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SECURING NUCLEAR SAFETY IN FUTURE YEARS

Review of the main themes discussed
at the EUROSAFE Forum
held in Berlin in November 2007

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Jacques Repussard and Lothar Hahn

The world is hungry for energy whilst the climate change is raising global concern. Sustainable strategies aimed at reconciling both trends are intensively masterminded and, after a long pause, nuclear power is experiencing a perceptible development.

Whereas nuclear fusion could use a reputedly infinite energy source, the uranium fission fuel cycle could be already highly improved by burning U_{238} . Future plants may be as different from today's NPPs as the latest multimedia pocket terminals from the mobile phones of the nineties. Obviously, this is a very anticipatory contemplation, but real technological and safety improvements are already present in the generation III reactors, and the research performed on generation IV reactor concepts should further enhance the fuel cycle safety and efficiency.

Regardless of the individual countries' strategy in the field of nuclear energy, operators are keen to enhance ever more the profitability of existing plants, for example by introducing higher fuel burn-up rates, reducing outage periods and by seeking life extension of the reactors. With regard to the large investment associated with NPPs, extending their service life is favourable to profitability up to the point where maintaining a demonstrated high level of safety will become too expensive – or even impossible – by comparison to the performance of new plants.

These combined evolutions translate into significant nuclear safety challenges at a time where countries with neither knowledge in nuclear engineering nor experience in NPP management consider embarking on nuclear power production programmes and where terrorist threats pose new security issues.

To take up this multifaceted safety challenge and contribute to securing nuclear safety in future years, TSOs are actively tackling such issues as the conservation and sharing of knowledge and experience, the recruitment of young, talented nuclear engineers to compensate for retiring employees, the build-up of R&D programmes and facilities aimed at assessing the safety of tomorrow's technologies and operating concepts. To simultaneously address all these issues in a context of stringent budgets, TSOs strive for pooling human and technical resources, networking R&D and promoting common safety requirements, in Europe and worldwide. This is what the EUROSAFE Forum held in the German capital on November 5th and 6th 2007 was all about. We are pleased to report from the corresponding presentations and debates, and wish you pleasant reading. ●

Jacques Repussard and Lothar Hahn

WELCOME AND ADDRESSES

Nuclear power: entering the modern age of nuclear safety



Nuclear 'renaissance': this is arguably the word that best epitomises the 2007 EUROSAFE Forum held in Berlin on November 5th and 6th, an edition focused on 'Securing nuclear safety in future years'.

Welcoming an audience of over 400, Lothar Hahn, the Technical and Scientific Director of GRS, put emphasis on the first steps taken by the European Technical Safety Organisations Network (ETSON) founded in May 2006.

2007: a very busy year for ETSON

The year was devoted to introducing the new network to national authorities and to international organisations: the European Commission, the Western European Regulators Association (WENRA), the International Atomic Energy Agency (IAEA), the OECD's Nuclear Energy Agency (NEA), and others. In the meantime, ETSON has taken or is about to take an active part in several initiatives such as the development of a European Operating Experience Feedback (OEF) system, the Sustainable Nuclear Energy Technol-

ogy Platform, or the elaboration of the so-called safety assessment guide. Moreover, the newborn network supported the IAEA in organising, in April 2007, the first TSO conference in Aix-en-Provence (France) and is ready to participate actively in the preparations of the next conference expected for 2010. "Far from being restricted to some happy few, ETSON is wide open for additional partnerships. The TSOs from the Czech Republic and Finland thus intend to join ETSON after the negotiation will be completed," Mr. Hahn stressed, adding as a conclusion: "All ETSON activities also serve to secure nuclear safety in future years, which is the topic of this year's EUROSAFE Forum. The continuous improvement of the safety of nuclear facilities worldwide is what all TSOs are striving for."

A forum to meet the safety challenges at a time of nuclear renaissance

Jean-François Lacronique, the chairman of the board of IRSN, reasserted the importance of the EUROSAFE forum as a place where people meet, debate on a wide range of issues, compare each other's experience, as a privileged arena to reinforce, when necessary, the ties between peer organisations, as well as a unique opportunity to contemplate the future, drawing upon different cultures, experiences and perspectives. *"At a time of 'renaissance' of the nuclear industry, evidenced by the construction of several new reactors in Europe, and also in China, Russia, India, Ukraine and Brazil, this is a major asset,"* Mr. Lacronique pointed out, urging the 'Old Europe' to play its full part in this renaissance by taking advantage of its long experience – more than 50 million hours of generating nuclear power – and safety records over the past 50 years. *"This outstanding situation, however, must be confirmed every day, every minute, and I think that the most important quality to be credited for in our field of risk assessment is responsiveness, i.e. the ability to make the competent decision without delay, taking into account the experience of problems encountered as illustrated in the European OEF system,"* he stressed.

But how could a sustainable technological renaissance develop without a renaissance in confidence and trust, as a result from a policy of openness, transparency and friendly contacts? *"We still have a long way to go to deserve the trust of the general public, but there are signs that efforts are paying off well,"* Mr. Lacronique concluded.

Promoting the European Operating Experience Feedback System

Taking his turn as an organising party, Jean-Jacques van Binnebeek, director general of AVN, commented on a major topic associated with

securing nuclear safety in future years: the European Operating Experience Feedback (OEF) System. *"OEF,"* he said, *"is characterised by the early detection of significant events, their in-depth analysis by an integrated team of senior experts, a clear identification of causes and lessons learnt, and the definition of a set of corrective actions."* In this respect, Mr. van Binnebeek highlighted the OSOs' privileged position to produce an outstanding added value, through their large and integrated expertise, as well as significant support to countries that somehow lack resources. *"It is well known that Europe, and the world in general, is facing a shortage of technical people, in particular of engineers,"* Mr. van Binnebeek recalled. *"This shortage induces today strong personnel movements between nuclear licensees, OSOs and regulators sometimes as a result of a competitive strategy between them. Some countries are facing that today, and I think such situations should be submitted to the OEF methodology of analysis to avoid repetition of blunders,"* he advocated.

Germany: the public opinion in the curve?

Taking the floor as the first speaker at the 2007 EUROSAFE Forum, Dr. Walter Sandtner, Head of Department of International Nuclear Organisations and Safety Research at the German Federal Ministry of Economics and Technology (BMWi), took stock of the trend in favour of nuclear energy across the world as well as the gradual rethinking of the nuclear issue taking place in Germany. *"Emnid, the renowned German opinion research institute, recently published figures showing that a majority of the German population, that is 48%, is in favour of extending the service life of nuclear reactors, while 44% are against. This change of attitude is truly remarkable and reflects a growing concern that the*



Angela Becker

*Expert in radioecology,
GRS*

« We have been operating NPPs in Germany for over 50 years. Back in those days, environmentalists used to compare the nuclear fuel cycle to a plane that takes off without checking whether or not a landing place is available. Now we are in the process of demonstrating that the landing place is available and safe. A final repository has to be safe for a million years, regardless of climate or geological changes. To cope with this issue, we are focusing on providing evidence that no change has occurred over such a period of time and that no water permeated the salt or clay layer. Only if we can fully provide that evidence the place is considered suitable to contain radioactive waste. Then radioecological calculations play their part, not only as legal prescription, but as necessary step to build confidence. I assume a sufficient number of sites is available in Germany to receive the radwaste already produced and the additional quantities to be generated up to the closure of the last facilities. »



