Hosted by the Government of China through the Nuclear and Radiation Safety Centre, National Nuclear Safety Administration State Nuclear Security Technology Center, China Atomic Energy Authority Radiation Internet Center, Ministry of Environmental Protection

EUROSAFE TRIBUNE

Towards Convergence of Technical Nuclear Safety Practices in Europe

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International cooperation The whys and hows

July 2015

Hints for successful networking

Going global: ETSON inputs to the 2014 IAEA TSO Conference in Beijing



Hosted by China in Beijing Scientific Support on 27 to 31 October 2014, the 3rd International Conference on Challenges and Security was devoted some 300 experts from Faced by Technical and

Organizations (TSOs) in Enhancing Nuclear Safety to "Strengthening

Cooperation and Improving Capabilities". It was attended by 42 countries.

(Front and second cover pages)

To our readers



For the first time, a TSO conference organised by the IAEA was hosted by the Government of China, bearing witness to this country's growing role in the nuclear field. With an audience nearing 300 participants from 42 Member States and 5 international organisations, this meeting can be reported as having been a success for different reasons, from the increased visibility of the TSO function and growing attractiveness of the 'TSO' brand to the active participation of ETSON member TSOs through a series of speeches,

posters as well as multi- and bilateral meetings and agreements. Reporting on the highlights from the International Conference on Challenges Faced by Technical and Scientific Support Organizations (TSOs) in Enhancing Nuclear Safety and Security: Strengthening Cooperation and Improving Capabilities which took place in Beijing on 27-31 October 2014, the present issue of the EUROSAFE Tribune acknowledges advances such as the emergent concept of institutional defence in depth, where the stakeholders - regulators, TSOs, citizens' associations, etc. - contribute to the safety of nuclear facilities alongside operators, who carry the ultimate responsibility in this area. It also tackles issues such as the need for an institutional definition of the TSO functions and responsibilities that would make TSOs internationally auditable through peer review processes. It also illustrates the need for sustainable, long-term funding of their activities, in particular research & development or training & tutoring, which provide the scientific and technical knowledge and skills that are key to credible and wide-scope expertise. Progress in these areas is first and foremost a matter of guidance; we therefore express our strong support of the idea of a TSO guide to be drafted under the auspices of the IAEA.

Such guidance will benefit the TSOs and, beyond them, the entire safety community in the established nuclear countries and, even more, in the embarking countries, which do not have the long history of starting nuclear power from science. Technology can be purchased on the market, safety cannot. An IAEA TSO guide would contribute to providing valuable rules and benchmarks to set up or upgrade a country's institutional nuclear safety framework.

We are glad to share these views with you and wish you pleasant reading.

Frank-Peter Weiss and Jacques Repussard



IAEA-ETSON: synergies

The focal point of safety-enhancing dynamics The role of the IAEA in enhancing nuclear safety and security is defined by its statute with, as an ultimate goal, the protection of the public and the environment from the harmful effects of ionising radiation. Tools such as the IAEA Safety Standards and security guidance are used to conduct, upon request of member states, peer review missions in different area such as: regulatory infrastructure (Integrated Regulatory Review Service), safety in operation (Operational Safety Review Team), siting (Site and External Events Design) or security (International Physical Protection Advisory Service). To identify gaps with the help of the IAEA Safety Standards in a member state's organisation and to deliver recommendations, the team members exchange views with their host, who will benefit from their experience, and

come back with a better understanding of the situation in the country, creating a situation mutually, beneficial to all parties. Such missions contribute to strengthening the ties between the IAEA and the TSOs, particularly in areas related to technical competence and capacity building. As explained during the Beijing Conference, which was focussed on strengthening cooperation and improving capabilities in the wake of the Fukushima accident, one IAEA priority is to develop, together with a number of TSOs, processes aimed at integrating the Agency's and the TSOs' expertise in a short period of time, so as to act as efficiently as possible in an emergency situation. Another priority is to provide assistance to building scientific, technical, legal, regulatory etc. capabilities with a view to strengthening the safety culture in its member states and to reinforcing the independence of their technical safety experts and regulatory authorities.

It is our belief at the IAEA that networks – in the sense of human, collaborative networks – are increasingly necessary. In this regard, one of our strengths is to be, through the IAEA Global Nuclear Safety and Security Network, the focal point of such dynamics.

Denis Flory

Deputy Director General of the IAEA and Head of the Department of Nuclear Safety and Security

EUROSAFE Forum and IAEA TSO International Conference: smart complementarities

The first conclusion from the IAEA TSO International Conference organised in Beijing on 27-31 October 2014 was that another conference would be set up within the next four years. The wide support of the audience to this proposal demonstrates the benefit derived from such meetings. Thus, the next IAEA TSO International Conference is expected to take place in Brussels in 2018, replacing the EUROSAFE Forum, which would have been held in the Belgian capital the same year. The kinetics of the forthcoming meetings consists of a yearly EUROSAFE Forum the first week of November replaced with the IAEA TSO International Conference every four years. Subsequently, the next EUROSAFE Forum will take place in Brussels in November 2015, dealing with issues related to safety culture and defence in depth, in relationship to the new Nuclear Safety Directive of the EU.

Benoît De Boeck

General Manager, Bel V

at work



Since nuclear safety knows no borders, how can the TSOs maximise the benefits derived from international cooperation to take up the safety enhancement challenge?

A matter of means

In a context of generation shift and globalised nuclear power, the credibility of expert assessment relies upon mapping competences, identifying potential gaps, managing knowledge and training & tutoring people.

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A matter of methods

Defining common approaches to topics such as the content of safety analyses, accident scenarios, code assumptions, etc. is the aim of the specialised technical working groups created by TSO networks.





 Consolidating our foundation involves continuing to innovate, improving regulations, enhancing technical capacities, and enriching the development of safety culture.

Li Ganjie

Vice-Minister of the Ministry of Environmental Protection of the PRC and Administrator of NNSA



The EUROSAFE Tribune

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July 2015

EUROSAFE Tribune expresses its appreciation to Benoît De Boeck (General Manager, Bel V) for the valuable support provided throughout the design and production of the present issue.

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IRSN, France



D. Louvat ENSTTI





UJV, Czech Republic

VTT Finland



M. Hirano NRA, Japan **A. Khamaza** SEC NRS, Russia



ETSON EVENT ETSON member TSOS were particularly active during the IAEA TSO Conference in Beijing, with lectures, meetings, poster sessions, a both, side events... The EUROSAFE Tribune takes pride in introducing some of the ETSON speakers at the Conference at the Beijing Conference ticoconference at the Conference ticoconference at the Conference ticoconference at the Conference

Kaleidoscope

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JSP WORKSHOPS

23–28 August 2015 **JSP Summer Workshop**. The next workshop of the Junior Staff Programme will be hosted by Paul Scherrer Institute (PSI) in Villigen, Switzerland. It will be focussed on material properties aspects in nuclear safety.

MEETINGS

09-10 July 2015

ETSON General Assembly and Board meeting. This event will take place at Castle Hohenkammer in Bavaria, Germany.

14-18 September 2015 IAEA 59th General Conference. to be held at the Vienna International Centre, Austria.

19-23 October 2015 International Conference on Global Emergency Preparedness and Response, organised by the IAEA in Vienna, Austria.

02-03 November 2015

EUROSAFE Forum. The topic will be safety culture and defence-in-depth, in relationship to the new Nuclear Safety Directive of the EU. In Brussels, Belgium.

20-22 January 2016

PREPARE dissemination workshop focussed on "Innovative integrative tools and platforms". In Bratislava, Slovak Republic.

NEW MEMBERSHIPS

Amec Foster Wheeler, through its Regulatory Safety Division, joins the ETSON network of European TSOs as the UK's leading TSO. AMEC's candidature was unanimously approved last October by the ETSON General Assembly held in Beijing on 27-31 October 2014.



20-24 July 2015

General safety: Application of nuclear safety concepts in the development of regulation and guidance. In Fontenay-aux-Roses, France.

o5-o9 October 2015 Reactor safety: Basic safety aspects and regulatory oversight of nuclear facilities. In Madrid, Spain.

