluation.

15.0 Fax and Telephone numbers of EIL, New Delhi are: Fax: 91-11-26191714 / 26167664; Telephone: 91-11-26762021/ 26762055.
E-mail: subhendu.mondal@eil.co.in / ak.rastogi@eil.co.in

ASSTT. GENERAL MANAGER (C& P)
ENGINEERS INDIA LIMITED – NEW DELHI

INSTRUCTIONS TO BIDDERS

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1.0 BIDDING DOCUMENT, CLARIFICATION AND ADDENDUM

1.1 Bidding Document

Bidding Document (also read as Bid Document / "Invitation To Bid" or "ITB") comprising following sections are issued in Compact Disc (CD) for the purpose of submitting Bid.

I. Invitation for Bid (IFB)
II. Instructions to Bidders
III. Commercial Terms and Conditions
IV. Technical Specifications
V. Schedule of Prices

The Bidding Document can also be viewed and downloaded from Engineers India Limited website http://www.indianprocessplants.com or Bharat Petroleum Corporation Limited website http://www.bharatpetroleum.com

Any Amendment/ Addendum issued in accordance with clause no.-1.4 hereinafter shall also form the part of Bidding Document.

Bidder shall submit two hard copies of Bidding Document one marked "Original" and one marked as "Copy" alongwith his Bid in token of his acceptance.

1.2 Bidding Document obtained /downloaded by a Bidder is not transferable to another Bidder. The proposal can only be submitted in the name of the Bidder in whose name the Bidding Document is obtained /downloaded. Any proposal submitted/ signed on behalf of the Bidder by an agent or representative of Bidder, shall not be accepted.

"Bidder" shall mean the Licensor/ Agency who has obtained /downloaded the Bidding Document and submitted the Bid for the services described in this Bidding Document.

1.3 Clarification Requests by Bidder

Bidder shall examine the Bidding Document thoroughly in all respects and if any conflict, discrepancy, error or omission is observed, Bidder may request clarification at any time but within 10 (Ten) days prior to the Bid Due Date. Such clarification requests shall be addressed to AGM (C&P), EIL, New Delhi, at the address given at clause no.-3.2 below. Any failure by Bidder to comply with the aforesaid requirement shall not absolve the Bidder of his responsibility, after subsequent award of contract, of performing in accordance with the agreement.

1.4 Amendment of Bidding Document

Owner/ EIL may, for any reason either at their own initiative or in response to the clarification requested by prospective Bidders, issue amendment in the form of Addendum/ Amendment during the Bidding period or subsequent to receiving the Bids. Any Addendum/ Amendment thus issued shall become part of Bidding Document and Bidder shall submit the copy of Addendum/ Amendment duly signed and stamped in token of his acceptance. If Addendum/ Amendment is issued during the Bidding period, Bidder shall consider the impact in his Bid. If Addendum/ Amendment is issued subsequent to receiving the Bids, Bidder shall follow the instructions issued along with Addendum/ Amendment with regard to submission of impact on quoted price/ revised price, if any.

1.5 **Confidentiality of Document**

Bidder shall treat the Bidding Document and contents thereof as confidential.

1.6 **Acknowledgement and Confirmation to Bid**

Bidder shall acknowledge receipt and confirm his intention to Bid for the work as per Annexure-IIA to ITB within 7 days of receipt of Bidding Document.

2.0 PREPARATION OF BIDS

2.1 **Bid Validity**

Bid shall remain valid for acceptance for a period of **6 (Six) months** from the due date/ extended due date of submission of the Bid During the said period, the Bidder shall not revoke or cancel his Bid or vary the Bid except and to the extent required by Owner/ EIL in writing. Bid shall be revalidated for extended period when required by Owner/ EIL in writing. In such cases, unless otherwise specified, it shall be understood that validity is sought and provided without varying either the quoted price or any other terms and conditions of the Bid finalised till that time. For proprietary items and proprietary catalyst the purchase order shall be placed at later date considering the physical progress at site, shelf life and the delivery schedule of the items.

2.2 **Cost of Bidding**

All direct and indirect costs associated with the preparation and submission of Bid (including clarification meetings and visits by Bidder to Owner/EIL offices or to licensee locations, if any) shall be to Bidder's account. Owner/EIL will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the Bidding process.

2.3 **Language of Bid**

The Bid and all correspondence incidental to and concerning the Bid shall be in the English Language only. Bids/ Documents/ Literature submitted in any other language shall be summarily rejected.

2.4 **Arrangement of Bid**

The Bid shall be neatly arranged, and printed on white paper with consecutively numbered pages. The Bid and all details submitted by the Bidder subsequently shall be signed and stamped on each page by a person, legally authorised to enter into agreement on behalf of the Bidder. The same person shall also sign corrections and alterations, if any. Bidder shall submit Power of Attorney in favour of the person who signs the Bid and subsequent submissions on behalf of the Bidder.

2.5 **Schedule of Prices**

The Schedule of Prices shall be read in conjunction with all other sections of the Bidding Document. Rates/ amount must be filled in the format of Schedule of Prices enclosed as part of this Bidding Document.

The Prices quoted by the Bidder shall be firm and fixed for the completion period of the offered services and supplies and in accordance with the price schedule format enclosed and strictly based on the terms specified related to the bid prices in the instructions/ conditions. Firm prices are required for all the items including supply of proprietary catalysts and proprietary equipment supplies. The escalation rates mentioned in Form-B7 of Schedule of Prices shall also be firm.

Escalation Rates shall be specified by Licensor as per details given in Schedule of Prices. In case Escalation Rates are not specified by the Licensor, then the prices quoted for the various items shall be considered valid and firm upto the date specified in the respective forms and no escalation shall be payable.

Bidder shall quote all the items of Schedule of Prices after careful analysis of cost involved for the performance of the completed item considering all parts of the Bidding Document. In case any activity is specifically not covered in description of item under Schedule of Prices but is required to complete the work as specified elsewhere in the Bidding Document, then the quoted prices for the item shall be deemed to be inclusive of cost incurred for such activity and no claims whatsoever on this account shall be entertained by Owner.

The foreign component of the Bidder's prices shall be quoted either in US Dollars/ Euro and the Indian component in Indian Rupees only. For services and materials to be procured from India, Bidder shall quote prices in Indian Rupees only. Currency once quoted shall not be permitted to be changed. Bidder shall quote prices both in figures as well as in words.

2.6 **Documents Comprising the Bid**

2.6.1 Bidder is advised that Owner/ EIL intends to fully evaluate the technical and unpriced commercial submissions. It is important that Bidder clearly demonstrates his experience and capability, giving Owner/ EIL a high level of confidence about the technology being licensed and also that if awarded, the Bidder will be able to perform within the stipulated Time Schedule and quoted price total scope requirements listed in the Bidding Document. Bidder is requested to furnish complete and correct information required for evaluation of his Bid.

2.6.2 Bidder shall arrange and submit his Bid in two parts as follows:

2.6.2.1 **Part-I - Technical and Unpriced Commercial Part**

Technical and unpriced commercial part shall comprise the attachments, specifying attachment number arranged in the order as follows:

1. Submission of Bid letter along with Validity of Bid as per requirement indicated under clause no.-2.1 above.
2. Two set of Bidding Document one marked "Original" and one marked "Copy" along with addenda (if any) duly signed and stamped on each page, in token of acceptance.
3. Power of Attorney in favour of authorised signatory of the Bid .
4. Compliance to Bid requirements or Exception and Deviation Statement as per Annexure-IIB to ITB.
5. Commercial Questionnaire duly filled in as per Annexure-IIC to ITB.
6. Integrity Pact (included as Annexure-IID) duly signed by the Bidder.
7. Annual Turnover and networth details duly filled in as per Annexure-IIG to ITB.
8. Contents of price Bid without any prices (prices shall be replaced by the word "QUOTED" or "NOT QUOTED" as the case may be in the Schedule of Prices). In the event of any price quoted in the Unpriced Bid, such Bidders are liable to be rejected.
9. Technical offer and Engineering details, containing the information required as per enclosed Technical Specification of Bidding Document. Bidder shall

also furnish any other information other than Price specifically requested in the Schedule of Prices.

10. Documents in support of meeting the Bidder's Qualification Criteria.

2.6.2.2 **Part-II - Priced Commercial Part**

Priced commercial part shall contain Schedule of Prices duly filled in.

No stipulation, deviation, terms or conditions, presumptions, basis etc. shall be indicated in Price part of the Bid. In case any stipulation, deviation, terms or conditions, presumptions, basis etc. are indicated in the Priced Bid, these shall be considered null and void and may render the Bid liable for rejection if these are not withdrawn by the Bidder.

3.0 SUBMISSION OF BID

3.1 Technical and Unpriced Commercial Bid and Priced Commercial Bid must be submitted in two separate sealed envelopes as follows:

PART -I - TECHNICAL AND UNPRICED COMMERCIAL BID

This envelope shall comprise the original signed copy of Bidding Document, Addenda/ Amendment (if any), and the information listed for submission under clause no.-2.6.2.1 above.

The envelope shall have the CUT OUT SLIP attached as Annexure-IIE to ITB, pasted on the outside of the envelope, failing which Owner/ EIL will assume no responsibility for the misplacement or premature opening of the Bid.

This part of Bid will be submitted in one Original + 5 Copies.

PART -II - SEALED PRICED COMMERCIAL BID

This part of the Bid shall contain the Schedule of Prices duly filled in and other information specifically requested for submission in priced part under clause no.-2.6.2.2 above. The envelope shall have the CUT OUT SLIP attached as Annexure-IIF to ITB, pasted on the outside of the envelope, failing which Owner/ EIL will assume no responsibility for the misplacement or premature opening of the Bid.

This part of Bid will be submitted in one Original + 1 Copy.

3.2 **Date, Time & Place of Submission**

Bid must be submitted by the due date and time mentioned in the Letter Inviting Bid or any extension thereof as duly notified in writing by EIL, at the following address:

AGM (C&P) Engineers India Limited, EI Annexe Bldg.(2nd Floor), 1-Bhikaiji Cama Place, R.K. Puram, New Delhi-110066, INDIA Tel.No.: 91-11-26762021 Fax No.:91-11-26191714, 26167664 Email: subhendu.mondal@eil.co.in	1 Original + 05 Copies of Part-I i.e. Technical And Unpriced Commercial Bid & One Original + 1 copy of Part-II i.e. Priced Bid.

4.0 BID OPENING AND EVALUATION

4.1 **Clarification & Additional Information**

During evaluation, Owner/EIL may request Bidder for any clarification on the Bid, additional or outstanding documents. Bidder shall submit all additional documents in one original and five copies. Bidder should furnish clarifications within a maximum period of one week from the query.

4.2 **Techno-Commercial Discussions**

Techno-commercial discussions with Bidder shall be arranged, if needed. Bidder shall depute his authorised representative(s) for attending the discussions at EIL office, in New Delhi, India. The representative(s) attending the discussions shall produce authorisation from Bidder to attend the discussions and sign the minutes of meeting on behalf of Bidder. The authorised representatives must be competent and empowered to settle all technical and commercial issues.

4.3 **Evaluation Criteria**

4.3.1 **Bidder Qualification**

The Bidder qualification shall be as mentioned in the Bidder Qualification Crteria stated in Invitation for Bids.. The Bidders who are considered qualified, on the basis of details furnished in respect of Bidder Qualification Crteria, shall be considered for further evaluation.

4.3.2 **Technical and Commercial Evaluation**

Technical acceptability shall be ascertained in accordance with requirements mentioned in Technical Specifications.

Commercial Acceptability shall be ascertained in accordance with Bidder's compliance to Inivitation for Bids, Instruction to Bidders, Commercial Terms and Conditions and Schedule of Prices.

The Bidders who are considered technically and commercially acceptable, shall be considered for Price Bid opening.

Economic evaluation of the bids will then be carried out by calculating Net Present value (NPV) as described in the Technical Specifications. **The licensor/ agency/ bidder with the highest NPV will be recommended for selection**.

4.4 **Evaluation of Price Bid**

4.4.1 The prices quoted by the Bidder shall be checked for arithmetic errors based on prices filled in by the Bidder in the formats issued. If some discrepancies are found between the prices quoted in words and figures, the total amount indicated in words shall be taken into consideration.

When the rate quoted by the Bidder in figures and words are the same but the amount is incorrect, the rate quoted by the Bidder shall be taken as correct and amount reworked.

When it is not possible to ascertain the correct rate, in the manner prescribed above the rate as quoted in words shall be adopted and amount reworked

Price submitted by the Licensor shall be taken into consideration while computing Net Present Value.

4.4.2 To facilitate evaluation and comparison of prices, all Bid prices shall be converted in to Indian Rupees based on the TT Selling Exchange Rate of US Dollar/ Euro declared by State Bank of India, New Delhi prevailing on the working day preceding the date of opening of Price Bids.

4.5 **Deviations**

4.5.1 No deviations/ exceptions/ alterations in the terms and conditions shall be entertained and such bids are liable to be rejected. In absence of any specific mention of any departure from the Bidding Document, the provisions of the Bidding Document will be binding on the Bidder. Bidder to note that no deviation/ departure in the Technical Specifications will be acceptable.

4.5.2 All exceptions and deviations retained by Bidder to the stipulations of the Bidding Document shall be indicated at one location in the Technical and Unpriced Commercial Part of the bid as per the format given in Annexure-IIB only and not in the Bidding Document or Priced Commercial Bid. Any exceptions or deviations indicated elsewhere in the bid shall not be construed as valid.

4.5.3 None of the exceptions/ deviations/ alterations in terms and conditions incorporated by Bidder in bidding document shall be part of contract terms and conditions unless specifically agreed and confirmed in writing by BPCL-KR/ EIL.

4.6 **Loading Factors**

4.6.1 To facilitate evaluation and comparison of prices the Price loading on account of commercial deviations taken by bidders in respect of payments and other conditions shall be as under:

i. Payment terms: Price loading on account of deviation to payment terms i.e, payment term accepted by the bidder vis-à-vis the payment term given in bidding document shall be loaded @ 14% per annum for the relevant period.

ii. Any differential in taxes and duties will be cost loaded on case-to-case basis. The Prices quoted should be inclusive of withholding tax /Indian Income Tax as per prevailing Income Tax rules. In the unpriced part bidder shall indicate the withholding tax included in his price in percentage only. Withholding tax shall be deducted and TDS certificate issued to the Licensor/ Agency so that he can claim tax credit in his country. However, in case, the Licensor does not include (or partially includes) the provisions of withholding tax /Indian Income Tax in his prices and withholding tax /Indian Income Tax as applicable is payable by Owner, the withholding tax /Indian Income Tax liability shall be estimated and added to the Licensor's prices for evaluation. In such a case, Licensor/Agency explicitly confirms that the TDS certificate would not be issued to the Licensor/ Agency for the tax paid by Owner and the same shall not be claimed as credit by Licensor/ Agency.

iii. Loading in respect of deviation in liabilities and price reduction schedule etc. shall be as per table given below:

A. LOADING FOR NOT MEETING THE LIABILITY REQUIREMENTS FOR LICENSE, BASIC DESIGN ENGINEERING, DETAILED ENGINEERING AND RELETED SERVICES GIVEN IN BIDDING DOCUMENT:

Liability	*Bidding Document*	*Offered by Bidder*	*Loading*
Price Reduction for delay in submission of final BDEP	½% per week of delay or part thereof subject to max. of 5% of BDEP Fees.	Same as specified in bidding document	No loading
		Limiting the max. to x%.	5% - x% of BDEP Fees.
Overall Aggregate	Limited to 50% of	Confirm Bidding	No Loading

Liability	*Bidding Document*	*Offered by Bidder*	*Loading*
Liability	License Fees + 50% of BDEP Fee	Document requirement	
		Confirm the liability clause but limits it to x% of License Fee + y% of BDEP Fee	Loading by 50% - x% of License Fees + 50% - y% of BDEP Fee
Amount of Performmance Bank Guarantee/ Standby Letter of Credit	As per Commercial Terms & Conditions	Same as per bidding document	No loading
		Limiting the max. to x% of order value for any item.	% specified in Bid Document for that item - x% of the order value.
Validity of Performmance Bank Guarantee/ Standby Letter of Credit	As per Commercial Terms & Conditions	Same as bidding document	No loading
		Reduced validity period	Stipulated BG Value X Ratio of Difference in Validity Period agreed by Licensor / Stipulated Validity Period

Note: It is clarified that no deviations are acceptable in respect of the following:

a) Liabilites for not meeting the Process Performance Guarantees, Minumum Guarantees, other guarantees and Guarantee for Catalyst and proprietary Equipments/Items as mentioned in Article 9.1.1 and 9.2 of Commercial Terms and Conditions and as detailed in the Technical Specifications.
b) Liabilites on account of Reimbursement of certain costs as detailed in Article 9.1.4 of Commercial Terms and Conditions and as detailed in the Technical Specifications.
c) Liabilites on account of Patent Infringement as detailed as detailed in Article 9.1.3 of Commercial Terms and Conditions.

B. LOADING FOR NOT MEETING THE LIABILITY REQUIREMENTS FOR SUPPLY OF PROPRIETARY ITEMS AND SUPPLY OF CATALYST GIVEN IN BIDDING DOCUMENT:

Price Reduction for Delay in Catalyst Supply	½% per week of delay or part thereof subject to max. of 5% of Catalyst order value.	Same as per bidding document	No loading
		Limiting the max. to x%.	5% - x% of Catalyst order value.
Price Reduction for Delay in Supply of Proprietary Items	½% per week of delay or part thereof subject to max. of 5% of Proprietary Item order value.	Same as per bidding document	No loading
		Limiting the max. to x%.	5% - x% of Proprietary Item order value.
Amount of Performmance Bank Guarantee/ Standby Letter of Credit	As per Commercial Terms & Conditions	Same as per bidding document	No loading
		Limiting the max. to x% of order value for any item.	% specified in Bid Document for that item - x% of the order value.
Validity of Performmance Bank Guarantee/ Standby Letter of Credit	As per Commercial Terms & Conditions	Same as bidding document	No loading
		Reduced validity period	Stipulated BG Value X Ratio of Difference in Validity Period agreed by Licensor / Stipulated Validity Period

4.7 **Process to be confidential**

Information related to the examination, clarification, evaluation and comparison of Bids and recommendations for award of contract shall not be disclosed to Bidder or other person not officially concerned with such process. Any effort by Bidder to influence the Owner's/ EIL's processing of Bidding or award decisions may result in rejection of such Bidder's Bid.

4.8 **Owner's Right to accept or Reject a Bid**

Owner reserves the right to accept a Bid other than the lowest and to accept or reject any Bid in whole or in part, or to annul the Bidding process or to reject all Bids with or without notice or reasons. Such decisions by Owner shall bear no liability whatsoever consequent upon such decisions.

4.9 **Rejection Criteria**

Non-acceptance of following may lead to **rejection of bid:**

a) A bid with incomplete scope of work and/ or which does not meet the technical specifications and requirements as specified in the enquiry documents shall be considered as non-responsive and rejected.

b) Governing laws to be Indian Laws, Jurisdiction clause as per bidding document {Refer Article 15 of Commercial Terms and Conditions(CTC)}.

c) Exclusion of Govt. of India's Liability (Refer Article 19 of CTC).

d) Submission of Integrity Pact duly signed.

e) Submission of bid in English language.

5.0 AWARD OF WORK AND CONTRACT DOCUMENT

5.1 Award of Work

The Bidder, whose Bid is accepted by Owner, shall be issued a Letter/ Fax of Intent prior to expiry of Bid validity. Bidder shall confirm acknowledgement by returning a signed copy of the same.

Owner/ EIL shall not be obliged to furnish any information/ clarification/ explanation to the unsuccessful Bidders regarding non-acceptance of their Bids. Owner/ EIL shall correspond only with the successful Bidder.

5.2 Contract Document

The successful Bidder shall be required to execute a formal agreement within specified period. This Bidding Document along with addendums, if any, will form part of the agreement.

6.0 INTEGRITY PACT

6.1 Bidders are required to sign an Integrity Pact (IP) as per the proforma enclosed herewith as Annexure-IID. Proforma of Integrity Pact shall be returned by the Bidder along with the bid documents (Technical Bid), duly signed by the same signatory who is authorized to sign the bid documents. All the pages of the Integrity Pact shall be duly signed. Bidder's failure to return the Integrity Pact duly signed along with the bid documents shall result in the bid not being considered for further evaluation.

6.2 If the Bidder has been disqualified from the tender process prior to the award of the contract in accordance with the provisions of the Integrity Pact, BPCL shall be entitled to demand and recover from Bidder Liquidated Damages/ Price Reduction as per provisions of the Integrity Pact.

6.3 If the contract has been terminated according to the provisions of the Integrity Pact, or if BPCL is entitled to terminate the contract according to the provisions of the Integrity Pact, BPCL shall be entitled to demand and recover from Contractor Liquidated Damages/ Price Reduction by forfeiting the Performance Bank Guarantee as per provisions of the Integrity Pact.

6.4 Bidders may raise disputes/ complaints, if any, with the nominated Independent External Monitor.

Address and contact details of the Independent External Monitor are as follows:

Shri. T.S. Krishnamurthy
Flat No.9, Gokul Tower
Next to Mookambika Complex

No.7 C P Ramaswamy Road
Alwarpet, Chennai-600 018

Phone: 044-24993077/ 24993079
Mobile: +91 9444999555

ACKNOWLEDGEMENT CUM CONSENT LETTER FORMAT

TO

Mr. S. Mondal
AGM (C & P)
Engineers India Limited,
EI Annexe, 2nd Floor,
1, Bhikaiji Cama Place, R.K. Puram,
New Delhi-110 066, INDIA

FAX NO. 91-11-26191714, 26167664
EMAIL : subhendu.mondal@eil.co.in

SUBJECT: SUPPLY OF LICENSE, BASIC DESIGN ENGINEERING PACKAGE AND OTHER RELATED SERVICES FOR FLUID CATALYTIC CRACKING UNIT (FCCU)
(BIDDING DOCUMENT NO. A166/T-046/11-12/SM/03)

Dear Sir,

We acknowledge receipt of your Invitation To Bid for the subject Package. We understand that the documents received remain the property of **M/s Bharat Petroleum Corporation Ltd. (BPCL)** . We indicate below our intentions with respect to the Letter Inviting Bid.

(A) We intend to bid as requested and furnish following details:

QUOTING OFFICE :

NAME OF LICENSOR/ AGENCY: M/S _____

(i) ADDRESS: _____

(ii) PHONE No.:_____(iii) FAX No.:_____

(iv) CONTACT PERSON: _____

(v) e-mail ADDRESS _____

INDIAN OFFICE (IF ANY)

(i) ADDRESS: _____

(ii)PHONE No.:_____(iii) FAX NO.:_____

(iv)CONTACT PERSON: _____

(v) e-mail ADDRESS _____

(B) We are unable to bid for the reasons given below and hereby return the Bidding Document.

_____

NAME OF LICENSOR/ AGENCY _____

SIGNATURE:_____

NAME:_____

DESIGNATION:_____

DATE: _____

EXCEPTIONS AND DEVIATIONS STATEMENT FORMAT

Sl. NO.	BIDDING DOCUMENT REFERENCE		SUBJECT	DEVIATIONS
	PAGE NO.	CLAUSE NO.		

NOTE :

1. Bidder is required to comply with the requirements of the Bidding Document, and not to stipulate any exceptions or deviations. In case it is unavoidable, Bidder may stipulate exceptions to requirements of Bidding Document in this format only.

2. All exceptions and deviations retained by Bidder to the stipulations of the Bidding Document shall be indicated at one location in the techno-commercial unpriced part of the bid as per this format only and not in the Bidding Document or price bid . Any exceptions or deviations indicated elsewhere in the bid shall not be construed as valid.

SIGNATURE OF BIDDER:_____

NAME OF BIDDER:_____

SUBJECT :- COMMERCIAL QUESTIONNAIRE

SL. NO.	EIL'S QUERIES	BIDDER'S REPLY
1.0	Confirm that you have sent your offer to EIL as per following Address:-	
1.1	Engineers India Ltd., AGM (C & P) RECEIPT SECTION 1, Bhikaiji Cama Place R. K. Puram, New Delhi – 110066. India. Part-I i.e. Technical And Unpriced Commercial Bid ('1' Originals + '5' copies) and Part-II i.e. Priced Bid (`1' Original + '1' Copy).	
2.0	Please confirm that while submitting your 'Price', you have taken into consideration the following:-	
2.1	'Price' has been submitted exactly as per the format included in the Bidding Document under section 'Schedule of Prices'.	
2.2	Price has been submitted in a separate sealed envelope as per clause no. 3.0 of 'Instructions To Bidders'.	
2.3	Blank copy of Schedule of Prices duly signed (i.e. without prices) has been submitted in Unpriced part.	
2.4	a) Confirm that Quantity of Catalyst with Unit rate has been mentioned in the Price Part. Please confirm that Quantity for each type of Catalyst have been indicated in unpriced part also. b) Confirm that contingencies towards losses & spillage have not been included by you.	
2.5	Confirm that Mandatory Services as per FORM – B4 has been quoted for.: (i) Mandatory Services for review of detailed engg. (ii) Mandatory Services for inspection at Vendors shop floor. (iii) Mandatory Services during pre-commissioning and commissioning. Also please confirm that the list/details of activities to be performed for the above mandatory services have been furnished along with Unpriced Copy of Schedule of Prices.	

SL. NO.	EIL'S QUERIES	BIDDER'S REPLY
2.6	Confirm that quoted prices for Mandatory Services as per FORM – B4 are inclusive of all costs, overheads and profits including the following:- - Transportation (local & airfare) - Accommodation during site stay and transit - Living Allowance - Communication - Taxes etc.	
2.7	a) Confirm that the Schedule of Personnel Rates as per FORM - B5 are inclusive of all costs, overheads and profits including the following: - Living Allowance - Communication etc. b) Confirm that the Schedule of Personnel Rates as per FORM - B5 are exclusive of the following: - Transportation (Airfare & local) - Accommodation during site stay and transit	
2.9	Please confirm that "Escalation Rates" have been specified as per FORM – B7 in Price Part. Please note that in case "Escalation Rates" are not specified as per FORM-B7, then the prices quoted as per FORM-B3A to FORM-B6 shall be considered valid and firm upto 31.12.2017 and no escalation shall be payable.	
2.10	Please confirm that prices as per FORM-B1 and B2 are firm till execution of work and no escalation shall be payable.	
3.0	Please confirm that you have complied with all the commercial terms and conditions of the Bidding Document and have not taken any exceptions and deviations. In case you have taken exceptions/deviations w.r.t. stipulations of commercial terms and conditions of the Bidding Document, then please confirm the following:	
3.1	Exceptions/Deviations have been submitted exactly as per the Format included as 'Annexure-IIB to ITB'. Please note that Exceptions/Deviations mentioned in any other format or in scope of work or draft copy of Agreement etc. or in any other part of your bid shall not be taken into consideration.	

SL. NO.	EIL'S QUERIES	BIDDER'S REPLY
4.0	Please note that 'Net Present Value' shall be calculated on the basis of philosophy mentioned in the Bidding Document supplemented by other details as decided by Owner/EIL.	

SIGNATURE OF BIDDER:_____

NAME OF BIDDER:_____

Annexure-IID

INTEGRITY PACT

Between

Bharat Petroleum Corporation Limited (BPCL) hereinafter referred to as "The Principal",

And

…….. hereinafter referred to as "The Bidder/ Contractor/ Supplier".

Preamble

The Principal intends to award, under laid down organization procedures, contract/s for …….. The Principal values full compliance with all relevant laws and regulations, and the principles of economic use of resources, and of fairness and transparency in its relations with its Bidder/s, Contractor/s and Supplier/s.

In order to achieve these goals, the Principal cooperates with the renowned international Non-Governmental Organisation "Transparency International" (TI). Following TI's national and international experience, the Principal will appoint an Independent External Monitor who will monitor the tender process and the execution of the contract for compliance with the principles mentioned above.

Section 1 - Commitments of the Principal

(1) The Principal commits itself to take all measures necessary to prevent corruption and to observe the following principles:

a) No employee of the Principal, personally or through family members, will in connection with the tender, or the execution of the contract, demand, take a promise for or accept, for himself/ herself or third person, any material or immaterial benefit which he/she is not legally entitled to.

b) The Principal will, during the tender process, treat all Bidders with equity and reason. The Principal will, in particular, before and during the tender process, provide to all Bidders the same information and will not provide to any Bidder confidential/ additional information through which the Bidder could obtain an advantage in relation to the tender process or the contract execution.

c) The Principal will exclude from the process all known prejudiced persons.

(2) If the Principal obtains information on the conduct of any of its employees which is a criminal offence under the relevant Anti-Corruption Laws of India, or if there be a substantive suspicion in this regard, the Principal will inform its Vigilance Office and in addition can initiate disciplinary actions.

Section 2 - Commitments of the Bidder/ Contractor/ Supplier

(1) The Bidder/ Contractor/ Supplier commits itself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the tender process and during the contract execution.

a) The Bidder/ Contractor/ Supplier will not, directly or through any other person or firm, offer, promise or give to any of the Principal's employees involved in the tender process or the execution of the contract or to any third person, any material or immaterial benefit which he/she is not legally entitled to, in order to obtain in exchange, any advantage of any kind whatsoever during the tender process or during the execution of the contract.

b) The Bidder/ Contractor/ Supplier will not enter with other Bidders into any undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelisation in the bidding process.

c) The Bidder/ Contractor/ Supplier will not commit any offence under the relevant Anti-Corruption Laws of India; further the Bidder/ Contractor/ Supplier will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

d) The Bidder/ Contractor/ Supplier will, when presenting his bid, disclose any and all payments he has made, is committed to, or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.

(2) The Bidder/ Contractor/ Supplier will not instigate third persons to commit offences outlined above or be an accessory to such offences.

Section 3 - Disqualification from Tender Process and Exclusion from Future Contracts

If the Bidder, before contract award, has committed a transgression through a violation of Section 2 or in any other form such as to put his reliability or credibility as Bidder into question, the Principal is entitled to disqualify the Bidder from the tender process or to terminate the contract, if already signed, for such reason.

