

Annexure- IV

Report on Energy Conservation, Technology Absorption and Foreign Exchange Earning as per the provisions of the Companies Act 2013 and rules notified thereunder

(A) Conservation of Energy:

(i) The steps taken or impact on Conservation of Energy & the capital investment on energy conservation equipments:

During 2022-23, 119 Energy Conservation Schemes were implemented across the IndianOil Refineries wherein energy savings of 2,55,379 SRFT/year, equivalent to a monetary savings of ₹ 840 Crore/year was achieved. Through implementation of the Energy Conservation schemes, IndianOil has achieved reduction in approx. 0.81 MMT equivalent CO₂ emission per year. Some of the major schemes implemented during 2022-2023 are provided below:

SL No	Energy saving schemes	Estimated Cost (₹ in Lakh)	Estimated Fuel Savings (SRFT) MT/Year
1	Operating of HDT MUGC-B on Grid at Guwahati Refinery	-	3000
2	Perlite Insulation of HP+MP+LP Steam lines (6.5 km) Barauni Refinery	168.1	3550
3	Execution of steam trap management program at BR at Barauni Refinery	87.5	7510
4	Piping from BS-VI offsite MP Steam line for supplying MP steam to bitumen terminal at Gujarat Refinery	38.2	3200
5	Recovery of PSA-II off gas and routing to FG header at Gujarat Refinery	673.1	7680
6	Rectification of identified hotspots of Insulation Survey at Gujarat Refinery	-	6100
7	PSV passing survey and rectification at Haldia Refinery	6.6	3700
8	Reduction of steam in VDU-2 1st stage ejector at Haldia Refinery	-	5926
9	Commissioning of WSA to generate steam and H2SO4 at Haldia Refinery	-	23700
10	MP steam stoppage in TPS Deaerator at Mathura Refinery	-	5500
11	O ₂ enrichment and stoppage of air preheat in SRU (Unit no. 25, 55 & 56) at Panipat Refinery	665	4500
12	Installation of Tail gas compressor at DHDS for routing of excess PSA Off gas to FG header post processing of H ₂ rich gases in HGU 06 PSA at Panipat Refinery	2290	4685
13	Rerouting of flash steam from HRSG de-aerator to UB de-aerator and stoppage of LP import from units at Panipat Refinery	-	5367
14	Ceramic coating for optimised emissivity in AVU 1 furnaces at Panipat Refinery	98.4	3079
15	Reducing stack losses in HRSG through MUH at Bongaigaon Refinery	20	3608
16	Coker De-ethanizer/Stripper inlet feed preheater for reduced MP Steam consumption in DCU at Paradip Refinery	214.0	6327
17	Crude preheat improvement by 5 degree celcius	-	6266

SRFT: Standard Refinery Fuel Equivalent Tones

Further, as part of energy conservation initiative, an Energy Efficiency Improvement Study (EEIS) of the 8 IndianOil Refineries (except Paradip) was awarded to Engineer India Ltd. (EIL) through Center for High Technology (CHT) in 2017. After a detailed review of total energy saving schemes by EIL, 122 energy saving schemes with estimated saving potential of approx. 4,47,300 SRFT/year were identified for implementation/further study, out of which 25 schemes, including all quick-win schemes, with energy saving potential of ~28000 SRFT/year, were implemented in 2018; 14 schemes with energy saving potential of ~22600 SRFT/year were implemented in 2019-20; 10 schemes with energy saving potential of

~8040 SRFT/year were implemented in 2020-21; 10 schemes with energy saving potential of ~14184 SRFT/year were implemented in 2021-22. 19 schemes were implemented in during 2022-23 with energy saving potential of ~31000 SRFT/ year.

