उच्च प्रौद्योगिकी केन्द्र
(पेट्रोलियम एवं प्राकृतिक गैस मंत्रालय)

सी एच टी

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

उ.प्रौ./एस.ए.सी./ 2५८।६
CHT/SAC/

अप्रैल 15, 2002
April 15, 2002

सेवा में,
To,

1. पेट्रोलियम और प्राकृतिक गैस मंत्रालय हाइड्रोकार्बन्स की वैज्ञानिक सलाहकार समिति के सभी सदस्यों को
   All Members of the Scientific Advisory Committee on Hydrocarbons of the Ministry of Petroleum and Natural Gas.
2. अपर सचिव/संयुक्त सचिव (वी)/संयुक्त सचिव (एस)/संयुक्त सचिव (एम)/संयुक्त सचिव एवं वित्त सलाहकार / सलाहकार (ई)/ओ.एस.डी. (रिफाइनरी), पेट्रोलियम और प्राकृतिक गैस मंत्रालय
   AS / JS (V) / JS (S) / JS(M) / JS&FA/Advisor (E) / Advisor (R) - MOP&NG.
3. सचिव, तेल उद्योग विकास बोर्ड
   Secretary, Oil Industry Development Board
4. सभी सार्वजनिक क्षेत्र की तेल कंपनियों के मुख्य कार्यकारियों को
   Chief Executives of all PSU Oil Companies.
5. निदेशक (रिफाइनरीज / परिचालन) - आई.ओ.सी.एल., बी.पी.सी.एल., एच.पी.सी.एल., सी.पी.सी.एल., के.आर.एल., बी.आर.पी.एल., एन.आर.एल.
   Director (Refineries / Operations) - IOCL, BPCL, HPCL, CPCL, KRL, BRPL, NRL
6. पेट्रोलियम एवं प्राकृतिक गैस मंत्रालय के सचिव के निजी वैयक्तिक सहायक को
   PPS to Secretary, MOP&NG

विषय : पेट्रोलियम और प्राकृतिक गैस मंत्रालय की हाइड्रोकार्बन्स पर 52वीं वैज्ञानिक सलाहकार समिति के कार्यवृत्त का परिचालन ।

Sub.: 52nd Meeting of the Scientific Advisory Committee on Hydrocarbons of the Ministry of Petroleum & Natural Gas - Circulation of minutes.

महोदय / महोदया,
Dear Sir / Madam,

पेट्रोलियम और प्राकृतिक गैस मंत्रालय की हाइड्रोकार्बन्स पर 1 अप्रैल, 2002 को सी.एस.आई.आर, विज्ञान केन्द्र, नई दिल्ली में हुई वैज्ञानिक सलाहकार समिति की 52वीं बैठक के कार्यवृत्त की प्रति आपकी सूचना एवं आवश्यक कार्रवाई हेतु संलग्न है ।

Enclosed, please find a copy of the minutes of the 52nd Meeting of the Scientific Advisory Committee on Hydrocarbons of the Ministry of Petroleum and Natural Gas held at CSIR, Science Centre, New Delhi on 1st April, 2002 for your information and necessary action.

धन्यवाद !
Thanking you,

भवदीय,
Yours faithfully,

(एस.जे. चोपड़ा)
कार्यकारी निदेशक
(S.J. Chopra)
Executive Director

संलग्न : यथोक्त
Encl.: As Above.

पाँचवां तल, कोर 6, स्कोप कॉम्पलैक्स, लोधी रोड, नई दिल्ली - 110 003
5th Floor, Core 6, SCOPE Complex, Lodhi Road. New Delhi - 110 003
E-mail : cht@giasdl01.vsnl.net.in Fax : 4362879, 4367350 Tel. : .....

Minutes of the 52nd Meeting of the Scientific Advisory Committee on Hydrocarbon of the Ministry of Petroleum & Natural Gas held on 1.4.2002 at CSIR Science Centre, New Delhi

List of the participants is enclosed as Annexure-I

Executive Director, CHT – Dr.S.J.Chopra, extended a warm welcome to the members and other participants. He mentioned that the Peer Review of the projects submitted during the 51st meeting of SAC has been completed. The comments have also been sent to the originators of the proposals, who have been requested to make a presentation in this meeting. The new proposals which were received at CHT have also been sent for Peer Review and their comments, as received, have also been sent to the originators of the proposals. ED-CHT also mentioned that the Executive Committee of CHT has decided that the project proposal recommended by SAC will not be routed through the Advisory Committee of CHT and would be submitted directly to the Executive Committee of CHT for its consideration/approval. This will help in reducing the time for approval of funding of various projects.

