उच्च प्रौद्योगिकी केन्द्र
(पेट्रोलियम एवं प्राकृतिक गैस मंत्रालय)

सीएचटी

Centre for High Technology
(Ministry of Petroleum & Natural Gas, Govt. of India)

Date: 2nd June 2010

To,

1. Chairman, all members and permanent invitees of Scientific Advisory Committee on Hydrocarbons of MOP&NG (as per list attached)
2. Chief Executives of PSU Oil Companies – IOC, BPCL, HPCL, EIL, ONGC
3. MD – MRPL, NRL, CPCL
4. Executive Director, IOC-R&D
5. ED (R&D), GAIL

Dear Sir,

Sub: **Minutes of the 67th Meeting of the Scientific Advisory Committee (SAC) on Hydrocarbons of Ministry of Petroleum & Natural Gas**

Enclosed please find a copy of the Minutes of 67th Meeting of the Scientific Advisory Committee (SAC) on Hydrocarbons of Ministry of Petroleum & Natural Gas held on 22nd May 2010 at CPCL Chennai, for your kind information and necessary action.

Thanking you,

Yours faithfully,

02/06/2010

(B.D.Ghosh)
Executive Director

Encl. As above

PS: Ltr (SAC)

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5th Floor, Core-6, SCOPE Complex, Lodhi Road, New Delhi - 110 003
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Chairman, Members, Permanent Invitees and Special Invitees to the Scientific Advisory Committee

1	Shri M.B.Lal Member Technical (PNG), Appellate Tribunal for Electricity, Core-5, 6th Floor, SCOPE Complex, Lodhi Road, **New Delhi**-110 003	Chairman
2.	Dr.M.O.Garg, Director, Indian Institute of Petroleum, P.O.IIP, Mohkampur, **Dehradun**-248 005 (Uttrakhand)	Member
3.	Professor S.K.Biswas, Department of Mechanical Engineering, Indian Institute of Science, C.V.Raman Avenue, **Banglore**-560 012	Member
4.	Professor D.N.Saraf, University of Petroleum and Energy Studies, Village Bitholi, Via Prem Nagar, **Dehradun-248 007** (Uttrakhand)	Member
5.	Dr.S.Pushpavanam, Professor, Chemical Engineering Department, Indian Institute of Technology-Madras, P.O. IIT, **Chennai**-600 036	Member
6.	Shri B.N.Bankapur, Director (Refineries), Indian Oil Corporation Ltd., SCOPE Complex, 5th Floor, Core-2, Lodhi Road, **New Delhi-110 003**	Member
7.	Shri R.K.Singh, Director (Refineries), Bharat Petroleum Corporation Ltd., Bharat Bhawan, 4&5 Currimbhoy Road, Ballard Estate, P.B. No. 688, **Mumbai**-400 001	Member
8.	Shri M.K.Joshi, Director (Tech.), Engineers India Limited, El Bhawan, 1, Bhikaiji Cama Place, **New Delhi**-110 066	Member

9.	Dr. D.M.Kale, Director General, ONGC Energy Centre, 15th Floor, South Tower, Core-4, SCOPE Minar Complex, Luxmi Nagar, New Delhi-110 092	Member
10.	Shri Arun Kumar, Secretary, Oil Industry Development Board, Plot No. 2, Sector-73, Noida (U.P.) - 201 301	Member
11.	Shri. B. D. Ghosh, Executive Director, Centre for High Technology, SCOPE Complex, Lodhi Road, New Delhi-110 003	Member- Secretary
12.	Shri S.Sundareshan, Secretary, Ministry of Petroleum & Natural Gas, Shastri Bhawan, New Delhi-110 001	Permanent Invitee
13.	Shri L.N.Gupta, Joint Secretary (Refineries), Ministry Of Petroleum & Natural Gas, Shastri Bhawan, New Delhi-110 001	Permanent Invitee
14.	Shri Vivek Kumar, Director (R), Ministry Of Petroleum & Natural Gas, Shastri Bhawan, New Delhi-110 001	Permanent Invitee
15.	Shri K. Murali, Director (Refineries), Hindustan Petroleum Corporation Ltd., 17, Jamshedji Tata Road, P.O. Box No. 11041, Mumbai-400 020	Permanent Invitee
16.	Shri Anand Kumar, Director, Indian Oil Corporation Ltd., R&D Centre, Sector-13, Faridabad-121 007	Permanent Invitee
17.	Shri K.V.Seshadri, Executive Director (Mumbai Refinery and R&D), Bharat Petroleum Corporation Ltd., Mahul, Chembur, Mumbai-400 074	Permanent Invitee

