

EUROPEAN OIL REFINERIES REDUCING GHG EMISSIONS

LUKOIL has three oil refining plants in Europe (in Italy, Bulgaria and Romania), one joint venture with Total in the Netherlands (Zeeland Refinery), and a number of medium-sized plants engaged in the lube oil refining and blending business. In line with the EU policy of reducing emission allowances for manufacturing plants, LUKOIL performs comprehensive assessments, including in terms of CO₂ emission levels, when designing high-profile investment projects.

A project on the replacement of afterburners at a sulfur recovery unit was launched at an Italian oil refinery, and a project aimed at improving energy efficiency of the IGCC unit is also under consideration. Both projects will facilitate CO₂ emissions reduction. A methanol production project is under consideration, the realization of which will facilitate the reduction of GHG emissions by about 600 thousand tonnes of CO₂-E, according to preliminary estimates.

Potential “green hydrogen” production at a Bulgarian oil refinery and CO₂ capture prospects at a Romanian oil refinery are now being analyzed.

In the Netherlands, even stronger plans have been set at the national level:

- to reduce by 2030 CO₂ emissions by 49% of the total GHG emissions (of the 1990 level);
- to reduce CO₂ emissions in the industry by 35% (of the 2016 level).

Taking into account preemptive CO₂ emissions reduction plans and appreciation of emission allowances, technological CO₂ capture and utilization, “green hydrogen” production and low-grade heat utilization solutions are being developed. The estimated contribution from this program to CO₂ emissions reduction by 2030 is expected to reach 600 thousand tonnes of CO₂-E. This know-how may also be used and replicated at other entities of the Company in the EU.

ENERGY CONSERVATION

KEY CHANGES AND RESULTS IN THE REPORTING YEAR



ENERGY CONSUMPTION FOR PRODUCTION PURPOSES IS REDUCED ON AVERAGE BY 1% PER YEAR FOR THE PERIOD 2017-2019



PILOT PROJECTS FOR THE CONSTRUCTION OF DIGITAL SUBSTATIONS ARE BEING IMPLEMENTED



THE ENERGY INTENSITY INDEX (EII) REDUCED BY **3.5** AS COMPARED TO 2014¹

¹ Since 2014, the list of organizations covered by the study has changed; the boundaries of the study, starting in 2014, did not change.

MANAGEMENT SYSTEM

ELEMENTS

OF THE MANAGEMENT SYSTEM

DESCRIPTION

CORPORATE DOCUMENTS



GOALS

The strategic goals and key activities to improve the energy efficiency in each business segment were determined

LUKOIL Group's Technical Policy on Energy Efficiency was approved by the Management Committee of OJSC LUKOIL on 26 March 2012



PRIORITIES/ STANDARDS

The composition of process-related indicators, fuel consumption rates, etc., were formalized

Seven corporate STO 1.20 standards



KEY PERFORMANCE INDICATORS

Specific electric energy consumption per tonne of fluid produced (in the Exploration and Production segment). The Solomon Energy Intensity Index (EII). Energy intensity per tonne of basic raw material for entities in Petrochemicals business-sector
Delivery of the approved energy conservation program¹

The KPI regulations were approved by the Management Committee of PJSC LUKOIL on 16 September 2019



CERTIFICATION OF THE MANAGEMENT SYSTEM

The Russian entities of LUKOIL Group implemented the ISO 50001:2011 compliant energy management system

As of 31 December 2019, 25 entities possessed compliance certificates covering 68% of the total LUKOIL Group headcount



TARGETED PROGRAMS, PROJECTS AND INITIATIVES

Energy Conservation Program of LUKOIL Group Entities for 2019–2021 in Russia². Energy audits performance by LLC LUKOIL-Nizhegorodniinefteproekt of the entities in the Exploration and Production, and Refining, Marketing and Distribution segments

STO LUKOIL 1.20.2-2017 "Energy Conservation. Energy Conservation and Energy Efficiency Improvement Program for LUKOIL Group Entities. General Requirements to Development and Execution" (introduced by Order of PJSC LUKOIL of 20 November 2017 No. 184)



FURTHER INFORMATION

The examination of investment projects covers the evaluation of energy efficiency of business plans and related activities. The findings are considered in the general assessment of the project's economic performance

¹ The KPI relates to the Exploration and Production in Russia, Oil Product Supply in Russia, Transportation in Russia and Power business sectors, as well as to the following entities belonging to the Refining, Marketing and Distribution business segment: LLC LUKOIL-Trans, transshipment facilities and LLC LUKOIL-AERO.

