

Natalia Golnik, Piotr Tulik

IRPA initiative on radiation protection culture

Warsaw University of Technology, Institute of Metrology and Biomedical Engineering, Warsaw, Poland
e-mail: n.golnik@mchtr.pw.edu.pl

The concept of radiation protection culture, proposed by French Society for Radiation Protection (SFRP) and then launched by International Radiation Protection Association (IRPA) is presented. The paper is focused on the role of radiation culture in preventing unjustified fear associated with the use of radiation. Principles of RP culture and optimization of radiation protection, as well as the problems how RP culture can be learned and how to engage the stakeholders are considered.

Key words: Radiation Protection Culture, IRPA.

Introduction

The use of ionizing radiation significantly increases in last decades, especially in the medical field but also the nuclear industry revival throughout the world is clearly seen. At the same time, considerable progress has been made in radiation protection, which is an inherent part of any use of ionizing radiation. However, the generation who developed radiation protection, like it is applied today, is gradually leaving now and a substantial change in the core of the teams will be needed in the next ten years.

On the other hand, radiation protection is also a subject of high actuality in the general public, because of possible harmful actions of ionizing radiation. Safety topics are frequently addressed and exploited by various players in society to pursue their own intentions, purposes, and goals, which generally are not specific for radiation protection. Some of these players do not flinch from making false statements, which are

scientifically not justified. As the result, the reality of the perception of radiation risk and radiation protection in the general public is a disaster [1].

In response to these challenges, International Radiation Protection Association (IRPA) has launched an initiative to establish and promote radiation protection culture [2]. The justification was rather bitter, saying that “we must remain vigilant as all the conditions are fulfilled for radiation protection to make no further progress and in this case even to go backwards. One way of preventing or at least limiting the risk is to root radiation protection in culture” [3]. Therefore, IRPA has initiated a project aimed at both fostering belief in the success of cultural approaches and developing guidance to help radiation protection professionals to promote a successful RP culture [4].

Concept of radiation protection culture

Initial Concept and Definition

The word “culture” has its roots in the Latin “colere”, meaning “to cultivate” [5]. It is not easy, to define the term precisely, and there is no consensus among scholars, philosophers, politicians and members of societies as to what exactly the concept should include. Obviously, there are different “cultures” in the world, so this paper focus on the concept of culture as it has been articulated in Western scientific and philosophical traditions and mainly on the definition of American anthropologist Edward Tylor, who gave his definition of culture in 1873: “Culture or civilization, taken in its wide ethnographic sense, is that complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society”.

With respect to the nuclear energy industry and medical use of ionizing radiation, the term culture is, however, not only used in a descriptive way, but also in a normative sense. In this sense, culture describes not only what it represents, but also what should be. Therefore, also moral and ethical standards are connected with the term culture [1].

It is intuitively clear, that the definition of RP culture should include an integrated pattern of human knowledge, belief, and behaviour, as well as the set of shared attitudes, values, goals, and practices that characterizes an institution, organization or group. Further, it must be emphasized that radioactivity and ionizing radiation are omnipresent phenomena of our “hostile” environment.

At the 12 Congress of International Radiation Protection Association (IRPA) in Buenos Aires in October 2008, the French Society for Radiation Protection (SFRP) proposed to launch an IRPA initiative for enhancing Radiation Protection (RP) culture among the RP professionals worldwide. This proposal was very favourably received by the participating delegates and the IRPA Executive Council decided to support this initiative.

Subsequently, the World Health Organisation (WHO), the European ALARA Network (EAN), the Health Physics Society (HPS), the American Association of Physicists in Medicine (AAPM) and the Image Gently Alliance also expressed their interest and support.

The early formulated goals were:

- To give visibility to the fundamentals of RP (science and values);
- To promote radiation risk awareness;
- To promote shared responsibility among practitioners, operators, management and regulators;
- To maintain the RP heritage;
- To facilitate its transmission;
- To improve the quality and effectiveness of RP;
- To contribute to the general safety.

The concept of radiation protection culture was introduced in analogy to a definition of safety culture, the term which was first used in INSAG's (International Nuclear Safety Group) Summary Report on the Post-Accident Review Meeting on the Chernobyl Accident [6]. At that time, safety culture was introduced in order to explain the impact of managerial and human factors on the outcome of safety performance and also to analyze how the lack of knowledge and understanding of risk and safety by the employees and organization contributed to the outcome of the disaster.

