

w.e.f. 01.04.2020 was implemented. The Scheme has now been extended till September 30, 2020 for those beneficiaries who have been credited with the advance for buying refills, but not able to buy the refills till 30th June 2020. As on 16.09.2020, 13.57 crore refills have been delivered to PMUY beneficiaries under this Scheme.

(c) Oil Marketing Companies (OMCs) have informed that LPG cylinders purchased by them are manufactured in India and no imports are done.

Further, Indigenous production of LPG is less than demand, hence OMCs import LPG to meet the deficit to maintain smooth supply of LPG in the country. During April, 2020 to June, 2020, 44 % of the total demand of the country has been met through domestically produced LPG and balance 56 % has been met through import.

(d) In order to protect the Domestic LPG consumers from volatility in the prices of LPG in the international market, the selling prices of domestic subsidized LPG are modulated by the Government. Domestic LPG prices are revised every month in line with international price of LPG with corresponding revision in monthly LPG subsidy under PAHAL Scheme. Applicable subsidy is transferred directly to the bank account of beneficiary upon purchase of refill at non-subsidised price and subsidy burden is borne by the Government. Current Retail Selling Price of 14.2 kg LPG refill at Delhi Market is ₹ 594/-.

#### **Research and Development in ONGC**

1250. SHRI K.J. ALPHONS: Will the Minister of PETROLEUM AND NATURAL GAS be pleased to state:

- (a) the amount of money spent by ONGC on Research and Development;
- (b) the new technologies inducted in ONGC during the past five years; and
- (c) what has been the impact of the use of Geocellular Modelling?

THE MINISTER OF PETROLEUM AND NATURAL GAS (SHRI DHARMENDRA PRADHAN): (a) The amount of money spent by ONGC on Research and Development during the last five years is given below:

Year	R&D Expenditure (in ₹ crore)
2016-17	592
2017-18	586

Year	R&D Expenditure (in ₹ crore)
2018-19	583
2019-20	556
2020-21 (Apr-Aug'20)	146

(b) ONGC has inducted the new technologies in the field of exploration, drilling and production. The new technologies inducted in the past five years are given in Statement (*See below*).

(c) ONGC has adopted Geocellular Modelling (GCM) as a development strategy for its fields. GCM also provides a methodology and reference case to study and review the dynamic behaviour of reservoirs in the field and offer mid-course corrections. The impact of GCM has been towards redevelopment of major fields in the country, maximizing production from young/green as well as old/brown fields.

***Statement***

Sl. No.	Technologies
<b>1. Exploration</b>	
1.	Digital multi-array tools for VSP data Acquisition enables in Multi-level VSP acquisition with better fidelity.
2.	Anisotropic Migration in seismic data processing technology has proved to be more reliable imaging by analysis of the Spatial and temporal variation of anisotropic parameters while PSDM.
3.	Litho Scanner-High Definition Spectroscopy on Demo basis for the first time in Shale gas wells of Cambay Basin
4.	Post Perforation dynamic Under balance Production (PE) Enhancement technology (Rigless P3 perforation)
5.	Magnetic Resonance (MR) for Drilling
6.	Surface Tension Analysis Technology
7.	New suite of Petroleum System Modeling solution consisting of Petrel and PetroMod software's technology

Sl. No.	Technologies
8.	Tomo Facilitator from M/S Paradigm used for velocity modeling and refinement
9.	Network Attached Storage (NAS) environment upgraded to 25 TB from Storage Area Network (SAN) environment
10.	Inductively Coupled plasma-mass spectrometry (ICP-MS) for carrying out heavy metal analysis in Sea water, Sediment samples, Fish samples, Benthos, Drill cuttings, Oil samples, etc.
11.	Microwave Digestion System
12.	Nuclear Magnetic Resonance (NMR) equipment
13.	Motorized Polarising Fluorescence Microscope with digital camera and image analyzer
14.	Natural Gama Ray Spectroscopy (NGS System)
15.	Seismic Interpretation software package viz. GEOTERIC, RockMod and RockSI
16.	Tomo Plus & Geothrust from M/s Geotomo for sub-surface imaging in the foothills, thrust fold belts and desert regions
17.	Processing software module EarthStudy-360 (ES-360)
18.	OMEGA software add on modules namely MPFI for 5D interpolation and GSMP for De-multiple for robust interpolation and regularization of irregularly sampled data sets and for 3D implementation of surface related multiple elimination process respectively
19.	Airborne Gravity Gradiometry method (an aerial method of collecting gravity data)
20.	Look ahead VSP
21.	Sonic scope as part of LWD
22.	Cyclic Steam Stimulation (CSS) followed by <i>In-situ</i> combustion (ISC) Process
23.	Polymer flooding in heavy oil reservoirs
24.	Gas Chromatograph and Resistivity meter with the upgraded version
25.	TechlogPetrophysical Analysis Tools

