SUMMARY AND CONCLUSIONS OF THE INTERNATIONAL CONFERENCE ON THE CHALLENGES FACED BY TECHNICAL AND SCIENTIFIC SUPPORT ORGANIZATIONS IN ENHANCING NUCLEAR SAFETY*

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BACKGROUND TO THE CONFERENCE

The peaceful uses of nuclear energy and ionizing radiation are currently experiencing a period of unprecedented change. The nature and pace of this change is affected by many factors—technological, economic, environmental, political and social. These factors not only influence the governmental and business environment in which the nuclear industry operates, but they also impact other stake-holders, the press and media, the public and international organizations. These developments have already resulted in significant changes to how nuclear enterprises are organized and operated. They can be expected to continue and even accelerate as new projects and designs for reactors and other facilities and new approaches to nuclear safety emerge.

It is essential that high levels of nuclear and radiation safety are maintained worldwide throughout this period of change and for the lifetime of nuclear facilities, including site and waste management legacies. Effective, efficient and independent regulatory bodies must be maintained and established in all countries utilizing nuclear energy to ensure that nuclear activities are conducted safely and securely, consistent with national standards and international good practices. In this respect, it is of utmost importance that all countries and expert organizations involved in nuclear-related activities participate as active partners in the Global Nuclear Safety Regime[1]. This participation includes uses of ionizing radiation in medicine, industry, agriculture and for the safe management of radioactive wastes and transportation of radioactive materials.

Nuclear and radiation safety are based on technical, managerial, administrative, economic and organizational requirements. In this respect, the role and quality of technical and scientific expertise in the nuclear industry and of regulatory systems are of fundamental importance.

Technical and Scientific Support Organizations (TSOs), whether part of a regulatory body or a separate organization, are gaining increased importance in providing the technical and scientific basis for decisions and activities regarding nuclear and radiation safety. International organizations such as the IAEA and Nuclear Energy Agency/OECD (NEA) also rely on the active contribution of TSOs. In light of the

* The views and recommendations expressed here are those of the President of the Conference and the participants, and do not necessarily represent those of the IAEA.

[1] The Global Nuclear Safety Regime is the framework for achieving the worldwide implementation of a high level of nuclear safety.

important role played by TSOs, it is essential that these organizations conduct their work consistent with the highest levels of technical competence, transparency and the observance of ethical principles. To enhance their capabilities in these areas, TSOs need to foster cooperative activities among themselves and other relevant organizations, whether on an ad hoc basis or in the framework of regional or multilateral arrangements and institutions.

Recognizing the need for TSOs to broaden their cooperation, the IAEA, its members and other relevant organizations has sponsored this first International Conference specifically addressing the role TSOs can play and the challenges they face in enhancing nuclear safety. It is hoped that the Conference provided a platform for further promoting and strengthening international nuclear and radiation safety cooperation to enhance the Global Nuclear Safety Regime.

CONFERENCE OBJECTIVES

The objective of the Conference was to provide TSOs from different countries and other organizations and experts the opportunity to discuss and develop a common understanding of the TSO's responsibilities, needs, and opportunities. A further objective was to explore appropriate approaches for addressing current and expected challenges in nuclear and radiation safety and to discuss the roles, functions, and value of TSOs, sharing their knowledge and experience. These exchanges should begin a continuing dialogue on technical, scientific, organizational, and legal aspects of the work of TSOs, thereby promoting expanded cooperation and networking among TSOs at international level.

OPENING ADDRESSES

H. Revol, Chairman of the Parliamentary Office for Evaluation of Scientific and Technological Options (OPECST), Standing Committee on Nuclear Affairs, **France** welcomed the participants to Aix-en-Provence and noted that the Conference would be important in confronting the challenges of nuclear energy development. He described recent progress in modernizing the legislative framework for nuclear safety in France through the adoption of three new laws in 2005 and 2006. He identified four challenges in the fields of nuclear safety and radiation protection that could benefit from the activities of TSOs. These include: waste management, older operating reactors, new generations of nuclear reactors and expansion of nuclear power to countries not previously using this energy source. He made a strong plea for international cooperation and pooling of resources to address these challenges.