² The energy conservation program covers a 3-year period and is revised and approved by management of PJSC LUKOIL on an annual basis. The program for 2019–2021 was approved on 31 May 2018. During the previous reporting period, the program for 2018–2020 was in effect.

OUR GOALS



WE VIEW ENERGY EFFICIENCY IMPROVEMENT AS ONE OF THE KEY FACTORS IMPACTING THE ENERGY INTENSITY OF PRODUCTS AND LUKOIL'S ABILITY TO ADAPT TO GLOBAL CLIMATE CHANGE. RATIONAL USE OF ENERGY RESOURCES ENABLES THE REDUCTION OF GHG EMISSIONS. ENERGY EFFICIENCY IMPROVEMENT PLANS WILL BECOME AN INTEGRAL PART OF THE CLIMATE CHANGE STRATEGY AND WILL BE PRESENTED IN THE STRATEGIC DEVELOPMENT PROGRAM.



OUR GOALS



securing the efficiency of operating procedures and the functioning of process equipment across LUKOIL Group



securing the effective use of fuel and energy resources across LUKOIL Group (electricity and heat, as well as boiler and furnace fuels)



effective development and upgrade of energy assets of LUKOIL Group



WE SEE THE POTENTIAL for further energy efficiency improvement through the implementation of the following measures:



continuous **improvement and performance optimization** of the energy efficiency management system



integration of innovative energy-efficient technologies and equipment across LUKOIL Group entities



use of the demand management mechanism of LUKOIL Group entities, which implies re-distribution of electricity consumption relative to peak demand and allows for the elimination of additional electricity output



securing the maximum return on LUKOIL Group entities' investments in the long term through management of energy supply, conservation and efficiency management

MANAGEMENT SYSTEM CHANGES

Taking account of external environment changes and the introduction of many new technical solutions, in 2019 it was resolved to update the Technical Policy. The new version is expected to be completed in 2020.

As part of preparing for the re-certification of energy management systems of LUKOIL Group entities for compliance with a new version of the international standard ISO 50000:2018 "Energy Management

System - Requirements with Guidance for Use," five corporate standards were amended¹. The schedule of certifying LUKOIL Group entities according to this standard was approved.

The Set of KPIs was supplemented with a new indicator - "Delivery of the Approved Energy Conservation Program," with reporting to be submitted starting in 2020. This indicator heightens the interest of senior

executives in improving energy efficiency and energy conservation.

Further energy cost optimization plans include implementation of projects aimed at increasing the cost effectiveness and reliability of production facilities of LUKOIL Group entities. Significant new energy facilities are expected to be put into operation at fields in the Komi Republic; and two digital substations are being built in the Perm Territory.

ENERGY CONSUMPTION STRUCTURE

Oil and gas production companies account for the biggest share of energy consumption for production purposes across LUKOIL Group entities. Heat is primarily consumed by oil and gas producers, oil and gas refineries and petrochemical plants. Fuels are basically consumed by oil refineries, petrochemical plants and power providers.

Russian heat and power entities of LUKOIL supply electricity and heat to local communities and industrial enterprises in the south of Russia.

The oil refining complex ISAB in Italy operates an energy park composed of two blocks of combined cycle plants. In addition to natural gas, the energy park makes use of synthesis gas as fuel. Synthesis gas is produced by gasification facilities from asphalt generated as a by-product from deep oil refining. Electricity produced is mainly supplied to external consumers.

The oil refinery in Romania operates an energy park composed of a power boiler with the capacity of 185 MW and a turbogenerator with the capacity

of 30 MW. The power boiler is made using the circulating fluidized bed technology that is the most advanced technology for solid fuel-fired boilers. Oil coke as a by-product of deep oil refining is used as a fuel. The power produced is primarily consumed for oil refinery process needs.