Dr. R.A. Mashelkar, Chairman, SAC in his opening remarks observed that the present times are very challenging, not only for the hydrocarbon sector, but for the entire economy of the country. He mentioned that a special one-day meeting of SAC with participation of invitees & experts in various fields shall be convened during the next 6-8 weeks to deliberate on the overall perspective of global business, technology and the developmental efforts required for hydrocarbon sector. Based on the views/recommendations emerging out of the discussions in the special SAC meeting, a task force will be constituted to prepare the document on "Vision 2010 – Thrust to R&D in Hydrocarbon Sector".

Dr. Mashelkar also emphasised the importance of the Peer Review and laid stress on the fact that the feedback of the Peer Group will help the Committee in making suitable recommendations.
Shri A.P.Ram, Advisor (R), MOP&NG observed that the funding of R&D projects through CHT/OIDB under the post APM scenario, also needs to be deliberated. He advised that the on-going R&D projects and the proposals which will be cleared in the near future, should be monitored closely for expeditious completion.

52.1 Proposal for involving SAC members in the activity committees of CHT

Dr. S.J. Chopra placed before the Committee a proposal of involving SAC members to function as Chairman of the various Activity Committees of CHT. He apprised the members that CHT Activity Committees generally meet every six months to discuss operational problems and other aspects of technology upgradation and information dissemination. The purpose of such involvement of SAC members is to generate interaction of the operating personnel with the experts in the field. This would enable greater appreciation of the various operational problems and might also help in identifying suitable projects / studies relating to the problem areas. This was agreed to and the list of proposed SAC

members as Chairman of the various Activity Committees of CHT is enclosed as Annexure-II.

52.2 Peer Group review of R&D project proposals presented in the 51st SAC meeting

The R&D project proposals presented in the 51st SAC meeting were again taken up for the consideration of the Committee. In this connection, the concerned institutes apprised the Committee about the modifications of their respective project proposals taking into consideration various suggestions / comments of the peer group members. The following points emerged during presentations on the project proposals:

52.2.1 Add-on facilities for development of Trickle Bed Reactor Technology : Part-I Large Scale Hydrodynamics Studies for Distributor & Redistributor / Quench System – EIL(R&D), IOCL(R&D) and IIT- Delhi

Dr. S. Banik (EIL) informed that the suggestions of the peer group to focus on the development of liquid distributor under high pressure and validation of wetting model, will be incorporated in the proposed studies for development of TBR.

52.2.2 Development of Regenerative Process for Sulfur Dioxide Removal from Lean Gas Streams – EIL(R&D) & IIP, Dehradun

Sh. Sumitro Nagpal (EIL) explained that :

i) The suggestions of the peer group to include accelerated degradability study of amines and the equilibrium study with the selected contractor, have been incorporated in the revised proposal.
ii) The amines selected for the proposed project will result in a more efficient regenerative process as compared to the BELCO process.
iii) The data available suggests that the regenerative process developed under the proposed project would be economical in comparison with the BELCO process.

Chairman, SAC advised that operational problems like fouling of the system by the dissolved solids in the cooling water, should be addressed in the studies to be undertaken for the proposed project.

52.2.3 Development of Feed Nozzle System and Study of its effect on FCC riser-reactor performance : A Computational Fluid Dynamics Approach – EIL(R&D)

Sh. Sheo Raj Singh (EIL) informed that :

i) CFD modeling of mean velocity and turbulence structure in the riser have been incorporated.
ii) Detailed computational Evaporation Model will be developed in the studies undertaken in the proposed project.

52.2.4 Development of Catalyst(s) for Ultra Deep Desulphurisation of Gas Oil – IIP

Dr. M.O. Garg (IIP) informed that :

i) Developmental activities related to design of hydrodesulphurisation units will be included in the proposed project by fine tuning the already developed HDS kinetic model.
ii) The scale of catalyst development has been enhanced to preparation of 1 kg. of the best catalyst which will be evaluated under selected conditions.

During discussions it was suggested by the members that the feed stock for catalyst evaluation should be tailor-made so that it contains refractory sulphur compounds which are most difficult to desulphurise.

