

The Roles of Institutions in Developing the Professionalism of Nuclear Personnel

**C.K. Scott
Atlantic Nuclear Services Ltd.
P.O. Box 1268, Fredericton, NB
E3B 5C8**

**Paper presented at 26th Annual Conference
of the Canadian Nuclear Society,
Toronto, June 12-15, 2005**

Abstract

The importance of professionalism in the construction and operation of nuclear power plants is reviewed. Given the role that a professional plays in business decisions, the institutions supporting the professionals in their competency and independence are important components of the industry. The paper discusses areas where the institutions can provide additional support including: standards of professional conduct, professional certification, development of standards, and professional exchanges. Improvements in these areas will improve the quality and productivity of the professionals. The benefit from the improvements is the business goals of safety, production and cost control are more readily achievable.

1. Introduction

The enhancement of professionalism has been one of INPO's themes for improving the operating performance of nuclear power plants. Their focus is on management activities to promote professionalism. However, the employer – employee relationship for professionals is bi-lateral and for mutual benefit. The primary responsibility for professional conduct and development is with the employee and the employer supports it. The purpose of this paper is to examine the support provided to professionals by institutions other than the employer.

The infrastructure supporting nuclear professionals is evolving because of three drivers in the industry.

1. The ageing of the professional staff and the need to develop new staff.
2. The transfer of the management of the electric power industry from state monopolies to the private sector.
3. The competitive need to improve plant performance in safety, production and cost control.

Examples of initiatives to support the development of the technical competence of professional staff include the following. The CANTEACH project is focused on preserving CANDU technology and is an important resource for developing new professionals for the industry. The Canadian Nuclear Society (CNS) has become more active in sponsoring training courses to transfer knowledge and skills to a new generation of professionals. Also, the universities and colleges have become more active in the basic training of students for nuclear careers. Other initiatives in the workplace include the adoption of the systematic approach to training, performance objectives and continuous improvement.

Building on these activities this paper makes the case for initiatives in the following areas:

- professional conduct
- technical standards
- professional certification
- professional exchanges

The concept of nuclear professionalism is discussed in Section 2. Its purpose is to establish the need for support for professionals. The benefits of improved professional conduct and standards are discussed in Section 3. The possible roles of existing institutions in providing the required support are described.

The paper concludes in Section 4 with a summary of the benefits of improved professional performance.

2. Nuclear Professionalism

An occupation or career is referred to as a profession if it requires particular skills or knowledge. Often the individual is designated as a professional or member of the profession through a certification process. If there is a certification process, there is a governing body that establishes the rules and standards of the profession.

A professional is a person whose job requires specialized education or training so they become a skilled practitioner or an expert. Most nuclear energy workers can be characterized as nuclear professionals. They need to perform their jobs with skill and expertise as professionals.

A nuclear professional brings their professional status to their work place and maintain it apart from the workplace. For example, registration as a Professional Engineer is a certification process between the individual engineer and the professional engineers association. The registration is not dependent upon the engineer's employment but it limits the type of work the engineer can perform for the employer. This 'sandwiching' of the professional between the employer and the professional associations is illustrated in Figure 1.

