

सीएचटी/एसएसी-87/ 2142

CHT/SAC-87/

सेवा में/ To,

26 दिसंबर 2019

26th December 2019

पेट्रोलियम और प्राकृतिक गैस मंत्रालय की हाइड्रोकार्बन पर वैज्ञानिक सलाहकार समिति के अध्यक्ष, सदस्यगण, स्थायी व विशेष आमंत्रित अतिथिगण।

(संलग्न सूची के अनुसार)

Chairman, Members, Permanent & Special Invitees of Scientific Advisory Committee (SAC) on Hydrocarbons of MoP&NG

(as per list attached)

विषय: पेट्रोलियम और प्राकृतिक गैस मंत्रालय की हाइड्रोकार्बन पर वैज्ञानिक सलाहकार समिति (SAC) की 87वीं बैठक का कार्यवृत्त

Sub: Minutes of 87th Meeting of the Scientific Advisory Committee (SAC) on Hydrocarbons of Ministry of Petroleum & Natural Gas

प्रिय महोदय/महोदया / Dear Sir/Madam,

आपकी सूचना एवं आवश्यक कार्यवाही हेतु दिनांक 13 दिसंबर, 2019 नई दिल्ली में सम्पन्न प्रधान मंत्री जी-वन योजना के लिए पेट्रोलियम और प्राकृतिक गैस मंत्रालय की हाइड्रोकार्बन पर वैज्ञानिक सलाहकार समिति की 87वीं बैठक के कार्यवृत्त की प्रतिलिपि संलग्न की जा रही है।

Enclosed please find a copy of the Minutes of 87th Meeting of the SAC on Hydrocarbons of Ministry of Petroleum & Natural Gas held on 13th December, 2019 in New Delhi pertaining to Pradhan Mantri JI-VAN Yojana, for your kind information and necessary action.

सादर,

With kind regards,

भवदीय,

Yours sincerely,



(के.के.जैन)

कार्यकारी निदेशक

(K.K.Jain)

Executive Director

Copy for information to:

- Secretary, P&NG
- Chairman IOCL
- CMD BPCL / HPCL / EIL
- MD MRPL / CPCL / NRL

Scientific Advisory Committee (SAC) on Hydrocarbons

1.	Dr. Anil Kakodkar Bhabha Atomic Research Centre, 7 th Floor, Central Complex, Trombay, <u>Mumbai – 400 085</u>	Chairman
2.	Dr. R. Kumar Professor Emeritus, Department of Chemical Engineering, Indian Institute of Science, Bangalore, <u>Bengaluru – 560 012</u>	Member
3.	Prof. J.B. Joshi Professor Emeritus, Homi Bhabha National Institute, Anushakti Nagar, <u>Mumbai – 400 094</u>	Member
4.	Dr. M.O. Garg Head-Refining & Petchem R&D, RTG, Reliance R&D Centre, Reliance Corporate Park, Bldg.No. TC 30B, 2 nd Floor, 'B' Wing, Thane-Belapur Road, Ghansoli, <u>Mumbai – 400 701</u>	Member
5.	Prof. A.B. Pandit Vice Chancellor, Institute of Chemical Technology, Nathalal Parekh Marg, Matunga (East), <u>Mumbai – 400 019</u>	Member
6.	Dr. Shashi Kant 58-Sundaramnagar Co-operative Hsg. Society, La Attic Villa, Near Vasna Jakat Naka, Vasna Road, <u>Vadodara 390 007</u>	Member
7.	Prof. Shankar Narasimhan Indian Institute of Technology Madras, Sardar Patel Road, Adyar, <u>Chennai – 600 036</u>	Member
8.	Dr. R.K. Malhotra Director General, Federation of Indian Petroleum Industry (FIPI), PHD House, 4/2, Sri Institutional Area, August Kranti Marg, <u>New Delhi – 110 016</u>	Member
9.	Shri S.M. Vaidya Director (Refineries) Indian Oil Corporation Ltd., SCOPE Complex, Core-2, Lodhi Road, <u>New Delhi – 110 003</u>	Member