52.2.5 Organo Zeolites for Sequestration and Recovery of Hydrophobic Fuel Components in Refinery Wastewater – NEERI

Dr.(Mrs.) S. Rayalu (NEERI) informed that the emphasis of the project proposal is on recovery of BTX in the influent to ETP from UDEX or other similar aromatic extraction units. The members, however, observed that the cost of recovering BTX from such influent in the refineries will not be economically viable considering the price of BTX.

52.3 <u>Presentation on new R&D project proposals</u>

52.3.1 Development of water diesel emulsion as green fuel for improving ambient air quality in Indian metro cities – IPFT, Gurgaon & IOCL(R&D)

Dr. P.K. Patanjali (IPFT) made presentation on the project proposal. The proposed developmental work will involve:

i) Optimisation of various parameters for development of stable water-diesel emulsion and micro-emulsion formulations.
ii) Testing of formulations developed for physico-chemical characterisation and also emulsion stability, corrosion and lubricity tests.
iii) Emission studies on Tata 407 engine for exhaust emissions for collecting data on NO_x, PM, unburnt hydrocarbons, CO, etc.
iv) Field trials on trucks to establish commercial viability of the formulations

The completion schedule of the project is 3 years, with an estimated cost of around Rs. 4.8 crores.

52.4 <u>Status of ongoing R&D project on "Boundary Lubrication Mechanism and its applications" – IISc., Bangalore</u>

Prof. S.K. Biswas, Head, Mechanical Engg. Dept., IISc, Bangalore, apprised the members about the status of activities under the subject project, which is being executed by IISc in collaboration with IOCL(R&D) and IIP. The activities under the project, involving studies of the additive molecules of gear oils, comprise

establishing correlations of chemistry/ structure with tribological performance, boundary lubrication mechanism and synthesis of designer molecules to obtain desired level of performance, are in progress. Chairman, SAC commended the work being done.

52.5 Approach paper on "Development plans of EIL(R&D)"

Dr. P.K. Sen, Head, EIL(R&D) made a presentation on the R&D competencies acquired by EIL and Business model for the future areas of R&D activities being envisaged by EIL. Appreciating the panorama of developmental activities undertaken by EIL in the past and future R&D plans, Chairman advised EIL to prepare a comprehensive document in the context of business opportunities, which should be circulated among the SAC members so that meaningful comments and suggestions could be given in the next SAC meeting.

52.6 Review of funding mechanism and commercialisation of R&D projects sponsored by CHT / OIDB – Dr. S. Sivaram, NCL, Pune

Dr. S. Sivaram, Dy. Director and Head, Polymer Division, NCL, Pune made a presentation on the subject. He suggested a system of process development involving following Toll Gates / Stages :

Toll Gate	Stage	Tasks / Activities Completed
0	Proof of concept	▪ Establish feasibility of concept ▪ Define issues related to quality, data reliability, scale up and IPR
1	Project opportunity identification	▪ Review of bench scale study ▪ Defining project goals ▪ Identification of project leader / project owner ▪ Approval of project plans ▪ Project financial assessment
2	Scope definition	▪ Freezing of process specifications ▪ Project financials and target costs ▪ Project time frame ▪ Financial authorisation requests for pre-engineering / pilot plant
3	Conceptual design	▪ Verification & testing of process specs. based on pilot plant data ▪ Defining process tolerances ▪ Manufacturing cost estimate ▪ Freezing of process design
4;5; 6	Basic engineering; EPC, commissioning, start up; operations and project closure	▪ Involve activities starting from project execution plan to commissioning & start up of the plant and closing of the project by comparing the results of the outcome vis-a-vis the planned objectives.

For the above Toll Gates / Stages of the project development, Dr. Sivaram suggested the following pattern for project funding :

Toll Gate	CHT / OIDB	Industry, %
T 0	100	0
T 1 and T 2	90	10
T 3	70	30
T 4	50	50
T 5 and T 6	0	100

Dr. A.K. Bhatnagar, Director, IOCL(R&D) remarked that as such the research institutes should complete the activities related to T0 & T1 Toll Gates by themselves and should approach SAC for funding the project proposal only when they are at the stages corresponding to T2 / T3 Toll Gates of project development. He also suggested that the funding mechanism should include provisions on providing Risk Capital for commercialisation of the technology developed by research institutes. Chairman, SAC commended the efforts of Dr. Sivaram and remarked that this conceptual frame work would provide the Committee constituted in the last SAC meeting to develop a comprehensive document on the subject, which would be taken up for finalisation in the next SAC meeting.

