



# उच्च प्रौद्योगिकी केन्द्र

(पेट्रोलियम एवं प्राकृतिक गैस मंत्रालय), भारत सरकार

**Centre for High Technology**

(Ministry of Petroleum & Natural Gas), Govt. of India

उ.प्रौ.के./जीसी/39/  
CHT/GC/39/

दिनांक: 24 जुलाई, 2020  
Date: 24 July, 2020

To,

उच्च प्रौद्योगिकी केन्द्र की गवर्निंग काउंसिल के माननीय अध्यक्ष महोदय एवं सभी सदस्यगण (संलग्न सूची के अनुसार)  
Chairman and Members, Governing Council of Centre for High Technology (As per list enclosed)

महोदय,

Dear Sir,

विषय: उच्च प्रौद्योगिकी केन्द्र की गवर्निंग काउंसिल की 39वीं बैठक का कार्यवृत्त

Sub: Minutes of 39<sup>th</sup> Meeting of the Governing Council (GC) of CHT

दिनांक 16 जुलाई 2020 को, वीडियो कॉन्फ्रेंसिंग द्वारा, सचिव, पेट्रोलियम और प्राकृतिक गैस मंत्रालय की अध्यक्षता में सम्पन्न हुई उच्च प्रौद्योगिकी केन्द्र की गवर्निंग काउंसिल की 39वीं बैठक का अनुमोदित कार्यवृत्त आपकी सूचना और आवश्यक कार्रवाई हेतु संलग्न किया जा रहा है।

Please find enclosed the duly approved Minutes of the 39<sup>th</sup> Meeting of Governing Council (GC) of CHT held on 16<sup>th</sup> July 2020 through video conferencing, under the Chairmanship of Secretary, P&NG, for kind information and necessary action.

भवदीय,

Yours sincerely,

(के. के. जैन)

कार्यकारी निदेशक

सदस्य-सचिव, गवर्निंग काउंसिल

(K.K. Jain)

Executive Director

Member-Secretary, Governing Council - CHT

संलग्न: यथा उपर्युक्त

Encl.: As above

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## MEMBERS OF THE GOVERNING COUNCIL OF CHT

1. **Shri Tarun Kapoor** **Chairman**  
Secretary  
Ministry of Petroleum & Natural Gas  
Shastri Bhawan  
New Delhi-110 001
2. **Vacant**  
Additional Secretary  
Ministry of Petroleum & Natural Gas  
Shastri Bhawan  
New Delhi-110 001
3. **Shri Rajesh Aggarwal**  
Additional Secretary & Financial Adviser  
Ministry of Petroleum & Natural Gas  
Shastri Bhawan  
New Delhi-110 001
4. **Shri Sunil Kumar**  
Joint Secretary (R)  
Ministry of Petroleum & Natural Gas  
Shastri Bhawan  
New Delhi-110 001
5. **Shri Amar Nath**  
Joint Secretary (E & CVO)  
Ministry of Petroleum & Natural Gas  
Shastri Bhawan  
New Delhi-110 001
6. **Shri Ashish Chatterjee**  
Joint Secretary (GP & M)  
Ministry of Petroleum & Natural Gas  
Shastri Bhawan  
New Delhi-110 001
7. **Shri B. N. Reddy**  
Joint Secretary (IC & Adm &G)  
Ministry of Petroleum & Natural Gas  
Shastri Bhawan  
New Delhi-110 001

8. **Shri Niranjan Kumar Singh**  
Secretary  
Oil Industry Development Board  
OIDB Bhawan  
Plot No. 2, Sector-73  
NOIDA – 201 301
  
9. **Shri S.M. Vaidya**  
Chairman  
Indian Oil Corporation Ltd.  
3079/3, Sadiq Nagar  
J.B. Tito Marg  
New Delhi – 110 049
  
10. **Shri Shashi Shanker**  
Chairman & Managing Director  
Oil & Natural Gas Corporation  
5, Nelson Mandela Marg,  
Vasant Kunj II, Vasant Kunj,  
New Delhi - 110070
  
