

## **Regulatory Supervision of Radiological Protection in the Russian Federation as Applied to Facility Decommissioning and Site Remediation**

M. K. Sneve  
Norwegian Radiation Protection Authority  
P O Box 55, N-1332 Osteras, Norway

N. K. Shandala  
Institute of Biophysics,  
Moscow, Russian Federation

### **ABSTRACT**

The Russian Federation is carrying out major work to manage the legacy of exploitation of nuclear power and use of radioactive materials. This paper describes work on-going to provide enhanced regulatory supervision of these activities as regards radiological protection. The scope includes worker and public protection in routine operation; emergency preparedness and response; radioactive waste management, including treatment, interim storage and transport as well as final disposal; and long term site restoration. Examples examined include waste from facilities in NW Russia, including remediation of previous shore technical bases (STBs) for submarines, spent fuel and radioactive waste management from ice-breakers, and decommissioning of Radio-Thermal-Generators (RTGs) used in navigational devices. Consideration is given to the identification of regulatory responsibilities among different regulators; development of necessary regulatory instruments; and development of regulatory procedures for safety case reviews and compliance monitoring and international cooperation between different regulators.

### **INTRODUCTION**

As in many countries, the Russian Federation is engaged in carrying out major work to manage the legacy of exploitation of nuclear power and use of radioactive materials. At the same time, the Norwegian Government, through a Plan of Action implemented by the Norwegian Ministry of Foreign Affairs (MFA), is promoting improvements in radiation protection and nuclear safety in North-West Russia. A substantial component of the Plan of Action strategy is to support Russian Federation regulatory authorities in their supervisory role. Key among those regulatory authorities is the Federal Medical-Biological Agency (FMBA), and the technical support organisation, the Russian State Research Center – Institute of Biophysics (IBPh); and Russian Nuclear, Industrial and Ecological Regulatory Authority (Rostechnadzor), which is supported by SEC-NRS. Implementation from the Norwegian side is via the Norwegian Radiation Protection Authority (NRPA), with the involvement of other western technical organisations.

### **GENERAL APPROACH**

The general approach to the projects involves the following steps:-

- Identification of roles and responsibilities;
- Review of current Russian Federation regulatory requirements, taking account of the technical problems specific to the situation under consideration, as well as developments in international recommendations and other national practice and experience;
- Preparation of a Preliminary Threat Assessment to identify major radiation protection issues and hence and regulatory priorities;
- Identification of gaps or weaknesses in regulatory requirements;
- Development of licence requirements and guidance on licensing process, including:-
  - development of situation specific norms and standards,

- procedures for making licence applications,
- content of safety assessment reports,
- nature of requirements for emergency preparedness and response

### **Identification of roles and responsibilities according above mentioned general approach.**

In Russia, the radiation protection of personnel and the general population as well as the protection of future generations against the harmful effects of ionizing radiation is managed by FMBA of Russia, whereas nuclear and technical safety of atomic power facilities is managed by Rostekhnadzor. Because of the large number of nuclear power and atomic industry enterprises and the necessity of high independence and objectiveness of these regulatory issues, such integration is considered to be inconvenient at the present time. In this light, RTG issues fall in the scope of regulatory responsibility of Rostekhnadzor. Conversely, radiation protection of the public and workers of the former STB<sup>1</sup> as well as the environmental protection near STBs, remediation and emergency response are in the scope regulatory responsibility of FMBA.

### **Organizational structure of the state surveillance of nuclear safety and radiation protection.**

The organizational structure relating to its purposes and goals of these systems in Russia is similar to those in other industrially developed countries, in particular, in UK. However, Russian inspection activities are more formalized by regulative documents, whereas the UK regulative requirements are of general character and the development of specific documents and measures is the responsibility of the operator. In this case, inspection is of the highest priority in operator – inspector interactions. The purpose of such inspection is to clarify, if the radiation protection of personnel, population and environment is sufficient and well optimized. At the same time, the order of inspector function execution in Russia and the UK is practically identical. The inspector has wide access to the industrial site and related technological documentation as well as the capability for independent measurements, and for the application of administrative sanctions, including termination of practice and initiation of court hearings.