52.7 Proposal on "Eminent Scientist / Professional Scheme"

ED, CHT explained the background of the proposed scheme, which has been conceived as a mechanism to gainfully exploit the accumulated knowledge / expertise of the noted luminaries for the benefit of hydrocarbon sector. He stated that such eminent scientists / professionals could provide strategic / technological inputs related to hydrocarbons in the back drop of global perspective, also taking into consideration the overall socio-economic needs of the country.

Secretary, OIDB remarked that as such there are good number of experts in the SAC on Hydrocarbon, who could always provide such expertise and support to the Ministry. Advisor(R), MOP&NG remarked that the composition of Search Committee would need to be reviewed. The members were also of the opinion that the scheme should not be restricted to superannuated persons.

Chairman, SAC remarked that as such the idea is laudable in principle, but appointment of personnel under this scheme would require fair amount of caution and prudence so that it is not looked upon as a vehicle of reemployment of superannuated personnel. SAC decided to recommend the proposal for approval.

52.8 Appraisal of R&D project proposals

The Chairman, SAC and the members decided that henceforth for each of the project proposal recommended by SAC for funding by CHT/OIDB, a project review team should be constituted. The idea behind this approach is not only for critical and rigorous review of execution of the project in line with the objectives

envisaged in the project proposal recommended by SAC, but it should also ensure that there is improvement in the present state of knowledge. . It was also decided that for the project proposals recommended by the Committee, the concerned research institute should clearly define the deliverables with the time frame of the project.

The recommendations of the Committee in respect of the project proposals taken up during its 51st and 52nd meeting are as under :

52.8.1 Add-on facilities for Development of Trickle Bed Reactor Technology : Part-I Large Scale Hydrodynamics Studies for Distributor & Redistributor / Quench System – EIL(R&D)in collaboration with IOCL(R&D) and IIT-Delhi

While observing that the project proposal is important as an endeavour to develop capability for design and engineering of hydroprocessing units, the Committee recommended the project proposal, involving estimated cost of Rs.135.48 lakhs and completion schedule of 24 months, for 100% funding by CHT/OIDB.

The Committee decided to constitute Project Monitoring Committee for this proposal, comprising Prof. A.B. Pandit (UDCT), Sh. M. Rohatgi (BPCL), Dr. M.O. Garg (IIP) and ED (CHT) or his representative.

52.8.2 Development of Regenerative Process for Sulfur Dioxide Removal from Lean Gas Streams – EIL(R&D) & IIP

The Committee recommended the proposal, involving total cost of Rs.97.36 lakhs with completion schedule of two years, for 100% funding by CHT/OIDB.

The Committee decided to constitute Project Monitoring Committee for this proposal comprising, Dr. R.N. Singh (NEERI), Prof. V.V. Mahajani (UDCT), Sh. H.P. Singh (IOCL) and ED (CHT) or his representative.

52.8.3 Development of Feed Nozzle System and Study of its effect on FCC riser-reactor performance : A Computational Fluid Dynamics Approach – EIL(R&D)

It was emphasised by the members that FCC nozzle system is a very important component of FCC unit, which directly affects the conversion of the feed stock and the product yields. The Committee therefore recommended the project proposal, involving estimated cost of Rs.92.0 lakhs with completion schedule of 30 months, for 100% funding by CHT/OIDB. It was also observed by the Committee that the priority of the activities of the project should be critically discussed with the project consultant.

The Committee decided to constitute Project Monitoring Committee for this proposal, comprising Prof. K.S. Gandhi (IISc.), Sh. K.K. Acharya (IOCL), Sh. M.K. Joshi (EIL) and ED (CHT) or his representative.

52.8.4 Development of Catalyst(s) for Ultra Deep Desulphurisation of Gas Oil – IIP

The Committee recommended the project proposal, involving estimated cost of Rs.53.20 lakhs with completion schedule of two years, for 100% funding by CHT/OIDB. It was also observed that although the target is to achieve desulphurisation upto a level of 50 ppm, the catalyst formulation developed should aim at reduction of sulphur to a level of 25-30 ppm.

The Committee decided to constitute Project Monitoring Committee for this proposal comprising, Dr. A. B. Halgeri (IPCL), Dr. A.V. Ramaswamy (NCL), Dr. R.P. Verma (IOCL) and ED (CHT) or his representative.