11. **Shri Sushil Chandra Mishra**  
Chairman & Managing Director  
Oil India Limited  
Plot No. 19, Near Film City,  
Sector 16A,  
Noida – 201301
  
12. **Shri D. Rajkumar**  
Chairman & Managing Director  
Bharat Petroleum Corporation Ltd  
Bharat Bhawan  
4 & 6 Currimbhoy Road  
Ballard Estate  
Mumbai-400 001
  
13. **Shri M.K. Surana**  
Chairman & Managing Director  
Hindustan Petroleum Corporation Ltd.  
Petroleum House  
17, Jamshedji Tata Road  
Mumbai-400 020

- 14. Shri Manoj Jain**  
CMD & Director (BD & Projects)  
GAIL (India) Limited  
16, Bhikaiji Cama Place, R.K. Puram  
New Delhi-110 066
- 15. Shri J.C. Nakra**  
Chairman & Managing Director  
Engineers India Ltd.  
El Bhawan  
1, Bhikaiji Cama Place  
New Delhi-110 066
- 16. Shri S.N. Pandey**  
Managing Director  
Chennai Petroleum Corporation Ltd.  
536, Anna Salai, Teynampet  
Chennai-600 018
- 17. Shri M. Venkatesh**  
Managing Director  
Mangalore Refinery & Petrochemicals Ltd.  
Regd. Office: Kuthethoor  
P.O. Via Katipalla  
Mangaluru - 575 030
- 18. Shri S.K. Barua**  
Managing Director  
Numaligarh Refinery Limited  
122A, R.G. Barua Road  
Guwahati – 781 005
- 19. Dr. Anjan Ray**  
Director  
Indian Institute of Petroleum  
P.O. Mohkampur  
Dehradun-248 005
- 20. Shri K.K. Jain**  
Executive Director  
Centre for High Technology  
9<sup>th</sup> Floor, OIDB Bhawan, Sector-73  
NOIDA – 201 301

**Member Secretary**

**Minutes of the 39<sup>th</sup> Meeting of the Governing Council (GC) of Centre for High Technology (CHT) held on 16<sup>th</sup> July'20 held through VC**

1. Shri Tarun Kapoor, Secretary, P&NG chaired the meeting. The list of participants is enclosed as **Annexure-1**.
2. Shri K.K. Jain, Executive Director, CHT welcomed the Chairman & Members of the GC and other participants to the Meeting.
3. The following are the salient points of discussions:
  - 3.1 **Approval for funding of IOC R&D Proposal "Development & Demonstration of commercially viable Fuel Cell buses based on Hydrogen produced from Multiple Pathways" under HCF**

Initiating the discussions, ED (CHT) highlighted the emerging importance of green hydrogen in the future energy mix, which is driven by concerns on environment, global warming and also falling prices of renewable power. Hydrogen also mitigates the problem associated with variable nature of renewable energy and solves the problem of range associated with EVs. The applications based on hydrogen are currently under development and deployment across the globe and advanced countries have drawn roadmap to usher in to hydrogen economy. India also need to take the hydrogen programme as a project of national importance and oil companies can take lead, as refineries already produce and handle hydrogen in large quantity.

Governing council, during its last meeting held on 27<sup>th</sup> Dec'19, deliberated and advised IOC R&D to put up the proposal again after deliberation with all the stakeholders along with additional information on the following:

- a. Plan for utilization of 15 buses post completion of the project
- b. Royalty sharing formula and IPR
- c. Tangible and intangible benefits
- d. Tie up with Commercial Partner viz. vehicle manufacturer as well as transport operators

IndianOil (R&D) made a detailed presentation. It was mentioned that the project is first comprehensive attempt under Make in India initiative to generate authentic scientific data for hydrogen fuel cell based mobility involving fuel supplier (IOCL), Technology developer and Academia (IISc) targeting commercialization of heavy duty buses operating on hydrogen & fuel cells.