13-15 October 2015 Nuclear security: **Extreme**. In Paris, France.

19-23 October 2015 General safety: Managements systems. In Paris, France.

02-06 November 2015 Reactor safety: Lessons learned from the Fukushima Daiichi accident and EU stress tests. In Cologne, Germany.

Find the full ENSTTI course programme on www.enstti.eu





Nuclear safety being by essence a transboundary issue, it is never too early for experts to cooperate. This is the underlying principle of the Junior Staff Programme, which brings together 24 young engineers from 10 countries around joint initiatives such as the organisation of a yearly Summer Workshop, thereby contributing to the alignment of nuclear safety practices in Europe.

NEW LEADERSHIPS

Jacques Repussard, Director General, IRSN, handed over the Presidency of the IAEA TSO Forum and Steering Committee to Terry Jamieson,

Vice-President of the Technical Support Branch, Canadian Nuclear Safety Commission. Benoît De Boeck, General Manager, Bel V, was appointed Vice-President of the Forum.

Stakes & Goals

Though it may be taken at first for granted, cooperation in nuclear safety and radiation protection still has a long way to go. The IAEA TSO Conference in Beijing provided an outstanding arena to discuss the purpose, priorities, limits and key factors for the success of such cooperation. Representatives from international organisations and associations share their views on the subject...

International cooperation: the whys and hows

10

uclear safety knows no borders, as demonstrated by the Fukushima accident. How best then to cooperate? Some thoughts from William D. Magwood, Director General of the OECD Nuclear Energy Agency, Hans Wanner, Chairman of the Western European Nuclear Regulators Association (WENRA), Jo Byttebier, Operating Experience Programme Director, World Association of Nuclear Operators (WANO), and Paul Woodhouse, Section Head, Nuclear Safety and Security Coordination, IAEA.

Purpose, priorities and limits of nuclear safety cooperation

W. D. Magwood What's important to remember here is that every government must protect OECD-NEA its citizens in whatever way it deems appropriate. The role of international cooperation is to help countries understand what the thinking is in other places. Cooperation on nuclear safety is not new; it has been going on for many years. The need for international cooperation was very clear in the aftermath of the TMI and Chernobyl accidents, and these events crystallised the belief that "a nuclear accident anywhere is a nuclear accident everywhere".

- P. Woodhouse Effective cooperation requires that common goals are identified and resources allocated to the cooperation. An attitude and culture that looks outside of an organisation as well as recognising and valuing the benefits of cooperation also are key factors.
 - H. Wanner It's true that the limits to international cooperation are national legislation WENRA and responsibilities. WENRA's main goal is the harmonisation of nuclear safety requirements among regulators. We agree on the principle of continuous improvement, we agree on the importance of safety culture and we agree on specific technical issues. We're a club: each of us is committed to implement recommendations back home, but we cannot make them compulsory.
 - J. Byttebier As an organisation of 130 nuclear operators that own and operate the 435 nuclear WANO power plants around the world, WANO's main goal is to maximise safety and reliability, to be a forum where we can talk about what is really important. We do this by exchanging information, doing peer reviews, sharing operating experience, organising workshops, etc. Though we are in a sense competitors, we are



able to work collaboratively because it is in our mutual interest since, as Mr. Bill Magwood and others have said, "a nuclear accident anywhere...".

Impact of the Fukushima accident

P. Woodhouse Following the accident, the IAEA Action Plan on Nuclear Safety further strengthened international cooperation through activities such as international conferences, a series of international expert meetings, peer reviews, and ongoing work to publish an IAEA Fukushima Report.

J. Byttebier Our organisation was created after Chernobyl to avoid similar events. And of course Fukushima happened in 2011 and the question was, did we fail, or did we not do enough? The "accident anywhere" adage was certainly true after Fukushima: eight units in Germany were closed immediately, even though they had nothing to do with Fukushima, and Japan's other nuclear plants are still not operating. Our Post-Fukushima Commission's twelve-point action plan highlighted the need to cooperate more. We believe in the importance of peer reviews. We will conduct purely WANO peer reviews every four years in each of the plants, with follow-up every two years to see how well they meet our revised performance objectives and criteria, published in 2013. The peer review report will include design-based prioritisation of areas for improvement and will apply an internal rating system on a scale of 1 to 5, to have an objective way of comparing. A poor rating could alert CEOs that increased assistance is required from international peers. Next to these peer reviews we offer technical support, and we have performance indicators and other tools, which make it possible for our members to compare themselves with each other and, by benchmarking, to try to improve. If we see that the plant is having major events which are causing problems for the rest of the industry, we will ask them to implement a recovery plan.

G The Fukushima Daiichi NPP accident did not create significantly different cooperation, but the magnitude of cooperation has increased.

William D. Magwood, Director General, OECD-NEA

STAKES & GOALS

H. Wanner As for WANO, an important outcome of Fukushima is the need for peer reviews. And since every peer review leads to recommendations, there must

be a follow-up process where you can monitor implementation. We support the peer reviews the IAEA is conducting and the expansion of their scope, the transparency of the process. Continuous improvement must also be stressed to prevent a future nuclear accident. Safety standards (i.e. the so-called WENRA safety reference levels) have been revised with a focus on natural hazards, containment integrity and accident management. Another outcome is that the 17 members of WENRA started a process of mutual assistance between European regulators in the event of an accident, to be able to provide guidance to governments in the first few hours, when nearly no information on what happened is available, and to help them make relevant decisions on sheltering, iodine administration or evacuation.

W. D. Magwood Fukushima did not create significantly different cooperation, but the *magnitude* of cooperation has increased. In the aftermath of the accident and the many bilateral exchanges to understand what happened and how to respond, there was remarkable similarity of the basic response, drawing on the same body of knowledge, in which international cooperation played a large role. Fukushima highlighted that, in matters of nuclear safety, absolute confidence in hardware is simply not sufficient. We must rely on excellent staff, excellent regulators and an excellent safety culture. One without the other is not enough. Nuclear operators and regulators are trying to come to grips with safety culture issues. NEA is focusing more strongly on safety culture and expects to explore concrete initiatives in this area.

A path forward for safety cooperation

- H. Wanner WENRA is trying to expand its work to areas outside Europe and to exchange with other regulators. Our consultation process of new safety reference levels is open to the public, and we seek input in particular from the operators (ENISS, WANO). The resources needed to do this are an extra burden, but a rewarding one. In the end, we must find a balance between our own job as nuclear regulators and participation in international projects, to have an effect both inside and outside Europe.
- J. Byttebier We don't have the pretension that we can cover everything; we can't focus on everything. We are not a TSO, we are a membership organisation of operators. Our focus is on operational safety: how you safely operate and maintain your plant. And our aim is to be self-regulating.
- J. P. Woodhouse A priority for the future in nuclear cooperation is to maintain the momentum internationally in taking forward lessons learned from the accident.
- W. D. Magwood Bringing about change through international cooperation is not that easy. Best approaches and practices must be discussed to enable each other to see what the international community sees as a path forward. Lessons must be analysed, learned and absorbed into the regulatory infrastructure. NEA and other international organisations have long provided and will continue to provide a forum for that to happen.

3 QUESTIONS TO... Li Ganjie on the past and future of nuclear safety in China

Vice-Minister of the Ministry of Environmental Protection of the People's Republic of China and Administrator of the National Nuclear Safety Administration, Li Ganjie looks back – and forward – at the organisation of nuclear safety in China.

You celebrate NNSA's 30th anniversary this year. What has been accomplished?

Through three decades of meticulous effort, we have been able to build up a solid shield in nuclear safety. We started from scratch, we innovated, we worked to catch up, and now we are reaching for greater achievements.