(1) If the Bidder/ Contractor/ Supplier has committed a transgression through a violation of Section 2 such as to put his reliability or credibility into question, the Principal is also entitled to exclude the Bidder/ Contractor/ Supplier from future contract award processes. The imposition and duration of the exclusion will be determined by the severity of the transgression. The severity will be determined by the circumstances of the case, in particular the number of transgressions, the position of the transgressors within the company hierarchy of the Bidder and the amount of the damage. The exclusion will be imposed for a minimum of 6 months and maximum of 3 years.

(2) A transgression is considered to have occurred if the Principal after due consideration of the available evidences, concludes that no reasonable doubt is possible.

(3) The Bidder accepts and undertakes to respect and uphold the Principal's absolute right to resort to and impose such exclusion and further accepts and undertakes not to challenge or question such exclusion on any ground, including the lack of any hearing before the decision to resort to such exclusion is taken. This undertaking is given freely and after obtaining independent legal advice.

(4) If the Bidder/ Contractor/ Supplier can prove that he has restored/ recouped the damage caused by him and has installed a suitable corruption prevention system, the Principal may revoke the exclusion prematurely.

Section 4 - Compensation for Damages

(1) If the Principal has disqualified the Bidder from the tender process prior to the award according to Section 3, the Principal is entitled to demand and recover from the Bidder Liquidated Damages/ Price Reduction equivalent to Earnest Money Deposit/ Bid Security.

(2) If the Principal has terminated the contract according to Section 3, or if the Principal is entitled to terminate the contract according to Section 3, the Principal shall be entitled to demand and recover from the Contractor/ Supplier Liquidated Damages/ Price Reduction equivalent to Security Deposit/ Performance Bank Guarantee.

(3) The Bidder agrees and undertakes to pay the said amounts without protest or demur subject only to condition that if the Bidder/ Contractor/ Supplier can

prove and establish that the exclusion of the Bidder from the tender process or the termination of the contract after the contract award has caused no damage or less damage than the amount of the Liquidated Damages/ Price Reduction, the Bidder/ Contractor/ Supplier shall compensate the Principal only to the extent of the damage in the amount proved.

Section 5 - Previous Transgression

(1) The Bidder declares that no previous transgression occurred in the last 3 years with any other Company in any country conforming to the TI approach or with any other Public Sector Enterprise in India that could justify his exclusion from the tender process.

(2) If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

Section 6 - Equal treatment of all Bidders/ Contractors/ Suppliers/ Subcontractors

(1) The Bidder/ Contractor/ Supplier undertakes to demand from all subcontractors a commitment in conformity with this Integrity Pact, and to submit it to the Principal before contract signing.

(2) The Principal will enter into agreements with identical conditions as this one with all Bidders, Contractors/ Suppliers and Subcontractors.

(3) The Principal will disqualify from the tender process all Bidders who do not sign this Pact or violate its provisions.

Section 7 - Punitive Action Against Violating Bidders/ Contractors/ Suppliers/ Subcontractors

If the Principal obtains knowledge of conduct of a Bidder, Contractor, Supplier or Subcontractor, or of an employee or a representative or an associate of a Bidder, Contractor, Supplier or Subcontractor which constitutes corruption, or if the Principal has substantive suspicion in this regard, the Principal will inform the Vigilance Office.

Section 8 - Independent External Monitors

(1) The Principal has appointed competent and credible Independent External Monitors for this Pact. The task of the Monitor is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement.

(2) The Monitor is not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the Chairperson of the Board of the Principal.

(3) The Bidder/ Contractor/ Supplier accepts that the Monitor has the right to access without restriction to all Project documentation of the Principal including that provided by the Bidder/ Contractor/ Supplier. The Bidder/ Contractor/ Supplier will also grant the Monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to this project documentation. The same is applicable to Subcontractors. The Monitor is under contractual obligation to treat the information and documents of the Bidder/ Contractor/ Supplier/ Subcontractor with confidentially.

(4) The Principal will provide to the Monitor sufficient information about all meetings among the parties related to the Project provided such meetings could have an impact on the contractual relations between the Principal and the Bidder/ Contractor/ Supplier. The parties offer to the Monitor the option to participate in such meetings.

(5) As soon as the Monitor notices, or believes to notice, a violation of this agreement, he will so inform the Management of the Principal and request the Management to discontinue or heal the violation, or to take other relevant action. The Monitor can in this regard submit non-binding recommendation. Beyond this, the Monitor has no right to demand from the parties that they act in a specific manner, refrain from action or tolerate action. However, the Independent External Monitor shall give an opportunity to the Bidder/ Contractor/ Supplier to present its case before making its recommendations to the Principal.

(6) The Monitor will submit a written report to the Chairperson of the Board of the Principal within 8 to 10 weeks from the date of reference or intimation to him by the 'Principal' and, should the occasion arise, submit proposals for correcting problematic situations.

(7) If the Monitor has reported to the Chairperson of the Board a substantiated suspicion of an offence under relevant Anti-Corruption Laws of India, and the Chairperson has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Vigilance Office, the Monitor may also transmit this information directly to the Central Vigilance Commissioner, Government of India.

(8) The word 'Monitor' would include both singular and plural.

Section 9 - Pact Duration

This Pact begins when both parties have legally signed it. It expires for the Contractor/ Supplier 12 months after the last payment under the respective contract, and for all other Bidders 6 months after the contract has been awarded.

If any claim is made/ lodged during this time, the same shall be binding and continue to be valid despite the lapse of this pact as specified above, unless it is discharged/ determined by Chairperson of the Principal.

Section 10 - Other Provisions

(1) This agreement is subject to Indian Law. Place of performance and jurisdiction is the Registered Office of the Principal, i.e. Mumbai. The Arbitration clause provided in the main tender document/ contract shall not be applicable for any issue/ dispute arising under Integrity Pact.

(2) Changes and supplements as well as termination notices need to be made in writing. Side agreements have not been made.

(3) If the Bidder/ Contractor/ Supplier is a partnership or a consortium, this agreement must be signed by all partners or consortium members.

(4) Should one or several provisions of this agreement turn out to be invalid, the remainder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

…….	…….
For the Principal	For the Bidder/ Contractor/ Supplier
Place …….	Witness 1 : ……. (Signature/Name/Address)
Date …….	Witness 2 : ……. (Signature/Name/Address)

DO NOT OPEN - THIS IS A QUOTATION

PART- I (UN-PRICED OFFER)

Client **:** ***Bharat Petroleum Corporation Limited.***

Project **:** ***Kochi Refinery- Integrated Refinery Expansion Project (IREP)***

Bidding Doc No. : A166/T-046/11-12/SM/03

Item : Supply of License, Basic Design Engineering Package and other Related Services for Fluid Catalytic Cracking Unit (FCCU)

Bid Due Date : 02.08.2011 Up to 1200 Hrs (IST)

From : ***To :***

	AGM (C&P) ***Engineers India Limited*** ***EI Annexe, 2nd Floor*** ***Bhikaji Cama Place*** ***New Delhi – 110066*** ***Phone : 0091 11 26762021***

(To be pasted on the outer envelope containing UN-PRICED OFFER)

DO NOT OPEN - THIS IS A QUOTATION

PART- I & II

Client **:** ***Bharat Petroleum Corporation Limited.***

Project **:** ***Kochi Refinery - Integrated Refinery Expansion Project (IREP)***

Bidding Doc No. : A166/T-046/11-12/SM/03

Item : Supply of License, Basic Design Engineering Package and other Related Services for Fluid Catalytic Cracking Unit (FCCU)

Bid Due Date : 02.08.2011 Up to 1200 Hrs (IST)

From : ***To :***

	AGM (C&P) ***Engineers India Limited*** ***EI Annexe, 2nd Floor*** ***Bhikaji Cama Place*** ***New Delhi – 110066*** ***Phone : 0091 11 26762021***

(To be pasted on the outer envelope containing PRICED & UN-PRICED OFFER)

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DO NOT OPEN - THIS IS A QUOTATION

PART- II
(PRICED PART)

Client **:** ***Bharat Petroleum Corporation Limited.***

Project **:** ***Kochi Refinery - Integrated Refinery Expansion Project (IREP)***

Bidding Doc No. : A166/T-046/11-12/SM/03

Item : Supply of License, Basic Design Engineering Package and other Related Services for Fluid Catalytic Cracking Unit (FCCU)

Bid Due Date : 02.08.2011 Up to 1200 Hrs (IST)

From :	***To :***
	AGM (C&P) ***Engineers India Limited*** ***EI Annexe, 2nd Floor*** ***Bhikaji Cama Place*** ***New Delhi – 110066*** ***Phone : 0091 11 26762021***

(To be pasted on the outer envelope containing PRICED OFFER)

ANNEXURE –IIG

ANNUAL TURNOVER AND NETWORTH DETAILS

ANNUAL TURNOVER

Annual Turnover data for the last 3 years

FINANCIAL YEAR	ANNUAL TURNOVER (indicate currency)

NETWORTH

Networth in the latest financial year

FINANCIAL YEAR	NETWORTH

SIGNATURE OF THE BIDDER : _____

NAME OF THE BIDDER : _____

ANNEXURE –IIH

FOR BIDDER'S QUERIES FOR PRE BID CONFERENCE/ MEETING

SL. NO.	REFERENCE OF BIDDING DOCUMENT				BIDDER'S QUERY	OWNER'S REPLY
	Section	Page No.	Clause No.	Subject		

NOTE: The Pre-Bid Queries may be sent on fax numbers 0091-11- 26191714 / 26167664 and also by e-mail to subhendu.mondal@eil.co.in / ak.rastogi@eil.co.in

SIGNATURE OF BIDDER : _____

NAME OF BIDDER : _____

COMMERCIAL TERMS AND CONDITIONS

TABLE OF CONTENTS

ARTICLE 1 – DEFINITIONS

1.1 "BPCL shall mean Bharat Petroleum Corporation Limited (BPCL), a Government Company as defined under Indian Companies Act, 1956, having its registered office at Bharat Bhavan, 4 & 6 Currimbhoy Road, Ballard Estate, Mumbai - 400 001, and having one of its refineries at Ambalamugal, Kochi (Kerala), India.

1.2 "BPCL-Kochi Refinery" or " BPCL-KR " means Kochi Refinery, a unit of BPCL located at Ambalamugal, Kochi, Ernakulam District, Kerala, India.

1.3 "Owner / Licensee" for the purposes of this Invitation to Bid (ITB) document, means Bharat Petroleum Corporation Ltd.-Kochi Refinery, Kochi, India

1.4 "Process Technology" shall mean data, experience and know-how, patented and unpatented, related to the Plant, which Licensor owns, controls or has access to on the date of this Agreement.

1.5 "Licensed Territory" shall mean India.

1.6 "Owner's Plant" shall mean the first plant constructed by or for Owner in the Licensed Territory by means of the Process Technology which plant shall have a Rated Design Capacity.

1.7 "Mechanical Completion" shall mean the date when the plant is ready for pre-commissioning and activities like hydrostatic testing, wiring tests, calibration of instruments and electrical motor rotation tests have been executed.

1.8 "Start-up" shall mean the initial operation of the plant upon the introduction of Guarantee feed stock charge into the plant after Mechanical completion.

1.9 "Owner's Contractor(s)" shall mean such engineering firm or firms, companies, individuals etc. selected by Owner for work on Owner's Plant or requested by Owner to bid on such work, subject to the provisions of Article 3 below.

1.10 "Manday" shall mean any calendar day or part thereof, during which a Licensor representative shall be engaged in work performed for Owner including travelling time as specified in Technical Specifications.

1.11 "Kick-off Meeting" shall mean the meeting between Licensor and Owner and with or without Owner's Consultant(s) as Owner may determine to establish and agree on certain typical basic design criteria to be used in the design of Owner's Plant in addition to or modification of the Design Basis set forth in Technical Specification hereof, and to establish the process boundaries of Owner's Plant for the purposes of Licensor's design.

1.12 The term "Basic Engineering Design Package" or BDEP for the Plant shall mean such design and engineering as set forth in more detail in Technical Specification.

1.13 "Unit" means Process Unit set up on License from Licensor, in Fluid Catalytic Cracking Unit (FCCU) in which the use of Process Technology is involved.

1.14 Licensor" shall mean the supplier of License for the process unit with process knowhow, BDEP and other related services responding to this enquiry.

1.12 "Project Management Consultant" mean person or persons, appointed by BPCL-KR for assistance during project implementation.

M/s Engineers India Limited, EI House, 1 Bhikaji Cama Place, R K Puram, New Delhi 110066 are the Project Management Consultant for Licensor selection and related activities of the process units.

ARTICLE 2 - SCOPE OF WORK

2. 1 The Licensors scope of work is as set forth here below:

a. License agreement comprising of granting to Owner a non-exclusive, irrevocable, non-transferable right to use the technical information and a non-exclusive, irrevocable license under Licensors patent rights, for the operation of the Process in the plant, for making or having made for its own use in so carrying out the Process any apparatus necessary therefor and for the use and sale of the products so produced from the plant in any country of the world.

b. Engineering agreement comprising of preparation and handing over of a BDEP for the Unit as per the agreed scope of work. Licensor shall also provide additional services such as training to Owners personnel, assistance during detailed engineering, construction, pre-commissioning, start-up and performance run tests under the terms and conditions/provisions of the agreement.

c. Proprietary Equipment/Items (if aplicable) supply agreement and Catalyst & Additive (if applicable) supply agreement comprising of supply of first charge of catalysts, additives required for operation of plant on FOB basis (Incoterms 2010).

d. Guarantee and Liability agreement, as suitably incorporated in the above agreements.

However the detailed scope of work shall be as per the Technical Specifications enclosed in the Bidding Document.

The above agreements shall be prepared strictly on the basis of terms and conditions mentioned in the Bidding Document modified only to the extent as agreed by Owner before award of work. Any amendment shall form part of Bidding Document.

The Licensor shall provide and transfer the know-how and process package in accordance with the Time Schedule specified in Technical Specifications.

ARTICLE 3 – CONTRACT PRICE

3.1 As full and complete consideration, payment and compensation to Licensor for performance of all Services and fulfilment of all Licensor's obligations under this Contract, Owner shall pay Licensor the Contract Price stated in Schedule of Prices. All costs and expenditures of whatever nature for which responsibility is not expressly assumed in this Contract by Licensor shall be deemed not to be covered by the Contract Price.

The total compensation provided herein, as it may be adjusted by Variation Order (s) issued pursuant to the provisions of Article 24 (Variations in the Services) is referred to herein as "Contract Price".

ARTICLE-4: TAXES/ DUTIES

4.1 In the case of Indian bidders the quoted rate shall be inclusive of all currently applicable taxes and duties. However Service Tax, if applicable shall be quoted separately. The Service Tax shall be paid to the Licensor only if a proper invoice addressed to BPCL-Kochi Refinery is given with details such as Licensor's Name & Address, Service Tax Registration Number, Description, and Category, indicating the value of Service and Service Tax amount separately.

4.2 In the case of Foreign bidders, the fees/ costs quoted shall be inclusive of all non-Indian taxes. All taxes (other than withholding tax) in India, assessments and other charges assessed or imposed by the Government of India or any other Government authority in India which Licensor, Licensor's personnel or any third party is required to pay in connection with this Contract or any goods or services provided by Licensor under this Contract shall be borne by BPCL-KR.

All bidders are required to provide Permanent Account Number along with the bid while quoting. The withholding rate applicable for consultants without PAN will be 20%.

4.3 Any fine, penalty or levies, required to be met by the BPCL-KR, arising out of non-compliance with respect to Indian taxation provisions by Licensor, Licensor's personnel or such third party shall be recovered from amounts payable to Licensor.

4.4 In the un-priced part bidder shall indicate the withholding tax included in his price in percentage only. Withholding tax shall be deducted and Tax Deducted at Source (TDS) certificated issued to the licensor/agency so that he can claim tax credit in his country. However, in case, the licensor does not include (or partially includes) the provisions of Indian income tax in his prices and withholding tax as applicable is payable by Owner, the income tax liability shall be added to the licensor's prices for evaluation. In such a case, Licensor/Agency explicitly confirms that the TDS certificate would not be issued to the licensor/agency for the tax paid by Owner and the same shall not be claimed as credit by Licensor.

ARTICLE 5 - PAYMENT SCHEDULE

5.1 LICENCE FEE/BASIC DESIGN ENGINEERING PACKAGE FEE

First payment to the Licensor (Licence Fee/ BDEP Fee) shall be made only after submission of Contract Performance Bank Guarantee for an amount equivalent to sum of 10% of License Fee + 10% of BDEP Fee. The Bank Guarantee shall be in a proforma enclosed as Annexure- IIIA. Owner shall pay progressive payments by against the lump sum price in accordance with following terms:

a) LICENCE FEE (Refer Sl. No. 1 of SOP under FORM B1)

i) 10% upon signing of agreement and successful completion of Kick-off Meeting.

ii) 20% upon submission of heat & material balance and process flow diagram

i) 20% upon submission of BEDP and its acceptance by Owner

iii) 20% upon mechanical completion of the unit

iv) 15% upon successful commissioning of the unit

v) 15% upon successful completion of performance guarantee run of the plant or 12 months from successful commissioning excluding the delays attributable to Licensor whichever is earlier.

b) BASIC DESIGN ENGINEERING PACKAGE FEE (Refer Sl. No. 2 of SOP under FORM B1)

ii) 10% upon signing of agreement and successful completion of Kick-off Meeting

iii) 15% upon submission of heat & material balance and process flow diagram

iv) 15% upon submission of data sheets for critical equipments (long delivery items to be identified in kick off meeting)

v) 20% upon submission of P&ID's and its acceptance by Owner

vi) 25% upon submission of BEDP and its acceptance by Owner

vii) 5% upon successful commissioning of the unit

viii) 10% upon successful completion of performance guarantee run of the plant or 60 months from submission of BEDP and its acceptance by Owner whichever is earlier.

5.2 PAYMENT FOR TRAINING OWNERS PERSONNEL

Payment for training Licensee's personnel:

a) One week Theoretical Training at Licensor's facility for 2 batches of 5 personnel each: 100% of fee upon completion of training.

b) Industrial Training at plant selected by Licensor for 15 personnel for 1 week: 100% of fee upon completion of training

c) Classroom Training at Owner's office/ plant for 30 persons for 1 week: 100% of fee upon completion of training

5.3 SUPPLY OF CATALYST AND OTHER MATERIALS AND PROPRIETARY EQUIPMENTS

90% upon shipment/ dispatch.
10% upon successful completion of performance guarantee run of the plant.

90% of the Catalyst price and prices of Proprietary Equipments through Letter of Credit on presentation of invoice and usual shipping documents and upon receipt by Owner of a Performance Bank Guarantee having a value of 15% of the Catalyst price and price of Proprietary Equipments separately as applicable. The Letter of Credit shall be opened at least four months prior to FOB delivery date.

5.4 MANDATORY AND OTHER SERVICES

Invoicing to be done after completion of services with only one invoice per month.

5.5 TIME AND MODE OF PAYMENT

Within Sixty (60) days after receipt of each correctly prepared invoice submitted by Licensor pursuant to this Contract, Owner will pay Licensor the invoiced amount properly due and payable through telegraphic /wire transfer (Mode of payment shall be NEFT/Bank transfer). Payment of each invoiced amount shall constitute full and complete consideration for performance of that part of the Services covered by the invoice.

ARTICLE 6 - PERFORMANCE OF SERVICES

6.1 The Licensor shall exercise all reasonable skill, care and diligence in the performance of the Services and such performance shall be in accordance in all respects with the terms and conditions of the Contract, with sound engineering principles and practices and to a standard compatible with the internationally recognised engineering standard.

6.2 Except as may be expressly provided elsewhere in the Contract the acceptance or approval by Owner of any recommendation made by the Licensor shall not in any way relieve the Licensor of his full responsibility for the adequacy thereof.

6.3 The Licensor shall provide all necessary personnel, equipment if applicable, and facilities for the satisfactory performance of the Services.

ARTICLE 7 - CONTRACT PERFORMANCE BANK GUARANTEE

7.1 Bank Guarantee for License Fee + BDEP Fee:
Within fourteen (14) days of the date of the Contract coming into force Licensor shall obtain and provide an irrevocable Contract Performance Bank Guarantee for an amount equivalent to sum of 10% of License Fee + 10% of BDEP Fee. Bank Guarantees pertaining to License fee and BDEP Fee shall be valid till successful completion of the performance test run of the plant or up to 60 months from the date of submission of BDEP, whichever is earlier.

7.2 Bank Guarantee for supply of Catalyst and Proprietary Equipments:
Licensor shall obtain and provide an irrevocable Bank Guarantee for an amount equivalent to sum of 15% of catalyst price and 15% of price of Proprietary equipments respectively towards performance and Price Reduction for delay in delivery.

Bank Guarantees pertaining to supply of catalyst shall be valid till 15 (fifteen) months from commissioning of the plant.

Bank Guarantees pertaining to Proprietary Equipments shall be valid till 15 (fifteen) months from commissioning of the plant.

7.3 Licensor shall effect Bank Guarantee through a Nationalised/ Schduled Indian Bank or an Indian Branch of Foreign Bank on a stamp paper of value INR 100/- (Indian Rupees one hundred only) and in the format enclosed as Annexure- IIIA. Licensor shall furnish such bond to Owner prior to commencement of any Services. In no event, however, shall Owner be obliged to make payments to Licensor under this Contract prior to receipt of the bank guarantee, duly signed. Upon written request of Owner, Licensor shall promptly effect such changes in the amount of, or the validity period of, the bank guarantee as may be required due to changes covered by Variation Orders or amendments.

ARTICLE 8 - GUARANTEES

Licensor to guarantee that the work as specified and described in the contract, and the technical documents to be developed shall be in accordance with sound and established engineering practices, using the latest International Standards and Indian Codes and Regulations, wherever applicable, for the purpose specified, free from defects and suitable for respective uses intended.

In the event of faulty design/engineering i.e. error or omission in the job performed by Licensor, the Licensor to agree to furnish corrective technical studies and engineering as may be required without any additional cost to Owner within a mutually agreed time frame, which shall be arrived at within 15 days from the date of request from Owner.

ARTICLE 9 - RESPONSIBILITIES AND LIABILITIES

9.1 RESPONSIBILITIES AND LIABILITIES

9.1.1 Licensor shall give guarantee for performance of the Unit and the liabilities for any shortfalls from the guarantee parameters will be applicable as per Article 9.2 below. Licensor confirms acceptance of all the guarantees and liabilities mentioned in the Technical Specifications.

9.1.2 PRICE REDUCTION SCHEDULE (PRS) FOR DELAY:

a) Submission of BDEP: The time of completion for submission of final BDEP shall be as mentioned in Technical Specifications and its subsequent amendments. The time period for submission of final BDEP shall be reckoned from the date of Finalization of Design basis. In case the Licensor fails to

submit the final BDEP within the stipulated period, then unless such failure is due to Force majeure or due to Licensee's defaults, the total price of BDEP shall be reduced by ½% (half percent) per complete week of delay or part thereof subject to 5%(five percent) of total price of BDEP.

b) Supply of Catalysts: In the event of delay on the part of Licensor for effecting the delivery of Catalysts as agreed contractually, a reduction in price for the delayed deliveries at the rate of ½% (half percent) of the total order value of the Catalysts per week of delay or part thereof shall be levied subject to a maximum of 5% (five percent) of the total order value of the Catalysts.

c) Supply of Proprietary Equipments/ Items: In the event of delay on the part of Licensor for effecting the delivery of Proprietary items/ equipments as agreed contractually, a reduction in price for the delayed deliveries at the rate of ½% (half percent) of the total order value of the Proprietary items/ equipments per week of the delay or part thereof shall be levied subject to a maximum of 5% (five percent) of the total order value of the Proprietary items/ equipments.

9.1.3 PATENT INFRINGMENT:

Licensor shall, at all times, indemnify and hold harmless Owner and Owner's Associate Companies from all liabilities, costs, damages and expenses arising out of any claims, actions or suits brought against Owner by third parties, or any related claims thereof, in respect of any actual or alleged infringement of any Patent Rights or registered design or any similar rights resulting from the use of the subject Technology or Technical Information or any improvements thereof provided by Licensor to Owner. Upon Owner's prompt notification to Licensor in writing of any such claims actions or suits upon such notice, or upon Licensor otherwise coming to know of such claims, actions or suits, Licensor shall, at its own expense, conduct, defend or dispose of, including settling of such claims, actions or suits on its own behalf and on behalf of Owner and Owner's Associate Company and are obliged to follow all instructions from Owner in this respect.

The Licensor shall ensure that the Technology, designs and engineering provided by them is free from any dispute etc.

The responsibility and liability of Licensor under the provisions of this Article shall be unlimited, without qualifications and not subject to any restrictions and shall include the following:

a) Defense of Suit (Court fees, Attorney charges, Incidental expenses):

Licensor will undertake at its own expense the defense of any such suit including court fees, attorney fees, incidental expenses etc.

Licensor will be fully responsible for and will have the sole charge in the defense of any such suit. Licensee will render Licensor all reasonable assistance that may be required by Licensor in the defense of such suit, at Licensor's expense.

Neither Licensor nor Licensee shall settle or compromise any such suit without the written consent of the other party if the settlement or compromise obliges the other party to make any payment or part with any property or assume any obligation or grant any licenses or other rights or be subject to any injunction by reason of such settlement or compromise.

b) Damages Awarded and or Rectification/ Modifications in Plant (including hardware) to take care of patent infringement.

9.1.4 REIMBURSEMENT OF CERTAIN COSTS:

Licensor shall reimbruse Owner the total costs of making modifications, additions, alterations or replacements to correct Owner's Plant due to faulty design, information and services furnished and rendered by Licensor. Licensor's responsibility and liability in this respect is described in detail in Technical Specifications. Licensor's liability under this Article shall be limited to to sum of 50% of the License Fee and 50% of BDEP Fee and shall be included in the limit of the overall aggregate liabilities detailed in Article 9.3.

9.1.5 In no event shall Licensor be responsible for defects arising from corrosion or erosion, defective material or equipment not supplied by Licensor, deficient engineering and design work furnished by others, improper operation and maintenance by Owner whether arising in contract, tort (including negligence) or otherwise.

9.1.6 All liability of Licensor and its Affiliates, as to certain or all Performance Guarantees, shall terminate upon occurrence of any of the events set forth below:

a) Such Performance Guarantees as have been satisfied as determined by the results of a successful Performance Test Run as herein provided; or

b) Owner's notification to Licensor in writing of its decision not to conduct a Performance Test Run; or

c) Licensor has paid Owner for remedial measures and paid liquidated damages as set forth in this Article-9 for failure to meet such performance guarantees; or

d) The performance test run not conducted within 12 (twelve) months after sucessful commissioning or 60 (sixty) months from submission of BDEP and its acceptance by Owner, whichever occurs first. The above period shall exclude delays attributable to Licensor.

9.2 PERFORMANCE GUARANTEES AND LIABILITIES

9.2.1 The provisions of Process Performance Guarantee, Minimum Performance Guarantee and the associated liabilities thereof shall be, as described in the Technical Specifications enclosed in the Bidding Document.

9.2.2 In case of Proprietary Items/ Equipments supplied by Licensor as agreed contractually, the liabilities shall be as detailed in Technical Specifications.

9.2.3 In case of Catalysts supplied by Licensor as agreed contractually, the liabilities shall be as detailed in Technical Specifications.

9.3 OVERALL AGGREGATE LIABILITIES

Licensor's overall aggregate liability on all accounts under the contract shall be limited to sum of 50% of the License Fee and 50% of BDEP Fee, excluding any liability for:

i) Rectification of defects in Licensor's services as per Article-8 above.

ii) Patent Infringement as per Article 9.1.3 above.

iii) Rectification of defects/ replacement of Prorietary Items as per Article-9.2.2 and PRS for delay in supply of Proprietary Items.

iv) Rectification of defects/ replacement of Catalysts as per Article-9.2.3 and PRS for delay in supply of Catalysts.

v) Deploying Licensor's Personnel for carrying out subsequent Performance Gurantee Test Runs (PGTR), if the PGTR had failed in the earlier attempt(s) due to reasons attributable to the Licensor. For details refer Technical Specifications.

9.4 In no event shall either party be liable for consequential or indirect damages such as loss of profits or loss of use, unless otherwise agreed in writing. This limitation shall apply whether the cause of action relates to this agreement or arises out of the services provided by Licensor under this agreement.

ARTICLE 10 - SUSPENSION

10.1 Owner may at any time, should Owner deem it necessary to do so for any valid reason, suspend all or part of work giving not less than fourteen days written notice to Licensor. Such notice of suspension shall specify the scope of the work to be suspended, and the effective date of suspension. Licensor shall suspend work on the date or dates specified by Owner in any notice under this clause and shall resume the work immediately upon receipt of Owner's notice to resume. The Licensor shall not be entitled for any claims/loss on account of such suspension of work.

ARTICLE 11 - TERMINATION

11.1 Owner shall have the right to terminate the agreement with at least seven (7) days notice. Licenser's documents shall be returned to Licenser and Owner's

documents shall be returned to the Owner. Licenser shall be paid for all payments accrued up to the date of termination as per payment terms.

11.2 However, in case of termination, Owner shall not be liable for any loss of profit, loss of use, business operation or any other indirect or special or punitive or incidental or exemplary or consequential losses / damages that may be suffered by the Licenser on account of such termination.

ARTICLE 12 - INSURANCE

12.1 LICENSOR will, at its expense, place workers compensation insurance or such other similar insurance to cover any claim that may be made by personnel furnished by LICENSOR hereunder alleging bodily injuries sustained by them or death as a result of or in connection with the performance of this Agreement and will hold LICENSEE and its employees and representatives harmless from any and all of such claims. LICENSOR's insurance policy shall include a waiver clause as to any insurer's action against LICENSEE, its employees and representatives.

12.2 LICENSEE will, at its expense, place workers compensation insurance or such other similar insurance to cover any claim that may be made by LICENSEE's employees and representatives alleging bodily injuries sustained by them or death as a result of or in connection with the performance of this Agreement and will hold LICENSOR and its subsidiaries harmless from any and all of such claims. LICENSEE's insurance policy shall include a waiver clause as to any insurer's action against LICENSOR or its subsidiaries.

