सीएचटी
ISO 9001:2015

उच्च प्रौद्योगिकी केन्द्र
(पेट्रोलियम एवं प्राकृतिक गैस मंत्रालय), भारत सरकार
Centre for High Technology
(Ministry of Petroleum & Natural Gas), Govt. of India

सीएचटी/एसएसी-92/
CHT/SAC-92/

29 जुलाई 2021
29th July 2021

सेवा में/ To,

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 92वीं बैठक का कार्यवृत्त

Sub: Minutes of 92nd Meeting of the Scientific Advisory Committee (SAC) on Hydrocarbons of Ministry of Petroleum & Natural Gas

प्रिय महोदय/महोदया / Dear Sir/Madam,

दिनांक 23 जुलाई, 2021 को विडियो कॉन्फ्रेंसिंग द्वारा सम्पन्न, पेट्रोलियम और प्राकृतिक गैस मंत्रालय की हाइड्रोकार्बन पर वैज्ञानिक सलाहकार समिति की 92वीं बैठक के कार्यवृत्त की प्रतिलिपि आपकी सूचना एवं आवश्यक कार्यवाही हेतु संलग्न की जा रही है।

Enclosed please find a copy of the Minutes of 92nd Meeting of the SAC on Hydrocarbons of Ministry of Petroleum & Natural Gas held on 23rd July, 2021 through video conferencing, 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**

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List of Members for 92nd meeting of SAC

S. No.	Name, S/Shri	Designation	Organisation
		CHAIRMAN	
1.	Dr. Anil Kakodkar	Former Chairman, Atomic Energy Commission	BARC
		MEMBERS	
2.	Prof. R. Kumar	Professor Emeritus	IISc, Bangaluru
3.	Prof. J. B. Joshi	Professor Emeritus	HBNI
4.	Dr. M. O. Garg	Head – Refining and Petchem R&D	RIL
5.	Prof. A. B. Pandit	Vice Chancellor	ICT, Mumbai
6.	Dr. Shashi Kant	Technical Advisor	Universal Group, Vadodara
7.	Prof. Shankar Narasimhan	Professor	IIT, Chennai
8.	Dr. R. K. Malhotra	Director General	FIPI
		EX-OFFICIO MEMBERS	
9.	Shri S. M. Vaidya	Chairman & Director (Refineries)	IOCL
10.	Shri Arun Kumar Singh	Director (R) & Director (M)	BPCL
11.	Shri V. S. Shenoy	Director (Refineries)	HPCL
12.	Dr. S.S.V. Ramakumar	Director (R&D)	IOCL
13.	Ms. Vartika Shukla	CMD-Designate & Director (Technical)	EIL
14.	Dr. Sanjeev S. Katti	Director General	ONGC Energy Centre
15.	Shri M. V. Iyer	Director (BD)	GAIL
16.	Shri Niranjan Kumar Singh	Secretary	OIDB
17.	Shri Niranjan Kumar Singh	Executive Director	PCRA
18.	Dr. Reji Mathai	Director	ARAI
19.	Dr. Anjan Ray	Director	CSIR-IIP
20.	Shri S.C.L. Das	Director General	DGH
		MEMBER SECRETARY	
21.	Shri K.K. Jain	Executive Director	CHT
		PERMANENT INVITEE	
22.	Shri Sunil Kumar	Joint Secretary (Refineries)	MoP&NG
23.	Shri V. Ravikumar	Head (R&D)	BPCL
24.	Shri S. Bharathan	Head (R&D)	HPCL
25.	Shri H. Shankar	Director (Technical)	CPCL
26.	Shri S.C. Gupta	Head (R&D)	EIL
27.	Shri Sanjeev Kumar	CGM (R&D)	GAIL

July 29, 2021

Minutes of 92nd Meeting of Scientific Advisory Committee (SAC) on Hydrocarbons of MoPNG

1. The 92nd Meeting of SAC was held on 23rd July 2021 through Video Conferencing. 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), other esteemed members of SAC and special invitees.