Christer Viktorsson

Section Head,
Policy and Programme
Support Section,
Division of Nuclear
Installation Safety/
Department of Nuclear
Safety and Security, IAEA

« If existing plants are operated well, the replacement of technicians on the boards of electricity companies by lawyers and economists results into a declining safety culture at this particular level. Since every economic decision made by top executives has safety implications, I think more attention for nuclear safety has to be required from the management to provide for sufficient leadership and safety governance. Thirty “new” countries – i.e. countries without any experience of nuclear power production – announced their intention to include nuclear power in their energy mix. This requires an industrial and regulatory infrastructure to be built up, and above all extreme political stability, due to the duration of the nuclear fuel cycle. Last but not least, stakeholder involvement as well as the funding of facility dismantling and waste repositories require further efforts. »

phasing-out policy will, in the end, bring Germany a lot more disadvantages than benefits,” Dr. Sandtner pointed out, mentioning several reasons to this progressive change in the public opinion and, in particular:

- a strongly growing energy need that can only be covered by making use of all energy forms including nuclear energy,
- the level of energy dependence of the EU Member States, on the rise to reach 70% in the next 30 years,
- the price of the various power sources, nuclear energy and hydropower being the two most inexpensive ones,
- the environmental impact of power generation, nuclear energy being the smallest contributor to CO₂ emissions.

With respect to the increased budget allocation for nuclear safety research for 2007-2009, Dr. Sandtner concluded his address by observing that 50% of the German funding for reactor safety research would be reserved for scientific projects carried out by GRS.

Plea for the ‘Multinational Design Evaluation Programme’

The Director-General of the OECD’s Nuclear Energy Agency (NEA), Luis Echávarri, reminded the audience of the challenges the current nuclear “renaissance” is faced with, starting with the availability of qualified people for countries that intend to increasingly rely on nuclear in the future, but also countries undergoing a phase-out process: *“It is very important that the governments take action in promoting young students, so that good ones come to the different areas of the nuclear fields. This has been agreed by everybody, even by countries with anti-nuclear policies,”* he stressed. Shifting to the NEA’s priorities both from a regulatory as well as from a technical safety perspective,

Mr. Echávarri mentioned, among other items, the improvement of inspection practices, the feedback from operating experience, the regulation of new reactors, the analysis and management of accidents, the integrity of NPP components and structure, in relationship with the plants’ service life being extended from 40 to 60 years in many countries, the seismic behaviour of plants, and the safety of nuclear fuel in the context of search for increased efficiency and the management of radioactive waste.

The NEA Director-General then appealed to the nuclear countries to adopt a common approach to safety for the new reactors on a global scale: *“It would be very beneficial for the industry, as vendors would not have to change the design from country to country. It would be very good also for the regulators who could save resources and do their job better together. It would also be helpful for the public to understand that there are clear international criteria for nuclear safety.”* In this regard, Mr. Echávarri introduced the ‘Multinational Design Evaluation Programme’ aimed successively at establishing the basis for the licensing of the EPR in the United States; fostering convergence of codes, standards and safety goals for the different technologies available on the marketplace; and implementing the result of this work in specific designs, e.g. of generation IV reactors. ■

PRESENTATIONS

An operator's and a TSO's perspective on the future of nuclear power



Regardless of the political orientation in favour of a phase-out or, oppositely, of a 'renaissance', nuclear safety implies to look forward to get set for future challenges. Michael Wenk, from EnBW Kernkraft, and Victor Teschendorff, from GRS, provide their respective views on the subject.

"We, at EnBW, believe in the future of nuclear, even in Germany"

EnBW Baden-Württemberg is the third largest electricity supplier in Germany with a plant capacity of about 15,000 MWe, of which about 5,000 MWe come from nuclear (including procurements and agreements with the EDF). EnBW Kernkraft GmbH, its subsidiary for nuclear power production, operates five units: 1 BWR + 1 PWR in Philippsburg, two PWRs in Neckarwestheim, and one unit decommissioned since May 2005, in Obrigheim. All plants are running with an average availability between 91% and 95%.

The Chairman of the Board of EnBW Kernkraft GmbH and Chief Nuclear Officer of EnBW Kraftwerke AG, Michael Wenk, reflected a major concern in his presentation: the replacement, by the end of 2025, of almost two-thirds of the current German power generation capacity, i.e. about 80,000 MWe. *"In Germany, nuclear is still ranking first for its contribution to gross electricity generation with 26%, and especially for its contribution to base load, with more than 50%. In 2020, there is a lack of more than 40% compared to today's capacity. If you keep in mind the necessary lead-times for replacing power plants,*



Dana Drábová

President, State Office for Nuclear Safety, Prague, Czech Republic
Chair of Western European Nuclear Regulators Association (WENRA)

◀ Created in 1999, the Western European Nuclear Regulators Association, WENRA, took part from 1999 to 2003 in the biggest EU enlargement move by technically assessing the level of nuclear safety in the accessing countries. This was an opportunity for WENRA to establish itself as an efficient platform for solving community matters thanks to its ability to reach consensus. The experience showed that if the time devoted to frank and open discussions results in relatively slow progress, but the solid consensus that is reached makes it difficult for individual countries to deviate from the commonly approved requirements. WENRA proved very efficient in promoting best practices through partnerships that enable free discussions about bottlenecks and about success stories. The management of nuclear risk is a task with no border. This is why WENRA is striving for closer co-operation and experience sharing! ▶▶

this is nearly tomorrow! Included is the nuclear capacity of about 20,000 MWe. Even if we assume reductions due to efficiency gains and savings, there will be a big problem to resolve the capacity requirements,” Michael Wenk claims.

In spite of the context driven by the phase-out law, EnBW is pursuing a strategy focussed on its number one priority: safety. To keep its nuclear fleet in top condition, the company built up a set of complementary procedures and tools such as:

- an overall guideline used as a basis to formulate goals each year, both cross-locational and location-specific goals being documented,
- the implementation of a safety management system aimed at ensuring transparency and traceability through 70 processes and 170 indicators,
- an ageing management system to cover the technical issues: mechanical engineering, instrumentation and control, structural engineering and operating supplies,
- an outage optimisation based on long-term planning to deal with extensive periodic inspections, maintenance or changes,
- medium to long-term personnel planning to guarantee retention of knowledge and expertise, and a prospective recruitment policy. “*We particularly care about the right time of overlapping between generations as well as cross-border training for future key personnel,”* Michael Wenk stresses. “*In this regard, EnBW and EDF have developed a joint recruitment and training programme in the field of nuclear techniques. With this programme titled ‘We offer a future which means work’, we intend to recruit and train future key personnel who have intercultural and language skills that are important for employment in Germany and France. At the moment, we have about 25 engineers in this programme.”*

Michael Wenk concluded his address with pointing out EnBW’s active role in promoting an aggiornamento of today’s German phase-out law with a view to extending the lifetime of the existing plants: “*I think a change is obviously necessary to reach the goals of CO₂ reduction and to assure the security of power supply in our country. We, at EnBW, believe in the future of nuclear, even in Germany.”*

“Safety research is one of the pillars on which all nuclear safety rests”

Presented by Victor Teschendorff of GRS and co-authored with his colleagues Pieter De Gelder from AVN and Giovanni Bruna from IRSN, the contribution titled “*Research for the Safety of Operating Nuclear Facilities*” reviewed the motivation of safety research, its drivers and trends, as well as the new forms of international cooperation.