12.3 LICENSEE shall take out and maintain, or cause its contractor to take out and maintain, at its own expense, an adequate all risks insurance policy including third parties liabilities to cover any loss or damage to the Unit and other properties of LICENSEE or of third parties at Ambalamugal, Kochi (Kerala), India, during the construction, commissioning, start-up and operation of the Unit. Such insurance policy shall include LICENSOR and its subsidiaries as additional insureds.

12.4 Except as specified above, each party waives all claims for recovery from the other party for any bodily injury (including death) to any of its personnel or any loss of or damage to any of its property.

ARTICLE 13 - FORCE MAJEURE

13..1 Force Majeure events ("Force Majeure") is defined as act of God, earthquake, typhoon, cyclone, flood, lightning, landslide, fire explosion, plague, strikes of a whole national category of workers, invasion, act of foreign enemies, hostilities, war (weather declared or not), civil war, rebellion, revolution, insurrection,

confiscation or power by military, trade embargoes by order or any act of Government of any public authority.

If either party is prevented or delayed in the performance of its obligations under this contract by an event of Force Majeure and if the affected party gives written notice within 14 (fourteen) days thereof to the other party specifying the matter constituting Force Majeure with necessary evidence that contractual obligations are thereby prevented or delayed, and the further period for which it is estimated that such prevention or delay will continue, then the affected party shall be excluded from the performance or punctual performance as the case may be, of such obligation from the date of such notice for so long as the relevant Force Majeure condition continues.

Owner and Licensor shall be diligent in attempting to prevent or remove the cause of Force Majeure. The parties upon receipt of notice of Force Majeure shall confer promptly with each other and agree upon a course of action to remove or alleviate such causes.

If either party is prevented form fulfilling its contractual obligation for a period of 3 (three) months because of Force Majeure, then the parties shall consult each other with a view to agreeing to the action to be taken under the circumstances. Failing such agreement either party is entitled to cancel further performance under the Agreement.

The existence of Force Majeure circumstances within the territory of the countries of the parties to the agreement shall be confirmed by certificates to be issued by the appropriate authorities in the countries concerned.

ARTICLE 14 – DISPUTE RESOLUTION

14.1 GENERAL

Any dispute or difference of any kind whatsoever between Owner and Licensor arising under, out of or in connection with this Agreement shall be settled in accordance with the provisions of this ARTICLE.

14.2 NOTICE

Each party shall notify the other in writing when it considers a dispute or difference has arisen and which it wishes to refer to the other Party for amicable settlement pursuant to Article 14.3, and to arbitration pursuant to Article 14.4 in the event that amicable settlement is not reached. Such notice shall contain sufficient information as to the dispute or difference to enable the other Party to be fully informed as to the nature of the dispute, the amount of any monetary claim and the length of any extension of time claimed.

14.3 AMICABLE SETTLEMENT

Where notice of dispute or difference has been given under Article 14.2, the Parties shall attempt to settle such dispute amicably before commencement of arbitration provided that, unless the Parties agree otherwise, such dispute may be referred to Arbitration, subject to and in accordance with Article 14.4 on or after the sixtieth day after the day on which notice of dispute or difference was given, attempt for amicable settlement has been made.

14.4 ARBITRATION

14.4.1 Any dispute or difference of any nature whatsoever, any claim, cross-claim, counter-claim or set off of the Corporation against the Consultant regarding any right, liability, act, omission or account of any of the parties hereto arising out of or in relation to this agreement shall be referred to the Sole Arbitration of the Director (Refineries) of the Corporation or of some officer of the Corporation who may be nominated by the Director (Refineries). The Consultant will not be entitled to raise any objection to any such arbitrator on the ground that the arbitrator is an Officer of the Corporation he had expressed views on all or any other matters in dispute or difference. In the event of the arbitrator to whom the matter is originally referred being transferred or vacating his office or being unable to act for any reason, the Director (Refineries) as aforesaid at the time of such transfer, vacation of office or inability to act may in the discretion of the Director (Refineries) designate another person to act as arbitrator in accordance with the terms of the agreement to the end and intent that the original Arbitrator shall be entitled to continue the arbitration proceedings not withstanding his transfer or vacation or office as an officer of the Corporation if the Director (Refineries) does not designate another person to act as arbitrator on such transfer, vacation of office or inability of original arbitrator. Such persons shall be entitled to proceed with the reference from the point at which it was left by his predecessor. It is also a term of this contract that no person other that the Director (Refineries) or a person nominated by such Director (Refineries) of the Corporation as aforesaid shall act as arbitrator hereunder. The award of the arbitrator so appointed shall be final, conclusive and binding on all parties to the agreement subject to the provisions of the "Arbitration and Conciliation Act, 1996" or any statutory modification or re-enactment thereof and the rules made thereunder for the time being in force shall apply to the arbitration proceedings under this clause.

14.4.2 The arbitrator shall have power to order and direct either of the parties to abide by, observe and perform all such directions as the arbitrator may think fit having regard to the matters in difference i.e. dispute before him. The arbitrator shall have all summary powers and may take such evidence oral and / or documentary, as the arbitrator in his absolute discretion thinks fit and shall be entitled to exercise all powers under the Arbitration Act, 1996 including admission of any affidavit as evidence concerning the matter in difference i.e. dispute before him.

14.4.3 The parties against whom the arbitration proceedings have been initiated that is to say, the Respondents in the proceedings, shall be entitled to prefer a cross-claim, counter-claim or set off before the Arbitrator in respect of any matter an issue arising out of or in relation to the Agreement without seeking a formal

reference of arbitration to the Director (Refineries) for such counter-claim, cross-claim or set off and the Arbitrator shall be entitled to consider and deal with the same as if the matters arising there from has been referred to him originally and deemed to form part of the reference made by the Director (Refineries).

14.4.4 The arbitrator shall be at liberty to appoint, if necessary any accountant or engineering or other technical person, to assist him and to act by the opinion so taken.

14.4.5 The arbitrator shall have power to make one or more awards whether interim or otherwise in respect of the dispute and difference and in particular will be entitled to make separate awards in respect of claims or cross-claim of the parties.

14.4.6 The arbitrator shall be entitled to direct any one of the parties to pay the costs of the other party in such manner and to such extent as the arbitrator may in this discretion determine and shall also be entitled to require one or both the parties to deposit funds in such proportion to meet the arbitrators expenses whenever called upon to do so.

14.4.7 The parties hereby agree that the courts in the city of "Ernakulam, Kochi" alone shall have jurisdiction to entertain any application or other proceedings in respect of anything arising under this agreement and any award or awards made by the Sole Arbitrator hereunder shall be filed in the concerned courts in the city of Ernakulam, Kochi" only.

14.5 CONTINUATION OF WORK

Unless this Agreement has already been terminated, Licensor shall continue with the Work with all due diligence during the process of amicable settlement and arbitration.

ARTICLE 15 - GOVERNING LAW & JURISDICTION

15..1 The contract signed between Owner and the Licensor shall be governed by and construed according to the laws in force in India. Subject to Arbitration, the parties hereto hereby agreed to submit to the jurisdiction of the Courts situated at Ernakulam (India) for the purpose of actions and proceedings arising out of the contract and the Courts at Ernakulam (India) only will have the jurisdiction to hear and decide such actions and proceedings.

ARTICLE 16 - NO WAIVER OF RIGHTS

16..1 A waiver on the part of either party of any terms, provisions or conditions of this contract shall not constitute a precedent, nor bind either party to a waiver of any succeeding breach of the same, of any other terms, provisions for conditions of this contract.

ARTICLE 17 - DAMAGE TO PROPERTY

17..1 Licensor shall be responsible for making good to the satisfaction of Owner any loss or/and damage of all structures and properties belonging to Owner or being executed or procured or being procured by Owner or of other Agencies within the premises of all WORK of Owner if such loss or damage is due to fault and/or the negligence or willful acts or omission of, his employees, agents or representatives. Licensor shall indemnify and keep Owner harmless of all claims for damage to property other than Owner's property arising under or by reason of this agreement if such claims result from the fault and/or negligence of willful acts or omissions of Licensor, his employees, agents or representatives.

ARTICLE 18 - SAFETY

18..1 The Licensor shall observe and abide by all safety regulations of Owner during the course of performance of the work at Owner's Refinery at Ambalamugal (India).

ARTICLE 19 - EXCLUSION OF GOVERNMENT OF INDIA'S LIABILITY

19.1 It is expressly understood and agreed that Owner is entering into this contract solely on its own behalf and not on behalf of any other person or entity. In particular, it is expressly understood and agreed that the Government of India is not a party to this contract, and has no liability, obligations or right whatsoever hereunder. It is expressly understood and agreed that Owner is an independent legal entity with power and authority to enter into contracts solely on its own behalf under the applicable laws of India and the general principles of Contract law. The Licensor expressly agrees, acknowledge and undertakes that Owner is not an agent, representative or delegate of the Government of India and that the Government of India is not and shall not be liable for any act, omission, commission breach or other wrong arising out of this contract. The Licensor hereby expressly waives, releases and forgoes any and all actions or claims, including cross claims, impleader claims or counter claims, against the Government of India arising out of this contract covenants not to sue the Government of India for any manner or claim, cause of action or thing whatsoever arising out of or under this contract.

ARTICLE 20 – NOTICES FROM LICENSOR

20.1 Without prejudice to any other mode of service, any notice or claim required hereunder shall be made by registered or certified airmail, return receipt requested, addressed to the proper address. The notices, invoice and claims

sent by the Licensor shall be addressed for the attention of Deputy General Manager (Projects) of Owner.

ARTICLE 21 -AMENDMENT

21.1 The Agreement may not be amended, modified or terminated orally, and no amendment, modification, or attempted waiver of any of the provisions hereof shall be binding unless in writing and signed by authorized representatives of both the parties. Authorised representative shall mean a person holding Power of Attorney for signing.

ARTICLE 22 - IMPROVEMENTS

22.1 If Licensor should develop any Improvement (s) or should acquire Improvement (s) from a third party (for which Licensor has free right of disclosure) relating to the unit designed and constructed in accordance with the process package with in 5 years of completion of PGTR, then Licensor shall promptly free of charge inform Owner of the details of such Improvement (s) and shall at Owner's request communicate to Owner free of any additional cost the details necessary for incorporation of such Improvement (s) in the Unit, not involving any engineering services by Licensor. If Owner requires Licensor to perform engineering services for incorporating such Improvement in the unit, Licensor shall be obliged to perform such services at Licensor's usual charge.

ARTICLE 23 - ASSIGNMENT

23.1 This Agreement shall not be assignable by either party without the prior written consent of the other party, except that without such consent, it may be assigned to the successor of either party or to a person, firm, or corporation acquiring all or substantially all of the business and assets of such party. No assignment of this Agreement shall be valid unless and until this Agreement shall have been assumed by the assignee. When duly assigned in accordance with the foregoing, this Agreement shall be binding upon and shall be to the benefit of the assignee.

23.2 Notwithstanding any other provision of this Article, Owner may, without the consent of Licensor, collaterally assign the benefit of this Agreement or any part thereof and any interest therein or thereunder to lenders to Licensee with respect to the Project (hereinafter referred to as the "Lenders") as security for the financing extended by the Lenders for such project, provided however that Licensor's obligations and responsibilities shall not be increased in any way by such assignment.

ARTICLE 24 - VARIATION IN THE SERVICES

24.1 Owner may vary the Services to be performed by the Licensor and in such event shall be entitled to require the Licensor to perform the Services as so varied and such variation shall in no way vitiate or invalidate the Contract and the charges for all such variation shall be computed and payable in accordance with rates appended hereto.

24.2 All such variations in the services shall be within the general scope of Services and all such changes desired by Owner which may involve additions, deletions or revisions to the Scope of Services shall be covered by a written document issued by Owner to the Licensor herein referred to as "Change Order".

24.3 Each Change Order shall set forth the changes in the Services to be performed by the Licensor and for the corresponding adjustment to the Completion Date, the Contract Price and the basis in which Licensor is to be compensated for the changes, as applicable.

24.4 No adjustment to the Completion Date or Contract price shall be made pursuant to this Contract except by issuance of a Change Order.

ARTICLE 25 - SEVERABILITY

25.1 The invalidity, or un-enforceability of any provisions of this Agreement, shall not impair, invalidate or affect the other provisions of this Agreement. In case any provision of this Agreement is found to be invalid or unenforceable both parties will meet and agree on an amendment of the relevant provision, such that the parties' mutual interests remain served as best as possible.

ARTICLE 26 - CONFIDENTIAL HANDLING OF INFORMATION

26.1 The Licensor and his employees, agents and sub-contractors and the employees and agents of the Sub-contractor's shall treat as strictly confidential and shall take all steps necessary to ensure confidential handling of all maps, plans, charts, designs, drawings, photographs, data, reports, tests, specifications, methods, and other information developed or acquired by the Licensor from or by means of the Bidding Document or any facility extended to the Licensor pursuant thereto or the award or performance of the works or any of them or otherwise disclose or make available to the Licensor or any of the aforesaid persons report, disclose or reproduce the same in any book, article, speech or other publications, provided always that the Owner may upon application by the Licensor to the Owner in this behalf permit report, disclosure or reproduction of the same in any book, article, speech or publications if it is satisfied that this

would not involve the disclosure of any classified or other information which would not be in the interest of public or security of disclose.

26.2 Application for such consent shall be submitted to the Owner in writing outlining the intended use of the relative material and shall be submitted to the Owner at least one month prior to the expected use accompanied by the text of the relative publication in which it is sought to be used. Photographs should be accompanied by their caption. An application shall not be understood to have been permitted unless expressly permitted in writing by the Owner.

ARTICLE 27 - GENERAL CONDITIONS

27.1 All documents from one party to another of whatever nature shall be submitted in English by e-mail, fax or letter.

27.2 In the event of any dispute in or disapproval by Owner of any part of the submitted invoices, Owner shall pay the undisputed portion of the invoice, and shall advise Licensor of the disputed portion for correction.

ANNEXURE-III A: PROFORMA OF BANK GUARANTEE

(On non-judicial stamp paper of Rs.100/-)

FOR SECURITY DEPOSIT

To

Bharat Petroleum Corporation Ltd.

Kochi Refinery,

Ambalamugal

Ernakulam - 682 302

Dear Sirs,

M/s.

_____

_____

have taken tender for the work

_____

for Bharat Petroleum Corporation Ltd., Kochi.

The tender Conditions of Contract provide that the Consultant shall pay a sum of Rs. _____

(Rupees_____

_____)as earnest money / initial / full security deposit in the form therein mentioned. The form of payment of earnest money / security deposit includes guarantee executed by Schedule 'A' Bank, undertaking full responsibility to indemnify Bharat Petroleum Corporation Ltd. in case of default.

The said_____ have approached us and at their request and in consideration of the premises we_____

_____having our office at have agreed to give such guarantee as hereinafter mentioned.

1. We_____

_____ hereby undertake and agree with you that if default shall be made by M/s. _____ in performing any of the terms and conditions of the tender or in payment of any money payable to Bharat Petroleum Corporation Ltd. We shall on demand pay to you in such matter as to you may direct the said amount of Rupees_____only or such portion thereof not exceeding the said sum as you may from time to time require.

2. You will have the full liberty without reference to us and without effecting this guarantee postpones for any time or from time to time the exercise of any of the powers and rights conferred on you under the contract with the said_____and to enforce or to for bear from endorsing any power of rights or by reason of time being given to the said which under law relating to the sureties would but for provision have the effect of releasing us.

3. Your right to recover the said sum of Rs._____(Rupees_____ _____) from us in manner aforesaid will not be affected or suspended by reason of the fact that any dispute or disputes have been raised by the said M/s._____ _____and/or that any dispute or disputes are pending before any officer, tribunal or court.

4. The guarantee herein contained shall not be determined or affected by the liquidation or winding up, dissolution or change of constitution or insolvency of the said_____ _____but shall in all respects and for all purposes be binding operative units payment of all money due to you in respect of such liabilities is paid.

5. Our liability under this guarantee is restricted to Rupees_____ Our guarantees shall remain in force until_____ unless a claim or demand is made against us within six months from _____(which is date of expiry of guarantee) all your rights under the said guarantee shall be forfeited and shall be relieved and discharged from all liabilities thereunder.

6. We have power to issue this guarantee in your favour under Memorandum and Articles of Association and the undersigned has full power to do under the Power of Attorney dated _____granted to him by the Bank.

Yours faithfully

_____ Bank by its Constituted Attorney

Signature of a person duly authorised to sign on behalf of the bank.

TECHNICAL SPECIFICATIONS

SUPPLY OF LICENSE, BASIC DESIGN ENGINEERING PACKAGE
AND
OTHER RELATED SERVICES
FOR
FLUID CATALYTIC CRACKING UNIT (FCCU)

INTEGRATED REFINERY EXPANSION PROJECT (IREP)
BHARAT PETROLEUM CORPORATION LIMITED-KOCHI REFINERY

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1.0 INTRODUCTION

Bharat Petroleum Corporation Limited (BPCL) Refinery at Kochi, Ambalamugal (BPCL-KR) has an installed capacity to process 9.5 Million Metric Tonnes Per Annum (MMTPA) crude oil. BPCL-KR has plans to improve the current operation & profitability by setting following targets:

- Expand refinery crude processing capacity to 15.5 MMTPA
- Achieve capability to process 100% high sulphur crudes
- Improve yield of light & middle distillates by adding capability to upgrade residue to value added products.
- Upgradation of auto fuels quality to Euro-IV/V norms.
- Install facilities for production and maximization of Polymer Grade Propylene

As part of their Integrated Refinery Expansion Project (IREP), BPCL intends to set up a Crude/Vacuum Distillation Unit, a Diesel Hydrotreating Unit for hydrotreating Diesel, Kerosene & Naphtha streams to meet Euro V Diesel specifications, a VGO Hydrotreater Unit to hydrotreat feed for FCCU, a FCCU to maximize Propylene production and a Delayed Coker Unit (DCU) for the residue upgradation.

BPCL has engaged EIL for the Technology Evaluation and Licensor selection of the above process units.

This document constitutes Technical Specifications of bid enquiry for inviting techno-commercial proposals from the Licensors for supply of License, Basic Design Engineering Package (BDEP) and other related services for the following:

- Fluid Catalytic Cracking Unit technologies
- Tertiary Separation System (TSS) for Flue gas treatment

2.0 BASIS FOR TECHNICAL PROPOSAL

The technical proposal from the Licensors shall be in line with the basis outlined in the following sections.

2.1 PROCESSING OBJECTIVE

2.1.1 The processing objective of FCCU unit is maximization of Propylene yields. FCCU unit Block includes Propylene recovery unit and LPG/Propylene Treating (as required to meet LPG & Polymer Grade Propylene product specifications)

2.1.2 The FCCU shall be designed for a nominal capacity of 2.2 MMTPA of hydrotreated VGO feed for the following two design cases as described in Section 2.3 below.

2.1.3 Other Propylene rich treated LPG streams from existing FCCU unit and LPG from Delayed Coker Unit, shall be processed in the Propylene Recovery Unit (PRU) for maximizing Propylene yield.

2.1.4 The FCCU unit is to be designed to produce Fuel Gas, polymer grade propylene, Liquefied Petroleum Gas (LPG), FCCU-Naphtha, Light Cycle oil (LCO) and Coke.

2.1.5 For the purpose of evaluation, feed and product quantities and operating costs as per Design case-1 will be considered. However, Licensor to ensure that the unit design is suitable for processing of required quantity and quality of feed for the other design case ensuring design objectives and product specifications are met in all cases. The hardware specifications should be based on the controlling case out of the two design feed cases and plant cost shall be estimated based on this.

2.1.6 All products from FCCU shall meet the required qualities specified in Section 2.7 and Annexure IVC of this document. The normal routing of the various products are envisaged as follows:

- Sour fuel gas to refinery Fuel Gas Treating system
- Propylene-Polymer Grade to storage
- LPG to LPG pool
- FCCU Naphtha to gasoline pool
- LCO to refinery Diesel Hydrotreater unit for upgradation to Diesel product specification

2.1.7 Tentative block flow schematic for FCCU is attached as Annexure-IVF.

2.2 DEFINITION OF BATTERY LIMITS

2.2.1 The facilities under FCCU Block battery limits shall consist of the following sections, all of which shall be within of the scope Licensor's design:

a) All processing facilities as needed to meet the process objectives and guarantees, conforming to the design basis and other considerations specified in this document
b) Facilities for carrying out on stream and shut down maintenance
c) Facilities for in-plant steam generation, if any
d) Special fire fighting and safety systems as necessary
e) Feed surge drum
f) Reaction-Regeneration section
g) Feed preheating & charge heater section
h) Main Fractionation section and Gas Concentration/ LPG recovery section
i) LPG & Propylene Treating section as required to meet Polymer Grade Propylene specifications. Licensor shall indicate the type of treatment required to meet Polymer grade Propylene specifications, the adsorbents with quantity and consumption pattern and other required details such as suppliers etc.
j) Propylene Recovery Section to recover Propylene from FCCU LPG and other external sources as specified.
k) Flue gas heat recovery steam generation section.
l) For SPM Reduction in FCCU Flue gas & stack, Tertiary Separator System (TSS) shall

be considered to meet Environmental regulations mentioned in Clause no. 2.12.36. Also it shall take care of the requirement of downstream expander (PRT) as a future provision.

m) For expander (PRT) mentioned in above point Process specifications shall be provided by Licensor and provision shall be kept in plot plan for future. However PRT/Expander shall not be considered for evaluation.

n) H2S/Sulfur removal from sour LPG product by amine treating and/or additional treatment, if necessary. Licensor to indicate whether this is a batch or continuous process and specify the quantity in offer.

o) Deaerator for BFW production and associated facilities.

p) Facilities for preparation, dilution, injection and storage of chemicals and similar items required if any, within the battery limit.

q) Facilities for loading, unloading and storage of catalyst & additives as per section 2.11.

r) Any special facility required for smooth/ safe start-up/operation/shutdown of the unit, if required.

s) Necessary facilities required for environment protection and occupational safety related to the process unit

t) It is desired to utilize sour water generated within Unit as wash water to the maximum extent in the unit. Licensor to indicate the limitation, if any. DM water / Boiler feed water (BFW) and Steam condensates are the alternate streams to be considered as process wash water.

u) 20 wt% caustic solution shall be available from OSBL for H2S removal. Facilities for dilution, storage and injection facilities to be included within the battery limit of FCCU.

v) Spent caustic degassing system

w) Boiler Feed Water preheating, facilities for steam generation from hot streams as well as furnace convection section if any.

x) Corrosion monitoring and Control facilities

2.2.2 The following facilities are specifically excluded from the scope of Licensor design:

a. Sour Fuel Gas treating facilities
b. Sour Water stripping facilities
c. Off-site feed and product storage tanks
d. Flare System including knock-out drum
e. Closed blow down (CBD) system

Sour Fuel Gas and Sour Water would be treated in the Fuel Gas Amine Treater and Sour Water Stripper units of the refinery respectively.

Utilities including Power, Steam, Cooling Water, Nitrogen and Compressed Air for the FCCU would be made available from the refinery's power and utility systems/ network. DM Water required for in-plant steam generation, Fuel Oil, treated Fuel Gas and Flushing Oil if required also shall be made available at battery limit.

2.3 DESIGN FEED AND UNIT CAPACITY:

2.3.1 The feed to the FCCU unit is Hydro treated VGO from VGO Hydrotreater Unit (which processes Straight run VGO from CDU/VDU and heavy coker gas oil from DCU).

2.3.2 **Fluid Catalytic Cracking Unit (FCCU)**:

The FCCU shall be designed for two design feed cases. Licensor shall submit technical and commercial proposal for both two design cases as given below:

Design case-I: The proposed FCCU shall be designed for processing 2.2 MMTPA of hydrotreated feed. Minimum yield of Propylene ex FCCU shall be 10 wt% of fresh feed. Maximization of Propylene is main processing objective and credit will be given for higher Propylene yield over & above minimum yield.

Design case-II: During the initial plant operation, due to market situation, or due to non availability of the downstream Propylene consumption facilities, it will become necessary to run the petrochemical FCCU at lower severity so that the proposed Propylene can be absorbed in the LPG product. This needs to be done with no major investment. The plant is to be designed for this case with the following considerations.

- No change in catalyst
- Utilize the overdesign margin for this case of operation
- Increase the capacity of the FCCU-Naphtha, LCO & slurry circuit equipment, if necessary
- Fresh feed can be reduced to 2.0 MMTPA

LPG, Propylene Treating and Propylene Recovery Unit (PRU)

Along with the streams from FCCU, Propylene bearing streams from existing FCCU and DCU shall also be processed in PRU of FCCU. For all Design Cases and check cases of FCCU Unit, matching capacity based on corresponding yields from FCCU Unit and external LPG feedstock shall be considered.

2.3.3 Check cases:

Licensor to note that there will be two check cases in BDEP apart from design Cases. Licensor to provide the following information as a minimum for check cases along with design cases:

1. Heat and material balance.
2. PFD's indicating operating conditions of check cases
3. Maximum throughput achievable and limiting equipments to achieve 100% throughput.

2.3.4 Licensor to provide the yield data & utility consumption for two design cases. All technical information requested in the tender (estimated product yields, product qualities, utility consumption, etc.) must be furnished for all the design cases. Licensor shall furnish PFD, Heat & Material Balances and product qualities for all the design cases in the BDEP.

2.4 FEED CHARACTERISTICS

2.4.1 The specifications of the feed to FCCU are given in the following tables.

Table 2.4.1.1: VGO Bottoms Feedstock Characteristics

Feed Stream	**Unconverted oil from VGO HDT Unit**	
Flow rate (TPA)	2200000	
Quality specifications		
Specific Gravity	0.89 (During SOR of VGO-HDT)	0.91 (During EOR of VGO-HDT)
H2 Content wt%	12.8 (min)	
Total Sulfur, ppmw	200 (max)	
Total Nitrogen, ppmw	200 (max)	
Basic Nitrogen ,ppmw	50(max)	
TBP cut point, Deg C		
Distillation, ASTM D1160, °C	During SOR of VGO-HDT	During EOR of VGO-HDT
IBP	372	359
5	380	362
10	396	384
30	432	425
50	460	453
70	486	483
90	540	537
95	563	557
EP	588	586
Total Metals (Ni/V etc), ppmw	0.5 (max)	
C7 asphaltenes, ppmw (IP-143)	500 (max)	
Conradson Carbon, wt%	0.05 (max)	
Pour point, °C	40	
Aromatics, vol%		
Mono	#	
Poly	#	
Total	#	
Bromine No., g/100g	#	
Aniline point, °C	99	
Kinematic viscosity, cSt @ 50 deg C	#	
Kinematic viscosity, cSt @ 100 deg C	#	

- #-Properties to be estimated by Licensor based on past experience. Licensor to report the estimated values along with the offer.
- Licensor shall specify the maximum permissible limits of Nitrogen and metals in the feedstock up to which catalyst performance will not alter. Licensor should also specify any other critical quality, which may have to be kept in mind while running the unit on feeds other than the design feeds.Licensor to estimate any other feed properties not available & indicate the same in the offer.

Table 2.4.1.2: Coker LPG feedstock Characteristics (Note-A)

Stream	Unit	Coker LPG
Flow rate	TPA	119000
Composition		
Ethane	wt%	0.13
Propylene	wt%	15.63
Propane	wt%	40.88
Iso butane (iC4)	wt%	4.52
Butylenes (C4=)	wt%	20.3
1,3 Butadiene	wt%	0.43
Normal butane (nC4)	wt%	17.3
C5-140 Deg C	wt%	0.81
Properties		
Total Sulfur	Ppmw	100 (max)
Mercaptan Sulfur	Ppmw	5 (max)
H2S		Nil
Cu Strip Corrosion @38 Deg C for 1 hour		Not worse than 1a
Free Water Content		Nil
Na+,	ppmw	1 (max)
Carbonyl Sulfide	ppmw	11
Carbon Disulfide	ppmw	30

Note A: This is external treated LPG feedstock for Propylene recovery Unit

Table 2.4.1.3: Existing FCCU LPG feedstock Characteristics (Note-A)

Stream	Unit	LPG from existing FCCU unit
Flow rate	TPA	416000
Composition		
Propylene (C3=)	vol%	31.1
Propane (C3)	vol%	7.6
Iso butane (iC4)	vol%	16.0
Normal butane (nC4)	vol%	7.1
Butylenes (C4=)	vol%	38.2
Properties		
Total Sulfur	ppmw	100 (max)
Mercaptan Sulfur	ppmw	5 (max)
H2S		Nil
Cu Strip Corrosion @38 Deg C for 1 hour		Not worse than 1a
Free Water Content		Nil
Na+,	ppmw	1 (max)
Carbonyl Sulfide	ppmw	11
Carbon Disulfide	ppmw	30

Note A: This is external treated LPG feedstock for Propylene recovery Unit

2.4.2 Wash water

Licensor will preferably use sour water produced within the unit as injection wash water. Stripped sour water with 50 ppmw H_2S and 50 ppmw NH_3 (from Sour Water Stripping Unit –outside Licensor's scope) shall preferably be used as back-up injection wash water. Additional wash water requirement shall be met from steam condensate from condensate header. DM water / BFW / steam condensate shall be used as back-up injection wash water. Licensor to indicate basis of selecting wash water rate such as %ammonium bisulphide, %liquid etc. Suggested wash water quality is indicated in the table below:

Table2.4.2: Quality of Stripped Sour Water

ESSENTIAL SPECIFICATIONS	
Parameter	**Value**
H_2S, ppmw (max)	50
NH_3, ppmw (max)	50
Oil Content, ppmw	200
Salt Content, ptb max	10

2.5 ON-STREAM FACTOR

The unit shall be designed for an on-stream factor (operating hours) of 8000 hours per annum towards arriving at the hourly processing rate but the unit design and engineering practices advised shall allow a minimum operating cycle of 3 years between turnarounds with units operating continuously at 100% capacity.