(ii) Steps taken by the Company for utilising alternate sources of energy:

- The renewable energy portfolio of the Company includes grid connected power and off-grid solar power. The Company is replacing fluorescent tube lights & incandescent lamps with LED lighting
- The Company has 25.57 MWp of solar panels across various refineries with a total annual generation capacity of 33 GWh of electricity

(B) Efforts made towards Technology Absorption, Adaptation and Innovation

As a continuous effort towards improvement of product pattern, product quality, improvement of energy efficiency as well as to meet the dynamic environmental emission norms and to improve profit margin, your Company has adopted most modern technologies in line with the latest worldwide developments in the field of petroleum refining and petrochemicals production. Major technologies adopted by the Company are as follows:

a. Indigenous Technology

i. indeDiesel® (Diesel Hydrotreatment) Technology

indeDiesel® Technology developed for BS-VI quality diesel production by R&D Centre along with 'Engineers India Limited' has been successfully implemented in Bongaigaon, Gujarat (DHDS revamp and DHDT revamp) and Haldia Refinery and is under implementation at Barauni Refinery.

ii. indeHex® (Hexane Hydrogenation) Technology

R&D Centre of IndianOil and EIL have developed/commercialised hydrogenation based indeHex® Process Technology for Food grade Hexane/Polymer grade Hexane production. 2 units are currently operational (Gujarat Refinery and HMEL, Bathinda Refinery).

iii. INDAdaptG Technology

INDAdaptG is reactive adsorption-based process technology, developed by R&D Centre and EIL, for production of low Sulphur gasoline component meeting BS-IV/BS-VI sulphur specification. INDAdaptG unit with a capacity of 35 kTA was successfully commissioned for BS-IV gasoline production in Guwahati Refinery.

iv. indDSK® Technology

indDSK® is low severity Hydrotreating Technology jointly licensed by R&D centre and EIL for production of ultra-low Sulphur PCK. The technology is under implementation at Paradip Refinery for grass-root 300 kTA unit under BS-VI projects.

v. indJet® Technology

indJet® Technology is jointly licensed by R&D centre and EIL for ATF production by selective removal of mercaptan Sulphur. The technology has been implemented for a grass-root 400 kTA unit at Barauni Refinery which was commissioned in Jun'22.

vi. indDSN® (Naphtha Hydrotreatment) Technology

indDSN® is a process technology, jointly licensed by R&D centre and EIL, for treating Naphtha range hydrocarbon streams to achieve product stream

containing ultra-low sulphur (≤ 0.5 ppmw). A 235 kTA grass-root unit have been licensed at Bongaigaon Refinery for Feed treatment of Isomerization unit and commissioned in May 2021.

vii. indSelectG Technology

indSelectG is in-house developed selective hydrotreating based technology for cracked gasoline desulfurisation with minimum octane loss. A 80 kTA grass-root unit has been commissioned at Guwahati Refinery in July 2022.

viii. INDMAX Technology

INDMAX Technology developed in-house by R&D centre and Lummus Technology for converting heavy distillate and residue into LPG/light distillate products has been implemented successfully at Guwahati Refinery, Paradip Refinery and Bongaigaon Refinery and are proposed to be implemented at Barauni, Gujarat, Panipat and CPCL Refinery. Based on the in-house formulation recipe, INDMAX base catalyst, manufactured and supplied for a commercial trial in FCC unit at Mathura Refinery for performance improvement in propylene yield. Performance test run was successfully completed and met the expected propylene yield.

ix. Octamax Technology

Octamax Technology, developed by R&D centre, has been successfully implemented at Mathura Refinery for production of High-octane Gasoline blending stream from refinery LPG streams. A 110 KTPA capacity plant based on this technology is under implementation at Gujarat Refinery under LuPech Project. The technology has also been licensed to CPCL under CBR Expansion Project.

x. AmyleMax Technology

AmyleMax Technology, developed by R&D centre, for improvement of octane number of light cracked Naphtha through increase in oxygenates has been successfully demonstrated at Gujarat Refinery in 2019. A grassroot unit is being considered for implementation at Gujarat Refinery.

xi. Hexane Hydrogenation Technology

Hexane Hydrogenation process for production of Food grade Hexane (WHO grade quality), developed by R&D centre with indigenous catalyst has been successfully implemented at Gujarat Refinery.

xii. Delayed Coker Technology

Delayed Coker Technology, developed by R&D centre and EIL has been successfully demonstrated for Coker-A revamp at Barauni Refinery. The technology is also under implementation for Coker-B unit revamp at Barauni Refinery Expansion Project.