The following sections describe work to date on the application of this generic approach to site remediation activities at STBs in NW Russia operated by SevRaO and to decommissioning of radio-thermal generators (RTG)

## **APPLICATION TO SITE REMEDIATION**

### **SevRaO's work**

During 2005-2006 the NRPA, FMBA and the IBPh have conducted three projects. These projects were designed to support the development of regulatory documents for radiation protection when handling SNF and RW under the projects for the remediation of STSs. Special regulations are necessary because of the extraordinary conditions at the STSs. The overall objective of these projects has been to ensure that remediation and improvement activities in NW Russia are carried out consistently within the Russian Federation regulatory framework, taking into account international guidance and recommendations as well as good regulatory practice from other countries, in so far as they are relevant to the Russian Federation. Furthermore, such regulatory supervision should be carried out efficiently, to assist the timely and effective implementation of industrial projects.

It was already known that an extreme and complicated radiation situation has arisen at the STSs which are situated in Andreeva Bay (50 km from Russian-Norwegian border) and in Gremikha village, also on the Kola Peninsula. Both bases are located on the Barents Sea coast. Current conditions of SNF and RW storage at STS area have caused substantial degradation of some part of SNF during its storage. Moreover,

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<sup>1</sup> Former STBs are currently designated as Sites of Temporary Storage (STS) of SNF and RW.

radionuclides have already leaked into the soil and deeper ground adjacent to the storage areas to the depth of few meters [1 – 5].

The independent results obtained in the recent projects have allowed estimation of the radiation situation on STS site and off-site [6 - 11]. Gamma dose rates were recorded from background level up to 142  $\mu\text{Sv/h}$  in Andreeva Bay STS and up to 8500  $\mu\text{Sv/h}$  in Gremikha STS. Maximum levels were observed near radiation-hazardous facilities, where the gamma dose rate is due to radiation from contaminated soil and from radioactive substances inside the storage facilities.

At the territory of STS industrial sites man-made contamination of the soil surface with Cs-137 and Sr-90 is observed, exceeding local background values by a factor up to 100 times or more. Levels of soil contamination with Cs-137 are 4-20 times greater than those of Sr-90. At the territory of industrial sites of Gremikha STS are also contaminated with Co-60 ( $9.7 \cdot 10^2 - 2.3 \cdot 10^5$  Bq/kg), Eu-152 ( $3.3 \cdot 10^2 - 7.5 \cdot 10^5$  Bq/kg) and Eu-154 ( $2.2 \cdot 10^2 - 7.5 \cdot 10^5$  Bq/kg). Within the Andreeva Bay STS contamination of the soil was detected at depths as deep as 15,6 m.

The concentration of Cs-137 in bottom sediments of the coastal strip at STS in Andreeva Bay is 100 Bq/kg near the mouth of the former brook and 36 Bq/kg behind the SSZ barrier. The concentration of Sr-90 in the same bottom sediment samples is 36.6 and 2 Bq/kg respectively. Locally, the concentrations of Cs-137 and Sr-90 in seaweed moderately exceed background for Cs-137 and are more than 50 times background for Sr-90. However, off-site, the seaweed contamination is small, similar to background values. However, when assessing dynamics of radioactive seaweeds contamination, some tendency is observed of Sr-90 accumulation in sea vegetation due to releases from the STS.

The concentrations of Cs-137 and Sr-90 in sea water near Andreeva Bay STS are 0.04 and 0.03 Bq/l, respectively. The concentrations of Cs-137 and Sr-90 in sea water near STS in Gremikha are higher – 3.9 and 0.41 Bq/l for Cs-137 and Sr-90, respectively. These values are more than 10 times (Andreeva Bay) and more than 100 times (Gremikha) than average background values of Cs-137 and Sr-90 concentrations in Barents Sea water (0.006 and 0.004 Bq/l, respectively).

