

13th UIC Sustainability Conference



Energy efficient technologies at railway stations and on
infrastructure of Russian Railways

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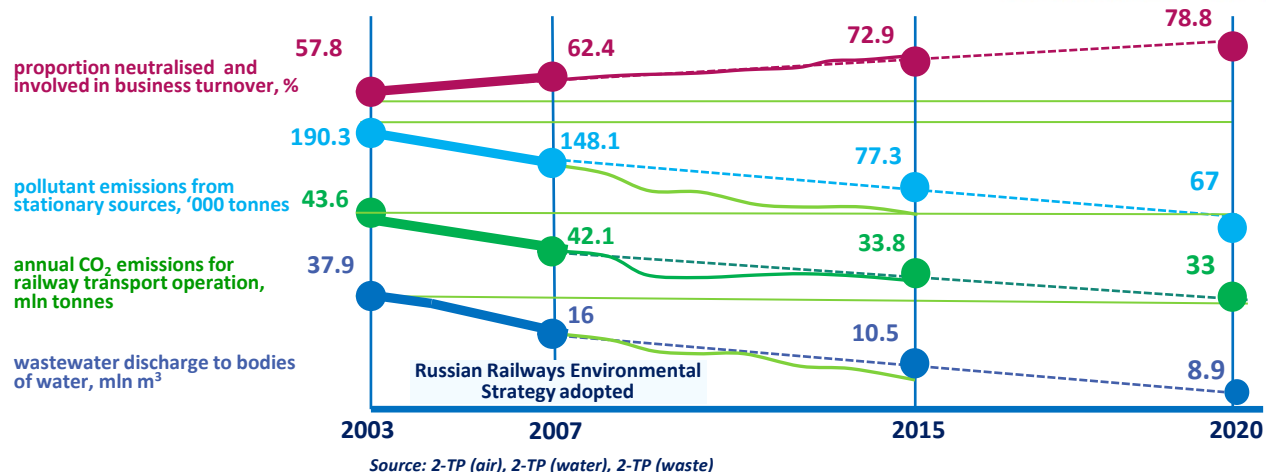
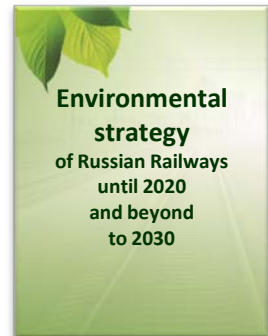


12, 13, 14 October 2016

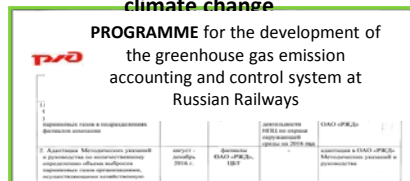
MAIN RESULTS OF RUSSIAN RAILWAYS ENVIRONMENTAL PROTECTION ACTIVITIES



Results of the implementation of the Russian Railways Energy Strategy

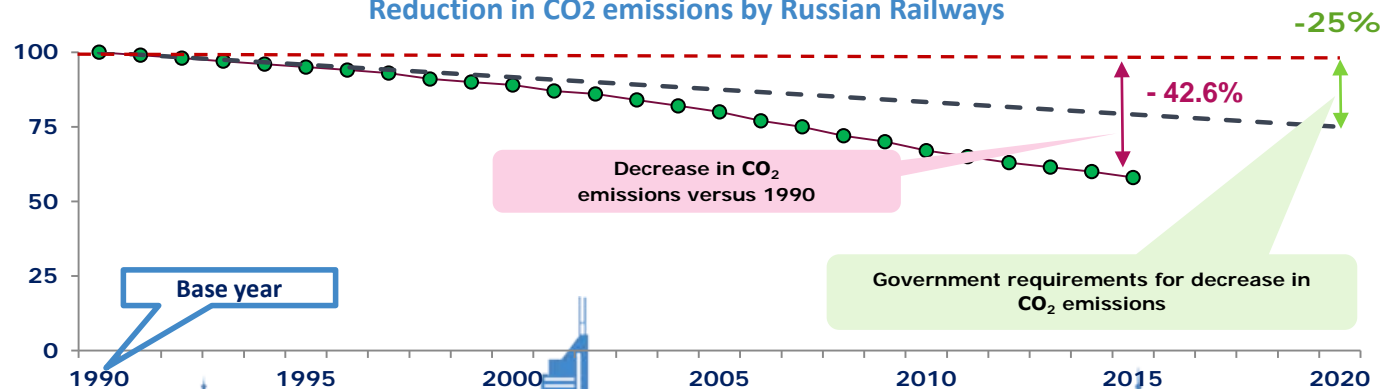


30 September 2015 — Russian Railways has undertaken obligations concerning its contribution to resolving the problem of **climate change**