52.8.5 Organo Zeolites for Sequestration and Recovery of Hydrophobic Fuel Components in Refinery Wastewater – NEERI

The Committee observed that the project objectives have not been clearly defined. Further in view of lack of any satisfactory analysis of the economics of the project proposal, the Committee decided not to recommend the project proposal at this stage.

52.8.6 Development of water diesel emulsion as green fuel for improving ambient air quality in Indian metro cities – IPFT, Gurgaon & IOCL(R&D)

It was noted by the Committee that the activities involved for development of formulations of emulsions / micro emulsions have not been critically established in the project proposal. As such, although the concept is good in principle, there appears to be lack of expertise required for developing formulations. The Committee, therefore, decided that the proposal could not be considered in the present form

The meeting ended with a vote of thanks to the Chair.

Annexure-I

List of Participants : 52nd Meeting of the Scientific Advisory Committee on Hydrocarbons of Ministry of Petroleum & Natural Gas

1.	Dr. R.A. Mashelkar (Chairman)	Director General	CSIR, New Delhi
Members.			
2.	Prof. K. Vasudeva	Ex-Head, Ch. Engg, IIT-D	
3.	Dr. R.S. Venkatraman	Ex-CMD, EIL	
4.	Dr. A.K. Bhatnagar	Director (R&D)	IOC(R&D), Faridabad
5	Sh. A.P. Ram	Advisor (Refineries)	MOP&NG, New Delhi
6.	Sh. Sudhir Singhal	Director	IIP, Dehradun
7..	Dr. K.V. Raghavan	Director	IICT, Hyderabad
8.	Sh. A. Soni	Director (Tech.)	EIL, New Delhi
9.	Dr. S. Sivaram	Scientist	NCL, Pune
10.	Dr.Mrs.Malti Goel	Advisor, Scientist-G	DST, New Delhi
11.	Sh. S.N. Sharma	Scientist	CSIR, New Delhi
12.	Sh. P.V.R. Ayyar	ED	OISD, New Delhi
13.	Prof. A.B. Pandit	Prof.Dept. of Chem.Tech.	UDCT, Mumbai
14	Prof. A.S. Moharir	Prof.–CAD & Chem.Engg.	IIT, Mumbai
15.	Prof. D.N. Saraf	Professor	IIT, Kanpur
16.	Prof. K.D.P. Nigam	Professor	IIT, Delhi
17..	Dr. S.J. Chopra	Executive Director	CHT, New Delhi

Delegates / Invitees

18.	Ms. Vandana Singhal	Secretary	OIDB, New Delhi
19.	Sh. R.M. Hazarika	Director (Commercial)	BRPL, New Delhi
20.	Sh. Koshy Verghese	Director (R)	KRL, New Delhi
21.	Dr. Sobhan Ghosh	Executive Director	IOCL(R&D) Faridabad
22.	Dr. R.P. Verma	Executive Director	IOCL(R&D), Faridabad
23.	Sh. M. Rohatgi	Executive Director (R)	BPCL, Mumbai
24.	Sh. V.D. Mahajan	CGM (RC)	HPCL, Mumbai
25	Sh. T.S. Subramaniam	Executive Director (Tech.)	EIL, New Delhi
26.	Sh. C.N. Trivedi	Executive Director	GAIL, New Delhi
27.	Sh. K.K. Acharya	General Manager	IOCL, New Delhi
28.	Sh. K.N. Mishra	General Manager	ONGC, Dehradun
29.	Dr. P.K. Sen	General Manager	EIL, Gurgaon
30.	Sh. M.O. Garg	Head (RTD)	IIP, Dehradun
31.	Dr. M.A. Siddiqui	General Manager (R&D)	BPCL, Greater Noida
32.	Dr. S.N. Kaul	Scientist 'G'	NEERI, Nagpur
33.	Dr. S. Banik	DGM (R&D)	EIL, Gurgaon
34	Sh. Anup Kacker	DGM (P&C – NE)	IBP
35.	Sh. Paramjit Singh	Chief Manager	PCRA, New Delhi