10.	Shri R. Ramachandran Director (Refineries), Bharat Petroleum Corporation Ltd., Bharat Bhawan, 4&6 Currimbhoy Road, Ballard Estate, <u>Mumbai – 400 001</u>	Member
11.	Shri V.S. Shenoy Director (Refineries), Hindustan Petroleum Corporation Ltd., 17, Jamshedji Tata Road, <u>Mumbai – 400 020</u>	Member
12.	Dr. S.S.V. Ramakumar Director (R&D), Indian Oil Corporation Ltd., R&D Centre, Sector-13, <u>Faridabad – 121 007</u>	Member
13.	Shri L.K. Vijn Director (Technical), Engineers India Limited, EI Bhawan, 1, Bhikaiji Cama Place, <u>New Delhi – 110 066</u>	Member
14.	Dr. Sanjeev Katti Director General, ONGC Energy Centre, 8 th Floor, Core-4, SCOPE Minar, Laxmi Nagar, <u>New Delhi – 110 092</u>	Member
15.	Shri Manoj Jain Director (BD), GAIL (India) Ltd., 16, Bhikaiji Cama Place, <u>New Delhi - 110 066</u>	Member
16.	Shri Niranjan Kumar Singh Secretary, Oil Industry Development Board, OIDB Bhawan, Sector – 73, <u>NOIDA – 201 301</u>	Member
17.	Shri R.K. Ahuja Executive Director, Petroleum Conservation Research Association, Sanrakshan Bhawan, 10, Bhikaiji Cama Place, <u>New Delhi – 110 066</u>	Member
18.	Smt. Rashmi H. Urdhwareshe Director, Automotive Research Association of India, S.No. 102, Vetel Hill, Off. Paud Road, Kothrud, <u>Pune – 411 038</u>	Member

19.	Dr. Anjan Ray Director, CSIR – Indian Institute of Petroleum, P.O.IIP, Mohkampur, <u>Dehradun – 248 005</u>	Member
20.	Dr. V.P. Joy Director General, Director General of Hydrocarbons, OIDB Bhawan, Tower A, Sector 73, <u>NOIDA – 201 301</u>	Member
21.	Shri Sunil Kumar Joint Secretary (Refineries), Ministry of Petroleum & Natural Gas, Shastri Bhawan, <u>New Delhi – 110 001</u>	Permanent Invitee
22.	Shri Sanjay Bhargava Executive Director (R&D), Bharat Petroleum Corporation Ltd., Corporate R&D Centre, Plot No. 2 A, Udyog Kendra, Surajpur Industrial Area, <u>Greater NOIDA – 201 306</u>	Permanent Invitee
23.	Shri S. Bharathan Chief General Manager (R&D), HP Green R&D Centre, KIADB Industrial Area, Tarabahalli, Devanagundi, Hoskote, <u>Bengaluru – 560 067</u>	Permanent Invitee
24.	Shri R. Srikanthan Director (Technical), Chennai Petroleum Corporation Limited, Manali, <u>Chennai – 600 068</u>	Permanent Invitee
25.	Ms. Vartika Shukla Executive Director (T), R&D Centre, Engineers India Limited, Sector-16, <u>Gurgaon – 122 001</u>	Permanent Invitee
26.	Shri D.V. Shastry Executive Director (Training, R&D and Start-Up), GAIL Training Institute, Plot 24, Sector 16 A, <u>NOIDA – 201 301</u>	Permanent Invitee
27.	Shri K. Salil Kumar Dy. Secretary, Ministry of New & Renewable Energy, CGO Complex, Block No. 14, Lodhi Road, <u>New Delhi – 110 003</u>	Special Invitee

28.	Shri Rajendra Kumar Soni Director, Department of Chemicals & Petrochemicals, Ministry of Chemicals & Fertilizers, Shastri Bhawan, <u>New Delhi – 110 001</u>	Special Invitee
29.	Dr. Rohit Misra Assistant Industrial Advisor, Department of Chemicals & Petrochemicals, Ministry of Chemicals & Fertilizers, Shastri Bhawan, <u>New Delhi – 110 001</u>	Special Invitee
30.	Shri V.K. Chaurasia Joint Advisor, Ministry of Housing & Urban Affairs, 646-A-C, Nirman Bhawan, <u>New Delhi – 110 011</u>	Special Invitee
31.	Dr. Suresh Kumar Malhotra Agriculture Commissioner, Department of Agriculture, Cooperation & Farmers Welfare, Ministry of Agriculture & Farmers Welfare, Shastri Bhawan, <u>New Delhi – 110 001</u>	Special Invitee
32.	Dr. Sangita Kasture Scientist 'E', Department of Biotechnology, Ministry of Science & Technology, 6th - 8th Floor, Block 2 CGO Complex, Lodhi Road, <u>New Delhi - 110 003</u>	Special Invitee
33.	Shri Dharmvir Jha Director (MGNREGA), Department of Rural Development, Room No. 372, Krishi Bhawan, Dr. Rajendra Prasad Road, <u>New Delhi - 110 001</u>	Special Invitee