T.Taniguchi, Deputy Director General for Nuclear Safety and Security of the IAEA, noted that this was the first international conference to specifically address the activities of TSOs. The conference was intended to build on the results of the 2006

Moscow Conference on Effective Nuclear Regulatory Systems. He described the current situation and developments in the field of nuclear energy, including the expected nuclear renaissance or "vitae nova" that could be expected to engage the work of TSOs. He noted the gap between ambitious plans for nuclear power development and corresponding plans for nuclear safety regulation. Strengthening technical and scientific support for nuclear safety would require increased effort, including networking and knowledge sharing between TSOs and other participants in the nuclear field and development of a Global Nuclear Safety Regime. Mr. Taniguchi concluded by emphasizing six actions that could be useful:

- Networking among TSOs to share information and resources
- Identifying and addressing safety research needs
- Ensuring adequate competence and independence of TSOs
- Building confidence in expert communities and the public
- Enlarging the role of TSOs in developing IAEA Safety Standards
- Supporting development of safety infrastructures in countries with limited experience which are embarking on nuclear power

J. Repussard (France), Director General of IRSN, noted that the purpose of the Conference was to determine what TSOs could do to enhance nuclear safety. He discussed recent and near-term future developments in the nuclear field that have affected the roles of TSOs. He identified several inter-linked challenges that needed to be addressed with support from TSOs, including:

- Technical availability
- Human resources and capital
- Public acceptance
- Visibility and effectiveness of the licensing process

He discussed the experience of IRSN as a TSO, including its competence and relationships with other relevant French bodies, including operators, government authorities and stakeholders. Mr. Repussard noted that there was little established doctrine on TSOs at the international level and that there were great differences in situations between regions and nations. He noted the absence of an IAEA service to assess TSO performance and the lack of an accepted vision of requirements for technical support. He outlined a possible agenda for further international cooperation including: clarification of the key concepts for TSOs; improved bases for cooperation, including networking; shared and coordinated safety and radiation protection infrastructures; and a peer evaluation system to enhance excellence.

G. Li (China), President of the Conference, noted the need to promote and enhance nuclear safety in view of the expected nuclear renaissance. He noted that much valuable work had been done in this field in establishing legislation, regulatory

frameworks and developing nuclear safety culture. He noted the increasing importance of TSOs for both regulators and operators in enhancing safety. He hoped that the Conference would contribute to a Global Nuclear Safety Regime for by promoting cooperation between TSOs and other relevant organizations in the nuclear field.

KEYNOTE ADDRESSES

Three Keynote Addresses set the scene for the Conference, identifying major challenges faced by TSOs and relevant stakeholders.

P.B.Lyons, USA (Commissioner of the United States Nuclear Regulatory Commission) delivered a presentation entitled "Managing Technical Support Organizations at the U.S. Nuclear Regulatory Commission". He noted that diverse challenges require diverse approaches and described the broad range of TSO support utilized by the USNRC. He discussed the economic aspects of TSOs in view of the USNRC's funding arrangements and noted the issue of maintaining the independence of regulatory decision making while taking advantage of sharing the costs of technical analysis. Avoiding conflicts of interest is an important legal requirement for the USNRC and Commissioner Lyons described several means through which this was achieved. He noted the great value in collaboration between international bodies and TSOs and the need for regulatory bodies to determine their TSO support requirements. He supported a strong continuing commitment to international research collaboration.

B. Thomauske, Germany (Managing Director of Vattenfall Europe Nuclear Energy GmbH) delivered a presentation on "Perspectives of the operator/industry" that identified a number of factors affecting the roles of TSOs. These include: the expected nuclear power renaissance; the merger of some TSOs with energy producing companies; difference in standards and regulatory arrangements in different countries. He felt that dependence on TSOs could pose issues in view of the need for expertise, particularly if there is an expansion of the nuclear industry. He noted the difference in expertise required for operators (specific and detailed) and regulators (generic). He noted the need to assure both economic and institutional independence of the TSO from the supported organization. He advocated the establishment of an international TSO platform in which all TSOs could participate in harmonizing safety standards and exchanging information.

M. Sené, France, Vice-President of ANCLI, discussed "ANCLI-CLI: Mediators of Access to Information and Expertise—An Instrument in the Service of Citizens". She described the history and activities of Local Information Commissions (Commissions Locales d'Informations or CLIs) and the National Association of CLIs (Association National des Commissions Locales d'Informations or ANCLI). The CLIs provide a means for exchanging information on existing and proposed nuclear sites between operators, regulators and stakeholders, especially the public residing near a facility. Madame Sené described publications issued by the ANCLI on the local governance of nuclear facilities and on nuclear waste. She also described the creation of an international body in Europe (EUROCLI) to share information for the purpose of enhancing safety and the quality of decision making on nuclear-related issues. She emphasized the importance of this mechanism for permitting the expression of public views on major nuclear issues, including safety of reactors, waste management, radiation protection, transportation and protection of the environment.

