Review Paper

Some Operational Aspects of BRR's Management System with respect to the Code of Conduct

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Abstract. The Code of Conduct (CoC) provides a basis for the self-assessment of all aspects of management practice. In line with this idea the evaluation of the BRR's (Budapest Research Reactor) past 15-year management practice with respect to the CoC has resulted in good feedback, which has supported the applied practices and also highlighted deficiencies and weaknesses. The period of self-assessment was an obvious choice as it encompasses the time since the full-scale reconstruction of the reactor (which was completed in 1992); that, moreover, represents a sufficient amount of time for drawing useful conclusions, summarising the experiences, and showing trends. In this paper, from the perspective of operation organization, some aspects of management practice are highlighted. These include: operation and utilization issues; conformity and safety reviews; and safety culture focusing on human factors. The paper also highlights how this management practice relates to, and supports, nuclear safety and demonstrates this safety to the public. It is hoped that the highlighted aspects of the management system described here may serve as a general methodology for the research reactor community.

1. Introduction

To a research reactor operator the Code of Conduct (CoC) could serve as a compass, guiding them through a self-assessment of operational practices. This is especially important for research reactors (RRs) that have a long operational history with several modernizations and upgrades. In such cases, application of the CoC during self-assessment reviews can help draw useful and comprehensive conclusions. This paper begins with a short introduction displaying the history of the facility including legislative and regulatory background. The main body of the paper discusses some aspects of management practice from the perspective of operation organization.

1.1. Facility Background

The Atomic Energy Research Institute (AEKI) operates the Budapest Research Reactor (BRR) and acts as the BRR's licensee. As is well known, the BRR is a tank-type RR, moderated and cooled by light water. The reactor is of Soviet origin and went critical in 1959. The initial thermal power was 2 MW. The first upgrade took place in 1967 when the power was increased to 5 MW using a new type of fuel and a beryllium reflector. The second, so-called full-scale reactor reconstruction and upgrade project began in 1986 following 27 years of operation since initial criticality. Although technically the upgrade was complete by the end of 1990, the physical start up could only be started after a two-year period of uncertainty due to the political changes in the country and other non-technical considerations. Thus, the upgraded 10 MW reactor received the operation license in November 1993. Since the time of start-up the upgraded reactor has been operating ≈3500 hours/year on average without any significant problem. The operation time record (scheduled and performed) is displayed in *Fig. 1*, while the operation cycles performed in 2006 are shown in *Fig. 2*.

In line with Hungarian safety regulations a Periodic Safety Review (PSR) was conducted in 2002-2003, as a result of which the operation license was renewed in November 2003.

The BRR, since its initial criticality, has been utilized as a neutron source for research and industrial applications on material science and education and for training proposes in the nuclear field (this is the mission of the reactor). Presently the irradiation and neutron research constitute the main utilization. Irradiations are performed in vertical channels (the reactor has more than 40 channels, including six flux traps that can be used for isotope production and material testing; in one of the channels there is a pneumatic rabbit system that serves for neutron activation analysis) whereas experiments are carried out at the horizontal neutron beam ports. The reactor has ten beam ports (eight radial and two tangential) and nearly all of them are in use. At one of the tangential beam ports a cold plug containing a moderator cell has been installed ensuring a cold neutron source (CNS) with three neutron guides (the measurement facilities of the CNS are placed in a neutron guide hall built adjacent to the reactor hall). The beam ports along with the research facilities installed in the reactor hall and neutron guide hall of the CNS can be seen in *Fig. 3*.