Minutes of 87th Meeting of Scientific Advisory Committee (SAC) on Hydrocarbons of MoP&NG

1. The 87th Meeting of SAC was held on 13th December, 2019 at Scope Convention Centre, New Delhi. The meeting was chaired by Dr Anil Kakodkar, Chairman, SAC.

The list of participants is enclosed as **Annexure-I**.

2. ED (CHT) welcomed the Chair, JS (R), special invitees & other members of SAC.
3. ED(CHT) reiterated that PRADHANMANTRI JI - VAN YOJANA' has been announced by GOI in Feb 2019 to support 12 Commercial scale 2G Ethanol Projects and 10 demonstration scale projects based on lignocellulosic biomass. Under the scheme, there is provision to provide support to 6 Commercial & 5 demonstration projects in each Phase-I (2018-19 to 2022-23) and Phase-II (2020-21 to 2023-24).

SAC, as nodal body, will appraise and recommend eligible Project proposals. CHT, as nodal Agency for implementation of the scheme, shall issue Request For Selection (RFS) and provide Secretarial assistance to SAC for selecting eligible Project Developers (PDs). Projects recommended by SAC will be approved by Steering Committee of CHT under the chairmanship of Secretary, MoP&NG.

Following sub committees were constituted for effective implementation of the scheme:

- I. Project Evaluation & Implementation Committee:** To review criteria for Project Developer Eligibility & Project Evaluation Parameters.
- II. Supply chain logistics Committee:** For raw material as well as product streams covering various business models including co-operative model.
- III. Research & Innovation Committee:** Enhancing viability of 2G ethanol projects including reduction of enzyme cost, valorisation of lignin, etc.

RFS were issued separately for Commercial & Demonstration Projects on CPP Portal as well as CHT Website (cht.gov.in) on 26th Aug'19. The Last date for receiving proposals was 22nd Nov'19. In response to the RFS, proposals for VGF for 6 commercial project proposals have been received. In addition one proposal for demonstration project has been received.

During 85th meeting of SAC held on 5th July'19, it was decided that the proposals received for VGF / Grant under PM JI-VAN Yojana shall be evaluated by a Select Committee before putting up to SAC. Accordingly, the following Committee was constituted with due approval of Chairman SAC;

1. Shri L.K. Vijh, Director (T), EIL --- **Chairman**
2. Shri Rohit Mathur, Director (S&CC), MoP&NG
3. Dr. Anjan Ray, Director, CSIR-IIP, Dehradun
4. Prof. A.B. Pandit, Vice Chancellor, ICT Mumbai
5. Dr. D.K. Tuli, DBT Bio-energy Chair
6. Shri Arvind Acharya, GM (Corporate Strategy), IOCL
7. Shri K.K. Jain, ED (CHT) ----**Convener**

Accordingly, meeting of the Select Committee of SAC was held on 3rd Dec'19 at CHT, wherein, PDs made presentations and detailed deliberations were done by the Committee.

4. Thereafter, CHT presented the brief about the scheme and pre-qualification criteria for selection of PDs to the SAC. CHT informed that the proposals are based on mainly two technology platforms:

- a. Cellulosic pretreatment, hydrolysis, enzymatic fermentation and distillation.

Five Commercial Proposals have been received as under:

- IOCL (M/s Praj tech),
- BPCL (M/s Praj tech)
- HPCL (M/s ICT DBT Tech)
- ABRPL (M/s Chempolis, Finland)
- SAB (M/s ENI Versalis, Italy).