2.6 TURNDOWN CAPABILITY

The unit shall be capable of a turndown (minimum operable hydraulic capacity) at 50% of design capacity while making on-specification products. Unit turndown should be achievable with cold feed also

2.7 PRODUCT SPECIFICATIONS

The FCCU is to be designed to produce products as per the specifications given in following tables.

Sour Fuel Gas		
Property	Unit	Specification
H2S Content	ppmw	Report
Ammonia	ppmw	Report
Chloride	ppmw	Report
Composition	wt.% & vol%	Report
C3 & Heavier Hydrocarbons	vol.%	Report
Net Calorific Value	Kcal/Kg	Report
Mol Wt		Report

Propylene (Polymer Grade)		
Property	Unit	Specification
Propylene, min	Wt%	99.6
Hydrogen,max	ppm wt.	2
Inerts (N2,CH4,C2H6, I-Butane, n-Butane),max	ppm wt	540
Propane, max	% wt	0.4
Noncondensables(N2,NH4), max	ppm vol	100
Ethane, max	ppm mol	200
C4,C5 sat hydrocarbons, max	ppm vol	200
Total C4's ,max	ppmwt	650
Ethylene, max	ppm vol	100
Butene, max	ppm mol	10
Pentene, max	ppm vol	10
Acetylene, max	ppmwt	3
Methylacetylene,max	ppm vol	3
Propadiene, max	ppm vol	5
1,3 Butadiene,max	ppm mol	5
Green oil (C8-C12), max	ppm vol	20
Oxygen, max	ppm wt	1
Carbon monoxide, max	ppm vol	0.03
Carbon dioxide, max	ppm wt	2
COS,max	ppm vol	0.02
Total Sulphur, max	ppb wt	500
Methanol, max	ppm wt	1
Isopropanol, max	ppm wt	1
Water, max	ppmwt	1
Arsine, max	ppb vol	30
Phosphine, max	ppm vol	0.03
Ammonia, max	ppmwt	2
Cyclopentadiene, max	ppm vol	0.05
Hexane + Nonene, max.	ppm wt	5
Hydrogen Sulfide, Max	ppb wt.	500
Methane, max.	ppmvol	100

LPG		
Property	Unit	Specification
H2S,max	ppmw	Nil
Methyl,Ethyl,Propyl Mercaptan ,max	ppmw	Report
Mercatan Sulfur,max	ppmw	5
CS2/COS	ppmw	Report
Total volatile sulphur, max	ppmw	150
Sp gr		Report
Composition(Butene-1 and iso-Butelene in particular)	Vol%	Report
LHV	Kcal/kg	Report
Vapour pressure at 40^{o}C,max	kPa	1050
C2 and lighters, max	wt%	0.2
C5 and heaviers, max	Mol%	1.0
Volatility, Evaporation Temperature for 95 vol% at 760 mm Hg, max	^{0}C	2
Cu Strip Corrosion test @ 38^{o}C for 1 hour		Not worse than 1
Free water, max	ppmw	Nil
Unsaturated Hydrocarbons, max	wt%	1
Residue on evaporation,max	wt%	0.05

FCCU-Naphtha		
Property	Unit	Specification
TBP Cut Points	^{0}C	Report
Specific Gravity		Report
RVP @38^{0}C,max	psia	7.1
RON C,min		92
MONC,min		82
Flash Point	^{0}C	Report
Bromine No.		Report
ASTM D-86 Distillation Temp.: 5/ 10/ 50/ 90/ 95 % Recovery	^{0}C	Report
ASTM D-86: End Point, max	^{0}C	150
Hydrocarbon Types : Paraffins Olefins, Napthenes Aromatics,max Benzene,max	 vol. % vol. % vol. % vol. % vol. %	 Report Report Report 35 2.5
H2S Content	wt.%	Report
Total Sulfur,max	ppmw	40
Mercaptan Sulfur	ppmw	Report
Nitrogen (Total & Basic)	ppmw	Report
Chlorides	ppmw	Report
Silicon Content	ppmw	Report
Metals (Ni+V)	ppmw	Report
Cyclic and Acyclic Olefins		Report
Diene Value		Report
Thiophenes		Report
Maleic Anhidride Value		Report
Existent & Potential Gum	gm/m^3	<50 (Potential) <40 (existent)
Cu Strip Corrosion test @ 38^{o}C for 1 hour		Not worse than 1
Oxidation Stability		Report

Light Cycle Oil (LCO)		
Property	Unit	Specification
TBP Cut Points	^{0}C	Report
Specify Gravity		Report
Flash Point (Abel),min	^{0}C	38
Pour Point	^{0}C	Report
Bromine No.		Report
Cetane No.		Report
Cetane Index D4737		Report
ASTM D-86 Distillation Temp. For 5/ 10/ 50/ 90/ 95 % Recovery & End Point (EP)	^{0}C	Report
Hydrocarbon Types: Paraffins Olefins Napthenes Aromatics	 vol. % vol. % vol. % vol. %	Report
Total Sulfur	wt.%	Report
ASTM D-86 95 LV% recovery, max	^{0}C	360
Total Poly Aromatics	wt.%	Report
Nitrogen (Total and Basic)	ppmw	Report
Acidity (Inorganic)		Report
Acidity(total)		Report
Aniline Point	^{0}C	Report
Total Aromatics (Di,Tri,Poly)	wt%	Report
Total metals	ppmw	Report
Asphaltenes		Report
Cyclic and Acyclic Olefins	Vol%	Report
Cloud Point	^{0}C	Report
Benzothiophenes	wt.%	Report
Di Benzothiophenes	wt.%	Report
Methyl DiBenzothiophenes	wt.%	Report
Dimethyl DiBenzothiophenes	wt.%	Report
Water	wt.%	Report
Kinematic Viscosity at 50 ^{0}C	cst	Report

Coke		
Property	Unit	Specification
H2 in Coke	Wt%	Report
S in coke	Wt%	Report
Calorific value	Kcal/Kg	Report
Metals	Wt%	Report
Ash	Wt%	Report

Flue Gas		
Property	Unit	Specification
Composition (including Sox,Nox)	Mole%	
Suspended particulate matter (SPM),max	mg/Nm3	50 (dry)

Notes:

Note-1: Licensor shall attempt to minimize LCO by adjusting cut point of LCO and Naphtha while meeting the product specification of Naphtha and LCO.

Note-2: A side stripper to be considered for LCO draw.

Note-3: For the purpose of proposal, there shall not be any HCO product from FCCU. However requirement of a draw for any other purpose shall be decided at design basis stage after discussion with Licensor.

Note-4: Clarified oil (CLO) as a product is not envisaged in this FCCU. However for start- up and other scenarios necessary facilities for CLO as a product shall be provided by Licensor. In such case, Licensor shall note that Catalyst fines content shall not exceed 200 wppm. The product properties and guarantee of CLO product if withdrawn as a product shall be discussed and finalized during Kick Off stage.

Note-5: Slurry from Main Fractionator Bottoms is considered to be recycled back to reactor.

Note-6: Licensor shall indicate product yields including coke and loss considering maximization of Propylene in LPG. The yield estimate data sheet should show the following summary of information for Ex Unit as well as Ex Reactor

- Yield of H2S, Gas (break up of C1, C2, C2= etc.), LPG (break up of C3, C3=, nC4, iC4, C4=, etc), FCCU-Naphtha, LCO, & Coke.
- Physio-Chemical properties of each streams mentioned above.

2.8 OPTIMIZATION CRITERIA

2.8.1 PRICES FOR FEED, PRODUCTS AND UTILITIES

For the purpose of unit optimization/ energy optimization, the prices for feed, products and utilities shall be considered as per Table – 2.8.1.1 & 2.8.1.2.

Table 2.8.1.1: Prices for Feeds and Products

S. No.	*Feeds/ Products*	*Prices (Rs/MT)*
FEED streams		
1.	VGO HDT bottoms	28814
2.	FCCU (existing)-LPG	32452
3.	DCU-LPG	32452
PRODUCT streams		
4.	Sour fuel Gas	20903
5.	Propylene	50000
6.	LPG	32452
7.	FCCU- Naphtha	37894
8.	Light cycle oil	28770

Table 2.8.1.2: Prices for Utilities

Sl. No.	*Utility*	*Price*
1.	Power	5.58 Rs/KWh
2.	HP Steam	2073 Rs/MT
3.	MP Steam	1954 Rs/MT
4.	LP Steam	1856 Rs/MT
5.	Fuel Gas	20903 Rs/MT
6.	Fuel Oil	22363 Rs/MT
7.	Re-circulating Cooling Water	1.87 Rs/M^3
8.	Raw Water	9.4 Rs/KL
9.	Boiler Feed Water	269 Rs/MT
10.	Demineralised Water	39.8 Rs/M^3
11.	Surface Condensate (Subcooled)	39.8 Rs/M^3
12.	Reboiler Condensate (>150^oC)	269 Rs/MT
13.	Nitrogen	5.41 Rs/NM^3
14.	Compressed Air	1.48 Rs/NM^3

2.8.2 PLANT LIFE

Plant equipment design life shall be considered as follows:

- 30 years for heavy wall reactors and separators
- 20 years for columns, vessels, heat exchanger shells and similar services
- 10 years for piping, furnace tubes, high alloy exchanger tube bundles
- 5 years for carbon steel/ low alloy heat exchanger tube bundles
- 20 years for all rotating equipment

2.9 BATTERY LIMIT CONDITIONS OF PROCESS STREAMS

Conditions of all incoming and outgoing streams at battery limits of FCCU shall be per table given below:

Table 2.9.1: Battery limit condition for process streams

S no.	Process Streams	Pressure, Kg/Cm^2 g	Temp, ^0C	Source/Destination
Incoming Streams				
1	Feed (Hot)	6.0	150	From VGO HDT Unit
	Feed (Cold)	4.0	80	From Storage
2.	Existing FCCU-LPG	22.0 (Note-4)	40	From existing FCCU
3.	Coker LPG	22.0(Note-4)	40	From DCU
4.	Lean Amine	5.0	45	From Amine Regeneration Unit
5.	Stripped sour water	4.0	40	From SWS Unit
6.	Caustic (20 wt %)	3.0	40	From Caustic System
Outgoing Streams				
1.	Sour fuel Gas	7.0	40	To Fuel Gas Treating Unit
2.	Propylene-Polymer grade	27	40	To Storage
3.	LPG	16 (Note-4)	40	To Storage
4.	FCCU- Naphtha	6.0	40	To MS Pool
6.	LCO (Hot) LCO (Cold)	6.0 4.0	120 40	DHDT Diesel Pool/CPP/DHDT
7.	Rich Amine	8.0	45	To Amine Regeneration Unit
8.	Sour water	5.0	As per design	To SWS Unit
9.	Spent Caustic	6.0	40	To ETP

Notes:

1.0 Feed and products could have hot/ cold conditions, depending on the source/ destination.

2.0 Mechanical design conditions of incoming streams shall be finalized at the time of design.

3.0 Licensor is to accept the above Battery Limit condition with revisions, if any during design basis meeting. There may be variance from the Battery Limit conditions specified by Licensor and BPCL requirement.

4.0 These pressures to be confirmed by Licensor based on requirement.

2.10 BATTERY LIMIT CONDITIONS FOR UTILITIES

Conditions of utilities at battery limits of unit shall be as per Following Table.

Table 2.10: Conditions of utilities at unit battery limits

		Minimum	*Normal*	*Maximum*	*Mech. Design*
HP Steam	Pressure, kg/cm2g	36	38	40	45
	Temperature, ^{0}C	365	375	390	420
MP Steam	Pressure, kg/cm2g	15	18	20	22
	Temperature, ^{0}C	255	265	275	285
LP Steam (Import)	Pressure, kg/cm2g	3.0	4.0	5.0	7.5
	Temperature, ^{0}C	Saturation	165	185	200
LP steam (Export)	Pressure, kg/cm2g			5.5	6.5
	Temperature, ^{0}C				200
Demineralised dWater	Pressure, kg/cm2g	7	8	10	12
	Temperature, ^{0}C		40		65
Raw Water	Pressure, kg/cm2g	3.0	4.0	5.0	--
	Temperature, ^{0}C	Ambient	Ambient	Ambient	--
Cooling Water Supply	Pressure, kg/cm2g		4.5		7
	Temperature, ^{0}C		33		65
Cooling Water Return	Pressure, kg/cm2g		2.2		7
	Temperature, ^{0}C			45	65
Stabilized Condensate	Pressure, kg/cm2g	6.0	7.0	9.0	17
	Temperature, ^{0}C		Saturation		250
Surface Condensate	Pressure, kg/cm2g		5.0		6.5
	Temperature, ^{0}C		49		65
Plant Air	Pressure, kg/cm2g	5.0	6.0	7.0	10.5
	Temperature, ^{0}C		Ambient		65
Instrument Air	Pressure, kg/cm2g	6.0	6.5	7.5	10.5
	Temperature, ^{0}C	Ambient	Ambient		65
Fuel Gas	Pressure, kg/cm2g	2.0	2.5	3.0	6.5
	Temperature, ^{0}C		40		65
Fuel Oil Supply	Pressure, kg/cm2g		15		22
	Temperature, ^{0}C		200		230
Fuel Oil Return	Pressure, kg/cm2g		5.0		22
	Temperature, ^{0}C		200		230
Nitrogen	Pressure, kg/cm2g	3.0	5.0	7.0	10.5
	Temperature, ^{0}C		Ambient		65
MP Boiler Feed Water	Pressure, kg/cm2g		25		30
	Temperature, °C		105		150
HP Boiler Feed Water	Pressure, kg/cm2g		47		70
	Temperature, ^{0}C		105		150

Notes:

1. All B/L pressure are as measured at grade.
2. Utilities will be made available at the Battery Limits at the conditions specified in the table above. Any utilities generated within the unit as surplus shall conform to these specifications.
3. Steam generators shall be floating on steam headers, i.e., no pressure control shall be provided on steam generators, unless warranted from process reasons. Accordingly, Licensor shall consider the normal Battery Limit steam pressures as indicated in table above for estimation and guarantee of the steam generation quantity. However, design of steam generation facilities shall be capable of operating at minimum as well as maximum Battery Limit pressure conditions also.
4. Licensor shall superheat the steam generated in the fired heater (in case steam generation is envisaged) operating continuously to match the Battery Limit temperature conditions indicated in table above unless warranted otherwise by process reasons
5. Licensor to indicate specifically higher utility pressure requirements if any for unit operation, regeneration, decoking, etc. along with the offer.

2.11 CATALYSTS, CHEMICALS, ADSORBENTS AND ABSORBENTS

2.11.1 Unit shall include all facilities for receiving, loading, unloading, auto catalyst/ additive loading system and storage of catalysts, adsorbents/absorbents keeping space within ISBL for all such operations. Licensor shall provide complete process specifications for catalyst/additive system, adsorbents/absorbents including normal and maximum dosing rates, delivery pressure and temperature, properties which have to be necessarily specified, etc., with which a detailed engineering contractor can develop the full system design without reverting to Licensor. Licensor shall design an automated fresh catalyst loading system to the fresh catalyst hopper, ensuring catalyst loss is minimum.

2.11.2 Licensor shall furnish the specifications of fresh catalyst, equilibrium catalyst any additive, adsorbents/absorbents required. Also, Licensor shall indicate the maximum allowable limit of metal content in equilibrium catalyst.

2.11.3 Licensor shall indicate the quantity of initial charge of equilibrium catalyst, adsorbents/ absorbents, make up requirement of fresh catalyst per day, catalyst loss through stack per day and ultimate life of adsorbents/absorbents. Licensor to note that no changes in quantity of catalysts, adsorbents/absorbents shall be permitted at a later stage for the feed indicated in the Design cases of this bid.

2.11.4 Licensor shall advise on details of treatment/ neutralization before unloading of spent catalyst and the disposal methods for spent catalysts.

2.11.5 Licensor shall indicate whether usage of any additive has been considered for boosting yields. If so, quantity of the same to be mentioned.

2.11.6 Unit shall include all facilities for preparing, storing and injection of required chemicals. Working storage volumes shall ensure smooth start-up, normal operation and shutdown

of unit. Licensor shall provide adequate definition of chemical injection requirements such as normal and maximum dosing rates, delivery pressure and temperature, properties which have to be necessarily specified, etc., with which a detailed engineering contractor can develop the full system design without reverting to Licensor.

2.11.7 Chemical passivation requirements shall be identified and suggestions provided for disposal of passivation effluent based on earlier experience.

2.11.8 Details of chemicals including name, function, annual consumption, storage and handling requirements, etc. shall be provided in the proposal. List of vendors for specialty chemicals if any, is also to be provided.

2.12 SPECIFIC PROCESS DESIGN GUIDELINES

2.12.1 Presently Heavy Naphtha draw and Heavy Naphtha Side Stripper is not envisaged in Unit configuration. However Licensor to review the requirement of Heavy naphtha side draw from fractionator along with side stripper and associated facilities. If this draw is made from column maximize blending of Heavy naphtha into LCO, meeting all the qualities of LCO product. This will be finalized at kick off stage. Licensor to note that no change is permitted in BDEP fee and License fee in case this facility is envisaged at kick off stage.

2.12.2 Presently Naphtha Splitter is not envisaged in Unit configuration. This will be finalized at kick off stage. Licensor to note that no change is permitted in BDEP fee and License fee in case this facility is envisaged at kick off stage.

2.12.3 Licensor shall indicate overdesign philosophy followed for broad equipment specifications in the bid. Design margin if any will be specified during design basis finalization of BDEP.

2.12.4 The Wet Gas Compressor shall be a centrifugal machine with 100% condensing steam turbine drive using HP Steam. Main Air Blower shall also be 100% condensing steam turbine drive with HP steam. Type of driver shall be finalized at kick off stage based on extraction level required.

2.12.5 Licensor to review the economics of heat pump vis- a- vis Hot water belt for PRU reboilers and recommend most economical one.

2.12.6 The sour water shall be degassed (pressure break) and then pumped to offsites.

2.12.7 Licensor to report SOx and SPM in FCCU Flue gas released after Heat recovery. Flue Gas treating scheme is included in Licensor's scope. Licensor to include in his proposal Tertiary Separator System (TSS) to restrict particulate emission to 50mg/nm3(dry)max in flue gas released.

2.12.8 Power recovery turbines (PRT) for energy optimization: Potential of power recovery through PRT/Expander in flue gases from the regenerator shall be furnished by the Licesnor. However the same shall not be considered for technology evaluation.

2.12.9 PRU unit to be designed considering continuous vapour recycle stream from Polypropylene Unit. Flow of this stream is to be taken as 2.5 wt% of net Propylene flow leaving FCCU Unit. This stream is expected to contain Propylene/Propane in 80:20 wt ratio; however actual flow and composition will be confirmed during design stage based on Polypropylene unit Licensors feedback. FCCU Licensor may indicate the maximum allowable contaminants, if applicable, in the recycle stream coming from Polypropylene Unit

2.12.10 Isolation facility and bypass for flue gas cooler to be provided. Licensor to recommend the type of isolation facility (Offline/Online)

2.12.11 Licensor shall minimize loss of LPG and Propylene to Fuel gas by suitable processing schemes. Licensor to optimise the heat integration to reduce overall energy consumption in the unit

2.12.12 Steam generation in Unit shall be corresponding to HP level for the purpose of evaluation however exact level of steam will be decided at kick off stage

2.12.13 Licensor shall propose equipment configuration within the limit of following weight and dimension constraints and without any requirement of site-welding:

Diameter/ width : 4.5 metres maximum (including nozzle projections)
Length (T/T) : 30 metres maximum
Weight : 680 tons

Equipment more than 4.5 M diameter meter may be site fabricated and Licensor to identify all such equipment specifically while proposing an optimal design.

2.12.14 Usually hot feed shall be processed in FCCU however Licensor to report maximum achievable throughput and turndown for 100% cold feed.

2.12.15 Licensor to consider and specify suitable system for preventing back up of catalyst from the regenerator to the Air blower discharge line in the event of shut down of air blower.

2.12.16 Requirement of Auxiliary firing in waste heat boiler shall be finalized at kick off stage. Licensor to furnish the implication in design and cost benefit analysis for auxiliary firing along with offer.

2.12.17 Licensor to consider stacked column (side strippers, primary absorbers, stripper) as applicable.

2.12.18 Two flare headers are envisaged in FCCU battery limit i.e. HP and LP flare headers

2.12.19 The plot area available for FCCU is attached as Annexure IVI. Licensor to confirm in the offer that all inside Battery Limit facilities can be accommodated in this specified plot size.

2.12.20 Air cooling shall be maximised with minimum water cooling. The process side outlet temperature for air cooled heat exchanger shall be considered as below:

- Air cooled exchanger not followed by water cooling: 50 ^{0}C
- Air cooled exchanger followed by water cooling: 55 ^{0}C

2.12.21 Maximum ambient temperature of air for design of air-cooled exchanger shall be 36^{0}C. Design minimum temperature shall be 20 ^{0}C.

2.12.22 Licensor shall use following suggested fouling factors towards preliminary sizing of heat exchangers in the plant, for the proposal:

Table 2.12.4: Fouling factors (hr-m^2-°C/kcal)

Stream	Fouling factor	Stream	Fouling factor
Atm Frac Overheads	0.0004	Hydrotreated VGO	0.001
Naphtha	0.0003	Cooling water	0.0004
Light Cycle Oil	0.0006	Steam	0.0001

Fouling factors for process streams shall be decided by designer based on past experience and good design practices. However, Owner's overriding considerations towards fouling factors for specific units or process streams shall be the basis of specifications, if spelt out in respective unit design basis.

2.12.23 Licensor to design the unit for maximum energy efficiency, meeting benchmark numbers of international bench marking agencies. Process and equipment design should incorporate features for maximizing energy efficiency. Design shall include waste heat recovery from hot flue gases, etc.

2.12.24 Licensor to note that steam generation from heater flue gases will not be considered for the purpose of evaluation/ NPV calculations. Licensor to provide the absorbed duty, Fired duty will be calculated considering a uniform value of heater efficiency.

2.12.25 Combination firing (Fuel Oil/ Fuel Gas) shall be considered in all fired heaters.

2.12.26 Licensor to confirm whether Lean Amine System is required for LPG or not. In case it is required facilities like Lean Amine surge drum and pumping, Rich Amine break vessel etc shall be a part of Licensor scope. If envisaged, Licensor shall design Amine wash facilities considering a maximum rich MDEA loading of 0.4 mol H2S per mol MDEA and lean MDEA loading of 0.015 mol H2S per mol MDEA. Lean amine from amine regeneration unit shall be 40wt% aqueous solution of MDEA.

2.12.27 Process scheme shall include in-built facilities for safe guarding the process system/ catalysts/adsorbents/absorbents in any type of emergency/ failure. Details of online analysers required during operation, catalyst regeneration, etc., shall also be furnished.

2.12.28 Special safety requirements such as Hydrocarbon/ H_2S leak detectors and snuffing rings around leak prone flanges, etc., shall be indicated, wherever necessary.

2.12.29 Licensor to recommend the type of drive preferred for pumps based on the criticality of the process streams and safety considerations. In general BPCL prefer motor drives wherever possible. Variable speed driven motors should be avoided and replace with back pressure turbines.

2.12.30 Slurry filter, if required, to be considered for meeting the catalyst fines specification in Clarified oil.

2.12.31 Licensor shall indicate the requirement of emergency power for the unit and also the single largest load on emergency. Licensor to also indicate the re-acceleration requirement and autostart requirement, if any, for the electric motor drives

2.12.32 Requirement of an Advanced Process Control package to be installed in the unit should be indicated. Also the list of vendors who could supply such a package should be furnished.

2.12.33 Centralized control center shall have DCS to support Foundation Field Bus (FF Bus) technology. All field instruments shall be compatible with FF Bus technology with digital signal processing.

2.12.34 Licensor to consider a steam air preheater to preheat air to adequate temperature on the combustion air side so as to minimize cold end corrosion.

2.12.35 Licensor to indicate the Safety Integrity Level (SIL) for the design of the unit. Systems shall be designed for appropriate SIL rating required as per accepted international practices/ standards.

2.12.36 Following standards are proposed by Central Pollution Control Board of India (CPCB) for emissions from FCCU regenerators:

S/No.	Parameter	Norms
1	Sulphur Dioxide (SO_2), mg/NM^3	500(for hydro-processed feed) 850 (for other feed)
2	Oxides of Nitrogen (NO_x), mg/NM^3	350
3	Particulate Matter (PM), mg/NM^3	50
4	Carbon Monoxide (CO), mg/NM^3	300
5	Nickel + Vanadium (Ni + V), mg/NM^3	2
6	Opacity, %	30

Licensor to report value of above-mentioned parameters in proposal.

Notes:

1. FCCU regenerators shall have continuous systems for monitoring of SO_2 and NO_x. One hourly average concentration values shall be met 98% of the time in a month, in case of continuous monitoring. Manual monitoring for all the emission parameters shall be carried out once in two months.

2. Any concentration value obtained through manual monitoring, if exceeds the limiting concentration value, shall be considered as non-compliance.
3. Data based on Sulphur (weight %), Ni (ppm) and V (ppm) content in the feed to FCCU shall be reported.
4. Limit of CO emissions shall be met except during annual shut down of CO boiler for statutory maintenance.

2.12.37 Features/provisions for easier debottlenecking of the unit capacity should be considered in the design such as modular heater design etc. Space for such provisions to be kept in layout.

2.12.38 Design should incorporate latest features of environment protection & occupational safety. It shall incorporate various safety features in line with international safety standards and design practices. Licensor shall furnish brief write up in the proposal highlighting such safety features. These should include but not limited to following provisions.

a. Necessary interlocks and automation to enhance operational safety.

b. Special safety requirements such as leak detectors and online analysers required during operation,

c. Provision for H2S and hydrocarbon detectors where operators will be required to approach during operation/ maintenance.

d. Special fire fighting and safety system as necessary.

e. Measures for handling of emergency shut-down.

f. Smart positioners for Emergency Shut Down (ESD) valves

g. In-built facilities for safe guarding the process system in any type of emergency/ failure.

h. Use of combustion and burner technology to achieve low levels of noxious components in the flue gases.

i. Closed sampling system.

j. Quick closing Slide valves (spent and regenerated catalyst) with feedback and supporting systems with the required systems to achieve high speed closure

2.13 SAFETY & ENVIRONMENTAL ASPECTS

2.13.1 The unit design shall incorporate state-of-art environmental control strategies. The proposed FCCU is being set up in an environmentally sensitive area and hence it has to be ensured that the impact of this unit on the environment is minimum.
Licensor shall optimize the consumption of energy and utility with proper heat integration between FCCU and propylene recovery unit.

2.13.2 The design shall conform to various environmental regulations stipulated by local statutory bodies like Central Pollution Control Board (CPCB), Minimum National Standards (MINAS) of India in addition to any international environmental standards being followed by Licensor.

2.13.3 While Licensor is expected to be aware of local environmental standards applicable to Indian units, a complete list of environmental standards to be followed shall be finalised at the time of actual design. Licensor shall furnish brief write-up in the proposal highlighting environmental control.

2.13.4 Licensor is to consider collection and primary effluent treatment facilities for liquid effluent for final discharge to outside battery limit effluent treatment plant. Details of such primary treatment facilities within the unit shall be indicated and the same shall be included in Licensor's scope.

2.13.5 Licensor to provide information regarding quantity & quality of continuous & intermittent gaseous, liquid and solid effluents generated during operation, start-up, shutdown, decoking etc. from the unit including the duration & rate of intermittent streams. Recommendation for effective and proven treatment method is to be submitted along with the offer.

2.13.6 Release of gaseous streams to the atmosphere shall be prevented. In case of operational upset, all pressure relief valves handling flammable components, are discharged into a closed system for safe disposal. For this purpose, a common closed blow down (CBD) vessel with suitable facility for slop pumping will be located inside the battery limit. Also, a common flare knock out drum (KOD) with suitable condensate pumping provision shall be considered within the unit battery limit.

2.13.7 Licensor shall use combustion and burner technology to achieve low levels of noxious components in the flue gases.

2.13.8 Licensor shall use latest riser termination device and separation device inside the Reactor/Regenerator to achieve lowest levels of catalyst carryover from Reactor overhead vapors/flue gases so that even in the event of flue gas treatments system being down, the emission of particulate matter into the atmosphere is minimized.

2.14 GENERAL:

2.14.1 The offer shall primarily be based on Design Capacity & Design Feed cases mentioned earlier. However, Owner reserves the right to make reasonable changes (± 10 %) in plant capacity, composition of feed-stock (including adding another alternate deign feed/ composition), properties of feed components etc. for design case and/or check case, utility specifications and battery limit conditions of process streams, at the time of finalization of design-basis after selection of Licensor.

2.14.2 List of Design Standards to be followed with respect to BDEP preparation would be advised at the time of finalizing the basis of design. Wherever Licensor's own engineering standards are to be necessarily followed with respect to equipment design, piping design, instrumentation design, etc., the same shall be issued to owner at no extra cost.

2.14.3 Complete Basic Engineering Design Basis (Part B) will be furnished during the design basis meeting for finalization of the unit design basis for BDEP. Licensor has to strictly adhere to this document for design.

3.0 SCOPE OF LICENSOR'S SERVICES & SUPPLIES

The scope of services & supplies to be provided by the selected Licensor shall be as follows:

3.1 GRANT OF KNOW-HOW:

Providing the Owner the right for constructing, operating and maintaining FCCU Unit using Licensor's technology.

3.2 BASIC DESIGN & ENGINEERING:

Preparation and supply of Basic Design Engineering Package (BDEP) that will have all information and documents necessary for a reputed engineering contractor to perform the residual basic engineering, detailed engineering, procurement and construction of the FCCU as defined above in Section-2. Such technical information and process book shall be in English language using metric system of measurements and shall contain, but not limited to, items defined in Annexure-IVA (Scope of Basic Design & Engineering Package).

