→ Director

उच्च प्रौद्योगिकी केन्द्र
(पेट्रोलियम एवं प्राकृतिक गैस मंत्रालय)

सीएचटी

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

CHT/AKA/SAC

Date: 16th October 2008

To,

1. All Members and permanent invitees of the Scientific Advisory Committee on Hydrocarbons of Ministry of Petroleum & Natural Gas
2. Special Invitees: Additional Secretary, MOP&NG; AS&FA, MOP&NG
3. Chief Executives of PSU Oil Companies – IOC, BPCL, HPCL, EIL, GAIL, ONGC
4. MD – BRPL, MRPL, NRL, CPCL
5. ED, IOC (R&D)

Dear Sir,

Sub: **Minutes of the 64th Meeting of the Scientific Advisory Committee on Hydrocarbons of MOP&NG**

Enclosed please find a copy of the Minutes of the 64th Meeting of the Scientific Advisory Committee on Hydrocarbons of Ministry of Petroleum & Natural Gas held on 18th September 2008 at CSIR, Vigyan Kendra, New Delhi, for your kind information and necessary action.

Thanking you,

Yours faithfully,

(Dr.K.S.Balaraman)
Executive Director /
Member Secretary, SAC

Encl. As above.

- PS- SAC file

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CHT/AKA

Date: 30th September 2008

Minutes of the 64th Meeting of Scientific Advisory Committee (SAC) on Hydrocarbons of MOP&NG held on 18th September 2008 (Thursday) at CSIR Vigyan Kendra, New Delhi:

64.1 **INAUGURAL SESSION**

64.1.1 Shri M.B.Lal, Chairman SAC welcomed the Secretary P&NG, Shri R.S.Pandey by giving him a bouquet of flower. Dr.K.S.Balaraman, ED, CHT presented the bouquet to Shri M.B.Lal, Chairman SAC.

64.1.2 Dr.K.S.Balaraman, ED, CHT welcomed the Secretary, P&NG, Shri R.S.Pandey; Chairman SAC, Shri M.B.Lal; other SAC members, officials from MOP&NG, Executives from Oil companies, Scientists from CSIR and national laboratories, academia and CHT officials to the 64th SAC meeting. He also gave a brief of the Agenda items for today's meeting.

64.1.3 Shri Mahesh B. Lal, Chairman SAC again welcomed Secretary, P&NG; senior officials from MOP&NG and OIDB, distinguished members of the SAC, Senior Executives of Oil companies and special invitees. He thanked Secretary P&NG for taking out time from his busy schedule to be present in the SAC meeting and address all of us. He said that nine SAC recommended R&D projects are under implementation at different laboratories. Development of technologies for Synthetic Aviation Lubricants is one of the collaborative research project, which on completion will provide strategic, commercial and self-reliance advantage to India as regard to synthetic lubricants.

He said that though technologies in refining and related areas are easily available, but in certain key strategic areas such as coal-to-liquid and natural gas liquefaction, a significant price tag is attached to it. Some of the other interesting projects which could be considered are nano-technology based catalyst development, second generation bio-fuel such as lingo cellulosic process for ethanol and ethanol from syngas, Gas to liquid technology, residue up-gradation and process intensification studies for increasing efficiency of processes and reducing capital cost. In today's age of globalised operations, technological capabilities directly translate into strategic advantages. He strongly stressed that Indian PSU oil companies should demonstrate that R&D is a top management priority and identify research projects of strategic importance, which can be taken up on collaborative basis.

On trained manpower attrition from R&Ds, he said that PSU oil companies might need to look at talent retention and motivational strategies for R&D personnel in their organisations.

64.2 **PRESENTATIONS DURING INAUGURAL SESSION:**

64.2.1 **"Scientific Advisory Committee's Role & Contributions" – CHT:**

64.2.1.1 Dr.K.S.Balaraman, ED, CHT presented the Scientific Advisory Committee's role and contributions to the august gathering. He said that SAC has played a key role in establishing R&D Centres at EIL, CPCL and the then KRL, catalyst development and testing facilities at IPCL, hydro-processing pilot plant at IOC (R&D) Centre etc. Due to paucity of time, he only briefed about the development and commercialisation of various SAC recommended technologies and their implementation in petroleum and petrochemical sector.

