सीएचटी

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

CHT/SAC-75/890

Date: 30th January 2015

To

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

Sub: Minutes of the 75th Meeting of the Scientific Advisory Committee (SAC) on Hydrocarbons of Ministry of Petroleum & Natural Gas

Dear Sir,

Enclosed please find a copy of the Minutes of 75th Meeting of the SAC on Hydrocarbons of Ministry of Petroleum & Natural Gas held on 13th January 2015 at Hotel Trident, Mumbai, for your kind information and necessary action.

With kind regards,

Yours Sincerely,

30/01/2015

(B.D.Ghosh)
Executive Director

Encl: As above

→ Shri P. Mastry

ओ.आई.डी.बी. भवन, टॉवर ए, 9 वॉ तल, प्लॉट नंबर 2, सैक्टर 73, नोएडा–201307 (उ. प्र.)
OIDB Bhawan, Tower "A", 9th Floor, Plot No. 2, Sector-73, Noida -201307 (U. P.)
Tel. 0120-2593701....., Fax: 91-120-2593780/2593782, Email: .....bdghosh.....@cht.in Website: www.cht.in
Liaison Office: C/o. OIDB, 301, World Trade Centre, 3rd Floor, Babar Road, New Delhi-110 001 Tel. : 91-11-23414692

Chairman, Members, Permanent Invitees and Special Invitees to the Scientific Advisory Committee

1.	Dr. Anil Kakodkar, Bhabha Atomic Research Centre, 7th Floor, Central Complex Trombay, **Mumbai** – 400 085	Chairman
2.	Dr. R. Kumar, Professor Emeritus, Department of Chemical Engineering, Indian Institute of Science, Bangalore, **Bengaluru** – 560 012 (Karnataka)	Member
3.	Dr. M.O.Garg, Director, CSIR – Indian Institute of Petroleum, P.O.IIP, Mohkampur, **Dehradun** – 248 005 (Uttarakhand)	Member
4.	Dr. B.D. Kulkarni, Distinguished Scientist, CSIR – National Chemical Laboratory, Dr. Homi Bhabha Road, **Pune** – 411 008 (Karnataka)	Member
5.	Dr. D.V. Khakhar, Director, Indian Institute of Technology-Mumbai, Powai, **Mumbai** – 400 076	Member
6.	Dr. (Ms) M. Lakshmi Kantam, Director, CSIR – Indian Institute of Chemical Technology, Uppal Road, Tarnaka, **Hyderabad** – 500 007	Member
7.	Prof. Shantanu Roy, Department of Chemical Engineering, Indian Institute of Technology-Delhi, Hauz Khas, **New Delhi** – 110 016	Member
8.	Dr. Ajit Sapre, President - Refining Technology Group Reliance Industries Ltd. Reliance Corporate Park, Bldg. No. 7A, Thane-Belapur Road, Ghansoli **Navi Mumbai** – 400 701	Member
9.	Shri R.K. Ghosh, Ex-Director (R), IOCL, AH-708, Amrapali Village, Indira Puram, **Ghaziabad** – 201 014	Member
10.	Dr. R.K. Malhotra, Ex-Director (R&D), IOCL, House no. 303, AGCR Enclave, Opp. Karkardooma Court, **Delhi** – 110 092	Member

