

RESULTS IN THE FIELD OF ENVIRONMENTAL PROTECTION

Water use

RusHydro Group is a large water user in the water management system of Russia, most of the Company's activities are carried out at water bodies. The Group uses water bodies in strict compliance with legal requirements. [103-2], [103-3] The Company receives permits in a timely manner, for the implementation of water use and protection of water bodies in the relevant executive authorities. The diversion of water from the RusHydro Group's water bodies does not have a significant impact on water sources. [303-2]

In 2017, the amount of water withdrawn by RusHydro Group decreased by 0.99% and amounted to 753,352 thousand m³.



Since 2013, the Company has published data on changes in the levels of the reservoirs of the Hydro Power Plant of RusHydro Group on a special Internet portal: <http://www.rushydro.ru>

Total amount of water withdrawn by source, thousand m³ [303-1]

Sources of water supply	PJSC RusHydro and controlled companies without RAO ES East Subgroup			RAO ES East Subgroup			RusHydro Group		
	2015	2016	2017	2015	2016	2017	2015	2016	2017
Total amount of water withdrawn from sources, including:	64,252	58,554.6	57,651.9	699,394	697,706.3	685,637.7	763,646	756,260.9	743,289.6
surface water bodies, including swamps, rivers, lakes	62,768	57,338.2	56,459.6	566,880	589,568.1	591,154.6	629,648	646,906.3	647,614.2
underground water bodies, municipal and other water supply systems	1,484	1,216.4	1,192.3	132,514	108,138.2	94,483.0	133,998	109,354.6	95,675.3

Impacts on water bodies

Total volume of wastewater discharges with indication of the receiving facility, thousand m³ [306-1]

Receiving facility	PJSC RusHydro and controlled companies without RAO ES East Subgroup			RAO ES East Subgroup			RusHydro Group		
	2015	2016	2017	2015	2016	2017	2015	2016	2017
waterbody	74,766	63,949.8	68,321.4	512,453	514,188.4	512,510.7	587,219	578,138.2	580,832.1
terrain	116	14.1	14.5	4,238	4,523.2	4,447.6	4,354	4,537.3	4,462.1
underground	0	0	0	22	17.9	0	22	17.9	0
water accumulator	8	7.4	2.6	0	0	19.6	8	7.4	22.2
Total discharges	74,890	63,971.3	68,338.5	516,713	518,729.5	516,977.9	591,603	582,700.8	585,316.4

Results of Activities

The total volume of wastewater discharges by the purification method, thousand m³ [306-1]

Purification methods	PJSC RusHydro and Subsidiary Companies without RAO ES						
	East Subgroup			RAO ES East Subgroup		RusHydro Group	
	2016	2017	2016	2017	2016	2017	
Without purification	3,474.7	3,429.4	213,330.7	216,611.2	216,805.4	220,040.6	
Insufficiently purified	1,076.0	923.5	21,385.3	21,825.3	22,461.3	22,748.7	
Satisfying established norms	57,913.6	59,873.4	279,245.9	273,792.9	337,159.5	333,666.3	
Purified in compliance with established norm on facilities (biological, chemical, mechanical cleaning)	1,351.1	4,111.3	226.6	281.3	1,577.7	4,392.6	

Water protection works of RusHydro Group

Name	Activities
Branches of PJSC RusHydro	<ul style="list-style-type: none"> ■ Bank protection hydraulic works ■ Repair of anti-erosion hydraulic structures ■ Repairs of regulatory structures ■ Regulation of clearing and dredging of water bodies ■ Clearing sections of river channels and canals; ■ Bank-reinforcement hydro-engineering works (repair) ■ Other water protection works
The controlled companies of PJSC RusHydro, except for RAO ES East Subgroup	<ul style="list-style-type: none"> ■ Clearing the water area of the reservoir ■ Other water protection works
RAO ES East Subgroup	<ul style="list-style-type: none"> ■ Regulation of clearing dredging of water bodies ■ Bank protection hydraulic works ■ Construction and repair of water checks (reservoirs, ponds, spur-guiding dams, etc.) ■ Other water protection works



Emissions

RusHydro Group controls emissions of pollutants into the air at all production facilities.