xiii. CBG Technology

Bio Gas technology, developed by R&D centre for production of CBG from cattle dung/paddy straw. A 100 TPD plant on cow dung feedstock was mechanically completed at Hingonia, Jaipur during May 2022 and commissioning underway. Also 200 TPD plant based on paddy straw feed is under implementation at Gorakhpur.

xiv. 2G Ethanol Unit

Technology from Praj Industries for production of Ethanol from rice straw (2G Ethanol unit) is being implemented at Panipat. Full scale commissioning of the envisaged 2G Ethanol Plant is scheduled during 2023-24. 2G Ethanol project targets production of 100 KLPD of bio-ethanol using waste biomass like paddy straw to enhance country's energy security, providing extra income to farmers and solving environment problems for burning of rice straw in fields.

xv. NEECOMAX Technology

NEECOMAX Technology is developed by R&D centre, for production of Needle grade petroleum coke from Clarified Oil. Calcined Needle Coke is a value-added niche product produced from low value feed stock. Needle Coker unit based on NEECOMAX Technology is proposed to be implemented at Paradip Refinery.

xvi. SR LPG Treatment Technology developed by R&D centre

LPG Hydrotreater Technology for treatment of SR LPG is under implementation under Panipat Refinery Expansion Project (P-25).

xvii. Ind-Coker^{AT} Technology

R&D centre has developed an indigenous technology for Delayed Coker unit with two stage cracking process to reduce the coke yield and increase the distillate yield from the unit. Existing DCU at Digboi Refinery is being revamped using Ind-Coker^{AT} Technology under Digboi Refinery Expansion Project.

b. Imported Technology

i. 3G Ethanol Unit

Technology from M/s Lanzatech, USA for production of Ethanol from PSA off gas has been implemented at Panipat Refinery.

ii. Alkylation Technology

For production of MS, Alkylation Technology from M/s Exxon Mobil, USA has been implemented at Paradip Refinery.

iii. ATF Treatment Technology

ATF Merox Treatment Technology from M/s UOP, USA has been implemented at Gujarat and Panipat

Refineries. Technology from M/s Merichem, USA has been implemented at Paradip Refinery.

iv. Biturox Technology

To produce various grades of Bitumen as well as to meet the quality requirements, Biturox Technology from M/s Porner, Austria is under implementation at Gujarat, Mathura and Barauni Refineries.

v. Butane Isomerisation Technology

For production of Alkylate, 'Butamer' Technology from M/s UOP, USA has been implemented at Paradip Refinery.

vi. Butene-1 Technology

For production of Butene-1 Technology from M/s Axens, France has been implemented at Gujarat Refinery and at Panipat complex.

vii. Catalytic Iso-dewaxing Technology

For improving lube oil quality in line with international standards and augmenting production capability of API Gr II LOBS, Iso-dewaxing technology from M/s MOBIL, USA has been implemented at Haldia Refinery. Catalytic Dewaxing technology from M/s Chevron Lummus Global (CLG) for production of API Gr II and Gr III LOBS has been considered in expansion project at Panipat Refinery and LuPech Project at Gujarat Refinery.

viii. Catalytic Reforming Technology

For improvement in Octane number of Motor Spirit, Continuous Catalytic Reforming Technology (CCRU) from M/s Axens, France has been implemented at Mathura and Panipat Refineries. Continuous Catalytic Reforming Technology from M/s UOP, USA has been implemented at Gujarat, Paradip and Barauni Refineries. Catalytic Reforming Technology (CRU) with Russian collaboration has been implemented at Gujarat Refinery and from M/s Axens has been implemented at Haldia, Barauni, Digboi and Bongaigaon Refineries. Continuous Catalytic Reforming Technology (CCRU) from M/s UOP has been considered in Expansion Project at Panipat Refinery.

ix. Coker Gas Oil Hydrotreatment Technology

Coker Gas Oil Hydrotreatment Technology from M/s Axens, France has been implemented at Haldia Refinery under DYIP Project.

x. Coke Calcination Technology

Coke Calcination Technology from METSO, USA for production of Calcined Needle Coke is proposed to be implemented at Paradip Refinery.

