MANAGEMENT OF OCCUPATIONAL RADIATION EXPOSURE IN GEORGIA

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Abstract

Georgia has established occupational exposure control system. Further developing of the system is going on. As a first step a new legislation base is elaborating – new national BSS is drafted and agreed among different ministries. The other task is practical implementation of requirements and providing of technical support for them. New approach for occupational exposure gives the possibility to increase effectiveness for implementation of main radiation safety principles.

1. Introduction

Georgia is small country situated on the south Caucuses territory was before the part of Soviet Union. After destroying Soviet Union the country had received difficult heritage for control of nuclear and radiation activity: Many enterprises stopped their activity or changed the profile without proper notification sent to state supervising authority. As a result in the first years of the country independence even no register of organizations conducted the nuclear and radiation activity was established. The major problem was s.c. orphan radioactive sources, which were disseminated over the country territory. The situation was changing step by step starting 1996 when Georgia become member of International Atomic Energy Agency (IAEA). Based on the international support the all main activities were focused on two ways: Searching and recovery of orphan radioactive sources and establishment of state regulation. The first important action was adoption of Frame Law "On Nuclear and Radiation Safety" at January 1, 1999 (No. 1674–IS) According to the law requirements Ministry of Environment and Natural Resources Protection (MENRP) was assigned as a state Regulatory Body and Nuclear and Radiation Safety Service (later converted to Department for Nuclear and Radiation Safety – DNRS) was created within the Ministry of practical fulfillment of state regulatory functions. RB started activity to define scope of regulatory area (establishment of state register for facilities and sources) and elaboration regulatory requirements.

Up to 2004 DNRS developed only partially completed inventory covered some main users of radiation sources. The information was kept as a hardcopy and in excels files. According to IAEA standards every state should have inventory of its radioactive sources [1]. Receiving support from US NRC Georgian RA – DNRS had started activity to create full scale inventory of all sources of ionization radiation existed in Georgia. DNRS was granted by

computer code RASOD elaborated by Armenian specialists under US NRC programme to support of some former Soviet country in establishment of inventory of sources of ionization radiation.

Information collection was divided on the two main stages. At the first stage special letters were disseminated to the potential owners asking them to provide information for their radioactive sources. As a Georgian experience showed this type activity was not as effective as it was desired. Therefore special on-site checkings were conducted. So, full scale inventory of ionization radiation sources (not only radioactive sources) and associated activities were created. The sources were grouped in classless according to IAEA requirements what provides base to determine security level for different sources [2] and associated activities.

2. Legislative framework

Every activity should be based on clearly defined legal basement. As it was mentioned above the first Frame Law was put in operation at 1999. During the last year a number of changes were incorporated into the law text, so new version of the Frame law (No. 5912–RS) was adopted at 2012. General principles for authorization of nuclear and radiation activity are defined by Law of Georgia No. 1775–RS "On Licenses and Permits" – adopted on June 24, 2005. (License process started at 2001. It was regulated by specials decree before). Georgia has its national basic safety standards s.c. RSL–2000 (Technical regalement No. 28 approved by Georgian government). The text of the regalement contains some old –exhaust requirements, therefore by IAEA support the new national BSS was drafted being fully corresponded to IAEA GSR Part 3. The text of the document is discussed among different ministries and waits its final approval. There are number of other legal documents (for instance technical regalement No. 34 "Main Rules for Handling with Radioactive Sources and other Sources of Ionization Radiation"), which also need to be upgraded. The new document "On Inspection of Nuclear and Radiation Activity" defines general rules and requirements for conducting of regulatory inspection of different types of activity. DNRS has clear action plan for legislation upgrade elaborated together with IAEA experts.

3. Occupational radiation management

Defining the standards and norms for occupational radiation three main exposure situations can be considered: Planned exposure, Emergency exposure and Existing exposure.

Planned exposure

Georgian legislation sets special way for application of graded approach: removing from regulatory control exempted sources and activities, and license all other activity (no simply registration). Up-to-date 667 license holder is fixed in Georgia. **Figure 1** shows dynamics for license issuing at last years.

One important document for authorization of activity is Radiation Protection Programme (RPP). Usually RPP contains description of responsibilities, setting of zones (controlled and supervised areas), working rules, integrated radiation protection functions with other ones, dose monitoring programme, emergency plan, training programme, Quality Assurance programme. RPP considers implementation of three main principles [3]:

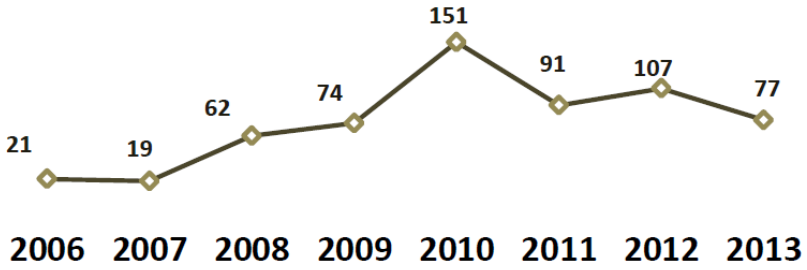

Figure 1. The number of licenses issued at the last years.

