

EUROSAFE TRIBUNE



SAFETY IMPROVEMENTS

REASONS • STRATEGIES • IMPLEMENTATION

Review of the main themes discussed at the EUROSAFE Forum held in Brussels in November 2005.



#NOVEMBER 2006#



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► The papers referred to in the seminar review are available at www.eurosafe-forum.org



Jacques Repussard and Lothar Hahn

Why strive further to improve the safety of nuclear facilities? Didn't we learn enough from severe accidents such as the Three Mile Island loss-of-coolant accident in 1979 and the Chernobyl explosion in 1986? Recent mishaps such as the Forsmark 1 reactor failure caused by a short circuit in a switchyard outside the power plant on 25 July 2006 are here to remind us that there is no such thing as zero risk and that improving safety is a never ending task.

Doubtlessly, major accidents have triggered significant advances. By highlighting the need for new safety approaches, they have resulted in considering extreme scenarios such as core fusion in the design of the reactors or trying to learn from apparently insignificant events. By stressing the need for new safety assessment methods, they have allowed probabilistic safety analyses or periodical safety reviews to be developed as additional sources of knowledge. By pointing out the excessive confidence and the complacency of some operators, they have contributed to reviewing safety culture and safety management systems, and to detecting degradations as early as possible.

On the challenge side, significant changes associated with the introduction of new technologies, such as instrumentation and control, with the globalisation of the economy and with the development of exchanges have reshaped the map of risks within the last couple of decades. Adding to the economic and industrial upheaval – liberalisation of the European electricity market, increased competition among operators, supplier concentration resulting from successive mergers and acquisitions, focus placed on costs, considerations on the plants' lifetime extension, etc. – an unprecedented terrorist surge symbolised by the 9/11 attacks raises new questions: where does safety rank in this new hierarchy of concerns? Is increased profitability compatible with improved safety? What is the vulnerability of nuclear plants towards malevolence?

Faced with those issues, licensees, technical safety organisations and safety authorities throughout Europe – and beyond – are involved in ever closer co-operation advocated by the EC and supported by EUROSAFE. By exchanging information on their respective skills, means and practices, by pooling resources needed to decide and carry out research programmes, they strive to improve nuclear safety through the increased convergence of strategies and implementation, continent-wide.

Improving safety was the central topic of the EUROSAFE Forum, held in Brussels on 7 and 8 November, 2005. We are pleased to publish this report and wish you pleasant reading. ●

INTRODUCTION TO THE PLENARY SESSION

Nuclear Safety Improvements: The drivers and players in a nutshell

■ Co-organisers of the EUROSAFE Forum, Jean-Jacques van Binnebeek, Director General of the Belgian TSO AVN, Lothar Hahn, Director of the German TSO GRS, and Jacques Repussard, Director General of the French TSO IRSN, introduced a floor in excess of 400 persons to the topic selected for the Brussels 2005 Forum: *Safety improvements – reasons, strategies, implementation.*

› Networking European technical safety organisations: a new deal for new times

The creation of a new, formal structure aimed at networking the respective efforts of the European technical safety organisations remains the breaking news of the Brussels EUROSAFE Forum (see **Towards the EUROSAFE Network**, p.14).

In a context of enlargement of the European Union, with now 13 Member States operating NPPs, of a new surge of nuclear power as an energy source capable of meeting growing energy needs while complying with the requirements of sustainable development and the Kyoto Protocol, the EUROSAFE Network intends to pursue an active policy aimed at enhancing safety in three different ways:

- contributing actively to the technical convergence in safety assessment in Europe;
- bringing actual convergence between the practitioners' needs, the research goals and the research capacities;
- helping capture and manage knowledge,

with a focus placed on the experience gained by the people who designed, constructed and commissioned the nuclear power plants.

The choice of Brussels for hosting the EUROSAFE Forum 2005 and announcing the imminent creation of the EUROSAFE Network highlights the significance, for the seven founding members of the EUROSAFE initiative, of such a move towards improved safety EU-wide.

› Putting safety improvements first

In a context of energy market deregulation, extension of the operating lifetime of NPPs and enlargement of the European Union, a common goal of the EUROSAFE Forum participants is *to analyse all signs that indicate the potential for safety improvements, irrespective of whatever interests may prevail*. Beyond the expectable primacy of safety versus any other consideration, emphasis is thus put on *operational safety* as a valuable source of progress

in all domains of nuclear safety, beginning with new requirements.