Cs-137 and Sr-90 concentrations in drinking water are 0.02 and 0,001 Bq/l, respectively for STS in Andreeva Bay. The concentrations of Cs-137 and Sr-90 in drinking water from Ostrovnoy and Gremikha are 0.009 Bq/l for both radionuclides. The principle components of people's diet are imported; concentrations of Cs-137 and Sr-90 in them are at average concentrations in Russia, 0.7 – 0.04 and 0.13 – 0.08 Bq/kg, respectively, for different components of diet. Local foodstuffs are mainly from wild-growing components: berries, mushrooms and sea fish, where concentrations of Cs-137 and Sr-90 are: mushrooms: 5.8 - 79.1 and 0.24 – 17.2 Bq/kg; berries: 1.84 – 26.9 and 0.28 – 9.4 Bq/kg; and sea fish: 0.4 – 1.6 and 0.57 – 0.99 Bq/kg, respectively.

The obtained results suggest that there are currently no major radiological impacts from the STS sites on the adjacent territory and population, with the possible exception of the sea media in the coastal areas (bottom sediments, seaweeds). The concentrations of Cs-137 and Sr-90 in the environmental media are at background levels typical for the present region. However, the on-site measurements suggest that remediation work will have to be planned so as to take account of the on-site contamination in two ways. Firstly, the activity levels will present external and internal irradiation hazards to remediation workers. Secondly, the SNF removal work must be planned so as not to disturb and hence release significant contamination from the sites.

### **Prospects for SevRAO enterprise**

According to the legislative and normative documents of the Russian Federation, regulating management of the radioactive contaminated areas (The Land Codex, The Governmental Directives etc.) after the identification of the contamination level, one of three decisions can be made:

- area conservation (guarded area creation and radiation monitoring elaboration);

- area renovation involves normalization of radiological and radiation-ecological situation at STS facilities and sites under the condition of further STS operation according to their direct usage. Restricted usage is assumed for the site (radiation examination and remediation with the subsequent radiation monitoring);
- unlimited (restricted) usage of the site (as a rule, after remediation and further radiation monitoring, the decision is made on the control exemption and following land usage for economical activity and the public settling).

Currently, the renovation implementation is in progress for “SevRAO” STSs. Within both sites (Andreeva Bay and Gremikha), the work on the improvement and recovery of the infrastructure is in progress (or in planning), so as to allow the opportunity for safe SNF recovery. In other words, in the present phase, the site remediation should be elaborated to levels giving the opportunity for safe operations of workers. In the future, the STS areas in Andreeva Bay and Gremikha can reach the limited usage level, when low and intermediate RW will be removed; in the interim these sites can be put into the status of storage facilities, pending a decision on final disposal of these wastes, e.g. in a local repository or removal to another location.

Stage-by stage implementation is the most appropriate approach to STS remediation. In particular, at Andreeva Bay STS at the first stage the building will be carried out of the SNF and RAW management departments with their further operation during about 15 years. The following actions are planned to implement as a result of the departments operation:

- all SNF will be removed from BDS; it will be prepared for withdrawal and it will be removed off-site;
- all radioactive wastes (both solid and liquid RW) will be removed from the open sites
- all RW, currently available (accumulated), together with the secondary ones being produced in the course of the departments operation, will be treated (processed), conditioned and prepared for their temporary storage during about 50 years.

As a result of 15-years work the following issues are planned to be managed:

- all SNF, stored in BDS and in the containers, will be repackaging and removed from the STS area;
- all rods will be extracted, dismantled, put into the shielded containers and located into the conditioned RW repository;
- all SRW will be treated, loaded into the shielded containers and located in the SRW repository or sent to other facility;
- all LRW will be conditioned, hardened, loaded into the shielded containers and sent to the place of their temporary storage;
- all secondary radioactive waste, produced in the course of the SNF, SRW and LRW management departments operation, together with those produced during the SRW repository dismantle, will be treated, loaded into the shielded containers and sent to the place of their temporary storage.

Other facilities (the former SNF repository of basin type, the building 5 decommissioned, as well as the rest STS area) will be conserved for some time.