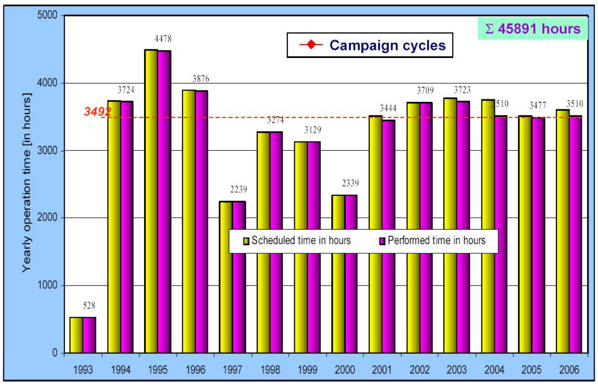

Fig. 1 Operation time record

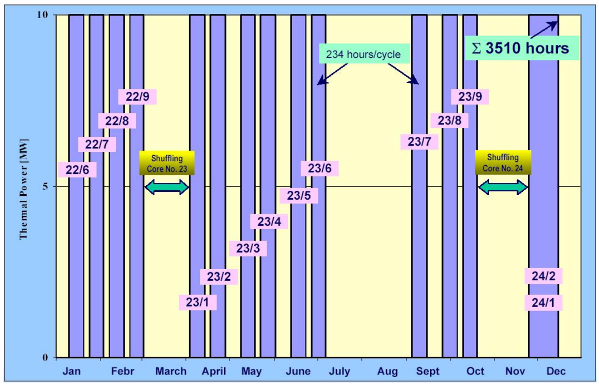

Fig. 2. Operation cycles in 2006

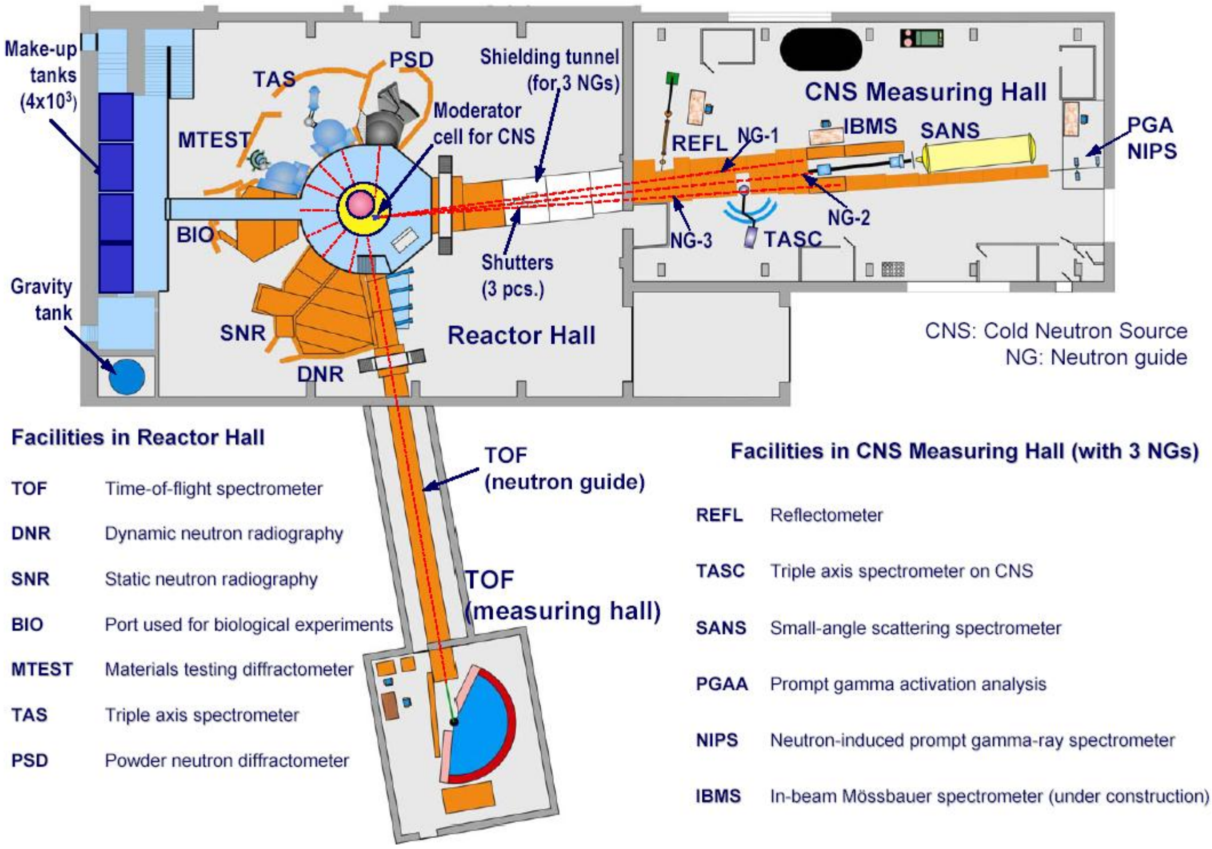

Fig. 3. Layout of the Horizontal Neutron Beam Facilities

1.2. Method of self-assesment

Just as the CoC provides recommendations and not obligations, the review was a non-binding act initiated by the reactor manager to gain a general overview of the reactor status and applied practices. It was handled as a special internal inspection with a limited scope, focusing on subjects relating to the regulatory environment and first of all to the applied operation practices to verify our conformity to regulations and desirable attributes in order to effect corrective measures and harmonization initiatives if needed and/or strengthen appropriate practices.

The reason for overlooking the regulatory environment was clear, while the period of self-assessment was also an obvious choice: viz. the period since the full-scale reconstruction of the reactor represents a sufficient amount of time for drawing useful conclusions, summarising the experiences, and showing trends. It is also convenient because the period till 2003 had already been reviewed and evaluated in the Report of the PSR. The method of the review and self-assessment was that of a comparison assessment where the Report of the PSR (14 volumes), then mandatory documentations of BRR, along with the everyday practices, etc. were compared with local, national and international regulations, with respect to the CoC. Several informal, individual and group interviews were made with staff members and users. In addition, feedback was considered that was received from authorities, civil organizations and 'lay' people. The experiences and conclusions, as well as the measures to be effected were discussed at the managerial level of the BRR[1].

1.3. Legislative and regulatroy background of a research reactor operation in Hungary

In order to present some operational aspects of BRR's management system relevant to the CoC, there is a need to provide a short, comprehensive review of the legislative and regulatory status of research reactor regulations.

In Hungary, the Act of Atomic Energy CXVI (1996), which came into force on 1st June 1997, enforces the required legislative and regulatory practices. In accordance with the provisions of this Law, the control and supervision of the safe application of nuclear energy is a government task, which is performed through the Hungarian Atomic Energy Authority (HAEA). The HAEA is a government-directed, central public administrative organization. The rules governing the peaceful application of nuclear energy in Hungary are settled in several governmental decrees, the most important of which are the nuclear safety regulations (NSRs), the latest version of which was issued in 2005. The practical issues are documented in a series of guides, which were edited and issued by HAEA following the publication of the new NSRs. The HAEA is the licensing authority, but its supervisory and appraisal roles are also considerable.