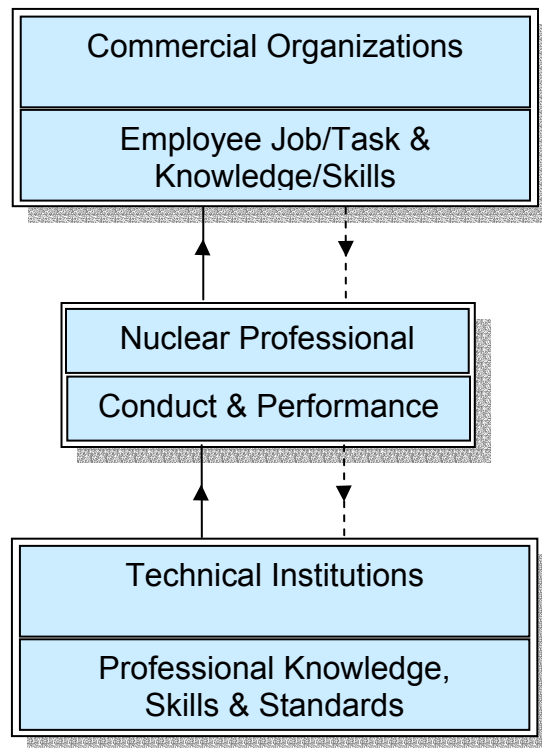


Figure 1 The Development of the Nuclear Professional as the Key Resource of Technical Enterprises

In Figure 1, the dashed arrows indicate the employers support for professional development beyond specific job requirements and the professional's contribution to the community.

Although professionals are defined by what they do, there are expectations for the way they conduct themselves and perform their job.

A minimum level of professionalism is needed to implement complex technologies as effective business operations. It is difficult to establish the minimum level of performance that is necessary for success. However, measures for acceptable levels of professionalism can be established by experience and bench marking against successful businesses.

2.1 Characterization of Professionalism

Professional societies usually have codes or standards of conduct that are expected of members. These codes and standards implement the following principles of professionalism.

1. A professional is committed to the highest standards of personal integrity and professional competence.
2. A professional places the interests of society ahead of their own self-interest.
3. A professional treats all co-workers fairly, honestly and with respect.
4. A professional seeks to improve the conduct of their profession and its benefits to society.

These principles are expanded into Codes of Ethics or Conduct that list specific behavioral expectations.

The enhancement of nuclear professionalism is an important component of performance improvement at nuclear power plants.

2.2. The Importance of Nuclear Professionalism

The principles of nuclear professionalism have a direct bearing on the business objectives of safety, production and cost control for a nuclear power plant. These three objectives are inter-dependent. A plant that is experiencing frequent equipment failures and forced outages is less safe, losing production and being operated at higher cost.

Nuclear safety is used here as an example to describe the importance of nuclear professionalism. Table 1 gives the three criteria that can be used to characterize and categorize deficiencies in operational safety.

Defence in depth captures the safety design of the plant including safety features and the operating limits and constraints.

1. Failures of each level of defence in depth are due to either equipment or human failures.
2. Application of professional standards in the performance of work minimizes the incidence of equipment and human failures.
3. A coincident failure of all three levels of defence can occur if the station's management system does not systematically apply high professional standards in the performance of work.
4. The responsibility for applying high professional standards is shared between the employer and the employee.

Table 1 – Criteria for Categorizing the Significance of Operating Deficiencies

Category	Criteria
<p>LOW</p> <p>A small impact on safety</p>	<p>Defence in depth One or more levels affected but DBA consequences unchanged</p> <p>Safety Culture Commitments to safety warrant improvements</p> <p>Performance Management Quality of work warrants improvements</p>
<p>MEDIUM</p> <p>A significant impact on safety</p>	<p>Defence in depth One or more levels significantly affected so that DBA consequences increased</p> <p>Safety Culture Commitments to safety are not adequate</p> <p>Performance Management Quality of work is inadequate</p>
<p>HIGH</p> <p>A major impact on safety</p>	<p>Defence in depth One or more levels are lost so that ability to prevent releases for DBA is not adequate</p> <p>Safety Culture Commitments to safety are unacceptable</p> <p>Performance Management Quality of work is unacceptable</p>

Safety Culture captures the commitment of the station staff to operating the plant as intended by the safety design.

