



**STANDING COMMITTEE ON
PETROLEUM & NATURAL GAS
(2025-26)**

EIGHTEENTH LOK SABHA

MINISTRY OF PETROLEUM & NATURAL GAS

EXAMINATION OF R&D ACTIVITIES OF OIL PSUS

NINTH REPORT



**LOK SABHA SECRETARIAT
NEW DELHI**

August, 2026/Sravana, 1948 (Saka)

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Presented to Lok Sabha on 12.08.2026

Laid in Rajya Sabha on 12.08.2026



**LOK SABHA SECRETARIAT
NEW DELHI**

August, 2026/Sravana, 1948 (Saka)

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**COMPOSITION OF THE STANDING COMMITTEE ON PETROLEUM
& NATURAL GAS (2022-23)**

Sl. No.	Name of Members
LOK SABHA	
Shri Ramesh Bidhuri - Chairperson	
2	Dr. Ramesh Chand Bind
3	Shri Pradyut Bordoloi
4	Shri Girish Chandra
5	Smt. Chinta Anuradha
6	Shri Dilip Saikia
7	Shri Topon Kumar Gogoi
8	Shri Naranbhai Bhikhabhai Kachhadiya
9	Dr. Kalanidhi Veeraswamy
10	Shri Santosh Kumar
11	Shri Rodmal Nagar
12	Shri Mitesh Rameshbhai Patel
13	Shri Unmesh Bhaiyyasaheb Patil
14	Shri M.K. Raghavan
15	Shri Chandra Sekhar Sahu
16	Shri Gajanan Chandrakant Kirtikar
17	Dr. Bharatiben Dhirubhai Shiyal
18	Shri Janardan Singh Sigrwal
19	Shri Lallu Singh
20	Shri Vinod Kumar Sonkar
21	Shri Ajay Tamta
RAJYA SABHA	
22	Shri Shaktisinh Gohil
23	Smt. Kanta Kardam
24	Shri Mithlesh Kumar
25	Shri Pabitra Margherita
26	Shri Rambhai Harjibhai Mokariya
27	Shri Surendra Singh Nagar
28	Dr. Sasmit Patra
29	Shri Subhas Chandra Bose Pilli
30	Dr. V. Sivadasan
31	Shri Ravichandra Vaddiraju

**COMPOSITION OF THE STANDING COMMITTEE ON PETROLEUM
& NATURAL GAS (2023-24)**

Sl. No.	Name of Members
LOK SABHA	
Shri Ramesh Bidhuri - Chairperson	
2	Dr. Ramesh Chand Bind
3	Shri Pradyut Bordoloi
4	Shri Girish Chandra
5	Smt. Chinta Anuradha
6	Shri Dilip Saikia
7	Shri Topon Kumar Gogoi
8	Shri Naranbhai Bhikhabhai Kachhadiya
9	Dr. Kalanidhi Veeraswamy
10	Shri Santosh Kumar
11	Shri Rodmal Nagar
12	Shri Mitesh Rameshbhai Patel
13	Shri Unmesh Bhaiyyasaheb Patil
14	Shri M.K. Raghavan
15	Shri Chandra Sekhar Sahu
16	Shri Gajanan Chandrakant Kirtikar
17	Dr. Bharatiben Dhirubhai Shiyal
18	Shri Janardan Singh Sigriwal
19	Shri Lallu Singh
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27	Shri Surendra Singh Nagar
28	Dr. Sasmit Patra
29	Shri Subhas Chandra Bose Pilli
30	Dr. V. Sivadasan
31	Shri Ravichandra Vaddiraju

**COMPOSITION OF THE STANDING COMMITTEE ON PETROLEUM
& NATURAL GAS (2024-25)**

Sl. No.	Name of Members
LOK SABHA	
Shri Sunil Dattatrey Tatkare - Chairperson	
2	Shri Gurjeet Singh Aujla
3	Shri Benny Behanan
4	Shri Maddila Gurumoorthy
5	Shri Dileshwar Kamait
6	Shri Putta Mahesh Kumar
7	Shri Vinod Lakhamshi Chavda
8	Smt. Joba Majhi
9	Smt. Pratima Mondal
10	Shri Laxmikant Pappu Nishad
11	Shri Jai Prakash
12	Shri Dilip Saikia
13	Smt. Kamaljeet Sehwari
14	Shri Janardan Singh Sigriwal
15	Dr. Amar Singh
16	Shri Vivek Thakur
17	Shri Ve Vaithilingam
18	Shri Balashowry Vallabhaneni
19	Shri Parbhubhai Nagarbhay Vasava
20	Dr. Kalanidhi Veeraswamy
21	Shri Dharmendra Yadav
RAJYA SABHA	
22	Shri Chunnilal Garasiya
23	Shri Narain Dass Gupta
24	Shri Chandrakant Handore
25	Shri Manoj Kumar Jha
26	Shri Mithlesh Kumar
27	Shri Dorjee Tshering Lepcha
28	Shri Mayankbhai Jaydevbhai Nayak
29	Shri K.R.N. Rajeshkumar
30	Dr. V. Sivadasan
31	Shri Ravi Chandra Vaddiraju

**COMPOSITION OF THE STANDING COMMITTEE ON PETROLEUM &
NATURAL GAS (2025-26)**

Shri Sunil Dattatrey Tatkare – Chairperson

Members

LOK SABHA

2	Shri Gurjeet Singh Aujla
3	Shri Benny Behanan
4	Shri Maddila Gurumoorthy
5	Shri Dileshwar Kamait
6	Shri Putta Mahesh Kumar
7	Shri Vinod Lakhamshi Chavda
8	Smt. Joba Majhi
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10	Shri Laxmikant Pappu Nishad
11	Shri Jai Prakash
12	Shri Dilip Saikia
13	Smt. Kamaljeet Sehrawat
14	Shri Janardan Singh Sigriwal
15	Dr. Amar Singh
16	Shri Vivek Thakur
17	Shri Ve Vaithilingam
18	Shri Balashowry Vallabhaneni
19	Shri Parbhubhai Nagarbhay Vasava
20	Dr. Kalanidhi Veeraswamy
21	Shri Dharmendra Yadav

RAJYA SABHA

22	Shri Chunnilal Garasiya
23	Shri Chandrakant Damodar Handore
24	Prof. Manoj Kumar Jha
25	Shri Mithlesh Kumar
26	Shri Dorjee Tshering Lepcha
27	Shri Manas Ranjan Mangaraj
28	Shri Mayankkumar Nayak
29	Shri K.R.N. Rajeshkumar
30	Dr. V. Sivadasan
31	Shri Ravi Chandra Vaddiraju

SECRETARIAT

1	Shri Harish Chandra Bist	Joint Secretary
2	Shri Sujay Kumar	Director
3	Smt. Raji Manish	Committee Officer

INTRODUCTION

I, the Chairperson, Standing Committee on Petroleum & Natural Gas having been authorised by the Committee, to submit the Report on their behalf, present this Ninth Report on the subject 'Examination of R&D Activities of Oil PSUs'.

2. The Committee took briefings by the representatives of the Ministry of Petroleum & Natural Gas/Oil PSUs in connection with examination of the subject at their sittings held on 28.02.2023 and 19.05.2023 and took oral evidence on 09.12.2024, 04.02.2025 and 24.02.2025.

3. The Report was considered and adopted by the Standing Committee on Petroleum and Natural Gas on 10.08.2026.

4. The Committee wish to express their thanks to the representatives of the Ministry of Petroleum and Natural Gas and Oil PSUs for placing their views before them and furnishing the information desired in connection with examination of the subject.

5. The Committee also place on record their appreciation for the valuable assistance rendered to them by the officials of the Lok Sabha Secretariat attached to the Committee.

**New Delhi;
10 August, 2026
19 Sravana, 1948 (Saka)**

***Sunil Dattatrey Tatkare,
Chairperson,
Standing Committee on
Petroleum & Natural Gas***

REPORT

PART I

INTRODUCTORY

The country's oil sector operates in a dynamic global environment marked by volatile energy markets, evolving regulations and rapid advances in technology. Research and Development (R&D) efforts by Oil Public Sector Undertakings (PSUs) are key to promoting innovation, improving efficiency and ensuring the nation's energy security.

Over the years, Oil PSUs have set up modern R&D centres with advanced facilities and skilled professionals. The R&D ecosystem of Oil PSUs comprises a network of 16 R&D Centres and 5 regional laboratories across the country. Their research covers various areas such as refining techniques, petrochemicals, alternative fuels, renewable energy solutions, clean technologies and digital solutions, aiming to optimize operations and diversify the energy portfolio. The Centre for High Technology (CHT) serves as the dedicated technical arm of the Ministry of Petroleum & Natural Gas. The 'Scientific Advisory Committee (SAC) on Hydrocarbons' under the Ministry of The Petroleum and Natural Gas evaluates and recommends R&D proposals for funding and implementation.

Today, the energy sector in general and oil sector in particular, are facing multi-faceted challenges such as limited crude oil availability, unstable global crude prices, strict quality and environmental rules and rapid changes in technology. In the present geopolitical environment, characterized by conflicts, sanctions, supply chain disruptions, trade uncertainties and heightened volatility in global energy markets, the importance of R&D has become even more pronounced. In this scenario, focussed and strategic R&D work by Oil PSUs are vital for development of indigenous technologies, cost-effective solutions and environment friendly processes that support both business growth and national energy objectives.

I. EXPENDITURE IN R&D

1.1 The R&D expenditure by PSUs is primarily met through Internal Resources and generally there is no budgetary support from the Government for R&D activities is provided. For selected projects such as for setting up Bioenergy demonstration plants, National Green Hydrogen Mission (NGHM), etc. support is provided by government agencies such as Centre for High Technology (CHT), PM JIVAN, Oil Industry Development Board (OIDB), Department of Science and Technology (DST), Department of Biotechnology (DBT), MNRE, etc., For FY 2025-26, MRPL has received a grant-in-aid of Rs 6.7 Crore from OIDB for PET plastic waste depolymerisation pilot cum demo plant.

1.2 The amount spent by Oil PSUs/CPSEs on R&D from F.Y 2021-22 to 2025-2026 are as follows:

(Figures in Crore)

Sl.No.	CPSE	FY 2021-22	FY 2022-23	FY 2023-24	FY 2024-25	FY 2025-26
1.	ONGC	531.59	569.85	686.68	667.31	744.48
2.	IOCL	576.55	698.21	946.14	1067.03	717.13
3.	HPCL	363.67	319.22	352.50	463.25	579.41
4.	BPCL	219.82	168.60	189.97	220.99	295.84
5.	GAIL	243.70	180.71	250.20	375.53	262.67
6.	OIL	100.96	179.03	149.22	147.3	173.22
7.	EIL	28.55	30.10	29.12	26.79	23.25
8.	BLC	7.91	7.84	8.36	9.01	10.24
9.	MRPL	1.01	0.57	5.57	40.18	46.73
10.	NRL	2.73	2.09	11.97	27.69	38.14
11.	CPCL	7.15	9.72	10.72	12.73	17.84
	TOTAL	2083.64	2165.94	2640.45	3057.81	2908.95

1.3 With regard to the query whether the expenditure of the Oil PSUs on R&D is adequate in view of the ambitious energy transition goals, the Ministry submitted the following written reply:

“The expenditure on R& D activities by the Oil and Gas PSUs is made available as per demand of the activities undertaken by them. As such, no financial constraint is faced by Oil PSUs in meeting requirement of funds for R&D activities. The R&D expenditure by PSUs is effectively aligned with the needs and strategic goals of the organizations. Several R&D initiatives are taken to align with energy transition goals and to support clean energy solutions, enhance fuel efficiency, and develop sustainable alternatives in areas of biofuels, Green Hydrogen, carbon capture, wastes utilisation, petrochemicals and niche products etc.

While Major PSUs have established their own R&D centres, R&D projects are also taken up in collaborative mode with various Engineering Institutes, CSIR Laboratories. Centre of Excellence have also been established in collaboration with various research and academic institutes like IITB, IIT Guwahati, CSIR-NEIST, etc. IOCL is setting up a New R&D Campus with a Capex of Rs. 3200 crore. OIL is focusing on energy transitional goal through renewable and alternate energy efforts like Solar, Wind, Green Hydrogen, Geothermal sources, CBG etc. for which an estimated Rs 20,000 crore has been earmarked till 2030”.

1.4 When the Committee observed that the expenditure in R&D sector by Oil PSUs is less vis-à-vis their profits, the Ministry furnished the following written reply in response:

“While R&D expenditure may appear modest relative to profits, it is effectively aligned with the organization’s needs and strategic goals and to meet India’s evolving energy needs. This allocation is aligned with the Government’s directive to foster innovation and strengthen the technological base of the oil and gas sector.” “R&D expenditures is continuously increasing on a year-on-year basis as these companies ventures into new sunrise areas and aligns with India’s sustainability goals, including achieving net-zero emissions by 2046.”

1.5 When the Committee desired to know about the combined as well as individual percentages of R&D expenditure by Oil PSUs during the year 2025-26, the Ministry furnished the following reply:

“The expenditure on R&D activities by some of the major Oil and Gas PSUs in comparison to their profit for FY 2025-26 is as follows:

Oil PSUs	R&D Expenditure (in Cr.)	PAT (in Cr.)	R&D Expenditure as % of PAT
ONGC	744.48	32894	2.26%
OIL	173.22	4455.34	3.89%
IOCL	717.13	43677.32	1.64%
BPCL	295.84	23303	1.27%
HPCL	579.41	17175.23	3%
EIL	23.25	691.59	3.36%
GAIL	262.67	6968	3.77%
	2796	1,29,164.5	2.16%

BLC, MRPL, NRL and CPCL have also spent 4.17%, 2.42%, 1.25% and 0.58 % of their Profit After Tax (PAT) on R&D in 2025-26, respectively.

1.6 With regard to the Gross Expenditure on Research and Development (GERD) in the petroleum sector during the year 2020–21 and the proportion it constituted of India’s total GERD amounting to Rs. 1,27,380.96 crore in 2020-21, the Ministry submitted the following written reply:

“The Gross Expenditure on Research and Development (GERD) in the petroleum sector during the year 2020-21 are:

India’s total GERD	1,27,380.96 Crore
Oil and Gas CPSEs GERD	1634.45 Crore
Ratio (%)	1.3 %

1.7 Regarding setting up a norm for all oil PSUs mandating to spend a minimum percentage of their turnover on R&D activities, the Ministry furnished the following reply:

“There is no separate guideline from Government mandating spending a minimum percentage of their PBT on R&D activities. During the fiscal year 2023-24, one of the key MoU parameters is to increase in Expenditure on R&D/Innovation Initiatives by 10% over the previous Financial Year with a 5% weightage. However, the ministry would explore the setting up of a norm for earmarked/ mandated minimum expenditure on R&D activities.”

1.8 Explaining further on this MoU parameter to increase in Expenditure on R&D/Innovation Initiatives by 10% over the previous Financial Year with a 5% weightage, the Ministry submitted the following details:

“During the fiscal year 2023-24, increase in Expenditure on R&D/Innovations initiatives by 10% over previous Financial Year was one of the MoU parameters for IOCL.”

1.9 As regards the Committee’s query during the sitting held on 04.02.2025 on the R&D expenditure and R&D expenditure to GDP ratio in comparison to other countries, the Ministry submitted the following written reply:

“The Gross Expenditure on Research and Development (GERD) in India has exhibited a consistent upward trajectory, from Rs. 60,196.75 crore in 2010-11 to Rs. 1,27,380.96 crore in 2020-21. This substantial increase reflects a more than twofold growth over the specified timeframe, underscoring the nation’s commitment towards research and innovations.

According to the UNESCO Science Report 2021, India’s global standing in GERD is noteworthy, constituting 3.1% of the World’s GERD. This recognition on the global stage signifies India’s growing significance in contributing to the collective pool of scientific and innovative endeavors. The escalating GERD figures and international acknowledgment underscore India’s dedication in advancing research across diverse domains, positioning itself as a key player in the global scientific landscape, India’s R&D spending has historically hovered around 0.7% of GDP.”

II. MANPOWER IN R&D SECTOR

1.10 With regard to the measures taken by the Oil PSUs to secure the services of quality manpower for R&D, the Ministry submitted the following written reply:

“Presently, induction at Oil PSU R&D Centres is done with candidates possessing desired qualifications as per specific requirements including post graduate and PhDs. The recruitment is made on Open (Paper Advertisements) and rigorous selection process. In addition to open recruitment, some recruits are carried out through campus placements from reputed institutes. Hiring of few experienced professionals for specific requirements in R&D on fixed term engagement basis is also done through advertisements to attract quality manpower. Salary, structured career growth, and performance incentives are offered in line with DPE guidelines to attract top talent.

The selected candidates undergo rigorous induction & training programs related to specific job role. Besides, as per need, manpower is also pooled from sister divisions. Furthermore, opportunity for continuous learning and skill development is provided by participating in regular training sessions, workshops, seminars, and conferences focused on emerging technologies such as green hydrogen, biofuels, and refining technologies etc.