Sl. No.	Technologies
26.	Hardware Virtualization Technology has been inducted using Red Hat Enterprise Linux as well as VMware systems
27.	Lustre File System Technology has been adopted in the Seismic Processing domain for the first time
28.	Infiniband based Networking Technology on HPCC in the Seismic Processing domain for the first time
29.	Production enhancement through stimulation of tight carbonate reservoirs in 14 wells of western offshore field
30.	Innovative techniques for Gas Production enhancement in low gas production wells of Assam/ Tripura/ Mehsana
31.	Development of chemical formulation for water shut off in gas wells of ONGC fields
32.	BWA-high bandwidth connectivity based on Wi-Max technology for Onshore Rigs in Western Onshore
33.	State-of-the-art technology-based Network devices to upgrade the LAN and WAN Infrastructure
34.	Technology for bioremediation of oily sludge/oil contaminated soil
35.	Dual fuel technology-Dynamic Gas Blending(DGB) system in EV-2000-2 drilling rig
36.	Technological upgradation of Landmark Well planning application software R5000 V 1
37.	Technological upgradation of HPHT Consisto meter (up to 3150C)
38.	Technological upgradation of Compressive Strength Testing Machine
39.	Segmented completion with Swell Packer & Sliding Sleeve
40.	Intelligent well completion in wells of Western Offshore
41.	Closed Fracturing Acidization (CFA) (Enzyme breakers-in-house developed chemical formulation for clean-up of drain holes for improving wellbore productivity in MH offshore field)

Sl. No.	Technologies
42.	Implemented well stimulation technique "Dissolvine Stimwell" in Mukta formation of Panna field
43.	"Float-Over Technology" for Offshore platform installation
44.	Installation of Dual ESP's to improve ESP availability and to ensure rig-less interventions
45.	Installation of Permanent Down-hole Gauge (PDG) in wells of Mumbai High field for continuous pressure monitoring facilitating optimization of production from wells
46.	Implemented Aqua MTM (Magnetic Tomography Method), a non- intrusive type of diagnostic survey for sub-sea pipelines in NH Asset for the first time in India for integrity assessment of the pipelines
47.	CTU conveyed Sand Jet Perforation for fracturing in CBM wells
48.	Premium screens for preventing sand production in wells of Mehsana and Cambay
49.	Sandface chemical dosing for improved flow assurance in heavy oil wells of Mehsana and the wells were completd on Progressive Cavity Pump (PCP) with control line for chemical dosing
50.	Directional Drilling Technologies viz. MWD, LWD and periscope related to directional drilling in Offshore & Onshore fields
51.	KCL-PHPA Polymer mud system in Tripura wells
52.	Implemented Cost Effective "Make in India" SRP Monitoring System in 57 wells in Ahemedabad fields
53.	Installed Variable Frequency Drivefor the first time to control SPM of SRP in Jorhat, Assam
54.	Implemented Low Frequency micro seismic Sounding survey (LFS technology) in Gandhar field
55.	In-line Inspection through Intelligent pigging
56.	Treatment of effluent water with help of nanotechnology in Akhol-Juni field
57.	Hi-way Hydro fracturing technology for production enhancement in Geleki field

Sl. No.	Technologies
58.	Implemented Hydrogen Thermo Baro Chemical Technology (TGC-HER) for production enhancement in well#NJ-69
59.	Stim gun perforation technology used in well#SK-141, AM-134 and G-391 to improve well bore to reservoir connectivity
60.	Implemented Propellant Stimulation Technique (PST) in well Matar-23
61.	Micro Bubble Drilling Fluid System used in 2 wells in Geleki, Assam to reduce mud loss in depleted reservoirs
62.	SIMEX (SIMultaneous EXploration) approach during development drilling to identify new oil pools
63.	Isotopic analysis of biomarkers (CSIB) and Total Scanning Fluorescence Spectrophotometry (TSF) for oil to oil correlation
64.	Fourier Transform Infra-Red spectroscopy (FTIR) methodology for estimation of thermal maturity of organic matter
65.	Intrepid Software for processing and interpretation of potential field geophysics data: ground, airborne and marine surveys
66.	Nobel Gas Mass Spectrometer (NGMS) for absolute dating of basalts and to understand thermo-tectonic evolution of basement rocks from different sedimentary basins of India
67.	Technology of making GCM through Landmark's "Earth Modelling Module" has been inducted
68.	ESSEME Technology for "Thin Bed Resolution" in Linch area
69.	Broadband Processing has been established in OMEGA System by inducting Adaptive Deghosting (AD) Technology on marine data
70.	Integration of reservoir model and 3D-MEM technology
71.	Profile modifications and water shut off jobs
72.	Several MEOR jobs in huff-n-puff mode and Paraffin Degrading Bacteria (PDB) jobs for paraffin degradation in tubular in Mehsana and Ankleshwar fields
73.	Application of in-house developed technology on Gas Tracer
74.	Chemical Tracer test technology