TOPICAL ISSUE 1: ROLES, FUNCTIONS AND VALUE OF TECHNICAL AND SCIENTIFIC SUPPORT ORGANIZATIONS

This session provided an overview on the role of TSOs in enhancing nuclear and radiation safety.

The presentation on “Roles, Functions and Value of TSOs” emphasized the broad notion of TSOs. The main roles of a TSO supporting a regulatory body and industry were addressed:

- Supplying the technical and scientific bases for regulatory decisions (in some countries providing safety assessments and conducting inspections and drafting regulations);
- Supporting industry by providing assessments of plant operations, resolving technical issues, and advising on important modifications; and
- supporting authorities in the field of emergency planning and response

To maintain their knowledge, TSOs need to be in the front line of technological development and should participate in national and international research and development programs and networks for exchange of information and lessons learned.

TSOs can also contribute towards increasing public confidence by providing information on the scientific bases of decisions, independent of political and economic interests.

In a presentation on “Independent Technical and Safety Advice for Regulatory Decision Making”, it was pointed out the role of TSOs as a support for regulatory bodies. The need for comprehensive know-how and know-why on nuclear science and technology as a whole and on the technical aspects of nuclear installations were emphasized. This comprehensive knowledge can only be achieved if the TSO is involved in the nuclear licensing and supervision process and participates in large research and development projects. The presentation discussed requirements for an effective regulatory process, emphasizing the role of contracting partners. Also discussed was TSO support for a regulator in various functions, including preparation of rules and regulations, licensing, operating experience feedback, inspection and research and development. The important role of international exchanges and networks was emphasized.

In a presentation on “Relevance of TSOs in Providing Technical and Scientific Services to Operator/Industry” it was emphasized that plant safety and economics are largely affected by the quality of TSO’s skill and confidence combined with those of the operator. The relationship between TSOs and their counterparts such as architect-engineering firms, vendors and construction companies was discussed. The role of KOPEC in Korea was detailed, concluding that KOPEC is able to enhance plant safety and performance without losing the benefits of standardization.

A paper on “Development and Maintenance of the Technical and Scientific Base” focused on the central role of the knowledge-base in supporting TSO activities, emphasizing the importance of maintaining, implementing and managing such knowledge. Suitable programs need to be established to support acquisition and assessment of the knowledge-base. To be able to respond to the expectations of stakeholders, TSOs need to be familiar with the installations, their operation and a large number of specialized technical issues. Moreover, they should possess a body of well established methodologies and concepts to perform the integration of various aspects of

its assessments. Several areas for future expansion of the knowledge-base in the field of operating plants were identified. They include: uncertainties in knowledge, fuel and ageing, public expectations, human and organizational factors. The urgent need to begin preparation for future challenges facing TSOs for ensuring the safety of GEN-IV plants was emphasized.

The Role of the TSO in Public Information/Debate, Openness and Transparency was presented. The paper focused on the support provided by TSOs in public information and in the debate on nuclear energy issues in Finland. The presentation discussed means for transmitting concrete, useful information to a large spectrum of stakeholders by adopting non-specialist language and making technical subjects accessible to non-specialists. A catalog was presented, including publication of research results, provision of background information and other material. It was emphasized that the views expressed should be balanced in the sense that they should not be interpreted as advocating only nuclear power as the only acceptable energy source. Finally, the presentation described the collaboration between the regulator (STUK) and the TSO (VTT) in applying these measures.

Discussion following these presentations focused on three subjects.

TSO Independence. While the principle of TSO independence was broadly supported, different opinions were expressed on specific aspects of how this was to be implemented. One participant stated that “what is actually important for TSOs is their capacity to deliver good advice, supported by their technical competence." One participant questioned whether it was possible to develop absolute criteria for independence. Another emphasized the need for TSOs to be separated from safety authorities and operators to ensure independence. Wide agreement on the need for functional separation was confirmed, but it was recognized that arrangements for this can vary from country to country. Seeking a reasonable compromise between protecting independent advice and maintaining technical expertise was noted as a possible issue. Strong support was expressed for separate financing of TSOs to avoid dependence.