3. ED(CHT) while giving the background mentioned that RFS for selection of 2G ethanol project developers under PM JI-VAN Yojana was floated two times by CHT. However, response was poor from private entrepreneurs as advanced bio fuels are presently in their early stages of development and there was no clarity on 2G Ethanol pricing in PM JI-VAN Yojana. Hence, SAC advised to consider price for 2G Ethanol as 1G ethanol maximum price i.e. from sugarcane juice for assessing commercial viability of the projects. Even that price was not making projects viable as 2G ethanol production cost is significantly higher than 1G ethanol.

   MoP&NG, vide letter dated 30th June'21 asked CHT to bring out a policy paper on pricing of 2G ethanol in consultation with SAC. CHT sought information from 2G Ethanol project developers on financials, CAPEX, OPEX of their ongoing projects as well as their suggestions on 2G ethanol pricing mechanism. Based on the input from project developers as well as information gathered by CHT from public domain, following options for pricing of 2G ethanol were proposed for deliberation by SAC:

   a. Linking with cost of biomass and cost of production
   b. Subsidy on biomass and utilities (power)
   c. Reimbursing the differential cost to OMCs (delivered cost of 2G ethanol and landed cost of unblended MS).
   d. Separate mandate for blending 2G ethanol, in which price is discovered by the market based on supply- demand and price of blended ethanol is determined by OMCs to recover impact of mandate.

   ED (CHT) also presented about challenges in 2G Ethanol technology, international practices for 2G ethanol pricing and financials of ongoing 2G ethanol projects.

4. Chairman in his opening remark mentioned that there are many routes available for biomass valorization from energy perspective. There is a need to incentivize all such technologies in order to promote biomass valorization in the most effective manner as well as generate enough competition among technology options. The incentivization should be technology agnostic and not for a particular technology. However, he opined that 2G ethanol technology is also required to be supported in order to derive returns from the investments already made. He also mentioned that incentive should lead

towards improvement in the process particularly in the operating cost. Thereafter, he invited members for comments and suggestions.

5. Prof. R. Kumar advised that incentives should be given for a fixed time period and should not be perpetual. He referred one of the papers wherein 2G Ethanol production cost in USA is mentioned as $ 2.65 per gallon (Rs 52 per litre @ INR 74/USD) with projection to further bring down to $ 1.07 per gallon, which is significantly lower than the cost coming in Indian projects. Therefore, efforts are required to be taken to bridge the gap in cost of production. He advised for integration of 2G ethanol plants with 1G ethanol to bring down the cost. He also mentioned to bring down cost of biomass through proper mechanism as its contribution in costing is significant.

6. Prof. J.B. Joshi advised that biomass conversion costs through all available technologies like thermochemical processes (combustion, gasification, pyrolysis, hydropyrolysis, etc.) and Biochemical processes (fermentation, anaerobic digestion, etc) should be compared in order to incentivize them.

7. Dr. Anjan Ray referred the success of biofuel promotion program in Southeast Asia particularly in Thailand and Indonesia and advised to give incentives based on the difference of landed cost of MS and ethanol as it is on a real time basis. The incentive may be given initially for 3 years and reduced gradually in subsequent years as by that time plant will become self-sufficient due to depreciation, process improvement, etc. He also advised to explore mechanism of collection of carbon certificates based on LCA done by third party, which can be used to meet CORSIA guidelines for bio-ATF in future. This will fill the gap in case of incentives are withdrawn at later stage.

8. Prof. A.B. Pandit suggested for two pronged strategy. At one end, ongoing 2G Ethanol projects need to be incentivized with mandated improvement in the technology and continuation of incentives should be linked with level of improvement done by project developers. On the other end, calorific valorization of biomass needs to be incentivized as a whole. He advised to analyze lower yields of 16-18% as compared to theoretical yields of 30%. He also highlighted about variations in CAPEX of the projects with same technology of M/s Praj.

9. Dr. R.K. Malhotra also advised that projects, wherein already investments have been made, need to be supported. On the other end, we need to incentivize biofuel production as whole which are feedstock agnostic and technology agnostic based on their merit.

10. Dr. M.O. Garg advised to explore value addition of residue which is being generated in 2G Ethanol projects. One of the ways is to produce steam and power in efficient ways, which has an added advantage of being a green energy. He referred case of sugar industries, wherein bagasse is being burnt in multiple effect evaporators to generate steam. Better approach is to generate high pressure steam at 100 bar followed by its use to drive the turbine and let down steam can be used in evaporators. He also mentioned

that there is huge demand of briquettes being made from waste biomass, which are being used in the boilers. Companies like Reliance are purchasing such briquettes and taking carbon credits by using it in the boilers. He advised for C5 sugars valorization into chemicals.