The executives posted in R&D are given extensive exposure of field activities in initial phase of their career to first understand the practical aspect of the E&P operations. Subsequently, they are given enriched exposure of R&D activities in the respective R&D institutes in the industry on regular basis. Executives who are found to have knack and acumen for delivering quality performance are retained for R&D jobs for quite a longer stint.”

1.11 On being asked about the system in place to assess the quality of R&D manpower available in the market and recruitment of qualified R&D scientists from the market/private sector in the last three years, the Ministry submitted the following written reply:

“The recruitment of manpower for R&D Centre’s is done on a requirement basis and met in many ways, by fresh recruitment and from deputation of experience and qualified manpower from other sister divisions. The recruitment is done against a pre-defined eligibility criteria detailing the basic qualification, related experience and credentials required for the advertised post supported by interviews of candidates to assess the quality of manpower through scientific contributions in terms of technologies / catalysts / products developed, and by the patents filed and publications in high impact peer-reviewed journals.

The recruitment of R&D manpower in IOCL is currently synchronized to meet the demand for its upcoming new R&D campus in Faridabad.

HPCL R&D has recruited 34 scientists in the last three years.

BPCL in the last 3 years, recruited 7 candidates for R&D setup who joined in 2024. OIL has recruited 04 persons for R&D discipline”.

1.12 When the Committee desired to know the reasons for unproportionate manpower allocation in R&D sector vis-à-vis the total manpower, the Ministry furnished the following written reply:

“The allocation of manpower in the R&D sector is defined by the specialized nature of R&D activities, requiring focused teams of experts with advanced technical skills and domain knowledge.

Being commercial R&D Centres, the Organization structure, and vacancies in the R&D sector are periodically reviewed, and manpower recruited and adjusted based on evolving research priorities and business needs, ensuring that resources are optimally allocated to address critical challenges and opportunities and MoUs with various agencies. Accordingly, the total manpower on R&D is being progressively strengthened.”

1.13 Regarding the extant mechanism available for hiring of manpower on contractual basis or specialization basis to work on specific projects, the Ministry submitted the following written reply:

“Some of the manpower like Research associates & Project Assistants are employed on a contractual basis through a contractor providing qualified

manpower against specific project requirements on a fixed-term contract by IOCL, BPCL and EIL. Besides permanent staff, a few research fellows doing their Ph.Ds in specific areas are also engaged for specific periods as per requirement. For this purpose, Oil PSUs contact various premier academic and research institutes like CSIR, IITs, etc.

However, HPCL R&D Centre hires Research Associates directly on basis of their specialisation. They are hired for fixed duration for carrying out specific research projects through open advertisement in newspaper/website. Selection is through computer-based tests (wherever applicable), Evaluation of CVs by SMEs, Personal Interview and Pre-Employment Medical Examination.”

1.14 Upon a query about the terms and conditions of employment of the Scientists/Engineers and Technicians working in R&D Centres of Oil PSUs and whether such terms and conditions are sufficient to attract best talent, the Ministry submitted the following written reply:

“The pay structure of Management Staff of Oil PSUs is in line with DPE norms on the matter. All Management staff are governed by the same. The pay and allowances applicable to non-Management staff of the Corporations are governed by the Long-Term Settlements (LTS) signed between Management and Unions. As on today, the present DPE terms and conditions, as well as LTS provisions (as applicable) are adequate to attract the best talent.”

1.15 Detailing on manpower in R&D, the Ministry stated as follows during the oral evidence: [Ref.: Verbatim Proceeding, Sitting dated 24.02.2025, Page No. 5]

“आरएंडडी मैंन पावर आप देख सकते हैं, इंडियन ऑयल का 457 है, बीपीसीएल 60 है, एचपीसीएल 140, ईएल 53 है, गेल 9 है, ओएनजीसी का 842 और रॉयल इंडिया का 58 है। इसमें आप देख सकते हैं कि कांट्रेक्टुअल मैंन पावर कुछ ज्यादा नहीं हैं। रिक्रूट ऑफ प्रोसेस जो है, इट्स बेसिकली ओपन, कैंपस सिलेक्शन से भी होता है और हम लोग विज्ञापन करके भी उन्हें लेते हैं which has two/three levels. We have to conduct exams. There are two levels of interviews.

We maintain reservation as per the government mandate and we also have few experienced professionals for specific requirement in R&D. Retention business, as you can see that we have well-defined career progression, long term and stable tenure posting, then mentorship development programs and recognition for our outstanding achievements and comprehensive induction and training programs are there by each PSU and sponsorship for advanced training programs.”

1.16 Regarding attrition, the Ministry stated as follows during the oral evidence: [Ref.: Verbatim Proceeding, Sitting dated 24.02.2025, Page No. 29]

“Fortunately, in our case, the total number of people employed in R&D activities across our major PSUs is nearly 2,000. Over the last five years, our attrition has been just about 100 to 110, which is a very low level. We also continue to hire new personnel, and attrition includes those retiring or seeking better

opportunities, so it is not a concerning issue. Now, is the number 2,000 sufficient? More than the number or the budget, we should be dissatisfied if we are not achieving adequate outcomes. We are outcome-focused; we aim to produce something useful. While it is easy to generate papers and write reports, we prioritize outcomes and providing quality, as well as creating the right environment for our personnel to conduct cutting-edge work. This is why investment in infrastructure and R&D facilities is crucial. Acquiring numbers is the easy part; delivering results and providing a supportive environment is essential.

At this point, we have no plans to extend the limit of CHT to upstream or downstream, as separate entities already exist for upstream, such as ONGC and OIL, which have full-fledged centres. There is currently no proposal to expand the limit of CHT.”

1.17 Expounding further on the legal status and terms and conditions of the service of research associates working in R&D Departments of Oil PSUs, the Ministry furnished the following written reply:

“Research associates are employed on a contractual basis through a contractor providing qualified manpower against specific project requirements on a fixed-term contract of usually two years extendable for one additional year depending upon the requirement of specific project. However, HPCL R&D Centre hires research associates directly.

The appointment of Research Associates is based on their educational qualification, research experience, and specific skills relevant to the project. Research associates are required to adhere with code of conduct, maintaining professionalism, integrity, and confidentiality regarding research data, results, and proprietary information of the organization. Adherence to statutory requirements applicable to the employment contract is ensured to protect the rights of the research associate.”

1.18 The Committee also understand that Oil Public Sector Undertakings (PSUs) participate in or host R&D talent conclaves to foster innovation, address the energy transition, and collaborate on challenges and opportunities in the oil and gas sector. These events are often organized by industry bodies like the Federation of Indian Petroleum Industry.

III. INFRASTRUCTURE IN R&D CENTRES AND BENCHMARKING

1.19 When the Committee desired to know about the R&D Centres of Oil PSUs, the Ministry, furnished the following reply:

“Each Oil PSU has its own R&D Center. The location of R&D Centers of Oil PSUs are as under.

PSU	LOCATION OF R&D CENTRES
IOCL	i. Existing R&D Centre is at Sector 13, Faridabad, Haryana. ii. New upcoming campus at IMT, Sector-67 in Faridabad, Haryana (consisting of new research centers for Alternative & Renewable

	Energy, Corrosion Research, Nanotechnology and Synthetic Biology. Slated for stagewise commissioning starting from Q4 2023-24.)
BPCL	i. Corporate R&D Centre at Plot No. 2A, Udyog Kendra, Surajpur, Greater Noida, Uttar Pradesh 201306 (India) ii. Sewree R&D Centre at 13, Sewree Ford Rd, BPCL Complex, Sewree, Mumbai, Maharashtra 400015 (India)
HPCL	Hindustan Petroleum Green Research and Development Centre, (HPGRDC) at Tarabanahalli, Devanagundi, Bengaluru, Karnataka.
EIL	EIL R&D Centre Sector16, Gurgaon, Haryana.

A complete List of the 16 R&D Centres and 05 Regional Labs established by Oil PSUs across the country are given at Annexure-I.

1.20 With regard to the availability of facilities for research in pure sciences in the research centres of Oil PSUs, the Ministry furnished the following reply:

“Being business R&Ds, the Oil PSU R&D Centres are primarily focused on the technology Push or Marketing Pull type of projects aligned to the short, medium, long term business objectives and overall government priorities around self-reliance & import substitution. The major research areas under R&D Centre inter alia include Fuel & Additives, Alternative Energy – Bioenergy, Solar Energy, Hydrogen, Energy Storage etc., Refining Technology & Catalyst Research, Nanotechnology, Pipeline & Corrosion Research, Petrochemical & Polymers, Tribology and Applied Metallurgy, API technology, CCUS, Basin Analysis, petroleum System Modeling, Fundamental Geoscience Research, Exploration in Frontier & Foreign Basins, Non-seismic Prospecting, Well Logging and Reservoir Studies, Biostratigraphy, Geochronology, Remote sensing and Geochemical Analysis, Unconventional Hydrocarbon Research, new Energy and Sustainability Initiatives (CCUS, Geothermal Energy & Geological Hydrogen), etc. As these Centre’s are working on technology and hardware development, analytical facilities for development of such technology and components based on pure sciences are broadly available.”

1.21 As regards benchmark for gradation of research centres of Oil PSUs, the Ministry submitted the following written reply:

“At present, there is no mandated benchmark for grading Oil PSU research centers in India. However, several globally established factors are used by PSU research centres to map their performance. This includes the number of publications in journals, patents filed, demonstration of products and technologies etc.”

1.22 With regard to the representation of R&D Department of Oil PSUs in their Board of Directors, the Ministry informed that “only IOCL’s R&D Department has representation on its Board of Directors.

1.23 With regard to on-going construction of R&D Centres, their focus areas, cost outlay and timeline for completion, the Ministry submitted the following written information:

“IOC R&D is setting up 2nd R&D Campus in Faridabad close to the existing campus with an approved outlay of 3199 Cr. The project is almost 60% complete and commissioning of facilities will start in stages from FY 2025-26. The new Centre will also house research facilities for areas like renewable energy, nanotechnology, and material & corrosion science. The Centre will house many facilities like a gas pig test loop, solar based and biomass gasification to green hydrogen pilot plants. The center will also be equipped with 9 MW solar generation capacity taking care of internal requirements.

HPCL R&D Centre is setting up Centre of Excellence (CoE) in Bitumen and Pavement Technology at a cost of about Rs. 70 crores. Expected time of completion is March 2026.

BPCL R&D is currently augmenting infrastructure by constructing Biotech, Polymer and Process Scale up Labs at an estimated cost outlay of Rs. 15 Crore with timeline for completion July 2025.

GAIL has envisioned a state-of-the-art research facility in NCR in an area of ~30 acres at an investment of Rs. 550–600 crores excluding cost of land and is slated for completion by the end of 2029 in a phased manner to ensure systematic development. The center will focus on developing cutting-edge technologies, processes, products, and solutions that enhance the efficiency, sustainability, and environmental responsibility in operations.

A state-of-the-art R&D Centre is under construction by OIL at an estimated cost of Rs. 172 crore with expected completion date is April 2026, for Centralized Core Repository and advanced geological laboratory facilities in Guwahati, Assam, India, the first of its kind in South-East Asia. It is projected that this will entail the preservation of conventional cores, drill cutting samples, rack samples, laboratory analysis, digital imaging of core, core viewing, digital archival system, etc.”

IV. RESEARCH ARTICLES

1.24 When the Committee desired to know whether R&D Centres of Oil PSUs publish research articles in major science journals, the Ministry submitted the following written reply:

“R&D Centres of Oil PSUs regularly submits research articles in major national and international science journals. Number of research articles published are as follows:

Period	IOCL	BPCL	HPCL	EIL	TOTAL
2022-25	127	71	144	21	363

Indian Oil R&D Scientists are also featuring in top 2% database published by Stanford University, USA and Elsevier, BV for the last 2 years.”

1.25 When the Committee sought details about studies conducted by Oil PSUs for organizing their research activities, either through outside agency or by themselves, the Ministry submitted the following written reply:

“CHT under the MoPNG is working with R&D Centres of oil PSUs through their Scientific Advisory Committee (SAC) and other project-based engagements. Besides, Oil PSUs undertake internal assessment of their research portfolios to ensure that they are aligned to the short, medium and long terms business objectives. There is established system of regularly identifying various business risks at organizational levels and in-turn, the elements associated with R&D are assigned to the R&D Centres to further work upon.”

V MONITORING OF R&D PROJECTS

1.26 When the Committee desired to know whether the Ministry of Petroleum & Natural Gas closely monitors and review the activities and performance of R&D Departments of Oil PSUs and the monitoring mechanism in place for the same, the Ministry submitted the following written reply:

“Yes, the Ministry of Petroleum and Natural Gas closely monitors and reviews the activities and performance of R&D departments in Oil PSUs. In this line, annual MOUs are signed by Oil PSUs with MoPNG. CHT under aegis of MoPNG act as the nodal agency for coordination among R&D Departments of Oil PSUs for selection of specific research areas aligned to government priorities and to fund/ monitor/review the progress of working groups. CHT not only sponsors and facilitates R&D projects undertaken by Oil PSUs but it also leverages its strong network of prominent scientific institutions and industry professionals to provide valuable technical expertise to assess the progress of ongoing projects. For better synergy of research efforts among oil PSUs & to avoid overlapping in areas of national importance, a committee comprising of R&D heads of IOCL, HPCL, BPCL & EIL was formed by MoPNG with CHT as coordinator. The committee deliberated and suggested critical areas of national importance around which CHT is now constituting collaborative projects with O&G PSUs, academic institutions etc under various funding schemes and monitoring periodically.”

1.27 With respect to the oversight mechanism in Oil PSUs for monitoring the activities of R&D Departments, the Ministry furnished the following written reply:

“The details of the oversight mechanism in Oil PSUs for monitoring the activities of its R&D Centres are as follows:

Oil PSUs have their internal arrangements on lines of Research Advisory Committees to help identify and monitor activities.

✓ R&D Centres are required to submit the details of major projects, financial allocations of R&D projects, their progress, etc.

✓ R&D performance is normally evaluated based on established Key Performance Indicators (KPIs), which may include patents filed, research publications, technology transfer and cost-effectiveness.

✓ Regular internal audits are also conducted to ensure compliance with policies and regulations as well as to assess the efficiency of R&D operations.”

1.28 As regards the mechanism for coordination among R&D Departments of Oil PSUs regarding selection of areas for research by them to avoid overlapping in research activities, the Ministry furnished the following reply:

“There are several mechanisms to ensure coordination among Oil PSUs to meet both the common objective aligned to government priorities as well as the individual specific business priorities of respective Oil PSUs. The details are as under:

Centre for High Technology (CHT) is set up under aegis of MoPNG to act as the dedicated technology cell of the Ministry for Hydrocarbon Sector. It is also the nodal agency for coordination among R&D Departments of Oil PSUs for selection of specific research areas aligned to government priorities while making use of industry academia-private partnership and also to fund/monitor/review the progress through Scientific Advisory Committee (SAC) and regular meetings of working groups.

Different regulatory boards, think tanks, industry associations, etc. such as Oil Industry Development Board (OIDB), Director General of Hydrocarbon (DGH), LPG Equipment Research Centre (LERC), Federation of Indian Petroleum Industry (FIPI), Centre of Excellence for Oil Gas & Energy (CoEOGE), etc. serve as platforms for effective and targeted collaboration among Oil PSUs focused on dedicated areas, enabling stakeholders to discuss and plan projects while facilitating information sharing and alignment towards common objectives.

The coordination among the R&D departments of Oil PSUs is also achieved through Working Group associations (related to specific areas as bioenergy, hydrogen, carbon capture, Advanced Cell Chemistry Batteries, etc.) with active involvement of Ministry involving representatives from Oil PSUs, think tanks and subject matter experts.

For better synergy of research efforts among oil PSUs & to avoid overlapping in areas of national importance, a committee comprising of R&D heads of IOCL, HPCL, BPCL & EIL was formed by MoPNG with CHT as coordinator. The committee deliberated and suggested critical areas of national importance around which CHT is now constituting collaborative projects with O&G PSUs, academic institutions etc. under various funding schemes and monitoring periodically.

Committee of ONGC Institutes (COIN) is setup under the aegis of Director (Exploration) as convener COIN to maintain coordination and overview of activities of the 8 R&D institutes of ONGC.”

1.29 In this regard, the Ministry also stated as follows during the oral evidence: [Ref: Verbatim Proceedings, Sitting dated 04.02.2025 & Page No. 20-21]

“There was an issue raised about coordination amongst various R&D activities. So, as we mentioned, we have an Advisory Council already under Dr. Kakodkar. We also interact very closely with the R&D member at the NITI Aayog. So, we keep coordinating all our efforts.

It is Scientific advisory council. In addition, at the Centre of Excellence which we have at IIT Mumbai, there also companies participate because they have funded it. So, two- or three-fold intention always there. First, we do not duplicate our efforts. Second, we focus our efforts into those things which the country needs and which companies will find it profitable to do.”