In addition, one Demonstration unit proposal has been received from IOC R&D based on its own developed technology.

- b. Biomass gasification followed by syn gas fermentation and distillation

- MRPL (M/s LanzaTech, USA)

A comparative analysis regarding pre-qualification criteria and other requirement of RFS are given in Annexure-1. Details of the proposed plant w.r.t. CAPEX, OPEX, Financial ratios & returns with & without VGF are given in Annexure-2.

In order to evaluate the project financials on common basis, the Guidelines for IRR, NPV and breakeven analysis have been revisited by committee (Annexure-3). Accordingly, PDs have submitted the revised project financials.

5. Based on the data submitted by PDs and discussion during presentations, salient points and recommendations of the Committee, proposal wise are as under;

IOCL: The commercial plant is proposed near Panipat Refinery with sharing of Power (@ Rs. 2.0 / KWh based on incremental cost) and water from refinery. Being near to the refinery, Ethanol storage requirement is very minimal. IOCL mentioned that they

are working with State Govt. regarding Land availability for distributed feed stock storage by third parties. The proposal envisages project execution through conventional mode.

The proposal meets the eligibility criteria and found complete in all respect. Hence recommended for SAC consideration.

BPCL: The commercial plant is proposed to be put up in Bargarh, Odisha. The proposal envisages project execution through LSTK mode and the project has been awarded to M/s Tata Projects Ltd. The committee has observed that the project cost indicated by BPCL is on higher side compared to that of IOCL having similar capacity and same licensor. Also, the contribution of power in operating cost is Rs. 16.05 / Litre of Ethanol production against that of Rs. 6.29 / Lt for IOC.

The proposal meets the eligibility criteria and found complete in all respect. Hence recommended for SAC consideration.

HPCL: The commercial plant is proposed to be put up in Bathinda, Punjab. The proposal envisages project execution through LSTK mode and the project has been awarded to unincorporated JV of Lauren Engineers & Constructors, USA and Tata Projects Ltd., India. Contribution of power in the operating cost is the highest among all proposals at Rs 21.19/litre of ethanol production. HPCL mentioned that the reactor sizing is under review by M/s DBT ICT, Mumbai. Hence, project has been kept on hold. HPCL has not submitted trial data of demo plant as per RFS requirement. HPCL informed that a trial of eight days was carried out in Nov'19 and the report is awaited.

The proposal for commercial project submitted by HPCL is meeting the eligibility criteria except the data of Demo plant trial as per the RFS. The committee has recommended the proposal for consideration subject to submitting the required data.

ABRPL: ABRPL is a joint venture of NRL (50%), Fortum 3 BV (28%) and Chempolis (22%). Fortum 3 BV is a Finnish state-owned energy company and Chempolis is a Finnish technology licensor. As JV was formed in April, 2018, the net worth and turnover data are not available. The Committee has recommended to consider net worth and turnover of NRL, the lead partner for eligibility.

The cost of production of Ethanol is lower due to value added co products (Furfurol and Acetic Acid) and lower utilities cost. The IRR is positive. ABRPL has developed innovative Bio-mass supply chain model with direct payment to Bamboo producers.

ABRPL has furnished undertaking that duly executed Ethanol Purchase Agreement shall be submitted before release of 1st instalment of VGF.

M/s ABRPL has submitted limited demo trial data, which was generated at Chempolis bio-refinery, Oulu, Finland using Bamboo feedstock supplied by ABRPL.

Though ABRPL has submitted limited demo trial data, the participation of technology licensor as well as Finnish state-owned energy company in the joint venture provides confidence in the success of technology. Hence Committee has recommended the proposal for consideration of SAC.

MRPL: The proposed technology of M/s LanzaTech is a combination of Gasification followed by Fermentation. M/s LanzaTech has tied up with M/s Ankur for Gasification Technology. Though, both the technologies have been separately established, the technology has not been tried at demonstration scale in integrated manner. However, LanzaTech has produced Ethanol using their prototype Gas-station at M/s Ankur's premises, Gujarat using SynGas produced from Gasification unit. MRPL has submitted LanzaTech technology data of commercial plant running at a capacity of 200 KLPD since 2018 in China. However, only 10 days data (Continuous / cumulative) at 100% capacity for Gasification of M/s Ankur has been submitted.