xi. Delayed Coker Technology

For bottom of the barrel upgradation, Delayed Coker Technology from M/s Lummus Technology, USA

has been implemented at Panipat Refinery as part of Panipat Refinery Expansion Project. Delayed Coker Technology from M/s Foster Wheeler, USA has been implemented at Gujarat Refinery under Resid Upgradation Project, at Paradip Refinery and also at Haldia Refinery under Distillate Yield Improvement (DYIP) Project.

xii. Diesel Hydro Desulphurisation Technology

Diesel Hydro Desulphurisation (DHDS) Units have been installed at Mathura and Panipat Refineries with technology from M/s Axens, France and at Gujarat and Haldia Refineries with technology from M/s UOP, USA to meet the Diesel quality requirement w.r.t Sulphur. Technology from M/s Haldor Topsoe, Denmark has been implemented for revamp of DHDS at Mathura Refinery.

xiii. Diesel Hydrotreatment Technology

Diesel Hydrotreatment (DHDT) Units have been installed at Guwahati, Barauni, Digboi, Panipat and Gujarat Refineries with the technology from M/s UOP, USA. Technology from M/s Axens, France is implemented at Mathura, Panipat, Gujarat and Paradip refineries. Technology from M/s Shell Global Solutions, Netherlands is implemented at Paradip Refinery and has been considered in Expansion Project at Panipat Refinery.

xiv. Divided Wall Column (DWC) Technology

Divided Wall Column (DWC) Technology is a new separation technology which separates a multi-component feed into three or more purified streams within a single tower, thereby eliminating the need for a second column to obtain high purity products. This design saves capital and energy costs by eliminating operation of second separation column. DWC of M/s KBR, USA has been implemented at Mathura Refinery at CCRU-NSU.

xv. Fluidised Catalytic Cracking Technology

Fluidised Catalytic Cracking (FCC) Technology from M/s UOP, USA has been implemented in Gujarat and Mathura Refineries for conversion of Vacuum Gas Oil to LPG, MS and Diesel. Technology from M/s Lummus Technology, USA has been implemented for revamp of FCCU at Mathura Refinery.

xvi. Hydrocracker Technology

Full Conversion Hydro Cracking Unit (HCU) Technologies from M/s Chevron USA and M/s UOP USA have been implemented at Gujarat Refinery and Panipat Refinery, respectively for conversion of Vacuum Gas Oil to Jet fuel, Kerosene and Diesel. Revamp of HCU Unit based on technology from Chevron Lummus Global is under implementation at Gujarat Refinery under LuPech Project to produce feedstock for LOBS/CDW Unit.

xvii. Hydro-finishing Technology for Treatment of Paraffin

Wax/Microcrystalline Wax Process Technology from M/s Axens, France for hydro finishing of paraffin wax has been implemented at Digboi Refinery.

xviii. Hydrogen Generation Technology

Hydrogen Generation Technology from M/s Linde, Germany was adopted for Hydrogen production and supply to Hydrocracker unit at Gujarat Refinery and has been implemented at Barauni Refinery under MS Quality Improvement Project. Hydrogen Generation Technology from M/s Haldor Topsoe, Denmark is in operation at Gujarat, Mathura, Haldia, Panipat and Barauni Refineries and has been implemented at Gujarat Refinery under Resid Upgradation Project. Similar technology from M/s Technip Energies, the Netherlands has been implemented for Hydrogen generation at Guwahati, Digboi, Mathura and Haldia Refineries. Hydrogen Generation Technology from M/s Technip Energies, Netherlands has been implemented at Bongaigaon Refinery under Diesel Quality Improvement Project.

xix. ISOSIV Technology at Guwahati Refinery

For production of Isomerase for blending in MS at Guwahati Refinery, ISOSIV Technology from M/s UOP, USA has been implemented.

xx. Kerosene Hydro Desulphurisation Technology

Kerosene Hydro Desulphurisation Unit has been installed at Haldia Refinery with technology from M/s Axens, France.