Now, Advisory Committee on the Safety of Nuclear Installations (ACSNI) describes safety culture of an organization as: "The product of individual and group values, attitudes, perceptions, competencies and patterns of behaviour that determine the commitment to, and the style and proficiency of, an organization's health and safety management" [7].

The first attempt to the definition of RP culture was formulated as: "The way in which radiation protection is regulated, managed, performed, preserved, and perceived in the workplace, in medicine, and every day's life and reflects the attitudes, beliefs,

perceptions, goals, and values that employees, practitioners, regulators, and society share in relation to radiation protection” [2,1]. Such defined culture of radiation protection extends far beyond the general industrial safety culture, because it must offer a consistent system for all fields of application of radioactivity and radiation, including medicine, research and in daily life.

It is worth to underline here, that across the whole field of safety there is growing acknowledgement of the central importance of embedding a safety culture in which all persons are doing “the right things at the right time with the right attitude”. A short-form definition of safety culture could be “The way we do things around here when no-one’s looking” [1].

Two IRPA workshops on the development of RP culture have been already organized. First one was held in Paris in October in December 2009 (organized by Bernard Le Guen, member of IRPA Council) and the second one in Charleston, South Carolina, USA in February 2011 (organized by Kenneth R. Kase, IRPA President). The text of this section of the paper is in large part based on outcome of these meetings and should be considered as a compilation of the opinions expressed by the experts attending the meetings. The compilation was prepared with the hope to increase visibility of the IRPA initiative, but the readers are strongly encouraged to compare the text with original presentations accessible from the IRPA site (www.irpa.net).

Four topics were identified for discussion:

- What are important elements of RP culture?
- What are criteria for success and how do we assess it?
- How do we engage the stakeholders in process of developing RP culture?
- What is role of RP professionals and professional societies in promoting RP culture and how is regional culture included?

This paper is focused on the role of radiation culture in preventing unjustified fear associated with the use of radiation. From this point of view, the most interesting is to see how the principles of RP culture can be used in order to gain necessary trust, how RP culture can be learned and how to engage the stakeholders, in order to promote the knowledge based awareness of the risk from low doses.

What are the important elements of RP culture?

The absolutely first principle of radiation protection is that it should be based on scientific knowledge. Then, just a few fundamental principles are sufficient to construct

the system of radiation protection. Usually, three pillars of radiation protection are specified [8], namely justification, optimization and limitation of individual doses. Recently, two other principles are often mentioned. These are the principle of sustainability and the precautionary principle.

The fundamental goal of radiation protection is to protect humans and the environment from the dangers of ionizing radiation in all exposure situations: in planned ones, existing ones, and in emergencies.

Radiation protection must be also prepared to cope with the consequences of military and malicious use and to minimize detriment and risk resulting from such exposure situations as far as possible.

These principles result in the beliefs that radiation protection enables us to peacefully use radioactivity and ionizing radiation to the benefit of man and environment and at the same time to avoid deterministic effects and to minimize stochastic effects as low as reasonably achievable (the ALARA concept).

All the principles mentioned above have a normative character and, consequently, the ethics of radiation protection [9] and the culture of radiation protection become inseparable parts of the system.

The main steps of the evolution of radiation protection are illustrated in Figure 1.

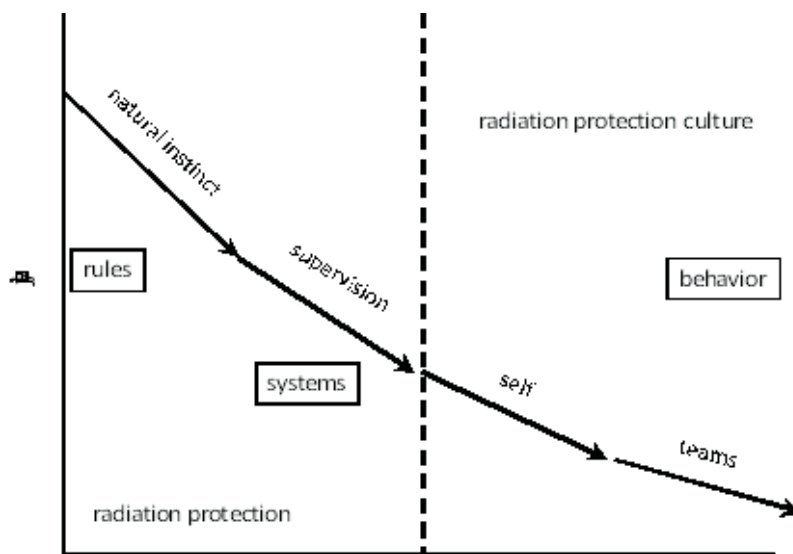


Figure 1. Illustration of a decrease in injury rate associated with evolution of radiation protection.