The proposal for commercial project submitted by MRPL is based on the FR and DFR is still under preparation (expected by May, 2020). Therefore, their proposal may be considered only after fulfilling the various requirements of RFS.

SAB Industries: The proposed technology was originally developed by Beta renewables and a commercial plant in Italy at a capacity of 20,000 TPA was in operation till 2018 with multiple feed stocks. Subsequently, company has been taken over by ENI Varsalis.

The proposal has been submitted by SAB Industries, which is a construction company and does not meet the eligibility criteria of requisite experience and turnover of Rs 250 crore in any of the preceding 3 years. Moreover, PD has only submitted extracts of a PFR/ FR giving financial analysis of project and has not submitted the DFR and operating data of the demonstration unit.

During the interaction with Committee, SAB shared that proposal was in the name of SAB since agreement with ENI Versalis and Punjab Govt. were in name of SAB. However, the other group company Indian Acrylics Ltd (IAL) is having the requisite bio-mass handling experience of many years (aggregating and using it in their boilers as fuel). They also proposed to enter into fresh agreements in the name of IAL, having relevant experience and turnover.

Accordingly SAB's current proposal is not recommended.

6. Recommendations

SAC deliberated extensively on each of the proposal, and following are the recommendations for consideration of the Steering Committee.

IOCL and BPCL: The proposals submitted by IOCL and BPCL meet the eligibility criteria and found complete in all respect. Hence, recommended for consideration of Steering Committee.

HPCL: During the interactions, HPCL mentioned that there are technical issues in reactor design with the selected technology of ICT-DBT, which require review, revalidation, subsequent scale up and amendments in DFR. It has been therefore, decided to identify alternative technology, which may take 2-3 months. Since the project is already approved by their Board, and there is full commitment to implement the project with alternative technology, the grant of VGF under the phase-1 may be kept on hold.

SAC was of the view that the grant of VGF to this project cannot be under hold for indefinite time and therefore has recommended that the fresh proposal as per RFS requirement may be considered till the decision on all the six projects under phase-1 is taken. In that case, HPCL may participate again for the second phase.

ABRPL: SAC endorsed to consider, the net worth and turnover data of NRL, the lead partner for eligibility. During interaction, ABRPL mentioned that the due diligence of the technology for cellulose to sugar has been performed by the joint team of ABRPL and BPCL-R&D. The rest of the technology i.e. fermentation of sugars to ethanol is fairly established commercially. ABRPL further informed that long lead items are already under ordering stage and loan agreement has been signed with PNB. ABRPL, therefore requested to consider grant of VGF under Phase-1.

SAC advised ABPRL to submit the operational data expeditiously by Jan 2020 as per the requirement of RFS, based on the same their project may be considered.

MRPL: SAC observed that the technology has not been tried at demonstration scale in integrated manner. Further, as DFR is expected by May, 2020, the proposal may be considered only after fulfilling the various requirements of RFS.

SAB Industries: The Current proposal is not recommended by SAC.

7. Proposal for setting up Demonstration unit by IOC R&D

The Proposal envisages setting up of Demonstration unit in the vicinity of proposed 2G Ethanol commercial plant in Panipat. The technology is developed by IOC R&D itself and the Pilot Plant operating data has been submitted. Proposed Demo plant comprises of facilities for biomass handling & washing, pre-treatment and simultaneous scarification & co-fermentation (SSCF). Additionally, facilities for onsite enzyme production, yeast propagation and Clean in Place (CIP) are also there. However, distillation shall be done in the proposed 2G Ethanol Commercial plant. The Capex for the plant has projected to be Rs 96 Crore. Proposal meets the eligibility criteria.

SAC has recommended for consideration of Steering Committee. Further, the fund may be released in instalments subject to Rs 15 crore.

- 8.** SAC observed that bioethanol is only one form of fuels and the same biomass could be used to produce other bio fuels like drop in fuels, pyrolysis oil, biogas, etc. There is

significant potential for decentralized production of Compressed Biogas (CBG) from biomass/MSW to augment gas supply particularly in rural areas where demand for cooking gas is expected to grow substantially. There is wide diversity of potential biomass feedstocks including waste gases, MSW, etc., and at the same time conversion technologies that are at different level of maturity and potential to improve in future.