11.	Shri Sanjiv Singh, Director (Refineries), Indian Oil Corporation Ltd., SCOPE Complex, 5th Floor, Core-2, Lodhi Road, **New Delhi** – 110 003	Member
12.	Shri B. K. Datta, Director (Refineries), Bharat Petroleum Corporation Ltd., Bharat Bhawan, 4&5 Currimbhoy Road, Ballard Estate, P.B. No. 688, **Mumbai** – 400 001	Member
13.	Shri B.K. Namdeo, Director (Refineries), Hindustan Petroleum Corporation Ltd., 17, Jamshedji Tata Road, P.O. Box No. 11041, **Mumbai** – 400 020	Member
14.	Shri B.P. Das, Executive Director – I/C (R&D), Indian Oil Corporation Ltd., R&D Centre, Sector-13, **Faridabad** – 121 007	Member
15.	Shri Ajay N. Deshpande, Director (Technical), Engineers India Limited, 1, Bhikaiji Cama Place, **New Delhi** – 110 066	Member
16.	Dr. B. Bhargava, Director General, ONGC Energy Centre, 15th Floor, South Tower, Core-4, SCOPE Minar Complex, Luxmi Nagar, **New Delhi** – 110 092	Member
17.	Shri B.N. Talukdar, Director General, Director General of Hydrocarbons, OIDB Bhawan, Tower A, Sector 73, **NOIDA** – 201 307 (U.P.)	Member
18.	Director (BD), GAIL India Limited, 16, Bhikaiji Cama Place, R.K. Puram, **New Delhi**-110 066	Member
19.	Shri L.N. Gupta, Secretary, Oil Industry Development Board, OIDB Bhawan, Plot No. 2, Sector – 73, **NOIDA** – 201 301 (U.P.)	Member
20.	Shri B. D. Ghosh, Executive Director, Centre for High Technology, SCOPE Complex, Lodhi Road, **New Delhi** – 110 003	Member-Secretary

21.	Shri Sandeep Poundrik, Joint Secretary (Refineries), Ministry Of Petroleum & Natural Gas, Shastri Bhawan, **New Delhi** – 110 001	Permanent Invitee
22.	Shri Sanjay Bhargava, Head (R&D), Bharat Petroleum Corporation Ltd., Corporate R&D Centre, Plot no. 2 A, Udyog Kendra, Surajpur Industrial Area, **Greater Noida** – 201 306 (U.P)	Permanent Invitee
23.	Shri N.V. Choudary, General Manager (R&D), HP Green R&D Centre, Hindustan Petroleum Corporation Ltd., KIADB Industrial Area Tarabanahalli, Devanagundi, Hoskote, **Bangalore** – 560 067	Permanent Invitee
24.	Shri Ganesh Prasad, Executive Director, R&D Centre, Engineers India Limited, Sector-16, **Gurgaon** – 122 001	Permanent Invitee
25.	Dr. A. Meenakshisundaram Chief Manager & Head (R&D), Chennai Petroleum Corporation Limited, Manali, **Chennai** – 600 068	Permanent Invitee
26.	Shri R.K. Kashyap, Executive Director (R&D), GAIL India Limited, 8th Floor, Jubilee Tower, B- 35-36, Sector – 1, **NOIDA** – 201 301	Permanent Invitee
27.	Shri Gautam Roy, Managing Director, Chennai Petroleum Corporation Ltd. 536, Anna Salai, Teynampet, **Chennai – 600 018**	Special Invitee
28.	Shri P. Padmanabhan, Managing Director, Numaligarh Refinery Limited, 6th Floor, Tolstoy House, 15 – 17, Tolstoy Marg, **New Delhi – 110 001**	Special Invitee
29.	Shri H. Kumar, Managing Director, Mangalore Refinery & Petrochemicals Ltd., Regd. Office: Kuthethoor, **P.O. Via Katipalla,** **Mangalore – 575 030**	Special Invitee

Minutes of the 75th Meeting of the Scientific Advisory Committee (SAC) on Hydrocarbons of MOP&NG held on 135th January 2015atHotel Trident, Mumbai

1.0 Dr. Anil Kakodkar, Chairman, SAC chaired the 75th Meeting of the Scientific Advisory Committee (SAC) held on 13.1.2015. The list of participants is enclosed as Annexure-1.

2.0 Shri B.K. Namdeo, Director(R), HPCL welcomed Chairman Dr. Anil Kakodkar and members of SAC. In his welcome address, Shri Namdeo presented the current refining scenario and stressed on the likely challenges and need for new initiatives in view of the depletion of resources and availability of new sources on the horizon.

