LOTOS Group
Integrated Annual Report 2016

05

# EFFICIENCY IN ACTION

# Value chain

**UPSTREAM SEGMENT**

Asset portfolio spanning three countries: Norway, Poland, Lithuania

2P hydrocarbon reserves: 72.7m boe

**DOWNSTREAM SEGMENT**

One of Europe's most technologically advanced refineries

Poland's third largest network of 487 service stations.

Wholesale of fuels and other petroleum products (bitumens and oils)

EXPLORATION → PRODUCTION → REFINING → PRIMARY LOGISTICS → SALES AND SECONDARY LOGISTICS → SERVICE STATION CHAIN MANAGEMENT

SUPPORT PROCESSES

# Overview

In 2016, the LOTOS Group consistently focused on its core business, i.e. exploration for and production of hydrocarbons, crude processing, and trading in petroleum products, while developing a strategy for those areas and defining objectives to be achieved in 2017–2022.

## Crude oil and natural gas exploration and production

he LOTOS Group produces oil and natural gas from fields located on the Norwegian Continental Shelf. It is also the only producer of hydrocarbons in Poland's Exclusive Economic Zone of the Baltic Sea. Upstream operations are also conducted in Lithuania.

In 2016, our Upstream segment delivered record high hydrocarbon production, driven by output from the B3 and B8 oil fields in the Baltic Sea in Poland, and from the Heimdal and Sleipner upstream assets in Norway.

### Strategic exploration and production areas

#### Norwegian Continental Shelf

In 2016, the Norwegian Continental Shelf (the Heimdal and Sleipner fields) accounted for approximately **76%** of the LOTOS Group's total hydrocarbon output. The LOTOS Group's production from those fields includes natural gas (approximately 75%) and light crude oil (condensate) (approximately 25%).

After in January 2017 LOTOS Norge was awarded interests in five new licences, the company now holds 25 licences on the Norwegian Continental Shelf, including:

- Interests in ten hydrocarbon exploration and appraisal licences in the North Sea and the Norwegian Sea, with LOTOS E&P Norge AS being the operator for one licence,
- Interests in eight licences at a pre-development and development stage,
- Interests in seven production licences in the North Sea.

#### Baltic Sea – Polish Economic Zone. > Lithuania

Within the LOTOS Group, all exploration, appraisal, and production licences in the Polish zone of the Baltic Sea are held by LOTOS Petrobaltic (or companies in which it holds equity interests). The B3 and B8 fields, i.e. Polish fields located in the Baltic Sea, account for **21%** of the Upstream segment's total output. The licences cover mainly crude oil and the associated gas.

LOTOS Petrobaltic is Poland's only company that engages in oil and gas exploration on the Baltic Sea shelf. In Poland, it holds or has an interest in 10 licences. It holds three joint exploration, appraisal and production licences for the Łeba, Rozewie, and Gotland areas, as well as the following four production licences: B3, B4, B6, and B8 – development work under those licences is performed by dedicated special purpose vehicles. The main player on the Polish market for onshore hydrocarbon licences is PGNiG, with whom LOTOS cooperates in two licence areas: Kamień Pomorski and Górowo Iławeckie. In the Kamień Pomorski licence area, drilling work began on the Stawno-1 exploration well in July

2017. Operations in the Młynary licence area are carried out by the LOTOS Group independently, without a partner.

Production and exploration work in Lithuania is carried out in eight onshore licence areas. All of the licences are joint licences, which means that they provide an authorisation for exploration activities and development of the fields, but also for production.

# Refining

The LOTOS Group operates one of the most advanced and youngest refineries in Europe, with an annual processing capacity of approximately **10.5m tonnes of crude oil**.

→ **In 2016, as in previous years, the main type of crude processed by the refinery was Russian REBCO, whose share in the total throughput stood at close to 75% and was smaller than in previous years.**

→ **Oil from other sources, including approximately 220,000 tonnes of crude supplied by the LOTOS Petrobaltic Group, accounted for the balance of the crude feed.**

→ **In 2016, the refinery processed 10.4m tonnes of crude, the highest throughput in Grupa LOTOS' history.**

The key groups of products obtained from crude oil processing at the refinery are:

- Fuels (unleaded gasoline, diesel oil and light fuel oil),
- Heavy fuel oil,
- Bitumens,
- Aviation fuel,
- Naphtha,
- Propane-butane (LPG),
- Base oils.

# Marketing

In 2016, the LOTOS Group's Downstream segment sold 11,061 thousand tonnes of products, **up 1.3% year on year**. Diesel oil had the largest share in the total sales volume – 43.4%.

| | |
|---|---|
| **Fuels:** | The LOTOS Group sells fuels (unleaded gasoline, diesel oil and light fuel oil) in Poland and on foreign markets. LOTOS Paliwa operates solely on the domestic market, and its main customers include fuel companies and the chain of LOTOS service stations. |

**Other petroleum products:**

Sales of other petroleum products are managed by Grupa LOTOS, its subsidiaries and jointly-controlled entities. LOTOS Oil sells lubricating oils in Poland and abroad, chiefly through distributors and authorised customer service points. LOTOS Asfalt offers road bitumens to customers in Poland and abroad, mainly construction companies. LOTOS-Air BP Polska's offers aviation fuel in Poland only; the product is purchased by airlines (the 'into plane' segment) and wholesale market operators.

# Upstream

**The LOTOS Group produces hydrocarbons from offshore and onshore fields. Three-fourths of our volumes come from fields in Norway, while the balance is produced in the Baltic Sea and in Lithuania.**

**As at December 31st 2016, the LOTOS Group's 2P (proved and probable) reserves were at 72.7m boe.**

**Daily production in 2016 was approximately 26,000 boe, and is to reach 30,000–50,000 boe/d by 2022.**

In recent years, efforts were made to develop a balanced upstream portfolio in Poland and abroad. Our goals include:

- Maintaining a steady and stable growth of hydrocarbon production,
- Ensuring energy security for Poland,
- Diversifying supply directions,
- Extending the margin chain of the Gdańsk refinery.

# Principal activities and performance in 2016

## Record-high production

In 2016, our Upstream segment delivered **record high hydrocarbon production of 9.8 mboe**, driven by output from the **B3 and B8** oil fields in the Baltic Sea in Poland, and from the **Heimdal and Sleipner** upstream assets in Norway. [1]

In 2016, the hydrocarbon output remained at approximately **26,700 boe/d**.

In line with the expectations, following the acquisition of the Sleipner production assets on the Norwegian Continental Shelf in December 2015, the LOTOS Group's production of oil and natural gas increased significantly. Record-high production was reported as early as in the first quarter of 2016, with the average daily output close to 30,000 boe.

[1] Production from the Norwegian assets commenced in January 2017.

The Heimdal and Sleipner areas are mature fields, expected to remain in production for a few years. The Heimdal field is planned to be abandoned in 2019–2021, and the Sleipner field in 2024–2025.

[OG1]

## Five new production licences in Norway

As in previous years, in 2016–2017 **new licences** were acquired with a view to increasing production in the future.

In January 2017, LOTOS Exploration & Production Norge accepted an offer placed by Norwegian authorities for five new production licences on the Norwegian Continental Shelf. The licences cover '**mature areas**', i.e. areas where oil and gas deposits are still present, and their extraction is facilitated by existing infrastructure.

**LOTOS Exploration & Production Norge** is engaged in oil exploration and production activities in the North Sea and the Norwegian Sea. At the end of 2016, the company held interests in **20 licences** on the Norwegian Continental Shelf.

### Młynary onshore licence

In 2016, the LOTOS Group was awarded **one new onshore licence – Młynary**. Under the licence, granted by the Ministry of the Environment for three years, LOTOS Petrobaltic is authorised to carry out oil and gas exploration and appraisal activities in the Młynary onshore area, between Elbląg and Braniewo, i.e. to acquire 200 km of seismic data, and – optionally – to drill two boreholes of up to 4,500 meters deep.

**LOTOS Petrobaltic** is a company responsible for the development of the Upstream segment within the LOTOS Group.

## LOTOS Petrobaltic Group's crude oil and natural gas resources (2P) as at December 31st 2016:

| | Crude oil [million tonnes] | As [mboe*] equivalent | Natural gas [bcm] | As [mboe*] equivalent | Total for Poland [mboe*] |
|---|---|---|---|---|---|
| **2015** | | | | | |
| **Poland** | 4,815 | 37,381 | 0,509 | 3,2 | 40,581 |
| **Norway** | 0,982 | 4,99 | 2,246 | 14,125 | 19,115 |
| **Lithuania** | 0,927 | 7,138 | - | 0 | 7,138 |
| **Total** | 6,724 | 49,509 | 2,755 | 17,325 | 66,834 |
| **2016** | | | | | |
| **Poland** | 4,577 | 35,538 | 0,482 | 3,029 | 38,567 |
| **Norway** | 1,22 | 9,142 | 2,934 | 18,452 | 27,594 |
| **Lithuania** | 0,848 | 6,536 | - | - | 6,536 |
| **Total** | **6,645** | **51,216** | **3,416** | **21,481** | **72,697** |

* Barrels of oil equivalent.