Public Acceptance. It was widely agreed that open-mindedness and the capacity to present and explain technical matters to the public in a clear and accessible way is vital to a TSO’s credibility. TSOs should contribute to the information of the public through various available means.

Safety Infrastructure and Safety Culture in New Nuclear Nations. It was emphasized that developing countries and new-comers to nuclear power needed to develop strong regulatory structures and their own information base for nuclear safety. Although some duplication cannot be avoided, external support from developed nuclear nations and international organizations cannot replace needed expertise. Such expertise typically requires a long learning process and means for maintaining the knowledge-base. It was emphasized that each country needs its own regulatory structure, regulations and resources sufficient to make proper use of TSO expertise. In the context of this issue, the IAEA Secretariat referred to the upcoming “International Conference on Topical Issues in Nuclear Installations Safety – Sustainable Nuclear Safety in the Face of Potential Nuclear Development” in 2008.

TOPICAL ISSUE 2: CHALLENGES FACED BY TSOS AND TSO EFFECTIVENESS

This session noted that TSOs are assuming greater importance in global nuclear development, making it particularly important to identify current and future challenges they face and means for addressing them.

The conference identified several key challenges faced by TSOs related to globalization, regulatory and management issues. These challenges seemed to fall into two categories; namely, those that are current and newly emerged and those that have been present for some time on a long-term basis.

New and current challenges include:

- A changing global environment, including renewed interest in the use of nuclear energy for electricity generation and, consequently, the likely worldwide expansion of its use;
- New concepts and technology such as Gen IV reactor designs and ITER;
- Keeping pace with the evolving science and technology;
- Stronger market competition in the energy sector.

Existing or long-term challenges include:

- Ageing workforce and knowledge management;
- Maintaining and enhancing technical and scientific competence;
- Enhancing regulatory effectiveness;
- Ensuring adequate financial and human resources;
- Enhancing excellence in management;
- Ensuring confidence of stakeholders and the public;
- Developments in the understanding of the potential health effects of acute and chronic radiation exposures.

From this perspective, there is an urgent need to clarify the legal status, credibility and confidence regarding TSOs. In light of the fact that no generally agreed definition of a TSO has been adopted by the international nuclear community, the importance of clarifying this matter was emphasized. Also, the independence of TSOs was discussed and it was suggested that the primary focus in this regard should be the need to ensure independence of the advice from the TSOs to the client, rather than merely organizational relationships. However, the effective separation of functions in situations where a TSO provides advice to both the regulator and operator is important. Aspects of independence that were identified as particularly important were those related to political, legislative, financial, and competence matters. Moreover, the roles of the TSO should also be discussed and clarified (e.g., whether or how a TSO should participate in regulatory functions such as inspection.) Ensuring the credibility of TSOs was an issue of importance to many participants. It was suggested that various aspects of this issue should be addressed, including: competence, independence, transparency, integrity, efficiency, responsiveness and accountability.

It was also suggested that external reviews or formal accreditation could play an important role in enhancing TSO credibility.

Some of the options or approaches for dealing with these issues that were discussed include the following:

- Interpretation of existing international instruments (e.g., in the framework of review meetings of relevant conventions);
- Development of a Code of Conduct for TSOs (elements for a possible Code were discussed);
- Including aspects relating to TSOs in the revision of existing IAEA Safety Standards documents;
- Development of new IAEA guidance documents (an outline similar to those offered for a Code of Conduct was suggested as a first basis for work);
- Taking the opportunity afforded by IAEA conferences and other international meetings to clarify these issues.

The need for qualification of TSOs was addressed in light of the importance of having adequate management and quality of the technical services delivered as well as ensuring credibility and continuous improvements in the processes for ensuring safety. It was suggested, for TSO supporting regulators that regulators either designate directly TSOs, or work through a system of accreditation. For the qualification, appropriate requirements, or criteria need to be developed. The qualification requirements or criteria need to address the organizational set up, personnel qualifications, processes of work as well as equipment of the TSOs. Also, the role of, and usefulness of international peer reviews were discussed, and a suggestion was made to start working in this direction.

In a presentation by the Australian regulator, the importance of having access to a range of expert support bodies in different countries was emphasized. Moreover, under national law in Australia, the regulator is required to consider international best practice in reaching its regulatory decisions. Therefore, broad international and bilateral cooperation made a major contribution to the quality of safety decision making on the construction of Australia's new research reactor. It was noted that the regulatory body in Australia continues to face significant challenges in maintaining a sustainable core of key expertise in-house for the purpose of assessing the quality of outside advice. This challenge is shared with many other countries with smaller nuclear programs.