2. Some operational aspects of BRR's management system with respect to the CoC

Although the overview of the BRR's management system with respect to the CoC yielded many results and practical experiences (whose use should either be encouraged or opposed), in this section only some operational aspects are highlighted. The introduced items may seem arbitrary choices, but they were selected to emphasize positive practices. The purpose of this is to present good practices or managing attitudes in general that could form a general methodology for the RR community. These are as follows: (1) operation and utilization issues; (2) conformity safety reviews; (3) safety culture focusing on human factors; and (4) demonstrate the safety.

2.1. Operation and utilization practice

The BRR has adopted a range of management practices since the time of first criticality in 1959. The development of these practices was influenced in a number of ways. Among others self-improvement methodology, regulatory requirements and the sense of practicality also played a significant role. One of the practical matters concerned the operation and utilization practice that arose during the two-year period following the political changes in Hungary in 1990. This was a period of uncertainty during which it was essential to demonstrate the necessity of the BRR. For this reason a consortium, the

[1] The review was done in two phases: the first one in late autumn of 2006 when the focus was mainly on the regulatory environment, and in the spring of 2007 when a self-assessment was made by a team of senor operators. The BRR's operative management, according to the QA/QC system, consists of the technological group leaders and some senior operators and advisors.

Budapest Neutron Centre (BNC), was founded by four academic institutes to coordinate the reactor utilization. However, its initial goal was to remove the doubts of some unconvinced academics and win the backing of the public for the reactor start up. With this ‘tactical action’, interest in the reactor increased significantly (two parties could lobby for the same goal) and as a consequence the BRR received the license for physical start up[2] and the operation license was then issued in November 1993. Following the reactor start up, as the BNC put the facilities around the reactor into operation and started to manage the utilization strategy, it became obvious that the BNC could effectively represent the user interests, thereby leaving the reactor management to focus on safe reactor operation. Thus, a decision was made to separate the reactor operation matters from the utilization ones.