## LOTOS Petrobaltic Group's production volumes in 2016

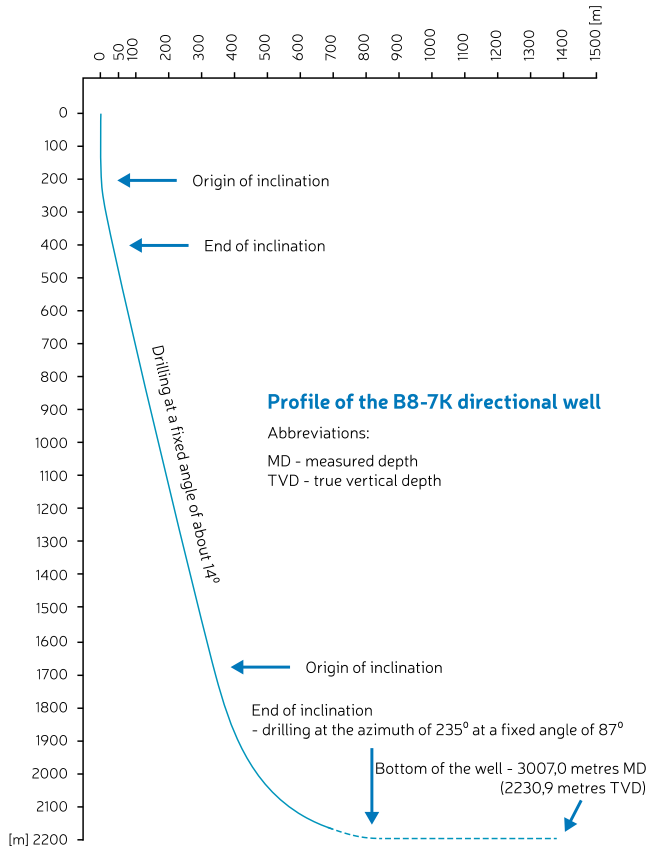
| | Crude oil [million tonnes] | Natural gas [bcm] | Total [mboe*] |
|---|---|---|---|
| **2015** | | | |
| **Poland** | 0,162 | 0,018 | 1,374 |
| **Norway** | 0,389 | 0,288 | 2,484 |
| **Lithuania** | 0,063 | - | 0,486 |
| **Total for the LPB Group** | 0,315 | 0,307 | 4,344 |
| **2016** | | | |
| **Poland** | 0,238 | 0,027 | 2,014 |
| **Norway** | 0,242 | 0,879 | 7,338 |
| **Lithuania** | 0,053 | - | 0,402 |
| **Total for the LPB Group** | 0,532 | 0,906 | 9,754 |

* Barrels of oil equivalent.

# Key growth-oriented projects of the LOTOS Group

## Objectives, activities, results in 2016

### Profile of the B8-7K horizontal well




Our key growth-oriented projects carried out in 2016 in the Upstream segment include:

## B8 field development – doubling of oil production in the Baltic Sea

In September 2015, LOTOS Petrobaltic started profitable production from the B8 field, which – despite a 60% decline in crude oil prices – has made a positive contribution to the company's financial standing. In 2016, **our oil production in the Baltic Sea doubled**, partly as a result of completion of the LOTOS Group's first ever drilling of the B8-7K **horizontal well** using the innovative drilling technology RSS. Bringing the well on stream allowed us to enhance oil recovery from the field.

The B8 site is the **third largest oil production facility** in Poland; the field holds the largest recoverable oil reserves in the **Polish part of the Baltic Sea**. Its 2P reserves are 29.5 mboe (chiefly oil), current production is **2,800 boe/d**, and planned production – 5,000 boe/d.

## Launch of the Utgard Project

In 2016, we made and formalised a decision to start the Utgard project. Its objective is to develop a new field in Norway through a tie-in with the nearby **Sleipner** area infrastructure, and to launch hydrocarbon production in **2019/2020**. The field's 2P reserves are **8.1 mboe** (55% crude oil and 45% natural gas), with planned daily production volumes of 4,000 boe/d.

**More information**
*Directors' Report on the operations of Grupa LOTOS S.A. and the LOTOS Group in 2016*
Chapter 2.2. Status of key development projects in 2016 (in terms of subtitle „Innovation and development projects")

## Upstream strategy for 2017–2022

Our main upstream objectives for the next 5 years are sustainable growth, continued development of a balanced upstream portfolio, and position of a production leader in the Baltic.

Sustainable growth of the Upstream segment will be pursued by the LOTOS Group through **presence on predictable markets**, i.e.:

- Expansion in Norway (centered around hubs, Norwegian Continental Shelf) and Poland (Baltic Sea), and
- Geographical diversification in response to market conditions.

Development of a balanced upstream portfolio will consist in **diversification of production sources and licence structure**, i.e.:

- Increasing involvement in field development projects,
- Gradually increasing the role of oil and gas exploration,
- Expanding the asset portfolio by capturing market opportunities,
- Reducing the share of mature fields in the portfolio.

In practical terms, the LOTOS Group strategy for 2017–2022 means:

**Development of the following fields:** B4/B6 (gas), Utgard, FriggGamma Delta, and YME,

- **Production from the following fields:** B8, B3; Lithuanian fields; Heimdal and Sleipner (70% crude oil, 30% natural gas),
- **Exploration** for new oil and gas deposits under onshore and offshore licences,
- **Production of** crude oil and natural gas at **30,000–50,000 boe/d**.

The upstream strategy is to be implemented in **two stages**. Its success metrics set for 2017–2018 are 2P reserves at approximately 60 mboe and production at approximately 22,000 boe/d. The corresponding targets for 2019–2022 are 2P reserves at more than 60 mboe and production at 30,000–50,000 boe/d.

# Safety management and industrial failure prevention

[OG5]

The LOTOS Group is committed to ensuring the highest production safety standards.

LOTOS Petrobaltic participates and employs its resources in annual oil spill prevention and response drills in Poland. Having such practical experience, our platform and vessel crews know how to act in the unlikely event of an emergency.

LOTOS Petrobaltic also has a mine rescue team responsible for rendering immediate emergency response in case of mine employees or other people on site being at risk of injury or death and for taking action where the safety of on-site operations is at risk. Rescuers take part in drills and competitions designed to test their teamwork and communications skills.

# Environmental efficiency

THE GLOBAL GOALS
For Sustainable Development

6 CLEAN WATER AND SANITATION

[OG7]

Pursuant to our *Integrated Management System policy*, we have committed ourselves to "environmental protection, including minimising environmental footprint and raising environmental awareness of our employees and trading partners". *The policy* lays down a number of procedures for various aspects of environmental protection, including carbon dioxide emissions monitoring, waste management and environmental monitoring.

## We take the following measures to ensure environmentally efficient production:

In 2016, LOTOS Petrobaltic discharged a total of 10,571.862 cubic metres of wastewater, including the following quantities of precipitation water: 43.862 cubic metres discharged to surface water (the Martwa Wisła River), 10,528 cubic metres to the Baltic Sea, and 3,575 cubic metres to municipal utilities. The wastewater was treated by the organisation and by a wastewater treatment plant.

We monitor the quality of precipitation water discharged from LOTOS Petrobaltic onshore facilities to the Martwa Wisła River.

Our goal is to have as much waste as possible transferred to external waste management companies or to recover or recycle it.

In 2016, LOTOS Petrobaltic applied the following waste management methods:

- **Recycling** of 4.9 tonnes of safe waste and 1.6 tonnes of hazardous waste,
- **Recovery** (including energy recovery) of 524.2 tonnes of safe waste and 56.35 tonnes of hazardous waste,
- **Incineration or use as fuel** of 7.22 tonnes of safe waste and 0.005 tonne of hazardous waste,
- **Landfilling** of 14.44 tonnes of safe waste,

[OG7]

**200.82 tonnes** was the total volume of drilling waste generated as a result of using water-based drilling fluid.

LOTOS Petrobaltic ensured that substantially no operations would be carried out in **Natura 2000 protected areas** overlapping with **the Młynary licence area** (Region of Olsztyn). Pursuant to the licence agreement, they are excluded from the permitted area of Petrobaltic's operations under the licence, and no exploration activities carried out under the licence have or will have any negative impact on those priceless biodiversity reserves.