Therefore the policy may move in the direction that is biomass feedstock agnostic as well as promote all biofuels on equal footing. In order to allow other biofuel options to develop and compete with each other, the scheme should allow broader options for biofuels. As industrial wastes are classified as renewable feedstock, ethanol production from industrial waste gases may also be considered for VGF under the scheme. Similarly, production of bio-crude, drop in fuels from MSW/ plastic waste/ biomass may also be considered on the basis of equivalence with ethanol, based on the calorific value. SAC recommended that if possible, the scheme may be made generic before inviting fresh proposals for the second phase. JS (R), mentioned that such change in the scheme may require cabinet/ Govt. approval.

The SAC has further recommended that the Govt. may consider including "Bolt on" plants & "Brownfield projects under the scheme. This will enhance project viability and promote wider participation.

The meeting ended with thanks to the Chair and the participants.

Annexure-1

Prequalification Criteria / Attributes

Attributes	RFS Criteria	IOCL	BPCL	HPCL	ABRPL	MRPL	SAB
Biomass	Info	Paddy straw	Paddy Straw	Rice Straw	Bamboo	Corn Cob	Paddy straw
Technology Licensor	Info	Praj	Praj	ICT	Chempolis	LanzaTech	ENI Versalis
Location	Info	Panipat, Haryana	Bargarh, Odisha	Bathinda, Punjab	Golaghat, Assam	Harihara, Davnagere, Karnataka	Patiala, Punjab
Ethanol Production, KLPD	Info	100	100	100	185	60	75
Ethanol Production, MTPD	Info	79.6	79.6	81	148	48	60
Biomass Processing, MTPD	Info	426	437	412	900	264	403
% of Ethanol Production	Info	16.7	16.1	19.7	16.3	18	14.9
Experience of PD	Required	Crude Oil Refining	Crude Oil Refining	Crude Oil Refining	Crude Oil Refining	Crude oil Refining	Construction
Whether PD has commenced mechanical erection of their projects before starting of this scheme?	No / Oil PSU exempted	No	No	No	No	No	No
Whether proposal is for Bolt on /Brownfield projects?	No	No	No	No	No	No	No
Whether Technology is demonstrated at 1/50th or higher Capacity, in India or elsewhere ?	Required	Demo Plant: 12 MT/ day (dry) of biomass	Demo Plant: 12 MT/ day (dry) of biomass	Demo Plant : 10 MT/day (dry) of biomass processing Trial done at 5	Pending	OK Gasifier operation in Jan 2012 @ 280 kg/h against requirement of	Not OK

						TPD. NOT OK		220 kg/h with wood as biomass LanzaTech demo plant in China to produce 200 KLPD Ethanol since May'18 based on off gases from steel mill.	
								Not OK Gasifier data is only for 10 days (cumulative) at 100% capacity	Not OK
Submission of operational data of 3 Months (Cumulative or Continuous) duration of atleast 50% capacity of demonstration/ commercial plant or 1 Month (Cumulative or Continuous) data at 100% capacity	Required	OK, 41 days @ 100% capacity (cumulative)	OK, 41 days @ 100% capacity (cumulative)	OK, 41 days @ 100% capacity (cumulative)	Trial 5 TPD (@ 50% Capacity for 8 days) NOT OK	Pending			
The annual turnover during any of the preceding three financial years from the date of RFS publication should be at least Rs 250 Crore (excluding GST/ Excise Duty).	Required	OK	OK	OK	OK	OK		OK	Not OK
FY 2016-17, Rs crore		438000	201251	213,489	13,947	43,192	19		
FY 2017-18, Rs crore		506000	235895	243,227	15,923	48,434	29		
FY 2018-19, Rs crore		605000	298226	295,713	18,511	62,030	33		