11. Ms. Vartika Shukla mentioned that there are different approaches to produce 2G ethanol. Price of 2G ethanol will depend upon value addition of other byproducts and will vary from technology to technology. Therefore, she suggested to go for a discovered price by project developers along with improvement in the process. The mechanism for implementation of the incentives should be simple and implementable. It should also be effective from management & control and policy perspective. She also advised review of incentives on regular intervals.

12. Shri V.S. Shenoy highlighted that challenges / issues in 2G ethanol projects are of varied nature viz. location specific, feedstock related, technology related, etc. These challenges may be there in future projects also. Further, all the projects have progressed significantly. Therefore, unification of CAPEX and OPEX might not happen. However, efforts are required to improve the process wherever feasible and also options like earning green certificates / carbon credits may be explored to optimize the cost. He advised for detailed deliberations for suitable pricing as single strategy may not be fitting for all.

13. Shri J.S. Prasad from HPCL highlighted that projects were approved by boards of OMCs with background understanding of mandate, inspite of high CAPEX involved and negative returns. With negative cash flows in future running, it is essential to incentivize these projects. He mentioned that in order to bring down production cost of these initial 2G ethanol plants, companies are looking for state support in passing proposed farmer incentives against stubble burning to the companies procuring rice straw and waiver of Electricity transmission/ wheeling charges and duties to get open exchange power or their own captive power at lower cost. They are also looking at feasibility of setting up 1G ethanol plant integrated with 2G ethanol project, towards bringing down average Ethanol production cost. He requested SAC that in the later scenario the entire quantity of ethanol produced from 1G-2G integrated ethanol plant may be considered as 2G ethanol. He also highlighted that the proposed penalties on defaulting Marketing companies in usage of 2G Ethanol as per prescribed percentage dosage, be passed on to these initial plants, for offsetting their losses, till the time technology matures further.

14. Shri Praveen Dongre from IOCL also mentioned that their project was also approved by Board with background of mandate. He referred the strategy adopted in case of Solar power incentivization in the year 2009-10, wherein higher tariffs were offered to initial projects.

15. Shri Nikunja Borthakur from ABRPL requested that mandate should be for a longer time. He also shared about value added products like furfural, acetic acid which will be

produced along with ethanol. Another byproduct bio-coal will be used in CHP and therefore, only residue left in the technology will be CHP bottom.

16. Shri Sanjeeb Paul from BPCL shared that they are going for 100 KLPD 1G ethanol plant from rice grain in the same premises of 2G ethanol project at Bargarh. By changing the project execution strategy from LSTK to EPCM, they are able to set up both the plants within same CAPEX approved by their Board for 2G ethanol project. They are anticipating little improvement in project IRR. Further value engineering exercises are being taken for cost optimization. They are working on ash and mud disposal which will be a huge quantity at around 150-170 MT/D in the projects. He highlighted plant availability issue in initial years as water and biomass might not be available throughout the year.

17. Shri Deepak Prabhakar from MRPL mentioned that they are going with a different technology and expecting reduction in CAPEX. There will be opportunities for process improvement but that will come through investment only. However, margins in the project does not allow any further investment. Therefore, incentives are required for longer time for plant sustainability. He also highlighted that penalty for short quantity should be calculated based on lowest grade 1G ethanol price i.e. molasses C rather than highest grade 1G ethanol i.e. from sugar cane juice. As there are chances that companies may procure lowest grade 1G ethanol and reduce their penalty amount.

18. Shri M.S. Patke mentioned that all components of OPEX except biomass price can be optimized by project developers through improvement measures. However, they do not have any control on the biomass price. He referred that many biomass based power plant had to shut down due to higher biomass price. Therefore, he advised to link 2G ethanol price with biomass price in line with 1G ethanol wherein prices are given based on feedstock. This mechanism will drive state authorities to control the biomass price within a band in order to ensure socio-economic development.