In 2017, the emissions exceeded the established maximum permissible values for Raichihinskaya GRES by 1,907.55 tonnes. The increase in emission allowances is due to increased electricity production.

Emissions into the atmosphere of SO_x, CO, NO_x solids, tonnes [305-7]

Pollutants	PJSC RusHydro and controlled companies without RAO ES East Subgroup								
	Subgroup			RAO ES East Subgroup			RusHydro Group		
	2015	2016	2017	2015	2016	2017	2015	2016	2017
Solids	162	161.3	162.2	97,243	93,689.8	92,182.3	97,405	93,851	92,344.54
Gaseous and liquid	975.5	976.7	980.6	180,561.7	176,692.3	177,784.4	181,537.2	177,669.0	178,765.0
including gaseous and liquid:									
Sulfur oxides (SO _x)	3.4	2.6	3.4	73,547.6	73,334.1	73,780.5	73,551.0	73,336.7	73,783.9
Carbon monoxide (CO)	18.0	21.4	34.3	42,343.2	42,207.8	41,498.5	42,361.2	42,229.2	41,532.9
Oxides of nitrogen (NO _x)	13.4	16.9	26.3	64,670.9	61,150.4	59,973.4	64,684.3	61,167.3	59,999.7
Total pollutants, released into the atmosphere	1,137.5	1,138.0	1,142.8	277,804.7	270,382.1	269,966.7	278,942.2	271,520.0	271,109.5

Operations of HPPs do not lead to large-scale greenhouse gases emissions.

Calculation of greenhouse gas emissions is carried out for RAO ES East Subgroup facilities in accordance with the Decree of the Ministry of Natural Resources and Environment of the Russian Federation of June 30, 2015 No. 300 and using RD 153-34.0-02.318-2001 "Methodological guidelines for calculating the emissions of carbon dioxide into the atmosphere from boilers of thermal power plants and boiler houses" and inventory data of the Carbon

Fund. Emissions of greenhouse gases are determined on the basis of data for a specific facility, based on the fuel balance of the facility. [103-2],[103-3]

In 2017, greenhouse gas emissions increased by 1.05%. That increase is due to the growth in electricity generation by the facilities of the RAO ES East Subgroup and increased consumption of tonnes of equivalent fuel of the East for electricity generation.

Greenhouse gases direct emissions of RAO ES East Subgroup (scope 1) [305-1]

Indicator	2015	2016 ¹	2017	2017/2016, %
Emissions CO ₂ , t	36,182,305.5	34,096,453.1	34,457,073.3	+1.06
Emissions N ₂ O in CO ₂ , eq. t	125,283.1	119,085.5	117,141.0	-1.63
Emissions CH ₄ in CO ₂ eq. t	14,433.5	14,369.5	13,895.4	-3.30
Total emissions	36,322,022.2	34,229,908.1	34,588,190.4	+1.05
including:				
from burning natural gas	10,453,851.7	9,935,983.0	10,101,464.3	+1.67
from burning oil	670,338.1	693,485.5	712,034.1	+2.67
from burning solid fuel	25,197,832.3	23,600,439.5	23,774,612.1	+0.74

Intensity of greenhouse gas emissions of RAO ES East Subgroup², tonnes CO₂-eq. [305-4]

Indicator ²	2016 ³	2017	2017/2016, %
Specific CO ₂ emissions, associated with electricity generation, in tonnes CO ₂ -eq.	785.10	785.80	+0.10
Specific CO ₂ emissions associated with generation of heat, in tonnes of CO ₂ -eq.	375.60	373.90	-0.45

In 2017 in the controlled companies in the Far East, measures were taken to reduce emissions of harmful substances into the atmosphere: [305-5]