Documents submission	RFS Criteria	IOCL	BPCL	HPCL	ABRPL	MRPL	SAB
technology							
Freedom to operate (FTO) with Licensor	Required	Submitted	Submitted	Submitted	Not submitted	Not submitted	Not submitted
Balance Sheet for earlier 3 preceding financial years	Required	Submitted	Submitted	Submitted	Submitted	Submitted	Submitted
P&L for earlier 3 preceding financial years	Required	Submitted	Submitted	Submitted	Submitted	Submitted	Not submitted
Cash Flow for earlier 3 preceding financial years	Required	Submitted	Submitted	Submitted	Submitted	Submitted	Not submitted
Documentary proof for connectivity with OMC depot (Not required if PD is an OMC)	Required	PD is an OMC	PD is an OMC	PD is an OMC	Not Submitted	Not Submitted	Not submitted

Comparative Analysis of Commercial Project Proposals

CAPEX

	IOCL	BPCL	HPCL	ABRPL	MRPL
Ethanol Production capacity, KLPD	100	100	100	185	60
Biomass Processing Capacity, MTPD	425.7	437	412	900	263.9
Plant operation annually, days	300	300	300	330	330
% of Ethanol yield	16.7/235	16.1/229	19.7	16.3	18%
CAPEX Component, Rs crore					
Land	2.1	1.5	0		7.8
Site Development+Piling	7.43	3.0	LSTK	29.2	15
Roads & Buildings+Const site facilities	39.69	19	LSTK		22.5
Process know-how, License fee	12.39	10		61.6	12
BEDP		10	11.42		
PMC / EPCM	3.28	20	28.94	49.4	27.3
Plant & Machinery	638.97		1148	896.61	457
Construction Expenses	6.22	1194	LSTK		
Commissioning expenses	3.01		LSTK	8.97	6
Contingency	29.72		64.44	77.76	30.67
Working Capital Margin	1.89	4	11.69	8.99	2.6
Other Miscellaneous Expenses		20	100.73	52.87	99.5
Interest during construction	19.26	48	56.24	73.4	8.12
GST	115	237	Included	206	7.1
Total CAPEX, Rs crore	908.96	1607	1421.46	1465	655.2

Contribution in Operating Cost, Rs/Liter of Ethanol Production

	IOCL	BPCL	HPCL	ABRPL	MRPL
Feedstock	15.36	23.72	32.69	16.65	16.94
Chemicals	9.45	16.55	11.90	4.91	1.01
Nutrients	1.32	0.31	2.02		
Enzymes	11.98	9.72	6.15	18.80	

	IOCL		BPCL		HPCL		ABRPL		MRPL	
Yeast		0.85		0.85						
Molasses		0.78		1.10						
Water		0.95		1.07		0.89		0.35		0.16
Power		6.29		16.05		21.19		4.67		11.22
Salaries & Wages		1.83		0.96		1.00		3.65		1.21
Overheads		0.64		1.2		1.00		0.92		1.19
Repair and Maintenance		3.45		9.39		7.66		1.78		4.55
Royalty		-		-		-		0.64		2.02
Rent & Insurance		1.33		2.14		2.34		0.62		0.15
Other cost		7.03 (Sec Fuel)		NA		3.21				
Total OPEX		61.26		83.05		90.04		51.50		38.45

Financial Ratios and Returns with VGF

Parameters	IOCL		BPCL		HPCL		ABRPL		MRPL	
	CHT	Self	CHT	Self	CHT	Self	CHT	Self	CHT	Self
Equity IRR	(-) ve	(-) ve	(-) ve	(-) ve	-ve	-ve	24.45	10.05	4.33%	3.97%
Project IRR	(-) ve	(-) ve	(-) ve	(-) 1.8	-ve	-ve	18.95	9.48	5.26%	5.03%
NPV at Discount factor	(-) 214.96	(-) 320.87	(-) 862	(-) 673	1147.93	1152.19	510.9	-104.5	-125.47	-131.73
DSCR	Not sufficient	Not sufficient	Not sufficient	Not sufficient	Not sufficient	Not sufficient	3.32	2.18	1.23	1.21
Breakeven Ethanol price at 100% operation	61.28	51.21	75.39	63	86.48	90.04	37.69	61.48	34	34.5
Price of Ethanol with NPV=0	71.16	60.9	119.02	105	149	145.41	38.84	63.09	71.6	72.2

Price of Ethanol for achieving threshold IRR	@12% 94.94	@12% 84.55	119.02	105	165.15	166.00	38.84	63.09	79.75	80.3
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Financial Ratios and Returns without VGF