TARGETED PROGRAM

Russian entities run the Energy Conservation Program of LUKOIL Group entities aimed at improving the energy efficiency of power and fuel and at loss reduction. The program covers activities carried out in entities of each business sector. A dedicated group of projects of the highest energy efficiency potential is highlighted. Such projects are included in roadmaps. For example, 76 highly effective projects are scheduled in 2020-2022 focused only on refineries.

In 2019, program performance is achieved primarily by the following activities:

- For entities involved in production, the key energy conservation activities include the replacement of asynchronous motors with magnet motors (PMSM), making use of electric submersible pumps as drives. Pumps of the system which maintain the formation pressure are also being upgraded.



In 2019, 3,885 units of PMSMs were integrated. This initiative is implemented in order to enhance the energy efficiency of the operation of the mechanized well stock and as part of the strategy of replacing asynchronous motors with PMSMs across oil and gas production companies of LUKOIL Group. As estimated by the Company, the delivery of this strategy will reduce electricity costs of the mechanized well stock.

¹. STO LUKOIL 1.20.1-2019 "Energy Conservation. Energy Resources Accounting System. General Provisions and Requirements for Equipping Production Facilities of LUKOIL Group Entities"; STO LUKOIL 1.20.3-2019 "Energy Conservation. Energy Audits of LUKOIL Group Entities. Methodology"; STO LUKOIL 1.20.4-2019 "Energy Conservation. Energy Efficiency. Constitution of Indicators for Entities, Processes, Structures and Production Facilities"; STO LUKOIL 1.20.5-2019 "Energy Conservation. Rates of Fuel Consumption, Heat and Power for Typical Processes and Production Facilities of LUKOIL Group Entities" and STO LUKOIL 1.20.6-2019 "Energy Conservation. Energy Management System of LUKOIL Group Entities. General Provisions and Regulated Facilities."

- Refineries carried out 132 activities intended to improve energy consumption and retrofitting.
- Power plants replace and upgrade their process equipment in order to increase the efficiency factor and shift heat loads from inefficient boiler stations which will subsequently be closed.

A good example is the project of decommissioning inefficient boiler stations and shifting heat loads to the source of combined heat and electricity

generation – at the Astrakhanskaya CHPP. Implementing this project will allow reduction in the volumes of burning non-renewable types of fuel by 7 million cubic meters of natural gas per year.

RESULTS

Over the last three years, energy consumption for production purposes was reduced thanks to the completion of energy conservation activities.

The reporting boundaries cover entities of all business segments in Russia and abroad that involve energy consumption for production purposes. The oil refinery in Netherlands is excluded from these boundaries.

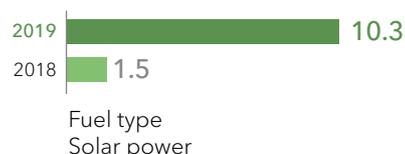
In general, the dynamics of power consumption for production purposes are accounted for by several factors. For oil and gas production entities, the construction of our own generating facilities allows for reducing purchases

Energy consumption for production purposes of LUKOIL Group entities from non-renewable sources and procurement, million GJ

	2017	2018	2019
Total energy consumption for production purposes, including:	497.5	489.3	487.5
• purchased electric power for production purposes	64.1	61.9	58.7
• purchased heat power for production purposes	35.7	19.9	17.4
• boiler and furnace fuels consumption for production purposes	520.1	537.9	529.6
power sales and supply, including:			
• electricity	75.1	73.9	66.7
• heat	47.3	56.5	51.5

Note. (1) Power consumption for production purposes by LUKOIL Group entities = Electricity and heat purchased for production purposes + Consumption of boiler and furnace fuel - Quantity of electricity and heat supplied to third-party consumers, as well as residential electricity/heat consumption. (2) The 2017-2018 data regarding power consumption for production purposes is different from the Sustainability Report for 2018 due to changes to the reporting boundaries, in particular, the addition of the Power Generation business sector to the reporting boundaries. Moreover, after publishing the 2018 Report, values of fuel and energy resources consumption for production purposes of LLC LUKOIL-Nizhnevolzhskneft for 2018 were amended. (3) The method to calculate indicators was improved: all inputs and estimates were converted into GJ. In this regard, the 2017-2019 data was re-calculated. When converting data, the following factors under GOST R 51750-2001 were used: 1 thousand kWh = 3.6 GJ, 1 Gcal = 4.19 GJ, 1 tonne of oil equivalent = 29.3 GJ).

