

2001 INTERNATIONAL ALARA SYMPOSIUM EXCELLENCE IN OCCUPATIONAL DOSE REDUCTION IN THE NEW MILLENNIUM: THE FIRST INTERNATIONAL ALARA SYMPOSIUM IN THE 21ST CENTURY

ANAHEIM, CALIFORNIA • FEBRUARY 5 -7, 2001

ANÍBAL MARTÍN, VICE-CHAIRMAN OF THE CSN

Del 5 al 7 de febrero ha tenido lugar en Anaheim (California) el Simposio Internacional ALARA 2001 sobre "Radiological Protection Challenges in NPP's Management on the Verge of the XXI Century".

En este Congreso, Aníbal Martín, Vicepresidente del Consejo de Seguridad Nuclear ha recibido una mención honorífica de la Health Physics Society por su trayectoria profesional dentro del mundo nuclear. Tras la entrega de la placa conmemorativa, Aníbal Martín pronunció un discurso, que reproducimos a continuación.

The International Symposium ALARA 2001 on "Radiological Protection Challenges in NPP's Management on the Verge of the XXI Century" took place in Anaheim, California on February 5-7.

In this Congress, Aníbal Martín, Vice-President of the Consejo de Seguridad Nuclear, received an honorable mention from the Health Physics Society for his professional career in the nuclear arena. After being awarded the commemorative plaque, Aníbal Martín addressed the meeting. His speech is reproduced below.

Let me first express my gratitude and recognition to the President Emeritus Committee of the United States Health Physics Society for having selected me as the Morgan lecturer in this occasion. It represents a great honour and responsibility to be here under this nomination.

I would like to greet you all and say that it is a pleasure to be with you today for the opening session of this first international ALARA Symposium in the 21st century on "Excellence in Occupational Dose Reduction in The New Millennium". Organized by the ISOE North American Technical Center and sponsored by NEA and IAEA, this workshop gathers the best world-wide heritage in encouraging scientific and technological progress and promoting contacts between radiological protection managers and experts within the domain of nuclear power plants.

As a member of Consejo de Seguridad Nuclear, the regulatory authority of Spain, I wish to convey our organization's salutation. My purpose today is to share some ideas and remarks on the current developments and trends affecting nuclear and radiation regulation related to occupational dose reduction.

A CHANGING AND CHALLENGING SCENARIO

First of all, the nuclear activity is constantly evolving even though its development has reached a state of maturity, and this dynamics continuously modify the shape of the mid- and long-term challenges. Issues such as waste management and installation dismantling, ageing and life management, staff restructuring and renovation, and maintenance of technological capabilities give rise to questions that are being addressed, and should be addressed systematically and sufficiently in advance. Therefore, it is to be expected that new initiatives will be undertaken in the form of research and development programs that may possibly be more important than current ones. Work methods should at least equal the challenges, and there is an obvious need to intensify multi-institutional and multinational collaboration, to which end each organization should have a clear idea of its own specific goals.

There is today, in my view, whatever the circumstances are, an international trend to gain effectiveness in regulatory control, through systematic strategic

analysis, formulation and implementation. Within the OECD's Nuclear Energy Agency framework, I have to make reference to the Strategic Plan for the Agency recently approved by the Steering Committee (1999), and also I would like to refer for a more detailed view on regulation, to the document "Future Nuclear Regulatory Challenges" issued by the Committee on Nuclear Regulatory Activities back in 1998.

It is highly recommended that short- and long-term needs be analyzed, and that strategies be established to systematically provide solutions. The current Consejo de Seguridad Nuclear established its Strategic Target Plan in 1995 to address the modernization and updating of regulatory activities in Spain. Certainly it has been a useful tool and that in general its goals have been achieved, such as implementation of a new licensing policy, improved standards, improved work procedures, regulatory process and information systems. A short- and mid-term analysis is now an established practice both in industry and regulatory bodies, as well as in international organizations, and this requires periodic refining and upgrading. Since

the speed of change is high a systematic and effective response is necessary well in advance.