After National Nuclear Safety Administration (NNSA) was officially established in July 1984, Nuclear Safety Inspection Offices were opened in Shanghai, Guangdong, Chengdu and North China, a number of other TSOs were set up, laws and standards in line with international practice were drafted, and basic regulatory systems were introduced, all in a dozen or so years. The second stage involved integration and improvement: incorporation of NNSA into the State Environment Protection Administration (SEPA), promulgation of the 2003 Law on Prevention and Control of Radioactive Pollution, and improvement of the regulatory organisation. Six regional offices were set covering all of China, and the technical resources of the Nuclear and Radiation Safety Centre (NSC) and other TSOs were enhanced. The third stage, beginning in 2008, has been one of rapid growth. SEP was upgraded to become the Ministry of Environmental Protection (MEP), and NNSA was expanded into three administrative departments in 2011. The institution of nuclear safety regulation made a leap forward, with optimised functions, a growing workforce, an improved legal system, and enhanced regulatory capacity.

How are TSOs and NNSA functions integrated in China?

China has an all-inclusive organisational structure for TSOs with a clear hierarchy in place. The NNSA has five permanent TSOs, led by the NSC, and radiation TSOs exist in all provincial environmental protection bureaus and some of the prefectural-level environmental protection agencies. The pro-fessional team engaged in nuclear safety regulation in China is comprised of well-educated professionals specialized in all relevant fields. The team comprises 100 staff at NNSA, 1,000 at the organisations of the central level, and 10,000 at the local levels.

What are the challenges for future years?

We are at a new starting point, with a new situation, new tasks and new requirements. Nuclear power is undergoing a new round of rapid growth, and there is an increasingly high demand for safety from the public. We must consolidate our foundation and strengthen support. This involves continuing to innovate, modernising the regulatory system, improving regulations, enhancing technical capacities, and enriching the development of safety culture. Cooperation and exchanges between China and other countries will become deeper and wider, and we will continue to strengthen international cooperation on nuclear safety. Our objective is to contribute to the sound, safe and sustainable development of nuclear energy and technologies in China. 🙀

Before passing on the baton

bout to hand over the chair of the IAEA TSO Forum, Jacques Repussard, Director General of IRSN, gives his analysis of the benefits the TSOs can derive from international cooperation and notably from the participation in the TSO Conference to take up the challenges associated with the steady enhancement of nuclear safety.



What are the main benefits of the IAEA TSO Forum and of the Conference?

The two of them complement each other: as a permanent body, the Forum provides continuous work and the conference, organised every 3 to 4 years, is a highlight to involve more participants, establish the consensus on important issues, make recommendations that become part of the overall IAEA processes and convey messages to the IAEA Member States and to the Board of the Agency. This system is very useful - and I would even say that we pay the price of its non-existence in the past. If technical experts have always played an important role in the functioning of the IAEA and of national nuclear safety frameworks to support decisions, regulations, standards, etc., their community is not organised and the availability of the resources they drawn upon to work - e.g. training, equipment, etc. - was not seen as a prerequisite for the sustainability of their work.

How would you characterise the progress achieved at each conference?

The first TSO conference held in France in 2007 brought to light the non-existence of a community of scientific and technical experts and the resulting difficulties in asserting their

International Conference on Challenges Focod by Technical and Scientific Support Organizations (TSOs) in Enhancing Nuclear Safety and Security Speakers at the first International Conference on the Challenges Faced by Technical and Scientific Support Organizations in Enhancing Nuclear Safety, held in Aix-en-Provence (France) in April 2007 (above), and programme of the second Conference, held in Tokyo (Japan) in October 2010 (left).

legitimate aspirations to develop and spread internationally otherwise than through the support provided to regulatory bodies. The need for the TSOs to tackle this issue if they wanted to achieve something together became obvious. The second conference organised in Tokyo in 2010 made it possible to continue on this path by issuing three major recommendations: create the IAEA TSO Forum; draw up a guide to the TSO functions and organise a third conference four years later to take stock of the progress made.



It seems things are progressing well...

There is a kind of interesting progression indeed, but at the same time I can see the persistence of sizeable hindrances of both psychological and institutional origins. Concerning the psychological aspect, a number of people who do not seem to fully realise what is at stake tend to think that, in a kind of zero-sum game, the enhanced visibility and level of organisation of entities carrying out a TSO function would be achieved at the expense of other bodies. What is at stake is by no means a struggle for power, but the optimisation of a function which is consubstantial to the progress of nuclear safety. From an institutional perspective, the discrepancies in the way the TSO function is approached depending on each country makes it difficult - notably for the IAEA - to 'plug' rules providing some kind of normative description of the TSO function in a system which is already highly standardised.

Have you noted a shift in the approach to nuclear safety since the Fukushima accident?

Unfortunately not! And I would even say that the accident itself is, to some extent, related to the fact that the risk of tsunami for instance was not taken into account as it should have

Paving the way for a full-flegded TSO

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"The Polish National Centre for Nuclear Research is discussing with the Institute of Nuclear Chemistry and Technology and the Central Laboratory for Radiation Protection whether we should create one single institute gathering all the competences of a full-fledged TSO. And we will benchmark our competences with those of our neighbours to make sure we have state-of-the art skills. A major issue for us in Poland is the institutional funding of the TSO function. We are currently in search of a legal mechanism that would provide the necessary financing of our activities, thereby guaranteeing our independence of judgment, and attract young talented experts who might be tempted to join the industry.

Beyond Poland, a central issue for all the TSOs is, in my understanding, the alignment of national nuclear legislations within the EU in order to allow one single safety assessment to be carried out for new generic designs of reactors in the future, whereas this procedure must be replicated for each unit of a nuclear plant, even if all units are built on the same design. This may contribute to decreasing the cost of new build while enhancing safety."

> Tomasz Jackowski Coordinator for Nuclear Energy Polish National Centre for Nuclear Research (CNBJ)

been, whereas scientific knowledge was available. This is a sign that the transmission of scientific information to the decision-making level is far from being perfect. However, the international community did not analyse the accident from this perspective, but from a merely technical one. The experts delved into the intricacies of the accident sequence, leaving in the shadows the reasons why major scientific data had not been reckoned with. This shows that ethical considerations play a pivotal part in ensuring safety.

You are about to hand over the chair of the TSO Forum. What is the main lesson learned from your presidency?

Through networking and co-working, international cooperation provides an essential contribution to safety enhancements, as it helps optimise the performance of the work done with the same resources in funding and manpower. There is real value in getting people to learn to know each other, in pooling training, etc., as exemplified by ETSON at European level and by the Forum at international level. I think the benefits derived from networking and co-working explain the sustained commitment of individuals, despite the lack of progress at institutional level. The Forum and the Conference are here to help gain momentum!



ETSON presented the participants in the IAEA TSO Conference in Beijing a series of posters displaying its member TSOs' research

and assessment activities, particularly in the field of severe accidents and preparedness for emergency situations.

There is a kind of interesting progression, but I can see the persistence of sizeable hindrances of both psychological and institutional origins.

I am going to hand over to Terry Jamieson as President of the IAEA TSO Forum. It will be interesting to see how the Vice-President and head of the Technical Support Branch of the Canadian Nuclear Safety Commission, an entity that integrates both safety authority and technical support functions, will pursue the work undertaken by the head of an independent TSO.

Science & Technology

In a science-based activity such as nuclear safety assessment, the credibility of experts builds on their scientific and technical knowledge and experience. From the identification of potential gaps in terms of competence to the ways to bridge them, the EUROSAFE Tribune provides an overview of the challenges associated with knowledge management and skill building.

Benchmarking severe accident models

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ow well do computer models predict a severe accident in a nuclear power plant? A major initiative is underway to benchmark these models with input from the Fukushima accident. Insights from Jack Ramsey, Senior Level Advisor for International Nuclear Safety Assistance, US Nuclear Regulatory Commission, Jean-Claude Micaelli, Director of Safety Research, IRSN, and Dr. Martin Sonnenkalb, Head of the Barrier Effectiveness Department, GRS.