– Justification – all activities should be justified;
– Optimization – doses should be As Low As Reachable Achievable (ALARA); and
– Limitation – special dose limits should be set.

RSL–2000 still divides workers in two main groups: Group "a", who works with ionization radiation sources and, group "b" who supports the activity of group "a" persons. This deviation will be abolished by adoption of new national BSS soon, but now annual dose limit for group "a" is defined as 20 mSv and for group "b" – 5 mSv. Annual optimized dose is assigned as 6 mSv. If annual dose is less than 6 mSv no individual dose monitoring is obliged. In other case individual dose as a ambient dose $H_P(10)$, $H_P(3)$ and $H_P(0.07)$. In measurement the type of exposure should be considered. For instance, during working with neutron sources the neutron flux measured by special detectors. Linear medical accelerators with energy 12 MeV and more are good examples for it. In case of using of unsealed radioactive sources the license should use radiometers for measurement of potential contamination. The doses monitoring programme defines two main actions: individual dose monitoring and workplace monitoring. There are four main reasons to conduct dose monitoring [4]:

(a) Routine monitoring is associated with continuing operations and is intended to meet regulatory requirements and to demonstrate that the working conditions, including the levels of individual dose, remain satisfactory;
(b) Special monitoring is investigative in nature and typically covers a situation in the workplace for which insufficient information is available to demonstrate adequate control. It is intended to provide detailed information to elucidate any problems and to define future procedures. It should normally be undertaken at the commissioning stage of new facilities, following major modifications to facilities or procedures, or when operations are being carried out under abnormal circumstances such as an accident;
(c) Confirmatory monitoring is performed where there is a need to check assumptions made about exposure conditions, for example to confirm the effectiveness of protective measures;
(d) Task related monitoring applies to a specific operation. It provides data to support the immediate decisions on the management of the operation. It may also support the optimization of protection.

Especial attention is paid for setting of doses constraints and reference levels. Usually all licensee uses recordable, investigation and intrusion levels. The first used as starting (zero) level to record individual doses, the second – to initiate the investigation (why doses become so high?), and third – start investigation simultaneously stopping one or all types of activities. Such approach allows avoiding achieving of dose limit occasionally.

Georgia is not nuclear country. The country had only one research nuclear reactor, which operation was stopped at 1989. The decommissioning of the reactor is going successfully based on IAEA support. The main area for application of ionization sources in Georgia is medicine (**Figure 2**). Individual dose monitoring is conducted by licensee or special technical support organization having appropriate license. The annual doses for personnel are appr.2.5 – 4.5 mSv. The doses are higher in brachitherapy and angiography.

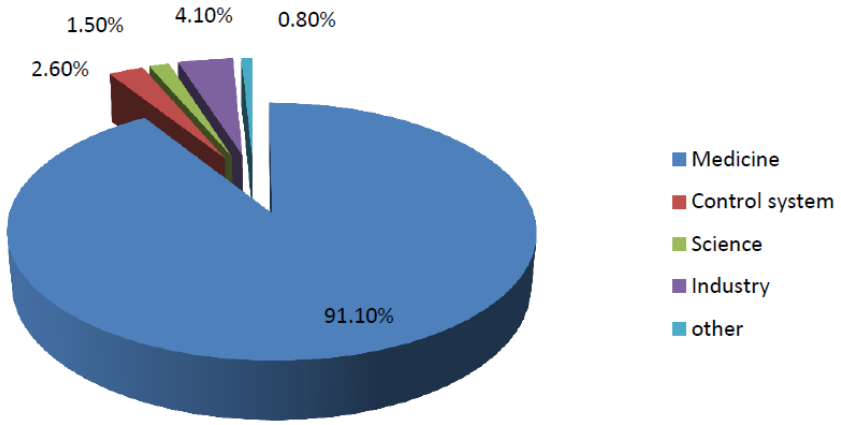

Figure 2. Application of ionization radiation in Georgia.

According to Req. 5 of BSS [2] Management System (MS) and Human and Organizational Factor (HOF) together with safety culture are essential elements having influence occupational exposure. Therefore all of them should be considered in authorization documents. Georgian legislation set clear requirements for HOF, but legal bases for others should be developed considered the local features.

Last years especial attention paid to NORM. Georgia has oil excavation and gas transportation industry providing of accumulation NORM. Usually if they amount are less as defined by unconditional clearance level [5], no regulation should be applied for them; other cases can be considered as a planned exposure.