Sl. No.	Technologies
75.	Implemented Gravity assisted Immiscible gas injection in depleted reservoir in KSU-5 sand of Borholla field
76.	Miscible CO <sub>2</sub> in Gandhar field
77.	LoSalin South Heerafield, Western Offshore
78.	Polymer flood pilot in Bechraji in heavy oils
79.	Integration of reservoirs and 3D-MEM technology for optimization of hydro-fracturing in Gamij field
80.	Development of Shockwave Assisted Fracking Tools
81.	Development of direct hydrocarbon solid oxide fuel cell (SOFC) for utilization of low pressure gas for power generation at remote locations
82.	Flow Assurance of Waxy Crudes in Pipelines
83.	Development of Nano material based particle gel system for W&GSO in carbonate reservoirs
84.	In-house developed process design software "i-Procalv-1", which includes sizing and rating of vertical as well as horizontal 3 phase separators including the effect of special internals
85.	Developed "PLUNGLift" software to determine if the existing well parameters are sufficient to operate the plunge and give an indicative design of plunger lift system
86.	Dynamic Gas Blending (DGB), a dual fuel technology, which enables to run diesel engines of drilling rig on a mix of diesel and gas, was implemented successfully on CAT 3512B engines in EV-2000-2 and E-1400-7 drilling rigs of Ankleshwar
87.	Orcaflex software (ORCINA) technology for carrying out deep water riser and mooring analysis
88.	Developed software "MATCAP" for analysis of bearing capacity of offshore shallow foundations, especially mud-mat foundation on which offshore jackets are supported initially, till long piles are driven to permanently secure a platform in the offshore

Sl. No.	Technologies
89.	ERDAS Imagine, Extension/Plug-in: ATCOR: Software: Remote sensing image processing software suite with extensions/ add-ins for physics-based atmospheric correction for image data processing and pre-processing of multispectral/ hyperspectral visible-shortwave infrared as well as thermal infrared image data
90.	CUDA FORTRAN Compiler Graphic Processing units for developing specialized software applications as a part of R&D activities
91.	CRAM (Common Reflection Angle Migration) for detailed velocity model building and for precise imaging in areas with complex structure and velocity for 3D onshore and offshore data.
92.	Implemented big data analytics using Machine learning approach to handle large datasets for analysing seismic and micro-seismic data, improving reservoir characterization and simulation etc in B-12/C26 area of Western Offshore Basin
93.	Developed in-house capability for Broadband processing technology
94.	The first E-line Intervention job was carried out in well HSC-2ZH of Heera field in Western Offshore Basin
95.	Dual Zone Testing (DST) in the Well B189#A
96.	GEOTEST1000. A new state-of-the-art technology GEOTEST-Triaxial Rock testing laboratory from Vinci Technology, France for determining geo mechanical properties
97.	Up-gradation of processing system for genomic analysis
98.	Developed Base Oils suitable for Drilling Fluids for Low Toxicity Oil Base Mud; and High Pressure Extreme Pressure lubes for Drilling Fluids with IOCL-an Make in India initiative
99.	Chemical EOR technology <i>i.e.</i> polymer flood in North Kadifield
100.	Bechraji Polymer flood pilot in heavy oil
101.	Alkali-Surfactant-Polymer flooding (ASP) scheme
102.	Immiscible gas injection in LBS-2 pay of Lakwa field
103.	Cyclic Steam Stimulation (CSS) Pilot in Lanwa Field
104.	LoSal water flood technology in Mumbai High Field