Victor Teschendorff first reasserted the rso’s commitment to perform safety research as a basis for the independence of technical judgment and the strong European and international support in this field, mentioning the 7th Framework Programme of the EU, which values continued safety research for operating facilities as highly as the efforts to contribute to the development of new facilities by research, and the development of a strategic plan for two important committees by the OECD/NEA: the Committee on the Safety of Nuclear Installation (CSNI) and the Committee on Nuclear Regulatory Activities (CNRA).

Shifting to the motivation of safety research, Victor Teschendorff stressed that first priority should be given to the activities that support the regulator in solving pending safety issues, and recalled the anticipatory character of research: “*A researcher has to look ahead on safety questions that may arise in the foreseeable future, and even beyond that,”* he claimed. This

implies a sufficiently broad layer of basic research to be performed, encompassing the development of simulation tools and of assessment methods, databases, experimental facilities with a laboratory infrastructure that has to be maintained independent of any daily questions a regulator may have.

“Challenging the search is an excellent means to preserve know-how and professional skills,” Victor Teschendorff commented, mentioning the major drivers of research:

- operating experience feedback,
- new technologies being introduced in the existing NPPs (this is specifically the case in the deregulated market with new fuels, high burn-up fuels, fuels with MOX and higher enrichment, high burn-up, and the behaviour of this fuel under loss of coolant accident and reactivity-initiated accident conditions),
- the quantification of uncertainties, which now is a requirement in daily practice,
- the intrinsic rationale of research: *“Sometimes research drives itself, as researchers find new tasks for themselves,”* Mr. Teschendorff highlighted. *“The German PKL facility for instance revealed the different behaviours of thermal-hydraulic loops, whereas the PHEBUS fission product experiment showed unexpected results, specifically regarding the behaviour of iodine.”*

At a time where operators strive for enhancing the efficiency of their reactors, Victor Teschendorff emphasised the concept of ‘safety margin’: *“It is not simply the difference between an analytical calculation and the licensing acceptance criteria for a safety variable. There is a lot more to it, this is why safety margins are really what research for existing facilities is all about. We know that facilities are safe, but we want to*

know how safe they are. We want to quantify this especially in cases where plants or operating modes are modified.” He reminded the floor of the action plan launched by the OECD/NEA to address this issue.

Lots of research is still to be performed in various areas such as thermal-hydraulics where 3D models are extended to interfacial area transport, fuel behaviour under accidental conditions where coupled phenomena are to be accounted for, or hydraulic calculation with the development of a new class of codes named ‘CFD’. In this context, the research needs for the future can be summarised as follows:

- Maintaining experimental infrastructures (such as PKL in Garching [Germany] or PHEBUS in Cadarache [France]) for a twofold purpose: they are the database for development and are needed for validation of analytical tools;
- Integrating research internationally in a sustainable form of cooperation to maintain a complete coverage of all relevant safety areas by research activities. Sarnet, the network of excellence in the field of severe accidents, supported by the European Commission, or the newly-established Sustainable Nuclear Energy Technology Platform (SNETP) are two emblematic examples of this move.

“Transforming international cooperation into sustainable networks will enable safety research to promote nuclear safety in the future,” Mr. Teschendorff concluded. ■



François Bréchnignac

*Director Scientific Assessment, Scientific Management, IRSN
President of the International Union of Radioecology*

◀ **The conservation of knowledge and experience, and their transmission to the next one is a real issue,**

notably in the field of radioecology. In the US, for instance, labs specialising in this domain are getting scarce, whereas a clear interest for additional nuclear power capacity is spreading among policy makers. Radiological protection is of pivotal importance in the nuclear landscape, and the development of nuclear power plants cannot be separated from the protection of man and the environment. Surveys established that the protection of man is not synonymous with that of biotopes. For this reason, the International Commission on Radiological Protection decided to set up a specific environmental protection system with a twofold objective: firstly, design a system compatible with the protection of man and, secondly, incorporate the interactions with stressors from other industrial sectors. ▶▶

PANEL DISCUSSION

Eight challenges to secure nuclear safety in future years



Moderated by the Director-General of the OECD/NEA, Luis Echávarri, the panel discussion of the Berlin 2007 EUROSAFE Forum gathered six panellists representing the EC, operators, regulators and TSOs to debate on the challenges to be faced in securing nuclear safety in future years. Eight topics emerged from this 90-minute exchange of views.

The moderator

Luis Echávarri

Nuclear Energy Agency (NEA) of the Organisation for Economic Co-operation & Development (OECD)

The panellists

Ute Blohm-Hieber

Unit H.2 (Nuclear Energy, Waste Management and Transport), DG TREN, European Commission

Dana Drábová

Western European Nuclear Regulators Association (WENRA)

Marcel Maris

Association Vinçotte Nuclear (AVN), Belgian TSO

Michel Schwarz

Institut de radioprotection et de sûreté nucléaire (IRSN), French TSO

Jari Tuunanen

Teollisuuden Voima Oy (TVO), private Finnish utility

Christer Viktorsson

International Atomic Energy Agency (IAEA)

Harmonise safety approaches through legally binding, common instruments

“One of WENRA’s objectives is to develop a common strategy with respect to nuclear safety and regulation in the EU,” claimed Dana Drábová. “Then it is to provide the institutions of the EU with the independent capacity required to evaluate and put into effect a common strategy for the resolution of issues emerging in the EU in relation to nuclear safety and regulation.” On this subject, a participant from the floor highlighted that “150 NPPs have been in operation in Europe, and it is very difficult to implement any design criteria for these plants in order to make them consistent. However, as suggested by the title of the present EUROSAFE Forum, it is high time to consider the

next generation of nuclear power plants. We could create common design criteria for the new plants for the whole of Europe, drawing upon IAEA safety regulations. Those have to be picked up and transformed into a form of directive, which needs to be enforced in all EU countries.”

Tackling the delicate issue of a legally binding, common instrument to enhance nuclear safety across the EU, Ute Blohm-Hieber remarked: “We have the IAEA safety standards, the CNS process, the conventional nuclear safety, the NEA, working groups in the EU, the WENRA... We have today lots of pieces and, unless we work together to join up the puzzle, it can fall apart. From a EU point of view, I think we should somehow have a legally binding instrument such as operational experience feedback. The Americans have one operational feedback for all the power plants in the west. Why shouldn't we have something similar in Europe?”

Accelerate networking to meet an increasing demand of expertise

The TSOs will be faced with many challenges in the coming years, as pointed out by Michel Schwarz: “The demand of expertise will be on the rise, due to the construction of new reactors, the extension of the service life of existing plants to 50 or 60 years, and evolutions in the operating modes for economic reasons. Since the resources of the TSOs are not likely to be increased in proportion, we'll be challenged with meeting the demands, providing the required volume of expertise, and maintaining adequate research capacities. We need to accelerate the networking process in order to share the cost of research and its results, so that the developed tools and techniques can be used by TSOs for assessment purposes as a support to regulators. Skills also need to be shared. One of the major tasks of the ETSON network will

be to establish a long-term plan for R&D for the next 10 or 15 years.” In this regard, Mr. Schwarz judged critical to pay utmost attention to the research pricing structure. “It must be made available to facilitate high-level safety research,” he concluded.