At the first stage the people behaviour is governed by natural instinct and simple rules. The goal is compliance with the rules. Safety topics are addressed as a delegation to a safety manager and generally there is lack of management support. The second stage forms an advanced system of radiation protection including management commitment, fear and discipline, strict rules and regulations, supervisor control, training and personal responsibility for compliance with the rules. People behaviour at this stage is dependent and driven by the legislative rules. Radiation protection culture is introduced at the third stage, where the people behaviour becomes independent. It is based now on personal knowledge, commitment and standards, exchange of experience, personal values, care for self practice and individual recognition. The most advanced fourth stage is associated with interdependent behaviour, when people care of others, help others and become networking contributors. This stage involves also confidence and organizational pride.

It can be therefore concluded that RP culture is a pattern of knowledge (scientific, technical, ethical, historical, practical) and behaviours (questioning attitude, personal accountability, integrity, modesty, engagement with stakeholders, openness, transparency).

Such behaviour should facilitate the key problem in building proper RP culture in the society, which is trust. We all know that radiation protection was born in early years of nuclear technology when first, military applications made this branch very closed and protected from understanding by general public. This also formed a strong organizational link between radiation protection and nuclear industry. This link is much weaker now, or even does not exist, but general public may become suspicious when the same people act as representatives of both nuclear industry and radiation protection.

The first task of the radiation protection was to limit the exposure of radiation workers below the level of already known effects. Even such protection measures were not always applied. Later discovery of possible health detriment for public leaving around military installations was neither properly presented nor explained to citizens, partly because of cold war conditions. It cannot be surprising to anybody that nuclear technology associated in people's minds with the time of secrets, hidden goals and dishonest information.

Of course, time changed and now almost everywhere, the ideology of radiation protection is to be open to maximum possible extent. However, even working in comfortable conditions of political freedom, we should always remember the words "now" and "almost" included to the previous sentence. In case of troubles, politicians

might not ask for the truth but just react emotionally or regarding their own career. RP culture makes it possible to contradict such a behaviour and to provide reliable ways for immediate and proper information given by professionals, who should be clearly included to the chain of the social agreement and whose opinions should be considered as trustful. At the moment, the battle is lost and the only way to improve the situation is a permanent fight for independence of radiation protection experts and for radiation protection culture. The special attention should be paid to strong ethos kept by leaders, to a system of continuous transfer of knowledge and expertise, to proper combination of innovation and conservation, keeping everything simple and practical, acting naturally and consistently, to a narrative in common language and all of this hopefully followed by social acceptance.

Role of ALARA principle

Even in a well-ordered and supportive environment such as a nuclear site it can be challenging to develop and embed an appropriate safety culture, of which radiation protection would be an important component. In many other work environments, such as hospitals, universities etc., the challenges can be much greater.

The ALARA (as low as reasonably achievable) principle of optimization is a perfect tool for development of personal radiation protection culture in the way of adequate planning, organizing and executing of work. Surprisingly, strong determination of the company to control exposure can be detrimental to personal investment in radiation protection. Overconfidence in organizational systems, the means of measurement and checking etc. may result in radiation workers failing to adopt sufficiently questioning attitudes during work in controlled areas. The ALARA policy is then too often seen to be just a matter for a committee that checks hazardous field work. It is no longer perceived as a personal matter, involving detailed planning before any radiation work. Finally, this leads to progressive loss of individual radiation protection culture [10].