64.2.1.2 He said that SAC has contributed in creating an environment of synergy for technical advancement and improvement through linkages and collaboration between academia and industry.

64.2.1.3 He also recalled the nostalgia of participating in the 1st meeting of the Scientific Advisory Committee after its formation by the erstwhile Dept. of Petroleum way back in 1981.

64.2.2 **"Synthetic Aviation Lubricants" - IICT, Hyderabad:**

64.2.2.1 Dr.Vijay Kale, Deputy Director, IICT, Hyderabad presented the ongoing SAC recommended R&D project on "Synthetic Aviation Lubricants project". He said that it is a multi institutional project and touched upon the strategic importance of the project, the collaborative partners and their role, project cost and brief status of the project.

64.2.2.2 The estimated cost of the project is Rs.1732.28 Lakhs, which is being shared on 50:50 basis by CHT / OIDB on one hand and participating organisations on the other. On a query from Secretary, P&NG, he said that the project was to be completed in 48 months from the zero date i.e. December 2007, but now it is expected to be completed by June 2009 for various reasons.

64.2.2.3 He mentioned that Synthetic Aviation Lubricant was produced from bench scale and then from the up-scaled pilot plant.

64.2.2.4 The samples were initially tested at IICT followed by formulation and testing by IOC (R&D) Centre. These samples were found meeting all the laid down specifications for the two grades of SAL products.

64.2.2.5 The SAL samples are also being tested at NAL for bearing tests followed by engine testing at HAL and GTRE. Centre for Military Airworthiness and Certification (CEMILAC) is the certifying agency for the developed products. He also mentioned that Ryder test would also be conducted on SAL products in USA.

64.2.3 **"Hydrogen as an alternative fuel" - IOC (R&D):**

64.2.3.1 Dr.R.K.Malhotra, ED, IOC (R&D) presented on "Hydrogen as an alternative fuel". He briefed about the initiatives taken by the Planning Commission for use of hydrogen as a fuel, preparation of

roadmap for the country by National Hydrogen Energy Board (NHEB) and creation of Hydrogen Corpus Fund (HCF) by MOP&NG.

64.2.3.2 Hydrogen roadmap considers running of one million vehicles on hydrogen based IC engines and fuel cells by 2020 that will require about 7000 tonnes of hydrogen per day.

64.2.3.3 Hydrogen can be produced through various routes. But major challenges are production and storage costs; weight, volume and durability of storage system, life cycle and efficiency, building a national hydrogen transportation and delivery system, codes and standards for safety and public acceptance. These challenges are to be met.

64.2.3.4 Hydrogen can be used as combustion fuel directly in IC engines in neat form or in admixture with CNG and LPG or as a fuel cell in hybrid vehicles etc.

64.2.3.5 Hydrogen being a lean burning fuel, results in increased thermal efficiency and reduced emissions. Increased NOx emissions of Delhi after CNG implementation can be mitigated by supplementing CNG with hydrogen. Existing CNG infrastructure can be utilised for using hydrogen. IOC (R&D) is already working on H_2-CNG demonstration project approved by MOP&NG and MNRE.

64.2.3.6 Presently, cost of fuel cell vehicles is very high and has to be brought down. Oil companies are also tying up with auto companies in fuel cell development.

64.2.3.7 Brief on Hydrogen Corpus Fund (HCF) creation, funding by oil companies and OIDB, maintenance of the fund by OIDB and methodology being followed in approval of hydrogen projects for funding from HCF was also given.

64.2.3.8 He also briefed about the two approved hydrogen projects of IOC (R&D) and another two projects of IOC (R&D) and ONGC under approval by the Steering Committee on hydrogen headed by Secretary, P&NG himself.