For Jack Ramsey of the NRC, "Even before Fukushima, there have always been questions about how we can benchmark our severe accident codes. I don't think the questions have changed since then. There's still a strong desire to better understand what our analytical tools are capable of and the ability they have to predict and assess. But now," he added, "the resolution of those questions is becoming a higher priority." A clear sign of this is a major programme launched by the OECD/NEA in late 2012 in which eight nations joined forces to benchmark severe accident codes. The BSAF Project, otherwise known as the Benchmark Study of the Accident at the Fukushima Daiichi Nuclear Power Plant, seeks firstly to gain the best

organisations from eight countries (France, Germany, Japan, Korea, Russia, Spain, Switzerland and the United States) are involved in the BSAF project organised by the Nuclear Energy Agency (NEA) of the OECD.

understanding possible of accident progression and the current core status of units 1 to 3 in preparation of fuel debris removal and secondly to assess and improve the capabilities of severe accident modelling codes to predict this type of accident.

Modelling the first days of the Fukushima Daiichi NPP accident

"The main objective is to apply different codes for the assessment of to the Fukushima accident," explains Martin Sonnenkalb of GRS, "to see if the conclusions which we can draw from the analyses will be similar or if there are still remaining discrepancies. The overall goal is to support the decommissioning of the plant many years later. Whereas the aim of the BSAF Project's first phase was to perform best-estimate analyses of the accident progression in comparison to the few data available from the accident, the second phase was intended to assess the amount of radioactivity still contained in the reactor vessel and the amount released to the environment. This fission product

<image>

issue is an important focus of the BSAF Project." With this purpose, in phase I of the project, from late 2012 to late 2014, each partner was tasked with modelling the first six days of the accident with the different computer codes - ASTEC, MAAP, MELCOR, ATHLET-CD/COCOSYS, etc. - based on common case calculations, and comparing the results against existing data and against the other partners' code calculations. The results were encouraging and proved to be generally consistent. Phase II, now in progress, will study radioactive releases both within the facility and into the environment. According to Jean-Claude Micaelli of IRSN, "We are extremely active in this programme and we have assigned our best experts to provide support to Japan for the dismantling of the damaged reactors. At the same time, IRSN and the international community will gain a deeper understanding of severe accidents to better prevent them in the future and to limit any impacts." IRSN was able to simulate the accident in all units affected by core melting using the ASTEC code, demonstrating the applicability of the code to BWRs. It is now investigating the question of degraded core coolability in its one-of-a-kind PEARL facility that experimentally simulates the reflooding of more than 100 kg of superheated debris.

The next step

The resources mobilized to model the Fukushima accident are part of a longer-term programme embodied by the OECD's Senior Expert Group on Safety Research Opportunities post-Fukushima (SAREF), a think tank on R&D programmes to be launched using the observations, measurements and analyses that could be made during forthcoming dismantling operations.

"The question is," according to Jack Ramsey, "how do we take the lessons learned from Fukushima and work them back into the operating fleet? How do we work them into reactors under construction and the reactor fleet that's going to exist 10, 30, 50 years from now? Because if you want to make sure that you have a positive impact on safety for the next generations of the population, now is the time to make sure that you gain that insight." Experimental results are used to enhance the simulation codes' capability to model such phenomena in a realistic manner, thereby improving the design of nuclear reactors. On the left.

the PEARL facility is operated by IRSN at Cadarache (southeastern France) for experiments to study phenomena associated with the reinjection of water into the debris of a reactor core damaged by a core meltdown accident. On the right, the containment code system COCOSYS allows for a comprehensive simulation of propagation in the containment, e.g. of hydrogen and fission products.

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Regulatory competences: gauging the organisations' temperature

The primary aim of SARCoN is to help regulatory bodies identify the competences they might need to perform their functions effectively and the potential gaps with the competences actually available within each organisation. This methodology developed by the IAEA can also be implemented by TSOs with the same purpose, as explain Maria Moracho-Ramirez, Safety Officer and Training Coordinator at the IAEA's Department of Nuclear Safety and Security, and Pierre Mignot, Consultant in Human Resources and Management Systems from Bel V.

How was the SARCoN methodology developed?

Maria Moracho-Ramirez. A Steering Committee on Competence of Human Resources for Regulatory Bodies was established in 2009 with the mission of advising the IAEA on how best it can assist regulators in the Member States to develop suitable competence management systems as well as discussing and sharing information and good practices in the area of competence management. As a result, the Committee came up with a safety report entitled *Managing Regulatory Body Competence* and, on the other hand, with a technical document entitled *Methodology for the Systematic Assessment* of *Regulatory Competence Needs* (SARCoN) for *Regulatory Bodies of Nuclear Installations.*

Can the methodology be directly implemented?

Maria Moracho-Ramirez. SARCoN is a step-by-step approach to identify the gaps between the existing and the required competences – which encompass knowledge, skills and attitudes – using a quadrant model of competence as a structure. This methodology needs to be examined in the context of the particular regulatory organisation concerned and its areas of responsibilities within the national infrastructure. In the case of countries embarking on nuclear power programmes, it is a means of planning the development of regulatory staff's competences.

Why did Bel V decide to use SARCoN to perform competence assessment?

Pierre Mignot. Bel V, the Belgian TSO, is certified according to ISO 9001:2008. It developed an integrated management system in which the human resource management process plays an important

role by covering all aspects related to recruitment, by providing role descriptions and by describing how to manage competence and training, as recommended by the Safety Reports Series No. 79 (see box opposite). For a TSO as much as for a regulator, it is important to ensure an appropriate match between its competence needs and available resources.

HOW are competences managed within Bel V?

Pierre Mignot. The initial phase consists of defining an organisational structure and describing the different roles or positions necessary to fulfil all the functions

IAEA documents on Competence assessment and building

Safety Reports Series No. 79

• Provides generic guidance based on IAEA safety requirements for the development of a competence management system within a regulatory body's integrated management system.

• An appendix deals with the special case of building up the competence of regulatory bodies of embarking countries.

TECDOC 1757 (SARCoN)

• Provides practical means to apply a systematic approach for competence needs assessment (from organisational down to individual level): define competence profiles, analyse competence gaps and, if training is chosen to fill the gaps, identify training needs and establish training programmes.

 Describes a step-based procedure to analyse systematically a broad range of competences that a regulatory body might need.

- Supports future planning and management of training in line with the quidance of the IAEA safety standards.
- Is based on an IAEA competence model supplemented by questionnaires for self-assessment (with more than 200 regulatory competences) and is making use of a software-based assessment tool developed by the IAEA.

Protecting man and

the environment against radioactive contamination requires highly skilled staff to use advanced technologies such as mass spectrometry to analyse samples collected in the environment or in industrial facilities, electrophysiology to analyse living tissues or body counting equipment to examine the thyroid or thorax of people, notably as part of emergency management exercises.



A competent TSO needs to permanently update the knowledge and skills of its staff to take up the nuclear safety challenges, notably by disseminating the results from experimental programmes such as EPICUR, focussed on iodine behaviour in nuclear facilities.

assigned. Within Bel V, 36 roles are described with the associated qualification requirements, and one or several roles are assigned to each staff member. Our competence needs assessment process is fully described in the integrated management system and consists of three main sub-processes. Firstly, the determination of the competence profile for each role and then for each staff member, taking into account all the assigned roles; this is the responsibility of the managers. Secondly, the determination of the existing level of knowledge, skills and attitudes by a self-assessment, followed by an evaluation interview with the supervisor in order to agree on the results of the self-assessment. And thirdly, the analysis of the competence gap using the SARCoN tool; this is performed by the training manager. The competence needs assessment process is presently being adapted to include the SARCoN tool for the analysis of the competence gaps.

Where does Bel V stand in the application of SARCON?

Pierre Mignot. Nine staff members, mainly newcomers with a role of inspector or safety analyst, have recently carried out a pilot application. The competence profiles were defined for each of them and they performed individually a self-assessment of the existing knowledge, skills and attitudes. A detailed evaluation of the results of this pilot application is in progress with a view to making a decision about the suitability of the SARCoN tool and methodology to satisfy Bel V's expectations. At the present time, a training approach based on the 'Systematic Approach to Training' is adopted in Bel V and fully incorporated in the company's integrated management system. If the pilot application provides positive results, SARCoN could be rolled out to improve the design of training programmes based on the results of the competence gap analysis.