3.0 Shri B.D. Ghosh, ED, CHT in his opening remarks welcomed Dr. Anil Kakodkar, Chairman SAC; members of the newly constituted SAC, invitees, academia and scientists to the 75th SAC meeting. He gave an overview of SAC in his opening remarks and briefed the participants regarding the salient achievements of the earlier committees and praised the contributions made by various members. He also informed the participants that the new charter of SAC has been notified by MoP&NG for implementation by the new SAC.

4.0 Chairman in his opening address observed that the new SAC charter gives us a proactive mandate. Referring to the integrated energy policy document, he brought out that by the year 2032 India would be importing around 2/3rd of her energy needs which are likely to be around 1667 – 2077 Mtoe. Import of oil and natural gas is expected to be in the range of 400 – 650 Mtoe. This would pose a serious challenge both in terms of balance of payment as well as sustainable sourcing of energy. This, he opined, calls for a more carefully designed strategy that not only looks at all potential hydrocarbon sources but also conversion of other energy resources such as coal, biomass, nuclear and solar energy into useable fluid hydrocarbons. He also advocated for inviting and utilizing the pool of huge intellectual resources available at IITs, NITs and research institutions.

The Chairman invited the views of the SAC members for addressing these challenges and also suggested that a sub-committee of SAC members lead by EIL may be formed to review, explore and recommend the major national initiatives / key research thrust area / projects which could be taken up or expression of interest invited by the SAC.

Based on the discussion paper prepared by the above sub-committee, Chairman suggested to have a separate brain-storming session, to be convened by CHT.

5.0 Dr. R. Kumar expressed that the role and composition of CHT is unique to our country with big basket of expertise in one place but it is not being utilized to its potential. He observed that the new SAC charter has now made it possible to address various resources and use the opportunities to put together the problems. He commented that while up to 10% conversion of the academic research to commercialization is well accepted, this

should be much higher at 30-35% with hydrocarbon industry which has not been the case so far.He stressed that retrospection, mission mode projects and intermediate improvements are necessary in order to improve the translation of R&D to commercialization at industry level. There is need to think about energy in a more integrated way.

6.0 Dr. R.K. Malhotra while agreeing with Dr. Kumar's views advocated for strengthening CHT with best people from the oil sector through collaborative approach. He opined that the SAC should decide on the kind of projects that should be taken up through deliberations and identification.

7.0 Shri Ajay Deshpande, Director (T), EIL commented that there is continued need to address the challenges in commercialization of technologies and sustain competence in the technology sector through improvements, cost cutting and lead time.

8.0 Shri G. Sriganesh, ED, HPCL suggested to review and revisit the projects which have been completed and also identified for exploring their commercial potential besides focusing on bio-fuels, bio-research as potential futuristic areas by PSUs. He also elaborated on the success of HPCL's HiGee technology and invited other members to avail the benefits of the developed technology.

9.0 Dr. Ajit Sapre, RIL suggested that enhanced oil recovery is of real importance to tap depleting reservoirs and increase production and emphasized brain storming to leap frog to long term requirements for next 10-20 years.

10.0 Shri A.S. Pathak, Director, CHT presented the ATR of the Minutes of the 74th meeting, the current status of the various on-going / approved projects and unresolved issues in respect of the project on "Synthetic Aviation Lubricants – Phase II" approved for funding in the 73rdSAC Meeting. The issues specifically pertain to MOU signing, sharing of knowledge and IPR sensitivity despite the fact that IOC-R&D had agreed to collaborate when Phase-II of the proposal was discussed in the meeting convened by IICT and subsequently presented to SAC in its 73rd meeting for consideration and approval.

CHT informed that signing of MOU for the project proposal of IICT, CEMILAC & IOC-R&D on "Synthetic Aviation Lubricants – Phase II" could not progress further as IOC-R&D has expressed its inability to sign the MOU due to its JV agreement with the competitor manufacturing similar lubricants and therefore has decided to withdraw from this project.