VI. R&D ACTIVITIES ON EOR/IOR

1.30 With regard to R&D activities towards Enhanced Oil Recovery (EOR)/Improved Oil Recovery (IOR) methods, developing marginal oil fields and exploration in non-traditional areas such as deepwater exploration and ultra deep-water exploration as a measure to reduce high import dependency, the Ministry submitted the following written reply:

“ONGC is implementing EOR technologies in its fields on pilot as well as commercial basis. Cyclic Steam Stimulation (CSS) is being implemented in a pilot project involving 14 wells in a Western Sector of ONGC. Cyclic Steam Stimulation (CSS) is a thermal Enhanced Oil Recovery (EOR) technique utilized to extract viscous oil efficiently by injecting steam at high temperatures. Microbial Enhanced Oil Recovery (MEOR) is another technique used to enhance the recovery of highly viscous oils by utilizing specific bacterial consortia, which help to reduce oil viscosity by breaking down higher hydrocarbons and generating bio-surfactants.

Exploration in Deep water and ultra-Deep water has expanded greatly during the past decades. ONGC is focusing to expand its exploration activities in India’s vast sedimentary areas falling in the Deepwater and ultra-deep water Offshore areas with an objective of converting the HC resources to reserves. ONGC is actively participating in OALP bid rounds and up to OALP Bid Round-IX, ONGC has been awarded a total of 15 blocks in deep & ultradeep water sector covering an area of 99,980 Sq.km. Increasing no. of blocks in deep/ultradeep-water sector in subsequent OALP bid rounds reflect ONGC’s dedicated efforts for exploration in these areas. With the persistent exploratory efforts, as on 01.01.2026, ONGC has notified 3 hydrocarbon discoveries in deep/ultradeep-water OALP blocks, namely Utkal & Konark in Mahanadi-DW and Chola in Cauvery-UDW.

ONGC is currently operating 20 acreages in Deep Water and Ultra Deep-Water offshore areas spanning a total of 1,02,597 km² spread over Mahanadi, Krishna-Godavari, Cauvery, Andaman, Kerala-Konkan and Saurashtra Offshore. Water depth in these acreages ranges from 200 to 3200m.

OIL has partnered with a range of national and international universities, research institutions, and private sector technology developers to explore cutting-edge

techniques such as CO₂ injection (CO₂-EOR) and microbial enhanced oil recovery (MEOR) for boosting oil recovery from ageing fields and reservoirs. Customised EOR screening methods specific to matured field of Assam has been devised through the collaborative study with University of Houston, USA. Studies related to Chemical EOR have been completed as collaborative projects and is currently in the field implementation stage. Further, these R&D collaborations, have paved the way for the designing of new chemical formulations to improve the recovery efficiency like utilizing optimized “Low Saline Water flooding (LSW)” techniques aimed at enhancing oil displacement. Currently, OIL is planning such R&D collaboration projects with some of the national institutes like IIT-Kharagpur, IIT (ISM) Dhanbad, IIT-Bombay etc. HPCL R&D has signed an MOU with Oil India Limited (OIL) towards exploring Enhanced Oil Recovery using CO₂ captured through in-house developed HP-BH₂ technology, and development of novel products for upstream applications.”

VII. R&D ON SHALE OIL AND GAS HYDRATES

1.31 As regards R&D activities undertaken in the shale and oil and gas hydrates and their economic viability in the near and long term, the Ministry submitted the following written reply:

“Gas hydrates in nature are crystalline solids containing water and mostly methane gas in a cage-like structure. Gas hydrate is basically found in high-pressure and low-temperature regimes in nature. These conditions are found mainly in continental margin and permafrost regions. In India, gas hydrate resources are found only in the continental margins in deep offshore. The gas hydrate research in India is being steered by the Ministry of Petroleum & Natural Gas, under National Gas Hydrate Program (NGHP) with participation from Directorate General of Hydrocarbons (DGH), National E&P companies and National CSIR Research Institutions. The program implementation is through the Technical Committee being coordinated by DGH. Commercial extraction of gas hydrate is still in the experimental phase globally, with no proven large-scale production.

Expedition	Objective	Outcome
NGHP-01	To establish the presence of gas hydrate in Indian offshore areas and assessment of the Gas hydrate resources.	Gas Hydrates presence was established in Krishna Godavari, Mahanadi and Andaman basins.
NGHP-02	Identification of sites with sand dominated reservoir and identify a suitable site for pilot production testing in NGHP-03 expedition.	Gas Hydrates bearing sand reservoirs were identified in Krishna Godavari basin.
NGHP-03	Identification of site(s) for Pilot Production testing, Preparation of Pilot Production Test Project Report, Evaluation of well integrity during Pilot production testing etc.	Expedition on-going.

There are three phases planned under NGHP out of which two expeditions

namely NGHP Expedition-01 and 02 has already been completed. The objective and outcome of these expedition is summarised as follows:

Bharat Petro Resources Limited (BPRL) has undertaken shale gas exploration activities in the operated Block in Abu Dhabi. ONGC had drilled total 30 assessments (10 exclusive shale gas wells and 20 dual objective) wells under Shale Gas Policy, 2013 in four basins viz. Cambay, KG, Cauvery and Assam & Assam-Arakan recovering a total of 118 conventional cores measuring total 1708 m along with recording of special logs for providing continuous inputs for geological and laboratory studies.

Shale Gas Exploration: National Oil Companies viz. ONGC and OIL were advised to carry out Shale Gas Assessment Program through the Shale Gas Policy notified by the Govt. of India 2013. ONGC began its shale oil/gas assessment with a pilot shale gas drilling programme in Damodar Valley. Four wells were drilled in this campaign targeting the Barren Measures Shale, two in Raniganj and two in North Karanpura. One of the wells in Raniganj where production testing was carried out flowed little gas.

ONGC drilled total 30 assessment (10 exclusive shale gas wells and 20 dual objective) wells in four basins viz. Cambay, KG, Cauvery and Assam & Assam-Arakan recovering a total of 108 conventional cores measuring total 1700 m along with recording of special logs. Based on the analysis of data generated through drilling, it is concluded that there are characteristic differences between the Indian Shale Play and the established shale systems of North America and the shale gas/oil potential does not demonstrate exploitation potential to be very encouraging in the areas assessed in the country till now.

ONGC under Shale Gas Policy Guidelines (Section-1, Para-V) had expressed for withdrawal from shale gas and oil operations in the nomination blocks.

OIL was granted permission for shale gas and oil exploration in six nominated blocks under Shale Gas Policy notified by the Govt. of India in October 2013 by the DGH. Based on the analysis of data generated through drilling, it is concluded that these formations do not hold encouraging potential for commercial shale oil and gas production.”

VIII. R&D ON IMPROVING REFINING EFFICIENCY

1.32 With regard to the initiatives undertaken to improve refining efficiency and produce cleaner fuels, the Ministry stated as follows in their written reply:

“Following R&D initiatives are being undertaken to improve refining efficiency and produce cleaner fuels

- Technical service support to refineries for improving process efficiency.
- Development of technologies and catalysts and chemicals to optimize refining processes, operational efficiency, resid upgradation, and improving fuel quality to support the clean fuel initiatives.
- Development of differentiated fuels with better fuel efficiency, lower emissions, and improved engine cleanliness.

- Development and deployment of clean technologies such as production of SAF, biomass gasification to hydrogen, 2G Ethanol, Bio methanation to produce CBG, Ethanol/ Methanol adoption etc.
- Circular economy initiatives like plastic circularity
- Leveraging AI/ML and digital technologies to improve operational efficiency.
- Development of real time crude oil assay crude oil compatibility prediction.
- Availability of technologies for boosting energy efficiency with cleaner fuels.
- Development of indigenous enzyme for production 2G bio ethanol.”

IX. UMBRELLA RESEARCH ORGANISATION

1.33 As regards establishing an umbrella Research organization in the Petroleum sector on the lines of CSIR or ICAR, the Ministry submitted the following written reply:

“In 2019, the Centre of Excellence in Oil, Gas, and Energy (CoEOGE) at IIT Bombay was established, as an umbrella platform, through an MoU signed by major seven oil and gas PSUs (IOCL, ONGC, HPCL, BPCL, GAIL, OIL and EIL) and IIT Bombay. The center fosters collaboration between PSUs and academia, allowing shared projects related to pressing national-level issues and bridging knowledge gaps.

MoPNG had also established Scientific Advisory Committee on Hydrocarbons (SAC), to promote research and innovation in downstream hydrocarbon sector. Today, the industry has been successful in developing ecosystem for carrying out research and innovation in the country.”

1.34 Detailing further on the functioning of CoEOGE, the Ministry submitted the following written information:

“The Centre of Excellence in Oil, Gas and Energy (CoE-OGE) is an interdisciplinary Centre, setup at IIT Bombay, under an MoU signed by seven PSUs of the Indian Oil & Gas sector, viz., IOCL, ONGC, HPCL, BPCL, GAIL, OIL and EIL and IIT Bombay.

The objectives of CoEOGE are as follows:

- Providing competitive advantage to India’s energy sector and its PSUs in the emerging business ecosystem driven by climate challenges, stressed resources, and disrupting technologies globally.
- Identifying areas of challenge beyond company boundaries and beyond the 10-year horizon.
- Translation of potential laboratory research to field prototyping and developing implementation-ready technology through collaboration with industrial professionals.
- Re-skilling and up-skilling of existing oil and gas industry professionals.
- Creating the next generation skilled human resources in the oil, gas, and new energy sectors and reducing the skill gap being faced in the sector.
- Exposing undergraduate and postgraduate students to the oil and gas sector.

The total budget for initial five years was Rs. 85 Crore, inclusive of Rs 25 crore as the initial setup and facility grant and an annual operation and research grant of Rs 12 crore. Initially the MOU was valid up to 2024 and later extended up to

2029. The total budget for initial five years was Rs. 85 Crore and for the next five years is Rs.88 Crore. The details of the grants and the shares of the participating PSUs are decided by the Governing Council. The CoEOGE carries out R&D works through mission, seed modes and PhD Fellowships. The CoEOGE also follows Strategized Research Approach (SRA) for carrying out specific research work in Battery, catalyst and Digitalization etc.

CoEOGE has undertaken 84 R&D projects through its various channels, namely exploratory seed projects, PhD fellowships, mission mode projects, and translational bridge-the-gap projects. The R&D projects completed at CoEOGE are now at the stages of further testing at relevant industrial conditions for translation to industrial applications and commercialization.

EIL is actively engaged in seven (7) mission mode projects with CoEOGE. EIL is also contributing to projects focused on Strategized Research Areas (SRA), including advanced batteries and Green Hydrogen.

OIL is pursuing Geothermal Energy Extraction from Abandoned Oil and Gas Wells with CoEOGE.

ONGC has very actively undertaken a total of 16 projects out of which 6 are SEED projects, 5 Mission Mode projects, 3 PhD Fellowship projects and 2 Bridge-the-gap project covering critical domains of unconventional hydrocarbons (gas hydrates, CBM), reservoir characterization, offshore/ocean monitoring, water & wastewater management, CCUS, renewable energy (offshore wind), and digital/numerical modeling.

These projects integrate exploration, production optimization, environmental sustainability, and energy transition, supported by capacity building through specialized training programmes for ONGC personnel.”

X. USE OF INDUSTRY 4.0 IN R&D

1.35 With respect to the use of AI, Robotics, Internet of Things (IoT) and big data analytics in R&D activities of the Oil PSUs, the Ministry furnished the following written reply:

“R&D Centre of Oil PSUs are working for adoption of AI, Robotics, Drone, the Internet of Things (IoT), and Big Data Analytics to enhance R&D activities, optimize operations, and making operations more intelligent, predictive, and automated.

Key initiatives are as follows:

- Adoption of data-driven simulation models to improve energy efficiency and reduce operational costs of in-house developed processes, developing digital twins of in-house developed refining processes, testing, and predicting lube and fuel formulations, development of catalysts and additives, material, and corrosion protection research.
- AI platforms are regularly employed for data analysis, trend analysis, gap analysis and predictive analytics, Cybersecurity Applications, Safety and Surveillance, Drone based inspection and AI based safety monitoring activities.

AI-enabled platforms for efficient Design of Experiments (DOE) in scientific projects. AI language models are used to facilitate complex brainstorming methods like TRIZ.

- AI tools, robots and drones are increasingly used for Molecular Modeling and Simulations such as Density Functional Theory (DFT) and Molecular Dynamics (MD) to gain insights into fundamental & scientific mechanisms.
- AI/ML based real time Optimizer have been developed and deployed for the power plant, polypropylene unit, and PFCC unit. AI/ML based predictive models for critical rotary machines have been implemented. AI based flare monitoring to identify the root cause of flaring has been deployed across the refinery complex.
- AI Applications with drone technology is utilised in Construction Site Safety to detects safety violations by analyzing worker behavior, equipment usage, and environmental conditions, providing real-time alerts to improve safety compliance.
- Inspection by AI powered self-navigating robots for pipe inspections, tank inspections, maintenance & monitoring of remote facilities, enhancing safety by reducing human exposure to dangerous environments and drones for monitoring column internals where human access is limited.
- GAIL, in collaboration with IIT Madras, is developing an AI-powered fiber-optic-based intrusion and leak detection system for gas pipelines. This advanced system aims to significantly improve safety and asset reliability by enabling real-time monitoring and rapid response to potential threats.
- IoT devices are being extensively used to monitor vibration and corrosion and take proactive action. Use of IoT-enabled sensors installed across refineries, pipelines, and storage tanks to monitor processes, physical assets (refineries, pipelines) gathering data for simulation, predictive analysis, and process optimization.
- EIL provides an IoT based Earthquake Warning System in technical collaboration with CSIR-CSIO. The system is presently in operation in Delhi Metro.
- ONGC has recently inducted its Seistelligence software integrating advanced Machine Learning (ML) workflows for seismic as well as data analysis, modelling and prediction.
- EIL is engaged with CERT-In/NCCC on the Honeybot project, which is used for enhancing threat intelligence.”

XI. PROTECTION OF R&D DATA AND INFRASTRUCTURE

1.36 In respect of R&D activities to protect infrastructure and R&D data of the Oil PSUs from cyber threats, the Ministry furnished the following reply:

“The R&D initiatives in cyber security are in line with the National Cyber security Frameworks and global best practices to enhance resilience against cyber threats. Continuous innovation and proactive defense mechanisms are being deployed to safeguard critical infrastructure and R&D data. Oil PSUs invest in robust cybersecurity measures for infrastructure, use advanced encryption, threat detection systems, and multi-layered firewalls to safeguard against cyber-attacks. All oil and gas PSUs have implemented a cyber-Resilient IT Infrastructure with cyber security frameworks integrated into industrial control systems (ICS) and IoT-based monitoring solutions. Security Information and Event Management (SIEM) systems also adopted for proactive monitoring and

response. Zero Trust Architecture Implementation, ensuring continuous verification of users, devices, and applications accessing the infrastructure. Use of multi-factor authentication (MFA), role-based access control (RBAC), and micro-segmentation strategies for enhanced security. Cyber Threat Intelligence and Information Sharing through dedicated teams for real-time monitoring, analysis, and mitigation of cyber threats established at Corporate Level.

Deployment of Incident Response and Disaster Recovery Frameworks to minimize downtime and ensure business continuity in case of cyberattacks. Also, deployed AI-driven security orchestration, automation, and response (SOAR) tools at corporate level for efficient threat mitigation. Simulation-based training and cyber drills to prepare personnel for cyber incidents. The R&D data is monitored through 24X7 central team. All the servers and end user machines have latest updated antivirus and patches. NextGen Firewalls and advanced AI tools are used to monitor threats and take appropriate action. The role-based internet access of users is monitored, and malicious sites are blocked. Cyber security is ensured for all the infrastructure used for various development activities. These AI-driven solutions continuously monitor security events, perform advanced log analysis, and strengthen the overall security posture through anomaly detection and behavioral pattern analysis”.

XII COLLABORATION WITH ACADEMIA IN R&D

1.37 With regard to collaboration with eminent research laboratories, universities and institutes in R&D Sector, the Ministry provided the following written reply:

“Oil PSUs either do the research work directly or as per need collaborate with various Indian and Foreign academic institutes with an objective to promote education, research, and innovation in the areas of mutual interest.