Currently, the plans for STS Gremikha are not as detailed as STS Andreeva Bay. Thus, the issues are more immediate, concerned with radiation safety of workers, who will perform renovation and conservation of the facilities and sites. Accordingly, the environment and the public are to be protected, especially within STS Gremikha, as domiciled near the present facility. Meanwhile, there are two settlements in surveillance area of Gremikha STS– Ostrovnoy city and Gremikha village. The distance from these settlements to STS is 1.5 – 2 km by land. There were approximately 4000 inhabitants in Ostrovnoy and Gremikha in 2006.

### Development of licence requirements and guidance on licensing process

The results and conclusions obtained in the course of the threat assessment served as initial data for implementation of further regulatory work, including for development and justification of the special regulatory document on work implementation at SevRAO facilities [12] and of the normative document on the principal criteria of the STS ecological remediation, which are needed for the choice of applied technologies and procedures and related justification [13].

The above-stated documents consist of the requirements, which should serve as a guidance at the stages of implementation of SNF and RW management operations, including remedial activity of STS territory and buildings, modernization of existing industrial buildings and constructions, as well as those for the technological process arrangement as adopted by the combine for SNF management and the combine for conditioned RW reprocessing, conditioning and intermediate storage operation. Each worker from “SevRAO” STS, as well as employers from other departments and institutions involved in working with radiation sources within the particular STS, has to fulfill the Regulation’s requirements. To clarify the Regulation’s requirements, special methodic and guide documents could be developed on some independent issues of radiation safety, which should not contradict the present Russian Regulations. A set of actions relating to the radiation safety, envisaged in the design, has to ensure the Russian requirements on implementation, together with the protection of workers and the public against the internal and external radiation exposure, as well as to prevent not only contamination of air and surfaces of the workrooms, skin and clothes of workers, but also radioactive substances release and discharges exceeding the accepted limits both in the course of routine “SevRAO” facilities operation and during the mitigation of the radiation accident consequences.

In the course of mentioned documents preparation some gaps were found in the Russian legislation relating to some abnormality issues both of the situation at SevRAO and the remediation of the contaminated sites. It was shown that justification of the quantitative criteria intended for the SNF and RW STS remediation is possible in terms of actual Russian regulatory legislative basis taking into account its improvement on the base of the international recommendations and modern practice.

Example, as an example, we can use the regulatory criteria and remediation norms.

Table I. In the case of liquidation of the building 5 decommissioned (Andreeva STS) during the site remediation the following conditions are to be met according to the document developed in our projects [13]

Option for site usage	The norms used [13]	Essence of the norms [13]
The site remains in the Controlled access area or in the Area of radiation safety regime	Norms for renovation of sites and facilities	Dose constraints for exposure to workers 10 mSv/y*; <i>Radionuclide concentrations in seafood should not exceed levels given in SanPiN 2.3.2.1078-01 **</i>
The site is conserved	Norms for the facility conservation (storage under observation)	Dose constraints for exposure to workers 2 mSv/y*; <i>Radionuclide concentrations in seafood should not exceed levels given in SanPiN 2.3.2.1078-01 **;</i> <i>Radionuclide concentration in underground waters should not exceed intervention levels for water set up in NRB-99: Co-60 – 41, Sr-90 – 5.0, Cs-137 – 11 Bq/kg.</i>
The site is released out of the sanitary shelter zone	Norms for the facility liquidation	Effective dose constraint for man-made exposure equal to 1 mSv/y for the critical group of the public *; <i>Concentration of man-made radionuclides in road covers should not exceed 1/10 SAMS (specific activity of minimum significance), adopted in NRB-99: Co-60 – <math>1 \cdot 10^3</math>, Sr-90 – <math>1 \cdot 10^4</math>, Cs-137 – <math>1 \cdot 10^3</math> Bq/kg;</i> <i>Radionuclide concentration in underground waters should not exceed intervention levels for water set up in</i>

		<i>NRB-99: Co-60 –41, Sr-90 – 5.0, Cs-137 – 11 Bq/kg.</i>
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\*Dose reduction below established values should be performed according to the principles of justification and optimization

\*\* Acceptable specific activity levels in fish and seafood, Bq/kg (SanPiN 2.3.2.1078-01). The activities carried out within the project are further described in [14, 15].