Under the Balitc Sea Action Plan, developed by HELCOM (Baltic Marine Environment Protection Commission – Helsinki Commission) and endorsed in 2007 by the Ministers of the Environment of the Baltic countries, offshore operations in the Baltic Sea are subject to the 'zero formation water discharges from offshore platforms' principle.

Therefore, a special **formation water re-injection system** was installed on LOTOS Petrobaltic's Baltic Beta platform to re-inject formation water into the rock mass. This has a positive effect on the environment and raises the reservoir pressure, improving its productivity. Trace amounts of water generated in the production process on the B8 field are pumped to a tanker.

[OG5]

## Volume and disposal of formation or produced water

| Total volume of formation or produced water by disposal method | Volume of formation or produced water [cubic metres] | Percentage of produced water |
|---|---|---|
| Reused | 0 | 0.00% |
| Recycled | 0 | 0.00% |
| Re-injected | 415638 | 99.66% |
| Other | 1429 | 0.34% |
| TOTAL | 417067 | 100.00% |

# Refining

THE GLOBAL GOALS
For Sustainable Development

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

- **The LOTOS Group operates one of the most advanced and youngest refineries in Europe and globally.**
- **In 2016, the Gdańsk refinery processed 10.4m tonnes of crude oil, thus utilising 99% of its total capacities.**

In 2016, the LOTOS Group prepared for a maintenance shutdown scheduled for spring 2017, during which the refinery's units were connected with EFRA units.

- **In 2016, the Gdańsk refinery had a Nelson complexity index of 10, indicating its high complexity and efficiency.**
- **The Risk Based Inspection (RBI) process applied at the refinery to manage industrial failure risk allows maintenance intervals to be extended from 4 to 5 years.**

# Principal activities and performance in 2016

## Record-high oil processing volumes

In 2016, the Gdańsk refinery processed **10.4m tonnes** of crude, the highest throughput in the LOTOS Group's history. Thus, the refinery utilised as much as 99% of its total annual capacities of 10.5m tonnes. **Every fourth barrel of** oil processed by the refinery was imported from sources other than markets east of Poland.

### Maintenance shutdowns – Spring 2017

2016 was marked by preparations for the biggest maintenance shutdown in the Gdańsk refinery's history – **Spring 2017**. The preparations included selecting maintenance contractors, contracting deliveries of replacement equipment, and ordering metal materials, spare parts, and automation and electrical accessories.

The **Spring 2017** maintenance, carried out in March and April (**30 days** in total), covered 55 refining units, more than 1,100 apparatuses, approximately 1,000 pipelines, approximately 1,500 manual and automatic valves, fittings and other piping accessories, and approximately 2,000 automation accessories. The maintenance work involved approximately **3,500 personnel** from more than 100 contractors.

During the shutdown, most of the new **EFRA Project** units were connected to the existing units, which will allow their smooth start-up on completion of the project in 2018, without halting all the operations at the refinery.

In 2016, the availability ratio of refining units at the LOTOS Group was **99.4%**.

In 2016, there were a total of **16** maintenance shutdowns, lasting from 3 to 20 days, due to scheduled maintenance work and unscheduled, though standard, repairs.

# Key projects

## EFRA – towards effective refining

EFRA, that is the Effective Refining programme, is a continuation of the wider effort to technologically modernise the refinery, and completion of the deep crude oil processing chain, which was initiated by the modernisation under the 10+ Programme, closed in 2011. It involves an investment in a **Delayed Coking Unit** , designed to ensure more advanced conversion of crude oil.

Implementation of the EFRA Project, thanks to connecting new units with the existing ones at the Gdańsk refinery, will mean a higher yield of high-margin products per each oil barrel processed by the refinery. In practice, EFRA means that:

- The refining margin per barrel of oil processed will increase by approximately USD 2/bbl,
- The EFRA units will turn out approximately an additional 900,000 tonnes of high-margin fuels per year, which will add PLN 0.6bn to EBITDA annually.
- When the project work is completed and the new units come on stream, the LOTOS Group refinery will be able to process each tonne of heavy residue into some 700 kg of fuels and 300 kg of coke, without having to produce unprofitable heavy fuel oil.


The project is scheduled for completion **in the first half of 2018**. Completion of the EFRA Project will take the Gdańsk refinery's Nelson Complexity Index **above 10.5. In 2016, the figure was 10**.

**The Nelson Complexity Index represents** crude oil processing complexity ratio. The ratio reflects the intensity of investments in the refinery, potential fixed costs, and the refinery's ability to generate value added. The ratio of 10 or more is reported only for **state-of-the-art refineries**.

## Summary of two years of implementation of the EFRA Project

- At the end of May 2017, the stage of completion of the EFRA Project was **73.8%** (above the planned 72.8%).
- At the end of December 2016, the progress of design, procurement and construction work was **54.1%**., almost 17% above the planned 37.2%.
- The project is progressing ahead of schedule mainly thanks to **shorter procurement and delivery times: +42.6pp.** Moreover, construction work is slightly ahead of schedule (+3.3pp).

## Our achievements under the EFRA Project in 2016

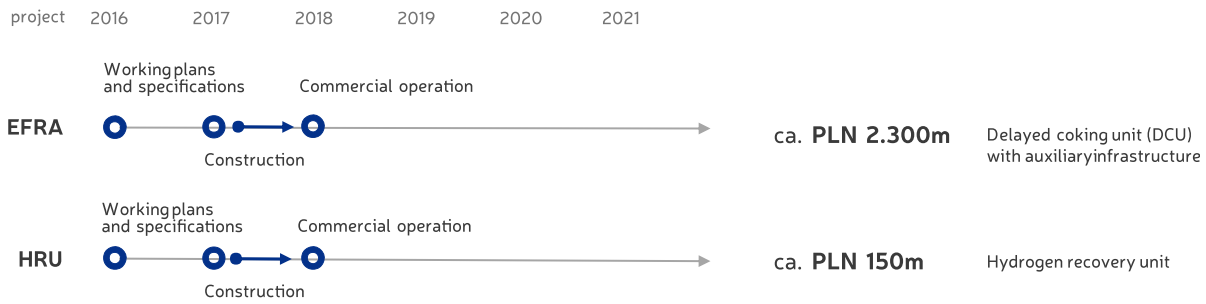
- In 2016, all necessary building permits required under the project's credit facility agreement with financing institutions were obtained,
- and all contracts for construction and modernisation of the units, auxiliary facilities and infrastructure were signed.
- Work on engineering design of the key Delayed Coking/Coking Naphtha Hydrotreating Units (DCU/CNHT), Hydrogen Generation Unit (HGU) and Hydrowax Vacuum Distillation Unit (HVDU) was nearing completion, and the necessary procurement activities were under way.
- Work on delivery and assembly of auxiliary facilities was carried out.
- Preparations for the Spring 2017 maintenance shutdown were performed to ensure smooth execution of the EFRA works planned to be carried out during the shutdown.

# Refining strategy for 2017–2022

The refining strategy will focus on building competitiveness with innovative technologies (e.g. EFRA)/maintaining technological advantage. Expected outcomes of innovation:

- The volume of high-margin products is expected to rise (on the back of investments in new technologies, such as construction of a new olefin complex or manufacture of motor gasolines from naphtha),
- New products will be launched on new markets (e.g. high-margin proprietary base oils made from hydrowax),
- Refining efficiency will improve (thanks to the construction of a CHP plant to meet internal needs of the LOTOS Group).

## Refining projects – schedule and economics



# Safe refining operations at the LOTOS Group

The assumption that underlies our approach to safety management and failure prevention at **the refinery is the integrity of means of production and safety**. Our approach is based on the following:

- Process units are built in compliance with Polish and international standards, relying on long-standing experience in operating such facilities,
- The units are operated by trained and experienced staff,
- Maintenance shutdowns are performed in accordance with the law and well-established procedures, including work permits, work procedures, checking the technical condition of equipment, equipment supervision by the Office of Technical Inspection (UDT) and the Company Technical Inspection, engaging specialised companies to perform overhauls, etc.

In 2016, we focused on ensuring **safety of work to be performed as part of the refinery maintenance shutdown scheduled for 2017**. The preparations included:

- Defining the scope of maintenance work to be performed and securing resources necessary for its proper performance, based on the requirements of Polish law (UDT) and the operational requirements (efficiency of technological processes), review of the technical condition of the equipment and its overhaul history, and the experience gained over many years of operation of the equipment,
- Purchase of spare parts and materials from proven suppliers,
- Engaging contractors specialising in overhauls of petrochemical units and energy generation facilities.