In this regard, Dr. Malhotra briefed on the background of the project and informed that no patents have been filed by IOC-R&D on the know-how generated during Phase-I of the project and hence the technical details could be shared by IOC. The members deliberated extensively on the developments and remedial action plan. IOC-R&D expressed its, in-principle, willingness to share the technical know-how and agreed to unconditionally part

with the intellectual information and knowledge base generated during the Phase-I of the project with the collaborating agency identified by IICT, Hyderabad.

Chairman expressed concern on these developments and suggested Director (R), IOCL and Director (R), HPCL to look into and address the issues expeditiously so that the project in National interest can be initiated by IICT, Hyderabad without further delay.

11.0 CHT informed that MOUs in respect of the following projects have been signed.

(i) "Development of process know-how for indigenous production of Biphenyl for thermic fluid and other application – by BPCL-R&D (Project cost – CHT/OIDB: ₹ 260.00 lakh with 36 months completion schedule) and

(ii) "Study to Examine the Possibility of Production of Naphthenic Base Oil and Paraffin Wax from Waxy Distillate Streams" – by CSIR-IIP and IOC-Digboi(Total Project cost – ₹99.28.00 lakh; CHT/OIDB: ₹ 87.28.00 lakh, IOC-Digboi: ₹ 12.00 lakh with 18 months completion schedule)

It was also informed that the MOUs for the following projects have been finalized and expected to be signed by the end of January 2015.

(i) "Parametric Study and Technology Development for Desalter Design" – by EIL-R&D and BPCL-R&D (Total Project cost – ₹ 14.511 crore; CHT/OIDB: ₹ 8.53 crore, BPCL: ₹3.481 crore and EIL: ₹ 2.5 crore with 36 months completion schedule)

(ii) "Development of Improved 3-phase reactor configuration for hydroprocessing applications" – by BPCL-R&D, EIL-R&D and IIT Delhi (Total Project cost – ₹ 115.00 lakh; CHT/OIDB: ₹ 115.00 lakh with 18 months completion schedule)

(iii) "Hydroprocessing of Residues" – by consortium of CSIR-IIP, IOCL, HPCL, BPCL & EIL (Total Project cost – ₹ 22.35 crore; CHT/OIDB: ₹ 13.66 crore, HPCL: ₹ 7.76 crore and IIP: ₹ 0.93 crore with 36 months with 36 months completion schedule)

The SAC expressed that the time delays in signing of MOUs should be minimized as bulk of the terms and conditions therein have been vetted by most of the oil industry members. SAC also advised members to curtail unnecessary delays in clarification of standard clauses, to reduce time-frame for signing, once projects are approved for funding by SAC.

12.0 CHT informed the members that nominations for the Innovation awards, in line with the approval accorded by Governing Council of CHT, were invited and have been received from various PSU & Private R&D institutions and these are required to be scrutinized for finalization of the award by the Innovation Awards Committee. Innovation Awards Committee was constituted and approved by the SAC comprising Chairman-SAC, ED-CHT

and 2 members each from oil industry, CSIR/IITs/National Institute & SAC nominated members/experts.

The composition was deliberated by the members and CHT was advised to forward the Committee's composition to Chairman for his concurrence. The Awards shall be subsequently decided by the said Committee.

13.0 IOC(R&D), BPCL(R&D), HPCL(R&D), EIL(R&D), CPCL(R&D) and CSIR-IIP made detailed presentation on their activities and capabilitiesfor introduction and benefit of the new members of the SAC.

14.0 Presentation and discussion on Ongoing Projects and New Project Proposals

14.1 "Coal to Liquid (CTL) Fuels Technology Project" of EIL-R&D and BPCL-R&D

Shri Ajay Deshpande, Director(T), EIL presented the background and highlights of the progress achieved so far. The overview and the challenges in the gasifier development phase was presented by Dr.Sonde from M/s Thermax who is partner in the CTL project for the gasifier. Dr R.N. Maiti, EIL-R&D subsequently briefed on the current status on the ongoing project on behalf of EIL and BPCL.