xxi. LPG Treatment Technology

Coker LPG Merox Treatment Technology from M/s UOP, USA has been implemented at Panipat Refinery and Haldia Refinery under DYIP Project. FCC LPG Treatment Technology from M/s Merichem, USA has been implemented at Haldia and Paradip Refineries. Straight Run LPG Treatment Technology from M/s UOP, USA has been implemented at Paradip Refinery. LPG Treatment Technology from M/s UOP is under implementation in B-9 Expansion Project at Barauni Refinery.

xxii. MS Quality Upgradation Technology

For MS Quality Upgradation, Isomerisation Technology of M/s UOP, USA have been implemented at Mathura, Panipat and Gujarat Refineries. Isomerisation Technology from M/s Axens, France has been implemented at Haldia, Guwahati, Digboi and Barauni Refineries. FCC Gasoline Desulphurisation Technology (Prime-G) from M/s Axens, France has been implemented at Haldia, Mathura, Panipat Barauni and Bongaigaon Refineries. Isomerisation Technology of M/s UOP,

USA is under implementation in Expansion Projects at Barauni, Panipat and Gujarat Refineries.

xxiii. MTBE Technology

Technology from M/s CD Tech, USA has been implemented for production of MTBE at Gujarat Refinery.

xxiv. Naphtha Cracker and Downstream Petrochemical Technology

Naphtha Cracker Technology from M/s ABB Lummus, USA has been implemented at Panipat Refinery. Technologies from M/s Basell, Italy, M/s Basell, Germany, M/s Nova Chemicals, Canada and M/s Scientific Design, USA have been implemented for downstream polymer plants viz. Poly-Propylene Unit (PP), HDPE Unit, Swing Unit (HDPE/LLDPE) and MEG Unit, respectively. Technology from M/s ABB Lummus has been implemented for production of Butadiene. Technology from M/s Basell, Italy is under implementation at Paradip Refinery for production of Poly-Propylene. Technology from M/s Scientific Design, USA is under implementation at Paradip Refinery for production of MEG. Poly-Propylene Unit (PP) with technology developed by M/s McDermott has been considered in Expansion Projects at Barauni and Gujarat Refineries. PP with technology from M/s Basell is under implementation in Expansion Project at Panipat Refinery.

xxv. Naphtha Treatment Technology

FCC Naphtha Treatment Technology from M/s Merichem, USA for removal of Mercaptans and H₂S is implemented at Paradip Refinery. Technology for Naphtha Hydrotreating and Fractionating from M/s UOP, USA is implemented at Paradip Refinery and has been considered in Expansion Projects at Barauni, Panipat and Gujarat Refineries. Naphtha hydro treating from M/s UOP, USA has been implemented at Barauni Refinery under BS-IV Project.

xxvi. Once Through Hydrocracking Technology

Once Through Hydrocracking Units (OHCU) have been installed at Panipat, Mathura and Haldia Refineries with the technologies from M/s UOP, USA, M/s Chevron, USA and M/s Axens, France respectively for improvement of distillate yield. OHCU Technology by M/s Chevron Lummus Global (CLG) has been considered in Expansion Project at Barauni Refinery.

xxvii. Regenerative Type Flue Gas Desulphurisation Technology

In order to recover Sulphur Di-oxide from Boiler flue gases a Regenerative type Flue gas Desulphurisation technology from M/s Cansolv Technology Incorporate (CTI), Canada, has been implemented at Paradip Refinery.

xxviii. Resid Fluidised Catalytic Cracking Technology

The Resid Fluidised Catalytic Cracking (RFCC) Technology from M/s Stone and Webster, USA (now part of Technip) has been implemented at Panipat, Haldia and Barauni Refineries.

xxix. Resid Hydrocracker Technology

H-Oil Technology (Resid-Hydrocracker) from Axens, France for enhancement of distillate yield from the bottoms (Vacuum residue) is being implemented at Panipat Refinery under P-25 Project.

xxx. Solvent Dewaxing/De-oiling Technology at Digboi

To upgrade the process for production of Paraffin Wax at Digboi Refinery, Solvent dewaxing/de-oiling technology from M/s UOP, USA has been implemented.