In general, the mission or goal of the operation of a RR, put briefly, is to: serve as a neutron source for research, industrial and nuclear medical applications; and to provide for education and training purposes on materials science and nuclear fields. Often in practice, one of the goals will play a bigger role at a reactor while the others are less or missing entirely due to technical reasons and/or local utilization policy. Fulfilling the service duties of a well-utilized RR requires a tight reactor operation with a precisely kept operation schedule, which may occasionally conflict sometimes with safe operation requirements. It is a manifestation of Murphy’s Law that the improving utilization level increases not only the duties of RR operators, but increases the user abilities to enforce their interests, directly or indirectly, referring to contract obligations or the unwritten ‘rating’ of the experimental facility, etc. The reactor operators know this phenomenon well, where the user interests appear parallel with the commissioning the experimental facilities. Thus, based on our experiences, the way that the operation and utilisation issues are managed plays a pivotal role from the viewpoint of safe RR operation.

As is well known, nuclear safety is paramount. However, on the other hand it is also important (and in certain circumstances an acceptable demand) that the interests of utilizations (e.g. service obligation of an experimental facility) should also be considered when making decisions on reactor operation. Since, in the end the goal is not just to be safe, but to safely serve research.

With respect to the 14-year operation since the overall reconstruction it can be reasoned that the applied operational structure at the BRR ensures a kind of proactive approach with the separation of operating duties from the utilization. This organizational structure allocates responsibilities and delegates authority within the organization with a view to achieving safety sensitive management and a proper decision making process. On the basis of the operating experiences it can also be reasoned that the independent representation of the interests of both sides (safe operation versus service obligations) increases nuclear safety and serves the user interests during the decision procedure.

The main features of the applied operation[3] structure at BBR, with respect to the IAEA Safety Standards [2], can be summarized as follows. The BRR’s operation structure is divided into two organizations: a) Operating Organization; b) Organization for Utilization which is as actually the BNC. The responsibilities and duties of the two structures are as follows:

a) Operating Organization responsible for:

   – Safe reactor operation including inspections, maintenance, fuel handling, as well as education and training of staff.

   – Performing all nuclear specific duties arising around the reactor, such as: radiation protection, physical protection, waste management, emergency planning, etc.

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[2] It should be emphasized also that the IAEA, with its encouragement, moral support, and impartial endorsement based on the review of the preliminary safety analyses report (PSAR) also provided considerable help to win the backing of the public and Regulatory Body for the reactor start up.

[3] The term operation is interpreted as it is defined under the title of “Operation” in [2], p 70.

- Operation of those experimental facilities (including their service) that can influence nuclear safety (e.g. rigs inserted into the core, and horizontal beam port facilities located before beam port shutters).

- Maintain regulations, including preparing, updating and archiving mandatory documentation.

b) BNC, acting as Organization for BRR's utilization, is responsible for:

- Effective and safe utilization of BRR facilities including implementation of new experimental stations and operation of the existing ones (except those that may influence safety). In addition they must operate and improve the research infrastructure to facilitate access for users and act as an interface between the users and facility operators.

- Managing an International Scientific Advisory Council (ISAC) of renowned European scientists (15 members) to provide important guidelines for the BNC's Executive Board when conducting scientific programmes, instrument developments, user policy etc.

- Operate national and international user programmes, 'marketing' user capabilities, managing international collaboration agreements, training young scientists or newcomers.

- Application for national and international research grants to contribute to the operation, development and scientific research budget. They must also manage the selection of applications (experimental proposals) by operating an international expert panel.

- Representation of BNC and/or the national user community by BNC experts (leading staff members) at various international bodies or organizations for RR operation and utilization (e.g. at IAEA, IGORR, ENSA, EU-NMI3).

- Dissemination of research and technical achievements, whilst ensuring transparency of utilization activities and free access to public domain databases.