- repair of ash removers, scrubbers, cyclones, electrostatic precipitators in order to maintain the degree of flue gas cleaning at the normative level. Such measures were carried out at the Arkagalinskaya GRES, Magadanskaya CHPP, Primorskaya GRES, Birobidzhanskaya CHPP, Urgalskaya boiler plant, Raichikhinskaya GRES, Blagove-

shchenskaya CHPP, Amurskaya CHPP, Vladivostokskaya CHPP-2, Partizanskaya GRES, Kamchatka, Nikolskoye, Central and School coal boiler houses, and also in Tigil coal-fired boiler No. 4 and in Manily, Central Coal Boiler House;

- transition to gas for Khabarovskaya CHPP-1.

¹ The change in CO₂ emissions for 2016, in direct and specific terms, is due to the clarification of data on the costs of tonnes of equivalent fuel, for electricity generation and heat release.

² This is the development excluding the Cascade of Vilyuisky HPPs and solar power plants, whose activities do not produce greenhouse gas emissions.

³ Specific emissions of CO₂ equivalent are determined by the ratio of emissions of tonnes of CO₂-eq. to the generation of electricity in million kWh and heat production in thousand Gcal.

Waste

At RusHydro Group's energy facilities, the main share is generated by waste products of the 4th and 5th hazard classes, which are formed as a result of the reconstruction of facilities, as well as during the repair and maintenance of equipment and structures. RusHydro Group companies do not transport their own wastes. The generated wastes are transferred under contracts to specialised organisations that have licenses for activities related to the transportation, collection and further management of wastes. [306-4]

The increase in the volume of waste generation in 2017 compared to 2016 for RusHydro Group was because of the increase in the volume of generation of waste of hazard class 5:

- in JSC DRSK, JSC Kamchatskenergo, PJSC Sakhalinenergo ash and slag wastes volumes increased due to the increase in the volume of coal combustion in the main production;
- in JSC LUR - the formation of wastes of overburden increased in connection with the increase in work on the development of overburden.

The total weight of waste generated in 2017, by hazard class, tonnes [306-2]

Waste	2015	2016	2017	2017/2016, %
PJSC RusHydro and Subsidiary Companies (without RAO ES East Subgroup)				
Wastes of the 1 and 2 hazard classes	14.2	20.7	31.2	51.0
Wastes of the 3, 4 and 5 hazard classes	30,964.61	29,179.35	29,191.0	0.04
Total	30,978.83	29 200.01	29,222.2	0.1
RAO ES East Subgroup				
Wastes of the 1 and 2 hazard classes	39.9	32.8	39.0	18.8
Wastes of the 3, 4 and 5 hazard classes	27,694,388.90	24,743,428.9	26,570,307.4	7.4
Total	27,694,428.8	24,743,461.7	26,570,346.4	7.4
RusHydro Group				
Wastes of the 1 and 2 hazard classes	54.12	53.5	70.2	31.3
Wastes of the 3, 4 and 5 hazard classes	27,725,353.51	24,772,608.2	26,599,498.4	7.4
Total	27,725,407.63	24,772,661.7	26,599,568.6	7.4

Biodiversity conservation

Impacts on biodiversity

Generating production facilities of PJSC RusHydro are not located within the boundaries of specially protected natural areas. The grid infrastructure facilities included in the RAO ES East Subgroup are located on the territories of specially protected natural areas, where rare species of plants and animals inhabit. [304-1], [103-2], [103-3]

The RAO ES East Subgroup seeks not to have a significant impact on biodiversity and protected natural areas. As a result of the activities of the Subgroup, there is no reduction in the number of species, the change of habitats, the spread of invasive species, pests and pathogens. [304-2]

Protected species the habitats of which are affected by the activities of RusHydro Group ^[304-4]

The habitat of the mandarin duck (*Aix galericulata*) in the Amur Region fell into the flood zone of the reservoir of the Nizhne-Bureyskaya HPP. The bird is listed in the Red Book of the Russian Federation as a rare species, as well as in the IUCN-96 Red List, Appendix 2 of the Bonn Convention, annexes of bilateral agreements concluded by Russia with Japan and the Republic of Korea and the DPRK on the protection of migratory birds.