To stress this idea in the U.S., in this country where systematic strategy setting is a must for any complex undertaking, it may appear as obvious. Again, the type of challenges foreseen for the next 10-15 years require highly innovative initiatives, in which research, development and innovation plans should play an increasingly relevant role.

DEREGULATION OF ELECTRICITY MARKET

In Spain, the 1997 Electric Industry Law has resulted in competition of different electric power generating sources, where nuclear power generation is no different from the rest. The situation is not very different than in other places and is leading to deep restructuring in the way nuclear power plants are operated, in an effort to reduce costs and to improve efficiency while maintaining safety.

I firmly believe that the new challenges also represent an opportunity to improve the way work is done, and that the new system should lead to greater maturity as business is conducted with enhanced quality, thus resulting in a better situation in all aspects. The two basic tools that the operator has available to face these challenges are innovation and high quality standards in management. Optimization of management and technological enhancement are the tools for reconciling the apparently unsolvable dilemmas of increased safety versus cost reduction. Nuclear and radiation safety is an inevitable premise of nuclear activity, and thus it can and should be maintained and reinforced by deregulation of the electrical market, along with all those technical and economic parameters required to improve the competitive position within the new regulatory framework. This more advanced framework should stimulate optimal use of the resources involved in production and, I repeat, nuclear safety is an immutable premise of production.

I have already mentioned, and it is worth insisting on the growing importance that I believe technological upgrade, innovation and research and development programs will have in the future, and these should be steadily, methodically and systematically established.

Although recent operational experience corroborate these assertions, Regulators have to become fully aware of the safety challenges produced by the new system of electricity market regulation and should consider whether new regulatory responses are needed.

Competition is also causing that many nuclear operators request reductions in what they feel as unnecessary regulatory burden.

I have to briefly underline that deregulation is pushing for change in the way work is performed both at the operators and regulators side and identification, understanding and action on those changes is essential.

International Atomic Energy Agency is keeping track of this process and special reference is made here to the technical contributions for Senior Regulators Meeting of last two years. Let me also mention the forthcoming report on "Regulatory Challenges arising from competition in electricity markets" produced by the Committee on Nuclear Regulatory Activities of the OECD's Nuclear Energy Agency. A careful reading of the document is recommended both for plant operators and for those involved in regulation.

QUALITY AND MANAGEMENT

I will now refer to the demand for higher quality in operational management. Experience demonstrates that a high level of safety is an attribute of excellent management. Safety is therefore not a goal that conflicts with economic or technical operating results. Moreover, safety is not achieved by pursuing it as an isolated objective, but rather it is the result of the series of correct actions that make up management. It is a known fact that there is a close relationship between management quality and safety.

The concept of the Safety Culture refers to this aspect. More attention should be paid to this point, wherein lies a good part of possible safety improvements; electricity market deregulation requires that quality methodologies be developed in order to optimally allocate the limited available resources according to their impact on safety. Operators face a situation where the range in which they can operate profitably is diminishing and the pressures of an increasingly intolerant public opinion, not only with accidents but with any problem, are increasing, which means the margin for failure is narrowing.

For the operator, the solution again is to maintain high levels of technical competence and to make use of improved management techniques. For the regulator, the task is to ensure that the processes of change do not negatively affect the levels either of the safety culture or of safety itself while striving for better regulatory effectiveness.

Going back to Safety Culture, the concept was first introduced in INSAG's Summary Report on the Post-Accident

Review Meeting on the Chernobyl Accident, published by the IAEA as Safety Series Nº 75-INSAG-1 in 1986, and further expanded on in Basic Safety Principles for Nuclear Power Plants, Safety Series Nº 75-INSAG-3, issued in 1988. Much progress has been achieved in understanding its meaning and its applications to improve safety worldwide. Still there appears to be large room for analysis of those factors related to individual, organisational and managerial behaviour that affect nuclear safety. To the extent that contributors to a sound Safety Culture are understood and determined, it will be possible not only having better tools for improving safety and efficiency, but to measure and monitor their impact on the risk of the plant.