3.3 Owner will appoint technically competent Consultant/ Contractor for carrying out Front-end Engineering/ Detailed Engineering based on the BDEP, which would be developed by the Licensor. It is necessary that the Licensor shall allow the Owner to share the related information contained in the Basic Engineering Package with such Consultants for the needed purpose after signing required secrecy agreement. Licensor will furnish to Owner and Owner's Consultant a reasonable amount of general consultation/ clarification, while using the inputs provided by the Licenser in the BDEP for carrying out detailed engineering of the unit.

3.4 Licensor to confirm that P&IDs included as part of BDEP has undergone an Internal Hazop and Licensor shall certify to the effect that the design of the unit is safe for operation.

3.5 Licensor shall identify the special equipment, which are unique for the relevant unit operation and provide complete design specifications for the same.

3.6 Licensor shall provide complete specifications of long lead items/ major equipment, if any, envisaged in the process for which data sheets shall be released early as per schedule so that procurement action can be initiated for the same without detailed engineering. Licensor shall provide a list of such long lead items in the proposal. This would facilitate Owner to order these upfront of the complete BDEP delivery to save on project execution time. Following are long lead items (i.e., equipment whose delivery period is expected to be more than 12 months) for which datasheets are to be released by Licensor on priority:

1 Main Air Blower & Wet Gas compressor
2 Reactor
3 Regenerator
4 Main Fractionator
5 Orifice chamber
6 Propylene Recovery columns
7 Stripper, Debutaniser and Depropaniser
8 Tertiary Separator System

3.7 Licensor shall supply first charge of Equilibrium catalyst (E-cat) and fresh catalyst make up for twelve months operation. This should include the catalyst make-up during precommisioning/ commissioning activities. The quantity of above catalysts should be firm and no variation in this quantity will be allowed after selection of Licensor for the design feed cases specified in this document. Further, Licensor has to supply special equipment for catalyst loading, if required. Licensee shall enter into catalyst-supply agreement with Licensor only. Licensee reserves the right to order for extra quantity of catalyst(s) as per the unit cost of catalyst(s) quoted by the Licensor. Licensor shall indicate typical composition and Purchase specifications of each catalyst for future procurement by Licensee.
Licensor has to provide firm details for catalyst, absorbents/adsorbents etc for LPG & Propylene treatment facility also.

3.8 Licensor will agree to participate in the following meetings at Owner's/ Consultant's office as and when required by Owner (approximate duration of meetings indicated):

a) Commercial/ Technical Clarification meeting shall be held across the table in Consultant's office in India
b) Design Basis finalization meeting (2 days)
c) Review meeting on PFDs submitted by Licensor (5 days)
d) Finalization of Agreement (2 days)

All the expenses on account of attending aforesaid meetings are to be borne by the Licensor.

3.9 P&ID review shall be in Licensor's office. Licensor shall permit participation of representatives of the Owner/ Consultant during the preparation of BDEP in Licensor's office for review of drawings/ documents from process and operation point of view.

3.10 Licensor shall quote lumpsum fee for grant of know-how and BDEP separately as per the Schedule of Prices included in this document.

3.11 TERTIARY SEPARATION SYSTEM (TSS)

Licensor shall provide Basic Design Engineering package (BDEP) for "Tertiary Separation System (TSS)" for flue gas treatment. This shall be included in Licensor scope of Supply.

3.12 PROPRIETARY ITEMS:

3.12.1 Licensor shall specify clearly the proprietary equipment/ catalysts/adsorbents/absorbents/ chemicals, if any, used in the process, and the cost thereof, separately. The proprietary item/ catalyst/ adsorbents/absorbents/ chemical is defined as the item which is available on single source basis, either supplied by Licensor or Licensor's recommended single vendor. This implies that the specification, engineering, manufacture and supply will be by Process Licensor. Licensor shall give justification for the items to be proprietary in nature.

3.12.2 Licensor should quote the firm price for such proprietary items, with escalation rate in the offer. In case of supply of any proprietary item by Licensor, the Licensor shall indicate the quoted cost (FOB basis) with mention of port, delivery schedule, scope of Licensor in supply and installation of the equipment along with other formalities for transport/ clearances etc.

3.13 MECHANICAL DESIGN OF REACTOR REGENERATOR SECTION:

Licensor shall provide the mechanical design of Reactor and Regenerator Section as per Scope indicated in Annexure IV G. This shall be a part of BDEP as per Annexure IVA.

3.14 MANDATORY SERVICES:

3.14.1 Licensor shall carry out the following mandatory services to the extent Licensor deems necessary for fulfilling the guarantees offered and other responsibilities.

a) Review and approval of Detailed Engineering documents, including fabrication drawings/ data of vendors of critical equipment.
b) Inspection at vendors' shop floor/ pre-qualification of vendors.
c) Assistance during pre-commissioning/ commissioning activities.
d) Conducting performance guarantee test runs.

Licensor shall furnish in their offer a list of services to be rendered for this purpose including documents/ drawings requiring their review/ approval and equipment to be inspected. Also Licensor shall provide the activities to be carried out during pre-commissioning/ commissioning and Performance Guarantee Test Run (PGTR) along with procedure.

3.14.2 An estimated total of 600 mandays inclusive of travel time will be considered for evaluation for the above Mandatory Services. Assistance for the above activities, if required by Owner, over and above the 600 mandays specified, shall be considered as Additional Services as explained under clause-3.16 below.

3.14.3 Licensor shall quote lumpsum fee for the above mandatory services considering 600 mandays as per the Schedule of Prices. The quoted prices shall be inclusive of all costs, overhead and profit, transportation (airfare & local), accommodation, living allowance, communication, taxes etc. Licensor personnel shall have to work 48 hours a week, i.e. 8 hours per day with Sunday as holiday. No additional payment shall be made for the first 600 mandays of Licensor's personnel for the above services.

3.14.4 In case the actual number of mandays utilized for the above Mandatory Services is lower than 600, the lumpsum amount quoted shall be prorated based on the actual number of mandays to arrive at the amount payable and payment shall be made accordingly.

3.15 ADDITIONAL SERVICES:

3.15.1 Licensor shall extend assistance through expert personnel with sufficient experience and knowledge for the following activities (under the service categories indicated) during detailed engineering/ procurement/ construction/ commissioning/ operation, if and as required by the Owner:

Engineering:

a) Assistance during Detailed Engineering including 3D model review
b) HAZOP studies during Detailed Engineering
c) Development of APC Strategies
d) Development of specifications for process simulators

Inspection:

a) Procurement/ inspection/ expediting of critical equipment
b) Supervision during construction
c) Any other activity/ service related to the project implementation

Commissioning Activities

a) Pre-commissioning, start-up and commissioning
b) Performance test run

Licensor shall render assistance for Detailed Engineering to Engineering Contractor/ Consultant in India, including model review, if any. A comprehensive HAZOP study will

be conducted by Owner/ Consultant after the completion of Detailed Engineering.

3.15.2 Licensor shall quote personnel rates for Licensor's personnel for rendering the above Additional Services at Owner's/ Consultant's places as well as at Licensor's office as per the Schedule of Prices. An estimated 400 mandays including travel time shall be considered for the Additional Services for evaluation.

3.15.3 Single rates applicable for Licensor's personnel for each of the following service categories shall be quoted.(number of days at Licensor's office + number of days in India considered against each for evaluation are indicated):

a) Engineering (30+30)
b) Inspection (10+20)
c) Commissioning Activities (10+300)

3.15.4 Licensor shall quote Man-day rate for services rendered at Licensor's office, which shall be inclusive of all expenses. Documentary evidence is to be furnished by the Licensor for services carried out in the Licensor's office.

3.15.5 Per-diem rates for services in India exclusive of travel (airfare and local) and accommodation, but inclusive of all other costs, overheads and profits including Living Allowance, Communication, Taxes etc., shall be quoted. Travel expenses at actual for the Licensor's personnel (international air travel by business class and domestic air travel by economy class), shall be borne by BPCL-KR. The per-diem rates shall be due from and including the day of arrival at the place where technical service is to be provided until the day of departure there from plus additional three (3) days (US based Licensors)/ two (2) days (non-US Licensors)/ one day (India based Licensors) for travel. Licensor's personnel shall have to have to work 48 hours per week, i.e. 8 hours per day with Sunday as weekly off day. However, in case of exigencies of work, Licensor's personnel will be required to put in extra man-hours without any additional payment. Licensor's personnel shall be provided suitable accommodation during his visit to the site as per the contract.

3.16 TRAINING:

3.16.1 Licensor shall provide Training to Owner's personnel on process design, operation, maintenance, analytical procedures etc. as indicated below:

a) One week Theoretical training at Licensor's facilities for two batches of 5 persons each
b) Industrial training in a substantially similar operating plant for upto fifteen (15) persons for one week.
c) One week classroom training for upto thirty (30) persons at Licensee's office/ plant.

3.16.2 Licensor shall quote separately for above training fee with item-wise break up. The quoted fees must be inclusive of any fees payable by Licensor to the Owners of the operating plants where the training is to be imparted and expenses for traveling and living etc. for Licensor's personnel supervising the theoretical and practical training

programs. No additional payment will be made for Licensor's personnel in this regard.

3.17 Licensor to furnish fixed escalation rate on quoted prices for services and supplies such as proprietary items etc. as per Schedule of Prices, enabling Owner to award these items of scope at an even later date, if required.

3.18 DELIVERABLES & TIME SCHEDULE:

3.18.1 Licensor shall agree to carry out services and deliver complete BDEP and other deliverables as per schedule given at Annexure-IVB. Licensor shall furnish the accepted schedule along with the technical proposal.

3.18.2 All documents issued for review have to be submitted in 6 copies each. Final Basic Engineering Package and operating manuals shall be submitted in 12 copies each. The complete package will also be supplied in soft form (CD).

Licensor shall also provide editable soft copies of PFDs, P&IDs and Full BDEP. All drawings/ documents shall be executed on software such as PDS, AUTOCAD, etc., and shall be compatible with the latest ERP software. Line list and Equipment/ Instrument Data Sheets shall be provided in MS Excel. PFDs, P&IDs and Drawings made on AUTOCAD are to be given in soft format.

3.18.3 Bidder shall indicate shortest possible time schedule, which should be assured, for proprietary catalyst/ chemicals and hardware items if any, in their technical proposal. Licensor to note that the quoted delivery schedule from date of order placement shall be valid till the completion of the project.

4.0 GUARANTEES & LIABILITIES

Licensor shall be required to fulfill the guarantees as detailed below and liabilities will apply in case of failure to meet the guarantees. Licensor shall furnish the guarantees conforming to the design specifications given in this document and authorized as per the format given in Annexure-IVC, along with the technical proposal.

4.1 PROCESS PERFORMANCE GUARANTEES:

4.1.1 Licensor shall furnish performance process guarantee including, but not limited, for the following parameters, with guaranteed values for both design feed cases:

(a) Capacity of unit in Metric Tonnes per Hour and Metric Tonnes per Day of Feed (ref: Table-1 of Annexure-IVC)

(b) Turn-down Ratio (ref: Table-1 of Annexure-IVC)

(c) Ex-unit and Ex Reactor Products Yield of LPG, Propylene, FCCU-Naphtha, Light Cycle Oil as wt.% on fresh feed and in Tonnes/hr (ref: Table-3 of Annexure-IVC).

Licensor to note that yield of Propylene, LPG, FCCU-Naphtha & LCO at unit battery limit shall be at least 96.5 wt% of reactor outlet yield (for each product individually).

(d) Quality of Products corresponding to guaranteed yield of the respective products (ref: Table-4A through 4F of Annexure-IVC)

(e) Make up fresh catalyst (MT/day) (ref: Table-6 of Annexure-IVC)

(f) Consumption of Utilities (Fuel, Steam, Power, Cooling water, BFW) (ref: Table-5 of Annexure-IVC).

Licensor to indicate steam consumption in two components:

A. For Reactor Regenerator section

B. For the rest of Unit (excluding Reactor and Regenerator Section)

(g) Generation of Steam (ref: Table-5 of Annexure-IVC).

(h) SPM of 50 mg/NM^3 (dry) max of Regenerator flue gas emitted from FCCU. (ref: Table-4G of Annexure-IVC)

4.1.2 Of the above parameters, Licensor shall provide following Minimum Guarantees:

(a) Unit Throughput	: 100% of the guaranteed unit throughput
(b) Propylene Yield*	: As indicated by Licensor in Sec 5 of Annexure IVC
(d) Propylene quality	: As indicated by Licensor in Sec 7 of Annexure IV-C
(e) LPG+ Liquid Product Yields**	: 95% of Sum of guaranteed values for LPG,FCCU-Naphtha& LCO

*- Licensor to note that yield of Propylene at unit battery limit shall be at least 96.5 wt% of reactor outlet yield.

**-For Liquid product yields the Minimum Guarantee value shall be 95% of sum of individual guaranteed value of FCCU-Naphtha and LCO provided as per clause 4.1.1 (C) above meeting the guaranteed qualities of the respective products. The guaranteed yields of individual product shall be used for evaluation.

4.1.3 For establishing the above performance guarantees, test runs will be conducted with stocks having substantially similar characteristics as those of design feed stocks.

4.1.4 Licensor to provide correlation/s for predicting unit performances with respect to feed processing rate, product yield pattern, product quality, utility consumption, reactor regenerator run length etc., in case the feed stock quality is different with respect to critical parameters from the design feed stocks. The same shall be furnished along with bid. In that case after consultation and mutual agreement with Owner, a new guarantee equivalent to the guarantee mentioned above shall be established.

4.2 **Test Run And Proof Of Guarantees:**

4.2.1 Prior to a test run, detailed methods to be used in the test run shall be agreed upon in writing between Licensor and Owner. These methods shall be in accordance with normal practice, and will include methods for measuring various process streams by calibrated measuring devices, methods for calibrating such measuring devices,

methods for sampling and analyzing process streams, as well as methods for evaluating the results of the measurements and analysis. Furthermore, acceptable tolerance for all results shall be specified.

4.2.2 The test run shall commence when the unit is operating under stable conditions and shall be conducted for a period of not less than 72 (seventy two) consecutive hours. Based on mutually agreed and jointly collected measurements during the test run, Licensor and Owner shall evaluate the results of the test run to confirm conformity with the performance guarantees.

4.2.3 The unit shall be deemed to have passed a successful test run, if during the test run, the unit has performed as guaranteed and the guarantees specified in section 4.1.1 have been successfully fulfilled.

4.2.4 If during a test run, the unit fails to perform as guaranteed for reasons attributable to the Licensor, as soon as possible the Licensor shall investigate the reasons for such failure and suggest modifications to the unit or its operation as the Licensor may deem necessary for enabling the unit to perform as guaranteed. The Owner shall, as promptly as is reasonably feasible in the circumstances carry out any modifications of the unit, which may be suggested by the Licensor. The engineering for unit modifications shall be done free of charge. The Licensor shall reimburse the Owner the cost of such modifications and the cost of equipment and materials required at site, which have been incurred by the Owner for or in connection with the modifications to the extent of maximum cumulative liability (50% of the aggregate of the License fee + Basic Engineering fees). A test run shall be re-conducted for the unit.

4.2.5 If necessary, the foregoing procedure will be repeated as often as is necessary with in a period 12 (twelve) months from the date of commencement of remedial actions, and the Licensor shall at its own costs and expense in all respects continue to perform such engineering, supplies and /or modification as are necessary to ensure that the UNIT performs to meet at least the minimum guarantees given in section 4.1.2

4.2.6 The Licensor shall pay and bear the cost of deputing its personnel for witnessing and supervising modifications and repeat test run under Clauses 4.2.4 and 4.2.5 hereof.

4.3 LIABILITIES FOR PROCESS GUARANTEES:

4.3.1 Licensor shall be liable for rectification of defects in Licensor services making additions, replacement to correct owner's plant due to faulty design.

4.3.2 If any operational problems are encountered in the unit for reasons attributable to Licensor including detailed engineering documents approved by the Licensor, the Licensor shall provide the corrective engineering at his own expense.

4.3.3 If, in spite of best efforts by the Licensor under Clauses 4.2.4 and 4.2.5 above, the unit fails to meet the minimum guarantee, as per clause-4.1.2 in full satisfaction of Licensor's obligation, Licensor will refund Owner by way of price discount in the sum of

the License fee and the BDEP fee received and/or receivable by Licensor from Owner, which will be equal to the maximum cumulative liability (50% of the aggregate of the License fee + Basic Engineering fees), received and or receivable by Licensor.

4.3.4 If, after the minimum guarantees have been met, the unit fails to meet the values guaranteed in the performance guarantees specified as per section 4.1.1 and the Licensor declares its inability to further improve the unit to meet such guarantees, the Licensor shall allow the Owner by way of price adjustment, a price discount as specified in the following table 4.1.1 subject to a maximum discount of an amount equivalent to 50% of the aggregate of the License fee + BDEP fee payable by the Owner to the Licensor. Discount for unpaid royalty or fees payable shall be by issue of a Credit Note for the value thereof by the Licensor in favour of Owner. However Licensor to note that the limit of maximum cumulative liability detailed above is excluding the liability on catalyst and proprietary items as detailed in Table 4.1.2 & 4.1.3

Table-4.1.1: Liability Schedule for Performance Guarantees (excluding catalyst)

Guarantee parameter	***Price Reduction Payment Schedule, % of Maximum Cumulative Liability (MCL)****
1. Turndown Ratio, % of Design Feed Rate	1.0% of MCL for each 1.0% of Feed Rate above the guaranteed value.
2.Products Yield (Ex-Unit)#	
LPG Product, wt.% of Fresh Feed	3.0% of MCL for each 0.5 wt.% Yield below the guaranteed value
FCCU- Naphtha, wt.% of Fresh Feed	3.0% of MCL for each 0.5 wt.% of Yield below the guaranteed value
Light Cycle Oil, wt.% of Fresh Feed	3.0% of MCL for each 0.5 wt.% of Yield below the guaranteed value
3.Products Quality	
A. LPG	
Vapour pr. @40^{o}C, KPa	1.0% of MCL for each 50 Kpa above the guaranteed value
Volatility: 95% evaporation temperature, ^{o}C @760 mmHg.	1.0% of MCL for each 1.0^{o}C above the guaranteed value
Hydrogen Sulphide, ppmw	1.0% of MCL for each 5.0 ppmw above the guaranteed value
Copper Strip Corrosion test	1.0% of MCL for each unit increase
B. FCCU- Naphtha	
RVP @38^{o}C, PSI	1.0% of MCL for each 1.0 PSI above the guaranteed value
Total Sulfur, ppmw	1.0% of MCL for each 10.0 ppmw above the guaranteed value
RON C	3.0% of MCL for each 0.5 unit less than the guaranteed value
MON C	3.0% of MCL for each 0.5 unit less than the guaranteed value
Copper Strip Corrosion test	1.0% of MCL for each unit increase

Guarantee parameter	*Price Reduction Payment Schedule, % of Maximum Cumulative Liability (MCL)**
C. LCO	
ASTM Distillation (D86): 95% Point, ^{o}C	1.0% of MCL for each 2.0^{o}C above the guaranteed value
Flash Point ^{0}C	1.0% of MCL for each 1.0^{o}C below the guaranteed value
4.Utilities Consumption	
Power, KWh	1.0% of MCL for each 1.0% Power consumption above the guaranteed value
Steam, MT/hr	1.0% of MCL for each 1.0% Steam consumption above the guaranteed value
Fuel, MMKcal/hr	1.0% of MCL for each 1.0% Fuel consumption above the guaranteed value
Cooling water,m3/hr	1.0% of MCL for each 1.0% Cooling water consumption above the guaranteed value
BFW,m3/hr	1.0% of MCL for each 1.0% BFW consumption above the guaranteed value
5. Steam generation	1.0% of MCL for each 1.0% Steam generation below the guaranteed value
6. Catalyst make up rate MT/day	5.0% of MCL for each 100 kg/day above the guaranteed value
7. SPM in regenerator flue gas emitted from FCCU, Mg/Nm^3(dry)	2.0% of MCL for each 10 Mg/Nm^3 of SPM above the guaranteed value

* Maximum Cumulative Liability (MCL) is as specified in the Commercial Terms and Conditions.

Products yields meeting the design quality specifications/ guaranteed quality of respective products when considered together.

Table-4.1.2: Liability Schedule for Catalyst Performance Guarantees

Guarantee parameter	*Liability*
Catalyst performance	If the catalyst fails to perform and because of which any of the Process Performance Guarantees are not met, Licensor shall replace at site 100 % quantity of catalyst under this contract. All the expenses towards the same shall be borne by the Licensor.

Table-4.1.3: Liability Schedule for Proprietary items (excluding catalyst)

Guarantee parameter	*Liability*
Proprietary items (excluding catalyst)	In case of any defect/failure, within 12 months of commissioning of the Unit, Licensor shall replace the Proprietary items (excluding catalyst) required at site.

4.3.5 In summary , the liability of the Licensor with regard to the various guarantees detailed in this "Technical Specification" shall be as below:

(a) Correction of defects in Engineering – Free of cost by Licensor
(b) Deputing personnel to site for repeating the test runs due to failure in the earlier attempts due to Licensor-Free of cost by Licensor
(c) For rectification works at site to meet the Guarantees, Penalty for not meeting process guarantees, penalty for not meeting minimum guarantees- Maximum Cumulative Liability (50 % of the aggregate of License Fee+ BDEP Fee)
(d) For catalyst and proprietary items- As per respective Tables 4.1.2 & 4.1.3 above.

5.0 EVALUATION CRITERIA

Licensors offer shall be evaluated based on the following criteria for technical acceptance and final selection:

5.1 TECHNICAL EVALUATION:

5.1.1 Minimum Qualification criteria: Minimum Qualification criteria for the bidders shall be as per Section "Bidder Qualification Criteria(BQC)" specified in Section 4.0 of "Invitation for Bids (IFB)"

5.1.2 Technical evaluation of Licensor's proposal shall be based on the following criteria:

a) Proven Experience: Provenness of technology and the extent of Licensor experience in having successfully implemented plants, which are similar in nature and objectives to the plant desired by the owner shall be considered. Licensor should have reference operating units where the offered/ guaranteed performance for process and equipment had been demonstrated.

b) Technical Assessment: Operability, reliability, guaranteed process performance, product quality, run-length etc.

c) Technical Services and Support: Adequacy of scope and quality of Licensor's Basic Engineering Package and conformance with the desired scope, engineering support services during design, follow-up engineering and plant commissioning and ongoing technical support after plant start-up.

d) Catalyst: The catalyst proposed by Licensor for FCCU shall have completed minimum one year of satisfactory operation in a commercial application meeting design yields and hydraulic performance. The evaluation will be based on the proposed catalyst. Additionally Licensor may provide information on alternate latest generation catalyst (estimated yield, quantity required, per unit cost) which is suitable for meeting the processing objectives.

5.1.3 Licensor is required to fill up the information in respect of above reference unit as per Annexure-IV D and to furnish documentary proof thereof.

5.1.4 Technically acceptable offers will be identified based on compliance to the bid document including Technical Specifications and Commercial Terms and Conditions.

5.2 ECONOMIC EVALUATION:

Economic evaluation of technically and commercially acceptable offers will be carried out for the final selection of Licensor as described below.

5.2.1 Net Present Value (NPV) of the offer will be calculated as net cash inflow for the plant operating life at a discount rate of 13% per annum. The cash flows/ NPV shall be arrived at by Owner at its option, through a competent Consultant, based on the information furnished and prices quoted by the Licensor, after due review by the Owner/ Consultant.

5.2.2 Estimation of NPV will be carried out on the following basis:

i) Design Case-1 as defined in this document shall be considered for evaluation.

ii) The NPV shall be computed for the facilities limited to unit battery limit.

iii) Expenses towards Royalty, Basic Engineering Package fee, fees towards Training and other services quoted by Licensor as well as other related costs as necessary e.g. Mechanical Design fees, Training fee, cost of proprietary/ hardware items etc. if any, shall be considered for estimation of capital cost.

iv) Owner will consider the equipment/ plant cost, as estimated by Owner/ Consultant, as per the process configuration and relevant equipment data furnished by Licensor in his offer, after due rationalization. Licensor shall agree to furnish additional information, if required, to facilitate plant costing.

v) Feed to the unit, products from the unit and utilities will be priced as given under Optimisation Criteria in this document.

vi) Guaranteed values of feed rate and product yields furnished by Licensor as per performance guarantee for the design feed case shall be considered.

vii) Licensor's guaranteed fuel and utility consumption figures shall be considered. Costs of fuel & utilities, catalysts/ chemicals etc. shall be included in the operating costs.

viii) Taxes, duties, freight and other indirect costs on plant/ equipment as applicable, shall be considered.

ix) Plant operating life for economic calculation shall be 15 years, with 5% salvage value. Construction period shall be considered as 36 months.

ix) Escalation rate quoted by Licensor shall be used for estimating the cost of respective items based on expected date of award.

x) In case of discrepancy in the equipment details given in the equipment list and other places in the Licensor's offer such as process description, PFD etc., the details as per equipment list shall be considered.

xi) Licensor's fee towards Mandatory Services and Additional Services shall be considered for evaluation as explained in clauses 3.14 & 3.15.

xii) Operating revenue and operating cost for NPV calculation will be based on 8000 onstream hours per year.

xiii) To facilitate evaluation and comparison of prices, all bid prices shall be converted in to Indian Rupees.

5.2.3 No technical deviations shall be accepted. Loading for commercial deviations shall be applied as described under Instructions to Bidders.

5.2.4 100% weightage shall be given for NPV and the Bidder who obtains maximum NPV shall be considered as the successful bidder and recommended for selection.

5.2.5 The information required from Licensor for estimation of NPV shall be furnished as per table enclosed in Annexure-IVE along with the technical proposal.

6.0 INFORMATION REQUIRED FROM LICENSOR IN PROPOSAL

Information to be furnished, as a minimum, in the Technical Proposal are defined in this section. Metric system of units shall be followed for all information. Please refer Instructions to Bidders for details on submission of Bid.

6.1 TECHNICAL INFORMATION & GUARANTEES

6.1.1 Acceptance of Time Schedule as per Annexure-IVB shall be submitted along with the proposal.

6.1.2 Licensor shall submit all the details and technical information including data with respect to Process Guarantees as per format given in Annexure- IVC, duly signed and complete in all respects, along with the offer. The information sought shall be furnished separately for each of the feed cases, where applicable.

6.1.3 The technical data including guaranteed values for all parameters required to be guaranteed wherever applicable (minimum/ maximum values as indicated in the respective tables) should be included in the proposal as these values are essentially required for evaluation of the offer. Guaranteed values should conform to the specifications given in this document. Proposal without these values may not be evaluated. Reason for omission if any, should be brought out.

6.2 PROCESS INFORMATION

6.2.1 Licensor is to provide the following information, as a minimum, in the proposal

a) Salient features of the process and its description indicating the function of various sections.

b) Process Flow Diagrams (including facilities for chemical injection) indicating process scheme, flow rates, major equipment, main process controls and important operating conditions in various sections of the plant. (for both the

design cases)

c) Overall material balance and component-wise flow rates of each in-coming/ out-going stream. (for both the design cases)

d) Ex-Reactor and Ex–unit yields (as wt% of feed) component-wise along with light ends composition, product cut points, product specifications, product distillation etc (for both the design cases)

e) Minimum expected run length of Reactor/Regenerator

f) Reaction kinetics: operating variables and their effects, the effects of variation of feed composition and feed rates.

g) Benefits of any technical features incorporated in the proposed design.

h) Correlation/s for predicting unit performances with respect to feed processing rate, product yield pattern, product quality, utility consumption, reactor regenerator run length etc., in case the feed stock quality is different with respect to critical parameters from the design feed stocks.

i) Effluent stream summary from the unit, comprising of all gaseous, liquid and solid waste streams/ material from the unit along with stream-wise quantity, quality and composition.

j) If any effluent treatment facility is included inside the battery limit, details of such facility to be described along with cost of such facilities.

k) Details of Sour Water generation – quantity as well as quality

l) Quality of water/ stripped sour water required. Confirmation on suitability of treated effluent water.

m) Design features for environment protection and occupational/ plant safety.

n) Number and type of online analysers in proposal.

o) Estimated maximum flare load and molecular weight.

p) Indicative P&IDs for a similar plant.

q) Normally hot feed will be processed in the unit. However, to take care of planned / emergency shut downs of up stream units, feed storage tanks have been envisaged. Licensor shall indicate the type of storage tank (whether fixed/ floating roof etc) required for feedstock along with blanketing requirements. In case blanketing is required, Licensor shall indicate N2 requirement.

r) Type, capacity & No. of reactor/ regenerator(s). Normal & emergency reactor cooling methods and safety measures.

s) Characteristics of feedstock considered by the Licensor and maximum acceptable limits of impurities in feedstock.

6.2.2 **Catalysts & Chemicals Consumption:**

1. Licensor is to provide the following information with respect to each of the catalysts/absorbents/adsorbents:

a. Type and size
b. Initial charge (volume and weight)
c. Catalyst make-up rate in MT/day
d. Catalyst losses through stack/ day and reactor effluent
e. Bulk density and other specifications
f. Delivery period
k. Regenerator wise/Reactor-wise catalyst distribution
l. Details of manufacturers/ suppliers of catalysts/ adsorbents
m. Recommended procedure for safe disposal of spent catalyst

2. Licensor is to provide a list of chemicals used in the process with their initial charge and consumption rate during normal operation as well as start-up, shutdown etc. Use of proprietary chemicals, if any, is to be clearly indicated. The list of recommended suppliers of proprietary chemicals shall be indicated by Licensor.

3. Licensor shall indicate whether usage of any additive has been considered for boosting yields. If so, quantity of the same to be mentioned.

6.2.3 **Equipment Data:**

Licensor is to provide an equipment list showing dimensions and other key design parameters, including Materials of Construction (MOC). Information concerning proprietary equipment shall be included. The equipment list shall contain information in sufficient details covering all the equipments so as to enable Owner or his Consultant to estimate equipment cost with an accuracy of ± 10%. Given below is the typical format in which the equipment specifications are to be provided by the Licensor. The data listed is the minimum information required, Licensor to provide any additional significant design information having cost implication.