The company wise status is as follows:

PSU	DETAILS
IOCL	IOCL R&D collaborates with various Indian and Foreign academic institutes like IIT Delhi, IIT Kharagpur, ICT Mumbai, IISc Bangalore, IIT Mumbai, IIT Madras, Andhra University, IIT Roorkee, RGIPT, JC Bose University, CSIR and foreign universities like Deakin (Australia), Lund University (Sweden), etc. with an objective to promote education, research, and innovation in the areas of mutual interest. IOCL R&D has 48 number of such collaboration with various Indian and Foreign academic institutes of repute in last 3 years.
BPCL	BPCL R&D has 31 number of ongoing collaborations with various Indian and Foreign academic institutes of repute like IITs BARC, Curtin University, Australia, ICAR etc.
HPCL	HPCL R&D Centre is pursuing collaborative research projects with IITs, IISc, and other National and Research Institutes & Universities in the diverse areas around both core and futuristic domains. Collaborative work is also pursued with various international institutes such as RMIT Australia

	for seawater electrolysis. Further, HPGRDC also actively participates and is a member of several international forums such as CISTAR (Center for Innovative and Strategic Transformation of Alkane Resources), PSRI (Particulate Solid Research, Inc.), IEA Task 34 (Direct Thermochemical Liquefaction), IEA Task 37 (Energy from Biogas), IPI
EIL	Major collaborative projects being pursued by EIL are: CSIR-IIP (Bio-ATF, PVSA O2, Aromatic Extraction, Lube Extraction, Sulfur dioxide (SO2) Removal, Visbreaking, Delayed Coking, Propane deasphalting, Slurry Hydrocracking), IIT Delhi (Trickle Bed Reactor Technology, Cross Flow Reactor), PMPL (Membrane Technology), OECT (He Recovery), CSIR-NCL (DME technology), DBT-ICT (3G Algal Biofuel production, Direct CO2 conversion to Dimethyl Ether through Catalytic Hydrogenation with IIT-Roorkee, Thermo-catalytic cracking of ammonia to produce Hydrogen with IIT-Kanpur

XIII. INVOLVEMENT OF START-UPS IN R&D

1.38 When the Committee desired to know whether start-ups of the country have been involved by R&D Departments of Oil PSUs in their research activities and the details of research projects supported by Oil PSUs as well as the business model of collaboration with them, the Ministry furnished the following written reply:

“Under the stewardship of MoPNG, Oil & Gas PSUs including IOCL, HPCL, BPCL, &EIL supports Indian startups using varied funding models like Grant-in-Aid, Equity, Mix of Grant/Equity and Loans. Ideation domains are identified by capturing pain points/possible areas of operational efficiency improvement broadly related to Operational issues of Sector, Clean Energy challenges, technology adoption, ways to promote health/safety and protect environment thereby creating social capital for overall good of society. Mentoring support is also provided to Start-ups thru’ Tie-ups with educational/ professional institutions like IITs/IIMs/NITs/NRDC, etc.

The Role of R&D Centers of various Oil PSUs & mechanism of selection of startups is given below:

PSU	DETAILS
IOCL	At IOCL, startup is funded and engaged by R&D Centre. Till date thru 3 Rounds (including Green Resolve – Amrit KaalAdhyay startup round) of Open Innovation Challenge, 42 startups are funded and incubated under IndianOil Startup Scheme. Major areas of funding / support are artificial intelligence, robotics, societal relevance, pipeline surveillance & maintenance etc. IOCL floats Open Innovation challenges through dedicated web portal for call of innovative ideas / concepts / research proposals from startups / aspiring entrepreneurs for funding & incubation. Subsequently, project proposals are selected following a rigorous 3 level transparent selection process.
BPCL	At BPCL, selection and enrolment of start-up is done by Corporate Strategy department through open participative programs like innovation grand challenge. 30 Start-up are engaged in developing solutions pertaining to refinery, retail and healthcare. They have collaborated with these startups

	on projects ranging from scaling up membrane less electrolyser technology to carbon capture and conversion of CO ₂ to dimethyl ether.
HPCL	HPCL, through its startup initiative 'HP Udgam' has funded 28 Startups through CCPS mode and provided 30+ pilot project opportunities to startups in the areas of electric mobility, renewable energy, biofuel, safety & sustainability, digital initiatives etc. An exclusive portal (www.hpcl.startup.co.in) allows any DPIIT-registered startup to apply for funding at any time throughout the year. HPCL follows a robust selection process including two high-level evaluation committees followed by detailed due diligence through mentor institute IIM Lucknow Enterprise Incubation Centre.
EIL	Till date, 29 Nos Startups have been funded under EIL's Startup Initiative. Model of collaboration with Startup is grant (with provision of equity/royalty in agreements). Proposals for startup funding are received through registered Host Institutions and Incubation centers for Phase-I (Innovation Challenge Grant), Phase-II (Seed Fund), and Equity Funding. Each proposal undergoes rigorous eligibility screening to ensure alignment with predefined criteria. Following this, proposals are evaluated and shortlisted based on their potential and feasibility.
GAIL	GAIL startup initiative "Pankh" is managed by R&D department and through this initiative GAIL has invested and supported 38 Start-ups in the areas of CBG, Battery, Pipeline monitoring, fintech etc.
NRL	NRL is engaging with M/s Zymolent for development of indigenous enzymes for production 2G ethanol. The startup has been funded through a mix of grant and equity investment.
OIL	Oil India Limited (OIL) startup program is named as SNEH (Startup Nurturing Enabling and Handholding) . OIL's SNEH program is intended to provide both technical and financial support to startups across all the sectors, fostering growth through innovations. OIL had entered into MoU with 5 (five) leading institutions as incubator for selection, guiding and mentoring the startups. Currently 25 (startups) are being funded by OIL .
ONGC	A Decision Support System (DSS) tool was developed through the collaborative project between IDWE, ONGC and IIT-Guwahati titled "Development of Comprehensive interactive well monitoring software tool for Drilling Supervisors". This Resulted in a Tripartite Legal Agreement (TLA) exists between IDT, ONGC, IIT Guwahati and M/s Softdrill Solutions.

1.39 As regards, major technological breakthrough in research projects of Start-ups carried out with the support of Oil PSUs, the Ministry provided the following written reply:

“IOCL:

IndianOil R&D spearheads the Start-up funding scheme which has seen incubation of 42 start-ups in 3 rounds of funding. The total valuation of these startups stands at an impressive ~Rs. 2580 Crores, as independently evaluated by third-party agencies. (Round 1 & 2). IndianOil incubated startups have till date created 89 IPRs. Some important technological breakthrough achieved under IndianOil Startup Scheme are given below:

- ✓ M/s Netprise Solutions, Bengaluru - An automated fuel dispensing station having a Smart & Auto Fuel Dispenser, with secure authentication for user, consumer mobile app with digital wallet integration to ensure quality & quantity.

- ✓ M/s Sukriti Social Foundation, Gurugram - Self-sustaining low maintenance, AI enabled with intelligent flushing system, „Eco-toilet“ which consumes less fresh water for Retail Outlets.
- ✓ M/s Vasitars Pvt Ltd., Delhi - Low cost, simple to use composite nano material for online in-situ repair (cold work) of cross-country pipelines.
- ✓ M/s Amol Carbons Pvt Ltd., Pune - Technology for production of fuel grade r-DME from agricultural waste.
- ✓ M/s EzeRx Pvt Ltd., Bhubaneswar - Non-invasive and non - contact device for measurement of Hemoglobin.

HPCL:

At HPCL, Startup initiative „Udgam“ is steered by Corporate Strategy and Planning Group. Two R&D based start-up technological supported under „Udgam“ Startup Scheme are given below :-

Voltrez Tech Pvt Ltd HPCL has supported the startup on its project of manufacturing Dendrite-free cells, first of its kind globally. With the fund received through HPCL startup initiative „Udgam“, the startup has completed the following phases –

1. large scale synthesis of proprietary material
2. electrode coating and technique development
3. anode processing
4. Cell making

Currently the cells are at 360 Cycles at 25 Degree C and 1C charging rate. The startup has raised funds from new investors and working on improving the cycle life.

ASN Fuels Pvt Ltd With the support received from HPCL „Udgam“ Startup Fund, the startup has successfully demonstrated the operation of a continuous process of 10 Litre Per Day (LPD) of 2G Bioethanol by way scaling up a lab scale continuous process of 2G Bioethanol production developed in collaboration with IIT Tirupati.

EIL:

Vayujal Technologies Pvt Ltd, Host Institution IIT Madras- Prototype for Water Extraction from Atmosphere.

It is an Innovative idea for extraction of water from atmospheric air. o Modular filter cartridges to make water potable. Avoids uses of RO cartridges and required power and water re-circulation.

o Smart IoT for adaptive controls to provide optimum machine performance leading to lowest energy consumption per liter of water produced.

o Solar operated units to make fully stand-alone unit, can be installed anywhere.

} IIT Kanpur - Project title: Designing of Farmers Friendly Electrospray Machine from Lab to Field Application

o The farm spin Nanomachine will be using a rental model for framers.

o It will be used to spray fertilizers and pesticides.

- o The machine will have an attachment with tractors for easy of operations.
- o The consumables, like nano-fertilizers, will supply to farmers.
- o Also, the machine will be used to spray pesticides and other components for plant protection.
- o IIT Kanpur : Project title: Development of Steel-Integrated Floating Jetties (SIFJ)
- o designed to enhance operational efficiency, durability, and sustainability in maritime applications
- o sustainable waterways infrastructure
- o expertise in floating jetty installations customized to meet diverse industrial requirements

XIV. INTERNATIONAL COLLABORATION IN R&D

1.40 With regard to international collaborations in R&D in upstream as well as downstream operations, the Ministry stated as follows in a written reply:

“With the objective to promote education, research, and innovation in the areas of mutual interest, IOCL R&D collaborates with Foreign academic institutes like Deakin (Australia), Lund University (Sweden), etc. and also collaborating with foreign research labs, such as INEOS, Viridis, VITO, Phinergy, Lanzatech, Lanzajet, Lubrizol and technology licensors like Lummus, USA for marketing in-house developed technologies in foreign territories.

HPCL R&D has ongoing international research collaborations with RMIT Australia, CISTAR (Center for Innovative and Strategic Transformation of Alkane Resources) led by Purdue University, PSRI (Particulate Solid Research, Inc.), International Energy Agency Task 34 & Task 37 (Direct thermochemical liquefaction & Energy from Biogas) and University of Birmingham. HPCL R&D has also associated with Massachusetts Institute of Technology (MIT) and American Fuels and Petrochemical Manufacturers (AFPM) association for industry collaboration program.

BPCL has Joint development and marketing arrangement for its BPMARRK®-A tool for rapid crude assay, at global level with M/s AspenTech, USA for. On similar lines, web platform for K-model (A digital tool for crude compatibility) has been developed. In the overseas blocks, BPRL is in partnership with global oil majors like Petrobras, Rosneft, ADNOC and TOTAL. Through such partnerships BPRL has been accessing latest innovations and methodologies in development drilling and the production enhancement.

OIL has signed a MoU with Research Institutes, and Universities from both national and international organizations to work towards a collective R&D Program for the development of indigenous technologies to improve the exploration and exploitation of hydrocarbons and alternative energy sources.

- Carryout subsurface modelling Study for revitalization of the field along with identification of potential for amenable EOR schemes through collaborative

static and dynamic modelling study with Texas A&M Engineering Experiment Station (TEES).

- Collaborations and knowledge transfer in diverse areas like exploration and development studies, training & skilling, R&D upgradation, Net Zero initiatives & geothermal projects etc with M/s IFPEN, France.

ONGC is pursuing International Outreach programme to collaborate with global E&P majors with the objective of Joint technical studies, acquiring technical assistance / partnership in specific portfolios, knowledge sharing and skill development. In this regard Memorandum of Understanding (MoU) has been executed with some of the Global Majors; the details are given below:

ExxonMobil: ONGC signed MoU with ExxonMobil with a focus on Joint technical studies and cooperation in frontier offshore areas and PEL blocks on the east and west coasts, and open acreages for joint EoI submissions/bidding. MoA with present focus area in KG deep water sector, was also signed in 2024.

IFP Energies Nouvelles, France: The MoU was signed with IFPEN in 2023, to cooperate and collaborate in the development and application of expertise and leveraging suitable technologies relating to production from India's hydrocarbon reserves.

BP Exploration Alpha Limited: ONGC inked MoU with BP Exploration Alpha Limited to collaborate for joint bidding of the block GS-OSHP-2022/2, transfer of operatorship to RIL upon successful award of the block, execution of the JOA, and participation in future OALP rounds.

PEPOV, Petronas (E&P): Confidentiality Agreement entered between ONGC and PEPOV in 2024 for potential collaboration and farm-in opportunities in Andaman, KG, Bengal, Kerala- Konkan and new blocks specially those offered in OALP-X bid round.

Petrobras: Confidentiality Agreement (CA) entered with Petrobras in 2025 to explore potential farm-In opportunities in OALP-IX round blocks and collaborations opportunities for the OALP-X /Future bid round.

Chevron New Ventures PTE Limited: ONGC signed MoU in 2022 for Joint exploration opportunities and evaluation of ONGC-operated and open offshore acreages in Bengal, Assam Fold belt, KG, Cauvery & Mannar Basins.

Total Energies: ONGC signed MoU with Total Energies in 2022 for Joint technical studies of G&G data in Mahanadi, Bengal Offshore, Andaman and KG Offshore. A series of meetings and technical workshop held involving TotalEnergies (TE) and ONGC teams.

Shell: MOU signed with Shell Markets Private Limited and ONGC in 2022 to collaborate and explore opportunities to create Low Carbon Industrial Hubs enabled by CCUS solutions in India through a Joint Study of potential storage sites and collaboration in CCUS project delivery.

University of Texas at Austin, USA: Collaboration for work of development of suitable chemical EOR formulation.

BP India Private Limited: ONGC plans to drill stratigraphic wells in Category II & III offshore basins (Saurashtra, Bengal, Mahanadi and Andaman) to improve geological understanding and enable future exploration. BP's technical support will include identification of suitable well locations using G&G data and

assistance in well design and drilling supervision, in coordination with ONGC teams.

EIL is having a continued relationship with both the international educational institutes as well as industrial consortium. Some of the key partnerships are listed below:

- **Process Integration Research Consortium (PIRC)** Membership - offered by University of Manchester
- **Fractionation Research Inc, US** has 71 members worldwide, including the world's leading petroleum, chemical, engineering, and distillation equipment supplier companies
- **PSTC** is an industry-academia collaboration that carries out advanced research in the three focus areas of separations technology development, process optimization, control & safety and energy & environmental research”.

1.41 As regards, collaboration with State Universities for R&D initiatives, the Ministry furnished the following written reply:

“Yes, Oil PSUs collaborating with IITs, CSIR labs, NITs, IISC- Bengaluru, ICT-Mumbai, RGPT, BITS, State Universities and various Private academic institutions for research & development initiatives.

Besides, MoPNG has founded The Centre of Excellence (CoE) in Oil, Gas and Energy to provide a competitive advantage to India's Oil and Gas sector PSUs and its energy sector in the emerging business ecosystem driven by climate challenges, stressed resources and disrupting technologies globally. The Centre is an interdisciplinary collaboration between Indian Oil and Gas PSUs (IOCL, ONGC, HPCL, BPCL, GAIL, OIL & EIL) and IIT Bombay.”

XV. R&D FOR NET ZERO TARGETS

1.42 With reference to the R&D activities undertaken by each PSU to reduce their carbon footprint and achieve net zero targets, the Ministry submitted the following written reply:

“Upstream and Downstream Industry in Oil Sector are faced with a more challenging and complex market going forward. The challenge for Oil sector in India is not only to grow to meet rising need for energy in the country but also to innovate continuously to reduce operational carbon footprint and produce alternative fuels that are green.

Petroleum Refining is one of the hard-to-abate sectors of the economy, where decarbonization options are limited and difficult to achieve. Various state-run oil companies are in the process of formulating their strategies to achieve goal of becoming net zero operational emission encompassing scope-1 and 2 emissions. PSU R&D Centres are actively engaged in several initiatives to facilitate this transition.

R&D Centres are actively engaged in several initiatives to reduce carbon footprint and facilitate transition to net-zero emissions. Some of the major ongoing R&D initiatives towards net zero are as follows:

- Development of high efficiency lubes and differentiated fuel grades for improved fuel economy and lower carbon emissions such as Xtragreen, Xtraboost, Xtra-Tej, PropanePlus and Green Combo Lube solutions.
- *Alternative Fuels*: Improving the production processes, optimizing blends, and ensuring the compatibility of bio fuels with existing infrastructure.
- *Hydrogen Economy*: Hydrogen production, storage, and utilization, including fuel cells with the aim to promote clean and efficient energy solutions for various applications.
- *Battery Technologies*: For energy storage applications & carrying out R&D related to increasing efficiency of lead acid batteries, advanced batteries including aluminum-air batteries, lithium-ion batteries for electric vehicles and renewable energy integration.
- *Nanotechnology*: Exploring the application of nano catalysts, nanocomposites & nanofluids in various refining and petrochemical processes, development of novel formulations of fuels and lubricants etc.
- *Circular Economy*: Coprocessing of non-edible and Used Cooking Oil in DHDS/ DHDT Unit for production of Green Diesel (Demonstrated at commercial scale). Re-refining of Used Lube Oil for production of Group-II/ III LOBS (Developmental stage). Study on feasibility of co-processing of plastic / tyre / biomass pyrolysis oil in Refinery Units (Developmental stage). INDEcoP2F - Co-processing of Waste Plastic in Delayed Coker (Demonstrated at commercial scale)
- *CCUS Technologies*: Development of carbon capture (IOCL's eCO2Sorb technology), utilization, and storage (CCUS) technologies. CO2 Valorization through utilization of CO2 to valuable products through Bi-reforming/Tri-reforming Technology (Developmental stage)
- *Evolving Areas*: Production of Advance Carbon Material – Carbon Fiber, Electrodes for Battery Application, Polymer composites, graphene etc. (Research at Initial stage). Development of Membrane based Separation Processes for gaseous applications for improving energy efficiency (Research at Initial stage).