Parameters	IOCL		BPCL		HPCL		ABRPL		MRPL	
	CHT	Self	CHT	Self	CHT	Self	CHT	Self	CHT	Self
Equity IRR	(-) ve	(-) ve	(-) ve	(-) ve	(-) ve	(-) ve	21.5	5.86	1.75%	1.43%
Project IRR	(-) ve	(-) ve	(-) ve	(-) 2.7	(-) ve	(-) ve	17.3	7.47	3.44%	3.23%
NPV at Discount factor	(-) 332	(-) 438	(-) 779	(-) 789	(-) 1214	(-) 1218	410	(-) 195	(-) 198	(-) 207
DSCR	Not sufficient	Not sufficient	Not sufficient	Not sufficient	Not sufficient	Not sufficient	2.95	1.96	1.23	1.2
Breakeven Ethanol price at 100% operation	61.28	51.21	75.39	64.94	86.48	90.04	41.61	64.96	34	34.5
Price of Ethanol with NPV=0	77.79	67.51	127.06	111.1	154.05	150.31	42.86	66.65	78.9	79.5
Price of Ethanol for achieving threshold IRR	@12% 104.42	@12% 94.14	127.06	111.1	173.10	173.95	42.86	66.65	88.4	88.9

Guidelines for IRR

1. Timeline for Cash Flows: Pre construction period + 20 years (Post Construction)
2. Capacity: 100% CUF (Capacity Utilisation Factor) by 3rd year from Project commissioning
3. No Escalation: The Financial model is to be built with constant prices throughout. No escalation to be taken for Revenues, Feedstock, and other operating expenditures. Hence in the model, from year 3 onwards (first year with 100% CUF), the EBIDTA should be same.
4. GST to be certified that the Capex GST is offset by net Revenue GST and hence not considered. In case it is not offset, the differential may be taken in the respective years cash flow
5. Project Cost: The elements of project cost must be shown in the workings
6. Debt-Equity Ratio: 50:50 before VGF. The interest payments on Debts taken to be shown in the cash flows.
7. Funding: To ensure that funding for project cost is procured, maintaining the Debt equity ratio of 50:50 and show the VGF infusion as per RFS timelines. Because VGF is conditional, both the cases with and without VGF to be worked out.
8. Ethanol price to be taken as Rs 59.48 without any escalation.
9. Feedstock prices to be taken without any escalation based on plant location (include the transportation cost/handling charges (if any) as per the RFS document.
10. Working Capital: The Cash flows must show the Working capital infused, incremental infusion over the years (if any) and must show the release of working capital at the end of project.
11. Salvage Value: The salvage value at 5% excluding land, which will be taken at original cost.
12. Taxation:
 - i. Since new tax rates have been notified from FY 2020-21 onwards for those companies which shall opt for it, hence PDs are requested to take only those rates, which represent the intent of management on date.
 - ii. Minimum Alternate tax to be taken where applicable.
 - iii. Tax rates must include Cess and Surcharge, wherever applicable.
 - iv. To be evaluated on a standalone basis without off setting of losses (if any) from group business profits
13. Returns and Ratios:
 - i. Equity IRR: Debt (50%) is included in project funding. Hence compute the Equity CF (Cash flows to equity shareholders). IRR is to be computed on the Equity CF.
 - ii. NPV at Discount factor: Discount factor to be decided by the PDs and must be indicated in the assumptions. The NPV of Equity CFs on such discount factor to be computed.
 - iii. DSCR: Compute the DSCR only for those years in which debt exists. Then compute the average for these years. If in any year the debt obligations are not met, it is to be mentioned that debt cannot be serviced.
 - iv. Breakeven analysis:
 - a. Breakeven Ethanol price at 100% operation
 - b. Price of Ethanol with NPV=0
 - c. Price of Ethanol for achieving threshold IRR










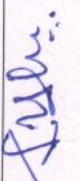
List of Participants

87th meeting of SAC held on 13.12.2019 at SCOPE Complex, Lodhi Road, New Delhi

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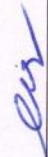



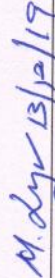


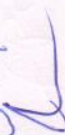

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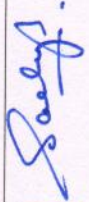



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