It was mentioned that IOC (R&D) has set up India's first H_2-CNG dispensing station at their Centre at Faridabad in October 2005.

64.2.3.9 On a query from Secretary P&NG, it was clarified that tests with different H_2-CNG blends were conducted on 5-6 3-wheelers and 18% H_2-CNG blends were selected for further optimisation.

64.2.3.10 IOC (R&D) requested Secretary, P&NG that hydrogen be declared as an auto fuel by MOP&NG. Secretary, P&NG desired to know as to why oil companies are investing on hydrogen if it has not been declared as an auto fuel. ED, IOC (R&D) clarified that up-to 20% hydrogen in admixture with CNG can be used as per the guidelines of MOSRT&H.

64.2.3.11 It was mentioned that IOC (R&D) joined the Sustainable Transport Energy Pathways Programme (STEPS) of Institute of Transportation Studies, University of California, Davis, USA for 2007-10. IOC (R&D)

is also the lead organiser of World Hydrogen Technologies Convention (WHTC) in August 2009 in New Delhi.

64.2.3.12 Secretary, P&NG suggested convening a meeting with MNRE on the subject issue. Secretary also desired that roadmap on hydrogen with timeframe be given to him. He wanted to know the technological and administrative issues that need to be tackled and the groups of scientists working on hydrogen projects.

64.2.3.13 Shri B.N.Bankapur, Director (R), IOC said that today the challenge is to produce cheaper hydrogen.

64.2.4 **"Commercialisation of SAC sponsored Project Technologies" - EIL-R&D:**

64.2.4.1 Dr.S.Banik, GM (R&D) said that SAC sponsored projects undertaken at EIL can be classified in four categories viz. demonstration of already developed technologies, development of new technologies, enhancement of existing competency and creation of new facilities. So far, 19 projects have been taken up by EIL, of which 2 are in progress.

64.2.4.2 SAC recommended project technologies that have already been commercialised are:

i) Sheet metal structured packing

ii) Flash zone entry device

iii) TBR – hydrodynamics studies

iv) CFD studies

v) Furnace efficiency studies.

The technologies that have high potential for commercialisation are super critical solvent recovery, SO_2 regeneration process and cooling tower facilities.

64.2.4.3 Acceptance of indigenously developed technologies by the refineries is still an issue.

64.2.5 **Concluding Remarks by Secretary, P&NG:**

64.2.5.1 Shri R.S.Pandey, IAS, Secretary P&NG commended the excellent role and the work of the SAC.

He said that about 80% of the crude oil is being imported and we are dependent on the outside world. Oil sector is an important sector and has lot of scope for cost effective research that should be done on war footing. The research may be in the field of making the process more energy efficient and to meet the genuine demands of consumer and the industry.

64.2.5.2 Secretary said that as per the information available with him, we in India are 30% less efficient in the Transport sector and consumes 2.88 times higher amount of energy in the Industrial sector. If we are able to improve energy efficiency even by 10%, we will not only

be saving 5-6 MMTPA of oil, but it will have an impact to bring down the crude oil price.

He opined that CHT could address the technology issues by identifying the areas for energy efficiency improvement. These are to be coupled with fiscal measures to make the operation more energy efficient.

64.2.5.3 Referring to the coal-to-liquid, he said that CTL technology is readily available with SASOL and others. He asked when technology is readily available off the shelf, is there any need to do the R&D in that area. It was explained that though technology may be available with foreign companies, due to relatively fewer number of such companies who have know-how in this area, it may be strategically advantageous to develop such know-how, especially around the different qualities of Indian coal from the different regions.

64.2.5.4 He said that non-availability of ethanol even for 5% blending in petrol is an administrative issue. In-spite of this, 10% ethanol blending was to start from 1st October 2008. Technically whether we can say that our vehicles cannot take 10% ethanol blended petrol without engine modification, SAC to provide the answer.