Sl. No.	Technologies
105.	Simulation study of Miscible CO <sub>2</sub> injection in Central Block of GS-8 Sand of Gandhar Field
106.	Pre-feasibility Study of Carbon Capture, Utilization and Storage (CCUS) technology for Enhanced Oil Recovery (EOR): Miscible CO <sub>2</sub> in Gandhar field
107.	Enzyme Application for Wellbore Cleaning to Remove Mud Cake in Oil/Gas Wells to Enhance the Productivity
108.	Gelled Emulsified Acid System for Stimulation of Carbonate Reservoirs
109.	Composition and Process for Preparation of a Fracturing Fluid
110.	Method for Recovering Heavier Hydrocarbons from Liquefied Natural Gas
111.	Software i-Procal v-1", developed on Visual Basic Platform for Sizing and Rating of Various Process Equipment
112.	Novel Demulsifiers for Separation of Water from Oil and Preparation
113.	Identification of Suitable Diverters for Improving Diversion Efficiency for Fracturing Operation in more than one Perforated
114.	Work-over Fluid for Sub Hydrostatic Gas Wells: An innovative eco-friendly Polylactide based Self-degradable Loss Control Particulate Pill
115.	H <sub>2</sub> S Reduction in Dispatched Oil from B-193 Platform
116.	Technology of Wax removal by Exothermic Chemical Reaction in wells of Mehsana and Cambay fields

## 2. Drilling

1. A new completion Fluid design for HPHT wells.
2. Non- Invasive Fluid Additive (NIFA) (500 psi)
3. A Drilling Fluid Composition Comprising Micro bubble
4. Micro bubble drilling fluid
5. Mixed Metal Oxide Drilling Fluid
6. Cementing Solutions for Cyclic Steam Stimulation (CSS) Wells
7. Flexible and Expanding cement for Shale Gas

Sl. No.	Technologies
8.	Suitable lubricant for CFD/CMC/PAC mud system
9.	Developed base oil for LTSOBM (Low toxic Oil base Mud) as a substitute of imported base oil, provided by IOCL & BPCL under make in India initiative.

### 3. Production

1. Closed Fracture Acidizing (CFA)
2. Deep Penetrating Retarded Acid System (DPRAS)
3. Viscoelastic Foamed Acid (VFA).
4. Wax Removal by Exothermic Chemical Reaction
5. Deliquification of Gas Wells
6. Production Enhancement in Intermittent Gas Lift Wells using Sweeping Pipe Bend
7. H<sub>2</sub>S Reduction in Dispatched Oil from B-193 Platform
8. Design of Tank-Degasser Assembly for Work-over Operation
9. i-Procal Software
10. Lift Selector Software
11. Automation with Artificial Intelligence for Sucker Rod Pumps Systems
12. Developed software "MATCAP"
13. Developed two in-house softwares, HOST (Hazard and Operability Software Tool) and GALLOP (Group analysis of laterally loaded offshore piles)
14. Procured Collapse module of SACS Software package for pushover analysis of fixed offshore structures. Software installed and put to use for higher level structural pushover analysis.
15. Updated SESAM-GeniE software by awarding AMC to M/S DNV GL.
16. Installation of System Advisory Model (SAM) software developed by the National Renewable Energy Laboratory (NREL) for the Solar photovoltaic modelling and simulation.

Sl. No.	Technologies
17.	Installation of System Advisory Model (SAM) software developed by the National Renewable Energy Laboratory (NREL) for the Solar photovoltaic modelling and simulation
18.	Acquired new software "ISOGRAPH 6.0" for HAZOP Study" from M/s. I Micro, Bangalore (developed by M/s Isograph, UK).
19.	The advanced technique of 3-D Computed Tomography
20.	Latest version of the software GRLWEAP-2010 (Combined standard and offshore version) installed and commissioned
21.	Digital Stereo Microscope SZX7, Inverted Microscope and Micro-hardness testing machine procured, installed and commissioned
22.	Upgraded Grapher software (Version 12) installed
23.	Acquired technology for carrying out deep water riser and mooring analysis by procuring Orcaflex software (ORCINA) and training by experts from 2H Offshore, UK
24.	As technology upgradation, updated and installed the "Plaxis 3D software" to version "PLAXIS 3D 2019.00" from earlier version of "PLAXIS 3D 2017.01"
25.	The USFOS structural analysis software updated
26.	Installed new version of PIPENET software (from version 1.8.0 to 1.9.0) with additional features for performance enhancement of Firewater Adequacy studies.
27.	Installed new upgraded version of SAFETI software from SAFETI- Ver. 8.1 to SAFETI- Ver. 8.2 used for quantitative risk assessment (QRA).
28.	Acid fracture by Emulsified Gelled Acid Emulsion Dispersion System (EGAEDS)
29.	Encapsulated Acid Emulsion Dispersant System (EAEDS)
30.	Inflow Control Device (ICD)
31.	Proppant Hydro-fracturing of Basal Clastics and Basement successfully implemented in Western Offshore wells and similar jobs planned for other wells in Basal Clastics layer
32.	State of art "Azitrack" Technology introduced in new wells of VSEA field to keep the drain hole in oil zone and successfully tried in one of the wells.