With regard to developing international guidance on TSOs, the opinion was expressed that the international nuclear community should move slowly and with caution. This view received general support in the session.

The importance of establishing a strong and competent regulatory body was considered essential for future nuclear development, particularly in countries moving toward nuclear power for the first time.

A need to differentiate between the enhancement of capability of regulators and the specific needs for research was emphasized. In both areas, the need for international cooperation was supported.

The human resources issue was addressed in the Canadian paper, where stagnation of nuclear activities had been experienced. The initiative to attract young and bright professionals to the nuclear community through university networks was explained.

Regional sharing of TSO services was discussed as one of the means to compensate for scarce resources on national levels. Also for countries considering the introduction of nuclear power for the first time this was thought to be an option.

In summary, it was emphasized that a step-by-step approach should be adopted by the IAEA in order to pursue the issues with TSOs identified in this session. The importance of TSOs in both the national and international context and the need for enhanced networking between them was supported.

TOPICAL ISSUE 3: INTERNATIONAL COOPERATION, NETWORKING AND APPLICATION OF IAEA SAFETY STANDARDS

This session of the conference focused on continuous improvement of the technical and scientific capabilities and expertise of TSOs and the contribution of TSOs to the enhancement of the Global Nuclear Safety Regime. Especially it addressed the need for international cooperation and for performing research on safety related issues to maintain and enhance the technical capabilities and expertise of TSOs. It was also stated that the cooperation should comprise an intense exchange with or even participation in up-to-date scientific and technical developments and research. The Conference underlined the importance of ensuring that TSOs are always familiar with the international status of research and technology and that they must have a comprehensive knowledge of international guidance documents. The international exchange of knowledge and sharing of experience and feedback is essential to maintaining and enhancing TSO competence.

This cooperation could be multiform, such as multilateral, sub-Regional, regional and bilateral cooperation. Cooperation at the regional level is thought to be of great value. Governments and relevant international organizations should encourage and support such co-operative.

TSOs are now playing a vital role in developing national safety regulatory frameworks, in facilitating the use and application of IAEA standards and in facilitating the implementation of the international legal instruments.

IAEA Safety Standards are extremely valuable to guide national regulatory activities. However, IAEA standards need to be continually updated to reflect new developments. TSOs should be more involved in this process and make a greater contribution in developing of these standards. At present, only a few TSOs are involved in the development of IAEA safety standards. Also, current IAEA guidance documents do not adequately address the status and responsibilities of TSOs. The Conference underlined the need for active involvement of national regulatory bodies and TSOs in the practical application of the Safety Standards. It was stated that a possible means of reinforcing international cooperation among regulators and TSOs would be in the effort to achieve harmonization of standards and practices.

The IAEA should develop a peer review service dedicated to TSOs, like IRRS, to review the qualification and effectiveness and share good practice for TSOs of Member States. The peer review between TSOs is also thought to be very beneficial.

So far, extensive bilateral technical cooperation between TSOs has been conducted. Regional cooperation is also being conducted (for example in the European TSO Network and the RCOP (the cooperative project among JAPAN, CHINA, and KOREA).

The establishment and broader use of information networks and databases to enable TSOs to share knowledge, experience and advice is necessary. At present, the Asian Nuclear Safety Network and the European TSO Network might be potentially useful models for sharing of relevant information between States.

Broader international cooperation and networking are needed with regard to countries with emerging nuclear programs to ensure that a high level of safety is achieved. The IAEA should support TSOs of Member States, especially in States with emerging nuclear programs with the aim of building infrastructures and developing the knowledge base for safety.

The Conference suggested that the IAEA facilitate the establishing of an international platform for cooperation between TSOs. Such cooperation could include establishing a mechanism for regular communication of TSO personnel and technology; to develop professional website for TSOs as a platform for communication. This would help overcome language barriers and regional difference, thus expediting information transfer and sharing. The IAEA might also establish a network of TSO experts, which would provide member states with technological consultation and expert support and assistance for national TSOs when necessary.

TOPICAL ISSUE 4: PERSPECTIVES OF THE EVOLVING NEEDS FOR TECHNICAL AND SCIENTIFIC SUPPORT

This session of the conference focused on the need for TSOs to keep pace with changes in nuclear technology, so that they can continue to provide optimum support for enhancing nuclear and radiation safety. Presentations at the session emphasized the perspectives of key participants in the nuclear development process: regulatory bodies; industry; users of nuclear applications; local authorities; and an international agency, the OECD/Nuclear Energy Agency.