1. Nuclear professionals understand the nuclear hazard and the potential consequences of an accident. They are committed to ensuring safety through the application of the basic safety principles of defence in depth, control/cool/contain, and ALARA.
2. The nuclear professional contribution to a plant's safety culture is the commitment to 'safety first' demonstrated by the attributes:
 - a questioning attitude that challenges assumptions, investigates anomalies and includes contingencies to compensate for potential adverse consequences of actions
 - a rigorous approach to work activities as implemented in the station's management system
 - a prudent approach to solving problems with conservative actions being taken whenever understanding is incomplete
 - continuous communication with managers, co-workers and peers to understand expectations, technical issues and best practices to create a shared understanding of safety and its importance to the success of the station
3. A weak safety culture compromises all levels of defence in depth leading to an unacceptable level of risk from operation of the plant.

Performance Management captures the effectiveness of the station's management system in achieving the business objectives.

1. Nuclear professionals are committed to being knowledgeable and skilled in all aspects of jobs and tasks assigned to them.
2. Management is responsible for ensuring that staff are qualified to perform assigned tasks. Nevertheless, a professional is responsible for only performing work for which they are competent.
3. Nuclear professionals follow a professional development plan and their effort is supported by their employer.
4. The objective of a quality management program is to prevent undesirable consequences of poor work practices. For a nuclear plant that objective is "safe and reliable" operation.

3. The Roles of Institutions

There are four types of institutions that support the development of nuclear professionals. They are shown in Figure 2 where the directional arrows indicate the dominant direction of the transactions.

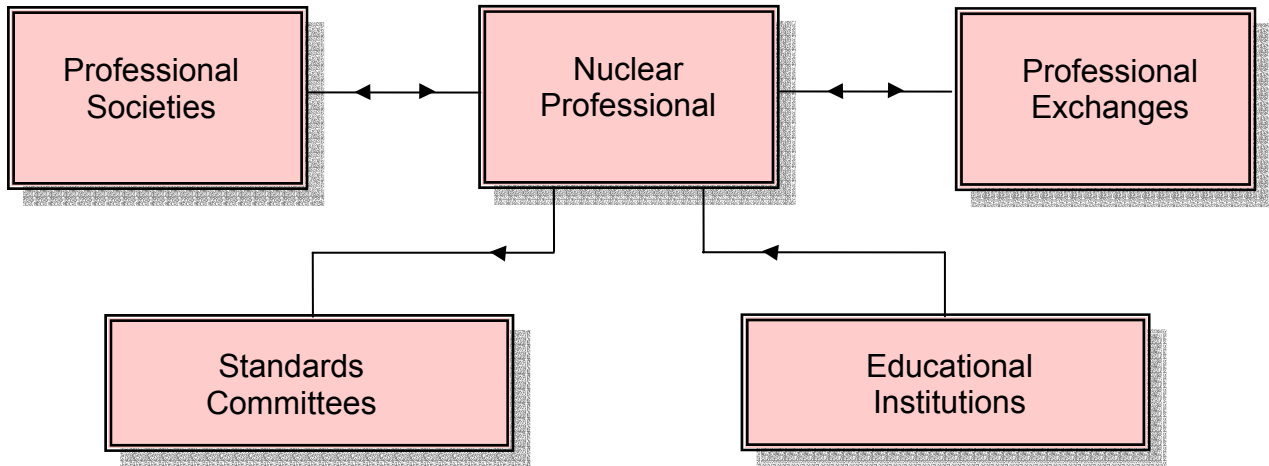


Figure 2 – Institutions that Enhance Nuclear Professionalism

3.1 Professional Societies

Most professions have professional societies that support their members through

- standards of professional conduct
- professional development
- peer exchanges of information
- promotion of the profession for the benefit of society.

The Canadian Nuclear Society has been a strong and effective society in supporting nuclear professionals in Canada. It has been particularly strong in providing opportunities for professional exchanges regarding CANDU technology. More recently, it has been sponsoring training courses on aspects of the technology.

The process of giving continuing education credits for professional development courses is becoming well established. However, it would be useful if there were guidance for nuclear professionals as to the courses they should take and the expected outcome. The Canadian Nuclear Society, as well as other professional societies, could provide recommendations for courses to reach a particular level of competence.