What is the first feedback of the evaluation of the pilot application?

Pierre Mignot. Well, at this stage, SARCoN is seen as an easy-to-use tool and methodology. However, since it has been devised for a broad spectrum of national situations within the IAEA, it is necessary to tailor it to the specific interests of Bel V. For instance, the definitions of the knowledge, skills and attitudes can be interpreted in different ways and therefore they need to be revised in order to better reflect Bel V's needs . Also, the evaluation criteria – which are defined in a generic way as 'basic, medium and high' – need to be more specific for a better assessment of the level of each existing and required competence. In any case, Bel V's intention is to apply SARCoN to its entire staff, keeping in mind that, in line with the guidance in TECDOC 1757 (see box page 21), SARCoN can be applied to an individual or organisational level.



Supporting a regulator in the successful hosting of IRRS missions

"Provided at the request of a Member State, the IAEA Integrated Regulatory Review Service (IRRS) is aimed at enhancing the effectiveness of the country's regulatory infrastructure in the field of nuclear and radiation safety. The initial IRRS mission to the Russian Federation was performed in November 2009 at the official request of the Government. In accordance with the practice in this domain, a follow-up mission was conducted in November 2013 to review notably the 46 measures taken in response to the recommendations and suggestions of the initial IRRS mission. As a TSO of Rostechnadzor, the Federal Environmental, Industrial and Nuclear Supervision Service of Russia., SEC NRS took the most active part in the preparation and conduct of both IRRS missions. Supporting the implementation of Rostechnadzor's measures, SEC NRS developed its R&D plan which included 29 actions aimed in particular at enhancing the Russian federal legislation in the field of atomic energy use as well as developing new federal regulations and safety guides. Among other support activities, SEC NRS rendered assistance to Rostechnadzor's Technical Emergency Centre and implemented assessment of additional

modules, which were not covered by the initial IRRS mission ("Emergency Preparedness and Response" and "Regulatory Implications of the Fukushima Accident"). Based on the results of their follow-up mission, the IRRS experts confirmed the efficiency and independence of Rostechnadzor as the regulator and recognised the timeliness and effectiveness of the actions taken by the Russian Federation in the wake of the Fukushima Daiichi NPP accident. Following the findings of the IRRS follow-up mission Rostechnadzor's action plan, developed with the assistance of SEC NRS, now includes 24 actions which are due for completion by the end of 2018. The example of SEC NRS provides an idea of the scope and significance of the activities performed by a TSO to support the regulator and to enhance the efficiency of the country's nuclear safety regulation drawing upon recommendations from the IAEA. For our partners in ETSON who are planning to host such IAEA missions, the Network is a good platform for sharing and gaining - practical experience and knowledge in this area."

Alexander Khamaza, Director, Scientific and Engineering Centre for Nuclear and Radiation Safety (SEC NRS) Russian Federation



3 **QUESTIONS TO...** Benoît De Boeck on the highlights of the IAEA TSO Conference in Beijing

As the President of the Conference, Benoît De Boeck (the General Manager of Bel V, the Belgian TSO) gives the EUROSAFE Tribune insights into some of the key considerations for the TSOs' future.

What major lessons learned from the Fukushima accident did the Conference address?

The Conference revealed that the challenges TSOs are facing aren't really new, but that they need to develop new approaches to address some of them, in particular extreme external events which are potentially conducive to simultaneous damage to several units, thereby making crisis management more complicated. TSOs need for instance to strengthen flexible means such as mobile lighting, mobile pumps, etc., and to organise regularly emergency exercises that integrate safety and security aspects, as pointed out at the previous TSO Conference in Tokyo, in 2010. In the knowledge management and competence building areas, the Beijing Conference brought to light the need for better identification of competence gaps and training needs using tools such as SARCON, a method developed by the IAEA with this purpose, as well as insufficient sharing of operating experience and of best practice in security and safety-security interfacing among operators. Besides the lessons learned from the Fukushima accident, the Conference recalled the necessity for newcomers to strongly focus on setting up adequate institutional organisation and urged them to join TSO associations under the aegis of the IAEA. Last but not least, the challenge of the generation shift was also stressed, with the importance of offering young engineers opportunity-packed careers to attract and retain the most talented ones.

Did any new safety concepts emerge at the Conference?

The idea of institutional defence in depth was introduced to the floor. This recent notion, first discussed within the International Nuclear Safety Group (INSAG), is not an alternative to the 'classical', technical notion of defence in depth but comes as a complement. It consists of three organisational barriers with the operator and the IAEA's Operational Safety Review Team (OSART) reviews as the first barrier, the TSOs and regulatory peer reviews (IRRS) as the second barrier and the stakeholders – governments, parliaments, media, citizen groups, etc. – as the third barrier. The ultimate aim of institutional defence in depth is to build and disseminate a nuclear safety culture throughout society.

What must be borne in mind regarding the TSOs' governance?

One of the conclusions from the Conference is the need for an IAEA Safety Guide for the TSO function. Safety analyses are not simply aimed at checking compliance with rules, but involve R&D activities to allow regulators making decisions that draw upon technical expertise based on robust scientific knowledge. In my opinion, the TSO function must be auditable just as any other activity; but to make it auditable, common quidelines must be drafted within an IAEA framework. Today, the Integrated Regulatory Review Service (IRRS) missions for instance do not review the TSO function itself due to lack of such guidelines. In think the IAEA TSO Forum is the right place to build momentum for creating these guidelines. 🙀

Bridging competence gaps

aintaining and enhancing the credibility of expert assessment in a context of generation shift and globalisation of nuclear power is what knowledge management and training & tutoring are all about. **Matthias Otto,** Chief Expert on International Knowledge Management at GRS' Projects and International Affairs Division, **Didier Louvat,** Managing Director of ENSTTI and **Maria Moracho-Ramirez,** Safety Officer and Training Coordinator at the IAEA's Department of Nuclear Safety and Security share with us their views.

Knowledge management, a cornerstone of skill- and experience-building at GRS

Knowledge management (KM) and knowledge networking are increasingly becoming cornerstones to fulfil the mission of a TSO such as GRS, as exposed in its mission statement: "Making available and further developing scientific knowledge and methods to protect people and the environment from dangers and risks of technical facilities". In addition, GRS is dealing with KM and its development on behalf of the German nuclear regulator, i.e. the Federal Ministry for the Environment, Nature Conservation, Building, and Nuclear Safety (BMUB). Faced with the growing concern about the loss of competence due to the retirement of many

of competence due to the retirement of many experts in the company, GRS focused on maintaining and transferring competence and making KM become part of the work processes on a daily basis. For this purpose, an information and document management system was put in place to collect the information and the documents dispersed in a wide variety of file-shares, databases, and Internet sites. Different search criteria allow easy access and fast retrieval of data.

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As a project-oriented organisation, GRS implements process-based KM aimed at capturing knowledge as it is being produced in the core processes, and to make it available when needed. In this regard, a distinction is made between explicit knowledge in the sense of documented knowledge (e.g. in databases, reports, web-based portals, etc.) and implicit knowledge, which is stored in the minds of the experts.

With a view to capturing and documenting project-specific knowledge, the project file will be maintained electronically with all the documents that are of interest to the project, and secondly the work planned during the course of the project will document the existing state of knowledge at project inception and the knowledge gained as it progresses. "Experience is to be stored in special 'lessons learned' documents," points out Matthias Otto.



(Right picture) Training performed on a voxelised phantom as part of an ENSTTI tutoring session devoted to the radiation protection of man.