From the regulatory perspective, four primary challenges were identified: new installations; existing installations; continuous process for safety; and broad vision of safety. These challenges were discussed in detail, with examples provided. It was emphasized that a broad vision of safety is necessary and that if processes to ensure safety do not progress, they regress. Consequences of these challenges for regulators were discussed. They include: a change in the quantity of needed experts; developing competencies in new domains, including human and organizational factors; and developing competencies in difficult areas, such as instrumentation and control and criticality. TSO involvement in nuclear safety research was also discussed, including need to ensure the capacity to conduct such research, operate facilities and to ensure adequate overview. Some issues for TSOs and their clients include harmonization of practices among TSOs; pooling and sharing of competencies and structures; and possible international reviews of TSOs. It as emphasized that there can be no national answers to these challenges, but they must be addressed on an international basis.

The presentation on the industry perspective began with a summary of the role of TSOs in the development of India’s nuclear program. A diversity of TSOs has been a positive aspect of the Indian program, both for the industry and regulator. Diverse challenges confront the nuclear industry, including aging facilities and management structures, leading to the need for increased inspections and handling of obsolete features. Evolving regulatory requirements also create a moving target for industry and

TSO work. For example, increasing regulatory emphasis on PSA, risk informed regulation, quality assurance and computer based systems are challenges for the industry and TSOs. New reactor designs also pose issues of competence. International networking and cooperation are very important for many countries. It was pointed out that networking opportunities for design organizations do not currently exist and that it would be desirable to develop appropriate forums for information sharing in this area. A platform for networking of TSOs would be desirable for the industry.

From the user perspective, it was felt important to ensure the technical basis for continued operation of existing plants, seeking out issues that could impact either operating reactors or future designs and maintaining a clear understanding of the regulatory context of a TSOs work. The legal basis for the USNRC's within-agency TSO—the Office of Nuclear Regulatory Research—and its key functions were discussed as an example of a user organization. Basic capabilities of the organization include:

- Independent technical insight;
- Issue assessment;
- Method and tool development;
- Future issue identification;
- Regulatory guidance promulgation.

An IAEA initiative to convene regional TSO workshop could be useful, possibly with separate workshops for regulatory TSOs and industry TSOs.

From the perspective of local authorities, several basic principles were emphasized. These include:

- A local population's safety is not negotiable;
- Transparency and access to information are necessary to enable citizen's to make decisions;
- Local communities should take part in decision making on nuclear development;
- Radioactive waste must be responsibly managed; and
- Economic development of affected areas must be sustained and integrated.

Several examples of industrial development affecting a locality were discussed, including a nuclear facility. It was emphasized that in cases where controversy exists, strong and acknowledged technical and scientific support is vital to ensuring an orderly and deliberate debate. In this regards, TSOs can make an important contribution to decision making affecting localities.

The final presentation on this topical issue presented information concerning the activities of the OECD/NEA to enhance cooperation on nuclear safety assessment and research. Three specific areas, conducted under the auspices of the Agency's Committee on the Safety of Nuclear Installations (CSNI) were discussed, including: the Safety Margins Action Plan; the SESAR/SFEAR report to identify facilities important for safety; and a significant number of Joint Projects on nuclear safety conducted since 2000. From the NEA's perspective it would be valuable to build on the successful framework developed over the past years by CSNI. Such joint research contributes to addressing common safety concerns and retaining technical expertise and infrastructure in strategic fields relevant for nuclear safety.

A number of additional contributions were made during discussions following the several presentations. One person noted the variety of TSO activities, needs and

demands and suggested that the two most important conditions for public acceptance were transparency and independence. He asked what the ideal contractual arrangements and legal structure would be to secure these conditions. If multilateral cooperation was to help more than bilateral contacts, he felt that a code of conduct could be important, with distinctions between TSOs working for regulators and those working for operators and more clear parameters for IAEA review missions. Another participant noted that such parameters do not currently exist at the IAEA and should be developed. Another person noted that there was a long-term "road map" for nuclear development that must be respected. Regulatory changes regarding TSOs should not negatively impact the technical capacities of these organizations. He indicated that some TSOs (including his own) have their own codes of conduct that guide their activities and that the IAEA could usefully provide help member states to develop common elements. The representative of a new TSO noted the difficulty of hiring sufficient qualified personnel; in particular because salaries were not equivalent to those offered by other organizations in the nuclear field. Further international cooperation could be of value, including an international association of TSOs. The head of one regulatory body suggested that further efforts regarding TSOs be modest and cautious, in view of the fact that there is no single, ideal structure for such bodies. He urged that relevant organizations be "rigorous about principles, but pragmatic about their application." Other contributions emphasized the need for TSO independence and the need to ensure public acceptance. One individual asked how TSOs could help new nations aspiring to nuclear power reduce the time necessary to introduce this technology.