## RBI and reliable production units

For a few years now we have been the first in Poland to implement the RBI (Risk Based Inspection) methodology, i.e. a system for comprehensive **management of risk related to the operation of pressure equipment**, which allows us to predict potential equipment failures due to the greatest exposure to damage. Following full implementation of the RBI system, the operation of the refinery units will be more reliable, and the period of uninterrupted operation of the units between maintenance shutdowns should extend **from four to five years**.

In 2016, we analysed risks for **12 key units which**, if stopped, could have extremely adverse consequences for the operation of the refinery as a whole.

## In case of failure – training for the manufacturing staff

- In 2016, we completed **69 training exercises** focusing on correct response to industrial failures. They were attended by employees that operate production units on all shifts, and office staff – a total of over 1,000 people. These were practical drills to deal with emergencies that may occur at the production units.

- In September 2016, our employees underwent training under an external rescue operation plan at units 930 and 150, where **leakage of hydrogen sulphide was simulated**. The training covered:
- Identification of sources of danger,
- Notification of the event to rescue services and the dispatcher,
- Evacuation of personnel from the unit to the meeting point,
- Identification of victims (if any),
- Closing and restricting access to roads around the unit,
- Attempts by control room operators, chemical emergency services and the unit crew to bring the situation under control.

The training session was attended, in addition to the technical and security personnel of Grupa LOTOS, LOTOS Straż, and LOTOS Ochrona, by officers of the National Fire Service, Provincial Emergency Management Centre, and Provincial Inspectorate for Environmental Protection. The purpose of the exercise was to **test cooperation of all the services involved in the containment effort**.

## Process safety audit at the refinery

To ensure the best safety management standards, an external process safety audit was conducted at the refinery in 2016. The audit was performed by a company with extensive experience in the implementation and assessment of process safety management systems at refineries around the world.

Among the evaluated areas were: integrity of resources and reliability, change management, measurements and indicators, auditing, that is checking the skills of the management, and continuous improvement.

In addition to analysing documents, that is procedures and instructions, the auditors checked individual cases of production incidents, changes in engineering and technological solutions, results of audits and reviews, as well as data on plant engineering and overhauls.

# We reduce energy consumption

[G4-EN1] [OG1] [OG8]

The LOTOS Group has in place a *List of Environmental and Energy Efficiency Objectives*, which includes the following three objectives:

1. Improved energy efficiency of the inter-plant pipeline steam heating system,
2. Reduced consumption of primary energy at the refinery,
3. Improved energy efficiency of the inter-unit connections system.

In our business, cost of energy represents the largest item of operating expenses, therefore we attach particular importance to energy consumption by:

- Ensuring the rational use of energy,
- Maintaining equipment in good technical condition,
- Implementing effective investment projects.

The effectiveness of such an approach is confirmed by the fact that our refinery has for many years ranked among the most energy efficient refineries in Europe.

We operate on the basis of the **Energy Management System (EnMS)**, whose primary purpose is to optimise energy consumption. The energy efficiency of the units and the intermediate processes they perform are monitored on an ongoing basis. The Energy Efficiency Team analyses individual areas and participates in activities aimed at reducing energy consumption.

The LOTOS Group undergoes an **energy audit** to identify potential for efficiencies and areas where undertaking organisational, overhaul or investment initiatives is most likely to bring energy savings and economic benefits.

[G4-EN1]

LOTOS Group's consumption of raw materials in production processes in 2016

REBCO (Russian Export Blend Crude Oil) accounted for **75.18%** of the total crude procurement volume. Crude oil from other sources, including approximately 220,000 tonnes supplied by the LOTOS Petrobaltic Group, accounted for the balance of the crude feed. The mix of crudes resulted from the production optimisation process whose objective was to take advantage of opportunities for increasing the refinery's processing margins.

| Crude oil | Volume (t) | Share |
|---|---|---|
| REBCO | 7,808,862 | 75.18% |
| ROZEWIE | 107,253 | 1.03% |
| B8 | 141,922 | 1.37% |
| LITHUANIAN | 40,873 | 0.39% |

| Crude oil | Volume (t) | Share |
|---|---|---|
| PGNiG | 268,787 | 2.59% |
| Other | 2,019,585 | 19.44% |
| TOTAL | 10,387,363 | 100.00% |

| Other feedstocks used in refining operations | Volume (t) | Share |
|---|---|---|
| Demineralised water | 322,295 | 33.32% |
| FAME (fatty acid methyl ester) | 36,974 | 3.82% |
| diesel oils | 118,046 | 12.20% |
| ETBE (ethyl tertiary-butyl ether) | 12,983 | 1.34% |
| ethanol | 49,318 | 5.10% |
| MTBE (methyl tertiary-butyl ether) | 24,857 | 2.57% |
| natural gas | 380,561 | 39.34% |
| additives | 2,527 | 0.26% |
| other | 19,693 | 2.04% |
| **TOTAL** | **967,254** | **100.00%** |

| Refinery's own consumption | Volume,(t) | Share |
|---|---|---|
| fuel gas | 311,13 | 33.31% |
| residual gas | 479,815 | 51.37% |
| fuel oil | 32,951 | 3.53% |
| other | 110,151 | 11.79% |
| **TOTAL** | **934,047** | **100.00%** |

| Final products | Volume (t) | Share |
|---|---|---|
| gasolines (with reformates) | 1,550,430 | 14.92% |
| naphtha | 520,762 | 5.01% |
| xylenes | 71,129 | 0.68% |
| diesel oil | 4,509,280 | 43.40% |
| gasoil | 262,059 | 2.52% |
| fuel oil | 1,515,381 | 14.58% |

| Final products | Volume (t) | Share |
|---|---|---|
| MGO bunker fuel | 72,074 | 0.69% |
| JET aviation fuel | 637,229 | 6.13% |
| bitumen components | 594,091 | 5.72% |
| LPG (Liquefied Petroleum Gas) | 186,214 | 1.79% |
| base oils | 267,605 | 2.58% |
| slack wax | 49,804 | 0.48% |
| plasticisers | 36,452 | 0.35% |
| sulphur | 98,132 | 0.94% |
| other, including: 2,509 tonnes of fuel gas sold to LOTOS Asfalt | 19,812 | 0.19% |
| TOTAL | 10,390,454 | 100.00% |

[OG8]

## Benzene, sulphur and lead content in Grupa LOTOS fuels:

| Substance | Unit | Requirement | 2015 - volume | 2015 - volume (average) | 2016 - volume | 2016 - volume (average) |
|---|---|---|---|---|---|---|
| benzene (in gasolines) | % V/V | max. 1.00 | 0.4 - 0.9 | 0,7 | 0.25÷0.94 | 0,73 |
| sulphur (in gasolines) | mg/kg | max. 10.0 | 0.3 - 10.0 | 2,8 | 0.1÷8.8 | 2,3 |
| sulphur (in diesel oil) | mg/kg | max. 10.0 | 2.0 - 9.6 | 6,7 | 2.8÷9.9 | 6,5 |
| lead | mg/kg | max. 5 | <2.5 | <2.5 | <2.5 | <2.5 |

# Marketing – sales and distribution

- In 2016, the LOTOS Group improved its operating profit again, and reported consolidated revenue of **PLN 20,931m**.
- In 2016, LOTOS Kolej increased its share in the Polish rail freight market **from 9.91% to 10.20%** and retained the **second position among rail cargo carriers**.
- LOTOS-Air BP began to sell aviation fuel to **Emirates Airline and Air China, and thus expanded the pool of its global customers**.
- Since its inception in 2013, LOTOS Oil has established its presence **on 57 foreign markets around the world**.
- In 2016, LOTOS service stations' retail sales hit a record-high. Adjusted EBITDA in 2016 amounted to PLN **156m**.
- Diesel oil (43.4%), gasolines (14.1%), and heavy fuel oil (13.6%) were the largest contributors to the LOTOS Group sales in 2016.
- In 2016, the LOTOS Group's share in the domestic fuel market was **29.5%**.

# 2016 at the companies – activities and sales performance

The LOTOS Group's marketing activities in 2016 were carried out by Grupa LOTOS and its subsidiaries: LOTOS Paliwa, LOTOS Oil, LOTOS Asfalt, LOTOS Kolej, and LOTOS-Air BP Polska.

Grupa LOTOS marketed its products in Poland (sales to foreign companies operating in the country) and on foreign markets (exports by sea and by land), while its subsidiaries targeted their sales at individual sectors, i.e. fuels, lubricants, and bitumens.