The top priorities of KM at GRS

Maintaining and further developing the technical competence with regard to:

- the state of the art in science and technology;
- knowledge-oriented planning and implementation of projects;
- distribution and sharing of knowledge;
- utilisation of knowledge
 - ••• The main platform to support internal KM at GRS is an Intranet portal which provides browser-based access to all information and knowledge sources available to the organisation, and supports a *Document Management* function covering important topical themes such as quality management, organisation handbook and many more, and a *Collaboration* function through open team-sites accessible to everybody in departments, projects, and particular areas such as emergency response and strategic programme groups. "The internal portal can thus be called a corporate memory of GRS," Mr. Otto stresses.

Besides the internal platform, GRS provides a web-based platform for inter-institutionary information and KM as well as for national and international cooperation of GRS with its partners. The main focus of this platform is the exchange of knowledge and the collaboration between different teams. In addition, this portal provides access to global, regional and thematic nuclear safety and security networks like GNSSN, the TSO-Forum, RegNet and ETSON.

Training & Tutoring: knowledge and experience tailored to the needs of each expert

"A weak point of nuclear safety often is chronic underfunding, and the first area impacted is training & tutoring" stresses Didier Louvat; "This is particularly alarming when an entire generation of experts is retiring and new countries are embarking on nuclear power programmes." Building up skills to bridge the competence gap at TSOs and NRAs is the original aim of the European Training & Tutoring Institute. It took a pivotal part in the EC's Nushare project, with the main objective to develop and implement education, training and information programmes strengthening competences required for achieving excellence in nuclear safety culture.

Through the set-up of standardised and auditable expert curricula, it contributes to enhancing the credibility of expert assessment. This European initiative is destined to extend to other regions, then, at the end of the day, competence-building concerns everyone, both well-established nuclear countries and new-comers. A view shared by Maria Moracho-Ramirez who concludes: "The IAEA has provided more than 25 training seminars all over the world to explain how to use the SARCoN methodology and help tailoring the IT tool to the national situation."

Learn more:
• ENSTTI: www.enstti.eu

• NUSHARE: www.nushare.eu

NOSHINICE. WWW.hushure.eu

Methods & Organisation

Through the daily exchange of experience and best practice, cooperation and networking provide useful guidance for TSOs to address different kinds of issues, starting with the management of interfaces and the prevention of conflicts of interest through to the conduct of preparedness activities as part of Emergency Planning & Response or the emergence of advanced concepts such as institutional defence in depth, which contribute to enhancing nuclear safety.



Commissioned in 1969 and 1971 respectively, the two units of the Beznau NPP, operated by the Swiss energy utility AXPO, belong to the oldest reactors in operation worldwide.

Management

ow to address divergent – and sometimes conflicting – views, priorities and interests? Martin Zimmermann, Acting Head of the Research Department for Nuclear Energy and Safety of PSI, the largest Swiss National Research Institute that also assumes the role of a TSO, Jean Jalouneix Security Adviser in IRSN's Defense, Security and non-proliferation Division, and Masashi Hirano, Director General for Regulatory Standard and Research at the Nuclear Regulation Authority of Japan, explain how they place the cursor to reach a fair balance in their respective area.

The notion of 'Conflict of interest' means that the outcome of a study relevant to safety and forming part of the nuclear licensing process could be biased e.g. by the selection of 'suitable' boundary conditions, or in the phase of interpreting simulation results by giving more or less importance to the uncertainty in the results of the calculation, etc.

As such a situation is obviously unacceptable, a 'simple' manner of regulating conflict of interest issues could be the parallel development by the licensee and the regulator of an organisation capable of performing the analyses and calculations necessary for safety assessment independently from each other and according to their respective roles. As a consequence, twice as many resources would need to be engaged... A quite challenging option for countries with a small-scale nuclear infrastructure or faced with budget restrictions!

Therefore, issues that represent potential conflicts of interest need to be addressed proactively, through a procedure transparent to all parties involved. This is the case for instance of large-scale experimental research facilities, such as the OECD Halden project, that are jointly operated by regulator, licensees and research organisations (TSOs) due to the requested financial commitment. "At PSI, when a project is particularly exposed to conflict-of-interest issues, a priority rule is in place that gives preference to work for the Swiss Nuclear Safety Inspectorate, and the industrial partners must agree to this rule in the bilateral contracts they sign with PSI," Martin Zimmermann explains, "moreover, we are currently working on a procedure to be deployed throughout our organisation with a focus on the need to adequately manage conflict-of-interest issues."

Holistic thinking

"Interface management issues do not pertain only to conflicts of interest," recalls Jean Jalouneix, "the management of interfaces between nuclear safety and nuclear security issues is another example of delicate problem solving". Since safety and security share one common aim – protecting the public and

of interfaces: in search of the right balance

the environment against radiological hazards -, both aspects must be analysed in a holistic, synergetic manner between the entities and experts concerned. This sounds obvious today, but in the past, safety and security assessments were compartmentalised. In France for instance, such integration is carried out at different levels, from inside the TSO (IRSN) to the government organisation, where a specific law of June 2006 and the associated decree require that the safety case should take into account accidents resulting from malicious actions. At international level, the departments of the IAEA tasked respectively with nuclear safety and security where brought together under the direction of Denis Flory, Deputy Director General of the IAEA and Head of the Department of Nuclear Safety and Security. "Tabletop exercises organised under the auspices of the IAEA help identify the concrete interfacing issues - and notably leadership and responsibilities issues involved in the protection of a nuclear facility against malicious actions," Jean Jalouneix advocates, adding that "such exercises raise awareness about the necessity to work jointly to assess safety and security files in a consistent way".

Achieving mutual respect and reliance

"Since the merger of the former Japan Nuclear Energy Safety Organisation (JNES) with the Nuclear Regulation Authority (NRA) in March 2014, I believe it has been generally recognised that the interface management between the TSO and the regulatory sections needs continuous efforts to achieve the common goal of the NRA," Masashi Hirano stresses. The Agency's current top priority being the conformance reviews of the 48 NPPs in Japan, the TSO section needs to fully support the regulatory section in carrying out these reviews whilst continuing its own safety research, with a view to contributing to the resolution of high priority regulatory issues and to the technical preparedness for future needs. "As part of the interface management, we have just started an evaluation of the research projects, where not only the TSO section but also the regulatory section as well as external experts - mainly university professors - are involved," Mr. Hirano goes on. The TSO section is evaluated from the viewpoint of whether its outputs actually contributed to solving the regulatory issue, whereas the regulatory section is evaluated in view of whether the outputs were properly understood and actually used in the regulatory actions taken. Efforts from both sides are required with the leadership of senior management to enhance the interaction and communication within the NRA and achieve in a long run the "mutual respect and reliance" that are indispensable for effective safety regulation.

At PSI, a priority rule gives preference to work for the Swiss Nuclear Safety Inspectorate, and the industrial partners must agree to this rule in the bilateral contracts they sign with us.

Martin Zimmermann, Acting Head of the Research Department for Nuclear Energy and Safety, PSI 30

hat role do TSOs play upstream from an emergency? And during a crisis? A trio of examples from **Olivier Isnard**, Deputy Head of the Emergency Preparedness and Response Department at IRSN (France), **Dr. Martin Sogalla**, Chief Expert Radiological Consequence Analysis and Emergency Preparedness of GRS (Germany), and **Dr. Seung-Young Jeong**, Department Head of Nuclear Emergency Preparedness at the Korea Institute of Nuclear Safety (KINS).

Emergency Planning & Response: the TSO's role

O. Isnard ♦ Many TSOs have a role in emergency planning; few have a role in emergency response. IRSN is an exception, as it plays a role in both. It has all the skills required to manage the expertise needed during an emergency, and the staff members share the same culture, work together every day. Planning is not everything; it's founded on assumptions that may or may not come to pass. It involves

The robustness and effectiveness of any emergency response organisation needs to be strained periodically through exercises such as this drill performed in the vicinity of the Cattenom NPP, located next to the border between France, Germany and Luxembourg (picture on the right). These exercises allow gauging notably the coordination between teams dispatched on field and crisis centres such as the GRS centre located in Cologne (picture on opposite page).



identifying accident scenarios, developing tools and organisations capable of remaining efficient in degraded mode, and carrying out response drills to make them robust.