PANEL DISCUSSION: STRENGTHENING TECHNICAL AND SCIENTIFIC SUPPORT: RECOMMENDATIONS FOR THE FUTURE

At the beginning of the closing session, a panel of heads of nuclear organizations (TSOs, regulatory bodies and institutes) made brief statements addressing the following questions:

- What is the main contribution of TSOs in enhancing nuclear safety?
- What is the main challenge faced by TSOs?
- What should be done in the short and medium term to enhance TSOs?

Mr. J. Repussard (France) discussed a "road map" for national nuclear capability having three elements: (1) establish technical and scientific competencies; (2) differentiate between the regulatory authority and the operator; and (3) separate technical assessment capabilities. TSOs can help in all three areas, bridging gaps though establishing a "tool box" of reference models and achieving mutualization through networking or other cooperative activities. Means for accomplishing this can include: harmonizing safety doctrine; providing mutual assistance on safety tools; mutualizing safety research; facilitating peer reviews; and supporting the technical dialogue between all concerned stakeholders.

Mr. J.-J. van Binnebeek (Belgium) identified human resource management as a major challenge, along with maintaining and renewing expertise. Networking can be very important in setting priorities and finding resources. He urged to consider qualification on the basis of the TSO's end user specifications on a "bottom-up" pragmatic approach that avoided "reinventing the wheel". Efforts should only "harmonize what needs to be harmonized".

Mr. H. Nariai (Japan) saw the need for TSOs to maintain and constantly enhance their technical expertise through collecting the latest technological knowledge, securing human resources, transferring technical knowledge to future generations and establishing effective knowledge bases. He also emphasized the importance of global and regional cooperation and networking among TSOs for coping with current and future challenges that they face.

Mr. B. Gordon (Russian Federation) emphasized the need to focus on probabilistic analysis aimed at improving regulatory requirements as a priority. He advocated regular TSO conferences sponsored by the IAEA.

Mr. S.K. Chande (India) noted that different TSOs face different challenges depending upon their role and historical evolution. Some common challenges were resource and manpower problems, new design concepts and new technologies. Effective international cooperation is important in several areas, including: harmonized technical requirements; standardised designs and technologies, and common technical problems. Such co-operation will also help in coordination of activities of different organizations; improvement in transparency and avoidance of problems in one country that can set back the programmes in other countries. He also noted the importance of open access to technical experience feedback and sustained technical support, particularly to those countries with emerging nuclear power programmes.

Mr. J. Ždárek (Czech Republic) felt the major TSO contribution was to identify technical problems and propose solutions. Main challenges include: explaining issues to different audiences; resources and financing; ageing of staff; work overloads associated with current and future technologies. Future work was needed on basic support for TSOs, including staff ageing. Networking should include both regulators and operators.

Mr. C. Waeterloos (European Commission) noted the need for an evolution of TSOs along the lines that has occurred with regulatory bodies. Clarifications are needed in the relations between TSOs and their clients. Challenges include coping with increased responsibilities in a variety of areas (radiation protection, security, safeguards), addressing global safety concerns and reassuring the public on safety issues. He noted that the EC was launching an initiative with senior regulators on safety and that a parallel effort was needed with TSOs.

In the following floor discussion, several points were made. Networking was supported by several speakers, noting that smaller countries could particularly benefit from such efforts. One speaker expressed the need for a conference addressing the role of TSOs in countries newly moving toward nuclear power. President G. Li (China) concluded the panel discussion with a review of activities in China, joining others in the emphasis on independence and transparency of TSOs.

CONCLUSIONS OF THE CONFERENCE

The Conference thanked the Government of the France, in particular the Institut de Radioprotection et de Sûreté Nucléaire (IRSN) for hosting this important conference, in partnership with the IAEA.