Update the R&D infrastructure to gain further understanding of phenomena

Commenting on the reasons for preserving and updating the research infrastructure, Jari Tuunanen declared: “We need to do so not only to ensure a safe future for our existing reactors but also to train new people. Finland is playing its part by deciding, for instance, to participate in the Jules Horowitz reactor project. We, at TVO, support the construction of a new test rig for EPR studies at the Lappeenranta University of Technology.” As a justification to ongoing research, Michel Schwarz asked: “Do we know enough? I would say ‘no’, but it is difficult to establish. We thought, for instance, we knew everything about the behaviour of iodine, and the PHEBUS test was performed just to confirm that everything was well understood. Then we had a surprise: there was more gaseous iodine than predicted by models that were not able to predict what was observed during the experiment. In the same way, the PKL dilution experiment could result in new phenomena that have not been observed in the earlier tests.”

Offer young engineers a future to attract them into a nuclear career

Making studies in nuclear engineering and physics more attractive would benefit safety, Marcel Maris advocated: “We should promote careers in the nuclear sector as multidisciplinary jobs that provide many opportunities. This starts with explaining what nuclear power is, the different applications of ionising radiations. We all know that it is used for example in hospitals, but these young people don't



In his role as moderator of the panel discussion, Luis Echavarrri, the Director-General of the OECD/NEA, carefully balanced the views voiced by regulators, TSOs, operators, the EC as well as international associations respectively.

know that! One of our department heads and one young engineer went back to their universities and met with students to talk about their jobs. This really appealed to the young people!" Mr. Maris suggested to take advantage of electronic communications to direct appropriate contents at potential recruits, but *"Are the nuclear industry and the regulators prepared to contribute to a common action?"* he asked. Sharing this view, Dana Drábová added: *"We have to offer people a future. This is a key point in terms of motivating people. The nuclear community has, step by step, developed a low profile in the perceptions of young people because it does not offer a clear, long-term future and high social status."* In this respect, Mrs. Drábová mentioned the Czech utility's decision to create specialised graduation programmes directed at people in highschoools and universities who would be motivated to join such dedicated courses. For Jari Tuunanen, one way to attract new people could be to make nuclear research more

interesting for students by setting up research projects, e.g. on fourth generation. *"We, at TVO, support generation IV for educational purposes,"* he claimed.

Pay more attention to leadership, organisation and human factors

Stressing that the prevention of accidents relies, beyond technical aspects, upon taking the human factor into consideration, Christer Viktorsson affirmed: *"Many of the incidents in NPPs have human and organisational factors as root causes, and in particular a lack of effective leadership. This has been clearly stated in the new safety fundamentals of the IAEA, through the principle called 'Leadership and Management for Safety.' Risk awareness is a question also linked to leadership. One important role of a leader is to remind the staff in an organisation that there is always the potential risk of an accident."* In this regard, Mr. Viktorsson wondered whether there is enough research in Europe on human organisational factors and on risk awareness. *"I think we need to make a greater effort to develop strong indicators to show how effectively organisations are led and to develop leadership based on an effective management system,"* he stated.

Develop the means to strengthen regulatory supervision

Establishing that licensees take sufficient care in all aspects of safety is as much part of the regulator's role as assuring that licensees have an open and transparent relationship with the authorities and with the public. To carry out this task, Marcel Maris recommends the continuous availability of a competent team of experts, the joint training of new regulatory and licensee staff, as well as the appropriate monitoring of NPPs by a sufficient number of inspectors tasked with observing and assessing daily prac-

Taking a question from the floor together with Luis Echávarri, Ute Blohm-Hieber, as a DG TREN representative, advocated Europe should make operational experience feedback a legally binding instrument.

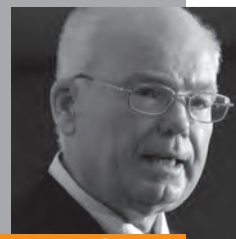


« In many countries it is very well understood that the growing hunger for energy can hardly be met without including nuclear power in the energy mix.

Major states such as China, Russia and India have initiated significant programmes to enhance their nuclear power production capacity. Russia alone intends to build 26 reactors till 2020. In Germany, where more than 40,000 MW of electricity generated by nuclear and fossil fuels will have to be 'substituted' over the next twenty years to meet the country's commitment regarding the reduction of CO₂ emis-

sions, there is a growing discussion regarding the current nuclear phasing-out policy. A recent public survey performed by Emnid shows that 48% of the interviewees are in favour of extending the authorised life-time of the currently operated NPP fleet while 44% are against, the remaining 8% being neutral. I assume this gradual change in the public mindset is largely due to the sky-rocketing prices of oil and other fossil fuels. But I still doubt whether the German public at large is fully aware of the problem's extent. In less than 2 years there will be federal elec-

tions and it could very well be the case that the issue of nuclear energy will play an important role. The German philosopher Hellmuth Plessner has written the remarkable book "The Belated Nation", meaning that Germany formerly has missed to some extent the development of the Renaissance and the Enlightenment. It would be a pity if Germany once again would miss a Renaissance, this time the so-called Nuclear Renaissance. But, as said, it looks like the worldwide need for energy will in the end also push Germany to reconsider its present policy. »»



Dr. Walter Sandtner

Head of Division,
International Nuclear
Organisations & Safety
Research,
German Federal Ministry
of Economics &
Technology (BMWi)

tices in the plant and discussing them at the suitable levels. "I would like to stress also the importance, for the regulator, of assessing his own work as well as the overall safety of the plant, so that he can form proposals for improving both his own work and the plant's safety regime," Mr. Maris suggested.

Communicate on nuclear issues

The interface between safety and the economy is a pivotal issue. "We, as regulators, are increasingly forced to communicate with the business-oriented management of utilities," Dana Drábová emphasised. "We therefore have to find a lingua franca, a common language to make them understand that even a relatively low-level event can turn into an economic disaster for them." The same difficulty in finding the right language to address the public was highlighted by Marcel Maris: "We cannot go to the public and say that everything is all right... They would call us liars. Conversely, they would think we are incompetent if we said that not everything is under con-

trol. I think we should not always rely only on engineers, on technical people, but also on people such as psychologists or communication specialists who know more about the human machine."

Make 'new' countries aware of long-term commitments

More than 30 countries from all over the world are interested in introducing nuclear power in their energy mix. In this context, Christer Viktorsson reminded the floor of the IAEA's position: "The Agency is saying, in essence, that when you introduce nuclear power, you have to introduce a nuclear safety infrastructure in parallel. We also say that, when you enter into a nuclear programme, it involves at least 100 years of commitment. This also gives the politicians an idea of what it means to launch a nuclear power programme. We are sometimes criticised for being too 'hardline' on this message. However, we have to be firm from a safety point of view, as this is a global issue." ■

OPERATIONAL EXPERIENCE FEEDBACK WORKSHOP

“There is no shame in not knowing, the shame lies in not finding out”



Quoted by Ashok Thadani from the US NRC, participant in the EUROSAFE Forum 2007 workshop devoted to the European Operating Experience Feedback System, the Russian proverb used to title the present article epitomises the fundamental issue associated with the operating experience feedback (OEF): enhancing the international feedback systems to ensure that operating experience is effectively used. What are the strong points and limitations of the existing systems? What are the prospects? The EUROSAFE Tribune interviewed some of the participants.