In March 2016 — Russian Railways approved a Programme for the development of the greenhouse gas emission accounting and control system

Reduction in CO₂ emissions by Russian Railways





MAKING RAILWAY TRANSPORTATION MORE ENVIRONMENTALLY FRIENDLY



- 5,400 t of CO₂

1,586

diesel locomotives with outdated diesel engines replaced since 2004



- 19,000 t of CO₂

35 mln kWh
496 t of diesel fuel

savings per year from switching passenger trains to optimal energy schedules



- 1,038,000 t of CO₂

2,036 mln kWh

electricity recovered using electric traction in 2015



- 302,000 t of CO₂

600 mln kWh

annual savings from introducing optimal energy schedules for freight trains as part of the Elbrus project



82

company branches certified for compliance of the SEkM with the requirements of ISO 14001:2004



- 74,5 тыс. т CO₂

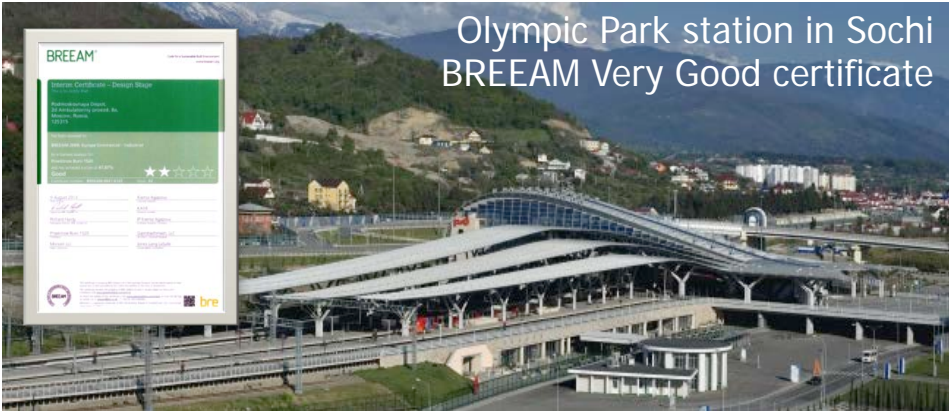
146 mln kWh

annual savings from the use of energy saving light bulbs

USE OF 'GREEN STANDARDS' WHEN BUILDING RAILWAY INFRASTRUCTURE FACILITIES



Full compliance with 'green standard' requirements during the design and construction stage enabled the Moscow Region depot to obtain a **BREEAM** (UK) certificate at the level of **Good** and the Olympic Park station in Sochi to obtain an operating certificate at the level of **Very Good**.



USE OF RENEWABLE ENERGY RESOURCES BY KALININGRAD REGION STATIONS



VIENNA 2016

34 outdated boilers of Russian Railways (coal and fuel oil) closed in Russian cities over the last **five years** during the implementation of the Programme to expand the use of renewable energy resources at railway facilities



Combined energy supply system of the Zelenogradsk station of Kaliningrad Railways



As part of the programme to modernise Russian Railways heat supply facilities in the Kaliningrad Region, 16 facilities switched to renewable heat energy resources with the closure of outdated coal boilers



'SMART STATION' PROJECT STATION MODERNISATION IN ANAPA



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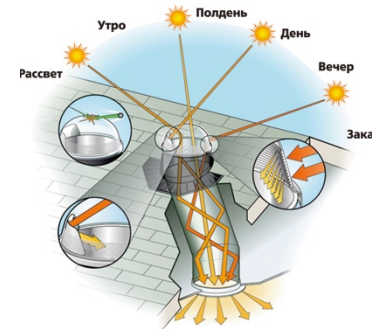
The concept of a **"Smart Railway Station"** is designed for mandatory use when developing projects for the new construction and reconstruction of railway stations and transport interchange hubs at Russian Railways

The updated Concept contains more than **80 regulatory and technical documents** in safety, energy efficiency, ecology, informatisation and the unified control of station engineering support systems

The implementation of the Concept at the **Anapa** station made it possible to provide autonomous electric and heat supply to the station solely through the use of renewable energy sources.



