ADVANCE IN RTGs DISPOSITION IN RUSSIA

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General State

Decommissioning of Radioisotope Thermoelectric Generators (RTGs) is one of important types of activity to reduce radiation hazard related to unattended operation of the ionizing radiation sources.

RTGs as sources of ionizing radiation are mainly used for autonomous power supply of navigational aids at the lighthouses. Specific feature of the RTG is that it poses a high potential radiological hazard in case integrity of its structure is damaged.

Experience in operating RTGs has demonstrated high reliability of these devices and their efficiency in ensuring safe navigation. Still, potential environmental and radiation hazard of RTGs has grown recently due to unauthorized activity on disassembly of RTGs and the acts of vandalism, as well as possibility of the terrorist actions with the use of RTGs.

Ministry of Defense of Russia, Rosmorrechflot of Ministry of Transport of Russia, and Roshydromet currently possess 705 RTGs of which 455 RTGs are in operation and 250 RTGs are placed for interim storage in the organizations of Rosatom (DalRAO, Mayak PA and Radon).

Current information on RTGs of the Russian Federation is given in Fig. 1 and Table 1.


85
24
181
12
Petropavlovsk-Kamchatskij
Magadan
45
Murmansk
79
17
8
Kaliningrad
S-Peterburg
Arkhangelsk
Moscow
Енисей
Амур
Khabarovsk
Обь
Иртыш
Ангара
Лена
Kurgan
Novosibirsk
"Mayak"
Irkutsk
Vladivostok
Krasnoyarsk
Legend:
- Navy (132 RTGs)
- Rosmorrechflot (283 RTGs)
- SMF (12 RTGs)
- 12th HD of MoD of Russia (24 RTGs)
ALL: 455 RTGs

Fig. 1

Table 1

Operating organization, region of RTGs location	Number of RTGs in the balance as of 17.09.2008, ps.	Decommissioned RTGs as of 17.09.2008, ps.		RTGs in operation as of 01.02.2008, ps.	RTGs decommissioned in 2008 as of 17. 09. 2008, ps.	RTGs, which are still in operation, as of 17.09.2008 ps.
		RTGs disposed of, ps.	RTGs placed for interim storage, ps.			
1	2	3	4	5	6	7
Total, including:	**705**	**288**	**250**	**528**[1]		**455**
Ministry of Defense of Russia, comprising:	**298**	**163**[2]	**140**	**231**		**168**
Baltic Fleet Hydrographic Service	**87**	**16**	**0**	**87**	**0**	**87**
Northern Fleet Hydrographic Service	**9**	**144**	**9**	**30**	**30**[3]	**0**
Pacific Fleet Hydrographic Service	**148**	**0**	**113**	**78**	**33**[4]	**45**
12th Head Directorate	**42**	**0**	**18**[6]	**24**	**0**	**24**
Strategic Missile Forces	**12**	**0**	**0**	**12**	**0**	**12**
Rosmorrechflot (Northern Sea Route)	**317**	**125**	**24**	**293**	**10**[5]	**283**
Roshydromet	**12**	**0**	**8**	**4**[7] **(Antarctica)**	**0**	**4 (Antarctica)**
Mayak PA	**78**		**78**			

Note:

1 – including 1 RTG lost in the course of transportation off Sakhalin Island near Nizki Cape;

2 – including 3 RTGs of MoD earlier operated in Norilsk;

3 – Of 30 RTGs removed from the sites of the Northern Fleet Hydrographic Service 27 RTGs have already been disassembled at VNIITFA (30 RHSes extracted from the RTGs have been sent to Mayak PA), 2 RTGs are damaged and cannot be disassembled, 1 RTG will be disassembled during the forthcoming visit of the Norwegian representatives to VNIITFA;

4 - 15 RTGs have been removed from the sites of the Pacific Fleet Hydrographic Service and delivered to DalRAO, 12 RTGs have been placed in the Korsakov storage facility, 6 RTGs have been dismounted and loaded on board a vessel, 5 RTGs are to be dismounted in the short term;

5 – 10 RTGs removed from the lights beacons have been delivered to VNIITFA, 6 RTGs are to be removed before 02.10.2008.

6 – 10 RTGs are in the interim storage facility in the territory of DalRAO, 8 RTGs are at the military base in Severomorsk

7 – 1 RTG sank into the coat of snow in Antarctica

RTGs of the Northern Sea Route

In 2007 Federal Target Program "Assurance of nuclear and radiation safety in 2008 and till 2015" (FTP) was approved in Russia. In the framework of this program it is planned to allocate 475.7 mln. rub., which equals to 18 mln. USD, out of the federal budget to remove RTGs from the light beacons of the Northern Sea Route and dispose of them. According to calculations made by Rosmorrechflot the amount of financing under FTP is not sufficient to provide for removal and disposal of all RTGs from the sites of the Northern Sea Route (removal and disposal of about 100 RTGs will not be covered with the allocated funds). In addition, within the framework of the mentioned FTP funds are not provided for to produce and install alternative power sources for replacement of the RTGs.