The only overlapped field is where the utilization concerns the reactor safety. The Operating Organization is responsible for design, commissioning and operating and/or service of experimental devises. Some limited operating function or service activity may be assigned or subcontracted to other organizations (e.g. BNC) but it shall not delegate their responsibilities. All responsibilities in connection with these facilities from the commissioning to the decommissioning remain with the BRR's Operating Organization in line with the recommendations of the CoC.

Due to this management system, which has been maintained almost since the time of reactor start up in 1993, the reactor manager is responsible only for the safe reactor operation, leaving the utilization issues to be managed by the BNC. The advantage of this management system, especially at those RRs that have an enhanced utilization, is obvious: this operational practice guarantees a high safety priority and at the same time looks out for user interests. In addition, as a consequence, the ability to lobby either for the reactor or utilization has been duplicated. Now this management system is highlighted as being one of the best operation practices [1].

2.2. Conformity and safety reviews

During the last 15 years, with an increased regulatory surveillance, two conformity reviews (CRs) and one periodic safety review (PSR) have been conducted at the BRR. Although the staff believed that the reactor and the applied procedures satisfied the NSRs in every respect, each review still revealed some deficiencies or highlighted some week points.

The CRs were passed following the issuing of NSRs in 1997 and then in 2005. The CRs essentially consisted of a number of comparison assessments, where the conformity to the design requirements and the implementation of operation requirements were reviewed and evaluated on the existing reactor structures and the applied operation practices including the status survey of mandatory documentation. The CRs were a kind of vertical screening, where a qualifying comparison was made during which we collated the points of the current NSRs with the existing status of the reactor or practices with the regulations followed. In this itemized comparison we displayed and verified the adequacy or deficiencies of the BRR and its operation practices with respect to the requirements. By virtue of the practices determined by the regulations and the long-term RR operational experience, no serious deficiencies were found that would have indicated any need for temporary or permanent restrictive and/or limiting measures. In the case of the CR in 2005 the conformity was nearly 100%. This was due to the PSR, which revealed deficiencies that had already been solved by that time. Nevertheless the deficiencies partly concerned the final safety analyses (FSAR), in which we had to supplement the analyses of the secondary circuit with special consideration to the maintenance of the heat exchangers, and the emergency preparedness, as a consequence of which we had to develop the emergency public communication procedure and install a HW unit to record the emergency communication.

Regarding the PSR, the Hungarian legal system, in line with the CoC recommendations, obliges operators to prepare a safety review every decade. As the BRR's operation licence was issued in 1993 the operating organization was obliged to conduct a PSR in 2002-2003, which ensured a complex overall review of the BRR, treating the reactor as a complex system whilst taking into account its service life. The general philosophy of the PSR was to assess the condition of the reactor structures with respect to the 10-year operation record, and evaluate all operational experiences including event records [3]. In general the review aspects were grouped into four types of audits, such as:

- audit of technical correspondence where the actual condition of the reactor had to be presented and the adequacy of the reactor systems and subsystems had to be verified with special consideration to the forthcoming 10 year operation period;

- audit of regulations regarding the rules of procedures, with special consideration to their periodic auditing and upgrade based on our own experience and that from other research reactors, which all had to be reviewed and evaluated;

- audit of human factors including activities, preparedness and all aspects of the organization of the staff, which had to be reviewed and evaluated;

- audit of conformity to nuclear safety regulations that included a detailed comparison between the current NSRs and the existing technical status of the reactor and/or applied procedures, practices, etc. in order to demonstrate and verify conformity with the requirements (in practical terms this was the 3rd CR in the review period).

The technical audit involved the review of six issues: the technical status of the facility; system qualification; ageing; features of safe operation (safety margins); environmental influences; and safety analysis. Although the utilization issues were not the focus of the PSR, their overview and influences on safety were also taken into account. During the PSR, the most important parts of the validation test procedures of the reactor systems carried out during system installation and commissioning in the period of the reactor upgrade were repeated and the latest results were compared with the nominal database values recorded 10-12 years earlier during the same validation test procedures. Based on the results of these comparisons and the operational data and event-audit it could be declared that no significant ageing problems, no unexpected degradation, and no singular phenomena on any safety-critical system or component was found. Any degradation was in accordance with the service life. As part of the technical audit we reassessed the final safety analysis report (FSAR). Taking into consideration the results of the validation procedures and the 10-year event records we concluded that the assumptions of the preliminary safety analyses report (PSAR) and its extreme conservatism were confirmed and verified both by the operational experience and by the FSAR reassessments.