The Net Zero target year of various Oil PSUs are given as under;

GAIL	EIL	ONGC	MRPL	NRL	HPCL	BPCL	OIL	IOCL	CPCL
2035	2035	2038	2038	2038	2040	2040	2040	2046	2046

- Carbon Capture and Utilization (CCU):

Pursuing a research project with IISER, Tirupati for the conversion of CO2 into polycarbonate diols.”

1.43 Detailing on the same, the Ministry submitted as follows during the oral evidence [Ref.: Verbatim Proceeding, Sitting dated 24.02.2025, Page No. 3-4]

“डाउनस्ट्रीम सैक्टर में ज्यादातर आरएंडडी फोकस नेट-ज़ीरो की तरफ है। इस दिशा में हम लोग, जैसा कि पिछली बार भी बताया गया था कि एनर्जी एफिशिएंसी पर काफी कार्य हो रहा

है। इसमें हम लोग एनर्जी एफिशिएंट फ्यूल्स और ल्यूब्रिकेंट्स में कार्य कर रहे हैं, कन्वेंशन बिजनेस तो एज-यूजुअल चलेगा। इसके अलावा green hydrogen, biofuels, advance mobility and carbon capture utilization and petro chemicals पर काफी हद तक फोकस रहेगा। कूड ऑयल टू पेट्रोकेमिकल्स पर भी काफी प्रोजेक्ट्स हम लोग कर रहे हैं।अपस्ट्रीम में भी न्यू एनर्जी फोकस एरिया है। जैसा कि हाइड्रोजन, पम्पड हाइड्रोजन स्टोरेज, सीबीजी, जियोथर्मल पर भी कार्य हो रहा है। अनकन्वेंशनल रिसोर्सज जैसे कि सीबीएम, गैस हाइड्रेट्स और हीलियम पर भी कार्य हो रहा है। अपस्ट्रीम में बायोफ्यूल्स और बायो एनर्जी भी काफी फोकस का एरिया है। Co2 sequestration utilization भी अपस्ट्रीम के लिए एक मेजर थ्रस्ट एरिया रहेगा।”

XVI. PATENTS AND MONETISATION OF R&D PRODUCTS

1.44 With regard to a query on the success rate of patents and monetisation of patents, the Ministry gave the following reply:

“In the downstream sector and for GAIL the, major areas in which IPs are filed include Refining technology, Lubricant technology, Bioenergy, gas processing, Petrochemicals, Catalysts, Nanotechnology, Pipeline Transportation, hydrogen production technologies, CO₂ utilization, etc. The company wise details of Patent filing and status of commercialization of patents are as under:

	IOCL	HPCL	BPCL	EIL	GAIL	MRPL
Patent Filed	1767	610	167	122	46	24
Patents Granted (Indian / Foreign)	416 / 965	125 / 108	45 / 53	71 / 1	31 / 3	9 / 0
Patents filed / granted in last 5 years (2019 to till date)	782 / 883	362 / 184	70 / 64	57 / 36	10 / 22	24 / 9
No. of Technologies & Products developed in last 5 years	115	97	33	16	-	9
No. of Technologies & Products commercialized in last 5 years	65	61	21	13	-	7
No. of Lubricant formulations developed	>7000	>3800	>3400	-	-	-

Upstream Sector (ONGC/ OIL)

Several patents granted to ONGC are in the field of Database management, Seismic and Well logging Interpretation and analysis, Remote sensing analysis, Geochemistry, Oil & Gas Production Technology, Ocean Engineering, etc. which are being actively used in ONGC in-house projects. 1 patent of ONGC has been

commercialized outside. As on date the number of patents granted to ONGC is 114 against 134 processed cases. 37 number of patent applications are under process at Indian Patent Office.

Oil India Ltd (OIL) has filed 23 patents, out of which 18 have been granted (7 Indian and 11 foreign patents). All the secured patents are being utilized in-house in OIL's activities / processes".

1.45 When the Committee sought to know whether any comprehensive data is available on the monetary benefits/revenue generated from R&D in Oil and Gas sector, the Ministry submitted the following written reply:

"Various R&D centers have been instrumental in driving innovation across refining, petrochemicals, upstream and sustainable energy solutions for changing product mix. While for these centres profit is not the primary driver, but still revenue is generated either directly through royalties, license fees, technical services etc. or indirectly by improving/ optimising operational efficiency of existing products and processes, providing niche products to create differentiation in market and also reducing cost by replacing imports or dependence on other suppliers with cheaper in-house alternatives for critical inputs.

Besides, these centers provide huge notional benefits to the parent organisations by playing key role in understanding and adaptation of technology by working hand in hand with their business units including dissemination and sharing of the knowledge, thus contributing significantly to the reliability of company's operations and supporting profitability and strategic goals through self-reliance. Some of them also related to O&M activities to enhance efficiency, safety, and sustainability

IOC R&D has earned revenue of Rs 27.49 Cr & Rs.14.91 Cr in F.Y 23-24 & FY 24-25 till date respectively as direct earnings in royalties, license fees, and service charges from commercialized technologies and products. Besides significant notional benefit has accrued through following activities;

- In-house testing of fuels and lubes using extensive facilities as Climatic Chamber, emission labs, engine testing and field-testing labs, analytical division facilities, to test the efficacy and suitability of new lube, grease and fuel formulation.
- By developing Basic Design Engineering Packages (BDEP) for patented processes, R&D saved Rs. 33.32 Cr in license fees, BDEP fee & fee for post BDEP services in FY 23-24, avoiding substantial external licensing costs for IOCL Refineries.
- Licensing DRA technology to a third party is anticipated to save Rs. 50 Cr for the IOCL's PL-division over five years, with additional recurring royalties from sales to other companies, ensuring a steady income stream.
- R&D Centre on an average tests 4000-6000 samples per years that are collected by field force and sent for detailed evaluation
- Applied Metallurgy and Corrosion research groups regularly works with sister divisions to help them for failure analysis, residual life analysis and provide solution to predict and improving the life and availability of existing assets which has a definite economic benefit.

Benefits on similar lines have also been earned by other R&D Centres.

BPCL has successfully commercialized products such as BMCG-Bharat Metal Cutting Gas-Nxt Gen for metal cutting application since 2019. This has resulted in annual revenue generation of Rs. 20 Crore since 2019. The use of digital tools namely BPMARRK® and K-Model for rapid crude assay and crude blending, respectively, have resulted into monetary benefits of Rs. 300 Crore during last 5 years.

Expected benefits from the patented First principle - AI Hybrid based applications developed by MRPL are as follows:

- a. Real time optimizers for Poly Propylene Unit: 40-45 INR Crore/ Year
- b. Real time optimizers for power plant: 50 INR Crore/year.
- c. Real time optimizers for Petrochemical Fluidized Catalytic Cracking: Rs 30-50 Crore/year.

The revenue generated/ business secured by EIL R&D over the last F.Y 2023-24 include Royalty/ License Fees of Rs 46.2 Lakh and BDEP Fees/ Study/ Hardware supply of Rs 453 lakh.”

1.46 Upon the Committee's desire to know about the action plan by Oil/Gas companies to bring R&D developed products in the market, the Ministry submitted the following written reply:

“Some of the initiatives are enumerated below;

- Some of the R&D projects are taken up based on interaction with the business units to ensure ready market and acceptance, ensuring that innovations are effectively translated into commercially viable solutions. Field trials and pilot projects are conducted in collaboration with business units and external partners to evaluate the product's real-world applicability.
- As part of the above activities, R&D centres often works closely with Oil PSUs, research institutes, and governmental agencies to ensure that the product meets both industry standards and regulatory requirements.
- Regular engagement with Marketing Division as well as directly with OEMs to develop lube and grease formulations as per market needs.
- Catalyst Manufacturing Unit has recently been commissioned by IOCL at Panipat refinery to meet the DHDS/ DHDT and FCC Additive requirements of IOCL refineries. Till date around 19000 MT of the IOCL R&D in-house developed catalysts have been used for captive requirements. IOCL is planning to set up a JV company to manufacture and market the catalysts based on in-house formulation of meeting internal needs and to sell it to other customers.
- Joint marketing arrangements are also made with technology licensors to market in-house developed technologies. Developing and supporting Marketing Division for development and successful commercialization of number of specialty products and chemicals for import substitution.
- Promotion of in-house developed R&D technologies and products through Technical Exhibitions and Conferences, Workshops and Webinars, investor forum, and Digital Outreach”.

XVII. DEVELOPMENT OF BIO-FUELS AND FLEX-FUELS

1.47 When the Committee desired to know about the status of development of bio-fuels and flex-fuels, the Ministry submitted the following written reply:

“The development of bio-fuels and flexi-fuels in India has seen significant progress, with active participation from Govt., industry stakeholders, and OMCs, who are the key player in Ethanol Blending Program (EBP) of Government of India (GoI). Govt. has aimed to achieve 20% blending target by 25-26.

IOCL, HPCL, BPCL and NRL have taken up project for production of 2G ethanol based on lignocellulosic biomass with financial assistance under Pradhan Mantri JI-VAN Yojana. IOCL plant has been commissioned and other plants are under advance stage of completion/ commissioning. OMCs are also setting up demonstration plants to innovate and improve technology.

E20 and E93 fuels are already being dispensed at select retail outlets. Work on development of other flex fuel blends is also underway as per BIS standard.

Oil companies are also key players in Sustainable Alternative Towards Affordable Transportation (SATAT) initiative of GOI, which aims to promote the production and use of CBG using various raw materials.

Government of India has targeted blending of 1% Sustainable Aviation Fuel (SAF) with aviation fuel by 2027 and 2% SAF by 2028 (initially for international flights) as part of its strategy to decarbonize the aviation sector. Oil companies are pursuing research and feasibility studies including demonstration to produce SAF through Alcohol To Jet (ATJ).”

1.48 As regards the initiatives taken for conversion of biomass into bio fuels, the Ministry submitted the following written reply:

“Oil companies have undertaken several initiatives for the conversion of biomass, particularly rice straw (parali), into biofuels, contributing to sustainable energy solutions and addressing environmental concerns like stubble burning. Key initiatives in these areas are listed below:

- IOCL, HPCL, BPCL have taken up commercial scale 2G ethanol bio-refineries, which processes lignocellulosic biomass like rice straw to produce ethanol. Additionally, as part of the research initiative, integrated demonstration plants using in-house developed technology are also being set up.
- Oil companies are the key players in Sustainable Alternative Towards Affordable Transportation (SATAT) initiative of GOI, which aims to promote the production and use of CBG. As part of R&D efforts, to scale up in-house developed biomethanation technology, Plans are underway for setting-up of demonstration/commercial plants.

MRPL is working on a combination of Biomass gasification and Gas fermentation technology with the technology supplier for production of 2G Ethanol from Biomass like Corn cob and cotton stalk. GAIL is working on Gasification Research for efficient conversion of biomass into syngas which can be converted in to liquid and gaseous fuels (e.g. green hydrogen).

ONGC is carrying out feasibility study on bio-hydrogen generation In addition. CBG plants are planned to be setup in various states based on biomass (Parali) as feedstock.

OIL is presently forming Joint Ventures with established CBG player for production of Bio Gas using Agri Waste as a feed stock.”

PART II
OBSERVATIONS/RECOMMENDATIONS

1. *MANDATING A MINIMUM SPEND ON R&D*

The Committee observe that the current funding model of R&D for Oil PSUs remains largely dependent on internal resources with limited budgetary support from the Government. The Ministry has stated that as such no financial constraint is faced by Oil PSUs in meeting the requirement of funds for R&D activities.

Over the years, the R&D expenditure of Oil PSUs has shown a general upward trend increasing from around Rs.2083.64 crore in FY 2021-22 to Rs.2098.95 crore in FY 2025-26 which is largely driven by the spending of IOCL and ONGC followed by HPCL, GAIL, BPCL and OIL. Balmer Lawrie & Co., MRPL, NRL and CPCL have also shown increase in percentage expenditure on R&D. The Gross Expenditure in Research & Development (GERD) in the Petroleum sector in 2020–21 was Rs.1,634.45 crore which was 1.3% of the Country's total GERD i.e. 1,27,380.96 crore. It is also notable from the data that some of the major Oil PSUs have spent around 2.16 % of their combined 'Profit After Tax' in the Financial Year 2025-26 on R&D. However, the percentage of spending by each PSU differ.

The Committee are of the view that a uniform R&D investment norm across PSUs may be explored for sustained innovation and technological advancement in petroleum sector, especially in view of the Country's energy transition goals and the present geopolitical situation evolving in West Asia which is a major oil exporting region. Therefore, in order to institutionalize a robust, outcome-driven R&D ecosystem in the oil and gas sector, the Committee recommend the following:

- (i) The Ministry may consider setting a benchmark of minimum expenditure on R&D for all Oil PSUs, preferably a minimum percentage of their 'Profit Before Tax', subject to periodic review and adjustments based on sectoral priorities and performance benchmarks.

(ii) The Ministry may explore the feasibility of creating a dedicated fund, managed through an institution, to co-finance high-impact, cross-sectoral R&D projects in areas such as green hydrogen, carbon capture, biofuels, waste-to-energy technologies etc., involving collaboration between PSUs and premier research institutions.

(iii) The Ministry may come up with ways and measures to encourage private co-investment in R&D sector.

2. MANPOWER IN R&D SECTOR

The Committee note that Oil PSUs are following a reasonably structured approach to R&D recruitment by combining open advertisements, campus placements, fixed-term specialist hiring as well as internal deputations. The recruitment process is aligned with DPE guidelines, offering performance incentives and training opportunities.

The Ministry has stated that the R&D recruitment is largely requirement based which the Committee feel is detrimental to maintaining a continuous talent pipeline aligned to long term national energy priorities. The Ministry has stated that fixed-term hiring is done but a sustained lateral inflow from global research entities, premier academic institutions or startup ecosystems need to be put in place. It is stated that structured career growth and performance incentives are offered in line with Department of Public Enterprises (DPE) guidelines to attract top talent. The Committee find from the replies of the Ministry that structural mechanisms for attracting talent in the R&D sector exist, but there appears to be a need for a long-term plan to match human resources with R&D goals or mandates. The Committee, therefore, recommend the following:

(i) A dedicated R&D career track may be put in place to attract and retain top researchers whereby they can progress on a 'technical excellence' route in the Oil PSUs/Organisations. Further, performance-linked incentives for patents that actually get deployed and technologies that earn royalties may be instituted so that the Scientists/Researchers stay motivated.

(ii) The Ministry/Oil PSUs may develop a robust HR framework to standardize recruitment, mobility and progression norms across Oil PSUs covering human resource planning with at least 3 year projection on manpower requirement for R&D in emerging technology domains.

(iii) The Oil PSUs may also explore the feasibility of organising ‘National R&D Talent Conclaves’ in collaboration with reputed institutes/ Colleges/Universities to identify and nurture young researchers.

3. *INFRASTRUCTURE IN R&D CENTRES and BENCHMARKING*

The R&D ecosystem of the Country’s Oil PSUs has evolved into a network of business-driven, technology-oriented centres focusing on applied research in refining, alternate fuels, catalysts, materials and process efficiency. It is also aligned with commercial objectives and overall government priorities around self-reliance, and import substitution. However, with regard to research in “pure science”, which serves as the base for long-term innovation rather than immediate business outcomes, the Ministry has stated that analytical facilities for pure-science-based work are broadly available.

As per the information furnished by the Ministry, the current R&D infrastructure expansion projects are IOCL’s second R&D campus in Faridabad (Rs.3199 crore, completion by 2026-27), HPCL’s Centre of Excellence (CoE) in Bitumen and Pavement Technology, Bengaluru, Karnataka (Rs. 70 crore - was to be completed by March 2026 but pending completion as on date) and GAIL’s planned R&D campus at Sohna, Haryana (Rs.550–600 crore – completion by March 2029). The timelines of these expansions vary and it is not clear whether there is any collaborative framework among these centres to prevent duplication or to create national-level synergies in R & D sector. Moreover, only IOCL’s R&D department has Board-level representation. Further, the Ministry has stated that there is no mandated benchmark to grade or evaluate the performance of PSU research centres. Current parameters applied by Oil PSUs are patents filed, number of publications in journals, demonstration of products and technologies, etc. In view of the above, the Committee recommend the following:

(i) The Ministry may formulate a standardized benchmarking system for R&D centres across Oil PSUs in consultation with NITI Aayog/CSIR/other research bodies or any such agencies, including metrics like innovation productivity, technology transfer success rate, external research collaborations, commercial adoption levels, amenability to cleaner energy, etc.

(ii) The PSUs may look into the feasibility of including the R&D department's representation at the Board-level to ensure that innovation strategy, capital allocation and business goals remain well-aligned.

(iii) The PSUs may also examine the scope of providing adequate funding to pure science or fundamental science research related to its core technologies with a long term vision with mechanisms in place to evaluate research quality.