The project zero date is July 2009 and revised scheduled completion is June 2015, as approved in the 74th SAC meeting. Total cost of the project is ₹ 33.0 crore with contribution by each of the participating members, EIL, BPCL, Thermax and CHT/OIDB.

The summary of the current status is as under:

1. Activities under FT technology development have been completed
   - Reactor model , Catalyst and kinetic studies, cold flow hydrodynamic & CFD studies
2. Activities under gasification studies:
   - Gasification kinetics studies using HPTGA completed with CO2 and with Steam is under progress
   - Gasifier has been mechanically completed & combustion trial under progress followed by gasification
   - Syngas pilot plant has been installed and trial runs performed.
3. Activities under Demonstration package
   - PFD, Mass & Energy balance prepared, P&ID under progress
   - BDEP for demo plant (1700 TPD coal) being prepared for costing

EIL informed the members that the trial runs on gasifier with all its components, in combustion mode,is currently in progress and shall be continued for next 1-2 months to

establish the confidence level. This will be followed by operation of the gasifier in gasification mode integrating the syngas clean up system which has been installed & commissioned. The data collection and remaining project activities is expected to be completed by June 2015.

EIL was advised to prepare a project report on further development of the unit/facility to make a cheaper & viable option, its integration and assessing the feasibility of implementation by the oil industry.

14.2 "Desulphurization of Fuel Oil using Solvent Extraction Route" – CPCL &CSIR-IIP

Dr. S.M. Nanoti, IIP briefed on the current status of the project. The total cost of the project is ₹ 116.7 lakhs and its revised completion schedule is March 2015.

It was informed by IIP that the targeted reduction in the S content < 1% could not be achieved with the solvent extraction route alone and oxidative route is required to be integrated with the extraction route for handling various feed streams.

SAC suggested IIP to further fine tune various process parameters and the operational options and present the details in the next SAC meeting.

In view of the observations made by the members on microwave and ultrasound methods and their utility for oxidative extraction for better results, the project may be reviewed by a smaller group to bring in proper closure in the final report.

14.3 "Production and upgradation of Algal biomass and biocrude for biofuel applications using refinery effluents and flue gases" of CPCL and Aban Infrastructure Pvt. Ltd.(NEW PROJECT)

Dr. A. Meenakshisundaram, CPCL presented the details of the project proposal to be undertaken jointly by CPCL and Aban Infrastructure.

Currently, effluent and waste streams generated form refineries are leading to various environmental problems and CPCL had proposed to develop a novel technology to integrate waste treatment coupled with biofuels production mediated by algae.

The aim of this multi-objective project was:

a) To produce algal biomass continuously in a 1000 m^2 open raceway pond using effluent water stream of CPCL

b) To develop a novel continuous-scale "subcritical water extraction process" to process 100 kg algal slurry per day

c) To convert the algal biomass into biocrude (about 3-5 kg/day) and

d) Upgrade the biocrude for production of drop-in biofuels.

The estimated cost of this collaborative project was₹ 1143.86 lakh with a completion schedule of 36 months

During the discussions, members expressed apprehensions on the methodology being adopted as the process is low on energy efficiency and may not be techno-economically feasible. Being an open pond technology which is an old technology it was felt that the process may not achieve viable rate/yield. The members were not very much impressed with the rate of conversion, huge land and water requirements, cost, etc. In order to make the approach workable, it was suggested to by members to split the project in to two proposals covering study of biomass under different conditions to understand the growth of biomass and use of algae to produce hydrocarbons in refineries, separately.

SAC advised CPCL to re-submit the proposals for its consideration, incorporating the views expressed by the members, in the next meeting.

14.4 **"Chemical Beneficiation of High Ash Indian Coal" of RGIPT, Rae Bareli(NEW PROJECT)**

Dr. Alok K. Singh and Dr.Ing.Sistla of RGIPT presented the details of the project proposal to be undertaken at RGIPT.

Research on Chemical beneficiation of coal, specifically with high ash content, is niche and no significant work details are available in the Indian scenario for reducing the ash content other than the conventional route of physical beneficiation.