EUROSAFE Tribune. What are the main lessons learnt from the TMI and Chernobyl events?

Bernard Fourest, EDF. These serious accidents showed that the OEF is certainly one of the most important tools to improve safety. The industry has consequently taken steps with the creation of the Institute of Nuclear Power Operators (INPO) and of the World Association of Nuclear Operators (WANO). I should also mention the experience shared among the various vendors in the Owners' Group. WANO's reporting system is very sim-

ilar to the Incident Reporting System (IRS), but in addition and on assignments of two to three years in the Association's headquarters, there is a small international team of experts who come from the operating side and who therefore know how the various plants are designed and operated. They not only review the events but also prepare recommendations on the lessons to be learned which are disseminated to members. Whether these lessons have been implemented is checked during peer reviews. The experience shared among INPO and

WANO members shows that the utilities learned from the benefit of reactor fleet standardisation. They try to have common safety requirements from all vendors, through the US utilities requirement document or the European Utility Requirements (EUR). I hope regulators will also consider standardisation when they review third generation reactors all over the world.

EUROSAFE Tribune. **What should be the focus of OEF?**

Jukka Laaksonen, STUK. The main message is that focus must be moved from reporting to learning. Instead of telling each other about the events, we must learn from them. What are the organisational risks and what has been done to reduce or eliminate those risks? Another important message is to increase human resources devoted to the international OEF, both within each country and within the international organisations. We should also tell each other about good practices that some plants have in place. For this purpose, the International Nuclear Safety Group (INSAG¹) encouraged all regulators and operators to pay more attention to the learning opportunities from their foreign colleagues.

EUROSAFE Tribune. **How is OEF handled in France?**

Rémy Bertrand, IRSN. OEF is of course primarily aimed at analysing the 'French' events, but also the 'foreign' ones. Our objective in analysing reports from abroad is to understand events occurring across the world, their causes and prevention, in order to identify design and operating improvements needed to prevent such events in France. The aim of the French OEF analysis is to generate insights, in terms of root causes and lessons learned, useful to maintain and improve the safety of nuclear

installations. To perform trend analyses, we consider it necessary to get consistent information. Therefore, the content of the 'French' safety-significant event (SSE) reports is standardised. Every week, about 20 engineers in charge of site safety assessment meet to review the SSE reports and select some SSEs for in-depth analysis. The IRSN database dedicated to SSEs, called SAPIDE, is updated accordingly and, for the most important ones, an in-depth analysis is conducted. Moreover, a probabilistic safety assessment (PSA) is initiated for a few carefully selected SSEs per year. Obviously, OEF analyses encompass a wide scope but, despite all these actions, we can observe new events occurring at the plants. This shows the need to sustain our efforts devoted to the OEF analysis.

EUROSAFE Tribune. **To which extent is the situation similar in Finland?**

Seija Suksi, STUK. Finnish rules indicate that operating experience has to be understood in a wide context: it doesn't only encompass operating events but also results from safety research. In the Finnish legislation, there are general requirements pertaining to the use of OEF for safety enhancement. A fundamental principle is that the licensee has the primary responsibility for safety and for OEF. The YVL regulatory guides issued by STUK provide designers and operators with detailed requirements on technical issues and guidance on how to handle regulatory and licensing matters. STUK's expectation is that licensees follow the principle of continuous safety improvements and meet the upgraded safety requirements. OEF is a part of such an advanced quality system. But let me point out that it is really surprising to note how similar our national requirements for reporting OEF and utilising it in different countries are. International discussions



Giovanni Bruna

*Deputy Director,
Reactor Safety Division,
IRSN*

◀ **For economic reasons, NPP operators have largely started to revise their business models and operating strategies,**

thus moving the cursor in terms of safety margins. Traditionally, safety margins are set drawing upon computation chains qualified on experiments. Now the search for ever more profitable operation implies reduced margins and, subsequently, improved computational codes in order to "get closer to the physics," as well as updated data bases from both experiments and operation. This shows the interactive and iterative connection between improvements in operation, safety margins, modelling codes and experiments. To contribute to a safe and economical nuclear plant operation, IRSN carries out its own experimental programme, participates in the development of integral coupled codes and closely cooperates with other institutes notably within the TSO network and the NEA/CSNI working groups. ▶▶



In the debate on OEF systems the audience was intently listening to Ashok Thadani from the US NRC, who provided some lessons learnt in the country with the largest, arguably most diversified, reactor fleet.

show that the same problems are prevailing in all organisations. Countries are doing what they can with their limited resources. Therefore, it is of utmost importance for all countries, but especially for those with only a few nuclear power plants, to benefit from international OEF.

EUROSAFE Tribune. Is this access insufficient?

Christer Viktorsson, IAEA. The IAEA is operating the IRS in cooperation with NEA. The IRS is continuously being improved based on input from the IRS users. The most important components of any international OEF system are the national systems for OEF. They need to be active and feed the international system. Also, it is important that the efforts of the international community in this area are to support the only international OEF system in existence between governments, namely the IRS. The IAEA has strongly encouraged national coordinators of the web-based IRS system to give wider access to their system. Today, we have about 1,000 IRS users and the number has increased sharply when IRS was put on the web. As soon as a new report is posted, we get about 100 hits immediately. So, there is a strong interest and monitoring of what is going on. Further efforts will be made to respond to requests from the international community.

EUROSAFE Tribune. What would you suggest to enhance OEF's effectiveness?

Seija Suksi, STUK. I would say: be selective, open-minded and proactive in sharing information! It is impossible and even useless to report all events or observations to other countries. In this respect, I think the number one criterion for reporting an event is its link to risk reduction and nuclear safety enhancement since the primary objective of reporting is to eliminate risk without any delay and not just write

reports on experience. I also think reports should be extended to equipment failures or human errors that have not resulted in certain events, but would cause a serious problem in other circumstances, since incidents are very often preceded by the degraded performance of organisations or components. Events occurring in non-nuclear facilities as well as good practices from other sectors can be relevant to help upgrade NPPs' safety. Concerning information exchange, I regret to see that when something happens somewhere, all countries do the same analysis separately. Results are sometimes disseminated, but very often they remain the property of the national level. I think we should make a more proactive use of the incident reporting system (IRS), of our contacts with neighbouring regulators and nuclear power plants, and of the possible benchmarking at NEA and IAEA levels.

EUROSAFE Tribune. What should be done on a European level?

Michel Bieth, EC. In Europe, we have powerful TSOs available to make in-depth assessments drawing upon significant experience and recognised skills and proficiency. The European Commission, through the Joint Research Centre, is well positioned to coordinate the individual Member States and is committed to supporting TSOs' and regulators' initiatives. We think the combined efforts will allow more detailed and systematic assessments of the OEF with certainly less investment than if being done individually in each EU country.

EUROSAFE Tribune. What can ETSON do to support the efforts aimed at strengthening the European OEF process?

Michael Maqua, GRS. Countries with a small nuclear programme may have insufficient technical resources to

analyse internationally reported events, as it requires comprehensive and very detailed knowledge about the design and operation of NPPs, for instance across the European Union. Moreover, the quality and timeliness of reports can be a concern: in some countries, the lack of resources seems to be one of the main causes for inadequate reporting. Therefore, ETSON proposes the establishment of a European OEF system consisting of an expert network with a technical board formed by high-level experts still based in their home organisations – either a TSO or the regulatory body – and working together, while they would still benefit from the technical support of their organisations.