Areas of specialisation of the subsidiaries engaged in trading and sale of raw materials, products and services of the LOTOS Group:

- LOTOS Oil – manufacturing and sale of lubricating oils and lubricants, and sale of base oils,
- LOTOS Kolej – railway transport,
- LOTOS Asfalt – manufacturing and sale of bitumens,
- LOTOS Paliwa – wholesale and retail sale of fuels and light fuel oil, management of the LOTOS service station chain.

## Selected activities and performance of the companies in 2016

### LOTOS Kolej

- In Poznań, the company opened its sixth Transport Division, which is used to develop its services in Germany. In 2016, using the services of German train drivers, it transported **881,000 tonnes of products** and intends to increase this volume to 1.1m tonnes in 2017 and 2m tonnes in 2019.
- LOTOS Kolej **started to transport grains and fodder** after it had been certified for compliance with the **GMP+ B4 standard**. The services are provided using LOTOS Kolej's own new rail cars.
- In 2016, the company increased its share in the Polish rail freight market from **9.91% to 10.20%** and retained the **second position (after PKP) among rail cargo carriers**. For many years it has been the **market leader** in transport of **dangerous goods** – in 2016 the volume of dangerous goods it carried rose 24% (from 5.59m tonnes to 6.94m tonnes).

### LOTOS-Air BP Polska

- The company began to sell aviation fuel to **Emirates Airline and Air China**, thus **enlarging its pool of global customers**.
- LOTOS-Air BP Polska **increased its fleet of road tankers to 16** and now boasts the newest and the best fleet among businesses operating in Poland's aviation fuel market.
- The Olsztyn-Mazury Airport in Szymany is the **fifth airport where the company sells aviation fuel 'at the wing tip'**. Altogether, LOTOS-Air BP Polska supplies **350,000 litres of fuel on average at five Polish airports every day**.
- In 2016, the company delivered record-high financial results, exceeding by several times the results it posted when it was established in 2014.

### LOTOS Asfalt

- In 2016, LOTOS Asfalt continued its activities under the EFRA Project, as part of which it was responsible for **covering the surface of roads with fullSMA bitumen**.
- In 2016, 47 employees, i.e. more than **20% of the company staff**, took part in a competition for innovative ideas.

### LOTOS Serwis

- In 2016, LOTOS Serwis provided maintenance, repair and other services for the production facilities of the LOTOS Group and worked on the process modules of the **Petrobaltic rig**.

- In 2016, the company's Integrated Management System was **certified by Polskie Centrum Badań i Certyfikacji, a Polish certification body**.
- In H2 2016, the company was extensively involved in technical and organisational work as part of the preparation for the **SPRING 2017** maintenance shutdown.

### LOTOS Oil

- LOTOS Oil developed a **new model of operation on the Polish market**, based on communicating the quality and cutting-edge properties of its lubricants. On the international arena, the company started to work the Japanese brand ISUZU.
- Being present on **57 markets**, LOTOS Oil was named 'Ambassador of the Polish Economy' and 'Polish Business – International Champion' in competitions held under the patronage of the Ministry of Foreign Affairs in 2016.

### LOTOS Petrobaltic

- The company continued work on full **development of the B8 field**, e.g. it worked on the construction of a gas pipeline to Energobaltic and upgrade of the Petrobaltic rig.
- **To renew its fleet**, in December 2016 LOTOS Petrobaltic acquired a new platform supply vessel (PSV) Sylur, which is ultimately intended to operate as a multi-task vessel.
- Preparations for development of the **B4 and B6** fields.
- **Strengthening its position on the Norwegian Continental Shelf**, where the LOTOS Group acquired interests in 5 licenses.

LOTOS Petrobaltic Group's production and sales of crude oil and gas in 2016

| Sales | Country | Volume ('000 boe) |
|---|---|---|
| Total crude oil and natural gas | Poland | 1 840,00 |
| | Norway | 6 750,3 |
| | Lithuania | 365,6 |

| Production [1] | Country | Volume ('000 boe/d) |
|---|---|---|
| Total crude oil and natural gas | Poland | 5,5 |
| | Norway | 20 |
| | Lithuania | 1,1 |

[1] Dzienna produkcja w boe/d stanowi sumę wolumenu wydobycia węglowodorów w 2016 r. podzieloną przez liczbę dni w roku.

## Diesel oil, gasoline, aviation fuel – what are our best selling products?

The increase in our domestic sales was driven mainly by **improved sales of diesel oil and gasolines** (partly an effect of fuel market legislation enacted by the Polish government in August 2016) – the key petroleum products marketed through the wholesale and retail channels, which are more profitable than exports. The increase in **sales of aviation fuel** followed from higher sales in the wholesale and 'at the wing tip' channels, with the contract for supply of specialist F-34 fuel for the military being an additional source of growth.

### LOTOS products with the highest share in sales in 2016

**Like in the previous years**, diesel oil **had the largest share in the total sales volume**. In 2016, the LOTOS Group sold 4,797 thousand tonnes of diesel oil, which accounted for **43.4%** of total sales.

**Gasolines** represented **14.1% of total sales**. The volume of gasolines sold in 2016 was 1,557 thousand tonnes, having grown by 0.6% on 2015.

**Heavy fuel oil** accounted for **13.6% of sales** in 2016. The LOTOS Group sold 1,477 thousand tonnes of the product in 2016, 2.7% up on 2015.

In 2016, the Downstream segment sold 7,026 thousand tonnes of products in Poland (2015: 6,446 thousand tonnes; 2014: 6,282 thousand tonnes) and exported 3,993 thousand tonnes (2015: 4,471 thousand tonnes; 2014: 3,824 thousand tonnes).

The LOTOS Group's sales by product category ('000 tonnes)

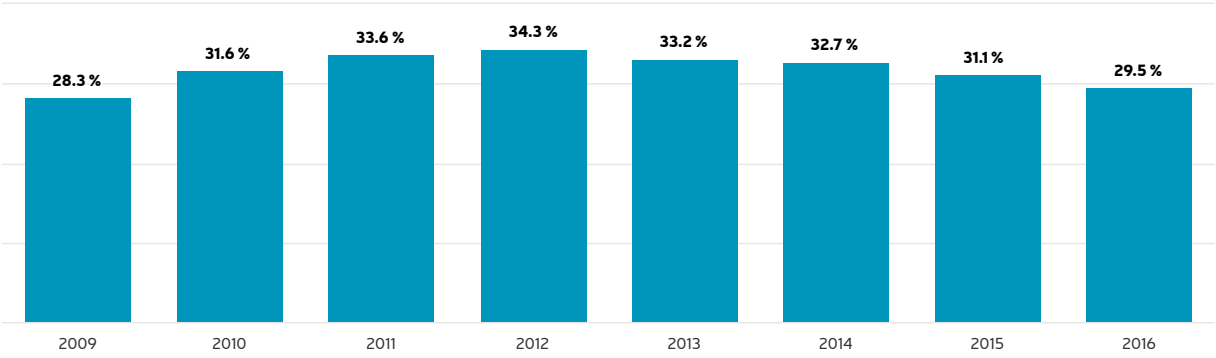
| | 2016 | | 2015 | | 2016/2015 change |
|---|---|---|---|---|---|
| | '000 tonnes | % share | '000 tonnes | % share | % |
| Gasolines | 1,557 | 14.10% | 1.547 | 14.20% | 0.60% |
| Naphtha | 521 | 4.70% | 508 | 4.60% | 2.60% |
| Reformate | 45 | 0.40% | 13 | 0.10% | 246.40% |
| Diesel oils | 4,797 | 43.50% | 4 853 | 44.40% | -1.20% |
| Bunker fuel | 65 | 0.60% | 66 | 0.60% | -0.,30% |
| Light fuel oil | 268 | 2.40% | 251 | 2.30% | 6.70% |
| Heavy products [1] | 2,118 | 19.20% | 2,099 | 19.20% | 0.90% |
| JET A-1 fuel | 656 | 6.00% | 556 | 5.10% | 18.00% |
| Lubricants | 60 | 0.50% | 60 | 0.60% | 0.10% |
| Base oils | 214 | 1.90% | 202 | 1.80% | 6.30% |
| LPG | 247 | 2.20% | 238 | 2.20% | 4.00% |
| Crude oil (commodity) | 195 | 1.80% | 243 | 2.20% | -19.80% |
| Other | 276 | 2.50% | 290 | 2.70% | 9.70% |
| **Total petroleum products, merchandise and materials of the Downstream segment** | **11,018** | **100.0%** | **10,917** | **100.0%** | **1.30%** |
| Natural gas (toe) | 675 | 6.20% | 223 | 2.00% | 202.90% |
| Crude oil (upstream) | 151 | 1.40% | 82 | 0.80% | 84.30% |
| NGC [2] | 43 | 0.40% | 8 | 0.10% | - |

[1] heavy fuel oil and bitumen
[2] natural gas condensate

## How we sell our fuels

The LOTOS Group offers fuels on the domestic retail market exclusively through **LOTOS Paliwa**. On the wholesale market, the LOTOS Group operates both through Grupa LOTOS (sales of fuels to international corporations and key customers, e.g. under contracts with the Material Reserves Agency and the Military Property Agency) and LOTOS Paliwa (transactions with wholesale customers and independent operators). In 2016, our share in the domestic fuel market was **29.5%**.