Under the regulation audit heading four items were reviewed, viz. the rules of procedures, utilization of experiences, research and development (R&D) activities, and the QA program. The regulations were also reviewed, from the operation limits and conditions (OLCs) to the safety regulations, as well as maintenance programs, education, training and examination rules. As an important factor the utilization of experience, as a method for using feedback to improve the applied procedures, was also investigated. With regard to the regulation audit, data log files on the 10-year operation period were processed and summarized from the viewpoint of (amongst other things): OLCs' violations, ageing, campaign pointers, environmental influences, fuel cycle handling, and waste management.

In the frame of the audit of human factors, thorough and painstaking reviews were performed involving all safety issues. These included all organization and administrative factors and human factors relating to safety culture. On the basis of the review it could be certified that the 10-year service life of the reactor was safe and there were no violations of the OLCs. The operation and maintenance practices met with both the Regulatory Body's regulations and the local regulations. From the perspective of human factors and safety culture appearing in everyday practice the PSR declared that the operational environment would promote future safe and reliable reactor operation.

The audit of conformity involved a qualifying comparison where the applied practices were compared and evaluated with respect to the NSRs as was described above for the CRs. An interesting result that should be emphasized is that any non-conformity found by the comparisons were the same as those revealed by the three audits already mentioned above (this is why we named the first tree audits as horizontal screening and the forth one as a vertical screening that could be used to verify the first three).

On the basis of the PSR the operation licence was renewed, and at the same time, as safety increasing measures the regulatory body prescribed renewals of some reactor systems and the update and completion of elaborating measures and work procedures (e.g. emergency plan, system qualification, QA programs, program for ageing management, etc.). Altogether this included more than 30 obligations for the next 4 years. As the deadline for satisfying the final prescribed obligation elapsed in this year, coinciding with our latest self-assessment, we certified that by the middle of 2007 the BRR had completed all binding-acts prescribed by the PSR's resolution.

Looking at the big picture, the CRs and PSR have been extremely useful not only in surveying the conformity of the applied practices with respect to the NSRs but also in strengthening the safety culture disseminated among the BRR's operators and frontline staff members. The key to gaining this extra benefit was to involve them in the review and make the review activity and goals transparent (including giving reasons for why it was happening) even to the frontline staff.

2.3. Safety culture focusing on human factors

An essential aspect of nuclear safety addressed in many chapters of the CoC concerns the subject of nuclear safety culture together with human factors and they are highlighted as being the concern of authority and operation organization. Indeed this is correct; the safety is essentially determined by the safety culture adopted by the organizations and individuals at the different levels of the hierarchy, along with their respective duties and responsibilities.

Safety has been given the highest priority at the BRR since the time of the first criticality. This safety-committed approach formed a deep-rooted nuclear safety culture at the reactor that has been inherited down through the generations. As it is essential, the importance of safety is understood both by the top reactor management and by all staff involved in the operation organization. During the PSR the safety culture of the operating organization with respect to human factors was reviewed, and the guidelines were appointed. That is: the good practices were reinforced while the bad ones were rectified.

The safety culture *"is that assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance."* [4]. The safety culture involves many elements. It is determined and driven by many factors. The culture itself is a strange thing that is difficult to accurately define. *"We see it every day; it drives our thinking, our values, what we eat, what we wear, how we behave and* *what we believe in. Yet within an organization we need to bring together a widely diverse set of individuals who outside of the organization live to their own cultural norms. At work they need to understand, adapt and adopt the culture norms of organization … (…) And it should be remembered that culture is not wholly self-sustaining; it takes time and effort to establish the correct culture, and enormous effort to maintain it...”* [5].

Emphasizing the complexity of safety culture we would like to highlight a few key elements and other, seldom mentioned factors that feature, determine and even drive the BRR’s nuclear safety culture within the operating organization.