Sl. No.	Technologies
33.	Acoustic Leak Flow Analyzer (ALFA) technology used to identify leakage points in tubing as well as liner and casing in western offshore
34.	Aqua MTM (Magnetic Tomography Method), a non-intrusive type for diagnostic survey for sub-sea pipelines implemented in Neelam & Heera Asset.
35.	Y-tool completion
36.	Premium screens installed in wells of Mehsana and Cambay Assets to prevent sand production from highly unconsolidated sands. Screens already in use in Western offshore wells
37.	Sandface chemical dozing is being done for improved flow assurance in heavy oil belt of Mehsana Asset
38.	Multistage Fracturing in horizontal wells have been taken up in four wells of Gamij Field in Ahmedabad Asset with the help of Consortium of M/s BJ Services & Baker Hughes
39.	Hydro-fracturing in HP-HT Wells: Carried out successful HF jobs in the HPHT environment (High Pressure, High Temperature) with the help of M/s Halliburton in 2 wells of Nandigama field, Rajahmundry Asset
40.	Ahmedabad Asset successfully tested innovative technology "Single well Anionic-Surfactant treatment for Productivity enhancement/Stimulation" in four wells of Kalol Field
41.	Gas Assisted Gravity Drainage (GAGD) for Kasomarigaon field of Jorhat Asset is presently under implementation
42.	Toe-to-Heel Air Injection (THAI): Pilot testing of Toe-to-Heel Air Injection (THAI) concept for In-situ Combustion is carried out in Balol field for the first time in Mehsana Asset
43.	Radial Jet Drilling: A pilot project for radial jet drilling in existing wells through M/s Radial Drilling Services for improved permeability & wider wellbore to reservoir connectivity in onshore fields
44.	Low Frequency micro seismic Sounding survey (LFS technology) has been implemented in Ankleshwar asset, Ahmedabad Asset & Meshana Asset
45.	Treatment of effluent water with help of nanotechnology has commenced by M/s OZO Nano Services in Akhol-Juni field of Cambay Asset

Sl. No.	Technologies
46.	Use of Microturbine in Linch field of Mehsana Asset and Geleki field of Assam Assets for power generation thereby reduction in flaring.
47.	Heavy oil operating system (HOOS Technologies), an artificial lift technology using Oleophylic continuous belt for transporting the crude oil to the surface, used in Ahmedabad Asset.

#### **Impact of ethanol blending in petrol**

1251. SHRI K.J. ALPHONS: Will the Minister of PETROLEUM AND NATURAL GAS be pleased to state:

- (a) what has been the impact of ethanol blending in petrol on environmental pollution;
- (b) the percentage of ethanol that is blended in petrol; and
- (c) the saving of PSU oil companies due to ethanol blending?

THE MINISTER OF PETROLEUM AND NATURAL GAS (SHRI DHARMENDRA PRADHAN): (a) Lab studies on vehicles have shown lower carbon monoxide and hydrocarbon emissions while using petrol blended with 10% ethanol.

(b) and (c) Oil Marketing Companies are blending 10 per cent ethanol in petrol as per availability of ethanol in line with the direction of the Government from time to time. Ethanol Blended Petrol (EBP) Programme is aimed at achieving multiple outcomes such as reducing import dependency, conserving foreign exchange, reducing carbon emissions and provide boost to agriculture sector.

#### **Bio-fuel production in the country**

1252. SHRI KANAKAMEDALA RAVINDRA KUMAR: Will the Minister of PETROLEUM AND NATURAL GAS be pleased to state:

- (a) whether Government has taken note of the fact that India being a large agricultural economy, a large amount of agricultural residue is available which can be used to produce bio-fuel in the country;
- (b) if so, the details thereof;
- (c) whether Government has undertaken any research activity in this field and taken any concrete steps to promote bio-fuel production in the country; and