(iv) The Ministry may also monitor the ongoing R&D infrastructure projects to make sure that they are completed on time and within budget and that they lead to useful research outcomes.

(v) The Committee also suggest that Oil PSUs may explore the feasibility of establishing R&D Centres close to Oil or Gas producing fields such as Mumbai High.

4. RESEARCH ARTICLES

The Committee note that the R&D Centres of Oil PSUs have actively published research articles in major national and international science journals in recent years, with a total output of 363 papers between 2022 and 2025. IOCL's R&D Centre has contributed the largest share with 127 publications, while BPCL accounts for 71, HPCL for 144 and EIL for 21. Additionally, IOCL R&D scientists have gained international recognition by being featured in Stanford University's top 2% scientist database as well as the Elsevier BV rankings for the past two years.

While commending this notable achievement, the Committee are of the view that the Ministry may mandate a standardized, detailed annual R&D reporting mechanism covering publication metrics such as journal, impact factor, patent conversion, collaboration details, applied outcomes etc. for all Oil PSUs, ensuring transparency and enabling informed resource allocation.

5. MONITORING OF R&D PROJECTS

The Committee note the Ministry's assertion that R&D activities of Oil PSUs are closely monitored through annual MoUs signed by Oil PSUs with MoPNG. The Centre for High Technology (CHT) functions as a nodal coordinator for selecting research areas aligned with Government priorities as well as for funding, monitoring, avoiding overlapping in areas of national importance and reviewing collaborative projects through working groups and committees comprising of R&D heads of major PSUs such as IOCL, HPCL, BPCL and EIL. The Committee also observe that Oil PSUs have internal oversight mechanisms similar to Research Advisory Committees; they submit details of major projects and allocations, track performance through Key Performance Indicators (KPIs) like patents, publications, technology transfer and cost-effectiveness and undergo regular internal audits for compliance and efficiency assessment.

However, the Committee are of the view that there is a need to make these institutional arrangements outcome-centric in addition to being process-centric. The Committee, therefore, recommend the following:

(i) Ministry may institutionalize a unified, periodic review mechanism that brings together the Centre for High Technology (CHT), Scientific Advisory Committee (SAC), R&D heads of all oil PSUs and independent experts. This review body can set clear benchmarks, monitor progress on collaborative projects, identify emerging technology areas, national priorities and facilitate inter-PSU knowledge sharing for avoiding duplication of efforts and ensure timely integration of R&D outputs into operational practices.

(i) While avoidance of overlapping research is claimed through inter-PSU committees coordinated by the CHT, there seems to be no explicit, standardised, cross-PSU benchmarking framework to demonstrate how duplication is prevented in practice. The Committee are of the view that while duplication at the early research stage need not be discouraged as parallel exploration often strengthens the eventual outcome, the same flexibility should not extend to maturing technologies. Accordingly, all R&D projects approaching a Technologically Readiness Level 6 (TRL-6) stage, i.e., technology demonstrated in a relevant environment, should undergo a comprehensive cross-PSU review, at which point each overlapping effort may either be consolidated under a designated lead Oil PSU or taken forward through structured joint research.

(iii) A list of ongoing and completed projects, as well as indigenous technologies developed by oil Public Sector Undertakings (PSUs) may be published on the CHT website.

6. R&D ACTIVITIES FOR EOR/IOR/DEEP WATER EXPLORATION

The Committee are note with satisfaction that ONGC is implementing Enhanced Oil Recovery (EOR)/Increased Oil Recovery (IOR) technologies in its fields on pilot as well as commercial basis and is aggressively pushing deep water/ultra deep water exploration while OIL is exploring cutting edge techniques for boosting oil recovery from ageing fields and reservoirs.

Considering the strategic importance of these technologies in enhancing recovery from mature fields, unlocking frontier offshore resources, reducing import dependence and strengthening country's energy security, especially in the wake of the present geo-political situation, the Committee urge the Ministry to extend all possible policy, financial, technological and regulatory support to the upstream companies to enable the successful execution of EOR/IOR/deep water exploration and production activities in order to maximise domestic hydrocarbon production. Further, the Government may ensure the expeditious evaluation of Pilot projects and facilitate the timely commercial deployment of technically and economically viable projects.

7. R&D ON SHALE OIL AND GAS HYDRATES

The Committee observe that while outlining the ongoing research and developmental status of the Country's shale and gas hydrate exploration, the Ministry has emphasized that both the domains remain technologically and economically challenging with commercial extraction still in the experimental phase. The National Gas Hydrate Program (NGHP) has completed two expeditions, identifying substantial gas hydrate deposits, especially in the Krishna Godavari basin. However, progress since 2015 has been limited with no breakthroughs in commercial extraction. The Country's efforts in shale gas production, including policy initiatives since 2013, have resulted in extensive

pilot studies and investments. However, analytical results suggest that Indian shale formations are less promising than North American analogues. Both ONGC and OIL have not found much promise in the explorations so far.

The Committee feel that in view of the growing energy needs of the country, prevailing geopolitical uncertainties and the resultant volatility in global energy markets, there is need to explore and develop all viable unconventional hydrocarbon resources to contribute to the country's long-term energy security and reduce dependence on import. Though the explorations conducted so far have not yielded positive results, the Committee urge the Government to keep up the R&D on shale oil and gas exploration, explore the possibilities of structured collaboration with international leaders in gas hydrate extraction technology and emulate the best practices to accelerate the Country's learning process and reduce costs. The Government may also examine the feasibility of putting in place PPP models or any such mechanisms for pilot production and scale up in order to optimize risk sharing and resource allocation

8. R&D ON IMPROVING REFINING EFFICIENCY

The Committee note that current R&D activities undertaken by Oil PSUs reveal a noteworthy spectrum of initiatives designed to improve refining efficiency and shift towards cleaner fuel production. The focus areas include technical service support to refineries, development of advanced refining technologies and differentiated fuels, promotion of clean technologies such as Sustainable Aviation Fuel (SAF), 2G ethanol and bio methanation to produce CBG as well as incorporating digital solutions and circular economy measures like plastic circularity etc.

The Committee understand that refining efficiency and Gross Refining Margin (GRM) are tightly linked because efficiency directly influences both the cost of producing materials from crude oil and the value that a refinery can extract from each barrel. The Committee also understand that the Ministry has initiated a comprehensive approach to refinery modernization as well. Therefore, while appreciating the Ministry for these initiatives aligned with global best practices in refinery efficiency and decarbonisation, the Committee would like to be apprised about the specific outcomes achieved as a result of these initiatives by quantifying the GRM pre and post the initiatives. Further, the

Committee would also urge the Ministry to maintain their momentum in modernisation of older refineries as such refineries tend to have structurally lower and more volatile GRMs than modern, high-complexity refineries. In view of the ongoing geopolitical situation, all the refineries of Oil PSUs are operating at more than 100% capacity. The Committee also recommend that adequate measures may be undertaken to ensure long term sustainability of refinery operations with minimum impact on domestic supply of petroleum products.

9. *UMBRELLA RESEARCH ORGANISATION*

The Committee note that the petroleum research front has a Centre of Excellence in Oil, Gas, and Energy (CoEOGE) at IIT Bombay backed by seven PSUs (IOCL, ONGC, HPCL, BPCL, GAIL, OIL and EIL) and guided by an eminent leadership anchored in MoPNG's ecosystem, covering a broad spectrum of objectives. The Ministry also cites the Scientific Advisory Committee on Hydrocarbons (SAC) as an institutional mechanism for downstream R&D promotion and long-term strategic studies. CoEOGE has so far undertaken 84 R&D projects through its various channels (viz., seed projects, PhD fellowships etc.) and some PSU-specific initiatives (Viz. EIL's seven mission mode projects, OIL's geothermal energy work etc.). The details of the grant and share of the participating PSUs are decided by the Governing Council of CoEOGE.

However, it is not clear from the replies of the Ministry as to how the R&D priorities are set, how cross-PSU missions are chosen or how duplication with in-house R&D centres and SAC-funded downstream projects are avoided. Further, the reply does not throw light on any quantitative linkage between CoEOGE and SAC portfolios and key national goals such as import dependency reduction, refinery decarbonization, hydrogen and battery technology leadership. The Committee feel that existence of an umbrella organisation overseeing downstream R&D promotion and long term strategy studies is necessary to have synergies in R&D efforts.

In view of the same, the Committee recommend that the Ministry may explore the feasibility of mandating the Governing Council of CoEOGE and the SAC/CHT mechanism to run a single, rolling 'National Mission Portfolio' with clearly prescribed outcomes.

10. USE OF INDUSTRY 4.0 IN R&D

The Committee note that Oil PSUs have taken several promising steps in embedding AI, robotics, Internet of Things (IoT), drones and advanced analytics into their R&D and operational ecosystem. The initiatives listed by the Ministry indicate a strong focus on using digital technologies to optimise existing refinery and pipeline operations, enhance safety and support in-house process and catalyst development. While appreciating the Ministry for the extensive use of Industry 4.0 to enhance R&D activities, the Committee advise the Ministry to carry out regular 'Digital Maturity and Safety Audit' for all AI, IoT and robotics projects by a panel of experts in order to check that rapid digitisation is not creating any hidden risks and to ensure that safety, ethics and resilience are built in from the start.

11. PROTECTION OF R&D DATA AND INFRASTRUCTURE

The Committee note that the Oil sector has deployed a fairly strong layer of cyber protection around R&D operational infrastructure with elements like advanced encryption, threat detection systems, Security Information and Event Management (SIEM), Multi Factor Authentication (MFA), Role Based Access Control (RBAC), AI-enabled monitoring, 24x7 teams in place to monitor R&D data, etc.

However, it is not clear whether these efforts are fragmented and company-specific or are consistently adopted across all oil PSUs. The Committee, therefore recommend that a unified cyber and data protection governance model, aligned to global frameworks such as NIST SP 800-171 and ISO 27001 may be explored across all Oil PSUs engaged in R&D.

12. COLLABORATION WITH ACADEMIA IN R&D

The Committee observe that IOCL, BPCL, HPCL and EIL have reported collaborations with reputed national and international academic and research institutions. However, it is not clear whether the upstream companies like ONGC or OIL also engage in such collaborations. The Committee are of the view

that partnerships with academia are critical in R&D as they accelerate innovation, lower risks and costs for industry and build a skilled, future-ready workforce while ensuring that research addresses real-world challenges. The Committee, therefore, urge the Ministry to increase the collaboration of Oil PSUs with the academia while ensuring that national priorities such as energy transition, net-zero pathways, Atmanirbhar Bharat, etc. are inevitably integrated into these partnerships. Additionally, outcome indicators of these collaborations like patents, commercialized technologies, pilots, start-ups, publications or capacity-building outcomes, etc. may also be evaluated.

13. INVOLVEMENT OF START-UPS IN R&D

The Committee find that oil and gas PSUs have a reasonably mature start-up support ecosystem in place using multiple funding models viz., Grant-in-Aid, Equity, Mix of Grant/Equity and Loans, structured selection processes and linkages with IITs/IIMs and startup incubators, leading to creation of valuable technologies and patents in areas like pipeline repair, clean fuels and advanced batteries. So far, the number of Start Ups funded by IOCL, BPCL, HPCL, EIL and GAIL are 42, 30, 28, 29, and 38, respectively. Further, NRL, OIL and ONGC are also engaging with Start Ups to foster growth through innovations. Indian Oil incubated startups have, till date, created 89 number of Intellectual Property Rights (IPRs).

However, the Committee feel that while having focus on early-stage ideas and small pilots, a well-defined path for taking a proven solution and rolling it out at scale across units or across different PSUs may also be explored. The Committee are of the view that R&D departments of Oil PSUs may increasingly engage with start-ups so as to strengthen and speed up innovation. The Committee, therefore, recommend that Oil PSUs may explore the feasibility of creating a special fund that not only supports ideas and pilots, but actually finances full-scale trials and commercial use of start-up technologies in PSU plants and pipelines, once the technology proves itself.

14. INTERNATIONAL COLLABORATION IN R&D

The Committee observe that Oil PSUs pursue a wide range of international R&D collaborations across upstream and downstream operations with foreign universities, research labs and technology licensor. They also engage extensively with Indian IITs, CSIR labs, premier institutes and Centre of Excellence in Oil, Gas and Energy at IIT Bombay for interdisciplinary work on emerging technologies and energy transition. The Committee also observe that current engagements largely consist of short-term projects with global universities, facilitated through MoUs specific to individual PSUs. The Committee are of the view that in order to strengthen coordination, capability and impact of international R&D for Oil PSUs, an international R&D roadmap can be developed at the Centre of Excellence (CoE) level around a few national goals like decarbonisation, methane abatement, energy transition, net zero target, etc.

The Committee, therefore, recommend that a mission oriented R&D roadmap may be developed under the Centre of Excellence (CoE, Mumbai), with clear national priority themes and time-bound outcome targets, instead of fragmented PSU-wise MoUs. Further, in addition, of focussing on short term projects, Oil PSUs may enter into long-term partnerships with leading global universities/ labs/companies with joint labs in the Country, shared funding and agreements on Intellectual Property sharing, so that PSUs help to create new technologies.

15. R&D FOR NET ZERO TARGETS

The Ministry has stated that oil PSUs face the dual challenge of meeting the Country's rising energy demand while reducing operational emissions and that their R&D centres are exploring several technology tracks to achieve the net zero target. The Committee acknowledge the fact that petroleum refining is one of the hard-to-abate sectors of the economy where decarbonisation options are limited and difficult to achieve. However, the Committee are also seized of the fact that to avert the worst impacts of climate change, aggressive and front-loaded action to reduce greenhouse gas emissions across all sectors is imperative.

The Committee believe that robust R&D can enable net zero by creating and scaling technologies, business models and processes that cut emissions faster and cheaper than today's options. Therefore, the Committee urge the Ministry and the Oil PSUs to focus on accelerated and mission oriented R&D programmes explicitly aligning with net-zero outcomes so that the nation's commitment towards net-zero is fulfilled.

16. PATENTS AND MONETISATION OF R&D PRODUCTS

The data provided by the Ministry show that Oil and Gas PSUs have built a large portfolio of patents and technologies and use many of them inside their own operations but they are earning relatively little from selling or licensing these to others. It appears that the Oil PSUs have many technologies or inventions in hand but they have not built the structured machinery to scale them up and take them to market. The Committee are of the considered view that Oil and Gas PSUs should treat patent generation and monetisation as a strategic pillar for revenue and competitiveness. Each successfully deployed patent directly strengthens financial resilience for the energy transition and reduces dependence on imported technologies and costly licenses. The Committee, therefore, recommend the following:

(i) The Ministry and the Oil PSUs may move from treating patents mainly as technical outputs to managing them as a focused business portfolio that funds the energy transition. The Ministry and Oil PSUs may explore the ways and means to set customised monetisation targets and KPIs for each PSU, depending on the performance of the PSUs, so that Oil PSUs become active technology suppliers rather than just asset owners and technology buyers.

(ii) Although the R&D spending by Oil PSUs is growing steadily, the Ministry may identify strategies to obtain commercial outcomes from R&Ds developed by the Oil PSUs. The Ministry may take appropriate measures to address the situation.

17. DEVELOPMENT OF BIO-FUELS AND FLEX-FUELS

The Committee note that the Ministry has stated that the Country is making significant progress in developing biofuels and flex-fuels. The progress is anchored by the Ethanol Blending Programme targeting 20% blending by 2025-26. Public sector undertakings like IOCL, HPCL, BPCL and NRL are setting up 2G ethanol plants using lignocellulosic biomass under the Pradhan Mantri JI-VAN Yojana. Flex-fuel blends are being developed as per Bureau of Indian Standards (BIS). Oil companies are also central to the SATAT initiative for compressed biogas from agricultural residues (including parali) and are piloting or planning commercial biomethanation, biomass gasification, gas fermentation, green hydrogen projects, etc.

The Oil PSUs have created an impressive architecture for biofuels, Compressed Bio-Gas (CBG) and Sustainable Aviation Fuel (SAF). The Committee are of the considered view that progress in this sector may be made uniform to meet the full potential with targeted reforms in feedstock policy. The Committee, therefore, recommend that the Ministry may mandate that every large new 2G ethanol or SATAT (Sustainable Alternative Towards Affordable Transportation) CBG project include at least one co-developed local skill centre and MSME incubation facility for services like biomass aggregation, organisation and management and component manufacturing. This would not only help the bio fuel project to run successfully but also provide a means for rural employment generation. The Oil PSUs can also coordinate with the State agencies and jointly set up hubs near major stubble-burning and agri-residue clusters to collect, clean, process and store residue and then send it out as needed to several different plants in the area.