The program would enable the Oil & Gas companies to develop hydrogen retailing as a new core area (hydrogen as a new dimension for emerging e-mobility paradigm) with simultaneous reduction of carbon footprints.

The project envisages generation of data for production of hydrogen from different pathways as well demonstration. Four different pathways, as under, for hydrogen production have been selected for demonstration at 10 kg/ hr capacity based on total life cycle CO<sub>2</sub> emission/ km and availability of feedstock;

- I. Steam Methane Reforming (SMR): Already a route followed at refinery for production of hydrogen. However, the quality of hydrogen is about 99.9% against requirement of 99.999% for fuel cell application. The demonstration of cost-effective vacuum based purification technology developed by IISc, Bengaluru has been envisaged. Further, the development of fuel cell to operate with lower quality of hydrogen as produced from SMR has been envisaged under this program.
- II. Electrolysis using solar power: With falling prices of renewable power, the hydrogen produced through this route is already competing with SMR route.
- III. Biomass gasification: IOC R&D has collaborated with IISc, Bengaluru, as they have already developed cost effective technology based on oxygen induced gasification.
- IV. Bio-methanation: based on gas available from existing facility at IOC R&D for bio-methanation of food waste.

On a query, IOCL explained as under;

1. Conversion of bio gas to Hydrogen is techno-commercially viable route considering that hydrogen has 3 times of calorific value than that of biogas and almost 2 times more efficient when used in fuel cells compared to IC gas engine. Considering the cost of CNG @ Rs 35 /Kg, the breakeven price of H<sub>2</sub> works out to Rs 210 /Kg. As against this, the cost of hydrogen at ~Rs 150 per kg following this route is achievable.
2. The total cost of ownership of hydrogen Fuel cell bus is estimated (based on internationally followed GREET model with India-centric assumptions) to be comparable with a diesel bus for 400 KMs of operation (when compared at equal volumes of buses) and hydrogen is produced from biomass gasification in a decentralised manner.

IOCL floated National Expression of Interest and got a good response from reputed automakers / fuel cell stack developers viz., BHEL, Tata Motors, Ashok Leyland, KPIT, etc. to be a part of the proposed project. IOCL presented the information gathered from various respondents of EOI on specific issues pointed out by GC as follows:

S.N.	GC Observations	Additional Information obtained through a National Eol
1.	Plan for utilization of 15 buses post completion of the project	Through National Eol, IOC could solicit the consent of at least one vendor to buyback the buses post field trials
2.	Royalty sharing mechanism and IPR	Upon commercialization, all respondents of Eol agreed for royalty sharing and joint IP option
3.	Tangible and Intangible benefits	<ol style="list-style-type: none"> <li>1. This project provides authentic scientific base for fuel cell based mobility in heavy duty transport sector.</li> <li>2. This project also envisages choosing right kind of technology pathway for hydrogen production depending upon geographic/feedstock preference</li> <li>3. Will define the contours for centralized / decentralized hydrogen production and dispensation</li> <li>4. Systematic and scientific data generation on aspects of life cycle emissions improvement, energy consumption and total cost of ownership.</li> <li>5. Development of capabilities for indigenous fabrication / manufacturing of fuel cell stacks – inline spirit of self-reliance.</li> <li>6. Valorization of biomass into green hydrogen</li> </ol>
4.	Tie up with Commercial partner (for supply of buses through Eol)	Leading Heavy-duty Vehicle manufacturers like Tata Motors / Ashok Leyland and organizations like BHEL and KPIT have agreed to work in collaboration with IOC on this project.

IOCL has indicated that they will go for tender to finalize the prospective partner for executing the project after GC's decision on funding.

**Project duration:** 3 years which includes the R&D activities, setting up of infrastructure, development of Buses and undertaking the trials on 15 buses.