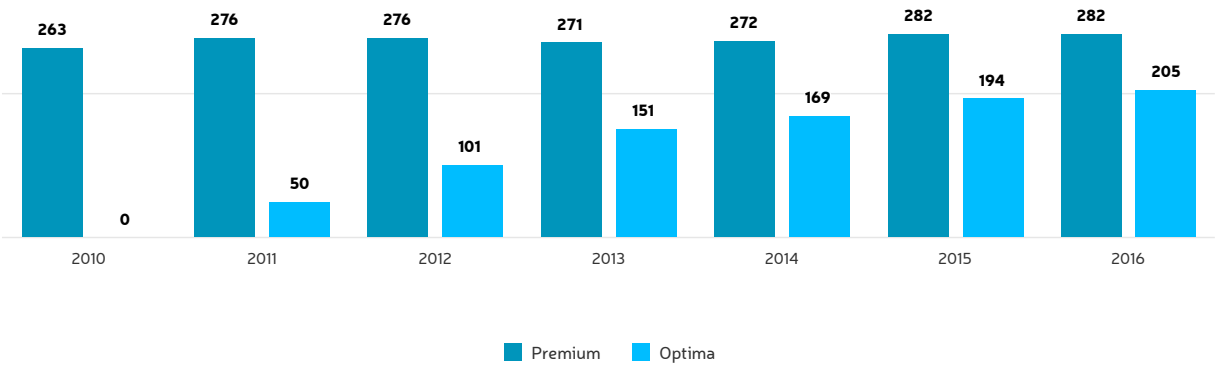
The LOTOS Group's share in the domestic fuel market




## 11 new service stations – record-high retail fuel sales

**In 2016, we posted record-high retail fuel sales.** At the end of 2016, the LOTOS service station chain comprised 487 stations, including 11 new ones. Optimisation efforts and the government's Fuels Package helped improve the chain's financial performance. Adjusted EBITDA in 2016 amounted to **PLN 156m**, compared with PLN 112m in 2015 and PLN 95m in 2014.

As at December 31st 2016, 487 stations oper-ated under the Lotos and Lotos Optima brands.




### Facilities for customers

- The LOTOS service station chain's performance was supported by our successful efforts to extend the value chain and expand the sales model. Non-fuel products and services generate increasingly more revenue for the chain. Their development was the Marketing segment's key expenditure item in 2016, and was pursued with the objective of ensuring comfort for motorists by:
  - Developing food services, the second largest (after sales of fuel) contributor to the 2016 profit. We have entered into long-term cooperation with the Subway restaurant chain,
  - Introducing other services, such as cashback, automobile services, trailer rental, manual car wash facilities, mobile payments,
  - Opening facilities which offer alternative fuels (electric car charging points in the Gdańsk-Sopot-Gdynia agglomeration).

- The sales efforts were supported by marketing activities – standardisation of the service stations' visual identification and offering customer-friendly solutions: dedicated call bells for disabled persons to call attention of the service station staff, baby changing tables, helmet racks in the toilet rooms for motorcycle riders, and dog watering stations for dog owners. Motorists can also charge their smartphones free of charge.

## Management of the service station chain

Grupa LOTOS' chain of service stations is organised into Economy (LOTOS Optima) and Premium (LOTOS) segments. In 2016, we opened 11 new LOTOS sites, including 10 CODO and 1 DOFO station. The chain expansion was based on a plan focusing on key locations which offer the highest potential of winning and retaining fleet customers. The need to eliminate gaps identified in the geographic coverage of the LOTOS service station network was also a priority.

To enhance the Company's position in the strategic MSA segment (service stations in Motorway Service Areas), **two MSA stations at the A1 motorway** section between Łódź and Gdańsk were opened in **Krzyżanów** (East/West).

| | | |
|---|---|---|
| LOTOS | **LOTOS PREMIUM** 282 stations | **159 CODO** stations<br>**20 MOP** stations<br>**103 DOFO** stations |
| LOTOS optima | **LOTOS Optima** 205 stations | **121 CODO** stations<br>**84 DOFO** stations |

### Expansion of the service stations' offering

#### Car rental service – partnership with 99rent

In order to enhance the range of services available to customers of its retail chain, LOTOS Paliwa commenced cooperation with 99rent, a car rental company. The objective is to establish a network of points **offering customers a quick and convenient car rental service**. In 2016, it was available at LOTOS stations in eight cities: Bydgoszcz, Częstochowa, Elbląg, Gdańsk, Kraków, Radom, Warsaw, and Wrocław.

Customers can rent cars and small vans. The rental procedure is simple and anyone aged 21 or over who has had a driving licence for at least 2 years can rent a car. The pickup and return processes take only a dozen or so minutes. For information about our service stations with car rental facilities, go to: www.lotos.pl/wypozyczauto.

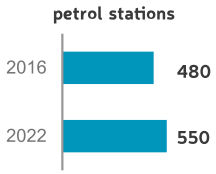
#### Addition of new sites to the retail sales network

In 2016, the Premium service station chain was further standardised, and new locations were added (both CODO stations and DOFO stations, the latter under new franchise agreements), including 10 CODO stations and 1 DOFO station.

## Marketing segment strategy for 2017–2022

## Retail: optimising the retail network, innovating the product and service portfolio

### Further standardisation and organic growth




- **Customer service and sales process** optimisation
- **Revamping the loyalty rewards scheme** with up-to-date technology solutions
- **Introducing a new quality in hospitality** in partnership with market leaders
- **Upgrading** on-site facilities: car wash stations, electric car charging points
- LOTOS **Energy Hub,** alternative fuels

### Acquisition opportunities

- Seeking out non-organic opportunities to expand the network
- Capturing opportunities to acquire complementary petrol station network

**Our ambition:**
**new quality of LOTOS retail**

2017–2022 CAPEX: PLN 0.6bn
- part of PLN 3.3bn CAPEX allocation decision in 2018

# Efficient distribution and logistics

[G4-EN25]

## Innovative fuel delivery monitoring system

In 2016, LOTOS Paliwa's modern fuel delivery monitoring system was upgraded to include a unique **video surveillance module**.

**The FDMS** (remote Fuel Delivery Monitoring System) helps enhance goods-in-transit security and reduce the risk of damage or loss of products moved by road, by closely monitoring the vehicle, the cargo and the driver along the transport chain.

LOTOS Paliwa **is working with seven transport companies**, hence the need for coordinated transport operations to deliver fuels to its own and third-party service stations.

The FDMS system comprises several autonomous yet **integrated components**, namely:

- GPS tracker,
- Electronic seal system,
- Compartment stripping control system,
- System preventing mixing of fuels in tanker trucks,
- Video surveillance system.

Some components of the FDMS system are already used by the fuel industry. After the launch of an online platform incorporating data from all systems as well as the **tanker truck video surveillance**, LOTOS Paliwa will boast the most innovative fuel transport monitoring system in Poland.

# Environmental efficiency

[G4-EN20] [OG7]

→ **The LOTOS Group does not emit any ozone-depleting substances (HCFC). HCFC agents used by LOTOS Paliwa have been replaced with HFC agents. In 2016, the service stations' air conditioning systems emitted a total of 150 kg of HFC.**

[G4-EN25]

→ **Total weight of hazardous waste transported by LOTOS Group companies in 2016 was 23,378.5 tonnes. Total weight of hazardous waste treated by the LOTOS Group was 13,954.95 tonnes.**

→ **Percentage of products sold and their packaging materials that is reclaimed, by category (at LOTOS Oil and LOTOS Paliwa):**

[G4-EN28]

## LOTOS Oil

| Name | Lubricants | Hazardous packaging | Packaging | Lubricant preparations |
|---|---|---|---|---|
| Volume of products and packaging materials reclaimed during the reporting period | 17,122.5 | 3.5 | 1,667.0 | 1,513.1 |
| Volume of products sold during the reporting period | 34,245.1 | 17.5 | 2,732.8 | 6,304.4 |
| Percentage of products sold and packaging materials that were reclaimed | 50% | 20% | 61% | 24% |

[G4-EN28]

## LOTOS Paliwa

| Name | 2016 |
|---|---|
| Volume of products and packaging materials reclaimed during the reporting period | 110,123.75 |
| Volume of products sold during the reporting period | 180,530.7 |

| Name | 2016 |
|---|---|
| Percentage of products sold and packaging materials that were reclaimed | 61% |

# Our environmental performance


[OG1] [G4-EN6] [G4-EN14]

In 2016, we consistently pursued initiatives to bring down energy consumption, as it represents the largest item of the LOTOS Group's operating expenses. Therefore, reducing the amounts of energy consumed by our plants is the key objective of our Energy Management System (EnMS), based on ISO 50001, and our *Energy Policy*.