Reactor/Regenerator	
Diameter	
Height	
Type of head	
Design Pressure	
Design Temperature	
MOC of shell / internals	
Corrosion Allowance	
Cladding thickness (if applicable)	
Refractory / Abrasion Resistant Lining details	
Estimated Weight (with internals & cladding)	
Estimated Weight (without internals & with cladding)	
Weight of internals	
Features/Type of Internals and typical sketch	
Column (Tray/packed) (Note-a)	
Diameter	

Height	
Type of head	
Design Pressure	
Design Temperature	
MOC of shell / internals	
Corrosion Allowance	
Cladding thickness (if applicable)	
Estimated Weight (with internals & cladding)	
Estimated Weight (without internals & with cladding)	
Weight of internals	
For trayed columns:	
No of trays	
Type of trays	
For packed columns:	
Volume of packing	
Type of packing	
Packing material	
Features/Type of Internals and typical sketch	
Drum/vessel/orifice chamber	
Diameter (including boot if applicable)	
Height (including boot length if applicable)	
Type of head	
Design Pressure	
Design Temperature	
MOC of shell / internals/boot	
Corrosion Allowance	
Cladding/internal lining thickness (if applicable)	
Estimated Weight (with internals & cladding)	
Estimated Weight (without internals & with cladding)	
Weight of internals	
Features/Type of Internals and typical sketch	
Orientation (horizontal/vertical)	
Fired Heater	
Design Duty - Fired/ Absorbed, Estimated	
Type of Furnace	
MOC	
Design Pressure	
Design Temperature	
Steam generating/ superheating coil details	
Exchanger	
Type	
Design Duty	
Heat Transfer Area	

MOC (Shell/tube) incl corrosion allowance	
No. Required	
Design Pressure (Shell/tube)	
Design Temperature (Shell/tube)	
Air Cooler	
Drive Shaft Power	
Design Duty	
Heat Transfer Area(Bare tube area)	
MOC incl corrosion allowance	
No. Required	
Design Pressure	
Design Temperature	
Pump	
Type	
Capacity	
Head	
Density of fluid	
No. Required	
MOC	
Driver (Motor or turbine)	
Shaft Power	
Pump efficiency	
Compressor	
Type	
Capacity	
Molecular weight	
Suction & Discharge Pressure	
No. of stages	
No of compressors	
MOC	
Driver (Motor or turbine)	
Shaft Power	
Compressor efficiency	
Cyclones	
Diameter	
Height	
Number of cyclones	
Design Pressure	
Design Temperature	
MOC	
Corrosion Allowance	
Slide valves	
Direction of Flow	
% Open area	
Number of slide valves	
Design Pressure	
Design Temperature	

MOC	
Flue gas cooler package	
Total Duty	
Individual duty of superheater/evaporator/ economiser	
Estimated area of superheater/evaporator/ economiser	
MOC of superheater/evaporator/ economiser	
Design Pressure of superheater/evaporator/ economiser	
Design Temperature of superheater/ evaporator/ economiser	
Miscellaneous Equipment	
Min Specifications required for costing	

Note: Licensor to provide the following:

a) In case of columns with varying diameters, specify length and diameters of each section.

b) Steam generation facilities along with regenerator flue gas ducting, orifice chamber, slide valve, stack details etc.

c) Details of equipments/ items for reactor/ regenerator such as air grid, cyclones, Slide valves, expansion joints, other internals good for costing.

d) Special requirements for e.g. PWHT, HIC, NACE etc. shall be specified for each equipment. This is required for costing purposes.

6.2.4 Proprietary Items:

A list of proprietary equipment/ catalyst/adsorbents/absorbents/ chemicals if any, along with acceptable vendor names and other details to be furnished. Licensor is to indicate firm prices these items as per Schedule of Prices. Shortest delivery period of such proprietary items is also to be indicated.

6.2.5 Licensor is to give a list of special equipment which is to be designed, fabricated and supplied by vendors nominated by the Licensor. A list of vendors is to be furnished for each such item.

6.2.6 Licensor is to indicate whether an Advanced Process Control Package needs to be installed in the unit. If yes, additional investment along with a list of recommended vendors is to be furnished.

6.2.7 Licensor is to provide an estimate of the Total Installed Cost of the FCCU unit excluding catalysts, adsorbents/absorbents,chemicals and proprietary supplies that are to be on U.S. Gulf Coast basis. This shall be included in the Unpriced Bid.

6.2.8 **Plot Plan:**

Estimated footprint plot area and preliminary plot plan of the plant showing optimum layout and indicating overall dimensions and locations of major equipment including accesses, operating and maintenance requirements, Analyser sheds for pollution monitoring etc. as applicable. Licensor to confirm offer that all Inside Battery Limit facilities can be accommodated in the specified plot size.

6.2.9 **Manpower for Operation:**

Licensor is to provide an estimate of the manpower required for operation of the plant assuming that the DCS Control Panel would be located in a Central Control Room. Indicative maintenance manpower is also to be provided.

6.3 COMMERCIAL INFORMATION:

6.3.1 Prices for all supplies, services and proprietary items are to be quoted in the specified format given as Schedule of Prices. The prices shall be quoted in the Priced Bid only.

6.3.2 Licensor to provide sufficient information in proposal to arrive at NPV.

6.3.3 Following additional information with respect to Licensor's services is also to be included in the proposal (please refer Schedule of Prices):

a) List of mandatory services - list of documents/ drawings requiring their approval/ review for Licensor to offer guarantee,

b) List of personnel categories and required/ recommended mandays for Mandatory and Additional Services

c) List of special equipment and facilities

d) List of proprietary items with justification

e) List of long lead items

f) List of equipments of Reactor and Regenerator section for which mechanical design as per Annexure IV G shall be carried out by Licensor.

6.3.4 **Commercial Reference:**

Information with respect to reference unit shall be submitted as per format given as Annexure-IVD.

6.3.5 **Information about Licensor:**

Licensor is required to bring out the salient features of the technology being offered. The following information/ documents in respect of Licensor's process shall be submitted:

a) Reference list (complete list of grass root plants Licensed by the Licensor) containing details of operating FCCU plants indicating owner, Licensed capacity/

feed rate, feed type/ quality, product quality, start-up date, scope of Licensor services provided, equipment supplied by Licensor etc.

b) Complete list of plants currently under design, engineering or construction including revamps and their details as per (a) above.

b) Certificate from the users on their experience on the units Licensed by the Licensor along with documentary proof for Licensing of the reference unit.

c) Reference information about the best commercial plant in operation (at an installation other than that owned by Licensor or its associate companies) for a plant of like capacity, nature of feed, products and which has demonstrated offered process performance.

d) Proposal for potential plants suitable for site visit.

e) Process/ product catalogues (standard brochures) and relevant recent publications.

f) Safety and environmental aspects in respect of the offered technology and process scheme.

g) Details of latest technology developments with reference to reduction in investment, reduction in operating and maintenance costs, product quality improvements, new safety and environmental considerations, new product developments, etc.

6.3.6 Information on the following shall be provided:

a) Details on the office(s) from where support to the project would be provided.

b) Resume of project manager and lead engineers who will prepare the BDEP for this specific project.

a) Organisation chart of the Licensor's team who will be providing the required services.

6.3.7 Format of all agreements including general terms and conditions by Licensor if any, which will need to be executed for the contract.

Annexure-IVA

SCOPE OF BASIC DESIGN ENGINEERING PACKAGE

1.0 INTRODUCTION

1.1 The Basic Design & Engineering Package (BDEP) which will be prepared by the Licensor shall contain adequate process and mechanical design data and information necessary to enable a competent engineering/ construction contractor to undertake and proceed with the detailed engineering, procurement, construction and commissioning of the unit. All documents are to be prepared with sound design and engineering standards followed in hydrocarbon industry.

1.2 The scope of deliverables shall be in strict conformance with the details given in this section. It is known that some of the deliverables listed may not form part of the usual basic engineering package for a given Licensor. However, for this specific project, Licensor shall make necessary arrangements to be able to satisfy the complete scope of BDEP.

1.3 All documents shall be in accordance with the Project specifications. Metric system of units shall be used for all deliverables with the only exception being extended to Licensors own standards which are issuable with their existing units of measurement. Wherever Licensor's own engineering standards are to be necessarily followed with respect to equipment design, piping design, instrumentation design, etc., the same shall be issued to Owner at no extra cost.

1.4 All drawings (i.e. PFDs, P&IDs & Engineering Drawings) shall be made by the Licensor following the requirement as listed below:

- Develop all drawings based on various colour codes and using AUTOCAD Version 14.
- All drawings to be given on tracing as well as in soft form (CD ROM).
- All drawings shall be made in layer concept and not in single layer basis.

1.5 The contents of BDEP shall be, but not necessarily limited to, in accordance with the details described in subsequent sections.

2.0 BASIS OF DESIGN

The Basis of Design (BOD) will provide all the information agreed upon between Licensor and Owner upon which the design and engineering will be based. It will contain the following minimum information as applicable:

a) Plant definition including function and scope of the unit.
b) Plant capacity, turndown ratio and on stream hours per year.
c) Definition of cases (design/ alternate check cases)
d) Feed stock source and specifications highlighting limiting specifications and their impact on unit design.
e) Products and their desired target specifications and destinations.
f) Estimated and guaranteed products and effluent qualities

g) Operating conditions of the major equipment
h) Specific design criteria and basis of selecting critical parameters.
i) Battery limit conditions.
j) Utility source and specifications.
k) Environmental requirements.
l) Safety requirements.
m) Codes and standards followed.
n) Site location and infrastructure requirements.
o) Local meteorological conditions.
p) Units of measurement.
q) Drawing standards.
r) Special owner requirements, if any.
s) Schedule of deliverables including advance release of critical Equipment data
t) Co-ordination procedure

3.0 PROCESS DEFINITION

3.1 PROCESS DESCRIPTION

A detailed process description of the unit following the Process (and Utility) Flow Diagrams shall be provided. This shall also include a description of the reaction chemistry, kinetics, range of critical operating parameters and their impact on product quality and operability, energy consumption, etc.

3.2 PROCESS FLOW DIAGRAM

The Process Flow Diagrams (PFDs) shall show the functionality of the unit, with all process streams, process equipment, main utility streams and process control philosophy. PFDs should be prepared for each of the cases. The following minimum information will be shown on the diagrams:

a) Process flow with all process streams (including start-up lines) and main utility streams (where they influence process configuration).

b) Main control loops and instrumentation necessary for understanding the process and utility systems regulation philosophy. Where a PFD is inadequate in explaining the complete control and interlock philosophy, Process Control Diagrams (PCD) shall be additionally generated.

c) Normal operating conditions of major process streams including temperature and pressure profiles.

d) Equipment number and equipment name shall appear for all major equipment.

e) Number of passes and functional outlines of convection and radiation section, coil arrangements consistent with furnace efficiency improvement strategies such as steam generation, steam superheating, etc. for fired heaters.

f) Diagrammatic outlines of columns, vessels and reactors/regenerator indicating operating pressure and temperature at key locations and including details of trays,

packed sections and other internals, relative location of feed / product and other nozzles, etc.

g) Functional depiction of heat exchangers indicating operating duties and types of exchangers such as air cooler, shell & tube, plate or spiral, double pipe etc. Allocation of shell and tube side streams.

h) Functional depiction of pumps and compressors indicating normal flows and types of pumps and compressors such as centrifugal, reciprocating, etc.

i) All process streams shall be numbered. The numbering shall correspond to Heat and Material balances. When there is a change in temperature, pressure or flow rate of the stream, a new stream number shall be assigned. The enthalpy and material balance information issued with PFD's shall have complete thermo-physical and transport property data for all numbered process streams.

j) All incoming and outgoing streams shall be flagged showing battery limit pressures and temperatures and indicating their source/ destination.

k) A separate PFD for catalyst regeneration (if applicable) shall be provided indicating process conditions to be maintained during this operation.

l) Broad specifications of equipment required are as follows:

- **Columns**:
  - Item number
  - Service
  - Diameter & Height
- **Vessels:**
  - Item number
  - Service
  - Diameter & Height/ Length
- **Heat exchangers**:
  - Item number
  - Service
  - Normal duty
- **Furnace:**
  - Item number
  - Service
  - Normal duty
- **Pump:**
  - Item number
  - Service
  - Rated capacity
  - Differential head
  - Power
- **Compressor**:
  - Item number
  - Service
  - Rated capacity
  - Differential head
  - Power

3.3 OVERALL UNIT BALANCE AND PRODUCT PROPERTIES

An overall unit material balance shall be provided for each of the design and check cases This overall balance shall include all feed streams to the unit and all product streams from the unit. Section-wise material balance and stream-wise material balance report with component break-down shall be provided as required. It shall also include a list of all relevant product properties.

3.4 HEAT AND MATERIAL BALANCE

Heat and Material Balances shall be provided for all design and check cases for each revision of PFD and will include as a minimum the following information:

a) Stream number (corresponding to PFD).
b) Stream name and phase of fluid.
c) Total mass & volume flow.
d) Component wise Heat and Material Balance
e) Normal operating temperature.
f) Normal operating pressure.
g) Density of fluid at operating conditions.
h) Specific gravity of liquid components.
i) Molecular weight of vapor components.
j) Kinematic Viscosity at operating conditions.
k) Thermal conductivity at operating conditions.
l) Specific heat at operating conditions.
m) Cp/Cv, Compressibility Factor
n) Surface Tension
o) Critical temperature and critical pressure.
p) Stream composition.
q) Stream enthalpy.

For mixed phase streams, the vapor and liquid phases will be shown separately.
Also for total stream: average enthalpy, viscosity, density and mol. wt. shall also be given. Weight % of vapour & free water shall be indicated.

3.5 PROCESS CONTROL PHILOSOPHY & DIAGRAMS

The control philosophy shall cover complete depiction/ explanation of critical and complex controls of the individual sections of the unit indicating all instrumentation for the unit operations inclusive of start-up, shutdown, emergencies, etc. The description of the control philosophies shall be aided by Process Control Diagrams (PCD). Advanced process control strategies, if employed, shall be specifically elaborated.

4.0 MECHANICAL DESIGN

4.1 MATERIAL OF CONSTRUCTION

Material Selection Diagrams (MSDs) shall be prepared (preferably coloured) showing the selected materials of construction of all equipment (including internals) and piping, with corrosion allowance and cladding requirements in sufficient details.

5.0 UTILITIES, CATALYSTS, CHEMICALS, ADSORBENTS/ABSORBENTS

5.1 UTILITIES

Utility summary shall be provided to cover estimated normal and maximum utility consumption and/or production of the following utilities at process design/ operating conditions:

a) Service Water (Raw Water).
b) Boiler Feed Water.
c) Demineralised (DM) Water.
d) Cooling Water.
e) Bearing Cooling Water.
f) Steam at each level (SHP/HP/MP/LP).
g) Condensate (at different levels).
h) Blowdown Streams.
i) Power*.
j) Nitrogen (Inert Gas).
k) Instrument Air and Plant Air.
l) Fuel Gas/ Fuel Oil (considering single or combined firing).

* Refer to Section-10.1 for electrical power consumption.

The estimates are to be provided as minimum, normal and maximum. Apart from continuous utility requirements, complete data must be given on intermittent utility requirements during start-up, shut down, catalyst regeneration and emergencies. Some items of the utility summary require vendor design information such as steam for turbines or power for pumps. In such cases, Licensor shall use good engineering judgment or in-house data in arriving at the summaries.

5.2 CATALYSTS ,CHEMICALS,ADSORBENTS AND ABSORBENTS

Catalyst, adsorbents, absorbents name, function, characteristics including bulk density, expected cycle length and ultimate life, list of vendors, etc., as well as initial load and annual consumption shall be given.

Chemical name, characteristics, function, initial load, annual consumption, handling precautions, injection rate, concentration, etc., shall be given. For specialty chemicals, list of vendors needs to be included. Chemical requirement during normal operation, startup, shutdown and regeneration shall be summarised.

Storage & handling requirements, adequate definition of chemical injection requirement such as normal and maximum rates, delivery pressure and temperature, dosing pattern/ frequency, properties which have to be necessarily specified, etc., with which a Detailed Engineering contractor can develop the full system design without reverting to Licensor.

Chemical passivation requirements to be identified and suggestions for disposal of passivation effluent to be provided based on earlier experience. Overhead corrosion control should be non-sodium based chemical to overcome the problems envisaged in effluent treatment.

6.0 PROCESS EQUIPMENT DATA

6.1 PROCESS EQUIPMENT LIST

A Process Equipment List shall be provided showing the following information:

- Equipment name/ tag number.
- Equipment type and service.
- Special remarks. This will include information like critical or proprietary items including vendor lists, specific testing and acceptability criteria, if any.
- Whether the equipment is a Long Lead Item.

6.2 EQUIPMENT SPECIFICATIONS

Each equipment, major as well as minor, proprietary or otherwise, shall be specified on individual Equipment Process Data Sheets. Each datasheet shall carry a document number and include equipment name, service and identify the case to which the data corresponds. Data sheets shall include information on process fluids including physical properties, operating conditions and mechanical design conditions. Also, sketches showing shape, dimensional details of internals and other design information shall be provided. Information in the data sheets shall be sufficient to carryout detailed mechanical design. Arrangements for steaming/ Nitrogen blanketing of vents, drains, etc., for making the equipment (including heat exchangers) free of hydrocarbons shall be shown in the P&IDs and data sheets.

The information to be provided for specific types of equipment are given below:

6.2.1 HEAT EXCHANGERS

a) Process conditions including fluid flow rates with breakup of vapor/ liquid/ steam/ water/ non-condensables, density, viscosity, thermal conductivity, surface tension (for two-phase conditions), critical temperature and pressure (for re-boiled streams), etc.

b) Operating temperature and pressure.

c) Mechanical design conditions. Licensor shall follow good engineering practice in evaluating system hydraulics and accordingly fix mechanical design conditions. It shall be reasonably ensured that such design conditions will not require to be revised upwards during Detailed Engineering.

d) Heat transfer duty and heating/ cooling curves as required Limitations with respect to fluid velocity, heat flux, etc to be included

e) Fouling factors

f) Materials of construction and corrosion allowance (for shell and tube sides).

g) Type of exchanger/ number of shells.

h) Insulation requirement shall be indicated.

i) Permissible pressure drop (specified based on past experience or in-house data of Licensor unless thermal design is under Licensor's scope). The same data should have been used in unit hydraulics executed by Licensor. When a group of exchangers, say multiple shells in series, together are to be designed within a pressure drop limit, the same shall be indicated. Any preference/ limitation in stacking of heat exchangers also to be indicated, where applicable.

j) Vaporisation & condensation data including critical pressure/ temperatures shall be provided.

k) Expected number of fans and sections for air coolers (based on conventional engineering practice), standard mechanical specifications and design temperature & pressure requirements.

l) For proprietary heat exchangers, for which thermal/ mechanical design are included in Licensor's scope as per agreed scope of engineering services, the details shall be complete to the extent relevant and necessary as per industry practice.

6.2.2 PUMPS

a) Process conditions such as minimum, normal and maximum flow rates/ normal & upset suction & discharge conditions/operating temperature & pressure, rated discharge pressure and NPSH available.

b) Fluid density, viscosity, pour point and annotations towards presence of toxic, corrosive or erosive materials.

c) Mechanical design conditions. Licensor shall follow good engineering practice and typical vendor information in specifying these.

d) Materials of construction, corrosion allowance of casing & internals and insulation / tracing requirements.

e) Number of operating & spare pumps.

f) Type of pumps

g) Recommended type of pump drive for main and spare pumps and estimated brake KW.

h) Capacity control and ranges where relevant.

i) Differential head.

j) Construction data (e.g., suggested API seal requirements, cooling requirements, external flushing requirements, etc.).

6.2.3 VESSELS/ COLUMNS/ REACTORS/REGENERATORS/ORIFICE CHAMBER

a) Process design conditions.

b) Sketches of Vessel/ Column/ Reactor/ Drum layouts showing dimensions, tentative elevations, location of nozzles and man ways, internals such as trays, demisters, packed sections, catalyst sections, collector trays, gravity or spray distributors, support grids,

type of head, etc. Vessel diameter shall be expressed as ID for vessel shells and OD for vessel boots.

c) Mechanical design conditions including recommendations, if any, on jacketing, stress relieving, insulation, surface finishing, etc. Licensor shall follow good engineering practice in evaluating system hydraulics and pressure relieving conditions (including considerations such as impact of vapour blow backs for high pressure vessel to low pressure vessel letdowns) and accordingly fix the mechanical design conditions. It shall be reasonably ensured that such design conditions will not require to be revised upwards in the course of detailed engineering.

d) Materials of construction and corrosion allowance of shell & internals.

e) Number, type and spacing of trays for towers.

f) Number, type & height of packed beds.

g) Elevation, size and service of nozzles.

h) Process data sheets for trays/ packed bed sections.

i) Details of other internals like demisters, distributors, linings, etc.

j) High, low and normal liquid levels in vessels and tower bottoms/ collector trays.

k) Vapor-liquid traffic data for trays and packed internals, indicating fluid flowrates, operating conditions, fluid density, fluid viscosity, liquid surface tension, allowable pressure drop, vapour molecular weight, etc.

6.2.4 HEATERS

a) Fluid flow rates with breakup of vapor/ liquid/ steam/ water/ non-condensable, density, viscosity, thermal conductivity, surface tension and vaporisation curve correlating pressure, temperature, enthalpy and percent vaporised.

b) Operating temperature and pressure.

c) Mechanical design conditions. Licensor shall follow good engineering practice in evaluating system hydraulics and accordingly fix the mechanical design conditions. It shall be reasonably ensured that such design conditions will not require to be revised upwards in the course of detailed engineering.

d) Allowable pressure drop (specified based on past experience or in-house data of Licensor unless thermal design is under Licensor's scope). The same data would have been used in unit hydraulics executed by Licensor.

e) Materials of construction and corrosion allowance.

f) Fouling factor or expected coke thickness.

g) Type of heater, e.g., cabin type or vertical cylindrical, natural draft or forced draft, double fired or single fired, etc.

h) Heat transfer duty/ absorbed heat for each section. Whether limitations such as fluid velocities, maximum skin temperatures, heat flux, etc. apply.

i) Fuel data for fired heaters.

j) Design requirements (e.g. number & size of passes, heat flux and/or velocity limitations, efficiency, excess air, NOx emission, maximum skin temperature, etc.)

k) Burners will be designed with Fuel gas and/or Fuel Oil for single & combined firing.

l) Expected thermal efficiency of heater and strategies for improving efficiency towards a target of 90%. These shall be evaluated in the course of BDEP, discussed with Owner, and included as directional instructions for detailed engineering contractor.

m) Details of burner(s) along with details of ignition equipment and flame scanning devices. Insulation details, including notes on recommend method of application and precautions, if any.

n) Stack details including monitoring instruments.

o) For heaters included in Licensor scope for thermal/ mechanical design, as per agreed scope of engineering services, the details shall be complete to the extent relevant and necessary as per industry practice and would include detailed evaluation of heater efficiency measures.

6.2.5 COMPRESSORS/ TURBINES/ BLOWERS/ FANS

a) Gas flow rates with pure component composition breakup, dry and wet molecular weights, range of molecular weights for machine specification, compressibility factor, C_P/C_V ratio, gas density, gas viscosity, etc.

b) Operating temperature and pressure at inlet and outlet conditions.

c) Minimum/ normal/ maximum flow rates.

d) Turndown and turn up ratios.

e) Mechanical design conditions. Licensor shall follow good engineering practice and typical vendor information in specifying these.

f) Number of operating & spare units.

g) Materials of construction and corrosion allowance (casing and internals).

h) Recommended type of main and spare machine and machine drive including estimated shaft KW.

i) Capacity control mechanism and ranges, where relevant.

j) Anti surge facilities.

k) Operating conditions for start-up/ regeneration (if applicable).

6.2.6 FILTERS

a) Design flow rates, fluid density and viscosity, pour point and annotations towards presence of toxic, corrosive and erosive materials. Adequate particle size distribution and % solids data shall be included for design of filters.

b) Operating temperature and pressure, allowable system pressure drop, efficiency, etc.

c) Mechanical design conditions. Licensor shall follow good engineering practice and typical vendor information in specifying these.

d) Materials of construction and corrosion allowance of filter casing & internals and insulation / tracing requirements.

e) Type of filter with definition, applicable back wash fluid, properties, frequency of backwash, supply and return pressures of fluid, etc.

f) Noise limitations (if applicable).

6.2.7 MIXERS

a) Process design conditions.

b) Mechanical design conditions.

c) Materials of construction.

d) Type & extent of mixing action.

e) Type of mixer and driver (if applicable).

f) Power consumption (if applicable).

g) Noise limitations.

6.2.8 MISCELLANEOUS EQUIPMENT

The duty specifications/ characteristics for miscellaneous equipment (such as slide valves, expansion joints, cyclones, other injection devices/nozzles etc.) shall be provided. This shall also include process performance specifications, fluid properties as relevant, mechanical design conditions, materials of construction and corrosion allowance, power consumption (if applicable), noise limitations (if applicable), etc. Licensor shall follow good engineering practice and typical vendor information in specifying these.

7.0 SAFETY, HEALTH & ENVIRONMENT

7.1 HAZARDOUS CHEMICALS

Physical and chemical properties of hazardous chemicals and streams present in the unit shall be defined and provided in completeness. The applicable Chemical Safety Data Sheets (CSDS) shall be included.

7.2 SAFETY REQUIREMENTS

Special safety requirement such as Hydrogen/ H_2S/ Hydrocarbon leak detectors and snuffing steam rings around leak prone flanges etc. to be indicated wherever necessary. The number required along with the location to be identified. Guidelines for any specialized fire protection and gas detection system for protection of equipment and personnel shall be provided. A conceptual layout & design of fire-fighting system and personnel protective facilities to be provided by Licensor, showing recommended sensory instruments, protective apparatus etc.

P&ID furnished in the Process Package would incorporate preventative measures for the identified hazards based on HAZOP studies conducted by the Licensor. Licensor shall certify

to the effect that the design of the unit is safe for operation. However, during detailed engineering, the identified hazards will be analyzed and preventive measures will be incorporated in the design to prevent the hazards. Licensor to include data on release rates, conditions etc. for hazardous release cases, so as to enable carrying out consequence analysis using Dispersion Model.

BDEP shall contain a description of the major potential hazards and safety system employed to control those potential hazards.

7.3 PLANT WASTE EFFLUENTS

All unit waste effluents and byproducts (gaseous, liquid and solid) produced continuously or intermittently shall be identified and estimated quantity and quality shall be described (physical and chemical characteristics in format by Owner). Recommended treatment/ disposal methodologies shall be given. An estimate of emissions, leaks and losses of chemical compounds shall be provided.

7.4 FLARE LOAD SUMMARY

For gaseous effluents connected to flare, a summary of flare loads shall be provided which will summarise the unit flare load for all relevant cases such as cooling water failure, general power failure, fire case, blocked discharge, any operational failure etc. Loads like venting of Hydrogen and any other gases during startups and emergency depressurizations etc. are to be provided to enable design the flare network and stack accordingly.
Licensors to furnish Flare mitigation study for minimising flare load from FCCU/PRU as a part of BDEP without any extra implication to the Owner.

8.0 PIPING & INSTRUMENTATION DIAGRAMS

8.1 PIPING & INSTRUMENTATION DIAGRAMS

Piping and Instrumentation Diagrams (P&IDs) of the unit shall be provided. The purpose of P&IDs is to allocate, identify and specify all piping items and instruments in the unit, consistent with the process flow scheme on the PFDs. The P&IDs shall include all process lines, utility lines to individual process consumers, all start-up/shut down lines, instrumentation for control, monitoring and interlocks.

P&IDs, equipment numbering and equipment naming philosophies and symbols shall be as per Owner's system which shall be provided at the time of Design Basis finalisation.

The following information, as a minimum, shall be included in the P&IDs:

8.1.1 PIPING

a) All process lines required for all operating modes of the unit including normal operation and abnormal conditions such as start-up and shutdown. Lines traversing

between P&IDs as well as lines at unit battery limits will bear flagged connecting arrow-boxes.

b) All utility lines required to individual process consumers. It stands clarified that a cooling water line to an exchanger such as product cooler is a process service and will have to be shown whereas cooling water line to a pump casing cooling is a non-process service and will not be shown. Also, utility distribution P&ID, showing unit utility headers and connections as per equipment layout, is excluded from Licensor's scope.

c) Line size, Line number & piping class designation and insulation types for all process and utility lines. Line numbering philosophy shall be as per owner.

d) Special piping items, like valves, spool pieces, spectacle blinds, process drains, vents, etc. will all be indicated. Owner shall furnish his own standard details for selected Licensor to review and follow as agreed upon.

e) Pressure relief valve inlet and outlet piping sizes (even if preliminary) and annotations towards location relative to connected equipment.

f) Insulation, heat tracing (steam or electrical) and jacketing wherever required for process reasons.

g) Requirements for sampling, special arrangements like relative elevation differences of lines, sloping of lines, hot or cold flushing, purge blanketing, minimum distance requirements, etc. shall be clearly identified wherever relevant.

8.1.2 INSTRUMENTATION

a) All instruments with their tag numbers for all operating modes of the unit including startup, shutdown and emergency situations. Signals traversing between P&IDs as well as at battery limits will bear flagged connecting arrow-boxes.

b) All instruments required from a process stand point on utility lines to individual process consumers. Definition of a process service is as defined above for piping.

c) Instrument number, instrument designation as per ISA, insulation/ tracing requirements for all instruments. Instrument numbering philosophy shall be as per Owner's system. All instrument P&ID symbols shall follow ISA symbols.

d) Control loops and instruments for proper and safe operation.

e) Size and air failure position of control valves. Type of control valve manifold either in the P&ID itself or as a legend referring to a specific table of valve size vis-a-vis manifold valve sizes to be followed.

f) Clear identification of all hardware and software instruments both in field and in control room, philosophy of automated trips and start-ups, alarms, etc.

g) Set pressure and recommended size of pressure relief valves.

h) Owner's philosophy towards use of single tapping points for multiple instruments, permitted use of a transmitter signal for both monitoring and interlocking, etc. shall be adopted after review.