xxxi. Spent Acid Regeneration Technology

To regenerate fresh sulphuric acid from spent sulphuric acid recovered from Alkylation Unit a Spent Acid Regeneration Technology from M/s MECS (Monsanto Enviro-Chem Systems), USA has been implemented at Paradip Refinery.

xxxii. Sulphur Pelletisation Technology

For production of Sulphur in Pellet form, Technology from M/s Sandvik, Germany has been implemented at Gujarat, Mathura and Panipat Refineries.

xxxiii. Sulphur Recovery Technologies for reduction of SO₂ emissions

Refineries at Gujarat, Haldia, Mathura and Barauni are provided with Sulphur Recovery Technology from M/s Worley, Netherlands. The Sulphur Recovery Technology from M/s. Delta Hudson, Canada has been implemented at Panipat Refinery. Further, Sulphur recovery technologies from M/s Black & Veatch Pritchard, USA have been implemented at Panipat, Gujarat and Paradip Refineries. Technology from M/s Technip Energies, Spain has been implemented at Haldia Refinery under once through Hydrocracker Project. Technology from M/s Worley, Netherlands has been implemented under additional Sulphur Recovery Unit at Mathura Refinery. Technology from M/s Lurgi, Germany has been implemented under DYIP Project at Haldia Refinery. Technology from M/s Axens, France is under implementation at Panipat Refinery and Bongaigaon Refinery. Sulphur Recovery Technology from M/s Kinetic Technology is under implementation in Expansion Project at Barauni Refinery and technology from M/s Worley is under implementation in expansion at Panipat Refinery.

xxxiv. Technology for Linear Alkyl Benzene (LAB)

Technology from M/s UOP, USA has been implemented for production of Linear Alkyl Benzene at Gujarat Refinery.

xxxv. Technology for Para-Xylene

For production of Para-Xylene at Panipat, technologies from M/s UOP, USA have been implemented. Technology from M/s UOP, USA has been considered at Paradip Refinery.

xxxvi. Technology for Purified Terephthalic Acid (PTA)

For production of PTA at Panipat Refinery, technology from M/s Invista, USA has been implemented. Technology from BP Amoco has been considered at Paradip Refinery.

xxxvii. VGO Hydrotreatment Technology

Technology from M/s UOP has been implemented at Gujarat Refinery under Resid Upgradation Project. Technology from M/s Axens, France has been implemented at the VGO-Treater installed at Paradip Refinery.

xxxviii. Sulphuric Acid Plant Technology

Technology from M/s HaldorTopsoe for Production of Sulfuric Acid by oxidation of H₂S has been implemented at Haldia Refinery in June 2022 under Fuel Quality Upgradation Project.

xxxix. TAME Technology

Tertiary Amyl Methyl Ether (TAME) Technology from M/s Axens has been implemented at Panipat Refinery in March 2022.

xl. Poly Butadiene Rubber (PBR) Technology

Poly Butadiene Rubber (PBR) Technology from M/s Goodyear Tire and Rubber Corporation, USA is under implementation at Panipat Refinery and Petrochemical Complex. PBR Unit is expected to be commissioned in March 2025. The product PBR is a major raw material for Automotive Tyres.

xli. Technology for Acrylics / Oxo-Alcohol

Acrylic Acid Technology from M/s Mitsubishi Chemical Corporation (MCC) is under implementation at Dumad, Gujarat. The unit is expected to be commissioned in November 2023.

c. The benefits derived like product improvement, cost reduction, product development or import substitution:

The benefits derived include:

- Upgradation of heavy oil to higher value products of improved quality such as LPG, gas oil, motor spirit, kerosene, ATF, etc.

- Reduction of Sulphur content impurity in petroleum products (like LPG, Naphtha, MS, Kerosene, ATF, HSD etc.).

- Feed Quality Improvement for subsequent processing resulting in improved product pattern.

- Production of higher-grade lubricant base stocks which help in reducing import dependence.

- Production of better grades of Bitumen.

- Reduction of Sulphur Dioxide emissions.

- Value addition to surplus Naphtha by

- o Naphtha Cracking and subsequent high value products like Glycols, Polymers, Butadiene, Benzene etc.