Regarding the topic selected for the Forum – *Safety improvements: reasons, strategies, implementation* –, two complementary goals of nuclear safety are to be considered: the protection of man and the environment on the one hand, the reliability and availability of facilities on the other. The drivers of safety improvements primarily are new research findings, ever more sophisticated analysis methods and the diversity of operating experiences.

A routine matter in nuclear power plants and a never ending task in a changing context, the implementation of safety improvements in a democratic process relies upon three major categories of players:

- the independent expert, tasked with presenting and documenting comprehensibly proposals and recommendations in agree-

ment with the regulatory authority;

- the licensee, expected to be open to these concessions and to question them critically;
- the regulatory authority, in charge of setting the rules and monitoring compliance with them.

In this respect, the three lectures successively given by Pieter De Gelder⁽¹⁾, Ingvar Berglund⁽²⁾ and Iván Lux⁽³⁾ provide interesting insights into the real world of nuclear safety from three complementary perspectives: the technical support organisation, the operator and the regulatory body. ■

(1) Division Head for Studies, Research and Development, Association Vinçotte Nuclear (AVN, Belgium). The corresponding paper was co-authored by Pieter De Gelder (AVN), Martial Jorel (IRSN) and Heinz Liemersdorf (GRS).

(2) Head of Safety and Environment at Forsmark NPP (Vattenfall AB, Sweden).

(3) Nuclear Safety Directorate Deputy Director General, Hungarian Atomic Energy Authority (HAEA, Hungary).



Anne-Marie Lizin

*Mayor of the City of Huy,
Chairperson of the Belgian
Senate*

“As the Mayor of the Belgian city of Huy, I have to deal with three nuclear power reactors

located in the French speaking area and four reactors on the Dutch speaking side, some of which – Tihange and Doel – are due to final shutdown by 2015. Completely amortised, these reactors are now operated with maximum profitability. However, as a local representative, my concern is pertaining to the investments devoted to providing maximum safety up to the very last day of operation – and beyond –, regardless of the possible extension of the reactors’ life time. In this respect, the operator’s decision to invest in operating and safety improvements, announced in January 2006, enhances confidence from both the power company’s personnel and the public at large.”



LECTURES

TSO – Operator – Regulator: Common challenges require joint efforts

■ **Achieve continuous safety improvements by networking the efforts of the technical safety organisations; get the NPP operators to be more proactive on safety issues; frame the upgrading measures implemented on power plants by updated regulatory policies: these principles summarise the suitable changes to allow continuous safety improvements, as voiced by Pieter De Gelder (AVN), Ingvar Berglund (Forsmark NPP) and Iván Lux (HAEA).**



► Intensify international work

Considering operating experience – one of the three main input sources that play an important role in safety improvements together with safety studies and research & development –, Mr. De Gelder underlined the importance of learning from minor occurrences to build a proactive safety culture. If significant back-fitting measures on facilities and software improvements such as training or operational procedures were derived from major events like the TMI and the Chernobyl accidents, important things for improving safety can be learned from minor occurrences often classified as incidents. *“In this respect, there is a fundamental need for open sharing of this experience feedback. This is the aim of the operational experience feedback process, in which the licensee, the safety authorities and the TSOs actively participate. In the future, aspects like market deregulation could lead to an increased level of the confidentiality of information. This point deserves attention”,* Mr. De Gelder stressed.

In addition to the safety analysis report issued at the licensing stage of a new plant, the periodic safety reviews performed in most of the countries give the opportunity to define some global solutions instead of finding separately independent measures for different topics. *“Some older power plants, originally not designed with protection against events like earthquakes or external hazards, thus benefited extensively from important back-fitting measures”,* Pieter De Gelder pointed out. Moreover, the development of probabilistic safety assessment besides the deterministic safety approach implemented for the design of new facilities has contributed to highlight the potential importance of minor events in the risk profile of nuclear power plants, leading to considerable back-fitting measures for some plants.

The third major input source to nuclear safety improvements, research & development plays an essential part when dealing with new phenomena, when new materials are used for the construction or the design of facilities or when potentially challenging operational modes are introduced, such as the higher fuel burn-up for example.