64.2.5.5 As far as acceptance of R&D by the industry is concerned, he suggested associating the user industry with R&D Centres / laboratories. He said that:

1. Researches are done by humans in the laboratories. We have to identify the people and the institutes.
2. Financial implications are to be identified including incentivisation of the researchers and making them accountable.

He expected a list of contributions from the Scientific Advisory Committee (SAC).

64.2.6 **Chairman, SAC Shri M.B.Lal** said that roadmap for hydrogen projects including pert network, overall scheme, concrete plan, time schedule shall be made and submitted to MOP&NG.

He opined that energy efficiency improvement should be looked not only in refineries but outside also such as in Transport and other sectors. Manpower issue is also an important area and needs to be addressed.

64.2.7 **Shri A.K.Agarwal,** Additional Director, CHT proposed the vote of thanks.

64.2.8 **Brainstorming session:** During the brain storming session on future R&D strategies, following emerged:

64.2.8.1 **Shri K.K.Acharya**, MD CPCL said that catalyst development takes 3-3 ½ years, but by the time it is indigenously developed, new improved catalyst is available from the foreign vendors. Such time

lags are to be addressed if we really want to achieve something worthwhile.

64.2.8.2 **Shri Anand Kumar**, Director IOC (R&D) suggested that projects should be well defined at the project stage. It should include responsibility for development, scale up and commercialisation and the manpower should also be identified and dedicated.

He said that refineries have lot of scope for energy improvement that can be achieved by replacement of old furnaces instead of retrofitting, new efficient motors in place of old ones and improvements in heat exchangers etc.

64.2.8.3 **Shri R.K.Singh**, Director (R) BPCL suggested:

i) Increasing frequency of meetings and review of projects by SAC

ii) Rigorous monitoring of projects in hand by clearly identifying the responsibility and time schedule

iii) Projects on hydrogen production should be taken up.

64.2.8.4 **Prof. S.K.Biswas**, IISC Bangalore said that No. of PhD students at IIT and IIIMs etc are coming down drastically. There is a need to give incentive for research work; else there would not be any one for the research work after 10 years.

64.2.8.5 **Chairman SAC** remarked that Public sector R&Ds need to do introspection, as it is not the money alone for which people are leaving PSU R&Ds.

64.2.8.6 **Prof. D.N.Saraf** said that roadmap preparation for developmental work is difficult, as different ways are there to carry the research.

64.2.8.7 **Dr.S.Banik**, GM (R&D) EIL suggested increasing the superannuating age of R&D personnel to 65 years for retaining them.

64.2.8.8 **Shri Govind Ram**, GM (T) IOC (R), HO suggested developing facilities for catalyst regeneration and recycling. Dr.K.K.Pant, IIT Delhi intervened and said that RIL has shown interest in development of FCC spent catalyst regeneration facility.

64.2.8.9 **Shri G.Sri Ganesh**, GM (R&D), HPCL said that R&D is basically to understand the basics of technology, which will help companies in evaluating technologies for implementation in their Refineries.

64.2.8.10 **Dr.R.P.Verma**, consultant to HPCL was of the opinion that reinventing the wheel is necessary, because its shape and efficiency goes on improving. We should develop technologies the way China and Japan have developed.

64.2.8.11 **Chairman SAC** said that we need to put more efforts and give a sustained focus to R&D.

64.2.8.12 **Prof. S.Pushpavanam**, IIT Madras said that core jobs of the company are performed by technocrats. Involvement of academia will definitely make the difference.

64.2.8.13 As some of the oil companies have so far not contributed to the Hydrogen Corpus Fund (HCF), OIDB requested them to contribute the same.

64.2.8.14 **Chairman SAC** reiterated that Director (Refineries) of oil companies are either members or permanent invitees to the SAC. Their presence is a must in the SAC meeting for its effective functioning.