The first one is the operational environment. A RR, in general, operates in an environment determined by research. More over, usually the operating organization belongs to a research institute. The research itself has a large degree of freedom with a widespread experimenting attitude where the guiding compass is cognition. In contrast the RR’s operation requires a rule-oriented behavior where the guiding compass is safety. Due to the operational environment, interference between the two culture attitudes cannot be avoided. Indeed it may be a risk factor and therefore from a perspective of safety it is important to develop a clear separation between the experimenting and operational matters. At the BRR it is obvious to every staff member that the reactor itself is not subject of any research and experiment. On the other hand the operation and utilization practice introduced in Subsection 2.1 means an organization must guaranty the safe handling of both demands from the primary viewpoint of safe operation. With this practice we maintain a safety committed operating organization, the duties and responsibilities of which are limited to the reactor safety and are free from any other obligations. However in practice it is not so straightforward to handle. The knowledge of how to separate the experimenting attitude from the operation attitude in such a way that the RR can support its experimenting environment whilst still keeping nuclear safety paramount can take time to acquire. This knowledge and/or ability indicates the maturity of the operating organization.

The second key factor is the documentation management, which is emphasized in the CoC as an important requisite of safe operation. It should be stated that prior to the regulatory demands, the BRR maintained a set of written regulations and documented all activities developed and improved by practical demands since the very beginning of its lifetime. This formed the cultural background that preceded the overall reconstruction and upgrade that was completed in 1993. Following the upgrade, in 1993 the operation license was issued on the basis of the FSAR that was based on the PSAR. This FSAR comprised the test results of commissioning procedures and the measurements of physical and energetic start-up. The most important mandatory documents were also elaborated by that time, but they were completed during in the 5-6 years after the reconstruction. Due to the two CRs and PSR mentioned above, presently the BRR has a well-structured, complete, and up-to-date set of operation documentation conforming to the NSRs in all respects. Integral parts of this documentation are: the regulation of OLCs; Safety Classifications of reactor systems; Quality Assurance (QA); Ageing Management; System Qualification Programs; and a set of Work Procedures. These work procedures regulate, in written form, all activates around the reactor and are reviewed and updated every 3 years.

More over it is worth emphasising in particular two documents. The first one is the Procedure of Experience Gathering (both within the BRR and in RRs in general), which forms the main basis of a document review (source of experience feedback) along with the Procedure of Calculation and Logging of the BRR’s Safety Indicators (pointers). The second is the QA program, which, among other things, identifies the structure of the documentation and defines the rules of document handling[4]. The most

[4] In connection with the QA program it should be mentioned that, in our opinion, many national regulations and international recommendations treat RRs as independent organizations, although an RR and/or its operating organization always belongs to an institute. That is, the RR, in general is not an independent organization with its own HR policy, financial background, or even QA program. In our case for example, in addition to the QA program of the parent institute the BRR’s Operation Organization has a separate QA program with special consideration paid to reactor operation issues, as opposed to the requirements of research and enterprise that dominate that of the parent institute. On the other hand we do not have our own financial, HR, or social policies, etc.

common feature of these documents is that each contains a ‘Document Maintaining Section’ in which a supervisor of the concerned document is named. This document curator is responsible for ensuring the document is up-to-date (e.g. by following the development of documentation at other institutes to ensure the best practises are used and by tracking regulations to ensure the current documentation contains no contradictions) and initiating prompt document review if necessary.

The new version of the QA program, which was also issued following the PSR, classifies the human function as a safety critical barrier and stipulates the expected safety policy. That is to say each staff member is committed to implementing a policy of safety awareness, which should be based on perception and prevention. The QA program prescribes as a general requirement that all activities should be carried out in planned, controlled and documented ways even if these obligations are not prescribed in a given case. This approach prescribes behaviour that everybody is expected to follow. In simple terms it is expected that everyone align his/her behaviour at all times by performing activities in the documented way at all times, not just when being supervised, coached, or observed.

Although there are no unusual elements within our managerial policy concerning the safety culture, it is worthwhile summarizing some that are consciously applied for the purpose of internalising safety culture in the everyday practice. They are: visible management commitment to safety; enhanced awareness and understanding of the concepts of safety issues; feedback methods on the basis of lessons learned; effectiveness versus safety; trust between management and front-line staff; safety training; fostering a questioning attitude and responding to given questions (eliminate ‘just do it’, behaviour); and right to make a mistake (pursue and punish concealing of mistakes).