Based on the three triggers above, significant work is performed in an international framework to continuously improve rules, regulations as well as technical practices:

- By regulators: for instance, WENRA⁽¹⁾ members are carrying out two harmoni-

sation projects: one in the field of existing nuclear power plants and one in the area of waste.

- By TSOs: IRSN, GRS and AVN have jointly developed a common Safety Assessment Guide available on their websites and are presently trying to open this initiative to further development through a project proposal within the Sixth Framework Programme of the EU.

› The power of networking

“Some important challenges remain to further improve safety such as the discovery of nonconformities with respect to the original design, human factor, plant modifications, major changes such as the deregulation of the power market, the management of knowledge, to mention only those. In this context, I consider on the TSO front that joining efforts by networking will play an essential part in achieving continuous safety improvements. And this is the very aim of EUROSAFE”, Mr. De Gelder concluded.

› Eliminate reactor specific licensing conditions; be in line with the latest international requirements

The next speaker, Ingvar Berglund, is Head of Safety and Environment at the Forsmark NPP⁽²⁾. Based on his experience as a Swedish operator, he considers responsibility for safety, trust, a safety programme, periodic safety reviews, a safety policy to keep competence and resources, predictability of production, costs and investments, and, last but not least, new and updated regulations as major motivations to safety improvements.

Given the energy policy change in Sweden, where the phase out of nuclear power by 2010 has been abandoned, the extension of



the NPPs' lifetime is a pivotal stake, since the Swedish plants all need reinvestments and modernisation in quite a short period of time. *“The new regulations issued on 1st January 2006 have two purposes. One is to eliminate the reactor specific licensing conditions, the other is to be in line with the latest international requirements”,* Mr. Berglund emphasises. Developed in a unique co-operation between the authority and the nuclear industry, these new regulations are based on mutual interest and enable licensees to know what to expect for the coming 10 to 20 years and to set the right investment levels in a proactive approach to safety aimed at keeping the plant producing in the long run. In compliance with those new regulations, investments at Forsmark for the period 2003-2013 will be performed in such areas as separation and independence, better tolerance to external events and accidents, long term cooling after an accident, post accident instrumentation and emergency control rooms.

› Is it ever safe enough?

In his conclusion, Ingvar Berglund mentioned three matters of concern which deserve utmost attention. The first is a safety-orientated mindset: *“Safety is not technology alone. It is actually built upon the interaction between man, technology and the organisation. If you have the mindset that “it’s safe enough”, it’s potentially dangerous”,* Mr. Berglund warned. The second is a management issue: to him, managers should be in the field, engaged in hands-on production and safety issues. *“It is easy to sit behind your desk or computer and attend meetings, but you should know what’s going on and should be active. In the responsibility line of a nuclear power plant, I think this applies to man- ➔*

→ *agers on all levels*”, he stressed. Third comes the necessity for licensees to be proactive on safety issues, to take the initiative. *“The licensee should be the driving force and should not be dependent on detailed regulations. In the long run, it’s cheaper to make your own plan and not have the authority do the planning for you”*, Mr. Berglund claimed.

➤ **Catching up with international standards**

Drawing upon the Paks nuclear power plant’s upgrading process, Iván Lux, Nuclear Safety Directorate Deputy Director General at the Hungarian Atomic Energy Authority (HAEA), summarised his view on the role of the regulatory body in this process.

The Paks NPP, which produced 36% of the Hungarian electricity consumed in 2004, is the only Hungarian nuclear plant which includes four units of the WWER 400/213 type. The four reactors have undergone upgrades bringing their power up to 460-470MW and another step of 8% upgrade is planned. Alongside these power upgrades, Paks underwent between 1991 and 1994 a safety upgrading process called AGNES⁽¹⁾ Project. HAEA, the regulatory body, first approved and licensed the measures proposed by the project and then linked all these measures to the upcoming Periodic Safety Review. Meant to eliminate the original design deficiencies of the power plant, the major improvement areas were pertaining to: the management of incidents and accidents, the reliability of the safety systems, the load of equipment, the containment capabilities, the seismic capability, fire safety as well as the support to the operating staff.

All these improvement areas were the starting point of the safety upgrading measures of the coming years. Within the framework

of the safety upgrading measures performed at the plant, emergency feed-water pumps were relocated to eliminate common cause failures, seismic reinforcement was performed, the reactor protection system was changed to digital, sump filtering was modified in order to prevent filter clogging, catalytic recombiners were put into operation to mitigate hydrogen burning hazard, and a maintenance and training centre was set up.