64.2.8.15 After brainstorming and deliberations, Chairman SAC constituted the following seven working groups:

S. No.	Working Group	Organisations	Name, S/Shri
1.	Energy Efficiency (Refineries)	▪ EIL ▪ IOC ▪ BPCL ▪ HPCL ▪ IIP ▪ CHT	▪ Dr.S.Banik ▪ Govind Ram ▪ P.Padmanabhan ▪ Narsimham ▪ Dr.S.M.Nanoti ▪ G.K.Dey
2.	Energy Efficiency (Automobiles)	▪ IOC ▪ SIAM ▪ ARAI ▪ IISC ▪ IIP ▪ CHT	▪ Dr.R.K.Malhotra ▪ K.K.Gandhi ▪ M.K.Chaudhari ▪ S.K.Biswas ▪ S.K.Singhal ▪ A.K.Agarwal
3.	Project Monitoring	▪ OIDB ▪ CHT ▪ EIL ▪ IIP	▪ Arun Kumar ▪ Dr.K.S.Balaraman ▪ M.K.Joshi ▪ Dr.M.O.Garg
4.	HR issues for getting more PhD students	▪ IOC ▪ HPCL ▪ BPCL ▪ IISC ▪ IIT Madras ▪ CHT	▪ Anand Kumar ▪ K.Murali ▪ R.K.Singh ▪ S.K.Biswas ▪ S.Pushpavanam ▪ B.D.Ghosh
5.	Hydrogen projects	▪ IOC ▪ HPCL ▪ BPCL ▪ ONGC ▪ OIDB ▪ CHT	▪ Dr.R.K.Malhotra ▪ Dr.R.P.Verma / G.Sri Ganesh ▪ Dr.M.A.Siddiqui ▪ Dr.D.M.Kale / Mrs Thomas ▪ Arun Kumar ▪ A.K.Agarwal
6.	Acceptance of technology	▪ IOC ▪ IOC (R&D) ▪ HPCL ▪ BPCL ▪ IIP ▪ EIL	▪ B.N.Bankapur ▪ Anand Kumar ▪ K.Murali ▪ R.K.Singh ▪ Dr.M.O.Garg ▪ M.K.Joshi / Dr.S.Banik

7.	Environment	▪ IOC ▪ HPCL ▪ EIL	▪ Govind Ram ▪ ▪

64.2.8.16 Chairman SAC desired that an approach paper on R&D strategies needs to be developed by the above working groups, which will be discussed in the next SAC meeting before submission to MOP&NG by December 2008.

64.2.8.17 Shri G.Sri Ganesh, GM (R&D) HPCL offered that HPCL could join with EIL for work on process intensification.

64.2.8.18 Process and chemicals for online cleaning of furnaces can be developed.

64.2.8.19 For the development of metal traps for use in hydrocracker and hydro-treaters, IIP can help.

64.2.8.20 **Prof.S.K.Biswas** suggested that project on emission reduction from automobile engines can be undertaken. IOC (R&D) agreed to put up a paper on emission reduction from auto engines.

64.2.8.21 To the suggestion of Prof.S.K.Biswas, it was agreed that working groups can co-opt the members.

64.2.9 EIL informed that they will be giving about Rs.6-7 Lakhs to CHT as royalty towards the technologies sponsored by SAC and commercialised by EIL.

64.2.10 **Hydrogen Production from Natural Gas (Methane) by Catalytic Decomposition by HPCL and IIT-Delhi:**

64.2.10.1 **Professor K.K.Pant**, IIT Delhi presented the subject project proposal and said that catalytic decomposition of natural gas is basically dissociation of CH_4 to C and hydrogen. In this process, pure nano carbon fibre and hydrogen is produced.

64.2.10.2 Prof. Pant replied to various queries of the members: As per the available literature, 90% conversion is possible with no emission of CO and CO_2. There will be only ppm level CO_2 and some methane in hydrogen. There are about 20 published papers for hydrogen production through catalytic decomposition of methane. Nickel modified catalyst supported on silica will be used for this process. In this process only 10% of the energy is required compared to other processes for hydrogen production. It was mentioned that market price for carbon fibre is US $ 300 / MT.