The project proposal presented by RGIPT was aimed to get maximum yield of clean coal (~70%) at the lowest ash level (~7%) without significantly altering the technological properties of coal through chemical beneficiation route. This can subsequently be used either in power generation or CTL process by the hydrocarbon industry. The estimated cost of the project was ₹ 150.18 lakh with a completion schedule of 36 months.

The members were of the view that already lots of washeries are functional and operating successfully and also queried whether the project has been taken up and discussed with Coal India Limited, being major beneficiary of the knowhow/approach proposed by RGIPT as it involves use of large quantity of alkali, acids and its recovery.

The SAC members though agreeing with the utility of the proposal to the Sector, expressed concerns regarding the feasibility and commercial viability of the proposal in its present form. SAC therefore declined to approve and fund the proposal from RGIPT.

15.0 Presentation and discussion on Ongoing Projects and New Proposals under HCF

15.1 "Hydrogen Generation from Water by Thermo-chemical process" of ONGC Energy Centre (OEC)

Dr. Parvatalu, OEC presented the background and highlights of the progress achieved so far. OEC informed that both Cu-Cl route and I-S route are being studied under the project and the current status of various activities is as under:

Cu-Cl cycle

1. Lab Engineering Scale closed-loop process development is in progress for H_2 generation @25 LPH at ICT.
2. A fluidized bed model metallic reactor for H_2 generation @25 LPH commissioned at ICT Mumbai.
3. Experimental data generated indicated low hydrogen conversions; Further modification was done to improve the performance
4. In the electrochemical section, a 12-A electrochemical cell was fabricated with improved design and optimization studies in progress
5. Cathodic current density, 187 mA/cm^2 has been achieved so far against the target 200 mA/cm^2at a cell voltage, 0.7± 0.1V . Further studies in progress.
6. A new process gadget has been designed to ensure complete conversion of Cu-Cl at the outlet of electrolytic cell.
7. Commissioned Spray driers for drying CuCl2. Performance found to be excellent
8. Using newer version of Aspen plus software, basic flowsheets were developed for all thermochemical reactions and validated with experimental data.
9. The project work is likely to be completed this year by June 2015.

I-S Cycle

1. Proof of concept of the complete cycle established using a combination of electrochemical and thermochemical routes.
2. Designed, fabricated & commissioned HP-HT reactor for mini-pilot scale operation of catalytic decomposition of H_2SO_4 for H_2 generation@ 150 LPH.
3. Achieved the highest equilibrium conversion at 850°C using cost-effective and highly stable non-platinum based catalyst system.
4. Electrochemical Bunsen reaction was proven with high current efficiency, low voltage, less water requirement and minimum cross-contamination levels.

5. Electro-electro Dialysis route established the HI concentration beyond HI azeotrope
6. Developed highly efficient non-Platinum based catalysts for HI decomposition.
7. Simulation / Modeling work on Electrochemical Bunsen & HI enrichment by EED studies completed to address scaling up issues.
8. Developed Basic flow sheets for Bunsen section, H_2SO_4 and HI decomposition sections using Aspen plus software.
9. Alternate paths for HI and H_2SO_4 sections and techno-economic feasibility of Partially open-loop I-S cycle established
10. Planning for closed loop experiments

OEC also informed that the construction of lab building and closed loop facilities is being taken up at Panvel and it has plans to shift engineering scale and other facilities OEC premises at Panvel.

OEC informed the members that there have been variations in the implementation strategy in the execution of the project activities and the method of utilization of funds to accelerate the pace of work. The entire funding sanctioned for the project has now been utilized for contract research with various research institutions/academiaand requested for allowing the re-appropriation within the approved cost of the project.

SAC reviewed the progress made by OEC and allowed re-adjustment of funds proposed by OEC, as per the MOU, with the consent/concurrence of OIDB/CHT and within the overall project cost of ₹1240 lakh.