Renewable energy (supporting generation) consumption for production purposes, million kWh



Note. (1) The 2018 data refers to LUKOIL Neftochim Burgas AD; the 2019 data – to LUKOIL Neftochim Burgas AD and PETROTEL-LUKOIL S.A. (starting from April 2019). (2) An increased consumption of power in 2019 was driven by the reorganization resulting in the transfer of the 9 MW solar power plant from S.C. LUKOIL ENERGY & GAS ROMANIA S.R.L. to PETROTEL-LUKOIL S.A. Starting from Q2 2019, this solar power plant supplies electricity for the operational needs of the refineries.

of power – notwithstanding an increased extraction of hard-to-recover reserves (HTR reserves) in the West Siberia and high-viscosity crude oil in the Komi Republic (which requires more heat), as well as a rise in water cut of wells in traditional production regions of West Siberia (which increases electricity consumption required to lift raw materials). In 2019, the specific electricity consumption indicator of Russian oil and gas production companies was 20.5 kWh per tonne of fluid produced, which is lower than the 2017–2018 indicator (20.6 kWh per tonne of fluid produced).

At Russian and foreign refineries, energy efficiency activities result in a considerable improvement of power consumption indicators: EII decreased by 3.5 percentage points against the 2014 level.

Specific power consumption at the refinery, GJ / tonne of manufactured products

	2017	2018	2019
Total for LUKOIL Group, including:	3.6	3.7	3.5
• Russian entities	3.7	3.7	3.4
• Foreign entities	3.3	3.5	3.5

Notes. (1) Data for Russian plants is displayed subject to the volume of oil products supplied from other Group refineries in Russia for further processing. (2) Data is displayed subject to gas processing products (LLC LUKOIL-Permnefteorgsintez) and petrochemical products (LUKOIL Neftochim Burgas AD and ISAB S.r.l.). (3) Data on mini-refineries is not included in the calculation of indicators on specific energy consumption at refineries.

DIGITAL PROJECTS

The application of digital technologies in the power sector opens up prospects of an extension in equipment life, as well as better use of fuel and energy resources thanks to flexible management

The Solomon EII¹ is used to evaluate the level of energy efficiency of refineries. Solomon produces global surveys of refineries fuel and lube profile every two years (in even-numbered years), with the most recent one held in 2019 for 2018. In uneven-numbered years, LUKOIL performs its internal monitoring of key indices (including as part of setting and checking compliance with the efficiency factor); however, Solomon experts do not verify such results. The Report shows indicator dynamics only based on verified survey data.

EII is used for long-term planning and as the efficiency factor for the medium term (three-year plans for the development of corporate sectoral development programs). This indicator is also monitored on a quarterly basis. At the time of this Report,

and improved forecasting. Expected effects include improved reliability and safety of the power infrastructure, reduced injury rates and decreased power grid losses.

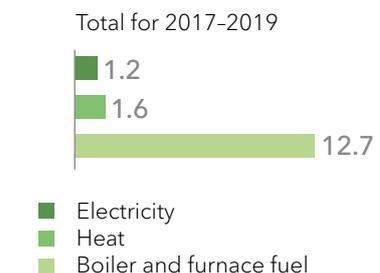
EII benchmarks for the sectoral development program for 2018–2027 were in effect.

In physical terms, the power saved is a significant resource for improving production performance.

Dynamics of Solomon EII as compared to 2014, %



Power savings resulting from the implementation of the Energy Conservation Program of LUKOIL Group entities in Russia, million GJ



In 2020, LUKOIL Group expects to put into operation its first digital Chashkino substation with a rated transformer capacity of 32 MVA to service oil production facilities.

¹ The EII index is calculated pursuant to the HSB Solomon Associated LLC methodology with the use of its own factors.