→ **The EnMS System allows us to monitor energy efficiency of the units and the intermediate processes they perform on an ongoing basis. The Energy Efficiency Team analyses their individual areas and engages in activities aimed at reducing energy consumption. Energy consuming machinery is monitored in a comprehensive and regular manner in order to maintain high efficiency of heat transfer in technological processes.**

→ **Energy intensity is monitored on an ongoing basis during the respective industrial processes to ensure the highest possible adequacy of operational efficiency assessment in our crude oil processing activities. Our organisation undergoes an energy audit to identify potential for efficiencies and areas where undertaking organisational, overhaul or investment initiatives is most likely to bring energy savings and economic benefits.**

The effectiveness of our approach to energy consumption management is confirmed by the fact that our refinery is ranked among Europe's most energy efficient refineries.

To sum up, our energy efficiency efforts and the procedures we have implemented in recent years and are continuously improving involve:

- Rational use of energy,
- Optimum use of technological processes,
- Maintaining proper technical condition of the energy-consuming infrastructure,

- Energy efficiency improvement projects,
- Procurement of services and assets taking into account their energy intensity's effect on long-term costs of their use.

[G4-EN3]

## Energy consumption within the organisation

| | | Amount (GJ) |
|---|---|---|
| Total consumption of energy from non-renewable sources (own or purchased) | coal | 274,453 |
| | natural gas | 7,909,737 |
| | Diesel oil | 623,026 |
| | fuel gas | 12,802,988 |
| | residual, special, reservoir gas | 3,825,240 |
| | heavy fuel oil | 0 |
| | light fuel oil | 1,364,562 |
| | marine oil | 0 |
| | LPG (if used for heat generation) | 0 |
| **Total** | **Total consumption** | **26,800,006** |
| | | |
| Total consumption of energy from renewable sources (own or purchased) | | 0 |
| **Total** | **Total consumption** | **0** |
| | | |
| Total consumption of purchased energy | electricity | 6,047,734 |
| | heat (including steam and cooling) | 127, 187 |
| **Total** | **Total consumption** | **6,174, 921** |
| | | |
| Total sales of self-produced energy | Total electricity sales | 171,059 |
| | Total heat sales (net) | 299,037 |
| | Total sales of cooling energy | 0 |
| | Total sales of steam | 208,953 |
| **Total** | **Sales** | **679,049** |
| | **Total energy consumption within the organisation** | **32,295,878** |

Our economic use of **water resources** is based on relevant water use and integrated permits. Analyses of the environmental impact of our water abstraction activities confirm that they have no material effect on any protected sites or areas of great environmental value, and that the amount of water abstracted is substantially below permitted volumes.

[G4-EN8]

## Water withdrawal by source

| Total volume of water withdrawn by the Company, by source | [cubic metres] |
|---|---|
| Water from rivers | 3,983,623.0 |
| Water from lakes | 0.0 |
| Seawater | 557,229.6 |
| Water from wetlands | 0.0 |
| Ground water | 370,705.0 |
| Rainwater collected directly and stored by the organisation | 0.0 |
| Municipal water | 314,354.8 |
| Waste water from another organisation | 0.0 |
| **TOTAL** | **5,225,912.4** |

Processes consuming large quantities of water:

- CHP plant: utilities production (Grupa LOTOS) – 2,984,550.0 cubic metres
- Refinery: circulatory cooling water (Grupa LOTOS) – 1,409,420.0 cubic metres
- Injection of seawater into the B3+B8 reservoir (LOTOS Petrobaltic) – 557,229.6 cubic metres
- Production of decarbonized water (LOTOS Infrastruktura) – 270,659.0 cubic metres
- CHP plant, heating and process steam generation (RCEkoenergia) – 135,766.0 cubic metres

[G4-EN10]

## Percentage and total volume of water recycled and reused

| Volume (cubic metres) | TOTAL |
|---|---|
| Total volume of water withdrawn by the organisation | 8,989,958.4 |
| Volume of water recycled or reused | 4,334,196.6 |
| Share of water recycled or reused in the total volume of water withdrawn by the organisation | 48.2% |

Our operations do not have a negative **impact on biodiversity** at the refinery's site or in its immediate vicinity, as confirmed by a wildlife survey. The LOTOS Group investigated its impact on biodiversity over the past few years as part of its CSR strategy effective until 2015.

In 2014 and 2015, we conducted a comprehensive wildlife survey on the grounds of our refinery and in surrounding areas and we identified the most valuable nature conservation areas. The survey report will be a starting point for monitoring activities planned to be taken after completion of the EFRA Project (2018).

In 2016, there was no need for work on biodiversity issues in or around the refinery.

[OG4]

## Number and percentage of significant operating sites in which biodiversity risk has been assessed and monitored

| Total number of significant operating sites | Number of significant operating sites where biodiversity risk has been assessed | Percentage of significant operating sites where biodiversity risk has been assessed |
|---|---|---|
| 1 | 1 | 100% |

| Total number of significant operating sites exposed to biodiversity risk | Percentage of significant operating sites exposed to biodiversity risk | Number of significant operating sites exposed to biodiversity risk in which Biodiversity Action Plans have been implemented and monitored |
|---|---|---|
| 1 | 1 | 0% |

[OG6]

## Volume of flared and vented hydrocarbons

| Location | Volume of flare gas ['000 cubic metres] | Volume of vented gas ['000 cubic metres] |
|---|---|---|
| Poland | 7,238.81 | 0 |
| International waters, Polish Exclusive Economic Zone (LOTOS Petrobaltic rig and BB rig) | 15,773.28 | 0 |
| **TOTAL** | **23,012.09** | **0** |

[G4-EN11]

Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas.

Grupa LOTOS' key operational site (refinery in Gdańsk) is not in or adjacent to protected areas. The closest protected area, the 'Ptasi Raj' reserve (Natura 2000 site), is located more than 4 km to the north-east from the refinery.

In 2016, LOTOS Paliwa added 11 service stations to its chain. Analyses carried out during the construction of new stations and inclusion of existing sites showed no potential impact on areas of great natural value or areas covered by the national biodiversity conservation strategy.

Energobaltic's CHP plant in Władysławowo, at the base of the Hel Peninsula, is adjacent to the Coastal Landscape Park located within a Natura 2000 site. The land used by the company is not part of the protected area.

LOTOS Geonafta produces oil and gas from onshore fields at five locations in the Kretinga district in Lithuania. They are located in close proximity to areas of great natural value due to aquatic ecosystems (Natura 2000). However, the area where the company carries out its work is 600–700 meters away from the nature sites.

The most critical source of environmental impact caused by our plants, both for the installations' immediate environment and areas located further away, is **gas emissions**. Therefore, we are most concerned to ensure that the processes involving gas emissions are based on Best Available Techniques and best practices reducing the plants' impact in that respect.

Since 2011, we have sought to reduce our Gdańsk refinery's carbon ($CO_2$) emissions intensity ratio, expressed in kg $CO_2$/CWT, every year. The target for 2016 was also successfully met.

29.1 kg $CO_2$/CWT is the current level of the Gdańsk refinery's average emissions intensity ratio after it was reduced from 29.8 kg $CO_2$/CWT in 2015.

The reduction was partly achieved by switching over to natural gas as fuel for the CHP plant and feedstock in hydrogen production, while reducing the volumes of heavy fuel oil used to meet the refinery's energy needs, which was made possible by the gas connection with the refinery constructed in 2012.