The Conference concluded that TSOs are playing an important role in the safe and secure use of nuclear energy and associated technologies both at present and in the

future. Thus, TSOs are an essential participant in efforts to achieve global energy security and sustainable development.

Some TSOs provide technical support to both regulators and industry. However, there are important differences between the roles of TSOs that provide support only to regulatory bodies and those that support operating organizations. Consideration should be given to how these differences could impact the future activities of these organizations. To be effective TSO must have a strong knowledge base and technical infrastructure. TSOs should be able to provide independent technical and scientific advice without pressure from regulatory bodies, industry or other stakeholders.

TSOs must be competent and have adequate resources to effectively perform their mission, which is to provide credible technical and scientific expertise to their stakeholders. International cooperation between TSOs is very important in ensuring and continuously improving their ability to provide services necessary for safety.

The Conference stressed that TSOs should give more attention to conducting research work aimed at ensuring the safety of existing and future facilities and activities. Common nuclear safety research projects should be developed among different kinds of TSOs, using to the extent possible existing frameworks, in particular those provided by the IAEA and the OECD/NEA.

The Conference noted that existing international legal instruments and guidance documents provide only very general information on the legal status and roles and responsibilities of TSOs in enhancing the safety of nuclear energy and ionizing radiation. Developing more focused guidance regarding the status and roles of TSOs could be useful. However, it was emphasized that the IAEA should take a cautious approach to developing new guidance documents until adequate consideration has been given to basic issues regarding TSOs.

TSOs should become more involved in supporting regulators in the process of developing IAEA standards and make a more active contribution to the enhancement of the global nuclear safety regime through a proactive approach.

TSO are now facing many challenges, such as confidence, independence, scientific competence, human resources, qualification, funding and long term planning.

The Conference affirmed the importance of establishing means for improved international networking to share knowledge and experience on technical and scientific practices and agreed that the TSOs should meet regularly to discuss common challenges and to exchange and share experience.

RECOMMENDATIONS

Following from the Conclusions discussed above, the Conference identified a number of recommendations that should be considered by TSOs, regulatory authorities, national governments, relevant international and regional organizations, the nuclear industry and stakeholders.

- The IAEA should facilitate the establishment of new or enhancement of existing networks on regional, international or topical bases between TSOs and other relevant bodies to enable TSOs to more effectively cooperate and share knowledge,

experience and advice. In this respect, the enhanced networks between TSOs could also assist individual countries in utilizing the services of TSOs.

- TSOs providing services to regulators and those supporting industry may find a common interest in cooperating in developing common research work on nuclear and radiation safety using where feasible the existing frameworks, in particular those provided by the IAEA and the OECD/NEA.

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- The IAEA should take the initiative in order to respond to the questions raised in Member States with respect to the roles and activities of TSOs in enhancing nuclear safety. The IAEA should proceed in a cautious, step-by-step, and deliberate manner to consider relevant issues and approaches, without jeopardizing existing arrangements between regulators and TSOs.

- In this initiative the following questions may be addressed, taking into account the different needs and requirements of the end users of TSO services and the variations at national levels and organizational background:

    - Definition and the concept of TSO;
    - Clarification of terminology regarding TSOs;
    - Objectives and roles of TSOs, and related needs of qualification and technical competencies;
    - Differences among types of TSOs;
    - Human and financial resources;
    - Relationships of TSOs to regulatory bodies, industry, the public and other relevant stakeholders;
    - Legal, technical, organizational and management aspects of TSOs;
    - Independence, values and accountability of TSOs; and
    - Activities of TSOs in the trans-national context.

- When basic concepts and principles have been sufficiently developed, consideration should be given to reflecting them in appropriate IAEA guidance documents, such as revised Safety Standards series documents or in a new document specifically dedicated to TSOs.

- The IAEA should consider developing peer review and self assessment approaches for the benefit of TSOs in enhancing nuclear safety.

- Information concerning the safety-related activities of TSOs should be included in National Reports submitted in conjunction with review meetings of the Nuclear Safety Convention and of the Joint Convention on the Safety of Spent Fuel Management and Radioactive Waste Management. This information should be considered at these review meetings and used to benchmark and improve TSO effectiveness.

- To provide better technical support, TSOs should adopt quality management systems based upon good quality management practices and implement continuous improvement programs to maintain and develop their capabilities.

- TSOs should provide continuing support to the IAEA in conducting activities related to nuclear installations and radiation safety, security and protection of the environment.