Group of food	Acceptable specific activity, Bq/kg,	
	Cs-137	Sr-90
Fish	130	100
Molluscs, Crustacea	200	100
Seaweed	200	100

### APPLICATION TO DECOMMISSIONING OF RADIO-THERMAL GENERATORS

Several hundred radioisotope thermoelectric generators (RTG) were deployed and used along the Russian Federation's Arctic coast to power remote lighthouses. Similar RTG were also used as power sources in other remote locations in the Russian Federation and elsewhere in the Former Soviet Union, and incidents involving such sources, particularly in Georgia, The RTG typically contain one or more Radionuclide Heat Sources (RHSs) each with an activity of thousands of TBq of Sr-90. This means that they are Category 1 sources as defined in the international Code of Conduct on the Safety and Security of Radioactive Sources.

Due to the remoteness of these lighthouses and other factors, maintenance and security of the RTG are difficult to achieve, and there have been several examples of unauthorised interference.

Naturally, concern has arisen about the potential misappropriation of the radioactive sources as well as the broader issues of continuing maintenance and safe use of RTG, especially in remote locations. This has become a matter of both national and international concern (see, for example, the Contact Expert Group workshop report, [16]). The Norwegian Government has taken a significant part in international efforts, in full cooperation with Russian Federation authorities, to safely decommission RTG and provide alternative power sources. It was appropriate, therefore, to review the situation and it was concluded that the decommissioning project should continue, since leaving the RTG in situ, inadequately monitored, could lead to a risk of undesired access to radioactive material. However, it was also noted that the relevant authorities and organizations need to be clear over their separate responsibilities throughout the entire process of inspecting, collecting, and dismantling RTG, as well as the storage and disposal of radioactive waste so generated, and that radiation protection guidelines should be reviewed and amended where necessary with correct procedures and checklists to ensure compliance.

Noting the above conclusions, NRPA has been providing support to regulators in the Russian Federation in parallel with the continuing industrial project. NRPA's main partner in the RTG Regulatory Support Project (RSP) is the Nuclear, Industrial and Environmental Regulatory Authority of the Russian Federation, Rostekhnadzor. After several years of cooperation with Rostekhnadzor on a variety of topics, NRPA recognises that the most efficient cooperation occurs when all relevant organizations are able to work together. For example, while Rostekhnadzor is the main regulatory body concerned with regulation of RTG decommissioning, there are interactions with other regulators, for example those concerned with transport. While it is necessary to maintain independence and clear lines of responsibility, it is very helpful to make progress with coordinated actions.

As a first step in the RTG RSP, an Initial Threat Assessment was carried out [17] to clarify the steps in RTG decommissioning and to identify priorities for regulatory action, based on the main radiological threats presented by each step. The steps identified were as follows:

- Operator's inspection of RTG in their place of operation;
- Recovery of RTG from their operational locations and loading onto a ship;
- Transport of RTG by ship to a temporary storage point (depending on its original location), short-term storage and transfer to train;
- Transport of RTG by rail to FSUE VO "Izotop" in Moscow Region;
- Loading onto trucks and transport by road to FSUE "VNIITFA" for dismantling;
- Removal of RHSs at FSUE "VNIITFA" and loading of RHS packages onto trucks;
- Transportation of packaged RHSs by road back from FSUE "VNIITFA" to FSUE VO "Izotop" and loading onto trains;
- Transportation of packaged RHSs by rail to FSUE PA "Mayak";
- Processing of RHSs at FSUE PA "Mayak".

Each of these steps should be developed for each RTG before work starts on decommissioning. There will be many common features in the plans and assessments between different RTGs, but they should be tailored to take account of the specific characteristics of each RTG (location, history, condition, etc.) and the specifics of the decommissioning process for that RTG.

The physical form of the RHSs is intended to make it very unlikely that significant dispersion or leaking of activity could occur except under extreme conditions such as:

- Very severe impact or crushing;
- Very intense and/or prolonged fire;
- Long term immersion in water (e.g. in the sea); or
- Explosion (presumably a deliberate act).

The primary radiological threat is therefore direct exposure to radiation from the source in the event that shielding is removed or is no longer effective because of an accident or other disturbance.