18.	Shri G.Sri Ganesh, General Manager (R&D), Hindustan Petroleum Corporation Ltd., 17, Jamshedji Tata Road, P.O. Box No. 11041, **Mumbai**-400 020	Permanent Invitee
19.	Shri. Ajay Deshpande, General Manager (R&D) Engineers India Limited, Sector-16, **Gurgaon**-122 001	Permanent Invitee
20.	Dr.R.K.Malhotra, Executive Director, Indian Oil Corporation Ltd., R&D Centre, Sector-13, **Faridabad**-121 007	Special Invitee
21.	Shri K.Balachandra, Managing Director, Chennai Petroleum Corporation Ltd., 536, Anna Salai, Teynampet, **Chennai**-600 018	Special Invitee
22.	Shri M.R.Hingnikar, Executive Director (R&D), GAIL (India) Limited, PARC Building, Plot No. 24, Sector-16-A, **Noida** (U.P.) -201 301	Special Invitee

Date: 2nd June 2010

Minutes of the 67th Meeting of Scientific Advisory Committee (SAC) on Hydrocarbons of MOP&NG held on 22nd May 2010 at CPCL, 536-Anna Salai, Teynampet, Chennai:

67.1 Opening of the Session

67.1.1 Shri K.Balachandran, MD, CPCL welcomed Shri M.B.Lal, Chairman SAC; Shri L.N.Gupta, Joint Secretary (R), MOP&NG; SAC members, invitees, academia and scientists to the 67th SAC meeting.

67.1.2 In his welcome address, MD CPCL highlighted the contribution of SAC to the petroleum sector. He said that CPCL is a technology driven refinery. He also mentioned about the joint efforts of IIP, EIL and CPCL in development and implementation of NMP extraction technology. Other firsts by CPCL included the use of indigenous catalyst in reformer unit which has outlived its life expectancy, trial runs of IOC (R&D) developed DHDS catalyst capable of producing < 50 ppm 'S' diesel and implementation of Oxy-rich process in SRU in collaboration with EIL which has helped in increasing the capacity by as much as 22%.

67.1.3 Shri. B.D.Ghosh, Executive Director, CHT in his opening address welcomed Chairman SAC, JS (R), MD-CPCL, executives, scientists, academia and invitees and gave a brief on formation of SAC, terms of reference, objectives, contributions, achievements etc as well as enlarged focus areas. He informed the members that this is the 67th meeting of the SAC and the 7th meeting under the Chairmanship of Shri M.B.Lal. This is also the last meeting of the present SAC. He highlighted achievements under his Chairmanship, particularly reports of the Working Groups constituted on 'Energy', 'Project Monitoring' and 'Acceptance of Indigenous Technology' etc. He said that SAC has been successfully working as the Screening Committee for Hydrogen projects for funding under Hydrogen Corpus Fund (HCF). He also informed about the preparation of Compendium of projects under-taken through SAC for their commercialisation.

67.1.4 Shri M.B.Lal, Chairman SAC expressed his happiness in having a good representation from refineries. He also welcomed JS (R), Directors and senior executives of IOC, BPCL, HPCL, EIL, ONGC, Secretary OIDB and special invitees and thanked CPCL for hosting the 67th SAC meeting. In his opening remarks he informed that the present SAC was reconstituted in February 2007 and has had 7 meetings. He acknowledged the keen interest of JS (R) in SAC meetings, which has been a great morale booster. Shri Lal also acknowledged the strong support of MOP&NG, OIDB and the oil industry, and excellent engineering inputs provided by EIL. He also acknowledged the significant work done in different research institutions and national laboratories in the country. Further, he made the following observations and suggestions:

67.1.4.1 Lack of number of projects from industry is certainly a negative point. On the other hand, he cited the example of MNCs and even some National oil companies in several countries, who have done and are continuing to place tremendous emphasis on research work in their areas.