- o Naphtha conversion to high value Paraxylene (PX) and benzene and subsequent PX conversion to higher value PTA product.

- Production of high value speciality products like MTBE, LAB, Food Grade Hexane etc.

- Production of products (like Styrene Butadiene Rubber and Butene-1) which are import substitution products.

- Production of Sulphur in pellets form which is more environment friendly and easier to handle.

- Auto Fuel Quality Improvement for HSD and MS so that these fuels can conform to BS-VI fuel standards and latest pollution control norms.

- Use of a number of indigenous technologies resulting in import substitution.

d. Details of imported technology (imported during the last three years reckoned from the beginning of the Financial Year):**i. Fuel Quality Upgradation Projects at Panipat Refinery:**

The details of technology imported:

- Technology for desulphurisation of gas oils, from M/s UOP, USA

- Technology for production of Sulphur from M/s Axens, France

- Technology for Hydrogen Generation from M/s Technip France

- Technology for High Ron Gasoline stream, Axens France

- Technology for TAME for FCC Gasoline, from M/s Axens, France

The year of import: 2017-18/2018-19

Whether the technology been fully absorbed: The Project has been implemented in 2020-21. TAME Unit has been commissioned in March 2022.

ii. Fuel Quality Upgradation Projects at Gujarat Refinery

The details of technology imported:

- Technology for desulphurisation of FCC Gasoline at Gujarat Refinery, from M/s Axens, France.

- Technology for desulphurisation of gas oils, from M/s UOP, USA.

- Technology for hydrogen generation from HTAS, Denmark.

The year of import: 2016-17/2017-18

Whether the technology been fully absorbed:

The Project has been implemented in 2020-21. FCC Gasoline Unit has been commissioned in August 2021.

iii. Fuel Quality Upgradation Projects at Haldia Refinery

The details of technology imported:

- Technology for Sulphuric Acid Plant at Haldia Refinery from M/s HTAS, Denmark.

The year of import: 2017-18

Whether the technology was fully absorbed:

The Project has been commissioned in June 2022.

iv. Fuel Quality Upgradation Projects at Bongaigaon Refinery

The details of technology imported:

- Technology for production of Sulphur from M/s Axens, France

The year of import: 2017-18

Whether the technology been fully absorbed:

The SRU has been commissioned in June 2022.

v. Mathura Refinery Expansion Residue Upgradation Project

The details of technology imported:

- Technology for Residue Upgradation through Ebullated bed Hydrocracker unit, from M/s Chevron, USA.

- Technology for production of Sulphur from M/s Axens, France.

- Technology for production of reformat through Catalytic Reforming Unit from M/s Axens, France.

The year of import: 2017-18

Whether the technology been fully absorbed:

Environmental Clearance for the Project obtained on November 22, 2021. Further clearance from Supreme Court is awaited.

vi. Fuel Quality Upgradation Project at Paradip Refinery

The details of technology imported:

- Technology for hydrogen generation and ROG PSA from M/s Linde, Germany.

The year of import: 2018-19.

Whether the technology been fully absorbed:

The Project is in implementation stage. Expected commissioning of HGU Plant by March 2024.

vii. Off-gas to Ethanol at Panipat Refinery from PSA Off gas of HGU

- Technology for ethanol production, from M/s Lanzatech, USA.

The year of import: 2018-19

Whether the technology been fully absorbed:

The Project has been commissioned in March 2023.

viii. Barauni Refinery Expansion Project

The details of technology imported:

- Technology for processing Vacuum gasoil in Hydrocracking Unit from M/s Chevron, USA.

- Technology for production of Isomerase through Isomerisation Unit from M/s UOP, USA.

- Technology for production of Sulphur from M/s KT, Italy.

- Technology for Poly Propylene production M/s CB&I Novolen Technology.

- Technology for LPG Treatment from M/s UOP, USA.

The year of import: 2017-18/2018-19

Whether the technology been fully absorbed:

The Project is in implementation stage - Expected commissioning by December 2024.

ix. Catalytic Reforming Unit Project in Guwahati Refinery

The details of technology imported:

- Technology for production of Reformat from M/s UOP, USA.