Response on the other hand is necessarily adaptive. Operational skills and experience are needed. Management gives way to chain of command, and expertise must be imparted in a matter of minutes with incomplete data. The Fukushima accident changed how we think about severe accidents. Governments must be made to see that we must go beyond planning: we must be able to learn from major accidents, to train for them, to plan for large-scale protection of the public. Safety authorities will turn to their TSOs to understand and respond to an accident. And this has



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an international dimension: TSOs must work together.

M. Sogalla GRS supports and advises the German federal authorities responsible for nuclear emergency planning and maintains its own emergency centre. We continually enhance the scientific base to understand nuclear accidents. We develop realistic exercise scenarios for the authorities, with input from the plant operator, and we train their staff. We also participate in exercises when the authorities ask us to: the last time was in June 2014. These exercises show that it is vital to provide all necessary but only relevant information about the accident for an efficient and fast response. Continuous efforts to customise information as part of emergency planning can save a lot of precious time during an emergency.

Although the Federal Republic has opted to phase out nuclear power production, and the focus will change to different types of accidents, the fundamental challenge will prevail. Some of the lessons learned from the Fukushima accident are the importance of information exchange at international level and the importance of international collaboration among TSOs.

S-Y. Jeong ◆ Our main mission is safety regulation, but emergency preparedness and response is also important. We have 50 people at headquarters devoted to emergency management, and another 50 are dispatched to the off-site emergency management centre when needed. We also give technical advice on scenarios for emergency drills conducted at local and central government levels.

Our technical advisory system continuously collects and displays safety parameters of operating reactors to monitor a radiological emergency. Weather data is included to calculate the source term and assess doses. Public communication is the most important part in an accident; we're developing several communication tools, such as a public speaker system Headquartered in Daejeon, South Korea, the Korea Institute of Nuclear Safety is tasked notably with emergency preparedness in its capacity as the country's nuclear safety regulatory expert organisation.

and a smartphone alert application. After Fukushima, a large number of people were evacuated quickly from a very large area. How do you support so many evacuated people? We are polishing our evacuation strategy and local governments are increasing infrastructure to support evacuees. We adopted the IAEA concept with a separate "precaution action zone" (3~5 km) and "urgent protective action zone" (20-30 km). The strategy is to evacuate the core quickly, then assess the risk for the rest of the area, rather than full evacuation. The criteria for returning must also be defined: how clean is clean? How safe is safe? We must communicate more with the public about these public health issues. 🖕

hat role does networking play in nuclear safety? How is it organised? What are the needs? Representatives of three networks join the discussion: Lingquan Guo of the IAEA for the GNSSN, Kazuhide Tomita of NRA for ANSN, and Miroslav Hrehor of Centrum výzkumu Řež for ETSON.

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The ins and outs of networking

L. Guo • The Global Nuclear Safety and Security Network (GNSSN) is a knowledge network and part of an integrated IAEA methodology for capacity building that aims to enhance international cooperation and dialogue in the field of nuclear safety and security. It is above all a human network: members connect with skilled nuclear safety and security professionals, and gain knowledge, skills and competencies.

GNSSN creates, develops and maintains knowledge as a resource. Several plenary and steering committee meetings are held each year within the GNSSN framework, and work plans are developed at national and regional levels to respond to members' needs, with more than 100 coordination activities held each year. Thematic networks are also hosted by GNSSN. Workshops, training and tutoring are offered to members to support national and regional capacity-building efforts. The GNSSN Platform gives members access to safety and security information, best practices and operating experience. And GNSSN is connected to national safety and security networks and information sources through the National Nuclear Regulatory Portals (NNRP). GNSSN is an effective mechanism to strengthen Member States' safety and security infrastructure and respond to their capacity-building needs.

K. Tomita ◆ Human networking is important, but the IT network is also important. The human network has knowledge and experience that must be collected and stored by each member country.

How do we network? We have 10 topical groups in thematic areas like education & training, emergency preparedness, radwaste management, safety analysis, and so on. They coordinate workshops, training courses and other activities each year. We also have a capacity-building management group. In addition, several non-Asian countries are supporting members of our network, including France, the USA and Germany.

TSOs contribution to Emergency Response & Planning

planning, the decision-makers should be supported with expert assessments of the expected doses, provided by the TSOs and availability of real-time data, SSTC NRS, the Ukrainian TSO. uses an automatic remote control system, which transmits technical parameters from all the Ukrainian NPP units. RODOS as a decision-making support system is currently under trial operation In the framework of the Convention on Early the Convention on Assistance in Case of a improving arrangements on international cises, and providing appropriate training TSO Conference in Beijing reaffirmed that the role of TSOs in emergency planning and response should be strengthened and

Ihor Shevchenko

Director, State Scientific and Technical Center for Nuclear and Radiation Safety (SSTC NRS), Ukraine ••• The 'Vision of ANSN for the year 2020' was revised after Fukushima. The pillars are to maximise the use of networking and practical experience, and to make good use of existing resources. Self-ownership is critical to our work. This starts with self-assessment by each member state, to find the gaps. We use the IAEA's SSG-16 (Specific Safety Guide for Establishing the Nuclear Safety Infrastructure for a Nuclear Power Programme) as it is a very comprehensive tool for self-assessment.

M. Hrehor ♦ Why do we feel the need for doing something together? Because we feel the need for harmonisation. We don't have common approaches to many topics: the content of safety analysis, accident scenarios, codes, code assumptions etc., even interpretation of results. We need to unify these views and approaches.

This is why ETSON established 14 specialised technical working groups which are developing guides. These are not detailed instructions, they are principles. What we are trying to do in ETSON is to find common approaches, a common philosophy, a common understanding of how things should be done. If more people have common thinking, technical approaches can be harmonised.

Who should start this harmonisation? In my view, it has to be a bottom-up effort: it should start with the TSOs, who have the technical expertise and know what the goal for protection of the public should be, then move to the regulators, and in the end result in a legislative initiative by parliament. Four years after the previous IAEA TSO Conference in Tokyo and after the dreadful accident at Fukushima, the Beijing Conference welcomed the progress made in enhancing international cooperation while pointing out the need for progress in key areas such as the availability of sustainable TSO funding, independent expert capability, appropriate guidance for the TSO function, or the support to new comers. The EUROSAFE Tribune asked some ETSON member TSOs about future prospects.

Special Focus IN SEARCH OF SUSTAINABILITY

onfidence, independence, scientific competence, human resources, gualification, funding, long-term planning... Which challenges are TSOs faced with in cooperating in the post-Fukushima era? What is expected from them? What can they draw upon to meet expectations? Frank-Peter Weiss, Director General of the German TSO GRS, Jacques Repussard, Director General of the French TSO IRSN, Benoît De Boeck, General Manager of the Belgian TSO Bel V, and **Denis Flory**, Deputy Director General of the IAEA and Head of the Department of Nuclear Safety and Security, exchange views on some issues raised by the participants in the closing session of the 2014 IAEA TSO Conference in Beijing.

IAEA TSO Conference: time for assessment

GRS

Frank-Peter Weiss During this conference, I noted with interest the affirmed importance of establishing means for improved international worldwide networking to share knowledge and practical experience in nuclear safety sciences and technology. To me, this is an obvious recognition of the science-based nature of nuclear safety and a clear sign of how important international cooperation between TSOs is in continuously improving their ability to provide the scientific and technical basis of safety enhancement.

Jacques Repussard IRSN

The different presentations and debates also highlighted the necessity for TSOs to devote increased attention to conducting joint research aimed at enhancing the safety of notably the existing and future facilities. I totally share this view and support the idea of developing further the joint research projects among the TSOs, based on the identification of common interest and goals in nuclear safety and radiation protection, as we already use to do among European TSOs, in particular through platforms such as SNETP or MELODI. Beyond Europe, joint research projects can be carried out in the framework of international organisations such as the IAEA or the OECD-NEA or, when appropriate, by joining or creating regional TSO networks such as ETSON in Europe.