64.2.10.3 The Scientific Advisory Committee approved the HPCL project proposal on "Hydrogen Production from Natural Gas (Methane) by Catalytic Decomposition" at a cost of Rs.51 Lakhs with a completion schedule of 36 months. The cost of the project shall be reimbursed from Hydrogen Corpus Fund (HCF). Prof. Pant, however, agreed to complete the project in 30 months.

64.2.10.4 Accordingly, a note will be sent to the Steering Committee on Hydrogen headed by Secretary, P&NG for sanctioning Rs.51.0 Lakhs for funding from HCF.

64.2.11 **It was decided by SAC members that the next SAC meeting would tentatively be held on 21-22nd November 2008 at NRL, Numaligarh.**

Annexure

Participants to the 64th Meeting of the Scientific Advisory Committee on Hydrocarbons of MOP&NG held on 18th September 2008 at CSIR Vigyan Kendra, New Delhi

S. No.	Organisation	Name, S/Shri	Designation
1.	SAC	M.B.Lal	Chairman
2.	IIP, Dehradun	Dr.M.O.Garg, Director	Member
3.	-do-	Dr.S.M.Nanoti	---
4.	-do-	Dr.S.N.Sharma	---
5.	IISC, Bangalore	Prof. S.K.Biswas	Member
6.	UPES, Dehradun	Prof. D.N.Saraf	Member
7.	IIT Madras	Prof. S.Pushpavanam	Member
8.	IOC	B.N.Bankapur, Director (R)	Member
9.	IOC	Govind Ram, GM (T)	---
10.	BPCL	R.K.Singh, Director (R)	Member
11.	EIL	M.K.Joshi, Director (T)	Member
12.	ONGC	Dr.D.M.Kale, DG (OEC)	Member
13.	OIDB	Arun Kumar, Secretary	Member
14.	-do-	R.K.Kaul	---
15.	-do-	T.S.Balasubramanian, FA&CAO	---
16.	CHT	Dr.K.S.Balaraman, ED	Member Secretary
17.	MOP&NG	R.S.Pandey, Secretary	Permanent Invitee
18.	MOP&NG	P.Karupasamy, Director	---
19.	MOP&NG	D.Pathak, Director (R&A)	
20.	IOC (R&D)	Anand Kumar, Director (R&D)	Permanent Invitee
21.	-do-	Dr.R.K.Malhotra, ED (R&D)	Special Invitee
22.	-do-	R.T.Mooken, DGM (R&D)	---
23.	-do-	N.K.Pal, Deputy Manager	---
24.	BPCL (R&D)	Dr.M.A.Siddiqui, ED (R&D)	Permanent Invitee
25.	-do-	N.V.Choudary, CM	---
26.	-do-	Dr.V.Ravi Kumar, SM	---

27.	HPCL	G.Sri Ganesh, GM (R&D)	---
28.	-do-	Dr. R.P.Verma, Consultant	---
29.	IIT Delhi	Dr.K.K.Pant	---
30.	EIL (R&D)	Dr.S.Banik, GM (R&D)	Permanent Invitee
31.	-do-	Dr.B.N.Lahiri	---
32.	IICT	Dr. Vijay Kale, Scientist 'F'	---
33.	-do-	Dr.P.VijayaLakshmi, Scientist 'F'	---
34.	CPCL	K.K.Acharya, MD	Special Invitee
35.	CHT	B.D.Ghosh, Director	---
36.	-do-	S.K.Shukla, AD	---
37.	-do-	A.K.Agarwal, AD	---
38.	-do-	G.K.Dey, AD	---
39.	-do-	Rakesh Narula, JD	---
40.	-do-	S.C.Das, JD	---
41.	-do-	Sunil Chaudhary, JD	---
42.	-do-	S.Bose, JD (Admn.)	---
43.	-do-	V.K.Suri, DD (Fin.)	---
44.	-do-	Rakesh Veer, DD (Fin.)	---
45.	-do-	Narendra Puranik, CH SAC Office	---

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13. Shri L.N.Gupta,
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14. Shri D.Pathak,
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