67.1.4.2 Chairman said that Synthetic Aviation Lubricants (SAL) project which is going to be completed by September 2010, will provide strategic, commercial and self-reliance advantage to India. To get real benefit from this project, IOC should concentrate on its commercialisation and IICT on technology patenting.

67.1.4.3 He stressed that hydrogen is a major challenge and needs to be addressed though concerted and synergised efforts of all the concerned agencies and organisations.

67.1.4.4 Chairman said that there are several areas where research and developmental activities can be intensified. He identified a few such areas but said the list was not exhaustive. The areas suggested by him are:

- Gas membranes for sweetening (developed at Hazira) - its scale-up from demo plant, and also for C_2 - C_3 recovery and solvent recovery.
- Energy efficiency improvement studies.
- Modelling and forecasting of fouling in preheat trains.
- Reducing cost of HDS for producing < 10 ppm 'S' product from high sulfur crude.
- Liquid phase hydro-desulphurisation studies
- Adsorption / chemi-sorption for sulphur and nitrogen removal from gasoline and diesel
- CFD has huge potential and advantages in design of internals and inlet devices etc which needs to be exploited. He suggested conducting 2-day workshop for identifying the projects to be handled through CFD
- Process Intensification, a new area to initiate
- High Performance catalyst for Hydro-processing

67.1.4.5 He suggested setting up a core group consisting of IOC (R&D), EIL (R&D), IOC, BPCL, HPCL and IIP to discuss and identify projects which could be taken up with CHT / OIDB for funding

67.1.4.6 He also proposed to expand the scope of SAC to cover the up-stream area as well. Some of the groups created for funding the projects under DGH or OIDB should also come under one platform i.e. under SAC.

67.1.4.7 ED (R&D) IOC informed that IOCL is in the process of evaluating a Technology proposal from University of Queensland for production of Hydrogen and carbon nano-tube. SAC has suggested that representatives from IOC & CHT should visit Australia and some other such universities to make an assessment of the technology as well as finalise terms of

Agreement including Intellectual Property. JS (R) supported the SAC suggestion and agreed to it.

67.1.4.8 Shri Lal also said that the recommendations of the Working Groups set up by SAC, which were discussed in previous meetings, should be implemented and CHT should coordinate the same.

There were some projects in which time extension was given in the past viz. "Development of Feed Nozzle System and Study of its Effect on Performance of FCC Riser Reactor: A Computational Fluid Dynamics Approach" by EIL. CHT should follow up on these and keep the SAC informed. CHT stated that due to very high cost of high speed camera and no response of vendors for test nozzles and solid heating system, the project on EIL request was foreclosed in May 2009.

67.1.4.9 He thanked all for providing him support and opportunity to contribute to SAC.

67.1.5 Shri. L.N. Gupta, JS (R) welcomed all and said that he is pleased to be here with the scientists and technocrats, without whom there would not be any progress. He touched upon areas of concern and said that the SAC forum is under-utilised due to less meetings / interactions and there aren't many projects. The existing projects are taking too much time for completion thereby resulting in less commercialisation. He advised that the core groups as suggested by Chairman SAC should meet more frequently to have more meaningful projects for SAC review and implementation.

JS (R) suggested setting up of 3 working groups – *one each for down-stream, mid-stream and up-stream oil sector.* The three groups so formed would have definite mandate to identify / recommend projects for long term / medium term. The constitution of three groups would be based on deliberations, mandate, as under and the activities of these Groups will be coordinated by CHT:

67.1.5.1 Down-stream Group comprising Director (R) of IOC, HPCL, BPCL, MD / Director CPCL, Director (T) EIL, Director IIP and Director (R&D) IOC.

67.1.5.2 Mid-stream Group comprising Director (BD) & Director (Proj.) of GAIL, Director (R&D) IOC, Director (P/L) IOC, Director (T) EIL, IOGPT Panvel of ONGC, IICT, CECRI Karaikudi.