The enormous stock of knowledge and the methodologies of scientific management can contribute extensively to this task. It is a sensitive issue, research and development should be based on cooperation, such that the regulator does not discourage the operator or relieve it of any of its responsibilities. For the regulator, the objectives should be to identify problems, evaluate them, and make sure that the operator performs its function.

Let me mention now some specific examples of research effort being undertaken today in which Spain is involved:

Within the framework of NEA, an Special Expert Group on Human and Organizational Factors has been set up. This group has initiated an activity to gain a deep understanding of the state of the art of management and behavioural sciences applied in organizations where safety is a fundamental goal. This activity aims to check if management approaches used in the nuclear field make use of the best knowledge and scientific approaches available to insure safety.

The EURATOM research, development and training framework programs have recognized also the important role of organization and management on the safety of nuclear power plants. The 4th Framework Program already supported an activity called ORFA (Organizational Factors) that aimed to identify research activities in the topic. The 5th Framework Program included as a topic to support, in the area of Organisation and Management of safety, the "development of methods, and tools to assess the role of man, organisation and management in maintaining and improving safety". Several proposals requesting funding have been prepared but they had not been successful due to the complexity of the topic, although new proposals are on the pipeline. It is expected that the 6th Framework Program will include

the "development of best practice for integrating safety management in the overall operation of nuclear power plants".

In Spain, after an initial research project to review the state of the art of activities regarding the impact of organization and management on the safety of nuclear power plants, the Nuclear Utilities and CSN have started a joint five years research program on the same topic. The program has five main activities: (1) The participation in the ORFA project previously indicated, (2) The implementation of a preventive tool to identify potential degradations in safety due to management activities (here the previous work of US NRC and AECB of Canada is being used and a pilot application has been performed already, with encouraging results, at a Spanish NPP), (3) The implementation of a corrective tool to analyze the contribution of organizational and management to the causes of events that have occurred, (4) The implementation of tools to assess such a contribution during refueling outages (here we start from previous work done in France by EDF and IPSN), and (5) The incorporation on the PSA models of organizational factors (In this activity we cooperate in the international cooperative research program (COOPRA) hosted by NRC). The program has been widely appreciated by the fact that has attained the collaboration of the utilities, the regulatory body and the research organization in a complex and sensible issue.

At the end operators will be provided with enhanced tools for their optimization efforts and will help regulators to be able to better objectify the concepts associated with the safety culture and assure they are within acceptable limits.

THE REGULATORY PROCESS

The new electrical framework also originates other challenges to the regulatory system. Regulation has to be a dynamic process interacting with the evolution of its regulated activity, an ongoing and alive process in which analysis, decisions, implementation, experience gathering and feed back take a key role. Pressure for optimisation affects the potentially different approaches of the Regulatory Process that has to be considered with a holistic vision to assure the overall effectiveness of regulation at any time. The Consejo de Seguridad Nuclear addresses this aspect in its Strategic Target Plan, and the activities in progress are paying increasing attention to the application of knowledge acquired through probabilistic safety analyses, so that this knowledge can begin to be used to improve evaluation and propose resolutions.

Last months had witnessed two important events in Spain that are related to the new regulatory framework of electrical activities. These are the processes of consolidated management, which were begun first in the Ascó and Vandellós power plants, and later in the Almaraz and Trillo plants. From a position of non interference and respect, CSN is tracking and monitoring these processes, so that safety will be updated and fortified as a result of the structural modernization of these consortia.

Regulatory actions have been related to the assurance of minimum human resources to maintain nuclear safety and radiological protection.

There is pressure for a better nuclear safety regulatory process, but there is also a good rational basis for an improvement. Remarkable progress since the 1984 WASH-1400 has been achieved in developing detailed plant probabilistic risk analysis.

The information developed along with the rich operational experience is allowing one big step forward for rationalisation, the so called risk informed and performance based regulation. Eventually there will be a transformation of the complex set of regulations, but it is possible to observe today remarkable progress to improve the regulatory process, through specific regulatory decisions and the US NRC Revised Reactor Oversight Process is probably the most outstanding example.