As of January 01, 2008 Hydrographic Enterprise operated 293 RTGs along Northern Sea Route.

In 2008 it is planned to remove 36 RTGs from the Northern Sea Route, including:

- 16 RTGs with the use of the funds allocated by the Norwegian government (10 RTGs have already been removed and delivered to VNIITFA, 6 RTGs according to the plan are to be removed before 02.10.2008);
- 10 RTGs under the contract between the US and VNIITFA (using the funds allocated by the Canadian government);
- 10 RTGs with the use of the funds provided for by the FTP.

The Norwegian Government also allocated funds for installation (work is under way) of 14 alternative power sources to replace the removed RTGs.

In 2009 it is planned under support of the Norwegian side to replace with alternative power sources, remove and dispose of 11 RTGs located on the coast of the Nenets Autonomous District and operated by Hydrographic Enterprise of Rosmorrechflot.

In 2010 the Arkhangelsk region and Nenets District will be free of RTGs.

In 2009 it is planned with support of the US to:

- Replace with alternative power sources, remove and subsequently dispose of 20 RTGs from the coast of the Chukotka Autonomous District operated by Hydrographic Enterprise of Rosmorrechflot;
- Replace with alternative power sources, remove and subsequently dispose of 20 RTGs from the light beacons located in the central part of the Northern Sea Route.

In 2009 it is planned to decommission 10 RTGs under FTP.

Antarctic RTGs

In accordance with the information made public by a representative of the State Institution "Arctic and Antarctic Research and Development Institute" (SI AARDI) of the Federal Service for Hydrometeorology and Environmental Monitoring at the international working meeting dedicated to RTGs which took place at RRC "Kurchatov Institute", September 9-10, 2008, 4 RTGs (exact location of one RTG is not established) as well as 6 sources of ionizing radiation located now in Antarctic are in the balance of SI AARDI.

It is planned to initiate search of the mentioned RTG during the course of the Antarctic freight forwarding expedition in 2009.

The FTP does not provide for funds allocation to remove the RTGs and sources from Antarctica.

Baltic RTGs

Now there are 87 RTGs in the Baltic Sea region.

Under a contract concluded by RRC "Kurchatov Institute" with the US the operating RTGs are being equipped with radio alarm systems to be monitored from a control center in the town of Lomonosov near St. Petersburg (Hydrographic Service of the Baltic Fleet).

Installation of the alarm systems in the Gulf of Finland is performed with consideration for the following factors:

- RTGs are located close to the densely populated districts of the Leningrad region;
- Region of deployment of the alarm systems has good (almost 100%) coverage with GSM mobile phone communication;
- Response time necessary for the rescue team in case of a contingency with RTG, for example – attempt of breaking light beacon, removal, or damaging RTG, is compared with the time of potential RTG disassembly and RHS removal from the light beacon.

The pilot alarm system installed in 2007 at 16 light beacons powered by 24 RTGs includes:

- Alarm modules with a motion sensor (RTG influence and movement control), GPS receiver (RTG location control), sensor controlling electricity supply to the alarm module (control of potential removal of the module from the RTG), radio station for communication with the repeater unit (control of movement and damaging of the alarm module);

- Repeater units with radio station to communicate with the alarm module (control of movement and removal of the alarm module from the RTG) and transmitter of information to the Monitoring center of the Baltic Fleet Hydrographic Service;
- Regional RTG monitoring center equipped with a PC with the installed specialized software allowing input of the database coming from the facilities, subprogram for visualization of the monitored region displaying light beacons equipped with alarm systems.

Alarm module is mounted directly on the RTG, and repeater unit – at the top mark of the light beacon near the light radiator.

In 2008 summer navigation period alarm systems were installed at 5 more sites powered by 5 RTGs. It is planned to install and put into operation alarm systems for 50 RTGs by the end of 2008.

In 2009 the Norwegian side plans to initiate decommissioning of the Baltic Sea RTGs.

The following should be done before the work begins:

- Risk analyses and environmental impact estimation for the Baltic Sea region in the course of RTG removal;
- Obtaining required licenses by the Baltic Fleet Hydrographic Service;
- Appointment of a Russian organization – general contractor for the work in the Baltic region as well as visits to the Baltic sites.

After that financial contribution of Norway and annual schedule will be determined.

The Finnish side plans to allocate funds for removal of the Baltic RTGs. The planned contribution of the Finnish side will be up to 0.5 million Euro/year, during three years, starting in 2009. The funds will be provided via the Norwegian side.

The French side plans to allocate 0.5 – 1 million Euro / year for the work on the Baltic RTGs during the period till 2012.

Now work is under way to conclude a contract between the French side and RRC "Kurchatov Institute" for removal of 4 most powerful RTGs installed on the Baltic Sea islands.