15.2 "Demonstration project on the use of HCNG blends in Automotive Vehicles" of IOCL-R&D

Dr. Brijesh Kumar, IOCL-R&D presented the background and current status of the project. He informed though the project was approved in 2007, the Euro IV engines from OEMs (Ashok Leyland and Tata Motors) could be procured from 2011 onwards for HCNG testing.

- The vehicles were provided from 2013 onwards as the engine optimization using HCNG data had to be generated and flashed in the vehicle ECM (Electronic Control Module).
- Since the buses have GVW more than 12 tonne, no testing on chassis dynamometer is recommended whereas testing of engine on engine dynamometer is carried out. IOCL informed that engine testing on engine dynamometer has been completed for both Ashok Leyland & Tata Motors.

- Field trials of Leyland buses have been completed, whereas field trials of Tata buses are in progress (expected to complete by June, 2015)

The balance activities pertaining to wear measurements of engine components of both Leyland & TATA Engine and compilation of results and report preparation have been initiated and sought approval of SAC for extending the project up to September 2015.

SAC reviewed the progress and advised IOCL to expedite the completion of the project and also agreed to IOCLs request for extending the project up to September 2015.

15.3 "Scale-up studies and process development for Hydrogen production by catalytic decomposition of natural gas" of HPCL-R&D and IIT Delhi (NEW PROJECT)

Shri Pramod Kumar, HPCL briefed about the background and presented the details of the proposal. It was informed that the project is an extension of the earlier project funded under HCF and completed in collaboration with IIT Delhi wherein the details kinetics, modeling and simulation studies were carried out for fixed bed as well as fluidized bed.

1. In the Phase-1 of the project for Hydrogen Production, study was undertaken by HPCL/IIT Delhi wherein catalytic decomposition of methane (CDM) was investigated for the production of COx free H_2 and carbon nanofibers. A series of catalysts were prepared by different techniques using different metals (Ni, Co and Fe), promoters (Cu and Zn) and supports and characterized. Among the catalysts, Ni-Cu-Zn/Al_2O_3 catalyst prepared by wet impregnated method was found to be most promising, for the production of COx free hydrogen and quality carbon nanofibers. The maximum methane conversion was 93% (91% H_2 yield) at 750 °C.
2. In continuation of the above efforts, the proposal was submitted by HPCL and IIT Delhi for scale-up studies for further achieving the objective of commercialization of the developed process know-how.
3. The estimated cost of the Project is ₹ 24.0 crore and completion schedule of 48 months. Contribution requested from CHT/OIDB is ₹ 18.0 crore.
4. In the present proposal scale-up studies in pilot plant with methane flow rate of 1.0 kg/hr (~24950 ml/min) and catalyst of 5.0 kg were envisaged.
5. During the presentation and subsequent discussions, the members observed that the Methane conversion levels of 65% achieved with fluidized bed is far below 90% conversion achieved in fixed bed configuration, in the studies taken up so far. HPCL indicated that the lower conversion levels could be attributed to distributor design in the fluidized bed set-up and opined that higher size may yield better results.
6. The members deliberated the above observation and suggested HPCL to carry out further optimization studies at lab scale before taking up the pilot scale project.

In view of the inconsistency in the proposal and explanations / clarifications given by HPCL, Chairman constituted a committee (comprising SAC members from EIL, IIT Delhi, Dr. B.D. Kulkarni and Dr.R.Kumar) to review and assist HPCL in deciding the various technical issues like reactor size and distributor design aspects and scale-up, before initiating the pilot scale studies. Based on the recommendations of the Committee, HPCL shall modify the project proposal with proper framework/deliverables for consideration of the SAC.

16.0 Concluding Remarks:

16.1 Chairman in his concluding remarks appreciated the excellent discussion and views expressed by members of the newly constituted SAC and other participants to the meeting.