#### Project Cost Breakup:

S. No.	Item	Amount (Rs. in crore)			
		Total cost	1 <sup>st</sup> year	2 <sup>nd</sup> year	3 <sup>rd</sup> year
1.	Equipment*	176.10	88.55	58.28	29.26
2.	Manpower	84.40	26.32	28.19	29.89
3.	Consumables	33.50	17.08	6.89	9.54
4.	Contingencies/ Other Costs (IT tools required by IISc)	1.40	0.80	0.60	0.00
5.	Travel	1.26	0.40	0.42	0.44
6.	Consultancy	-	-	-	-
7.	Institutional Overhead charges	-	-	-	-
<b>Total</b>		<b>296.66</b>	<b>133.15</b>	<b>94.39</b>	<b>69.13</b>

\* Excluding Land cost for setting up the pilot plants, hydrogen dispensing units at IOC R&D

IOCL mentioned that the total project cost of Rs 296.66 crore includes the cost of already approved and on-going separate project “Creation of Solar based Hydrogen Production system and dispensing station for refuelling Hydrogen Fuel Cell vehicles” at cost of Rs 65 crore with contribution of Rs 25 crore from HCF. Therefore, CHT’s contribution in the project through HCF will be Rs 163.32 crore out of total project cost of Rs 296.66 crore and as additional Rs 138.32 crore is being sought for funding from HCF.

**Proposed participant wise contribution (Rs crore)**

Agency	IOC	IISc	OEM	Total
CHT	90.79	22.01	50.51	163.32
self	62.34	-	71.0	133.34
<b>Total</b>	<b>153.14</b>	<b>22.01</b>	<b>121.51</b>	<b>296.66</b>

OIDB indicated that the available fund under HCF is ~Rs 117 crore, after considering the commitment for ongoing projects under HCF.

**GC deliberated on the above in detail and approved funding of Rs 72.52 crore as under:**

- Rs 22.01 crore for biomass gasification project with IISc.
- Rs 50.51 crore to chosen OEM/OEMs for the development of stack and procurement of fuel cell buses.

This is in addition of Rs 25 Crore already approved to IOC R&D for the project “Creation of Solar based Hydrogen Production system and dispensing station for refuelling Hydrogen Fuel Cell vehicles”.

**Action: IOCL (R&D)**

**3.2 Organization of 25<sup>th</sup> RPTM (Refining & Petrochemicals Technology Meet)**

CHT mentioned that the RPTM is organized by CHT every year with one of the Oil PSU as co-host. CHT informed that EC has recommended to hold next RPTM (25<sup>th</sup>) in association with HPCL, who has agreed for the same.

**GC advised to approach MoP&NG in Sept’20 for seeking date & venue considering COVID situation.**

**Action by: CHT/ HPCL**

The meeting ended with thanks to chair and participants.



**39<sup>th</sup> Meeting of the Governing Council (GC) of Centre for High Technology (CHT)  
held on 16<sup>th</sup> July'20 through VC**

**Participants**

1. Shri Tarun Kapoor, Secretary, MoP&NG – Chair
2. Shri Rajesh Aggarwal, AS&FA
3. Shri B.N. Reddy, JS (IC)
4. Shri Ashish Chatterjee, JS (GP &M)
5. Shri Sunil Kumar, JS(R)
6. Shri Niranjana Kumar Singh, Secretary, OI DB
7. Shri M.K. Surana, CMD, HPCL
8. Shri D. Rajkumar, CMD, BPCL
9. Shri S.M. Vaidya, Chairman, IOCL
10. Shri Manoj Jain, CMD, GAIL
11. Shri Sushil Chandra Mishra, CMD, OIL
12. Dr. Anjan Ray, Director, CSIR-IIP
13. Shri M. Venkatesh, MD, MRPL
14. Shri S. N. Pandey, MD, CPCL
15. Shri S.K. Barua, MD, NRL
16. Shri J.C. Nakra, CMD, EIL
17. Dr. S.S.V. Ramakumar, Director (R&D), IOCL
18. Dr. Sanjeev Katti, DG, OEC
19. Shri D.V. Shastry, ED, GAIL
20. Shri K.K. Jain, ED, CHT