Also in the flood zone of the reservoir, the main habitat of the fern species, *Aleuritopteris kuna* (*Aleuritopteris kuhni*), was found. The plant is listed in the Red Book of the Russian Federation as a threatened species.

The process of filling the reservoir of the Nizhne-Bureyskaya HPP affected also the habitats of ungulates living in the flood zone of the reservoir.

Construction of the Nizhne-Bureyskaya HPP, as well as the activities of JSC DRSK of RAO ES East Subgroup, has an impact on endangered species, Far Eastern storks (*Ciconia boyciana*) in particular. This species is listed in the Red Book of the Russian Federation and in the Red List of IUCN-96, Appendix 1 of CITES, annexes of bilateral agreements concluded between Russia and Japan, the Republic of Korea and the DPRK on the protection of migratory birds.

RusHydro Group implemented the "Bureysky Compromise" project. Within the framework of this project activities for the resettlement of animals and birds from the flooded zone and transfer of rare plants were carried out.

Belonging, volume and value from the point of view of biodiversity of water bodies impacted by activities of RAO ES East Subgroup ^[306-5]

Subsidiaries of the RAO ES East Subgroup	Water body ¹	The volume of the water body or the average source of the river, mn m ³	Value in terms of biodiversity
JSC DRSK	Kivdinskoe Reservoir	9.6	first category
	River Controvod	-	highest category
	A creek without a name, flowing into the river Knevichinka	-	highest category
	Promezhutichnaya Bay	-	highest category
	Obyasneniya River	-	first category
	Lozovyy Kluch Creek	-	first category
	Partizanskaya River	-	first category
	Rudka Creek	-	second category
	Reservoir on the Olongoro river	43.2	first category
	Semenovskiy Creek	-	second category
	The Bezymyanniy Creek	-	second category
	Amnunakt River	-	first category
	Amur Channel	-	highest category
	Amur River	-	highest category
	Lake Horpy	-	highest category
	Channel Galbon (Old Amur)	-	highest category
	West Bay	-	highest category
	Nantes Creek	-	highest category
	Pravaya Berezovaya River	-	second category
	Chernaya River	-	second category
	Polezhaevka Creek	-	second category
Gnilaya Pad Creek	-	second category	
Malaya Sita River	-	first category	

¹ All facilities are not protected natural areas.

Results of Activities

Subsidiaries of the RAO ES East Subgroup	Water body ¹	The volume of the water body or the average source of the river, mn m ³	Value in terms of biodiversity
PJSC Kamchatskenergo	Avachinskaya Bay	3,800	highest category
	The river of Halaktyrka	-	highest category
	Lake Halaktyrskoye	11	highest category
	Lake Sypuchka	-	highest category
JSC SENK	Bystraya River	43.2	first category
PJSC Magadanenergo	Magadanka River	127.5	highest category
	Kamenushka River	37.9	first category
	Myoungja River	37.9	highest category
PJSC Sakhalinenergo	Terpeniya Bay of the Sea of Okhotsk	211,250	highest category
PJSC Yakutskenergo	Lena River	515,610	highest category
	Vilyuy River	21,290	highest category
JSC Chukotenergo	The Kazachka River	22	second category
	Lake Hunting	0.25	second category
	Chaun Bay	-	first category
JSC Teploenergoservis	Vilyuy river	72,400	highest category
	Yana River	29,297	highest category
	Aldan River	154,683	highest category
	Indigirka River	14,002	highest category
	Allah-Yun River	5,550	highest category
JSC LUR	Nera River	3,658	highest category
	Controvod River	-	highest category



Activities on biodiversity conservation

RusHydro Group is implementing biodiversity conservation activities in five areas.