The ALARA principle plays also important role in contacts with society members. Radiation protection professionals live with the conflict that ionizing radiation has harmful effects, on the one hand, and can be used to the benefit of man and environment, on the other. In this context, the key word of the ALARA principle is “reasonable” and just this word is often questioned at all occasions of communication with public. The modern societies are aware of their rights to influence the decisions concerning the quality of life and any attempt to set the “reasonable” level by

professionals is considered as technical arrogance. Moreover, taking into account the linear non-threshold hypothesis, it is very difficult to provide any sound argument that a particular level of protection is more “reasonable” than somewhat higher or lower. In extreme situations, the opinions expressed by several specialists, may easily lead to few “reasonable” values of the effective dose, different one from another even by order of magnitude. Therefore, it should be emphasized that the radiation protection limits form a kind of social agreement and include rather wide margin of safety covering all the area of scientific uncertainties concerning the radiation hazard for humans and the environment.

The Author of this paper proposed some time ago the name ALASA (as low as socially acceptable) for a modification of the ALARA concept in order to facilitate the public relation questions. ALASA includes the same cost-benefit analysis as the ALARA, with the benefits specified by the user of the radiation source. The final decision results from judgements between the technical and social reasons, however, the social factor is now clearly emphasized. With such a concept one can avoid saying to the public that their opinion is “unreasonable” and perhaps the discussions have more chance to concentrate on the society needs and on the reasonable distribution of the available funds. This should also facilitate the comparisons with the safety levels of the non-nuclear activities where the higher risk levels are socially acceptable. It becomes more clear that the high level of radiation protection is not because of some special mysterious danger of radiation but because people want to be extremely well protected against just this kind of threat and because it is possible to provide so high protection level, if the proper funds are available.

Role of education

All domains using ionizing radiations are concerned by a sustainable education and training in radiation protection. In a context of both the increasing demand and decreasing number of radiation protection experts available in Europe, education becomes an essential aspect to enhance a radiation protection culture.

People learn culture and this is culture’s essential feature. Because the relationship between what is taught and what is learned is not absolute (some of what is taught is lost, while new discoveries are constantly being made), culture exists in a constant state of change. Culture is learned, passed on and changed by: a pattern of basic assumptions, the cultural paradigm, groups of people who have shared significant problems, solved

them, observed the effects of their solutions. The solutions are accepted by new members of the group, while basic assumptions stabilize the group and are highly resistant to change.

If the process of learning is an essential characteristic of culture, then teaching also is a crucial characteristic. The way how the culture is taught and reproduced is itself an important component of culture.

Generally, one can distinguish three main systems of learning and personal development – basic, self directed and behavioural. The definitions adapted to radiation safety can be formulated as:

- Basic compliance system – safety training programs, work conditions, procedures and processes comply with regulations. This is passive compliance;
- Self-directed safety compliance system – workers ensure regulatory compliance and take personal responsibility for training and other regulatory provisions. This emphasizes active compliance with the regulations;
- Behavioural safety system includes teaching individuals to scan for hazards, to focus on potential injuries and the safe behavior(s) that can prevent hazards, and to act safely [11].

There are two, well recognized problems associated with teaching about the effects of radiation:

- Probabilistic effects form a target of RP concerning public exposure below 1 mSv/y, however, there is no actual and detectable health damage from exposure in the dose region below 50 mSv/y. How can we ensure the visibility for such low probabilistic risk?
- Fundamentals of RP are currently too difficult and sometimes ambiguous for understanding by public. RP experts should have more comprehensive understanding of radiation risk on a basis of their own countries' data to improve communication with their societies.

Therefore, more attention should be paid to development of better description of the radiation protection below 1 mSv/y, expressed in terms of background radiation and background cancer risk.

It is obvious that we should transmit the acquired knowledge to others, but the problem of RP culture is how to teach wisely, and even more important, how to teach well. Benefits brought to humanity by the use of radiation should be presented cleverly

and we always should remember that even “uneducated” person possesses nowadays an important practical knowledge.

Participation of stakeholders

Stakeholder engagement is probably the most important element in rooting the RP Culture because culture itself is a collective identity and can't be formed by a small portion of members of a society. When engaging with stakeholders, an opportunity should be provided for both the stakeholders and those responsible for the process to give feedback on the approaches and tools used, as well as on the outcomes. Stakeholder engagement commonly involves a series of meetings, discussions and other types of face-to-face encounters [12].

Due to the wide range of applications of radiation protection in practically all areas of life, the players comprise professionals as well as various members of the general society.