New Delhi;
10 August, 2026
19 Sravana, 1948 (Saka)

Sunil Dattatrey Tatkare,
Chairperson,
Standing Committee on
Petroleum & Natural Gas

Annexure-1**Details of 16 R&D Centres:**

S.NO	PSU	NAME OF R&D Centre	LOCATION OF R&D CENTRES
1	IOCL	R&D Centre	Faridabad, Haryana
2		New R&D Centre	Faridabad, Haryana
3	BPCL	Corporate R&D Centre	Greater Noida, Uttar Pradesh
4	HPCL	Hindustan Petroleum Green Research and Development Centre, (HPGRDC)	Bengaluru, Karnataka.
5	EIL	EIL R&D Centre	Gurgaon, Haryana.
6	OIL	R&D Department	Field Headquarters, Duliajan, Assam
7		Centre of Excellence of Energy Studies (CoEES)	Guwahati, Assam
8	BALMER LAURIE	Applications Research Laboratory (ARL)	Kolkata, West Bengal
		Balmer Lawrie Manufacturing & Testing Facility	Manali, Chennai
9	ONGC	Keshava Deva Malaviya Institute of Petroleum Exploration (KDMIPE)	Uttarakhand, Dehradun,
10		Institute of Reservoir Studies (IRS)	Ahmedabad, Gujarat
11		Institute of Drilling and Well Engineering (IDWE)	Dehradun, Uttarakhand
12		Institute of Production Engineering and Ocean Technology (IPEOT)	Navi Mumbai, Maharashtra
13		Geodata Processing and Interpretation Centre (GEOPIC)	Dehradun, Uttarakhand
14		Institute of Biotechnology & Geotectonics Studies (INBIGS)	Jorhat, Assam
15		ONGC Advanced Training Institute (ATI)	Goa
16		Centre for Excellence in Well Logging Technology (CEWELL)	Vadodara, Gujarat

Regional Labs of ONGC:

S.NO	Name of Lab	Location
1	Regional Geoscience Laboratory	Navi Mumbai, Maharashtra
2	Regional Geoscience Laboratory	Kolkata, West Bengal
3	Regional Geoscience Laboratory (Southern / Cauvery Basin)	Chennai, Tamil Nadu
4	Regional Geoscience Laboratory (Eastern / Assam Basin)	Jorhat / Sivasagar, Assam
5	Dr. B.R. Ambedkar Regional Geoscience Laboratory (Western Region)	Vadodara, Gujarat

MINUTES

STANDING COMMITTEE ON PETROLEUM AND NATURAL GAS

(2022-23)

NINTH SITTING

(28.02.2023)

The Committee sat on Tuesday, the 28th February, 2023 from 1130 hrs. to 1320 hrs. in Committee Room 'C', PHA, New Delhi.

PRESENT

Shri Ramesh Bidhuri - Chairperson

MEMBERS

LOK SABHA

- | | |
|----|---------------------------------|
| 2 | Dr. Ramesh Chand Bind |
| 3 | Shri Girish Chandra |
| 4 | Smt. Chinta Anuradha |
| 5 | Shri Topon Kumar Gogoi |
| 6 | Shri Naranbhai Kachhadiya |
| 7 | Shri Rodmal Nagar |
| 8 | Shri Mitesh Rameshbhai Patel |
| 9 | Dr. Bharatiben Dhirubhai Shiyal |
| 10 | Shri Janardan Singh Sigriwal |
| 11 | Shri Lallu Singh |
| 12 | Shri Ajay Tamta |

RAJYA SABHA

- | | |
|----|-----------------------|
| 13 | Shri Shaktisinh Gohil |
| 14 | Smt. Kanta Kardam |
| 15 | Shri Mithlesh Kumar |
| 16 | Dr. Sasmit Patra |
| 17 | Dr. V. Sivadasan |

SECRETARIAT

- | | | | |
|----|--------------------------|---|------------------|
| 1. | Shri Y.M. Kandpal | - | Joint Secretary |
| 2. | Shri H. Ram Prakash | - | Director |
| 3. | Shri Brajesh Kumar Singh | - | Deputy Secretary |

Representatives of the Ministry of P&NG

- | | | | |
|----|---------------------------|---|----------------------|
| 1. | Shri Pankaj Jain | - | Secretary |
| 2. | Shri Praveen Mal Khanooja | - | Additional Secretary |
| 3. | Ms. Sujata Sharma | - | Joint Secretary |

Representatives of PSUs

- | | | | |
|----|-------------------------------|---|----------------|
| 1. | Shri Pushp K. Joshi | - | CMD, HPCL |
| 2. | Shri Vetsa Rama Krishna Gupta | - | CMD, BPCL |
| 3. | Dr. S.S.V. Ramakumar | - | Director, IOCL |
| 4. | Shri S. Bharathan | - | Director, HPCL |
| 5. | Shri Sanjay Khanna | - | Director, BPCL |
2. At the outset, the Hon'ble Chairperson welcomed Members of the Committee and apprised them about the agenda of the sitting *i.e.* **‘Briefing by representatives of the Ministry/PSUs in connection with the examination of the subject “R&D activities of PSU OMCs”.**
3. Thereafter, the representatives of the Ministry of P&NG/PSU OMCs were called into the sitting of the Committee to brief the Committee on the subject. The Chairperson welcomed the representatives of the Ministry/PSUs and stated that since India is an established player in refining industry with world's fourth largest refining capacity, it needs to properly invest in research and development of refining technology to keep its competitive edge. Accordingly, he requested the representatives to brief the Committee on the R & D activities of PSU OMC's. He also requested them to brief the Committee on the role of CHT in Research and Development Projects of PSU OMCs, monitoring by the Ministry of the Research and Development Projects of PSU OMCs, R&D projects pertaining to PSU OMCs carried out in government funded scientific institutions etc.

4. After customary introduction, the representatives of the Ministry of P&NG and PSU OMCs gave a power point presentation on the subject covering various issues such as Manpower and Expenditure, R&D: PSU OMCs at a glance, Product/Technology basket, augmenting core competence, be future ready, oil and gas sector - towards net zero, green H2 Projects, Sustainable and Green Uniform - a step towards Net Zero, Start Up Schemes of PSU OMCs etc.
5. Subsequently, Members of the Committee sought clarifications on various issues such as R&D budgets of PSU OMCs, sharing of R&D activities by PSU OMCs with Ministry of Petroleum and Natural Gas, research into net zero emissions, research pertaining to safety of gas cylinders, cooperation of R&D departments of PSU OMCs with outside scientists and experts, blending of diesel, R&D initiatives of PSU OMCs in the field of development of alternate fuels, commercialization of technologies development by PSU OMCs and their valuations, restructuring of R&D activities of PSU OMCs and carrying out them through a subsidiary company, need to focus on core areas, R&D initiatives of PSU OMCs in the field of treatment of water used in refineries, R&D projects on reduction in emission of nitro oxide from transport fuels, research on reduction in production cost of ethanol, use of nano technology in production of petrol and diesel, solar cooker and solar panel etc.
6. The representatives of the Ministry/PSU OMCs furnished clarifications on some of the queries raised by the Members. On some of the points on which the information was not readily available with the representatives, the Chairperson asked them to furnish written replies on the same within ten days to the Lok Sabha Secretariat. The Chairperson then thanked the representatives of the Ministry of P&NG/PSU OMCs for providing valuable information on the subject before the Committee.

(The witness then withdrew)

7. A copy of the verbatim proceedings is kept in the Branch for record.

The Committee then adjourned.

MINUTES

STANDING COMMITTEE ON PETROLEUM AND NATURAL GAS

(2022-23)

TWELFTH SITTING

(19.05.2023)

The Committee sat on Friday, the 19th May, 2023 from 1200 hrs. to 1400 hrs. in Main Committee Room, PHA, New Delhi.

PRESENT

Shri Ramesh Bidhuri - Chairperson

MEMBERS

LOK SABHA

- | | |
|---|-----------------------------------|
| 2 | Dr. Ramesh Chand Bind |
| 3 | Smt. Chinta Anuradha |
| 4 | Shri Naranbhai Kachhadiya |
| 5 | Dr. Kalanidhi Veeraswamy |
| 6 | Shri Mitesh Rameshbhai Patel |
| 7 | Shri M.K. Raghavan |
| 8 | Shri Gajanan Chandrakant Kirtikar |
| 9 | Shri Janardan Singh Sigriwal |

RAJYA SABHA

- | | |
|----|---------------------------------|
| 10 | Shri Shaktisinh Gohil |
| 11 | Smt. Kanta Kardam |
| 12 | Shri Mithlesh Kumar |
| 13 | Shri Rambhai Harjibhai Mokariya |
| 14 | Shri Subhas Chandra Bose Pilli |
| 15 | Dr. V. Sivadasan |
| 16 | Shri Ravichandra Vaddiraju |

SECRETARIAT

- | | | | |
|----|--------------------------|---|------------------|
| 1. | Shri Y.M. Kandpal | - | Joint Secretary |
| 2. | Shri H. Ram Prakash | - | Director |
| 3. | Shri Brajesh Kumar Singh | - | Deputy Secretary |

Representatives of the Ministry of P&NG

- | | | |
|----|---------------------------|----------------------|
| 1. | Shri Pankaj Jain | Secretary |
| 2. | Shri Praveen Mal Khanooja | Additional Secretary |
| 3. | Ms. Sujata Sharma | Joint Secretary |

Representatives of ONGC

- | | | | |
|----|----------------------|---|----------|
| 1. | Dr. Arun Kumar Singh | - | CMD |
| 2. | Shri O.P. Singh | - | Director |
| 3. | Smt. Sushma Rawat | - | Director |
| 4. | Shri Pawan Aggarwal | - | ED |

Representatives of EIL

- | | | |
|----|---------------------|----------|
| 1. | Smt. Vartika Shukla | CMD |
| 2. | Shri Rajiv Agarwal | Director |

Representatives of OIL

- | | | |
|----|---------------------------|----------|
| 1. | Dr. Ranjit Rath | CMD |
| 2. | Shri Pankaj Kumar Goswami | Director |
| 3. | Dr. Manas Kumar Sharma | Director |

Representatives of GAIL

- | | | |
|----|--------------------|----------|
| 1. | Dr. M.V. Iyer | Director |
| 2. | Shri Sanjeev Kumar | ED |

2. At the outset, the Hon'ble Chairperson welcomed Members of the Committee and apprised them about the agenda of the sitting *i.e.* **‘Briefing by representatives of the Ministry/Oil PSUs in connection with the examination of the subject “R&D activities of PSU with specific reference to ONGC, OIL, GAIL and EIL”.**

3. Thereafter, the representatives of the Ministry of P&NG/Oil PSUs were called into the sitting of the Committee to brief the Committee on the subject. The Chairperson welcomed the representatives of the Ministry/Oil PSUs and requested them to give an overview of the current R&D activities of ONGC, OIL, GAIL and EIL also areas in focus for developing R&D capabilities for futuristic technologies, R&D activities in upstream sector for Improved Oil Recovery (IOR) and Enhanced Oil Recovery (EOR), details of funds allocated by each of Oil PSU's, number of persons working in R&D units/departments in each PSU, details of R&D centres, number of patents and Intellectual Property Rights obtained over the last five years, mechanism to transfer the technology for commercial production and royalty earned from such transfer of technology, details of joint ventures/collaborations with prominent national and international institutes etc. He also highlighted that. since India is an established player in refining industry with world's fourth largest refining capacity, it needs to properly invest in research and development of refining technology to keep its competitive edge. He further requested them to brief the Committee on the role of CHT in Research and Development Projects of PSU OMCs, monitoring by the Ministry of the Research and Development Projects of PSU OMCs, R&D projects pertaining to PSU OMCs carried out in government funded scientific institutions etc.
4. After customary introduction, the representatives of the Ministry of P&NG and Oil PSUs viz. ONGC, OIL, GAIL and EIL gave a power point presentation on the subject covering various issues such as structure of Research and Development, Manpower, Budget, R&D Centre, research activities in core areas of business, energy transition and clean energy, technology developed and technologies commercialized, patents applied for and patents granted etc.
5. Subsequently, Members of the Committee sought clarifications on various issues such as lack of in-house R&D Centre of GAIL, technologies developed in last five years by EIL, cost benefit of R&D activities, duplication of R&D activities among Oil PSUs specially in areas of energy transition and clean energy and lack of proper coordination among them for selection of research projects for judicious and optimum utilization of resources, under staffing of some of the R&D Centres of ONGC, new hardware/instruments developed by EIL in last two years, impact of R&D activities on production of Oil PSUs, undue delay in plastic to diesel project being undertaken by GAIL, monetisation of patents, new technologies developed in

the field of exploration, feasibility of budgetary support by Government of India for R&D activities, sources of cheap diesel being sold in Gujarat illegally, lack of growth in R&D expenditure by EIL, association of corporations and local self governing bodies in research activities of ONGC, research initiatives in exploitation of unconventional hydro carbons, association of startups in research activities by ONGC and other Oil PSUs, principles of fixation of R&D budget, development of technology for fixing leakage of gas from pipelines etc.

6. The representatives of the Ministry/Oil PSUs furnished clarifications on some of the queries raised by the Members. The representatives of the Ministry also agreed in principle to the suggestions of the Committee pertaining to the need of in-house R&D Centre of Oil PSUs, establishment of the coordination mechanism among Oil PSUs for selection of research projects, development of technology for fixing gas leakage from pipelines. On some of the points on which the information was not readily available with the representatives, the Chairperson asked them to furnish written replies on the same within ten days to the Lok Sabha Secretariat. The Chairperson then thanked the representatives of the Ministry of P&NG/Oil PSUs for providing valuable information on the subject before the Committee.

(The witness then withdrew)

7. A copy of the verbatim proceedings is kept in the Branch for record.

The Committee then adjourned.

MINUTES

STANDING COMMITTEE ON PETROLEUM AND NATURAL GAS

(2024-25)

FIFTH SITTING

(09.12.2024)

The Committee sat on Thursday, the 9th December, 2024 from 1530 hrs. to 1735 hrs. in Committee Room 'B', PHA, New Delhi.

PRESENT

Shri Sunil Dattatrey Tatkare - Chairperson

MEMBERS

LOK SABHA

- 2 Shri Maddila Gurumoorthy
- 3 Shri Dileshwar Kamait
- 4 Shri Putta Mahesh Kumar
- 5 Shri Vinod Lakhamshi Chavda
- 6 Shri Laxmikant Pappu Nishad
- 7 Shri Dilip Saikia
- 8 Smt. Kamaljeet Sehrawat
- 9 Shri Janardan Singh Sigriwal
- 10 Dr. Amar Singh
- 11 Shri Vivek Thakur
- 12 Shri Parbhubhai Nagarbhai Vasava
- 13 Dr. Kalanidhi Veeraswamy
- 14 Shri Dharmendra Yadav

RAJYA SABHA

- 15 Shri Narain Dass Gupta
- 16 Shri Chandrakant Handore
- 17 Shri Mithlesh Kumar
- 18 Shri Mayankbhai Jaydevbhai Nayak
- 19 Shri K.R.N. Rajeshkumar
- 20 Dr. V. Sivadasan

SECRETARIAT

1. Shri Rajesh Ranjan Kumar - Joint Secretary
2. Shri Sujay Kumar - Deputy Secretary
3. Shri Brajesh Kumar Singh - Deputy Secretary

Representatives of the Ministry of Petroleum and Natural Gas

1. Shri Praveen Mal Khanooja - Additional Secretary
2. Shri Asheesh Jos - Joint Secretary
3. Shri Vinod Seshan - Joint Secretary
4. Shri D.K. Ojha - DDG

Representatives of IOCL

1. Shri A.S. Sahney - Chairman
2. Dr. Alok Sharma - Director

Representatives of BPCL

1. Shri G. Krishnakumar - CMD
2. Shri N. Chandrashekhar - Head R&D

Representatives of EIL

1. Smt. Vartika Shukla - CMD
2. Shri Rajiv Agarwal - Director

Representatives of ONGC

1. Shri Arun Kumar singh - CMD
2. Smt. Sushma Rawat - Director

Representatives of HPCL

1. Shri Rajneesh Narang - CMD
2. Shri S. Bharathan - Director

Representatives of OIL

1. Shri Saloma Yamdo - Director

Representatives of GAIL

1. Shri Sandeep Kumar Gupta - CMD

2. Shri R.K. Singhal - Director

Representatives of CHT

1. Shri Shekhar Kulkarni - Director

Representatives of DGH

1. Shri Kaustav Nag - ADG

2. At the outset, Hon'ble Chairperson welcomed the Members to the sitting of the Committee and apprised them about the agenda of the sitting i.e. consideration of the Draft Report of the Committee i.e. 'Demands for Grants (2024-25)' of the Ministry of Petroleum and Natural Gas and thereafter to take oral evidence from the representatives of the Ministry of Petroleum and Natural Gas/Oil PSUs on the subject 'R&D Activities of Oil PSUs'.

3. The Committee then took up for consideration the draft report on 'Demands for Grants (2024-25)' of the Ministry of Petroleum and Natural Gas. Some hon. Members made certain suggestions to the draft recommendations of the Committee. The report was then adopted with slight modifications in the recommendations.

4. The Committee, then authorised the Chairperson to finalize the Report and present/lay the Report in both the Houses of Parliament.