16.2 Chairman suggested that a sub-committee lead by Director(T), EIL and members from IIP, IOCL, RIL and IIT Delhi shall prepare a Position paper to review, explore and recommend the initiatives / research area / projects which could be taken up or expression of interest invited by the SAC and also to address the various issues for discussions during the proposed Brain storming session. The committee may cover the following aspects as well in its position paper:

a. Prioritize the areas in development of technologies
b. Identify key issues to have control on
c. Identify serious vulnerabilities that can set in and ways to avoid them
d. Synergy in translation to commercialization and pushing technologies
e. Invite proposals on identified ideas
f. Supporting fellowships for research through academia (projects of industry interest like alternatives to HC, alternative sources to HC, enhancing output from depleting wells, coal bed methane, etc.)

16.3 Chairman agreed that CHT will organize a brain storming session shortly based on the inputs received from the above sub-committee and before the next SAC meeting.

16.4 Shri B.D.Ghosh, ED (CHT), thanked Chairman and other participants for a very fruitful meeting. He thanked Chairman for steering the SAC effectively for smooth functioning of SAC and valuable advice on future R&D projects. He extended special thanks to Director(R), HPCL & his team for the excellent support provided and hosting the meet.

17.0 The meeting concluded with thanks to the Chair.

Annexure-1

75th Meeting of the Scientific Advisory Committee (SAC) on Hydrocarbons of MOP&NG held on 13th January 2015 at HotelTrident, Mumbai

List of participants

	Name	Designation	Organisation
1	Dr. Anil Kakodkar	Chairman – SAC	BARC
2	B.K. Namdeo	Director (R)	HPCL
3	Dr R. Kumar	Hon. Professor	IISc, Bangalore
4	Dr. B.D. Kulkarni	Distinguished Scientist	NCL, Pune
5	Dr Shantanu Roy	Professor	IIT, Delhi
6	B.K. Datta	Director (R)	BPCL
7	Dr Ajit V. Sapre	President - RTG	RIL
8	Dr. R. K. Malhotra	Ex-Director (R&D)	IOCL
9	Sanjiv Singh	Director (R)	IOCL
10	Ajay N. Deshpande	Director (T)	EIL
11	Dr. Devang V. Khakhar	Director	IIT, Bombay
12	Dr. M. Lakshmi Kantam	Director	IICT, Hyderabad
13	Gautam Roy	MD	CPCL
14	R. K. Kashyap	ED	GAIL
15	G. Sri Ganesh	ED	HPCL-Visakh
16	Sanjay Bhargava	Head, CRDC	BPCL
17	Dr. B. Bhargava	DG	ONGC Energy Centre
18	B.D. Ghosh	ED	CHT
19	Brijesh Kumar	DGM	IOC-R&D
20	Puneet Kishore	GM	ONGC Energy Centre
21	Dr. S. M. Nanoti	Scientist	IIP
22	Dr. B. R. Nautiyal	Scientist	IIP
23	B. M. Shukla	Head, RPBD	IIP
24	Dr. R.N. Maiti	DGM	EIL

	Name	Designation	Organisation
25	Ms. NehaBajpai	Senior Geologist	DGH
26	Dr. D. Parvatalu	DGM	ONGC Energy Centre
27	Dr. N. V. Choudary	GM	HPCL
28	Dr P.V.C. Rao	DGM	HPCL
29	Dr. A. Meenakshisundaram	DGM	CPCL-R&D
30	Dr. SenthilChinnasamy	CTO, Biotech Division	Aban Infra.
31	Dr. R.R. Sonde	Exe.VP	Thermax, Pune
32	Dr. R. Ravishankar	SM	HPCL- Corp. R&D
33	Pramod Kumar	SM	HPCL- Corp. R&D
34	Dr. RegiMathai	CRM	IOC-R&D
35	Umish Srivastava	CRM	IOC-R&D
36	Dr. D. T. Gokak	CM	BPCL-R&D
37	Dr. Alok Kumar Singh	Professor	RGIPT, Rae Bareli
38	Dr. Ing. V. S. Sistla	Professor	RGIPT, Rae Bareli
39	A.S. Pathak	Director	CHT
40			
41			