Solar light pipe



Solar module system



Hot air pump units



Dry cooler



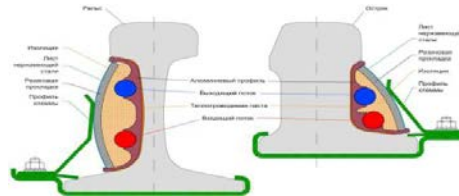
Hybrid LED lighting system



TURNOUT GEOTHERMAL HEATING SYSTEM



The innovative turnout heating system utilises a virtually inexhaustible source of energy – underground heat. The heat pump with its modern regulation system and improved rail heat exchangers **make it possible to heat turnouts in a reliable, regulated and eco-friendly manner**. A modern smart control and regulation system **ensures the supply of heat to turnouts as needed** as a result of which the unit is not constantly in the on mode.



The weather station monitors precipitation, humidity and temperature and based on their mixture the control system **selects the operating mode**. This station consists of a closed vandal-proof detection head installed in the track zone.



HEAT MODE CONTROL SYSTEM OF TRACTION SUBSTATION TRANSFORMERS



Heat is actively removed using modern heat pumps **that make it possible to reuse the heat that is emitted for heat coolant** in the central heating and hot water supply system of traction substation buildings and structures.

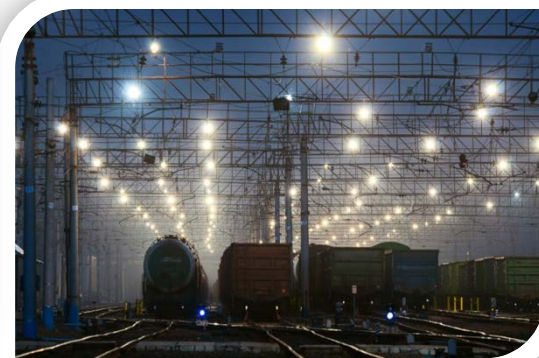


ENERGY EFFICIENT LIGHTING SYSTEM FOR STATION DEPOTS WITH AUTOMATED CONTROL



Investment over 2007-2015
totalled **4.1 bln roubles**

- **35,970** crossing light signals
- **9,247** three-digit mounted light signal heads with LED modules
- **5,060** route and position indicators
- **113** railway stations (railway lighting)
- **43** locomotive, multiple unit and railcar repair depots
- **47** passenger platforms
- **12** railway bridges
- **22** railway stations
- Severomuysky Tunnel