[G4-EN15]

## Direct greenhouse gas emissions

| **Direct greenhouse gas (GHG) emissions** | **[Mg$CO_2$e]** |
|---|---|
| Emissions associated with electricity production | 28,083 |
| Emissions associated with heat production | 1,326,738 |
| Emissions from cooling and steam generation systems | 47,322 |
| Emissions from physical and chemical processing | 628,331 |
| Hydrofluorocarbons (HFC) emissions | 0 |
| Emissions related to transport of materials, products and waste | 175 |
| **Total direct emissions** | **2,030,649** |

| Operations/processes of particular relevance (where they represent a material proportion of the organisation's emissions profile) | GHG emissions [tonnes of $CO_2e$] 2016 |
|---|---|
| Heat generation at CHP plant | 282,019 |
| Refining production | 1,617,919 |
| Emissions from extraction processes – burning of fossil fuels to meet the rigs' energy needs and burning of waste gas in the burner head | 78,437 |

[G4-EN16]

## Indirect greenhouse gas emissions

| Indirect greenhouse gas (GHG) emissions | [tonnes of $CO_2e$] |
|---|---|
| Emissions from electricity purchased for the organisation's needs | 545,560.3 |
| Emissions from heat purchased for the organisation's needs | 1,115.0 |
| Emissions from steam and cooling energy purchased for the organisation's needs | 0.0 |
| **Total indirect emissions** | **546,675.3** |

[G4-EN18]

## Greenhouse gas (GHG) emissions intensity

| $CO_2$ emission intensity | Grupa LOTOS | Energobaltic | Asphalt | RCEkoenergia |
|---|---|---|---|---|
| $CO_2$ emissions volume | 1,899,938 $MgCO_2$ | 8,055 $MgCO_2$ | 15,378 $MgCO_2$ | 29,565 $MgCO_2$ |
| Production value | 65,289 Mg | 145,190 GJ | 673,593 Mg | 297,399.3 GJ |
| $CO_2$ emissions intensity ratio (tonnes of $CO_2$/mboe or other production factor) | 29.1 $kgCO_2$/CWT | 0.06 $MgCO_2$/GJ | 0.02 $MgCO_2$/Mg | 0.10 $MgCO_2$/GJ |

The volumes of our air emissions did not exceed the permitted levels set out in the integrated permit covering our companies.

[G4-EN21]

## $NO_x$, $SO_x$, and other significant air emissions

| $NO_x$, $SO_x$ and other significant air emissions | Total [Mg] |
|---|---|

| $NO_x$, $SO_x$ and other significant air emissions | Total [Mg] |
|---|---|
| $NO_x$ | 1281.32 |
| $SO_x$ | 1852.049 |
| Persistent organic pollutants (POP) | 0 |
| Volatile organic compounds (VOC) | 66584.234 |
| Hazardous air pollutants (HAP) | 3.3 |
| Particulate matter (PM) | 298.633 |
| Other standard categories of air emissions | 41244.686 |

| Emission intensity in oil and gas production | Total [Mg/mboe] |
|---|---|
| $NO_x$ | 46.338 |
| $SO_x$ | 4.447 |
| Volatile organic compounds (VOC) | 388.334 |
| Particulate matter (PM) | 4.576 |

For years, Grupa LOTOS has maintained a high quality of **treated wastewater**. Regular monitoring has confirmed that the wastewater discharged meets the required parameters.

As in previous years, in 2016 we sought to keep the effluent parameters at below 50% of admissible levels, in line with our corporate CSR strategy effective until 2015.

[G4-EN22]

## Total water discharge by quality and destination

| Wastewater discharge destination | TOTAL |
|---|---|
| To groundwater | 0.0 |
| To surface water (lakes, rivers, etc.) | 6,531,834.9 |
| To municipal utilities | 220,882.0 |
| Total wastewater volume | 6,752,716.9 |

| Wastewater treatment method | TOTAL |
|---|---|
| By the organisation | 6,531,834.9 |

| Wastewater treatment method | TOTAL |
|---|---|
| By a wastewater treatment plant | 220,882.0 |
| Total volume of treated wastewater | 6,753,186.9 |
| Other | 470.0 |

We favor the most environmentally-friendly **waste management** methods, such as recycling and recovery, and we take firm steps to curb the use of methods that are harmful to the environment, such as burning without energy recovery, landfilling and other forms of disposal.

Therefore, we put considerable effort into having as much waste as possible collected by external waste management companies for further recovery or recycling. As much as 99.4% of waste we transferred to external companies in 2016 was reused or recycled.

[G4-EN23]

## Total weight of waste by type and disposal method

| | TOTAL [Mg] | |
|---|---|---|
| **Total weight of hazardous and non-hazardous waste by disposal method** | **hazardous waste** | **non-hazardous waste** |
| Reuse of waste | 0.0 | 67.8 |
| Recycling (including organic recycling, e.g. composting) | 51.,4 | 42.8 |
| Recovery (including energy recovery) | 8,162.1 | 7,912.4 |
| Burning (or use as fuel) | 1,044.1 | 20.3 |
| Landfilling | 5.7 | 29.6 |
| Discharge to deep wells | 0.0 | 0.0 |
| On-site storage | 2,335.4 | 18.4 |
| Other | 412.3 | 713.7 |
| **TOTAL** | **12,011.0** | **8,805.0** |

In this respect, we follow the provisions of applicable EU and Polish laws and decisions. We strive to ensure that our waste management does not harm the environment.

[G4-EN25]

The total weight of hazardous waste transported by LOTOS Group companies in 2016 was 23,378.5 tonnes, whereas the total weight of hazardous waste treated by the LOTOS Group was 13,954.95 tonnes.

[G4-EN24]

No significant spills were recorded in 2016, but our production facilities are adequately prepared for a spill emergency, with each having relevant spill prevention and response procedures in place. Response operations are handled by dedicated in-house chemical emergency services. Any waste generated from a spill (for instance soil contaminated with petroleum products) is handed over to specialist companies for legal disposal.

We have taken a strategic approach to minimizing our environmental impacts, which is why the LOTOS refinery, our major plant, is now one of the most environmentally friendly refineries in Europe.

When selecting and implementing innovative solutions, we always seek synergies between the needs of the company and benefits to the environment, and especially to the natural world.

[G4-EN29]

No fines or sanctions for non-compliance with environmental laws and regulations were imposed on any LOTOS Group company in 2016.

[G4-EN31]

## Total environmental protection expenditures and investments by type

| Total environmental protection expenditures and investments | TOTAL |
|---|---|
| Waste disposal, emissions treatment, and remediation costs (PLN) | 63,129,077 |
| Prevention and environmental management costs (PLN) | 149,323,135 |

Companies included in the calculations: Grupa LOTOS, Energobaltic, LOTOS Asfalt, LOTOS Biopaliwa, LOTOS Infrastruktura, LOTOS Kolej, LOTOS Lab, LOTOS Oil, LOTOS Paliwa, LOTOS Petrobaltic, LOTOS Serwis, LOTOS Straż, LOTOS Terminale, RCEkoenergia.

| Total environmental protection expenditures and investments | TOTAL |
|---|---|
| Waste disposal, emissions treatment, and remediation costs (EUR) | 222177 |
| Prevention and environmental management costs (EUR) | 8901 |

Company included in the calculations: LOTOS Geonafta

[G4-EN34]

| Number of grievances about environmental impacts | Grupa LOTOS, Energobaltic, Geonafta, LOTOS Asfalt, LOTOS Infrastruktura, LOTOS Kolej, LOTOS Oil, LOTOS Paliwa, LOTOS Petrobaltic, LOTOS Terminale, RCEkoenergia |
|---|---|
| Number of grievances about environmental impacts filed during the reporting period through formal grievance mechanisms | 4 |
| Number of grievances filed and addressed | 3 |
| Number of grievances filed and resolved | 3 |

| Number of grievances about environmental impacts | Grupa LOTOS, Energobaltic, Geonafta, LOTOS Asfalt, LOTOS Infrastruktura, LOTOS Kolej, LOTOS Oil, LOTOS Paliwa, LOTOS Petrobaltic, LOTOS Terminale, RCEkoenergia |
|---|---|
| Total number of grievances about environmental impacts filed prior to the reporting period and resolved during the reporting period | 0 |

No grievances were received directly by LOTOS Paliwa, but the company had noise levels measured at its two service stations in response to two complaints filed with the local county governors. It was found that permitted noise levels were exceeded, and the company was served a noise abatement notice. Acoustic screens were installed at the two service stations in 2016, and currently proceedings are pending to affirm the company's compliance with the prescribed noise limits.

[OG13]

In 2016, we recorded five Tier 2 process safety events as per API RP 754 definitions. All took place at the refinery, were associated with refining processes and caused no environmental damage. Thanks to the security and protection systems in place and the efficient operation of our rescue services, the incidents had no major impact on the refinery's operation.

In 2016, no API RP 754 Tier 1 process safety events were recorded at the LOTOS Group companies.

**More information**
*Directors' Report on the operations of Grupa LOTOS S.A. and the LOTOS Group in 2016*
Chapter 7.3. Environmental protection