8.1.3 EQUIPMENT

The equipment on the P&IDs will show the tag number and service name of all equipment (major as well as minor, normal as well as spare) along with the following data in line with the information provided on equipment data sheets:

a) Columns: Diameter, height, mechanical design pressure and temperature/ temperature profile.

b) Vessels: Diameter, length/ height, mechanical design pressure and temperature.

c) Heat exchangers & fired heaters: Rated heat duty, mechanical design pressure and temperature, type of equipment, etc.

d) Pumps & compressors: Rated volumetric flow rate, differential pressure/ head, mechanical design pressure and temperature.

e) Filters: type, mechanical design pressure and temperature etc.

f) Functional outline sketch of equipment (using Licensor's symbology of depicting equipment) showing all connected process and process related utility piping and nozzles.

g) All internals for heaters/ vessels/ towers/ reactors. Indication of vessel details showing all nozzles and manways, internals such as trays, demisters, packed sections, collector trays, gravity or spray distributors, etc. shall be provided.

h) Type and number of static and rotating equipment with driver type.

i) Position and elevation requirements. For vessels with connected pumps, this elevation will correspond to pump NPSHA specified.

j) Insulation/ tracing requirements.

k) All equipment required in the unit, major as well as minor, normal as well as spare, shall be shown in the P&IDs.

8.2 PROCESS CAUSE AND EFFECT DIAGRAM

A Process Cause and Effect Diagram (PC&ED) shall be provided. The PC&ED gives an overview of the process related safeguarding controls ("trips" or "shutdowns") as described in the Process Control Philosophy and shown on the P&IDs.

The PC&ED shows causes (e.g.: high pressure protection by a switch) and their effects (e.g.: plant depressurizing, compressor trip) in the form of a matrix-diagram.

The PC&ED forms the basis for the detailed design of the safeguarding system and has to be considered as an integral part of the P&IDs.

8.3 INTERLOCK DESCRIPTION AND LOGIC DIAGRAMS

Interlock descriptions and logic diagrams shall be provided. Logic diagram and description shall indicate the emergency shutdown causes and the effects on the emergency shutdown

valves as installed in the unit. Control algorithms of special loops, if any, used for operability/ optimization will be provided with explanation.

9.0 PLANT DESIGN

9.1 PLOT PLAN

A conceptual plot plan for the unit with major dimensions showing all process equipment, accessories and battery limit shall be provided. The plot plan shall meet all stipulations of Oil Industry Safety Directorate (OISD 118). This drawing shall include the following:

- Location of equipment based on construction/ operating/ maintenance requirements and on safety aspects taking into consideration owner's broad requirement towards inter equipment distances and other applicable safety norms, codes, standards/ guidelines.
- Plant limits and overall dimensions.
- Access roads and surrounding roads.
- Main pipe racks and main structures.
- Plant North, actual North and predominant wind direction data furnished by owner.

Licensor's hydraulic calculations have to necessarily correspond to this indicative equipment layout and Licensor will ensure that so long as the indicative layout is unchanged, all hydraulic calculation data (pump head, line sizes, control valve operating pressure drops, etc.) provided by the Licensor in BDEP will hold good.

Licensor shall review and approve the final unit plot plan developed during detailed engineering.

9.2 PIPING SPECIFICATIONS

Licensor shall employ Owner's Piping Material Specification (PMS) to standardise the design which would be provided to Licensor at the outset of the project. Licensor is obliged to provide his observations on Owner's PMS and deviations required therein to meet Licensor's requirement prior to the stage of BDEP finalisation. Equivalent Line Class will be jointly developed by Owner and Licensor.

P&ID's, line list and all other documents shall indicate owner's PMS. Piping specifications shall be provided based on fluid properties, corrosion allowance, operating and design pressures/ temperature. Specifications will also indicate nominal size, rating and wall thickness (schedule), valving and welding requirements, gasket types, flange facings and reinforcing requirements, if any.

9.3 LINE SCHEDULE

Line Schedules shall list all lines shown in the P&IDs and include line number, service, description, line size, piping class designation, starting and ending points, operating/ design conditions, upset condition temperature and pressure (when exceeding mechanical design

conditions), steam out requirement (if applicable) and flow regime, velocity, pressure drop, material specification, tracing and insulation designation and details of any special piping items.

9.4 INSULATION SPECIFICATIONS

Specifications for the various insulation types covering the requirements of all equipment and piping shall be provided.

10.0 ELECTRICAL AND INSTRUMENTATION

10.1 ELECTRICAL

A summary of all process electrical consumers and their estimated normal and maximum power consumptions shall be provided. Consumers requiring emergency power shall be indicated.

10.2 INSTRUMENT DATA SHEETS

Process data sheets for all instruments covering all instrument loops (open or closed and field or control room) indicating main components, operating conditions, special conditions, etc. Instrument list with process data (tag no., min. value, low and high alarm limits, engineering units) shall be supplied in the package. Each control valve, safety valve and analyzer will be specified on an instrument process data sheet. The ultimate instrument design conditions shall be verified and confirmed by the detailed engineering contractor during the project implementation phase.

For the specific types of instruments, the following minimum information shall be provided in the Instrument Data Sheet:

10.2.1 CONTROL VALVES

Tag number, location, flow rates (minimum, normal and maximum), sizing pressure drop, density and viscosity for liquids, molecular weight and compressibility factor for gases, whether liquid is congealing, operating & mechanical design conditions, air failure position, control valve size, mechanical limit stops (if applicable), spring action, etc.

10.2.2 SHUTDOWN VALVES

Tag number, location, operating & mechanical design conditions, air failure position, mechanical limit stops (if applicable), action, quick opening/closing requirement (if applicable), leakage class, limit switch requirement (if applicable) etc.

10.2.3 SAFETY/ RELIEF VALVES

Tag number, location, sizing flow rates, set pressure, operating & relieving conditions, allowable over pressure, density and viscosity for liquids, molecular weight and compressibility factor for gases, whether liquid is congealing, estimated valve size (to be

finalised by detailed engineering contractor), etc. In the case of flashing liquid discharges, outlet condition liquid and vapor flows and physical properties will be provided for the project specified superimposed back pressure.

10.2.4 ANALYZERS

Tag number, location, type of analyser, composition of fluid to be analysed, physical properties to be analysed, ranges of measurement, density and viscosity for liquids, molecular weight and compressibility factor for gases, operating & mechanical design conditions, alarm set point, control set point, etc. Composition of the fluid shall be indicated in terms of mol% for vapors and wt% for liquids. Type and details of on-line analysers and their desired range of measurement during normal operation, catalyst regeneration, startup etc. should be clearly mentioned.

10.2.5 TEMPERATURE AND PRESSURE INSTRUMENTS

Tag number, location, ranges, fluid properties data, operating & mechanical design conditions, alarm set point, control set point, etc.

10.2.6 FLOW INSTRUMENTS

Tag number, location, flow rates (minimum, normal & maximum), allowable pressure drop, density & viscosity for liquids, molecular weight and compressibility factor for gases, whether liquid is congealing, operating & mechanical design conditions, alarm set point, control set point, recommendation for type, etc.

10.2.7 LEVEL INSTRUMENTS

Tag number, location, upper and lower fluid density & viscosity, whether fluid is congealing, operating & mechanical design conditions, alarm set point, control set point, etc.

10.2.8 OTHER MISCELLANEOUS INSTRUMENTS

Tag number, location, process performance specifications and fluid properties as relevant including physical properties, operating & mechanical design conditions, alarm set point, control set point etc.

10.3 GENERAL INSTRUMENT SPECIFICATIONS

a) Centralized control center shall have DCS to support Foundation Field Bus (FF Bus) technology. All field instruments shall be compatible with FF Bus technology with digital signal processing.
b) Instrument Technical specification and Instrument data sheets shall be provided in BDEP according to FF Bus technology. However, FF Bus technology shall be excluded for ESD, Fast loops like compressor controls, Critical process loops where faster execution time is recommended and for analyzers.
c) Advanced process controls as required for the process are to be incorporated.
d) Functional Schematics for Complex schemes with complete description and write-up shall be provided.

11.0 SUPERVISORY OPERATING MANUAL

The supervisory manual will refer to process description and shall contain the following as a minimum:

- Process description along with process chemistry and kinetics
- Advanced technical features of the process
- Operating variables and their effect on unit operation
- Equipment operating procedures
- Description of instrumentation, interlocks and permissives
- Procedure for preparation of start-up (pre-commissioning and commissioning)
- Procedures/ operating instructions for normal operation, start-up, short-term shutdown, planned long-term shutdown and emergencies
- Catalyst handling and regeneration procedures
- Special procedures as applicable to heaters (e.g.: decoking), reactors, etc.
- Normal operating parameters
- Emergency & safety information
- Description of normal operating practices
- Operating flexibilities
- Recommended laboratory test procedures, Licensor's own procedures if different from ASTM methods, frequency of analysis, parameters to be analysed for feed streams, products & intermediates
- Plant troubleshooting
- Safety data
- List of alarms and trips
- Online spalling of heater
- Decoking (off-line) of heaters/transfer lines/other equipment as required will be achieved by pigging.
- Licensor should provide the hierarchy of the technical systems involved in the FCCU and all the equipment/instruments under each technical system in a software format.

The manual shall be adequate for the Owner or Detailed Engineering contractor to develop a detailed operating manual subsequently. Licensor shall review the manual so developed.

12.0 SPECIAL EQUIPMENT

Datasheets/ specification for special equipment for operation of the unit shall be provided. Details of such equipment including process, instrument, mechanical, metallurgical, electrical, structural etc. aspects shall be provided completely to enable Owner to obtain offers without requiring any further engineering by Owner/ Detailed Engineering contractor and also take up erection/ execution subsequently. The list of such special equipment shall be finalized during Design Basis finalization.

13.0 MECHANICAL DESIGN OF REACTOR AND REGENERATOR SECTION

Licensor to provide mechanical design of reactor regenerator section as per Scope given in Annexure IVG of this document.

ANNEXURE-IVB

TIME SCHEDULE

Time Schedule for preparation of BDEP, completion of Mechanical Design and release of deliverables by Licensor are as follows from the date of finalisation of design basis (from Zero date):

A.	Finalization of Design Basis	: 0 week
B.	Heat & Material Balances and Process Flow Diagrams (PFDs) for Owner review	:3 weeks
C.	Release of critical Process Data Sheets:	
	(a) Reactor and Regenerator	: 6 weeks
	(b) Other Long lead equipment data sheets	: 6 weeks
	(c) Other major equipment data sheets	: 6 weeks
D.	Indicative Plot Plan	: 6 weeks
E.	Piping and Instrumentation Diagrams (P&IDs) with preliminary Hazop incorporated, for Owner review	: 12 weeks
F.	Utility Summary	: 12 weeks
G.	Cause and Effect Diagram	: 16 weeks
H.	Mech. Design Drawings/ Data Sheets, where applicable	: 18 weeks
I.	Final BDEP (hard copies, inclusive of all reviews)	: 18 weeks
J.	Operating Instructions/ Laboratory Manual	: 23 weeks
K.	Other Check Case data	: 19 weeks
L.	"Tertiary Separator System" Package	: 25 weeks

The above schedule assumes that Owners reviews are completed as follows:

A.	Process Flow Diagrams	: Week 5
B.	P&IDs review	: Week 14

Notes:

1. Design Basis Meeting will be held within two weeks from the date of issue of Fax/ Letter of Acceptance, in which design basis shall be finalised.
2. P&ID review meeting will be held at Licensor's office.

(SIGNATURE OF BIDDER)

ANNEXURE-IVC

TECHNICAL INFORMATION & GUARANTEES

1.0 Feed rate, MMTPA

- Design:----------
- Guaranteed:----------

2.0 **Feedstock Data**:

Feed quality considered for the design: (in tabular form indicating properties of individual feed component)

Table: 1, Feedstock Design Parameters

	Attribute	Unit	Guaranteed
1	Density	Kg/m3.	
2	Sulfur		Note-1
3	H2 Content		Note-1
4	Flow Rate	MT/hr.	100% of design capacity
		MT/day	100% of design capacity
5	Turndown ratio	% design feed rate	50% of design capacity

Note: 1 (Table: 1) the values wrt. 'Process guarantees' of the Unit need to be included in the offer for evaluation of the offer.

3.0 **Feed impurities if any:** ----------

4.0 **Operating Conditions Summary**

Table-2: Operating Conditions

Parameter	Unit	Value	
		Estimated	Guaranteed
1. LHSV	hr^{-1}		
-Catalyst			
2.0 Temperature			
2.1 Reactor	^0C		
2.2 Regenerator	^0C		
3 Pressure			
Reactor in/out Regenerator in/out - Design Pressure	Kg/cm2(g) Kg/cm2(g) Kg/cm2(g)		

4.	Space/ superficial velocity	cm/s		
5.	Combined feed ratio			
6.	Cyclone velocities in reactor, regenerator	m/s		
7.	Vapour line velocity	m/s		
8.	Naphtha recycle if any			
9.	Air to regenerator (MAB flows)			
10.	WGC suction flows, temperature & pressure			
11.	Catalyst/ oil ratio			
12.	Catalyst condition (like activity, metal content, CCR)			
13.	Standpipe flux			
14.	Flue gas temperature	^{0}C		
15.	Catalyst loading in flue gas			
16.	Reactor/Regenerator run length	days		

Notes:

1. The values for 'process guarantees' for all the items marked should be included separately for each alternate feed stock- in the offer for evaluation of the offer.

5.0 Yield estimates

The yield distribution to be indicated below for both Ex Unit and Ex Reactor.

It should be noted that the yield distribution to be indicated below, both for estimated as well as guaranteed values, should correspond to product streams for Ex Unit and Ex Reactor and not for any intermediary processing position.

Table 3: Yield Distribution

S.no.	Attribute	Yield, % wt. on feed	
		Estimated	Guaranteed
1.0	Feed rate, MMTPA		
2.0	Turn-down ratio		
3.0	Yield (**ex unit-dry basis**)		
3.1	H2S		
3.2	Fuel Gas		
3.3	Propylene		Note:1 (min.)
3.4	FCCU- Naphtha		Note:1 (min.)
3.5	Light Cycle Oil		Note:1 (min.)
3.6	LPG		Note:1 (min.)

3.7	Coke		
3.8	Flue gas		
4.0	Yield (**ex reactor-dry basis**)		
4.1	Propylene		Note:1 (min.)
4.2	FCCU- Naphtha		Note:1 (min.)
4.3	Light Cycle Oil		Note:1 (min.)
4.4	LPG		Note:1 (min.)

Note 1: The values w.r.t. 'Process guarantees' on these items need to be confirmed by Licensor along with the offer, as these values are essentially required for evaluation of the offer, and on offer without these values may not be evaluated.

6.0 Equipment Details

Reactor/Regenerator	
Diameter	
Height	
Type of head	
Design Pressure	
Design Temperature	
MOC of shell / internals	
Corrosion Allowance	
Cladding thickness (if applicable)	
Refractory / Abrasion Resistant Lining details	
Estimated Weight (with internals & cladding)	
Estimated Weight (without internals & with cladding)	
Weight of internals	
Features/Type of Internals and typical sketch	
Column (Tray/packed) (Note-a)	
Diameter	
Height	
Type of head	
Design Pressure	
Design Temperature	
MOC of shell / internals	
Corrosion Allowance	
Cladding thickness (if applicable)	
Estimated Weight (with internals & cladding)	
Estimated Weight (without internals & with cladding)	
Weight of internals	
For trayed columns:	
No of trays	
Type of trays	

For packed columns:	
Volume of packing	
Type of packing	
Packing material	
Features/Type of Internals and typical sketch	
Drum/vessel/orifice chamber	
Diameter (including boot if applicable)	
Height (including boot length if applicable)	
Type of head	
Design Pressure	
Design Temperature	
MOC of shell / internals/boot	
Corrosion Allowance	
Cladding/internal lining thickness (if applicable)	
Estimated Weight (with internals & cladding)	
Estimated Weight (without internals & with cladding)	
Weight of internals	
Features/Type of Internals and typical sketch	
Orientation (horizontal/vertical)	
Fired Heater	
Design Duty - Fired/ Absorbed, Estimated	
Type of Furnace	
MOC	
Design Pressure	
Design Temperature	
Steam generating/ superheating coil details	
Exchanger	
Type	
Design Duty	
Heat Transfer Area	
MOC (Shell/tube) incl corrosion allowance	
No. Required	
Design Pressure (Shell/tube)	
Design Temperature (Shell/tube)	
Air Cooler	
Drive Shaft Power	
Design Duty	
Heat Transfer Area(Bare tube area)	
MOC incl corrosion allowance	
No. Required	
Design Pressure	
Design Temperature	
Pump	

Type	
Capacity	
Head	
Density of fluid	
No. Required	
MOC	
Driver (Motor or turbine)	
Shaft Power	
Pump efficiency	
Compressor	
Type	
Capacity	
Molecular weight	
Suction & Discharge Pressure	
No. of stages	
No of compressors	
MOC	
Driver (Motor or turbine)	
Shaft Power	
Compressor efficiency	
Cyclones	
Diameter	
Height	
Number of cyclones	
Design Pressure	
Design Temperature	
MOC	
Corrosion Allowance	
Slide valves	
Direction of Flow	
% Open area	
Number of slide valves	
Design Pressure	
Design Temperature	
MOC	
Flue gas cooler package	
Total Duty	
Individual duty of superheater/evaporator/ economiser	
Estimated area of superheater/evaporator/ economiser	
MOC of superheater/evaporator/ economiser	
Design Pressure of superheater/evaporator/ economiser	
Design Temperature of superheater/ evaporator/ economiser	

Miscellaneous Equipment	
Min Specifications required for costing	

Licensor to provide the following:

e) In case of columns with varying diameters, specify length and diameters of each section.

f) Steam generation facilities along with regenerator flue gas ducting, orifice chamber, slide valve, stack details etc.

g) Details of equipments/ items for reactor/ regenerator such as air grid, cyclones, Slide valves, expansion joints, other internals good for costing.

h) Special requirements for e.g. PWHT, HIC, NACE etc. shall be specified for each equipment. This is required for costing purposes.

7.0 Product's Quality Data:

Licensor's offer should include products' quality data as per the tables shown below. The quality data for which guarantees are required are also shown. The various properties of products should be reported in accordance with the test methods against respective properties of the particular product.

Table-4A: Sour Fuel Gas

Property	*Unit*	*Specification*	*Value*	
			Estimated	Guaranteed
H2S Content	ppmw	Report		
Ammonia	ppmw	Report		
Chloride	ppmw	Report		
Composition	wt.% & vol%	Report		
C3 & Heavier Hydrocarbons	vol.%	Report		
Net Calorific Value	Kcal/Kg	Report		
Mol Wt		Report		

Table-4B: Propylene (Polymer Grade)

Property	*Unit*	*Specification*	*Value*	
			Estimated	Guaranteed
Propylene	Wt%	99.6		Note-1 (Min)
Hydrogen	ppm wt.	2		Note-1 (Max)
Inerts:(N2,CH4,C2H6, I-Butane,n-Butane)	ppm wt	540		Note-1 (Max)
Propane	% wt	0.4		Note-1 (Max)
Uncondensables(N2,NH4)	ppm vol	100		Note-1 (Max)
Ethane	ppm mol	200		Note-1 (Max)
C4,C5 sat hydrocarbons	ppm vol	200		Note-1 (Max)
Total C4's	ppmwt	650		Note-1 (Max)
Ethylene	ppm vol	100		Note-1 (Max)
Butene	ppm mol	10		Note-1 (Max)
Pentene	ppm vol	10		Note-1 (Max)
Acetylene	ppmwt	3		Note-1 (Max)
Methylacetylene	ppm vol	3		Note-1 (Max)
Propadiene	ppm vol	5		Note-1 (Max)
1,3 Butadiene	ppm mol	5		Note-1 (Max)
Green oil (C8-C12)	ppm vol	20		Note-1 (Max)
Oxygen	ppm wt	1		Note-1 (Max)
Carbon monoxide	ppm vol	0.03		Note-1 (Max)
Carbon dioxide	ppm wt	2		Note-1 (Max)
COS	ppm vol	0.02		Note-1 (Max)
Total Sulphur	ppb wt	500		Note-1 (Max)
Methanol	ppm wt	1		Note-1 (Max)
Isopropanol	ppm wt	1		Note-1 (Max)
Water	ppmwt	1		Note-1 (Max)
Arsine	ppb vol	30		Note-1 (Max)
Phosphine	ppm vol	0.03		Note-1 (Max)
Ammonia	ppmwt	2		Note-1 (Max)
Cyclopentadiene	ppm vol	0.05		Note-1 (Max)
Hexane + Nonene	ppm wt	5		Note-1 (Max)
Hydrogen Sulfide	ppb wt.	500		Note-1 (Max)
Methane	ppmvol	100		Note-1 (Max)

Table-4C: LPG

Property	*Unit*	*Specification*	*Value*	
			Estimated	Guaranteed
H2S	ppmw	Nil		Note-1 (Max)
Methyl,Ethyl,Propyl Mercaptan	ppmw	Report		
Mercatan Sulfur	ppmw	5		
CS2/COS	ppmw	Report		
Total volatile sulphur	ppmw	150		
Sp gr		Report		
Composition(Butene -1 and iso- Butelene in particular)	Vol%	Report		
LHV	Kcal/kg	Report		
Vapour pressure at 40^{o}C	kPa	1050		Note-1 (Max)
C2 and lighters	wt%	0.2		
C5 and heaviers	Mol%	1.0		
Volatility, Evaporation Temperature for 95 vol% at 760 mm Hg	^{0}C	2		Note-1 (Max)
Cu Strip Corrosion test @ 38^{o}C for 1 hour		Not worse than 1		Note-1 (Max)
Free water	ppmw	Nil		
Unsaturated Hydrocarbons	wt%	1		
Residue on evaporation	wt%	0.05		

Table-4D: FCCU- Naphtha

Property	*Unit*	*Specification*	*Value*	
			Estimated	Guaranteed
TBP Cut Points	^{0}C	Report		
Specific Gravity		Report		
RVP @38^{0}C	psia	7.1		Note-1 (Max)
RON C		92		Note-1 (Min)
MONC		82		Note-1 (Min)
Flash Point	^{0}C	Report		
Bromine No.		Report		
ASTM D-86 Distillation Temp.: 5/ 10/ 50/ 90/ 95 % Recovery	^{0}C	Report		
ASTM D-86: End Point	^{0}C	150		
Hydrocarbon Types: Parafins Olefins Napthenes Aromatics Benzene	 vol. % vol. % vol. % vol. % vol. %	 Report Report Report 35 2.5		
H2S Content	wt.%	Report		
Total Sulfur	ppmw	40		Note-1 (Max)
Mercaptan Sulfur	ppmw	Report		
Nitrogen (Total & Basic)	ppmw	Report		
Chlorides	ppmw	Report		
Silicon Content	ppmw	Report		
Metals (Ni+V)	ppmw	Report		
Cyclic and Acyclic Olefins		Report		
Diene Value		Report		
Thiophenes		Report		
Maleic Anhidride Value		Report		
Existent & Potential Gum	gm/m^3	<50 (Potential) <40 (existent)		
Cu Strip Corrosion test @ 38^{o}C for 1 hour		Not worse than 1		Note-1 (Max)
Oxidation Stability		Report		

Table-4E: Light Cycle Oil (LCO)

Property	*Unit*	*Specification*	*Value*	
			Estimated	Guaranteed
TBP Cut Points	^{0}C	Report		
Specify Gravity		Report		
Flash Point (Abel)	^{0}C	38		Note-1 (Min)
Pour Point	^{0}C	Report		
Bromine No.		Report		
Cetane No.		Report		
Cetane Index D4737		Report		
ASTM D-86 Distillation Temp. for 5/ 10/ 50/ 90/ 95 % Recovery & End Point (EP)	^{0}C	Report		
Hydrocarbon Types: Paraffins Olefins Napthenes Aromatics	 vol. % vol. % vol. % vol. %	Report		
Total Sulfur	wt.%	Report		
ASTM D-86 95 LV% recovery	^{0}C	360		Note-1 (max)
Total Poly Aromatics	wt.%	Report		
Nitrogen (Total and Basic)	ppmw	Report		
Acidity (Inorganic)		Report		
Acidity(total)		Report		
Aniline Point	^{0}C	Report		
Total Aromatics (Di,Tri,Poly)	Wt%	Report		
Total metals	ppmw	Report		
Asphaltenes		Report		
Cyclic and Acyclic Olefins	Vol%	Report		
Cloud Point	^{0}C	Report		
Benzothiophenes	wt.%	Report		
Di Benzothiophenes	wt.%	Report		
Methyl DiBenzothiophenes	wt.%	Report		
Dimethyl DiBenzothiophenes	wt.%	Report		
Water	wt.%	Report		
Kinematic Viscosity at 50 ^{0}C	Cst	Report		

Table-4F: Coke

Property	*Unit*	*Specification*	*Value*	
			Estimated	Guaranteed
H2 in Coke	Wt%	Report		
S in coke	Wt%	Report		
Net Calorific value	Kcal/Kg	Report		
Metals	Wt%	Report		
Ash	Wt%	Report		

Table-4G- Flue Gas

Property	*Unit*	*Specification*	*Value*	
			Estimated	Guaranteed
Composition (including Sox,Nox)	Mole%	Report		
Suspended particulate matter (SPM)	mg/Nm3	50 (dry)		Note-1 (Max)

Notes:

1. The values with respect to Process Guarantees for these items (maximum/ minimum values as indicated) should be included in the offer.
2. Guaranteed values should correspond to guaranteed yield of respective product and should conform to the values specified in the design specifications, where applicable.
3. Guaranteed values should correspond to guaranteed feed rate and design feed quality.
4. The various properties of products should be reported in accordance with the test methods and unit mentioned against respective properties of the particular product.
5. The information sought in the tables (Table-4A to Table-4G) shall be furnished separately for each of the feed cases along with the offer.

8.0 Utilities Consumption/ Generation:

Table-5: Utilities Data (Generation & Consumption)

Utility Item		Estimated		Guaranteed	
		Gen.	Con.	Gen.	Con.
Steam, MT/hr. (Note-3)	HP			Note-1 (min)	Note-1 (max)
	MP			Note-1 (min)	Note-1 (max)
	LP			Note-1 (min)	Note-1 (max)

Power, KW				Note-1 (max)
Fuel Fired, MMKCal/hr. (Note-4)				Note-1 (max)
Demineralised (DM) Water, m3/hr.				
Boiler Feed Water, m3/hr. (Note-5)				Note-1 (max)
Cooling Water, m3/hr. (Note-6)				Note-1 (max)
Condensate (Surface), m3/hr.				
Condensate (Reboiler), m3/hr.				
Process Water (Raw), m3/hr.				
Nitrogen, Nm3/hr.				
Compressed Air, Nm3/hr.				

Notes:

1. Guaranteed figures for all items (minimum/ maximum values as indicated), wherever applicable, in the above table should be included in the offer.
2. The above Table should be used for representing data with respect to continuous consumption/ generation of utilities
3. Licensor to indicate steam consumption in two components.

   A. For Reactor Regenerator section

   B. For the rest of Unit (excluding Reactor and Regenerator Section)
4. The indicated figures based on fuel of net calorific value 10,000 Kcal/Kg, and 90% efficiency of fired heater(s).
5. The indicated figures based on 3% blow-down.
6. The indicated figures based on 10^0C temperature rise.
7. The guaranteed utilities shall be based on design conditions of feed to FCCU unit (hot & cold feed) and products running down at cold conditions.
8. Any utility information in the table, if varying for the alternate feed cases, should be brought out clearly with separate values in the offer.
9. Licensor shall indicate separately the power required and steam usage considering maximum usage of electricity power for drive of pumps/ compressor etc.

9.0 **Wash Water Quality**

Acceptable quality of wash water/stripped sour water:

Contaminants	Wash Water Quality	Stripped Sour Water
TDS		
Chloride		
O_2		
NH_3		
H_2S		
pH		
Hydrocarbon		
Phenols		
Cynaide		

10.0 **Start-up/ shutdown requirement of Inert gas (Nitrogen)**

10.1 Battery limit conditions:- As required by Licensor.

Parameters	Min.	Normal	Max.
Pressure kg/cm2(g)			
Temp.,°C			

10.2 Quantity of Nitrogen required, Nm^3/hr

	Start-up				Shut-down			
	Normal	Duration Hr	Peak	Duration Hr	Normal	Duration Hr	Peak	Duration Hr
Nitrogen								

10.3 Inert gas Purity ------ %

11.0 **Requirement of Utilities during start-up/shutdown**

	Start-up				Shut-down			
	Normal	Duration Hr	Peak	Duration Hr	Normal	Duration Hr	Peak	Duration Hr
HP steam								
MP steam								
LP steam								

12.0 **Catalyst/Adsorbents/Absorbents**

Table 6A: Catalyst Details

	Estimated value			Guaranteed Value			Remarks
	(m3)	Loading density (kg./m3)	(Kg)	(m3)	Loading density (kg./m3)	(Kg)	
Catalyst Quantity-Initial fill							
Catalyst hourly make up rate							
Catalyst make up/day							Note-1 (max)
TOTAL							
Catalyst loss hourly rate							
Drum Size							
Delivery schedule							

Table 6B: Adsorbent/Absorbent Details

	Estimated value			Guaranteed Value			Remarks
	(m3)	Loading density (kg/m3)	(Kg)	(m3)	Loading density (kg/m3)	(Kg)	
Quantity-Initial fill							
Drum Size							
Delivery schedule							

Note-1 The values wrt. 'Process guarantees' on these items need to be confirmed by Licensor along with the offer, as these values are essentially required for evaluation of the offer, and on offer without these values may not be evaluated.
Note-2: For above ultimate life of absorbent/adsorbent shall be included in offer.