RTGs of the Pacific Fleet

Works on removal of 35 + 3 RTGs of the Pacific Fleet are carried out within the frameworks of contract between USA and RRC "Kurchatov Institute" in 2008 year. At present time 15 RTGs from the above mention amount are already installed for temporary storage at DalRAO, 12 RTGs are placed for storage in short-term temporary storage in Korsakov, 6 RTGS

are removed from navigation signs sites, it is possible that 5 more RTGs would be removed in the nearest future during already organized expedition.

42 more RTGS of the Pacific Fleet are planned for removal in 2009 under financial support of the American side.

In a long-term perspective American side is planning to allocate financing for transportation of all Far East RTGs for disassembling and long-term storage.

Canadian side also in the first place is interested in removal of RTGs from the Far East but it would operate through intermediary of American side. Program, which describes participation of the Canada, is developed and transferred for approval which would happen not earlier than December of this year.

Northern Fleet RTGs

30 RTGs were removed from Northern Fleet sites over 2008 year at the expenses allocated by Norwegian government. All 30 RTGs were delivered to VNIITFA for disassembling. 27 RTGs (September 17, 2008 information) are already disassembled – 30 extracted RHSs are sent to Mayak PA, 2 RTGs are not subject for disassembling because of the alarm condition, 1 RTG will be disassembled during visit of Norwegian representatives to VNIITFA.

Thus all RTGs from Northern Fleet sites are removed.

RTGs of the Strategic Missile Forces (SMF)

SMF RTGs are used for power supply of electronics at a hard to rich sites of Kamchatka region. Removal and replacement of those RTGS will require considerable funds because alternative power supply sources which could be installed as a replacement of being decommissioned RTGs from those sites should provide uninterruptible operation of electronics in difficult weather conditions with minimum level of technical maintenance.

In 2009 American side is planning to conduct financial study to determine necessary funding and possible technical problems for replacement of 12 SMF RTGs on alternative power supply sources.

RTGs of the 12th Head Directorate of Ministry of Defense

At present time 8 RTS are located at a military base in Severomorsk; 4 of them are in alarm condition. In 2009 under financing support of USA it is planned to organize removal of

those RTGs for disassembling in Moscow with further transportation of extracted RHSs to Mayak PA for their long-term storage.

10 RTGs from Yakutiya were removed, delivered and placed for temporary storage at DalRAO in 2008 year. Rest 24 RTGS are planed for removal from Bilibino region within the framework of contract with USA. Initially it was planned to remove those RTGs for temporary storage to DalRAO. At present time a modification of contract which will enable transportation of RTGs from Bilibino directly to Moscow for disassembling is considered.

RTGs of the 12th Head Directorate of Ministry of Defense do not require replacement on alternative power supply sources.

Introduction of addendums to Federal Target Program "Assurance of nuclear and radiation safety in 2008 and till 2015"

By Government order Rosatom together with Ministry of Defense are preparing proposals for addendums to Federal Target Program "Assurance of nuclear and radiation safety in 2008 and till 2015"

Allocation of budget funds for decommissioning of RTGs of Ministry of Defense of Russia within the frameworks of mentioned program is planned to foresee. In accordance with preliminary estimations, 75 mln. US dollars is required for decommissioning of the Navy RTGs for Rosatom enterprises (RTGs temporary storage at Rosatom sites, transportation for disassembling, RTGs disassembling, transportation of RHSs to the place of long-term storages, long-term storage).

In being formulated proposal for adjustment of mentioned program funds necessary for those worked would be demanded.

In case those proposals will be accepted, financing could be allocated in 2010 year.

Conclusion

For the enhancement of interaction and coordination of efforts of donor-countries and Russian departments and enterprises it was proposed during CEG Workshop on Problems of Decommissioning of Radioisotope Thermoelectric Generators (which was hold in April 23-25,2008 in Moscow) to create international coordination group for RTGs problem. It is proposed to follow following conditions during creation of coordination group:

- Compact structure of the group – 1-2 representatives from a donor – country;

- Open structure of the group – in order to afford an opportunity of joining for new donor countries;
- Groups assembles at least twice a year and reports about carried out work and results annually at plenary meetings of CEG IEAE;
- Head of the group from Russian side is Rosatom authorized representative.

Such a group was created at the workshop in Moscow in RRC “Kurchatov Institute”. First meeting took place on September 9-10, 2008.

Participants of the Meeting confirmed necessity of creation of international coordination group on problems of decommissioning of RTGs in Russia. Group consisted from representatives of Russian departments and organizations and also representatives of foreign countries-donors participating in solving of the problem of RTGs decommissioning.

Participants of the Meeting discussed and accepted as a base draft Terms of reference of international coordination working group on RTGs problem proposed by executive secretary O.V. Goroshko. Adjusted variant will be presented for approval during next meeting of international coordination group.