THE REGULATORY SYSTEM IN RADIOLOGICAL PROTECTION

Let me now turn my sight more specifically to the regulatory system in radiological protection. The latest Recommendations of ICRP provide a new conceptual framework and represent a major step forward in the development of a comprehensive system of radiological protection. Much of Publication 60 is concerned with the establishment of dose limits. During the 1980's there were re-evaluations of the risk estimates that claimed for a reduction in dose limits. On this basis, ICRP recommended dose limits of an average of 20 mSv/y for occupational exposure. It is important that reduced dose limits were not regarded as a tool to reduce doses in general; it just meant that the borderline between barely tolerable and always unacceptable moved down. The actual mechanism to keep doses low is optimization, to as low doses as reasonably achievable. Reduction of doses in general (much below the dose limits) came about because of the increased risk figures. They meant that measures that had previously appeared disproportionately

expensive now became reasonable alternatives in optimization.

Within the nuclear industry the emphasis in the principle of optimization over the last years, and its practical implementation, have led to a world-wide situation in which the assumption of the new limits should not involved excessive difficulties.

ICRP Publication 60 also clarified some other matters. One was the clear distinction between practices, activities which add radiation exposures or risks, and interventions, other activities which can decrease the overall exposure, was made trying to clarify different principles for decisions on control of exposure. For practices, the system of protection is based on justification, optimization and limitation, whilst dose limit does not apply for interventions, but action is being taken to reduce the level of exposure as much as reasonable.

In fact, over the years, ICRP has extended its advice away from the central core of dose limitation to deal with other exposure situations, such as radon and other natural sources, solid waste disposal or the protection of the public in emergencies, where dose limits do not apply. The Recommendations also discussed potential exposures from accidents, as opposed to those exposures that are nearly certain to occur.

ICRP 60 has put the philosophy in place, which is now in its last stage for application through the regulation. Member States of European Union are supposed bring into force the laws, ordinances and administrative provisions necessary to comply with the Council Directive 96/29/Euratom before the past month of May, which revises the basic standards according mainly to ICRP 60.

Although this process is close to finish, there is now a major task to be undertaken to fully implement the system, and many specific topics will need to be addressed in detail. As the process of optimization is now constrained by restrictions on doses to individuals at levels below the dose limits, the complex issues involved in establishing dose constraint should be solved. While progress has been made towards the objective of establishing internationally accepted principles for exemption and clearance levels, it is recognized that some problems remain to be solved. Exposures to significant levels of natural sources at work should be classified as occupational exposure under some type of criteria and the application of radiological protection requirements should be defined. The principles set for intervention also create practical problems that should be considered in the future.

FUTURE: PROTECTION OF THE INDIVIDUAL

The NEA Committee on Radiation and Public Health (CRPPH) had pointed out in its 1998 Collective Opinion document that scientific and technological developments in the near future may be expected, which might have a profound influence on the concepts and the practice of radiation protection ("Developments in Radiation Health Science and their Impact on Radiation Protection"). In particular, it has identified a number of research lines in radiation health sciences, particularly in molecular biology and epidemiology, which might affect in the long run the scientific basis of the system of radiation protection and its practical application.

The not proven linear non-threshold response model selected by the plausible precaution criterion, has been the foundation of our protection system against radiation for more than 30 years. For the last decade, the old and never ending controversy, especially on the existence or non-existence of a threshold for the harmlessness of exposure, has been alive. Because of the continuing lack of definitive scientific evidences that would prove the existence of a dose threshold that would break the consistency of the present system, ICRP has opened a discussion to consider for the future an individual-based protection frame using the concept of controllability of sources. On the basis of comments and the observations received, the Commission will begin to develop the outline of the next Recommendations. It is expected to offer a first draft of the new recommendations to the new Commission in 2001 and a possible target date for a Consolidated and Recapitulated set of new Recommendations might be in 2005.