The professional players are not only real persons-experts, regulators, governmental office-bearers and practitioners, but also legal entities such as companies, institutions, societies and associations and commissions.

The list of non-professional players in the general society is even larger: politicians, entrepreneurs and share-holder, non-governmental organizations and pressure groups, stakeholders and lobbyists, associations and societies, which are not engaged in radiation protection, groupings and parties, professional associations, patients, the media, schools, universities and other training schools, and the members of the general public.

Perhaps the most important lessons concerning the stakeholders involvement follow from the experience of rehabilitation efforts after the Chernobyl accident, where stakeholder involvement has emerged as a central theme [13]. The striking change was reported in attitude of people between the top-down approach and the stakeholder approach. The initial perceived remoteness of experts changed to the attitude where they were seen as having a commitment to the community. The consequences were clearly positive for trust and confidence. People perceived that the stakeholder involvement forced everyone to be clear what the problems were and what could reasonably and realistically be done. It was also observed that the local authorities also finally identified this feature of the approach as a way of overcoming a lack of trust and unblocking possibilities for solving the problems.

Summary

People reaction to risks and chances usually is not rational but is widely governed by social predefinitions and influenced by actual perception of information. Taking into account the present situation and perception of radiation protection in society one may conclude that we need a Culture of Radiation Protection for survival and in order not to fall back into medieval times where anxiety and beliefs were ruling and where scientific inference was rewarded by being burnt at the stake.

Our message to the general public should say that radioactivity is a kind of pollution that can be easily detected by almost any person equipped with an appropriate instrument, however, the quantitative measurements and risk assessment are subjects of knowledge and expertise.

We can expect that it will be a very long way to include the RP culture to the culture of the society. Another problem is that some specialists have lost a clear sight of the motivation for contacts with general public. The common reason is traumatic experiences of contacts with “green” activists and fanatic liars. There are many possible “excuses” to avoid an obligation to teach general public or to help the tax-payers to understand what is going on around them, or even to tell them the truth about parascience and false information. Nevertheless, we have to remember that culture is not a stationary state, it must be a process. The human history shows that self-satisfying, stagnating cultures die out.

References

- [1] Michel R. What is Radiation Protection Culture and why do we care for it? 1st IRPA Workshop on RP Culture, 2009 Dec 14-15, Paris, France. Available from: <http://www.sfrp.asso.fr/IMG/pdf/3-Michel.pdf>
- [2] LeGuen B. Initiative on RP culture. International Radiation Protection Association. Available from: <http://pbadupws.nrc.gov/docs/ML1017/ML101760234.pdf>
- [3] LeGuen B. IRPA Radiation Protection Culture initiative: An opportunity for the nuclear industry. Proceedings of Third European IRPA Congress 2010, Jun 14-18, Helsinki, Finland.
- [4] <http://www.irpa.net>
- [5] Harper D. Online Etymology Dictionary.2001. Available from: <http://www.etymonline.com>

- [6] IAEA, Summary Report on the Post-Accident Review Meeting on the Chernobyl Accident. IAEA Safety Series; 1986. Report No. 75-INSAG-I.
- [7] Third report of the Advisory Committee on the Safety of Nuclear Installations-Organising for Safety-Health and Safety Commission; 1993. ISBN 0118821040.
- [8] IAEA, International Atomic Energy Agency: International Basic Safety Standards for Protection against Ionizing Radiation and for Safety of Radiation Sources; 1996; Austria. Safety Series No. 115, ISBN 92-0-104295, ISSN 0074-1892.
- [9] IRPA Code of Ethics. Available from: <http://www.irpa.net>
- [10] Tandonnet J. The Inspector General for Nuclear Safety and Radiation Protection of the EDF Group: The Inspector General's report on Nuclear Safety and Radiation Protection; 2010 Jan 18, Paris, France.
- [11] LeGuen B. IRPA initiative on RP culture. Available from: http://www.irpa.net/index.php?option=com_docman&task=cat_view&gid=216&Itemid=173
- [12] IRPA Guiding Principles for Radiation Protection Professionals on Stakeholder Engagement. Available from: <http://www.irpa.net>
- [13] NEA OECD Stakeholders and Radiological Protection: Lessons from Chernobyl 20 Years After. A report by the Committee on Radiation Protection and Public Health (CRPPH); 2006. NEA Report No 6170, ISBN 92-64-010885-8.