19. Shri Sunil Kumar, Joint Secretary (Refineries) apprised that there is significant improvement in 1G ethanol supply as a result of Government's policy support and this year it is expected to achieve 8 - 8.5% blending. One of the major reasons for this success, he mentioned was high price offered for 1G ethanol from sugarcane juice. This has encouraged sugar industries to make more ethanol from sugarcane juice instead of producing sugar and has resulted supply of almost 50 crore litres from earlier supply of 1-2 crore litre. Therefore, differential pricing may also boost private sector investment in 2G ethanol production. One of the major advantages of Ethanol blending is that it does not require any additional investment in infrastructure unlike with other bioenergy forms like CBG etc. With this background, CHT was advised to discover price mechanism for 2G Ethanol in consultation with SAC. CHT can also be advised to explore export potential of Ethanol.

20. After extensive deliberations, SAC recommended the following:

a. SAC advised to constitute a group under the chair of EIL and comprising of 2-3 members of SAC and ED-CHT to review all 2G ethanol projects being executed in India. This group will identify areas for improvement in the process based on global benchmark available with an objective to bring down the OPEX. The Group should include representative of project developer while reviewing that particular project.

b. SAC opined that companies, who have invested in 2G ethanol technologies so far, are required to be supported. Therefore, in order to ensure sustained operation of such plants, SAC recommended to create a separate mandate for 2G ethanol and proposed to constitute an expert group by MOPNG for detailing the entire mechanism. Its blending percentage to be kept small initially depending on ethanol availability from plant and the price recovery would be 100% atleast for 2 years. Meanwhile, these plants will put all out efforts to bring down the cost. SAC, on a regular basis will review the progress made by these plants in the area of process improvement. SAC will review the recommendation of mandate after 2 years.

c. For future projects, SAC reiterated its earlier recommendation that Government should promote all liquid biofuels, which can reduce crude import, on equal footing. SAC also opined that more innovative technological solution should be explored and to be promoted. There is a need to incentivize all such technologies which are producing liquid biofuels. This will promote biomass valorization in the most effective manner as well as generate enough competition among technology options. The incentivization should be technology agnostic and not for a particular technology. SAC opined that suitable mechanism may be required to adopt these liquid biofuels.

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

Annexure-1

92nd Meeting of Scientific Advisory Committee (SAC) on Hydrocarbons of MoPNG held on 23rd July 2021 through Video Conference

List of Participants

S.N.	Name	Designation	Organization
1	Dr. Anil Kakodkar	Chairman - SAC	BARC
2	Sh. Sunil Kumar	Joint Secretary (Refineries)	MoP&NG
3	Prof. R. Kumar	Professor Emeritus	IISc
4	Prof. J.B. Joshi	Professor Emeritus	HBNI
5	Prof. A.B. Pandit	Vice-Chancellor	ICT
6	Dr. M.O. Garg	President (R&D)	RIL
7	Dr. R. K. Malhotra	Director General	FIPI
8	Dr. Shashi Kant	Technical Adviser	Universal Group
9	Dr. Anjan Ray	Director	IIP
10	Ms. Vartika Shukla	CMD Designate & Director (T)	EIL
11	Sh. V.S. Shenoy	Director (R)	HPCL
12	Sh. K.K. Jain	ED	CHT
13	Dr. Reji Mathai	Director	ARAI
14	Sh. J.S. Prasad	ED (Pipelines & Projects)	HPCL
15	Sh. Manoj Sharma	ED (O)	IOCL
16	Sh. M.S. Patke	Ex. ED (Biofuels), BPCL	
17	Sh. S.C. Gupta	Head (R&D)	EIL
18	Sh. Nikunja Borthakur	Sr. CGM(CA) and Dir, ABRPL	NRL
19	Dr. Ravikumar V.	Head (R&D)	BPCL
20	Sh. Sanjeev Kumar	CGM (R&D)	GAIL
21	Sh. Sanjeeb Kumar Paul	CGM (Biofuels)	BPCL
22	Sh. Pravin T. Dongre	CGM (Biofuels)	IOCL
23	Sh. Deepak Prabhakar	CGM (CS)	MRPL
24	Sh. Ramachandra Rao B.	GM (R&D)	HPCL
25	Dr. M. Lavanya	DGM (CP)	CPCL
26	Sh. Prashant Kumar	CFO	ABRPL
27	Dr. N.S. Raman	Director	CHT