The key operator actions to reduce the threats are therefore to:

- Manage the handling of intact RTG and packaged RHSs so that doses to workers are kept low;
- Develop and apply effective procedures for managing RTG found to be damaged or defective, to make them safe while minimizing the doses and risks to personnel;
- Apply technical and administrative safety measures to prevent (as far as possible) accidents or incidents that could damage RTG or RHS packages at all stages of the decommissioning process;
- Apply technical and administrative security measures to prevent (as far as possible) unauthorized access to RTG or RHSs (whether with malicious or misguided intent) at all stages of the decommissioning process;
- Develop, and apply if necessary, emergency measures to mitigate the consequences of any accidents or incidents, or breaches of security, that may occur.

The following nine key regulatory issues were derived from the above analysis:

- Compliance with terms and conditions of licences, permissions and implementation of previous prescriptions;
- Operator's personnel selection and training;
- Regulatory inspection of RTGs prior to decommissioning;
- Measures to prevent accidents and incidents and preparedness to respond effectively to any accidents or incidents that do occur;
- Transportation of RTGs and RHSs;
- Compliance with radiation safety requirements;
- Physical protection of RTGs and RHSs;
- Accounting and control of RTGs and RHSs; and
- Investigation of any accidents or incidents.

The 9-by-9 matrix of tasks and issues was analysed to identify a number of priority areas for regulatory action, as follows:

- Systematic and timely definition of decommissioning plans and specification of decommissioning projects, and regulatory approval of these. This has been addressed in depth and emphasised through the specification of requirements for decommissioning programmes (Task 1) and the inspection procedures developed in Task 3;
- Thorough inspection prior to starting decommissioning operations, including operational inspection of the RTG's condition (as part of the basis for the decommissioning plan) and regulatory inspection of the preparedness of the operator to carry out the decommissioning work. This is explicitly set out and emphasised in the inspection procedures developed in Task 3;
- Preventing and responding to accidents during the various types of transport. This has been addressed through emphasis on requirements for safe transport (Task 1), assessment of risks during transport (Task 2), inspection of safety arrangements for transport (Task 3) and emergency preparedness and response arrangements specifically for accidents during transport (Task 4). The response arrangements have been developed using experience from real cases of recovering damaged RTGs. These focus on recovery of a damaged RTG on land, which is apparently considered to be a worst case. However, further consideration may need to be given to the scenario of a (possibly damaged) RTG dropped into the sea from a helicopter. The planned response is evidently to recover such an RTG to avoid the possibility of long term dispersion of the Sr-90 in the marine environment (which could be considered a worst case in terms of the extent of impact), and precautions are described for avoiding such a scenario and mitigating the effect by providing a marker at the location. However, the procedure for recovering an RTG from the sea has not been described;
- Physical protection of RTGs during transport. This aspect of physical protection has been particularly emphasised in Task 5, and the relevant requirements are being modified to give special attention to transport;
- Safety and security of collections of RTGs at temporary storage locations (where multiple RTGs could present an increased hazard if not properly controlled). Inspection of the safety and security arrangements at storage locations is specifically addressed in the handbook developed in Task 3; and
- Ensuring consistency in safety and security arrangements. Regional offices of Rostekhnadzor are responsible for regulating RTG decommissioning in their regions, and the unified norms and guidance developed under this project should help to provide a common basis for regulation in all regions. It is also important that the requirements be clear and consistent for all operating organisations, military and civilian. Licensing of all RTG decommissioning by Rostekhnadzor should help to provide this clarity and consistency.