5. Thereafter, the Committee took up the second agenda of the sitting i.e. to take oral evidence from the representatives of the Ministry of Petroleum and Natural Gas/Oil PSUs on the subject 'R&D Activities of Oil PSUs'. Then the representatives of the Ministry of P&NG/Oil PSUs were called into the sitting. The Chairperson welcomed the representatives of the Ministry/Oil PSUs and requested them to introduce themselves and brief the Committee on the subject. After customary introduction, the representatives of Ministry of Petroleum and Natural Gas/Oil PSUs made a power point presentation on the subject.

6. Subsequently, the Members of the Committee raised several issues related to the subject such as R&D activities being undertaken by Oil PSUs, major thrust areas in focus for developing R&D capabilities, R&D expenditure by Oil PSUs, quantum of investments made and man-power engaged in R&D activities, details of existing as well as new R&D centres proposed to be set up in coming years, R&D initiatives of PSU OMCs in the field of development of alternate fuels, commercialization of

technologies developed by Oil PSUs, research and development activities for achieving net emissions, R&D activities in fields of oil exploration, production and refining processes so as to ensure self-reliance, major achievements in field of R&D, number of patents and intellectual property rights obtained over the last five years and details of joint ventures/collaborations with other national/international institutes of prominence in the field of R&D by Oil PSUs, need to find innovative technologies to find solution to waste management particularly for tackling crop residue burning by farmers, development of green-hydrogen and hydrogen fuel cell technology, future projects being chalked out by Oil PSUs for R&D activities etc;

7. The representatives of the Ministry/PSUs furnished clarifications to the queries raised by the Members. On some of the points on which the information was not readily available, the Chairperson asked the representatives to furnish written replies on the same within seven days to the Lok Sabha Secretariat.

8. The Chairperson then thanked the representatives of the Ministry of Petroleum and Natural Gas/Oil PSUs for providing valuable information on the subject.

(The witnesses then withdrew)

9. The Committee also deliberated upon undertaking study visit of the Committee in the month of January 2025 in connection with examination of subjects selected. The Committee then authorised the Chairperson to finalize the proposed study visit.

10. A copy of the verbatim proceedings is kept in the Branch for record.

The Committee then adjourned

MINUTES

**STANDING COMMITTEE ON PETROLEUM AND NATURAL GAS
(2024-25)**

**SEVENTH SITTING
(04.02.2025)**

The Committee sat on Tuesday, the 04th February, 2025 from 1500 hrs. to 1615 hrs. in Committee Room 'C', Parliament House Annexe, New Delhi.

PRESENT

Shri Sunil Dattatrey Tatkare - Chairperson

MEMBERS

LOK SABHA

- 2 Shri Gurjeet Singh Aujla
- 3 Shri Benny Behanan
- 4 Shri Dileshwar Kamait
- 5 Shri Vinod Lakhamshi Chavda
- 6 Smt. Joba Majhi
- 7 Smt. Pratima Mondal
- 8 Shri Laxmikant Pappu Nishad
- 9 Shri Dilip Saikia
- 10 Shri Janardan Singh Sigriwal
- 11 Dr. Amar Singh
- 12 Shri Ve Vaithilingam
- 13 Shri Balashowry Vallabhaneni
- 14 Dr. Kalanidhi Veeraswamy

RAJYA SABHA

- 15 Shri Chunnilal Garasiya
- 16 Shri Chandrakant Handore
- 17 Shri Mithlesh Kumar
- 18 Shri Mayankbhai Jaydevbhai Nayak
- 19 Shri K.R.N. Rajeshkumar

SECRETARIAT

1. Shri Rajesh Ranjan Kumar - Joint Secretary
2. Shri Sujay Kumar - Deputy Secretary
3. Shri Brajesh Kumar Singh - Deputy Secretary

Representatives of the Ministry of Petroleum and Natural Gas

1. Shri Pankaj Jain - Secretary
2. Shri D.K. Ojha - DDG

Representatives of IOCL

1. Shri A.S. Sahney - Chairman
2. Shri Alok Sharma - Director

Representatives of BPCL

1. Shri N. Chandrasekhar - Head R&D
2. Shri Sanjay Khanna - Director

Representatives of ONGC

1. Smt. Sushma Rawat - Director

Representatives of GAIL

1. Shri Sandeep Kumar Gupta - CMD

Representatives of OIL

1. Dr. Ranjit Rath - CMD
2. Shri Saloma Yamdo - Director
3. Shri Trailukya Borgohain - Director

Representatives of EIL

1. Shri U.K. Verma - ED

Representatives of CHT

1. Shri Shekhar Kulkarni - Director

2. At the outset, the Hon'ble Chairperson welcomed Members of the Committee and apprised them of the agenda of the sitting i.e. **oral evidence of the representatives of Ministry of Petroleum and Natural Gas/Oil PSUs on the subject 'R&D activities of Oil PSUs'.**

3. Thereafter, the representatives of the Ministry of P&NG/Oil PSUs were called into the sitting of the Committee to brief the Committee on the subject. After customary introduction, representatives of the Ministry/PSUs made a power point presentation

on the subject giving overview of the R&D activities in upstream and downstream segments of oil and gas sector in the country.

4. Subsequently, Members of the Committee raised several issues related to the subject such as major thrust areas of R&D activities of oil PSUs, R&D infrastructure facilities in oil PSUs, products and technologies developed through R&D initiatives, allocation of funds and actual utilization for R&D activities of Oil PSUs, increasing budgetary allocation on R&D in view of energy transition requirements need to set-up an umbrella Research organization in the Petroleum sector on the lines of CSIR or ICAR, to coordinate R&D activities being undertaken by oil PSUs. Energy efficiency improvement in refineries, timely completion of under construction R&D centres of oil PSUs, roadmap for augmenting Green Hydrogen production in the country along with steps taken towards use of indigenous technologies in manufacturing of Electrolyser for Green Hydrogen production. Some members also raised query about the initiatives of oil PSUs for achieving Net zero targets and carbon capture and utilization, status of R&D for development of new and alternate fuels like ethanol, bio-diesel etc: R&D in lubricants segment, hydrogen purification, solar energy, number of patents filed and obtained by oil PSUs, revenue generated from royalty, licensing fees and commercialization of technologies by oil PSUs. Members also sought clarification about current staff strength and measures taken for augmenting skilled manpower in R&D centres of oil PSUs, R&D activities for reducing environmental impact due to oil and gas processes, Industry-Academia linkages for developing indigenous technologies in oil and gas industry, international collaborations of oil PSUs for R&D activities, use of Artificial Intelligence in R&D projects of oil PSUs. functioning of Centre of High Technology, long term plan of the Government on R&D in oil and gas industry, steps taken to engage Start-ups in R&D projects, etc.

5. Further. Secretary of the Ministry apprised the Members about the upcoming India Energy Week Event being organized at Yashobhumi Convention Centre. Delhi from 11 to 14 February, 2025 and invited members of the Committee to visit the same.

6. It was also decided that another sitting of the Committee will be held on the subject 'R&D activities of oil PSUs'.

7. The representatives of the Ministry/PSUs furnished clarifications to the queries raised by the Members. On some of the points on which the information was not readily

available, the Chairperson asked the representatives to furnish written replies on the same within seven days to the Lok Sabha Secretariat.

8. The Chairperson then thanked the representatives of the Ministry of Petroleum and Natural Gas/Oil PSUs for providing valuable information on the subject

(The witnesses then withdrew)

9. A copy of the verbatim proceedings is kept in the Branch for record
The Committee then adjourned

MINUTES

**STANDING COMMITTEE ON PETROLEUM AND NATURAL GAS
(2024-25)**

**NINTH SITTING
(24.02.2025)**

**The Committee sat on Monday, the 24th February, 2025 from 1445 hrs. to
1615 hrs in Committee Room 'G- 074', Parliament Library Building, New Delhi**

PRESENT

Shri Sunil Dattatrey Tatkar - Chairperson

MEMBERS

LOK SABHA

- 2 Shri Gurjeet Singh Aujla
- 3 Shri Benny Behanan
- 4 Shri Maddila Gurumoorthy
- 5 Smt. Pratima Mondal
- 6 Shri Jai Prakash
- 7 Shri Janardan Singh Sigrwal
- 8 Shri Vivek Thakur
9. Shri Balashowry Vallabhaneni
10. Shri Parbhubhai Nagarbai Vasava
11. Dr. Kalanidhi Veeraswamy
12. Shri Dharmendra Yadav
13. Dr. Amar Singh

RAJYA SABHA

14. Shri Chunnalal Garasiya
15. Shri Narain Dass Gupta
16. Shri Chandrakant Handore
17. Shri Dorjee Tshering Lepcha
18. Shri Mayankbhai Jaydevbhai Nayak
19. Shri K.R.N. Rajeshkumar
20. Dr. V. Sivadasan

SECRETARIAT

1. Shri Rajesh Ranjan Kumar - Joint Secretary
2. Shri Sujay Kumar - Deputy Secretary
3. Shri Brajesh Kumar Singh - Deputy Secretary

Representatives of the Ministry of Petroleum and Natural Gas

- | | | |
|----|---------------------------|---|
| 1 | Shri Pankaj Jain | - Secretary |
| 2 | Shri Praveen Mal Khanooja | - Additional Secretary |
| 3 | Smt. Kamini Chauhan Ratan | - Additional Secretary& Financial Advisor |
| 4 | Smt. Sujata Sharma | - Joint Secretary |
| 5 | Ms. Esha Srivastava | - Joint Secretary |
| 6 | Shri Asheesh Joshi | - Joint Secretary |
| 7 | Shri Vinod Seshan | - Joint Secretary |
| 8 | Shri D.K. Ojha | - DDG |
| 9 | Shri Rajinder Kumar | - Economic Advisor |
| 10 | Shri Deepak Srivastava | - Director |

Representatives of ONGC

- | | | |
|----|--------------------------|------------|
| 1. | Shri Arun Kumar singh | - Chairman |
| 2. | Shri Vivek C. Tongaonkar | - Director |
| 3. | Smt. Sushma Rawat | - Director |

Representatives of DGH

- | | | |
|----|-------------------------|-----------|
| 1. | Smt. Pallavi Jain Govil | - DG, DGH |
| 2. | Dr. Kaustav Nag | - ADG |

Representatives of BPCL

- | | | |
|----|----------------------|------------|
| 1. | Shri G. Krishnakumar | - CMD |
| 2. | Shri V.R.K. Gupta | - Director |

Representatives of OIL

- | | | |
|----|--------------------------|------------|
| 1. | Shri Saloma Yamdo | - Director |
| 2. | Shri Trailukya Borgohain | - Director |
| 3. | Shri Abhijit Majumder | - Director |

Representatives of GAIL

- | | | |
|----|--------------------------|-------|
| 1. | Shri Sandeep Kumar Gupta | - CMD |
|----|--------------------------|-------|

Representatives of EIL

1. Shri Rajiv Agarwal - Director
2. Shri R.P. Batra - ED

Representatives of IOCL

1. Dr. Alok Sharma - Director

Representatives of HPCL

1. Shri Rajneesh Narang - CMD

Representatives of Balmer & Lawrie

1. Shri Adhip Nath Palchaudhuri - CMD

Representatives of CHT

1. Shri Rajesh Agarwal - ED
2. Shri Shekhar Kulkarni - Director

Representatives of M/o Chemicals & Fertilizers

1. Shri Anurag Rohatgi - Joint Secretary

Representatives of Rashtriya Chemicals and Fertilizers Ltd.

1. Shri S.C. Mugderikar - CMD

2. At the outset, the Hon'ble Chairperson welcomed the Members of the Committee and apprised them about the agenda of the sitting *i.e.* to take oral evidence by representatives of the Ministry of Petroleum and Natural Gas/Oil PSUs and Ministry of Chemicals and Fertilizers (Department of Fertilizers)/Rashtriya Chemicals and Fertilizers Ltd. on the subject '**R&D Activities of Oil PSUs**'.

3. Thereafter, the representatives of the Ministry of Petroleum and Natural Gas/Oil PSUs and Ministry of Chemicals and Fertilizers (Department of Fertilizers)/Rashtriya Chemicals and Fertilizers Ltd. were called into the sitting of the Committee to brief the Committee on the subject. After customary introduction, representatives of the MoPNG/PSUs made a power point presentation on the subject giving overview of R&D

initiatives of oil and gas PSUs over the years. Thereafter, Ministry of Chemicals and Fertilizers (Department of Fertilizers)/Rashtriya Chemicals and Fertilizers Ltd. briefed the Committee on the Subject.

4. Subsequently, Members of the Committee raised several issues related to the subject such as key areas identified in upstream and downstream sectors for undertaking R&D activities by oil PSUs, manpower engaged in R&D activities, revenue generated by oil PSUs from R&D activities by way of commercialization of patents and innovative technologies, collaboration in R&D projects with national and international players in oil and gas sector, action plan to create synergy among R&D centers of oil PSUs, initiatives to improve energy efficiency of automobiles, number of CBG plants functional in the country and steps taken to expedite setting up of more CBG plants. Further, some members also raised queries regarding low investments in R&D sector by oil PSUs, quantum of budgetary support to oil PSUs for R&D activities, need to increase expenditure on R&D activities, challenges being faced by oil PSUs in augmenting their R&D capabilities, development of new and alternative energy sources like solar, wind, bio-fuels etc and R&D activities for achieving net-zero commitments of the Country. A few members sought clarifications on the need to evolve national policy for coordinating R&D activities in oil and gas sector, status of implementation of recommendations made by Dr. Anil Kakodkar Committee for creation of separate R&D cadre for oil PSUs, functioning of Centre of High Technology (CHT) to promote R&D in oil and gas sector etc;

5. The Members also raised queries on the issues such as natural gas consumption in manufacturing of fertilizers, measures taken for energy efficiency in fertilizer industry, steps taken to popularize Fermented Organic Manure (FOM) and Liquid Fermented Organic Manure (LFOM) to reduce dependency on chemical fertilizers, release of subsidy to CBG producers, development of new technologies for production of nano fertilizers, implementation of PM-PRANAM Scheme to promote sustainable agriculture by reducing excessive reliance on chemical fertilizers, new fertilizers plants being set-up in the country, details of R&D centers set up for fertilizer industry, objectives of PM Kisan Urja Suraksha Evam Utthan Mahabhiyan and its outcome, reasons for fall in share prices of Rashtriya Chemicals and Fertilizers Ltd. Etc.

6. The representatives of the Ministry of Petroleum and Natural Gas/Oil PSUs and Ministry of Chemicals and Fertilizers (Department of Fertilizers)/Rashtriya Chemicals

and Fertilizers Ltd. furnished clarifications to the queries raised by the Members. On some of the points on which the information was not readily available, the Chairperson asked the representatives to furnish written replies on the same within seven days to the Lok Sabha Secretariat.

7. The Chairperson then thanked the representatives of the Ministry of Petroleum and Natural Gas/Oil PSUs and Ministry of Chemicals and Fertilizers (Department of Fertilizers)/Rashtriya Chemicals and Fertilizers Ltd. for providing valuable information on the subject.

(The witnesses then withdrew)

8. The committee, thereafter, deliberated on the subject of next sitting and it was decided that the next sitting of the Committee will be held on the subject 'Review of On-going Projects of Oil PSUs including CGD Projects with special reference to ongoing pipeline projects'. It was also decided that in addition to the MoPNG/PSUs, the state government authorities concerned will also be called in the next sitting subject to approval of the Hon'ble Speaker.

9. A copy of the verbatim proceedings is kept in the Branch for record.

The Committee then adjourned

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MINUTES

STANDING COMMITTEE ON PETROLEUM AND NATURAL GAS

(2025-26)

NENETEENTH SITTING

(10.08.2026)

The Committee sat on Monday, the 10th August, 2026 from 1600 hrs. to 1700 hrs. in Committee Room Samanvay - 5, First Floor, Parliament House, New Delhi.

PRESENT

Shri Sunil Dattatrey Tatkare - Chairperson

MEMBERS

LOK SABHA

- 2 Shri Maddila Gurumoorthy
- 3 Shri Dileshwar Kamait
- 4 Smt. Pratima Mondal
- 5 Shri Laxmikant Pappu Nishad
- 6 Smt. Kamaljeet Sehwat
- 7 Shri Janardan Singh Sigriwal
- 8 Shri Ve Vaithilingam

RAJYA SABHA

- 9 Shri Chunnilal Garasiya
- 10 Shri Mithlesh Kumar
- 11 Shri Dorjee Tshering Lepcha
- 12 Shri Mayankkumar Nayak
- 13 Dr. V. Sivadasan
- 14 Shri Ravi Chandra Vaddiraju

SECRETARIAT

1. Shri Harish Chandra Bist - Joint Secretary
2. Shri Sujay Kumar - Director

2. At the outset, the Hon'ble Chairperson welcomed the Members to the sitting of the Committee. XXX XXX XXX XXX XXXX XXX XXX

3. Thereafter, the Committee took up for consideration the draft report on the subject 'Examination of R&D Activities of Oil PSUs' and adopted the Report with slight modifications.

4. The Committee then authorised the Chairperson to finalize the Report and present/lay the Report in both the Houses of Parliament.

The Committee then adjourned.

XXXX- Matter not related to this Report.