67.1.5.3 The Up-stream group would have Director (Expl.) and Director (offshore) ONGC, Director (Expl.) OIL, Institute of Reservoir Studies, and ISM Dhanbad etc as its members.

67.1.5.4 He suggested keeping SAC meeting in Delhi at least once a year or half, preferably at MOP&NG, to enable Secretary P&NG to attend it.

67.1.5.5 It was pointed out that one of the biggest challenges would be fuel conservation, based on the fact that diesel and petrol consumption in the current year has risen by 9% and 15%

respectively. JS (R) concluded his remarks by appreciating the contribution of Shri. M.B.Lal as Chairman SAC.

67.1.5.6 JS (R) also advised IOC (R&D) to prepare database on PhD students in various institutes including sabbatical arrangements and circulate to all concerned. The database to include institutes, PhDs, research students, programme and numbers etc.

67.1.5.7 IOC (R&D) to circulate the guidelines on sabbatical arrangements to BPCL and HPCL.

67.1.5.8 Dr.R.P.Verma, consultant to HPCL will give a paper on sabbatical exchange programme of UNDP.

67.2 **Presentations:**

67.2.1 **Presentation on Synthetic Aviation Lubricants (SAL) Project by IOC (R&D):**

67.2.1.1 Dr.R.T.Mookken, GM informed that both SVS-11 and SVS-21 grades of synthetic lubricants base oils have been formulated and met all the stipulated specifications as well as low temperature rheological and high temperature thermal / oxidative stability of the formulation. Bearing tests for both the grades have been successfully completed by NAL. Engine test for SVS-11 oil has been completed by HAL and that for SVS-21 is in progress and expected to be competed shortly.

67.2.1.2 GTRE will shortly conduct test with SAL products on Kaveri marine engine.

67.2.1.3 SVS-11 sample has also been submitted to US Navair for Ryder test. CEMILAC approval for Airworthiness shall be sought after receiving Ryder test results.

67.2.1.4 It was informed that all the stated objectives of SAL projected are expected to be achieved by September 2010.

67.2.1.5 Chairman SAC suggested that IOC (M) and engine manufacturers should be associated for commercialisation of SAL products.

67.2.1.6 JS (R) enquired about the quantity required for military and civil use. He desired that the product be taken to the market immediately and advised to give demonstration to SAC after its completion in September 2010.

67.2.1.7 IICT stated that expenditure for the SAL project will be more than approved MOU target for various reasons and requested for additional funds. CHT / OIDB to look into.

67.2.2 **Presentation on completed project "Development of Polymer Modified Bituminous Binder" by IIP:**

67.2.2.1 The presentation on this collaborative project involving IIP, CRRI and CPCL was made by Shri. U.C.Gupta of IIP.

67.2.2.2 The scope of the project was preparation of Polymer Modified Bitumen (PMB) using polymeric materials and also included testing & monitoring of the test track on long term basis (typically 3 years). It was informed that the test track performance (on 1 Km section on Delhi-Yamunotri Marg, SH-57) has not shown any sign of distress under heavy traffic even after experiencing two rainy seasons.

67.2.2.3 The benefits of this technology includes enhanced lifespan of pavement surfacing, lower thickness requirement of 25 mm against typically 40 mm employed and reduced cost of pavement construction by up-to 30%. However, the feedstock is restricted to lube refineries only.

67.2.2.4 Director (R), IOC mentioned that though the technology and know-how is good for indigenous development, the application would be limited to lube based refineries only because of feed composition and would not be a viable option for non-lube refineries. He suggested that the technology should be made more generic so that it could be extended to even non-lube refineries such as IOC-M, IOC-P.

67.2.2.5 Chairman opined that the present project may be considered completed as the stated objectives have been met. He also opined that to start with, lube refineries can take benefit of this technology for commercial scale production.

67.2.2.6 JS (R) also agreed to help in increasing consumption of PMB by writing to Chief Secretaries of States for making 20% roads using PMB.