Some priority issues identified through this analysis were not fully addressed during the current project and may need to be considered for future work. These include:

- Preventing accidents during hot cell transfer of RHSs from RTGs to transport packages. This is a specific task performed by VNIITFA at its own facility (or, in the future, at Mayak), and appears potentially to represent a significant risk because the RHSs are temporarily vulnerable when they are neither in the RTG nor in a shielded transport package. The risk assessments presented in this project indicate that the associated risks are taken to be negligible, but detailed demonstrated that this is the case has not been presented;
- Long term management of RHSs at Mayak. There remains some uncertainty about the final fate of the RHSs at Mayak, and therefore the long term safety cannot be definitively assessed. As described in Appendix C, the stated plan is to vitrify the RHSs for storage and subsequent disposal underground, but there is no currently operational vitrification facility at Mayak; and
- Application of EIA methodology to RTG decommissioning. EIA may not be strictly necessary under Russian law, as the decommissioning of RTGs can be considered to be simply a continuation of the planned life cycle of facilities that were in operation prior to the introduction of EIA regulations. It might nevertheless be desirable to conduct some form of assessment of the environmental impacts of RTG decommissioning and their mitigation, and consideration of alternatives.

In general, however, the key need for the future in relation to the regulation of RTG decommissioning is to achieve consistent practical implementation of the framework of regulations and processes already in place and enhanced through this project, through all steps of decommissioning and for all RTGs. Although there may be scope for further improvements in the framework, regulations and procedures are now in place, and the operators and



regulators need to be engaged in understanding them and ensuring that they are applied. A significant element of future work will therefore be to raise awareness among the regional inspectors of Rostechnadzor and the operators (and also among the controlling organisations and organisations rendering services) of the regulations and procedures, the reasons behind them, and the importance of applying them.

## CONCLUSIONS

NPRA is the national radiation protection authority in Norway and so the natural role for NPRA is to support, extend and develop the Russian system of regulatory supervision of nuclear and radiation safety.

In previous work, the general goal has been described as support in the development of safety culture; that is to say, inclusion of safety in all aspects of project development and implementation.

Now we can say that, on the back of a broader and growing acceptance of the importance of safety from all concerned, the new objective is to be re-focussed on supporting strong independent regulatory authorities,

- to ensure that regulatory supervision of projects is efficient and transparent, and
- to ensure that environmental and human health and safety objectives are met.

The need for this re-focussing arises particularly because of major changes in the sub-division of responsibilities of the various Russian organisations and changes in the structure of the organisations themselves. This includes operator and regulator organisations.

In addition, there are major international developments on-going in the evolution of strategies for environmental protection within the context of sustainable development. This evolution applies to radiation protection, and notably includes the extension of protection objectives to the environment as well as to humans, and the practical development and implementation of techniques to show that projects are implemented in an optimised manner.

Regulatory supervision is complex, particularly for large scale projects which have a lifetime measured in tens of years rather than months. It is a continuing process which has to take account of project changes, new scientific and other information and policy responses to the changes circumstances. Current experience of the situation in Russia suggests that while there is a great deal of technical expertise, there is still a need for an improved process for implementing safety supervision. The logical steps include:

- Practical interpretation of general Russian Federation policy on protection objectives, in environmental and human health and safety.
- Development of norms and standards, which, if they are complied with, correspond to meeting the policy objectives. Licenses to work cannot be issued unless the norms and standards are met.
- Development of regulations and/or guidance on demonstration of compliance, such as requirements for the content of safety assessment reports, and derived standards which apply in particular or special circumstances. The operator has to follow these regulations or guidance in preparing his application for a license.
- Development of capabilities to review the licence application documents. This includes technical review of the assessment and other assumptions in the licence application, as well as independent assessment capabilities. It also includes keeping technical review capability up to date, taking account of new scientific and technical developments.
- Development of licence conditions. The licence will not normally be a simple yes proceed; it will normally include conditions which can be monitored and if the monitoring shows that the

conditions are not being met continually, the licence can be revoked, or other measures taken to require the operator to improve (improvement notice).

- Development of regulatory monitoring, supervision and corrective action procedures which ensure licence conditions are being met, which in turn feeds right back up through the above steps demonstration of meeting protection policy objectives.

In addition, support to regulators needs to be provided in project planning for such activities, so that the process is efficient, allowing for open dialogue with operators while maintaining confidence in an independent regulatory review process. This support can be applied at the project specific level and the level of strategic planning. Such support can take advantage of experience from other national programmes and from international expertise from, e.g. International Atomic Energy Agency. Exchange of experience with other countries that ultimately participate in this type of project is highly important.

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