Bel V

Benoît De Boeck As concerns the development of TSO capabilities, the Conference clearly acknowledged the IAEA's role as a driving force and outlined the necessity to continue on this course. Several participants noted that existing international legal instruments and guidance documents provide so far very general information on the legal status and roles and responsibilities of TSOs in enhancing the safety of nuclear energy and ionising radiation. They noted - and this reflects my opinion - that more focused IAEA guidance regarding the status and roles of TSOs could be useful.

Jacques Repussard, Denis Flory, Benoît De Boeck (left) and Frank-Peter Weiss (right) exchanging views with the floor.

Frank-Peter Weiss

Absolutely, Benoît, and one important aspect of such guidance pertains to the TSO's necessary independence of judgment, in particular when it provides technical support to both the regulators and the industry. There are differences between the roles of a TSO in either case, and consideration should be given to how to safely exclude any potential for conflict of interest by an appropriate code of conduct, quality assurance, funding, and staff policy. Because, ultimately, a TSO is not only expected to provide a comprehensive and holistic view of the safety and security issues at hand but also independent and transparent technical and scientific advice without any undue influence from regulatory bodies, industry or other stakeholders. Certainly, more IAEA guidance on the functions and working principles of TSOs could be helpful in propagating these principles worldwide.

I think the TSOs should become more proactively involved in supporting regulators in the process of developing IAEA standards. **J**

Denis Flory Deputy Director General IAÉA

Denis Flory Coming back to cooperation and networking, several participants in the Conference addressed the issue of the so-called newcomers, who are in the process of setting up a IAEA safety framework - legislation, creation of a regulatory body, of a TSO, etc. - for their nuclear power programmes. As TSOs from elder nuclear countries know, it takes much longer to develop an efficient safety and security research and education & training system in physics, chemistry, mechanics, etc. than to draft an atomic law. TSOs are instrumental in helping to ensure the establishment of the necessary scientific and technical knowledge and capability, which is an integral part of the regulatory processes. As new regulatory authorities are being established, their need for support appears to be growing. In this context, existing TSOs will need to organise themselves to respond to this crucial need, even if regulators remain fully responsible for their own judgments and decisions, whether based on the work by TSOs or not.

- Jacques Repussard Another major issue addressed during the Conference relates to risk assessment. I noted a broad consensus on the crucial role of state-of-the-art risk assessment capabilities in ensuring effective nuclear safety and security supervision in a global perspective. Such capabilities draw upon a set of complementary activities which should be continuously developed in a cooperative multinational manner wherever possible. Just to mention a few, scientific risk-orientated research is an essential prerequisite for the success of defence in depth in terms of safety and operational expertise. For nuclear security, the equivalent prerequisite is an updated design basis threat. Operating experience feedback analysis also provides a pivotal contribution to enhancing our risk assessment capabilities, just as do knowledge management, dissemination and transfer to new generations of experts as well as occupational education & training courses and e-learning at a national, regional or international level.
 - Denis Flory One conclusive remark and a call, if I may! - on the TSOs' contribution to the enhancement of the global nuclear safety regime. Their central role in providing the knowledge and experience necessary to assess the safety of nuclear systems being acknowledged by all stakeholders, I think the TSOs should become more proactively involved in supporting regulators in the process of developing IAEA standards. 🕁

A roadmap for the IAEA TSO Forum

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B ased on the lessons learned since the previous IAEA TSO Conference in Tokyo in 2010 and on the exchange of views held in Beijing, **Benoît De Boeck**, who chaired the Conference, identified nine priority issues to be tackled by the IAEA TSO Forum and the member TSOs within the coming years. This is how they were summarised.

CONTINUE WITH THE IAEA TSO CONFERENCES

"A lot of progress has clearly been made since the last conference, but we noted that the TSOs still face the same challenges. The first recommendation is therefore that there should be a further TSO conference."

ENSURE INDEPENDENT EXPERT CAPABILITY

"Regulators need to have access to independent technical expertise and there should be provision for the continuing education, capability-building and knowledge-sharing needs of experts so that they can continue to provide a competent advisory service to the regulator in a timely manner."

SECURE SUSTAINABLE TSO FUNDING

"There is widely shared concern that developing and maintaining the capabilities of the TSOs is not always being adequately resourced. Ensuring long-term planning and funding is a critical challenge for the effectiveness and sustainability of TSO functions and TSOs need to have competent experts and adequate resources. Organisations performing TSO functions must have the resources to allow them maintaining a balance of judgment while achieving the highest level of technical

competence and transparency. Furthermore, they should
PROVIDE APPROPRIATE GUIDANCE FOR THE be able to provide independent technical and scientific advice without pressure from regulators, industry or other stakeholders. To ensure that the necessary expertise and competency is there, appropriate resources have to be made available, wherever they come from. Our next recommendation is therefore that member states should ensure that adequate and sustainable resources are available for maintaining TSO capabilities."

EXPAND THE ACTIVITIES OF THE TSO FORUM TO ENCOMPASS THE TSO FUNCTIONS

"There was general agreement at the conference on the crucial nature of international cooperation and networking amongst TSOs, which contributes to increasing feedback on experience and practice as well as providing information on new cases. The conference recognised that the IAEA, through the TSO forum, is a strong driving force for the development of TSO functions and capabilities. We therefore recommend that the IAEA should expand the activities of the TSO forum to provide a comprehensive coverage of issues dealing with the TSO functions."

PUT THE TSO FORUM OF THE IAEA TO GOOD USE IN SUPPORTING NEWCOMERS

"For newcomer countries - and those that are expanding or phasing out nuclear energy programmes - it is important to create, develop and maintain scientific safety and security capacities. TSO functions are instruments that will help ensure the establishment of the necessary scientific and technical safety as well as security knowledge and capacity which is an integral part of the regulatory process. However, progress in this area has been limited and it therefore matters to put the recently created TSO forum to good use in supporting newcomers."

CAREFULLY MANAGE INTERFACE ISSUES

"The interface between the TSO and the regulator needs to be carefully managed and it was felt that the TSOs should place attention on research work aimed at ensuring the safety and security of existing and future facilities and activities, and that common research programmes and projects should be developed. Understanding the interfaces between safety and security, such as in emergency exercises, must be another point of attention."

TSO FUNCTION

"TSO functions must be compatible with the regulatory system. The previous conference recognised that the regulatory system was comprised of three key areas of the regulatory function: the regulatory body function; the technical and scientific expertise function; and the development of a knowledge base and associated tools. The latter two constitute the TSO functions. As we know. appropriate guidance has not yet been produced and work should therefore continue on providing a safety guide for the TSO function."

PLACE EMPHASIS ON JOINT NUCLEAR SAFETY AND SECURITY RESEARCH PROJECTS

"Special efforts are needed to develop and maintain competence-based knowledge and effective nuclear safety, and security supervision requires access to stateof-the-art assessment capabilities. In turn, these capabilities require scientific and technical knowledge along with sufficient assessment practice and the proper management of knowledge and knowhow, and this must be continuously developed in a sustainable manner at national, regional or international level. In particular, research and development is indispensable for creating and developing the knowledge and expertise required for the assessment of existing and future nuclear installations. A further recommendation is therefore that there should be additional work on common nuclear safety and security research projects."

STRESS NUCLEAR AND RADIOLOGICAL EMERGENCIES

"Knowledge and capabilities exist in member states and we recommend that the TSOs should register these capabilities with the authorities in their country. We further recommend that the expertise of the TSOs should be further integrated in developing the assessment capabilities in nuclear and radiological emergencies."

Credits

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COMING NEXT. Severe Accident Management

The accident at the Fukushima Daiichi NPP brought to light areas where scientific, technical or organisational skills were insufficient, be it in terms of severe accident prevention or in terms of mitigation. This issue offers an overview of the endeavours undertaken to better understand the root causes of severe accidents and identify the measures conducive to better decision-making when the protection of the population is at stake. More on: www.eurosafe-forum.org

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echnical Nuclear Safety Practices in Europ