67.2.3 Presentation on On-going Project "Development of Coal to Liquid (CTL) technology" by EIL / BPCL:

67.2.3.1 Shri Ajay Deshpande, GM (R&D) EIL briefed about the status of the project which is being done along with BPCL (R&D).

67.2.3.2 He informed that gasifier procurement is a critical area. As per the SAC suggestion in its previous meeting, concerted efforts were made by both EIL and BPCL to arrive at feasible tie-up with L&T for getting gasifier. The proposal from L&T for possible frame-work of working together is still awaited. SAC suggested to sort out the issue in a months time or two.

67.2.3.3 It was observed during the deliberations that one disadvantage of this technology may perhaps be increase in the CO_2. This however, members felt could be diluted by use of CO_2 in fertiliser industry.

67.2.4 Presentation on New Project concept "Algal Bio-fuels" by ONGC Energy Centre:

67.2.4.1 Dr.D.M.Kale, DG, ONGC Energy Centre presented a detailed overview of this 2nd generation approach and invited the refining industries to collaborate in this challenging area.

67.2.4.2 Chairman said that algae is a wide area, if we can identify focus areas, it would be good.

67.2.4.3 Since IOC (R&D) is already working in this area and ONGC, HPCL and IICT are interested in this field, it was suggested to form a committee comprising of IOC (R&D), HPCL, ONGC and IICT, who would deliberate on various aspects and identify proposals in specific areas which could be taken up in the next SAC meeting.

67.2.5 **Presentation on *"Development of Large Scale Photo-catalytic process using Modular Reactors for Hydrogen production"* by IOC / IT-BHU:**

67.2.5.1 Prof. A.S.K.Sinha from IT-BHU made a presentation on the project proposal which could not be made during the previous SAC meeting.

67.2.5.2 As suggested by Chairman SAC during its 66th meeting, a committee comprising Dr.D.M.Kale, DG-ONGC Energy Centre, Prof. S. Pushpavanam, IIT-Madras and Shri B.D.Ghosh, ED, CHT visited IT-BHU on 29-30th January 2010 for comprehensive review of the project proposal and has recommended financial support for the proposal.

67.2.5.3 It was noted during the presentation that the process will be feasible technically with ~800 MHz wave-length with maximum efficiency of the order of 20-22%. As band width is important for the catalyst, the catalyst development is targeted to meet this requirement.

67.2.5.4 It was observed during the preliminary experimental studies conducted so far, that though 1 m^2 area reactor was theoretically expected to produce 25 litres of H_2 in a day, actual production was limited to only 6 litres. One of the reasons for this was thought to be absence of multiple reflecting devices which are known to be effective.

67.2.5.5 It was noted that since the surface area requirement for capturing the sun radiations is quite large, commercial viability of the project could be a concern.

67.2.5.6 Chairman observed that the project at this stage is purely a basic research project for knowledge generation only.

67.2.5.7 SAC, however, agreed to fund the project at an estimated cost of Rs.70.62 Lakhs (including foreign exchange component of US $ 60,000) considering revised overhead charges @ 10% and completion schedule of 36 months.

67.2.6 **Presentation on "Hybrid-sorption Enhanced Steam reforming for the Production of Hydrogen from Natural Gas" by BPCL:**

67.2.6.1 The revised proposal summary of the project was presented by Dr. N.V.Choudary, Chief Manager (R&D).

67.2.6.2 The subject Hydrogen project proposal for funding under Hydrogen Corpus Fund (HCF) was earlier reviewed by the Scientific Advisory Committee in its 66th Meeting held on 30th November 2009 at HPCL, Mumbai.

67.2.6.3 The initial cost of the project was Rs.800 Lakh with completion schedule of 4 years.

67.2.6.4 SAC during the above meeting had suggested splitting the project into two phases. Phase-1 comprising of adsorbent development and evaluation as well as conceptual design work to be completed in 2 years and Phase-2 involving detailed engineering design & Pilot plant demonstration for 1 Nm^3/h hydrogen production in the balance 2 years.