Expanding a little the last mentioned attitude, it is a general policy that mistakes and failures are kept as a part of the human activity (human in the loop). Although we intend to mitigate the human risk with careful planning and multilevel control, we cannot exclude small or large mistakes, omissions or near misses. We expect that if someone makes a mistake, they do not conceal it, but reveal it immediately, and we in turn take care that no one gets penalized for the admission of the mistake. Conversely we do not tolerate the concealment of mistakes, no matter the reason. Using the recommendation of international practices we tolerate mistakes and correct it on the one hand, but on the other hand we ensure that mistakes made at all levels be transparent (it also is clear that mistakes can not only be made in the lower levels of the hierarchy).

2.4. Demonstrate the safety

It has been obvious since the PSR that there is an increasing demand by society for a nuclear facility not only to be safe, but also to be seen to be safe. Thus the BRR’s operating organization continuously strives to demonstrate the safety. There are many traditional (regular reporting, open door policy, etc.) and modern practices (internet technologies) that ensure near continuous access to the reactor indicators and events. On the basis of general experience in this field it can be stated that to meet the demand (demonstrate the safety) the common approach of any public information system is to increase the transparency and traceability of the activities. The public information must not only contain the information necessary to justify the conformity and demonstrate the safety, but must do so in an easily accessible manner. We systematically pay special attention to increasing the transparency of our activity and do much to avoid appearing secretive. For decades we have maintained a visitor policy on fixed days (the last Friday in each month is an open day) when we ensure a guided tour for all our visitors from schoolchildren to the pensioners and allow them to view our everyday work. We host visitors of different national and international civil organizations, representatives of media, delegates of authorities, etc. We are members of several national informative programs, which provide excellent opportunities for bringing in visitors to resolve some of their doubts. For example we joined the program of European Cultural Heritage Days, which year by year ensures an outstanding opportunity to open our doors to the world in the frame of a standalone organization infrastructure. The BRR and BNC use modern mediums of communication offered by internet technologies (http://www.kfki.hu/brr, http://www.bnc.hu/). For example the real-time data of the campus environmental monitoring system (gamma dose-rate values of 17 probes) is available online at the IP-address of http://148.6.176.241. In any case the operation and utilization practice introduced in Subsection 2.1 automatically ensures a good level of transparency, that independent users have a clear insight into the reactor throughout, and that information publication is not controlled by the operating organization.

Based on feedback from the public, the most important considerations are that the information be authentic, coherent and comparable with previous years. It must also clearly report unscheduled events and provide comparison to well-known pointers. To meet this public demand one of the best comparisons to make is to demonstrate conformity to operation regulations and records. Another strong comparison to make is between the safety indicators of the reactor and the appropriate aspects of the IAEA's standards and recommendations, and (above all) the IAEA's 'Code of Conduct on the Safety of Research Reactors'. Based on our experiences from the time of restarting the upgraded reactor we can emphasise the importance of the INSARR (Integrated safety assessment of RR) missions of the IAEA that include impartial screenings of the reactor, observations and advice that can act as a guide. In addition, as the screenings are 'weighted' by the RR community the reactor has an authentic record, which validates the reactor status including human issues and demonstrates the safety. Being self-critical, we have to admit that (due to many factors but chiefly time) in the past 15 years we did not take the opportunity and advantages of such an integrated safety assessment conducted by the IAEA. This omission has denied us an effective driving force for the demonstration of safety.

3. Conclusions

In summarizing the general management practice with respect to the CoC, two important statements can be made. Firstly: the CoC does not contradict the everyday practices (including the legislative and safety standards and regulation system). Secondly: the CoC clarifies the duties and responsibilities of all, be they organizations, regulatory bodies, or individuals (regardless of their position relative to the management hierarchy). Hence, the CoC acts as a compass that harmonizes and directs the safety approach taken at all levels, from the top to the implementation. It may be said therefore that it shapes the unity of content and form of a RR's safety.

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