EUROSAFE Tribune. What would the expert network be tasked with?

Michael Maqua, GRS. It would evaluate OEF reports from the Member States and international event reports for significant lessons to be learned and to draw conclusions and give recommendations in respect of the various designs in the European countries. On the request of a European Member State, it could provide support for the evaluation of significant events, the development of international event reports and the definition of specific actions to be taken. It should also collect and evaluate the actions taken by the Member States. Furthermore, the expert network could develop reports on various topics within the OEF system on the request, for instance, of the European Commission's Joint Research Centre or Member States. This European OEF system would target three complementary objectives: to set up a central database of user-friendly information and a coordinating team to oversee these system operations; to mutualise progressively the benefits of the robust OEF services which exist today in several countries for national purposes; and to develop new services

on the basis of advanced national experiences.

EUROSAFE Tribune. How would the expert network function?

Michael Maqua, GRS. The experts could be supported in their home organisations using the already established working procedures and taking advantage of the experience pooled in the different organisations. Moreover, a technical board composed of high-level experts of different TSOs and regulatory bodies should meet regularly, ensure the proper functioning of the network, and serve as an interface between the safety authorities and the international organisations. On its side, the EC could provide financial support as well as a secretariat to coordinate and technically support the work of the European OEF system.

EUROSAFE Tribune. What does the NEA consider as priorities for the future?

Javier Reig, NEA. At the NEA, we started a group called the International Operating Experience Research Group. We tried to analyse the weaknesses and the limitations of the OEF system from the international point of view and we think that emphasis should be put on clarifying the roles of the different players at national, regional and international levels to avoid complications and to use resources as efficiently as possible. Another priority would be to make the OEF information exchange systems more user-friendly. ■

(1) The International Nuclear Safety Group (INSAG) is composed of experts from 15 countries (Brazil, Canada, China, Finland, France, Germany, Hungary, India, Japan, Republic of Korea, Russian Federation, South Africa, Spain, United Kingdom, and United States) and from the OECD/NEA to provide authoritative advice and guidance on safety approaches, policies and principles at nuclear power plants and other nuclear facilities.



Juhani Hyvärinen

*Executive Vice President,
Nuclear Engineering,
Fennovoima Oy*

« Countries where the nuclear industry is lively tend to have fewer safety significant events than those where people are working in the context of a phase-out. We experienced strong opposition against nuclear energy in Finland. It took us twenty years to change the mind-set but the atmosphere improved dramatically, as shown by the Decision in Principle to build Olkiluoto3. And when we declared, at Fennovoima, that we were looking for a greenfield site to build another NPP, dozens of communities invited us to come over and investigate their sites! To build public confidence in the future, I think it would be sound to develop the technology into directions where processes are intrinsically stable and where specific safety functions – if needed – are implemented in a way as natural and 'embedded' as possible. Safe systems usually are simple systems. So, let us make technology and safety cases simpler and more intuitively obvious... also for the layman. »

SEMINAR 1 | Nuclear installation safety

Simulation codes and experimental tests: the head and legs of nuclear safety research



The introduction of new types of reactors as well as changes in the management of nuclear fuel translate into a significant need of high-level expertise based on the availability of updated data from experimental tests aimed at validating increasingly sophisticated simulation codes. At a time where a growing number of safety cases is submitted to safety authorities and the supporting technical safety organisations, the necessity to dedicate sufficient investments to research as an essential support to relevant expertise was reflected in several lectures at this 2007 seminar.

The inseparableness of ever more refined, 3D numerical models and of experimental testing appears as the Ariadne's thread throughout the different papers summarised below:

■ **The experimental fission product test** (PHEBUS FPT3) carried out on 18th November 2004 is the last integral test performed in the PHEBUS research reactor with the aim to investigate the degradation of fuel rods and the behaviour of the fission products released via the primary coolant circuit into the containment building

during a core meltdown accident. It provided important experimental data on major events occurring during the fuel bundle degradation. It revealed notably that the relocated molten material had a low melting point, an important information in case of a severe accident, and that the concentration of gaseous iodine in the containment during the degradation phase was clearly more significant (between one and two orders of magnitude) than that measured in the previous tests.

■ **The requirements of higher accuracy** simulations raise questions that can only be answered by detailed experimental investigations combined with the use of three-dimensional simulation techniques. This is the case of the thermal-hydraulic behaviour of reactors, e.g. the simulation of flows in the primary system and in the containment of nuclear reactors, analysed using computational fluid dynamics (CFD) codes that are validated using test facilities such as ThAI and TOSCAN. This is also the case of transients and accidents in NPPs that may lead to strong changes of the power distribution and complex coolant flow conditions. Their simulation requires coupling 3D neutron kinetics models with thermal-hydraulic system codes. The coupled code, called TORT-TD/ATHLET, allows 3D analyses of transients to be performed fuel pin by fuel pin. The next step, in preparation, is aimed at performing calculations of larger configurations like a quarter core.

■ **Aircraft impacts on safety-related structures** of NPPs have been recognised for a long time as a relevant loading case, especially when designing and building plants in areas with heavy air traffic. The numerical models developed to simulate the relevant phenomena that occur during the high-energetic impact of deformable missiles can be used with enhanced confidence if they are validated by experiments. This is why VTT constructed a test facility for medium-scale soft missiles impacting reinforced concrete walls. The test results established that even the fragmentation of the projectiles and the failure process of reinforced concrete targets could be approximated.

■ **The search for profit increases** has led utilities to operate light water reactors at higher power and with

higher burn-ups of the fuel. The Reactivity Initiated Accident (RIA) tests performed in France and Japan on Zr-4, the current fuel cladding material, showed that this traditional cladding material was inappropriate for the targeted burn-up levels. The behaviour of an improved fuel cladding material called Zirlo™, developed to accommodate constraints associated with burn-ups above 75 GWd/t, was studied in CABRI CIP0-1 (France) and NSRR VA-2 (Japan) by means of tests under RIA conditions. Although the two tested samples were very similar, the results obtained were quite different: the CIP0-1 rod reached a 93 cal/g enthalpy without failure, whereas the VA-2 rod failed at 55 cal/g. The experiments on Zirlo™, scheduled in both the CIP programme in CABRI and the ALPS programme in NSRR, are essential steps to understand the basic phenomena involved and model them. ■

→ **The text of the contributions presented at this seminar is available online at:**
www.eurosafe-forum.org → EUROSAFE Forum 2007 → Seminar 1



Chantal Mommaert

*Nuclear Inspector
and Medical Physicist,
Association Vinçotte
Nuclear (AVN)*

« I am tasked with inspecting nuclear industry facilities as well as equipment used in nuclear medicine and radiology. Faced with a steadily increasing demand of diagnosis and therapy, the medical sector is urged to provide trained and experienced personnel as well as quality control to avoid cancers induced by overexposure to ionising radiations. I think medical applications of ionising radiation could largely benefit from the high level of safety culture and strict procedures implemented in nuclear industrial facilities. For instance, a dedicated structure could be tasked with making incident declarations mandatory for professionals of the nuclear medical sector and with classifying each incident on a scale comparable to the INES scale in the nuclear fuel cycle industry. By issuing such vigilance reports, these professionals would meet the requirements of the European directives and help TSOs enhance nuclear safety. »

SEMINAR 2 | Environment & Radiation Protection

Revised approaches and extended application domains



This 2007 seminar was characterised by new concerns appearing on the environment and radiation protection area such as the radiological exposure in the medical sector or the relationship between radiological protection and security with a purpose of protection against sabotage. The seminar also reflected important developments in other domains, such as the collaborative work performed internationally to reconsider the norms of radiation protection, the growing consideration given to the management of waste generated by the industry using naturally occurring radioactive material, or the new calculation methods developed with a view to assessing more accurately the radiological exposure resulting from the dismantling of highly activated components in nuclear power plants.