67.2.6.5 The revised proposal aims to complete the adsorbent development studies and its integration with the catalyst within a time frame of 3 years. The project cost would be Rs.415 Lakh for this Phase. In the subsequent phase, detailed engineering design and demonstration of pilot plant for 1-2 Nm^3/h hydrogen was proposed by BPCL.

67.2.6.6 Dr.M.O.Garg suggested for a honeycomb structure for catalyst, to which BPCL agreed to study during the development stage.

67.2.6.7 SAC approved the project proposal at an estimated cost of Rs.415 Lakh with a completion schedule of 36 months and suggested that revamps of the existing reformers should also be looked into considering the commercial potential for the project.

67.2.7 **Presentation on "Design and Construction of Metal-Organic Framework materials for Storage of Hydrogen" by GITAM University:**

67.2.7.1 The project proposal was presented by Dr. Sarat Chandra Babu of GITAM University with HPCL as industry partner. The project cost was Rs.77.95 Lakhs with a time frame of 2 years.

67.2.7.2 The Hydrogen project proposal for funding under HCF was also reviewed by SAC in its 66th meeting held at HPCL, Mumbai.

67.2.7.3 In this revised proposal patenting issues for Metal Organic Frameworks (MOFs) to be developed as a part of the project and modelling aspects have been included.

67.2.7.4 Dr.M.O.Garg of IIP offered to provide certain lab facilities / instruments which may be required for the project to meet the objectives and design and characterisation of MOFs. Shri K.Murali, Director (R) HPCL welcoming the IIP proposal said that they would look into it on specific need basis through a separate existing arrangement which they have with IIP.

67.2.7.5 SAC approved the project proposal at an estimated cost of Rs.77.95 Lakhs with completion schedule of 24 months. Chairman, however, suggested constituting a sub-committee for reviewing and monitoring of hydrogen projects so as to avoid duplication of efforts.

67.2.8 **Presentation on "An Integrated approach for Bio-hydrogen production through combined dark and photo fermentative process" by TERI:**

67.2.8.1 Dr. Banwari Lal from TERI presented the highlights of the joint proposal with HPCL.

67.2.8.2 The subject Hydrogen project proposal for funding under Hydrogen Corpus Fund (HCF) was also reviewed by the Scientific Advisory Committee in its 66th Meeting held on 30th November 2009 at HPCL, Mumbai.

67.2.8.3 As suggested by the Chairman SAC during the previous SAC Meeting, HPCL interacted with TERI to work-out the Hydrogen production cost for the proposed route. The project cost has also been re-visited.

67.2.8.4 The cost of bio-hydrogen production through proposed route for various feed stocks, as worked out by TERI, varied from Rs.65 to Rs.137.50 / kg.

67.2.8.5 The project cost has been revised from Rs.164 Lakhs to Rs.141.63 Lakhs with a completion schedule of 2 years.

67.2.8.6 SAC observed that further equipments requirement for absorption of CO_2 would be an added cost to the overall process and hence commercialisation would not be easy.

67.2.8.7 SAC agreed for funding the proposal at an estimated cost of Rs.141.63 Lakhs with a completion schedule of 24 months under HCF. He opined that this project be primarily considered as a basic research project, since there may be several challenges to commercialisation which would need to be addressed later.

67.2.9 **Presentation by GAIL on Hydrogen Projects:**

67.2.9.1 Shri S.Sen, GM (R&D) GAIL presented the overview of hydrogen and hydrogen related project activities initiated by GAIL (R&D). GAIL is exploring for bio-hydrogen production from land fill at Gazipur (Delhi).

67.2.9.2 Chairman requested GAIL to submit Hydrogen project proposals for funding under HCF after having a look at various hydrogen project proposals approved so far.

67.2.9.3 Since some of the areas where GAIL is proposing to work, have already been initiated by other institutes / industries, GAIL was requested to interact with them viz. BPCL, IOC (R&D) and ONGC. Shri S.Sen agreed to revert on this.

67.2.10 Presentation on New Project Proposal "Studies on Suitability of Indian Petroleum Refinery Feed Stocks for Needle Coke through Mesophsae formation" by IIP, Dehradun:

67.2.10.1 The presentation on the project proposal was given by Mr. Manoj Kumar.

67.2.10.2 Needle Coke is one of the premium quality coke due to its low CTE for making electrodes for Steel industry. But due to non-availability of appropriate feed stock, there is insignificant commercial production and most of the demand is met through imports.