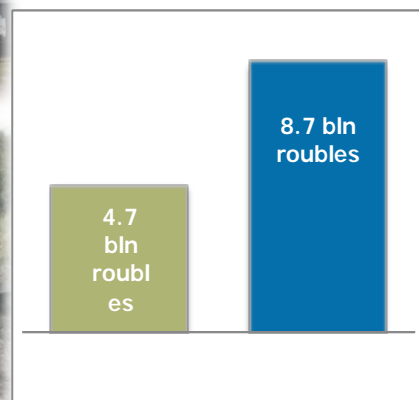
IMPLEMENTATION OF THE LUBRICATION TECHNOLOGY DEVELOPMENT PROGRAMME



74 units
TBEMA rail lubricator cars



4.7
bln roubles
investment
over the period of
1998–2015



over
8,500
units

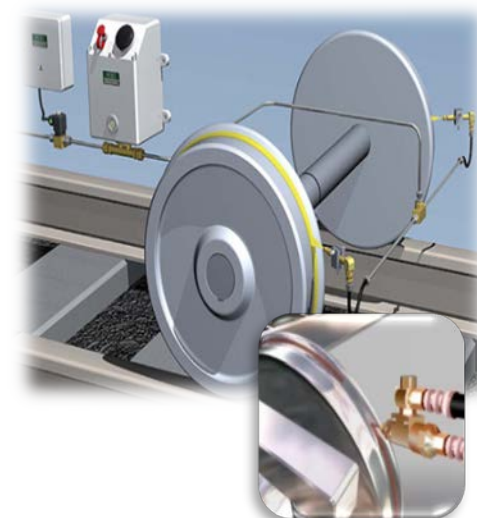


Stationary track-based
rail lubricators on the
entire railway network

3 units
mobile hybrid road-rail
lubricators



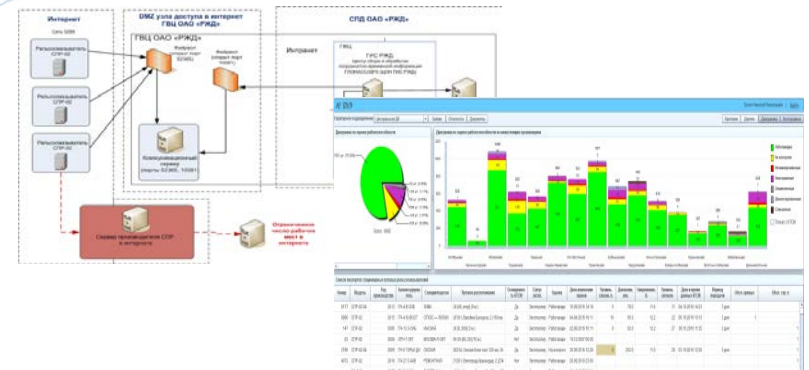
8.7
bln roubles
total savings from
lubrication technology



over
8,800
units
onboard locomotive
flange lubricators



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The system makes it possible to switch rail lubricator maintenance from the scheduled regime to rail lubricator maintenance based on rail conditions



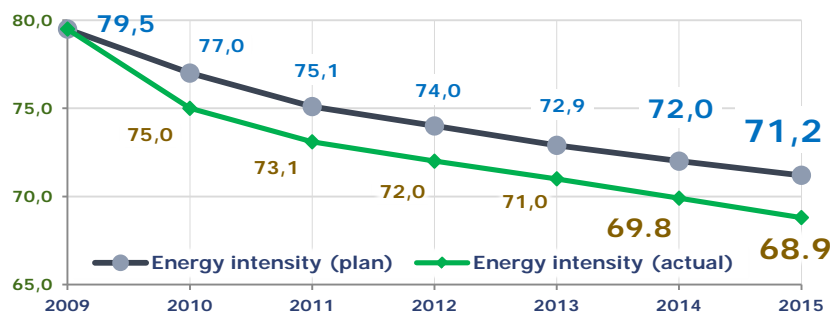
RESULTS OF ENERGY SAVING ACTIVITIES BY RUSSIAN RAILWAYS IN 2015



ACHIEVING TARGET ENERGY SAVING INDICATORS AND IMPROVING ENERGY EFFICIENCY AT RUSSIAN RAILWAYS FOR 2015

Target indicator	Measurement unit	Objective	Actual
Decrease in the energy intensity of production activities (ΔE)	kg of standard fuel/10,000 virtual tonne-km net	- 0.8	- 0.9
Increase in energy efficiency of production activities ($\Delta \eta$)	virtual tonne-km net / kg of standard fuel	1.7	1.9

ENERGY INTENSITY OF PRODUCTION ACTIVITIES, KG OF STANDARD FUEL/10,000 VIRTUAL TONNE-KM NET



FUEL AND ENERGY RESOURCES SAVED IN 2015



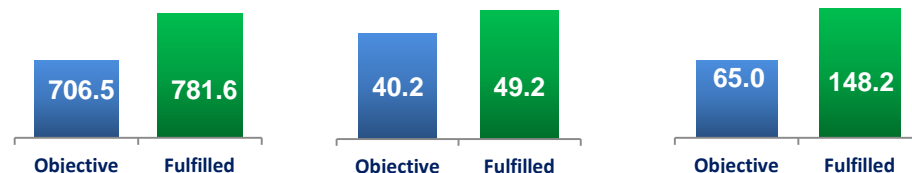
Electricity, mln kWh



Diesel fuel, '000 tonnes



Heat, '000 Gcal



Implementation at **2,192** structural units of **41** branches of Russian Railways

9,895 measures as part of the Programme for energy savings and improved energy efficiency enabled the Company in 2015 to save

9,360.5 TJ of energy resources and reduce CO2 equivalent emissions by **904,000** tonnes