36.	Sh. R. Ramachandran	Chief Tech. Manager	BPCL, Mumbai
37.	Sh. D.K. Tuli	CRM	IOCL(R&D), Faridabad
38.	Dr. A.A. Gupta	Chief Manager	IOCL(R&D), Faridabad
39.	Dr. S.K. Puri	Research Manager	IOCL(R&D), Faridabad
40.	Sh. Sheo Raj Singh	Sr.Manager	EIL, Gurgaon
41.	Sh. Rajdeep Aggarwal	Sr.Manager	EIL, Gurgaon
42.	Dr. Soumitro Nagpal	Dy.Manager	EIL, Gurgaon
43.	Dr. N.N. Rao	Scientist	NEERI, Nagpur
44.	Dr.(Mrs.) S. Rayalu	Scientist 'C'	NEERI, Nagpur
45.	Sh. M.I.R. Swami	Sr.Manager (R&D)	CPCL, Chennai
46.	Dr. D. Sengupta	Director	IPFT, Gurgaon
47.	Sh. P.K. Patanjali		IPFT, Gurgaon
48.	Prof. S.K. Biswas	Professor	IISc., Bangalore
49.	Sh. S. Sampath	Asst. Professor	IISc., Bangalore
50.	Sh. B.D. Ghosh	Director	CHT, New Delhi
51.	Sh. P.N. Dodeja	Addl.Director	CHT, New Delhi
52.	Sh. M.K. Dutta	Addl.Director	CHT, New Delhi
53.	Sh. S.K. Shukla	Addl.Director	CHT, New Delhi
54.	Sh. M.A. Rizvi	Joint Director	CHT, New Delhi
55.	Sh. S. Khan	Joint Director	CHT, New Delhi

Annexure-II

PROPOSAL FOR INVOLVING SAC MEMBERS IN ACTIVITY COMMITTEES OF CHT

S. No	TITLE OF ACTIVITY COMMITTEE	CHT COORDI-NATOR	CONVENOR	PROPOSED SAC MEMBER AS CHAIRMAN
		S/SHRI	S/SHRI	
1.	DISTILLATION	C.S.S. NARAYANA, Jt. Director	S.S. SUNDERARAJAN, Ch. Mgr, BPCL	PROF. K. VASUDEVA
2.	FLUIDISED CATALYTIC CRACKING	S.K. SHUKLA, Addl. Director	G. SRI GANESH, DGM (Tech), HPCL (Mumbai)	SH. A. SONI
3.	CATALYTIC REFORMING	A.K. AGARWAL Jt. Director	DR. R.P. VERMA, GM(RT), IOC(R&D)	DR. R.S. VENKATARAMAN
4.	DELAYED COKER AND VISBREAKER	S. KHAN, Jt. Director	L.W. KHONGWIR, SPNM, IOCL-Digboi / M. GOPINATHAN DGM (Mfg.), KRL	PROF. A.B. PANDIT
5.	HYDROPROCESSING	M.K. DUTTA, Addl. Director	DR. R.P. VERMA, GM(RT), IOCL (R&D)	PROF. K.D.P. NIGAM
6.	LUBE OIL BASE STOCKS (LOBS) & WAXES	A.K. AGARWAL Jt. Director	-	DR. A.K. BHATNAGAR
7.	FUEL & LOSS AND ENERGY OPTIMIZATION	G.K. DEY, Jt. Director	V.K. AGRAWAL, DGM (Tech), BPCL	PROF. A.S. MOHARIR
8.	ENVIRONMENT MANAGEMENT	M.K. DUTTA, Addl. Director	H.P. SINGH, GM(S&EP), IOCL- HQ, New Delhi	PROF. I.M. MISHRA

S. No	TITLE OF ACTIVITY COMMITTEE	CHT COORDI-NATOR	CONVENOR	PROPOSED SAC MEMBER AS CHAIRMAN
		S/SHRI	S/SHRI	
9.	ADVANCED CONTROL AND OPTIMIZATION	S.K. SHUKLA, Addl. Director	T. PHILIP BHASKAR, Mgr (Oprn.) CPCL,Chennai	PROF. D.N. SARAF
10.	INSPECTION	M.A. RIZVI, Jt. Director	-	
11.	ROTATING EQUIPMENT	M.A RIZVI, Jt. Director	-	
12.	INSTRUMENTATI-ON AND CONTROL	S. NATH, Dy. Director	A. BHOWMICK, Sr. Mgr.(M&I), IOCL	
13.	POWER GENERATION, BOILER OPERATION AND ELECTRICAL DISTRIBUTION & MAINTENANCE	S.K. BAHAL, Addl. Director	SHAHJI IDICULA, Ch. Mgr, HPCL-Mumbai	
14.	PIPELINE OPERATIONS	S.K. BAHAL, Addl. Director	-	