The year of import: 2018-19

Whether the technology been fully absorbed:

The Project is in implementation stage - Expected commissioning by October 2023.

x. Ethylene Glycol (MEG) Project at Paradip

- Technology for Ethylene Recovery Unit, from M/s CB&I Lummus, USA

- Technology for Ethylene Glycol from M/s Scientific Design, USA.

The year of import: 2016-17/2017-18

Whether the technology been fully absorbed:
The Project has been commissioned in February 2023.

xi. Gujarat Refinery Expansion Project

The details of technology imported:

- Technology for production of Reformate and Isomerate from M/s UOP, USA.
- Technology for Poly Propylene production from M/s Lummus Novolen, Germany.
- Technology for production of Lube oil base stock through HCU revamp and Catalytic Dewaxing Unit from M/s. Chevron Lummus Global, USA.

The year of import: 2018-19

Whether the technology been fully absorbed:
The Project is in implementation stage - Expected commissioning by 2024-25.

xii. Panipat Refinery Expansion Project

- Technology for desulphurisation of gas oils, from M/s Shell.
- Technology for desulphurisation of Vacuum Gas oils from M/s UOP, USA.
- Technology for production of Reformate and Isomerate from M/s UOP, USA.
- Technology for upgradation of bottom of barrel to distillates by Resid hydrocracking from M/s Axens, France.
- Technology for production of API Gr II and Gr III LOBS from M/s CLG, USA.
- Technology for production of Polypropylene Unit from M/s Basell Polyolifine, Italy.
- Technology for Sulphur Recovery Unit from M/s. Worley.

The year of import: 2018-19/2019-20

Whether the technology been fully absorbed:
The Project is in implementation stage - Expected commissioning by September 2024.

xiii. PX-PTA Project at Paradip

- Technology for PX Unit, from M/s UOP, USA.

- Technology for PTA from M/s BP Amoco, USA.

The year of import: 2017-18/2018-19

Whether the technology been fully absorbed:
The Project is in implementation stage - Expected commissioning by January 2024.

xiv. Catalytic Dewaxing Unit at Haldia

- Technology for CDW Unit, from M/s CLG, USA.

The year of import: 2018-19

Whether the technology been fully absorbed:
The Project is in implementation stage - Expected commissioning by November 2023.

xv. Acrylics/Oxo Alcohol Project at Dumad, Gujarat

- Technology for Butyl Acrylate Unit, from M/s Mitsubishi Chemical Corporation, Japan.
- Technology for Acrylic Acid Unit, from M/s Mitsubishi Chemical Corporation, Japan.
- Technology for Normal Butanol Unit, from M/s JM Davy, UK.

The year of import: 2018-19

Whether the technology been fully absorbed:
The Project is in implementation stage - Expected commissioning by November 2023.

xvi. Poly Butadiene Rubber Project, Panipat

- Technology for Goodyear Tire and Rubber Corporation, USA.

The year of import: 2021-22

Whether the technology been fully absorbed:
The Project is in implementation stage - Expected commissioning by March 2025.

e. Expenditure on R&D

- (a) Capital - ₹ 409.26 Crore
- (b) Recurring - ₹ 288.95 Crore
- (c) Total - ₹ 698.21 Crore

(C) Foreign Exchange Earning and Outgo

The total Foreign Exchange earned and outgo during the year is as under:

- Foreign Exchange earned : ₹ 26,857.11 Crore
- Foreign Exchange outgo : ₹ 5,12,231.90 Crore

Recycle, Repurpose, Recreate

Unbottling Sustainability

#Go Green

IndianOil

IndianOil is driven by its sustainability and net-zero commitment. Our 'Unbottled' initiative transforms discarded plastic bottles into uniforms to be worn by our frontline energy soldiers. By choosing recycled polyester (rPET), we reduce plastic waste and help protect the environment. Currently, 100 million plastic bottles are being recycled per annum. The garments are being sold at select IndianOil Retail Outlets. Demonstrating its commitment to circular economy, IndianOil launched its new brand of polymer recycle, Cycloplast. The brand blends recycled petrochemicals with a proportion of virgin or solo plastic and is expected to be a game-changer in the industry.