Activities of the RusHydro Group for Biodiversity Conservation

-  Support of protected natural areas (Cooperation and charity)
-  Preservation of the ungulate animal population (The project "Bureysky compromise")
-  Plants preservation (The project "Bureysky compromise")
-  Preservation of the bird species
-  Restoration of the fish resources (Planting of fish actions)

PJSC RusHydro develops international cooperation in the field of environmental protection, in particular, in matters of biological diversity's conservation. Within the framework of the UNDP project in 2017, the practical part of the implementation of the environmental project "Bureysky Compromise" was completed. It was implemented by the State-Financed Institution " Directorate for the Protection and Use of Wildlife and Specially Protected Natural Areas", JSC Nizhne-Bureyskaya HPP, scientific and environmental organisations of the region, and the media.

In 2015, the Bureysky Nature Park was established in the area of the reservoir of the Nizhne-Bureyskaya HPP. Since 2014, JSC Nizhne-Bureyskaya HPP has been implementing a programme of socio-ecological monitoring on the territory of the natural park and on adjacent territories. With the support of the UNDP Project in the programme of socio-ecological monitoring for 2015-2017, an assessment of the impact of economic activities on biodiversity was included. In 2017, the monitoring coverage area was 567 thousand hectares.

¹ All facilities are not protected natural areas.

In 2017, PJSC RusHydro supported the programme to restore the Persian leopard in the Caucasus. Within the framework of the Agreement on Cooperation between the North Ossetian Branch of PJSC RusHydro and the Severtsov Institute of Ecology and Evolution of RAS, a unique project has been launched to prepare the zone for the release of individuals of the Persian leopard in Ossetia. The project of the IEE RAS and PJSC RusHydro for the implementation of the programme for the restoration of the Persian leopard (Caucasian leopard) on the territory of Ossetia includes a set of scientific, environmental and eco-education activities aimed at ensuring the preparation of the territory as a zone for the production of Asian leopards that are prepared in the framework of the international programme implemented Ministry of Natural Resources of Russia.

Measure on the preservation of the ungulate animal population

To minimise the risks of injuries and death of ungulates during the filling of the reservoir of the Nizhne-Bureyskaya Hydroelectric Power Plant, more than 25 feeding complexes equipped with mineral and vitamin additives were placed in advance on the territory of the Bureysky nature park adjacent to the reservoir. The event is intended to concentrate the animals in the center of the Bureysky Nature Park and to displace them from the reservoir storage areas.

The complexes are equipped with automatic cameras for photo and video recording, which allows receiving information about their attendance by animals. In 2017, the feeding grounds were repaired and equipped with additional mangers for the winter period and the period of filling the reservoir.

Measures on the preservation of plants

In the flood zone of the reservoir of Nizhne-Bureyskaya HPP, five species of rare and endemic plant species were found. For the conservation of rare plant species in 2017, an additional transfer of endemics to new growth sites was implemented. An additional measure of plant support was the "ex-situ" event in relation to the fern *Alevritopters Kuna*, listed in the Red Book, the main habitats of which were in the flood zone of the Nizhne-Bureyskoye Reservoir. In the Botanical Garden of Blagoveshchensk, with the support of the UNDP Project, the creation of specialized climate chambers began, where, from the spores of a rare fern, plants are grown to be introduced into places suitable for growth. The first planting of plants grown in the Botanical Garden of Blagoveshchensk took place in June 2017. Planting of plant populations grown in a climatic chamber will be carried out until 2019.

Preservation of the bird species

Measures to minimize the impact on the bird fauna were directed at the two most vulnerable species: the mandarin duck and the Far Eastern stork. In 2017, measures were continued to install additional artificial nests during the filling of the reservoir and monitor the effectiveness of this solution to maintain the mandarin duck population in the process of creating a water body.

Artificial supports for nests of Far Eastern storks are established in Muravievsky reserve.

The subsidiary company of JSC RAO ES East - PJSC Yakutskenergo equips high-voltage power lines with special bird protection devices passing through a specially protected natural area in Ust-Maysky ulus in Yakutia, where 24 species of birds are under protection.