Emergency Exposure

Emergency workers can be divided into four main groups [4]:

(a) Emergency workers who have specified duties in response to a nuclear or radiological emergency;

(b) Workers performing their duties at working places and being not involved in response to a nuclear or radiological emergency;

(c) Workers who are asked to stop performing their duties at working places and to leave the site;

(d) Workers who are accidently exposed as a result of an accident or incident at a facility or in an activity and whose exposure is not related to the emergency response.

By the requirement of national frame law every licensee should develop emergency plan and conduct its activity according to the plan including the notification of Regulatory Body. By the decision of RB the facility emergency accident can be assessed as a national radiation accident in solving of what specialists of Civil Defense Department of Ministry of internal Affairs can be also involved. So, exposure situation for workers of groups (b) and (c) can be considered as a planned exposure situation.

A number of emergency recovery operations were conducted in Georgia- the country had great problems with to s.c. orphan radioactive sources. Unfortunately some people (no workers) were overexposured due them. All emergency actions should be conducted according to elaborated plan, which considers transformation of emergency exposure situation to the existing exposure situation according to requirement No. 46 BSS [2]. It is should be emphasized that justification principle should be applied for emergency workers, especially started with the first phase of activity when gathering information and assessment of nature of the event is necessary. At the second phase the situation should be evaluated and recovery operation plan should be developed (**Figure 3**).

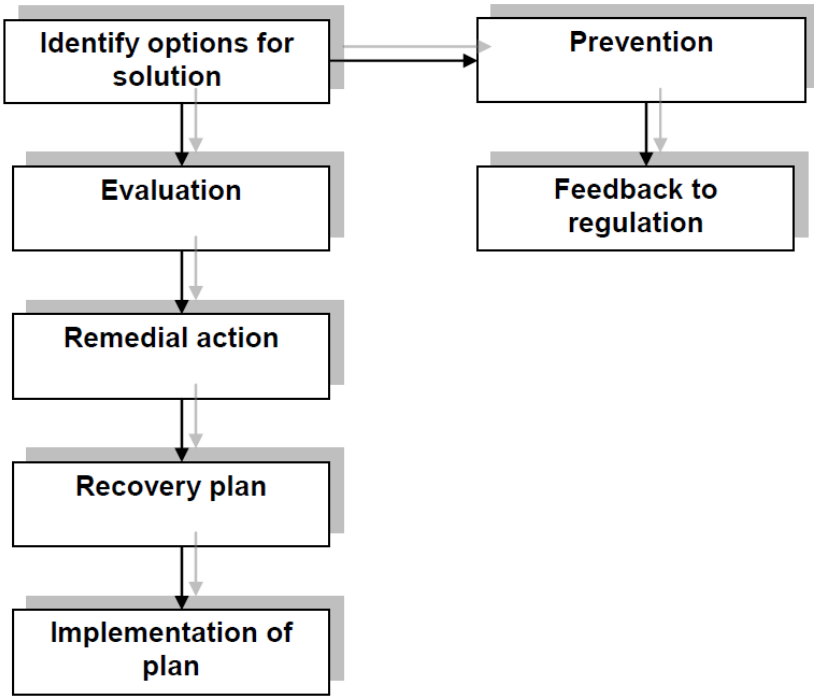

Figure 3. Chart for phase two for recovery operation.

It is important also to consider feedback to regulatory requirements for prevention in future of occurring of such situations. Phase three considers implementation of the plan. It is important to implement optimization and limitation principles during the emergency actions. The good example is recovery operation conducted for naked RTG sources (Two radioactive sources. Each of two contains radionuclide ^{90}Sr with initial activity 1295 TBq) at Georgian village Lia in 2002 [6]. The special trainings were conducted for emergency workers to better identify:

- Emergency workers groups and their collaboration;
- Coordination among emergency workers;
- The tools to be used;
- Options to upgrade emergency (recovery) plan.

These actions allow implementation of optimization principle for workers. Georgian legal base sets the same requirements for doses limitation as defined by international requirements [4], but maximum individual dose received by one person was 1.16 mSv, usually doses were in range 0.05 – 0.95 mSv [6].

Existing Exposure

Existing exposure can be occurred by ending of emergency exposure or due to natural exposure. It contains exposure of workers and population. As usual justification, optimization and limitation principles can be considered for workers. It is important that RB should be satisfied with emergency actions and identify them as an ended. In other case the situation can not be defined as "Existing" (Anaseuli case in Georgia).

4. Conclusion

According to economic development application of ionization radiation in different branches is growing in Georgia, especially in medicine. More attention needs to paid for radioactive waste processing and NORM. So, implementation of new approach for occupational exposure is important task to provide nuclear and radiation safety for all types of activity.

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