67.2.10.3 The proposal from IIP focused on suitability as well as preparation / identification / analysis of refinery feed stock suitable for needle coke production through Mesophase formation in a systematic framework. This would help in identifying and modifying the feed stock to make them more suitable (CTE < 1) for Needle Coke production.

67.2.10.4 The projected cost of the proposal was Rs.75 Lakhs with a time schedule of 18 months.

67.2.10.5 Dr.R.K.Malhotra, ED, IOC (R&D), informed that needle coke technology is already well developed by IOC and has US patent on this.

67.2.10.6 Considering the importance of Carbon fibre and feasibility of its production in refinery, it was suggested by Chairman that this can be added to the objective to have more value addition to the proposal. For this additionally spinneret, calcination furnace and stabilisation equipments would be required. IIP shall re-visit the proposal and revert.

67.3 **Concluding Remarks:**

67.3.1 Chairman in his concluding remarks appreciated the services of Shri M.K.Joshi, Director (T), EIL and Shri Anand Kumar, Director (R&D), IOC who will be superannuating shortly, for their contribution to the oil industry in general and SAC in particular.

67.3.2 Shri B.D.Ghosh, ED (CHT), thanked Chairman and other participants for a very fruitful meeting. He thanked Chairman for steering the SAC for the last 3 years as well as for his support, advice and contribution for smooth functioning of SAC. He also thanked CPCL management, Shri K.Balachandran and his team for hosting the SAC meeting and excellent hospitality.

67.3.3 List of participants is enclosed as Annexure-1.

Annexure-I

Participants to the 67th Meeting of the Scientific Advisory Committee (SAC) on Hydrocarbons of MOP&NG held on 22nd May 2010 at CPCL, Chennai

S. No.	Organisation	Name, S/Shri	Designation
1.	SAC	M.B.Lal	Chairman
2.	MOPN&G	L.N. Gupta, JS (R)	Permanent Invitee
3.	IOC	B.N. Bankapur, Director (Refineries)	Member
4.	OIDB	Arun Kumar, Secretary	Member
5.	BPCL	K.V. Seshadri, ED (MR / R&D)	Permanent Invitee
6.	BPCL (R&D)	Dr. N.V. Choudary, CM	Member
7.	EIL	M.K. Joshi, Director (Technical)	Member
8.	EIL (R&D)	Ajay Deshpande GM (R&D)	Permanent Invitee
9.	HPCL	K. Murali, Director (Refineries)	Permanent Invitee
10.	- do -	G. Sri Ganesh, GM (R&D)	Permanent Invitee
11.	- do -	Dr. R.P.Verma, Consultant	---
12.	IIP, Dehradun	Dr.M.O. Garg, Director	Member
13.	- do -	U.C. Agrawal, Scientist 'G'	---
14.	- do -	U.C. Gupta, Scientist 'F'	---
15.	- do -	Manoj Srivastava	---
16.	- do -	Manoj Kumar	---
17.	IOC (R&D)	Dr. R.K. Malhotra, ED	Permanent Invitee
18.	- do -	Dr.R.T.Mookken, GM	---
19.	ONGC	Dr. D.M. Kale	Member
20.	BHU	Prof. A.S.K.Sinha	---
21.	CPCL	K. Balachandran, MD	Special Invitee
22.	- do -	S. Chandrasekaran, Director (T)	---
23.	CRRI	Dr. Sangita, Scientist 'F'	---
24.	GITAM Univ.	Prof. N. Saratchandra Babu	---
25.	GAIL	Dr. S.Sen, GM (R&D)	Special Invitee
26.	IICT	Dr. Vijay Kale	---
27.	TERI	Dr. Banwari Lal	---
28.	CHT	Shri B.D.Ghosh, ED	Member Secretary
29.	-do-	A.K.Agarwal, Director	---
30.	-do-	A.S.Pathak, Addl. Director	---