An element of this could be a 'certification' process whereby a given set of courses qualify the individual as a specialist. This would serve as a motivating factor for professionals to engage in the professional development programs.

The Canadian Nuclear Society has not been involved in establishing standards of professional conduct. This is an area where it could make a significant contribution.

There is a gap because many members of the CNS are not members of professional engineering associations which have standards for professional conduct.

Standards for professional conduct are fundamental for the integrity of business decisions regarding the use of technologies. Practicing professionals have to remain vigilant in ensuring they present facts and reasoned positions for decision makers to select options.

3.2 Professional Exchanges

Professionals are committed to improving and advancing their technology. Exchanges with peers are important for benchmarking their practices and adopting improvements. One of the major activities of professional societies is the sponsorship of conferences and workshops to facilitate technical exchanges and adoption of best practices. The Canadian Nuclear Society does a good job of promoting technical exchanges within the CANDU community.

The Canadian community of nuclear professionals is a small national unit. This and the localized CANDU technology tends to isolate the community from exchanges with the international professionals associated with other technologies.

Professionals need to look beyond the Canadian community to be aware of developments in nuclear technology that are not specific to a reactor type. There are many developments in the past 20 years that are generic. Nearly all the industry's improvements in operational performance, both safety and production, are in this category.

Professionals have to establish their own links to the international community. This can be via membership in other societies such as the American Nuclear Society and by attending major international conferences. Some of these activities would require support from employers.

The Canadian Nuclear Society could support this by arranging conference sessions with an international perspective. Another mechanism would be focused workshops on particular topics with international participation. Examples of topical areas that would be useful include, management of ageing plants, risk informed decision making, and technical training of nuclear professionals.

3.3 Standards Committees

Technical standards are best practices that are prepared by a panels of professionals with experience in the topical areas. Their technical recommendations are adopted for use by the industry and published by a controlling standards organization (e.g. CSA). There are many standards organizations and industry groups with common interests. Consequently, an industry group often chooses to adopt a standard from another jurisdiction. For example, IEEE standards are widely used internationally.

In Canada we use a mix of Canadian and international standards (e.g. IEEE, IAEA, ASME, IEC). As well, the Canadian Nuclear Safety Commission sets out regulatory standards for the design and operation of nuclear power plants.

The use of technical standards is fundamental to performance management for nuclear professionals. They are important for both the quality of the work done and for cost control.

The technical committee that prepares the standard performs the technical review for the verification and validation of the method adopted in the standard. When the standard is used in the workplace, the only technical decision that has to be made is the appropriateness of the standard for the job at hand. If a standard is not used to guide the technical work, there has to be an independent review for verification and validation of the work done. This is an additional cost that would not be required if a standard was used.

The Canadian Nuclear Society, with support from the Canadian Nuclear Association could play a significant role in the initial technical development or adoption of standards. By providing a coordinating function the members could make up the committees for standards review and development. There are many retired technical experts who have a lot to contribute.

The Canadian Nuclear Society could also coordinate Canadian contributions to international standards. The IAEA standards and guides are produced by international committees. Often the only Canadian input is from the Canadian Nuclear Safety Commission.

3.4 Educational Institutions

There has been a lot of progress in Canada recently in reviving the capacity of educational institutions to perform the basic training needed for a viable nuclear industry. This is important infrastructure development that is best handled by the institutions responding to the industry's needs.

4.0 Summary

In this paper I have outlined the importance of professionalism in the nuclear community. There are several areas where we can look to improving the support provided to professionals, including:

- standards of professional conduct
- development and/or adoption of standards
- workshops and conference sessions to bring the international perspective on technical issues to Canadian professionals
- certification status as a goal for continuing education.

The Canadian Nuclear Society is in a position to provide the leadership in these initiatives.

One of the problems besetting the Canadian nuclear industry is the high cost of building and operating the power plants. A strong commitment to the principles of professionalism would contribute to reducing cost through high quality performance and standardized work procedures.