■ While an ever greater number of patients has access to nuclear techniques for diagnostics and therapy, the increase of radiological exposures in the medical sector tends to become a growing concern among professionals. The same trend can be observed in veterinary medicine, where X-rays are used more and more. Today, radiation-based imaging techniques tend to become more sophisticated, delivering images of improved quality, but at the price of a higher doses. A growing number of hospitals and clinics is using such equipment, and both patients and professionals are impacted. Therefore, investigations have to be performed to assess the exposure of particular parts of the human body – e.g. hands and fingers – linked to such activity. TSOs have to play their role to increase physicians' awareness concerning their patients as well as themselves. This applies both to human and to veterinary medicine, where doses may be even higher in case large-sized animals such as equines are taken care of. In Germany for instance, where this topic is drawing much attention, GRS designed a matrix aimed at developing job exposure metrics with a view to setting up exposure mitigation procedures.

■ **Since the 9/11 terrorist attack on New York City**, the protection of nuclear facilities and fissile material transport against sabotage has become a high-priority concern, debated up to now mostly among specialists for confidentiality reasons. At the crossing of nuclear safety and nuclear security, growing attention is paid to the relationship between radiological protection and security, and considerable work is correlatively devoted to tackling the '3s' in a holistic approach, i.e. to find the best possible balance between *safety* (encompassing the 'conventional' and radiological aspects of protection), *security* (in the sense of physical protection of radioactive material and facilities against malevolence) and *safeguard* (i.e. the control of non-proliferation and uses of radioactive sources other than peaceful). This is delicate work since the goals and requirements of each of the '3s' are partly overlapping and sometimes contradictory. Just to mention one example: safety objectives recommend access to and escape from facilities that is as easy as possible in case of an accident, whereas security conversely suggests as many as possible and hardly crossable barriers to be set up to prevent intrusion. Among other contributions to the debate, rsos performed source-term calculations aimed at supporting decision-making in the field of protection against sabotage.

■ **The 2007 edition of the 'Environment and Radiation Protection'** seminar echoed the work performed by rsos to provide useful data for the management of waste from naturally occurring radioactive material (NORM). The particularity of this type of material used or produced by several industrial sectors is to generate particularly long-lived waste that concentrates most of the radioactivity contained in the material. Produced

in significant quantities, waste from NORM requires the development of interim models that go back to the isolation properties of the rock bed, since adequate isolation has to be provided for one million years. Current research looks promising, as it seems possible to evidence that the intermediate bedrock can fulfil appropriate isolation for the desired period of time.

■ **The management of waste** generated by the dismantling of highly activated parts of nuclear power plants (such as reactor vessels) has become a major topic, as a growing number of decommissioned reactors will have to be dismantled. In order to help decision makers reach the optimum judgment, i.e. to bring the costs and radiological exposure linked to dismantling to a level as low as reasonably achievable, rsos are working on the development of an activation calculation method aimed at assessing the best approach and period of time to start the dismantling operations.

■ **The growing contribution of international organisations** to radiological protection issues was highlighted during the seminar through the work performed by the International Commission on Radiological Protection (ICRP). In March 2007, the ICRP adopted new general recommendations for the protection of man and the environment against ionising radiation. These recommendations are 'innovative' in the sense that they put an end to the previous two-speed system (practices versus intervention) which was replaced by a single approach to handle all the exposure situations (planned, emergency and existing). The three exposure categories (occupational, medical and public) continue to be considered separately.



Michael Wenk

Chief Nuclear Officer,
EnBW Kraftwerke AG

◀ **The replacement, over the next 20 years, of 80,000 MWe in the energy mix of Germany is a huge challenge** given our environmental commitments. Today, about 55% of the electricity generated by EnBW Kraftwerke AG is nuclear, and corresponding to this importance we are pursuing a strategy based on continuous updates carried out in our reactor fleet as well as in the HR area. For a utility like EnBW that—due to regional conditions—cannot rely much on wind to produce electricity and has to transport imported hard coal from remote harbours through the Rhine and Neckar rivers down to its plants, the nuclear phase-out translates into a significant competitive disadvantage. For these environmental, social and economic reasons, EnBW is promoting a modernisation of Germany's nuclear phase-out with the goal of taking back the reduction of the authorised service life of the current facilities, which today is only 32 years. ▶▶



Ute Blohm-Hieber

*Head of Unit H.2
(Nuclear Energy,
Waste Management
and Transport)
DG Energy
and Transport,
European Commission*

« **Considering the numerous challenges associated with the future of nuclear power**, I think building confidence among the public is a major task. In this respect, I regard a regular and confident dialogue with all stakeholders as the best way to avoid preconceptions, prejudices or just misunderstandings. Let me take the back end of the nuclear fuel cycle as an example to illustrate this. Some people pretend we don't have any solution for the back end, arguing that there is presently no final

repository in operation for high-level waste in Europe. It is a fact that we don't operate such repositories today, but we are making a lot of progress on our road-map. Therefore, instead of claiming that we have no solution, I would rather say that it takes decades to implement a demonstrated, validated and acceptable solution. This message is accurate and contributes to building confidence. To facilitate dialogue and exchange between stakeholders, the Commission took initiatives such as the

Sustainable Nuclear Energy Technology Platform, the High-Level Group gathering regulators and safety authorities from the 27 Member States or the European Nuclear Energy Forum, bringing together a wide range of stakeholders, such as industry, civil society, public authorities on national and European level and finance. In this context I welcome as well the set-up of the European TSO Network in this overall process aimed at building confidence in the future of nuclear power. »

Practical consequences of these new recommendations for the protection of man and the environment against ionising radiation are expected in the more stringent management of emergency and existing exposure situations. Moreover, the ICRP recommends that the impact of radioactive sources be assessed on the environment itself and not only through the human protection. On their side, the IAEA and Euratom started a process to revise their own basic standards for

radiological protection, and the International Union of Radioecology (IUR) contributes to the protection of the environment. ■

→ **The text of the contributions presented at this seminar is available online at:**

www.eurosafe-forum.org → EUROSAFE Forum 2007 → Seminar 2



SEMINAR 3 | Nuclear Material and Facilities Security

The need for a global and systemic approach



The presentations made at the EUROSAFE Forum 2007 seminar devoted to Nuclear Material and Facilities Security bore witness to the thriving activity carried out in this domain, highlighting the necessity to interact at national and international levels, and to regard plants as a whole when considering safety and security objectives. The growing concern posed by information systems and technology was also debated.