This possible new trend reflects a shift from societal-based values and a reduction in the emphasis on collective dose and cost-benefit analysis. The new scheme is born, according to its proponent (Prof. R. Clark, director of UK NRPP and chairman of ICRP), with the vocation of being "more straightforward single scale", "logically consistent" and "may be complementary to, rather than a fundamental change in, the Commission's system of protection", based on acceptable risks. It may be explained more understandably to individuals as multiples or fractions of the natural background and break the link with the linearity, creating a more balanced outlook on the public's perception from radiological risk, somewhat distant from the facts. Within this approach, the Commission's principle of justification and the principle of

optimization would need to be redefined and guidance would need to be developed on its application.

Beyond the variations in the wording of the optimization principle and the progress in elaborating mathematical tools to make objective the social and economically reasonable, the most profound evolution has taken place in its praxis and, in particular, within the nuclear power plants organizations. This principle has transformed into a personal challenge for workers and managers, setting a more rational hierarchy of decisions, getting close to the efficient management and the motivation of its workers. Within this context, the collective dose today represents an indicator of excellence in management and the reflection of the workers' positive attitude. This change in mentality, which has taken place in many western countries after a long process of evolution, should not be forgotten in any new definition of this principle.

It would not be allowed for any operation, practice or licensee to cause exposures by more than a small fraction of the dose limit, since members of the public are exposed to a sum of small dose contributions from many sources, superimposed on background and medical doses. It would allow regulators to deal on a more rational basis with dose limits to the public. Perhaps if a 2005 set of new Recommendations is arranged, that may address these topics in order to elucidate practical applications of the ICRP principles for the protection of the general public.

Furthermore, ICRP continues to regularly issue guidance on the application of its recommendations. Reports on genetic susceptibility to cancer and on doses from new radiopharmaceuticals are currently being printed. Some eight ongoing tasks are expected to be completed during the next two years. One project, very close to completion, concerns the possible influence of radiation on the incidence of multifactorial hereditary diseases. Two projects aim to compile age-dependent doses to members of the public from intakes of radionuclides. One of those tasks concerns doses the offspring from radionuclides ingested or inhaled by the mother before and during pregnancy. Another task is intended to provide a discussion of general values of effective dose coefficients for populations and their reliability.

ROLE OF ISOE

Throughout the world, occupational exposures at nuclear power plants have been steadily decreasing over the past decade. Regulatory pressures, particu-

larly after the issuance of ICRP 60, technological advances, improved plant designs, improved water chemistry and a global approach to work, consistent with the ALARA principle, usually referred to as "work management", have contributed to this decreasing trend. To facilitate the exchange of techniques and experiences in occupational exposures reduction, the information System on Occupational Exposure (ISOE) was created by the OECD Nuclear Energy Agency in 1992, after two years pilot programme. The International Atomic Energy Agency (IAEA) co-sponsored the system for those countries, which are not members of the NEA, as Eastern and South American countries, and formed together with NEA a joint Secretariat.

ISOE provides a worldwide forum for the communication and the debate among radiological protection experts from utilities and regulators in the area of protection of workers at nuclear power plants. Their publications are an international reference for good practice and excellence in practical radiological protection, such as the "Work management in Nuclear Power Industry" translated to several languages, including Russian and Japanese.

In this context, the ISOE program has played a leading role to extend good practices in occupational exposure and to harmonize the implementation of radiation safety standards all over the world. ISOE represent an excellent watchtower to monitor, over the next years, the effects these regulatory changes will have on occupational exposures. Additionally, the perspective of ISOE participants, which includes representatives from both utilities and regulators, openly expressed in workshops like the present could play a major role to shift the 21st century ICRP's recommendations from the theoretical to a practical approach.

Close to the end now, we have discussed several aspects which challenge the main purpose of the symposium, "reduction in occupational doses". These challenges need to be rigorously faced. Technological innovation and quality management are the tools to succeed. I am confident success can be achieved.

Finally, I also wish to express this workshop will provide the professionals present here today the opportunity to improve the co-operation and communication among them through open and fruitful discussions, and contribute to the continuous improvement of the goals of ISOE.

To conclude, I wish to congratulate all the people involved in the organization of this ambitious event.

Thank you for your attention.