13.0 **Need for coalescer/drier**

14.0 **List of Proprietary equipment**

This implies that the specification, engineering, manufacture and supply will be by Process Licensor.
a)
b)

15.0 **Any specific comments/information.**

ANNEXURE –IVD

INFORMATION IN RESPECT OF OPERATING UNITS FOR REFERENCE

FCCU Unit

1. Name of the Unit/ Company :

2. Location of Plant :

3. Details of Contact Person

   Name :
   Address :
   Telephone :
   Fax no. :
   E-mail ID :

4. Technology Licensor :

5. Process Package/ BDEP by :

6. Detailed Engg. Contractor :

7. Month & Year of Signing of License Agreement :

8. Month & Year of Start-up :

Design/ Guaranteed/ Operating values for the following (items 9 to 25):

		Design	*Guaranteed*	*Operating*
9.	Capacity :			
10.	On-stream Days, hrs/year :			
11.	Feedstock Composition :			
12.	Feedstock Quality			
	Sp gr :			
	CCR :			
	Sulfur :			
	Metals Content :			
	H2 content :			
13.	Yield of Products			
	Fuel Gas :			
	Ethylene :			

Propylene :
LPG :
Naphtha :
LCO :
CLO :
Coke :

14. LPG Quality

H2S content :
Mercaptan content :
Copper strip corrosion @ 38 deg C for 1 hr :
Sodium (Na+) content :
Total volatile Sulphur content:
Free water content:
Vapor pressure:
Volatility:

15. Propylene Quality

Propylene, % wt min. :
Hydrogen, ppm wt.max. :
Propane, % wt max. :
Ethane, mol ppm max :
Total C4's :
Ethylene, ppm mol max :
Acetylene, ppm wt max :
Methylacetylene, ppm mol max :
Propadiene, ppm mol max :
1,3 Butadiene, mol ppm max :
Oxygen, ppm wt. Max :
Carbon monoxide, ppm vol max :
Carbon dioxide, ppm wt. Max :
COS, ppm vol :
Total Sulphur, ppb wt max :
Water, wt. ppm max :
Arsine, ppb vol max :
Phosphine, ppm vol max :
Ammonia, ppmw max :
Cyclopentadiene, ppm vol max :
Hexane + Nonene, ppm wt max :
Hydrogen Sulfide, ppb wt. Max :
Methane, ppmv max :

16. Naphtha Quality

Sp gr :
RONC :
MONC :
Total sulfur :
Distillation :
Cu Strip Corrosion :

RVP @ 38^0C :

17. LCO Quality

Sp Gr	:
Cetane No.	:
Flash Point	:
Total Sulfur	:
Distillation	:
95% vol recovery Temp.	:

18. Coke Quality

Sulphur Content	:
HGI	:
VCM	:

19. SPM in flue gases :

20. Unit Design/ Process Parameters

21. Process Configuration

22. Catalyst/adsorbent/absorbent System
- Type of catalyst/adsorbent/absorbent
- Quantity/consumption rate of each type of catalyst/adsorbent/absorbent
- Additives, if any
- Cycle Length/life for each type of catalyst/adsorbent/absorbent

23. Cat/oil ratio, feed pre-heat temperature & riser outlet temperature

24. Whether the FCCU is operated for generation of petrochemical feedstock.

25. Any operational or other problems faced in the unit and remedial measures adopted.

Notes:

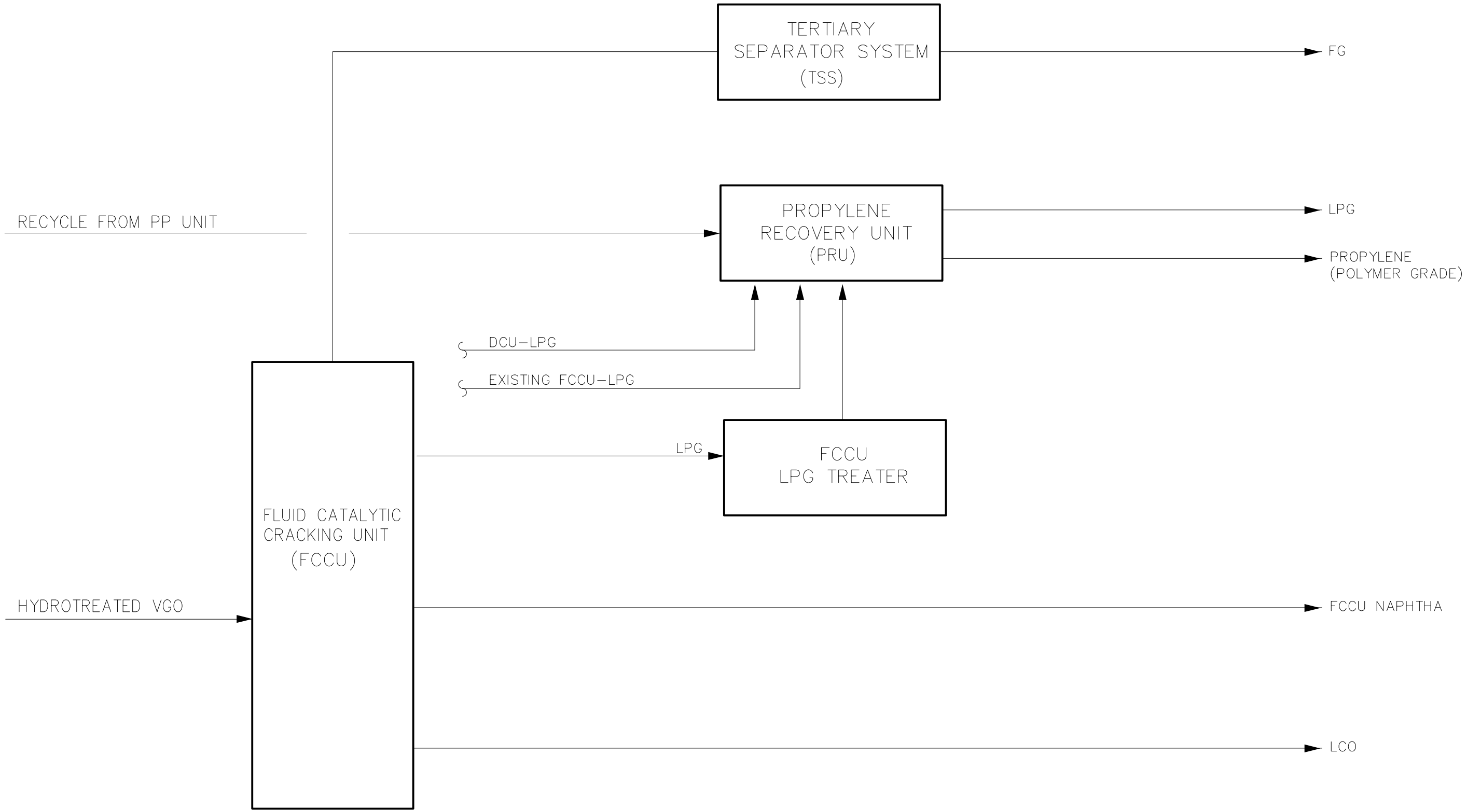
1. Detailed references for at least one actual operating unit using Licensor's technology close to the offered process and conforming to the conditions specified in the document are to be submitted.
2. Documents required as per qualification criteria given under Invitation to Bid have to be included.

ANNEXURE-IVE

DATA FOR NPV CALCULATIONS

Data for NPV calculations for FCCU	
	Guaranteed data for evaluation case
Overall Unit Material Balance	
Feed (at Unit B/L):	
VGO Feed, kg/hr	
Lean amine, Kg/hr	
Coker-LPG, Kg/hr	
FCCU (existing) LPG, Kg/hr	
Total feed, kg/hr	
Products (at Unit B/L):	
Fuel Gas, kg/hr / LHV, Kcal/Kg	
LPG , kg/hr	
Propylene, kg/hr	
FCCU- naphtha, kg/hr	
LCO, kg/hr	
Coke, kg/hr	
Flue gas, kg/hr	
Rich amine, kg/hr	
Total product , Kg/hr	
Overall Utility Summary	
Power consumed KW	
Steam, (Kg/hr)	Consumption Generation
-HP Steam (P= Barg, T= °C)	
-MP Steam (P= Barg, T= °C)	
-LP Steam (P= Barg, T= °C)	
Absorbed Heat Duty , MM Kcal/hr	
Fired Duty , MM Kcal/hr	
Cooling water, m3/hr (Del T = 10°C)	
BFW ,Kg/hr	
Nitrogen, Nm3/hr	

Instrument Air, Nm3/hr	
DM Water, kg/hr	
Catalyst and Chemical Summary	
FCCU Catalyst , MT/day	
First charge, Tons	
-Catalyst 1, Name / Quantity, Tons	
-Catalyst 2, Name / Quantity, Tons	
Additive – if any, Tons	
Make-up Rate, MT/day*	
-Catalyst 1, Name / Quantity, MT/day	
-Catalyst 2, Name / Quantity, MT/day	
(*) : Details of frequency (hrs/day) to be included.	
PRU Catalyst/ Adsorbent/Absorbent	
First charge, Tons	
Molecular sieve-for Propylene driers	
COS/RSH Removal Bed	
Arsine Removal Bed	
Ultimate Life, Years	
Molecular sieve-for Propylene driers	
COS/RSH Removal Bed	
Arsine Removal Bed	
Chemicals:	
Daily consumption kg/hr	
Caustic	
Lean Amine	
Other chemicals	



BLOCK SCHEMATIC DIAGRAM

EIL ENGINEERS INDIA LIMITED NEW DELHI			BPCL-KR INTEGRATED REFINERY EXPANSION PROJECT (IREP)									FCCU BLOCK		REV.
	DWG. NO.	REF. DRAWING		NO.	DATE	REVISION	BY	CH	APPD				ANNEXURE-IV-F	0
				0	10.06.11	ISSUED FOR ITB	Varun	IB	CG					

Annexure-IVG

Scope of Mechanical Design of Reactor Regenerator Section

Licensor to provide mechanical design as per following for the Reactor Regenerator Package:

1. Regenerator/Reactor/Stripper General Arrangement Elevation, Plan View & Details
2. Reactor/ Regenerator Internals including---Combustion Rings/Other Rings, Distributor Etc. along with support details.
3. Regenerator /Reactor/Stripper Nozzle detail
4. Regenerated and Spent Catalyst Standpipe Elevation, Plan View, Nozzles & Misc Details
5. Reactor Riser & Wye Elevation, Nozzle details
6. Design Data And Material Specifications
7. Temperature Profile Diagrams
8. Refractory Specifications And Skin Temperature Profile
9. Injector Detail.
10. Specifications and details for Feed Nozzles, Slide valves and Electro Hydraulic Actuators, Cyclones and Expansion Joints

Along with above, following specifications shall be given by the Licensor:

1. Refractory Lined Pipe
2. Regenerator Combustion Air Rings
3. Induction Bends If Recommended
4. Surface Preparation, Supply And Installation Of Refractory Materials

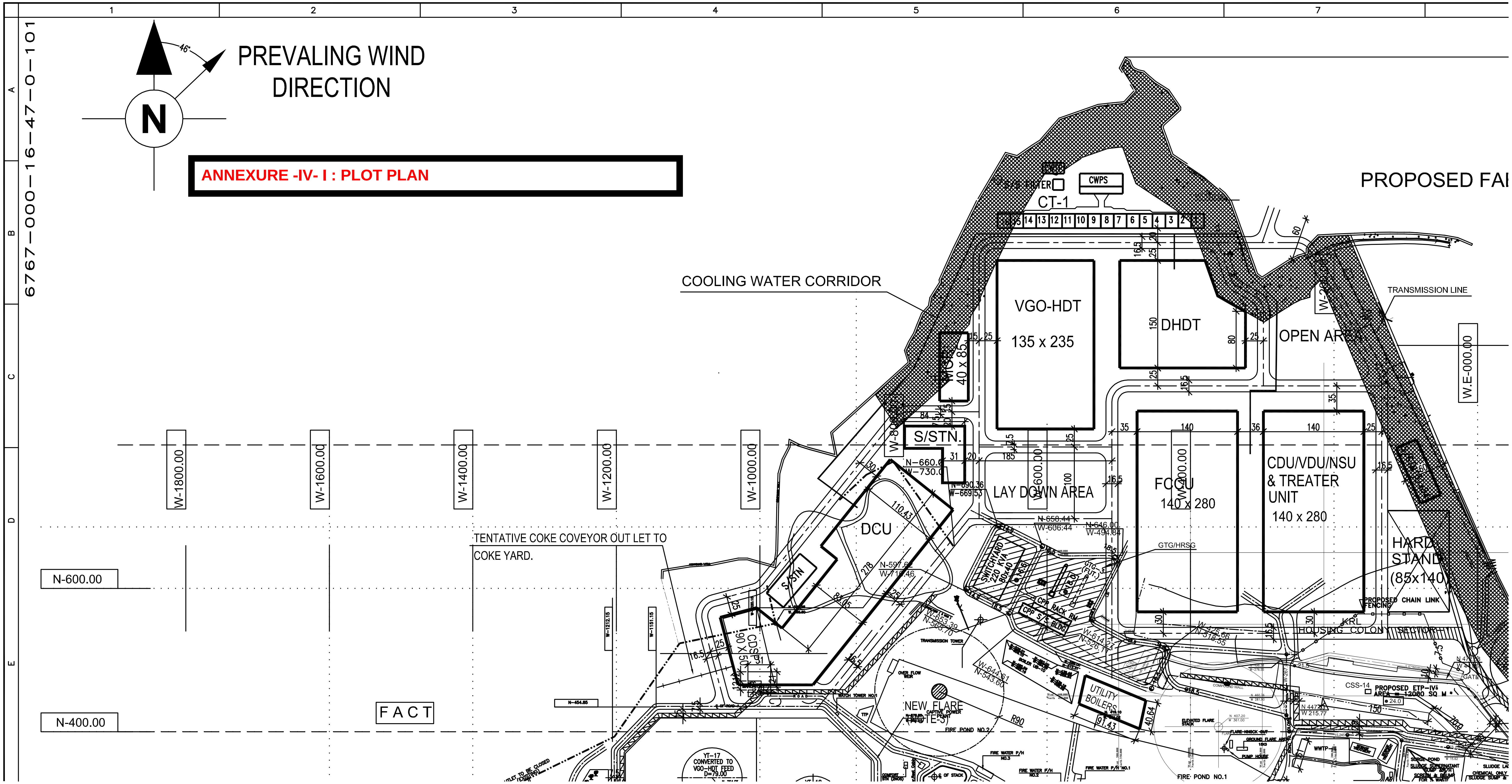
Annexure-IVH

Scope for "Tertiary Separation System (TSS)" Package

Licensor on his own or through his associates / sub-licensors shall provide the following information and documents as a part of BDEP to facilitate residual design and detail engineering for the Tertiary Separation System (TSS).

The following information shall be provided as a minimum along with the BDEP of TSS:

1.	Process Description with Process Flow Diagram (PFDs)
2.	Piping and Instrument Diagram (P&IDs)
3.	Material Balance (MBs)
4.	Utility Summary (Normal & Peak)
5.	General Arrangement Diagram (GADs)/ Standard Drawings / Sketches
6.	Project specifications and Process Data Sheets for the following a) Vessels and Reactors b) Instruments c) Electrical items d) Piping & Valves e) Internals f) Auxiliary equipment such as Filters, Accumulators, Dryers etc
7.	Standard specifications
8.	Operation and analytical manual with operating variables
9.	Start-up procedures a) Preparation of start-up b) Start up operation procedures
10.	Normal shutdown and emergency procedures
11.	Performance testing procedures
12.	Safety recommendations
13.	Recommended Refractory Application and Dry out procedures
14.	Specialized and general maintenance procedures
15.	Special equipment
16.	Equipment list
17.	Spare parts lists (only for critical components)


6767-000-16-47-0-101
PREVALING WIND DIRECTION
N
46°
ANNEXURE -IV- I : PLOT PLAN
COOLING WATER CORRIDOR
PROPOSED FA
TRANSMISSION LINE
W-1800.00
W-1600.00
W-1400.00
W-1200.00
W-1000.00
W.E-000.00
N-600.00
N-400.00
FACT
TENTATIVE COKE COVEYOR OUT LET TO COKE YARD.
CT-1
CWPS
S/S FILTER
VGO-HDT
135 x 235
DHDT
MCC
40 x 85
S/STN.
DCU
CDSP
90 X 50
S/STN
LAY DOWN AREA
FCCU
140 x 280
CDU/VDU/NSU & TREATER UNIT
140 x 280
OPEN AREA
HARD STAND (85x140)
SWITCHYARD 220 KVA 80x40
CPP RACK RN
CPP S/S BLDG
GTG/HSRG
UTILITY BOILERS
NEW FLARE (NOTE-3)
HOUSING COLONY SECTOR
PROPOSED CHAIN LINK FENCING
KRL
PROPOSED ETP-IV4 AREA = 12000 SQ. M
CSS-14
FIRE POND NO.1
FIRE POND NO.2
WWTP
YT-17 CONVERTED TO VGO-HDT FEED D=79.00
TRANSMISSION TOWER
R90

SCHEDULE OF PRICES

CONTENTS

FORM - A

SUMMARY OF PRICES

Sl. No.	*ITEM DESCRIPTION*	***AMOUNT OF FOREIGN COMPONENT (IN US$/ EURO)***		***AMOUNT OF INDIAN COMPONENT (IN INDIAN RUPEES)***	
		IN FIGURES	*IN WORDS*	*IN FIGURES*	*IN WORDS*
1	License and Basic Engineering Fees for FLUID CATALYTIC CRACKING UNIT as per FORM-B1				
2	DELETED				
3	Prices for Supply of Proprietary Equipment if any, as per FORM-B3A				
4	Prices for Supply of Catalysts/ Chemicals/Adsorbents/Absorbents, if any, as per FORM-B3B				
5	Prices for Mandatory Services as per FORM-B4				
6	Prices for Training of Owner's Personnel as per FORM-B6				
	TOTAL AMOUNT [1 + 3 +4 +5 +6 above]				
7	Schedule of Personnel Rates- Additional Services as per FORM-B5	PER DIEM RATES AS PER FORM-B5			

Withholding tax considered in the offer is …….. % (Licensor/Bidder to indicate the same in the Un-priced). In case the withholding tax is not indicated here it will be taken as PRICES EXCLUDE WITHHOLDING TAX and offer shall be evaluated as per the provisions of the Bidding Document.

Notes:

1. Bidder shall specify "QUOTED" or "NOT QUOTED" as the case may be in unpriced bid in all FORMS of Schedule of Prices.

2. Bidder shall quote prices in US Dollars/ Euro/ Indian Rupees only. Currency once quoted shall not be permitted to be changed.
3. For services and materials to be procured from India, bidder shall quote prices in Indian Rupees only.
4. Bidder must clearly specify the name of currency as applicable in the various FORMS.
5. In case of any difference in the prices quoted in figures and words, the rates quoted in words shall be considered as correct.
6. All Prices quoted in all FORMS shall be gross of all non-Indian taxes.
7. The Prices quoted should be inclusive of Indian Income Tax. In the unpriced part bidder shall indicate the withholding tax included in his price in percentage only. Withholding tax shall be deducted and TDS certificated issued to the licensor/agency so that he can claim tax credit in his country. However, in case, the licensor does not include (or partially includes) the provisions of Indian income tax in his prices and withholding tax as applicable is payable by Owner, the income tax liability shall be added to the licensor's prices for evaluation. In such a case, Licensor/Agency explicitly confirms that the TDS certificate would not be issued to the licensor/agency for the tax paid by owner and the same shall not be claimed as credit by licensor.

FORM - B1

LICENSE FEE AND BASIC ENGINEERING (BDEP) FEES

Sl. No.	*ITEM DESCRIPTION*	***AMOUNT OF FOREIGN COMPONENT (IN US$/ EURO)***		***AMOUNT OF INDIAN COMPONENT (IN INDIAN RUPEES)***	
		IN FIGURES	*IN WORDS*	*IN FIGURES*	*IN WORDS*
1	License fee for supply, delivery and transfer of know-how for FLUID CATALYTIC CRACKING UNIT complete in all respects in accordance with provisions of Bid Document on Lump-sum basis.				
2	Basic Engineering fee for supply of Basic Design Engineering Package for FLUID CATALYTIC CRACKING UNIT complete in all respects in accordance with provisions of Bid Document on Lump-sum basis.				
TOTAL AMOUNT [i.e. 1 + 2 above]					

Notes:

1. The above prices shall remain firm till execution of work and no escalation shall be payable.
2. Basic Engineering Fee should include all works as per the scope of BDEP as per Technical Specifications.

FORM - B2

DELETED

FORM - B3A

PRICES FOR SUPPLY OF PROPRIETARY ITEMS

Sl. No.	*ITEM DESCRIPTION*	*UNIT*	*QTY.*	***AMOUNT OF FOREIGN COMPONENT (IN US$/ EURO)***		***AMOUNT OF INDIAN COMPONENT (IN INDIAN RUPEES)***	
				IN FIGURES	*IN WORDS*	*IN FIGURES*	*IN WORDS*
1	(Bidder to specify proprietary equipment/ items, if any)						
TOTAL AMOUNT							

Notes:

1. The rates/ prices quoted shall remain firm till 31.12.2012. However, beyond this date, the Prices are subject to escalation for each calendar year as per FORM-B7.
2. Bidder to list proprietary items, furnishing item description, quantity, unit lumpsum price and firm delivery schedule in the Price Part. Bidder shall submit the Un-Priced copy of the same blanking out the prices in the Un-Priced part for evaluation.
3. Bidder shall quote Lump-sum prices for supply of proprietary items/ equipment on FOB Port of Shipment (i.e. excluding cost of freight & insurance) for Foreign component (Incoterms 2010) and FOT dispatch point basis for Indian component.
4. Port of receipt for all imported items shall be considered as Kochi.
5. Prices of commissioning spares shall be included in the price of proprietary equipment. Prices for Spares for 2 years of operation shall not be included in the Prices for Supply of Proprietary Items. Prices for Spares for 2 years of operation shall be quoted separately and it shall be valid for 12 months after ordering of the proprietary items.
6. Delivery schedule shall be firm and valid till completion of the project.

FORM - B3B

SUPPLY OF CATALYSTS/ CHEMICALS/ ADSORBENTS/ ABSORBENTS

Sl. No.	ITEM DESCRIPTION	AMOUNT OF FOREIGN COMPONENT (IN US$/ EURO)		AMOUNT OF INDIAN COMPONENT (IN INDIAN RUPEES)	
		IN FIGURES	IN WORDS	IN FIGURES	IN WORDS
1	(Bidder to specify the list of proprietary catalysts/ chemicals/ adsorbents/ absorbents, if any)				
TOTAL AMOUNT					

Notes:

1. The rates/ prices quoted shall remain firm till 31.12.2012. However, beyond this date, the Prices are subject to escalation for each calendar year as per FORM-B7.
2. Bidder to list proprietary catalysts/ chemicals/ adsorbents/ absorbents in accordance with provisions of Bid Document, furnishing item description, quantity, unit price and firm delivery schedule in the Price Part. Bidder shall submit the Un-Priced copy of the same blanking out the prices in the Un-Priced part for evaluation.
3. Bidder shall quote Lump-sum prices for supply of proprietary catalysts/ chemicals/adsorbents/ absorbents on FOB Port of Shipment (i.e. excluding cost of freight & insurance) for Foreign component (Incoterms 2010) and FOT dispatch point basis for Indian component.
4. Port of receipt for all imported items shall be considered as Kochi.
5. Bidder to specify quantities in kilograms and unit rates as per table below. Contingency towards loss/ spillage is not to be included.
6. Delivery schedule shall be firm and valid till completion of the project.

QUANTITY OF CATALYSTS/ CHEMICALS/ ADSORBENTS/ ABSORBENTS

Sl. No.	Name of Catalyst/ Chemical Adsorbents/ Absorbents	Total Quantity (in Kgs.)	Unit Rate (Per Kg.)
1			

FORM - B4

PRICES FOR MANDATORY SERVICES

Sl. No.	*ITEM DESCRIPTION*	***AMOUNT OF FOREIGN COMPONENT (IN US$/ EURO)***		***AMOUNT OF INDIAN COMPONENT (IN INDIAN RUPEES)***	
		IN FIGURES	*IN WORDS*	*IN FIGURES*	*IN WORDS*
1.	Mandatory Services for review of detailed engineering documents, inspection at vendors' shop floor and assistance during pre-commissioning/ commissioning and performance guarantee test run essential for Licensor to fulfil guarantees and other responsibilities considering 600 man-days of licensor's personnel in accordance with provisions of Bidding Document on Lump-sum basis.				

Notes:

1. The above prices shall remain firm till 31.12.2012. However, beyond this date, the prices are subject to escalation for each calendar year as per FORM-B7.
2. Bidder shall quote Lump-sum prices for 600 man-days specified in the Technical Specification for above Mandatory Services in accordance with provisions of Bidding Document. Also refer to sections on Mandatory Services of Technical Specifications for details. Additional mandays if required by Owner for above services shall be considered as Additional Services as per FORM-B5.
3. Licensor to list the documents to be reviewed, equipment to be inspected and services to be rendered to fulfil guarantees and other responsibilities in accordance with provisions of Bid Document. These details shall be included in the Unpriced Bid also.
4. The above prices shall be inclusive of all costs, overhead and profit, transportation (airfare & local), accommodation, living allowance, communication, taxes etc.
5. In case the actual number of mandays utilized for the above Mandatory Services is lower than 600, the lumpsum amount quoted shall be prorated based on the actual number of mandays to arrive at the amount payable and payment shall be made accordingly.

FORM - B5

SCHEDULE OF PERSONNEL RATES- ADDITIONALSERVICES

Sl. No.	*CATEGORY*	***PERSONNEL RATES FOR SERVICES RENDERED***					
		AT LICENSOR'S OFFICE (PER MANDAY) IN US$/EURO/INR		***IN INDIA (PER MANDAY) IN***			
				US$/ EURO		***INDIAN RUPEES (INR)***	
		IN FIGURES	***IN WORDS***	***FIGURES***	***WORDS***	***FIGURES***	***WORDS***
1.	Engineering						
2.	Inspection						
3.	Commissioning						

Notes:

1. The above prices shall remain firm till 31.12.2012. However, beyond this date, the prices are subject to escalation for each calendar year as per FORM-B7.
2. Personnel rates shall be furnished for Licensors personnel involved in rendering Additional Services in accordance with the provisions of Bidding Document. Please refer to sections on Additional Services of Technical Specifications for details.
3. Per-diem rates for services in India shall be exclusive of travel (airfare and local) and accommodation, but inclusive of all other costs, overheads and profits including Living Allowance, Communication, etc.
4. Single rates applicable for each of the service categories- Engineering, Inspection and Commissioning Activities shall be quoted.
5. For the purpose of evaluation total of 400 man-days shall be considered and the break-up shall be as under:
   a) Engineering: 30 man-days at Licensor's office and 30 man-days in India
   b) Inspection: 10 man-days at Licensor's office and 20 man-days in India
   c) Commissioning: 10 man-days at Licensor's office and 300 man-days in India

FORM - B6

PRICES FOR TRAINING

Sl. No.	*ITEM DESCRIPTION*	***AMOUNT OF FOREIGN COMPONENT (IN US$/ EURO)***		***AMOUNT OF INDIAN COMPONENT (IN INDIAN RUPEES)***	
		IN FIGURES	*IN WORDS*	*IN FIGURES*	*IN WORDS*
1.	Providing training to Owner's personnel in operation, maintenance etc. of FLUID CATALYTIC CRACKING UNIT as per requirements of Bid Document (Lumpsum amount). a) 1 week Theoretical Training at Licensor's facility for 2 batches of 5 personnel each. b) Industrial Training at plant selected by Licensor for 15 personnel for 1 week. c) Classroom Training at Owner's office/ plant for 30 persons for 1 week.				
TOTAL AMOUNT [i.e. 1.(a) + 1.(b) + 1.(c) above]					

Notes:

1. The above prices shall remain firm till 31.12.2012. However, beyond this date, the prices are subject to escalation for each calendar year as per FORM-B7.
2. Licensor shall quote lumpsum prices for the above. The amount quoted shall be inclusive of all costs, overhead, profits, transportation (airfare & local), accommodation, living allowance, communication, taxes, etc. for Licensor's personnel and also inclusive of fees to be paid to plant owner towards practical training at industrial plant.
3. The above amount shall be exclusive of transportation (airfare & local), accommodation and living allowance of Owner's personnel.
4. In case of any change in number of personnel or duration of the training, the above quoted lump-sum rate would be prorated to arrive at the amount payable.

FORM - B7

ESCALATION RATE

Sl. No.	***Year***	***Rate of Escalation in Percentage for Prices specified in (in figure as well as in words)***				
		FORM - B3A (PROPRIETARY ITEMS)	***FORM - B3B (CATALYSTS/ CHEMICALS/ ADSORBENTS/ ABSORBENTS)***	***FORM - B4 (MANDATORY SERVICES)***	***FORM - B5 (PERSONNEL RATES-ADDITIONAL SERVICES)***	***FORM - B6 (TRAINING)***
1.	**2013**					
2.	**2014**					
3.	**2015**					
4.	**2016**					
5.	**2017**					

Notes:

1. Rate of Escalation shall be indicated in terms of percentage in figure as well as in words. In case any percentage is not mentioned, then it will be construed that the prices in FORM-B3A to FORM-B6 are valid and firm up to 31.12.2017.
2. The above escalation rate shall be considered for computation of NPV based on the expected date of award.

3. It is explained that if any escalation percentage is mentioned in 2013, then it automatically applies to 2014. It means, the percentage mentioned in 2014 shall be in addition to the price already increased during 2013 as a result of percentage mentioned for 2013. Similar provisions shall be applicable for subsequent years also.

Example:

Base Price: 1000 valid upto 31.12.2012		Price in 2012	: 1000
Escalation for 2013	: 2%	Price in 2013	: 1000 X 1.02
Escalation for 2014	: 1%	Price in 2014	: 1000 X 1.02 X 1.01
Escalation for 2015	: 1%	Price in 2015	: 1000 X 1.02 X 1.01 X 1.01
Escalation for 2016	: 1%	Price in 2016	: 1000 X 1.02 X 1.01 X 1.01 X 1.01
Escalation for 2017	: 1%	Price in 2017	: 1000 X 1.02 X 1.01 X 1.01 X 1.01 X 1.01