■ In his presentation the IAEA representative explained that nuclear security is a national responsibility, but that it is not a matter of indifference to the other states whether and to what extent this responsibility is fulfilled. Comparing global nuclear security with a chain composed of national nuclear security systems, he pointed out that this chain is only as strong as the weakest link. To cope with this, the Vienna Agency developed an international security regime composed of a set of binding and non-binding instruments and guidance to meet the obligations resulting from these instruments. The latter describes the activities, systems, equipment, procedures, and personnel required to implement framework, as well as the

regulatory support provided by the IAEA. This international regime could be improved by including a baseline international threat statement aimed at providing notably threat components to be incorporated into national threat statements.

■ The protection of nuclear facilities against malicious acts is increasingly impacting information technology and notably software-based instrumentation and control. Drawing upon the German experience, GRS pointed out that no specific requirements for IT security in NPPs exist so far in German laws and regulations, but that state-of-the-art requirements can be developed using the existing regulations for physical protection of



Franzjosef Schafhausen

Head of Department Environment & Energy, German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)

« I think Germany is in a position to fulfil its commitments regarding the reduction of its emissions of greenhouse gases and maintain its nuclear phase-out policy at the same time. This requires a future-orientated energy structure to be developed, i.e. a structure where energy is generated and used in a far more efficient way, as both aspects have to be considered in an integrated approach. On the production side, it will be

necessary, up to 2050, to have a proper mix between renewable fuels and fossil fuels used in new, highly efficient and environmentally friendlier facilities. In this respect, new lignite power plants have an efficiency rate of 43-45%, whereas older plants have a rate of 30% only! Beyond 2050, I think renewable energies will be made cost-effective enough to be used as the main power generation source. But I would like to stress

that consumers play a very important part in the sound use of energy, by choosing energy saving products such as light bulbs, washing machines, refrigerators, etc. Energy savings are in their interest, also from an economic perspective, and I think manufacturers and distributors should provide them with more information on the pay-back and the economic dimension of energy saving activities. »

NPPs. After several years of work in this field on behalf of different German Länder authorities, GRS presented the lessons learned from IT security projects both at technical and organisational levels: e.g. the introduction of a IT security official tasked with assisting the physical protection commissioner; distribution of redundant digital I&C trains over different rooms; access to the IT system only after strict identification; requirements for the protection against an insider IT attacker when developing software and when servicing.

■ **During the seminar, IRSN presented its website** dedicated to non-proliferation in the nuclear, chemical and biological fields (www.irsn.org/non-proliferation), a site aimed at providing general information to the players involved in such industrial areas, at replacing inspections carried out in France in an international context, and at reinforcing IRSN's mission of assistance and advice to the operators. Accessible online since February 2007, this website enjoys a growing number of connections and good return from the operators who use it.

■ **The German utility EnBW contributed to the seminar** through a presentation of an operator's view on the performance and results of a deterministic physical protection analysis. Being part of the periodic safety review, such analysis is aimed at checking whether or not physical protection measures implemented by operators in the NPPs are purposeful, to ensure that the plant's safety parameters are met in view of possible attempted sabotage or other forms of outside attack. Based on their implementation experience, EnBW pointed out the necessity to consider physical protection and engineered safety as parts of a jigsaw puzzle that forms the full safety picture, adding that existing physical protection and possible 'backfits' should be assessed when taking this full picture into consideration, and that a literal application of the physical protection functions might result in demands that are impossible to implement. ■

→ **The text of the contributions presented at this seminar is available online at:**

www.eurosafe-forum.org → EUROSAFE Forum 2007 → Seminar 3

A Summer School to foster convergence of nuclear safety practices

Seizing the opportunity of the Berlin 2007 EUROSAFE Forum, about 10 junior staff members of AVN, GRS and IRSN met to evaluate the results of the JS3P's past activities and to discuss its future scope of work and projects. In this respect, emphasis was put on starting an ETSON Summer School from 2008 onwards.

Over the past 12 months, the JS3P members focused their activity on four technical pilot projects pertaining respectively to radioactive waste management, thermal-hydraulics, fracture mechanics and the creation of a website (see the *EUROSAFE Tribune* #011). The review of each project established a different status, ranging from a successfully completed fracture mechanics project to the postponing of the thermal-hydraulics project due to new assignments of some of the staff members. "We are creating for instance an electronic platform used not only to communicate, but also to set up a database available for all participants to e.g. identify colleagues likely to provide assistance on a given topic. This contributes to increasing our respective TSO's responsiveness," IRSN's Vincent Bessiron claims.

A TSO's perspective at European level

The Junior Staff Project was originally set up with a view to promoting staff exchanges among TSOs. Yet, no such exchange could be carried out in four years, showing the difficulty to reconcile day-to-day priorities and longer term evolutions. "To give our projects new momentum and to keep the promise of the *EUROSAFE* initiative by fostering convergence of nuclear

safety practices, we are now working on a yearly Summer School project within the ETSON Network, aimed at pooling, in a bottom-up approach, the methods developed by each TSO and reviewing how our different countries work on the same issues or problems to improve the level of safety in their own nuclear facilities," explains AVN's Wim Uyttenhove. To be organised from August 25th-29th 2008 in Garching, near Munich, the first Summer School will gather 30 to 40 people from AVN, GRS, IRSN as well as other TSOs keen to participate for one week. "It will be different from other summer schools, as the focus will be placed on the TSOs' perspectives at European level," GRS' Stefan Weber stresses. The topic of the first Summer School will be *Nuclear Reactor Safety Assessment*. By offering additional opportunities to work on an international level, the Summer School is also intended to motivate young talented engineers and scientists to start a career in nuclear safety. ■



Pooling the methods developed by each TSO when addressing similar issues is a major aim of the Junior Staff Project.

VENUES & WEBSITES

On nuclear safety and the future of nuclear energy

8-11 September 2008, Portorož, Slovenia

Nuclear Energy for New Europe 2008
Organised by the Nuclear Society of Slovenia
port2008@gen-energija.si

14-19 September 2008, Interlaken, Switzerland

PHYSOR'08, International Conference on the Physics of Reactors: "Nuclear Power: A Sustainable Resource"
Jointly organised by the Paul Scherrer Institut and the Swiss Nuclear Society
www.physor2008.ch

28 September - 2 October 2008, Avignon, France

Decommissioning Challenges: An Industrial Reality
Organised by Société française de l'énergie nucléaire (SFEN)
decommissioning2008@sfn.fr

1-3 October 2008, Dubrovnik, Croatia

TopSafe 2008, ENS conference on Safety of Nuclear Installations
Organised in cooperation with the Croatian Nuclear Society
www.topsafe2008.org

A few links for reading more about nuclear safety

Never Safe Enough

An interview with Richard Meserve, one of the world's top advisors on nuclear plant safety
IAEA Bulletin 49/1 – September 2007
<http://www.iaea.org/Publications/Magazines/Bulletin/Bull491/pdfs/o9nuclear-safety.pdf>

Security and Development: The Two Sides of Nuclear Technology

by IAEA Director General Dr. Mohamed El Baradei
Statements of the Director General
30 November 2007
<http://www.iaea.org/NewsCenter/Statements/2007/ebsp2007no21.html>

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**The EUROSAFE Forum 2008 organised
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in the context of an increasing demand
for safety expertise”.**

**The corresponding debates and
seminars will be reported in the
EUROSAFE Tribune #015.**



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E U R O S A F E

*Towards Convergence of
Technical Nuclear Safety Practices in Europe*