PJSC Yakutskenergo provides insulation of the power lines with a special self-supporting insulated cable in the territory of the natural park "Living diamonds of Yakutia", through which the high-voltage line 6-10 kV passes. In addition, the company equips with fences and shrouds transformer substations on transmission lines to prevent animals from entering the substation.

Restoring fish resources activities

Due to the specifics of its activities, the Company pays special attention to the conservation and restoration of fish stocks of rivers, for which, since 2003, annual voluntary stocks for stocking rivers and reservoirs of hydroelectric power stations have been held.

In early 2017, the Dagestan branch released 20,000 fry of rainbow and stream trout to the Chirkey reservoir. In June, the Cheboksary HPP released 11,000 fry of sterlet into the Cheboksary water reservoir, a fish of a particularly valuable species listed in the Red Book. In June 2017 in the Amur Region there was an action on stocking the Zeya River - Krasnoyarsk, with the participation of PJSC RusHydro, released 5,000 fry of Amur sturgeon into the river, a rare and particularly valuable representative of sturgeons. The project was implemented to maintain the abundance of species in the Upper and Middle Amur basin. In July 2017, RusHydro's funds to the Volga near Saratov produced 14,000 sterlet fry and in October, 77,000 carp and white carp. Nizhne-Bureyskaya HPP in July 2017 in Bureya released 6,000 fry of valuable species of fish species.

Restoration of disturbed lands

The preserved and restored habitats by RAO ES East Subgroup ^[304-3]

Controlled companies	PJSC DGK	PJSC Magadanenergo	PJSC Sakhalinenergo	PJSC Chukotenergo	JSC LUR	Total
01.01.2017						
Total disturbed land, ha	2,267.92	272.0	257.64	175.48	3,932.39	6,905.43
including:						
Processed disturbed land, ha	59.00	51.00	3.22	0.00	24.39	137.61
Stored topsoil, thousand m ³	287.48	0.00	0.00	0.00	578.78	866.26
For 2017						
Total disturbed land, ha	32.60	0.00	0.08	0.00	94.80	127.98
Total processed disturbed land, ha	0.00	0.00	0.08	0.00	0.00	0.08
Total re-soiled land, ha	0.00	0.00	0.08	0.00	0.00	0.08
31.12.2017						
Total disturbed land, ha	2,300.52	272.00	257.64	175.48	4,027.19	7,033.33
Total processed land, ha	75.10	51.00	3.22	0.00	24.39	153.71
Stored topsoil, thousand m ³	287.48	0.00	0.00	0.00	578.78	866.26
Location	Far Eastern Federal District					



RENEWABLE ENERGY SOURCES¹

The Group considers the use of traditional and alternative renewable energy sources (RES) as its priority and steadily increases the installed generation capacity through the construction of new hydroelectric power stations and the commissioning of new power generating capacities.

RusHydro was one of the first companies in Russia to develop projects based on renewable energy sources. One of the tasks of the Innovation Development Programme of RusHydro Group for 2016-2020, with the prospect of prolonging it through 2025, is to increase energy efficiency through the use of alternative renewable energy sources.

RusHydro Group is engaged in wind, solar, and geothermal energy. Most of these projects are located in isolated areas that are not part of the unified energy system.

Over the past five years, in Yakutia, the Group has launched 19 solar stations with a capacity of 1.6 MW and three wind power plants with a capacity of 2.2 MW. The total volume of investments in the projects amounted to 895.63 million rubles, the annual planned savings of diesel fuel - 1,580 tonnes per year.

Due to the peculiarities of each settlement, all projects under implementation are individual, including the northernmost solar power plant in the village of Batagay with a capacity of 1 MW. As part of the research and development activities, RusHydro Group developed its own models of wind-diesel and solar-diesel complexes, tested various equipment options, including power storage, for use in isolated power districts.

¹ Here, RES is all renewable energy sources, except hydropower.