➤ **New requirements to come for an extended lifetime**

Changes in the regulatory policy led to these upgrading measures. First, the Safety Upgrading Process was linked to the Periodic Safety Review process. Second, the Final Safety Analysis Report and the Periodic Safety Review Report – which were formally overlapping for a long time – were given definitely different purposes and contents according to the recent regulations: *“The Final Safety Analysis Report is to be updated yearly and shall reflect all the changes which have to do with the safety of the power plant and have been performed during the given year. In contrast to that, the Periodic Safety Review Report, which is due to be performed in a 10-year period, shall include the changes during the latest period altogether”*, Mr. Lux explains.

The new regulations were introduced in 1997. And in 2001, a strategic decision was made by the Paks NPP on the extension of the plant’s lifetime. HAEA will issue its requirements and conditions for continued operation in a lifetime extension context. ■

(1) Western European Nuclear Regulators Association.

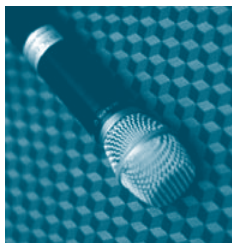
(2) Operated by Forsmark Kraftgrupp, a subsidiary of Vattenfall AB.

(3) Advanced General and New Evaluation of Safety.

PANEL DISCUSSION

Information and Knowledge: Keys to sound decision making

■ Drawing upon the perspectives successively voiced by a TSO, a licensee and a licensor, Professor Jean-Pierre Contzen⁽¹⁾, chairman of the Brussels 2005 EUROSAFE Forum, focused the subsequent debate on the social and political issues associated with nuclear safety improvements. How are improvements perceived by the public at large? Why is communication pivotal to sound risk governance? These and other questions were answered in a straightforward, sometimes unexpected, manner.



For this panel discussion on Safety Improvements: *Reasons – Strategies – Implementation*, the previous speakers were joined on the stage by Anne-Marie Lizin, mayor of the City of Huy and chairperson of the Belgian Senate; Jozef Mišák, director for strategy at the Nuclear Research Institute Řež plc (Czech Republic); Olena Mykolaychuk, chairperson of the State Nuclear Regulatory Committee of Ukraine; Jean-Paul Samain, director general of the Federal Agency for Nuclear Control (Belgium) and Seppo Vuori, chief research scientist at VTT (Finland).

To launch the debates, Professor Contzen reminded the floor of some major issues associated with the perception of safety improvements: identifying what has to be perceived, assessing the public's awareness of the improvements performed, describing the results achieved in terms intelligible to non-specialists, guaranteeing that the message conveyed is unbiased, entrusting the appropriate spokesman to deliver the

right message. And beyond these difficulties, a question: even when safety improvements are made, does this really alter fundamentally the discussion? Not necessarily, as witnessed by Jozef Mišák.

› The Bohunice case: a purely political phase-out

Today a Slovak citizen working for the Czech Nuclear Research Institute⁽²⁾, Jozef Mišák has his particular experience of the perception of risks, of social concerns and of unexpected political decisions. This goes back to the beginning of the 80s, when Bohunice-1 and Bohunice-2, two WWER-type reactors designed and manufactured in the USSR, were put into operation. Informed by the manufacturer of defaults in the plant's design as early as 1984 – i.e. six years after commissioning – the Czechoslovakian Atomic Commission decided, in 1991, to implement 81 urgent measures to upgrade the plant's safety and to launch a comprehensive upgrading process with the assistance of 3,000 experts involved in a project led by the International Energy Agency (IEA). Successfully completed in 1999 and 2000 with an investment of €250 million, the safety upgrading of the plant was reviewed several times by the IEA, Siemens, the Austrian Government, WANO⁽³⁾, WENRA⁽⁴⁾ etc. In spite of very positive assessments, the newly elected ➔

→ Slovak government decided, surprisingly, in 1999 – i.e. just before the completion of safety upgrading – to close the nuclear power plant's first unit in 2006 and the second unit in 2008. These closure deadlines were confirmed in 2003 by the 9th protocol of the accession agreement signed by Slovakia and the EU.

"The incredible thing in this story is that the Bohunice NPPs will be irrevocably shut down whereas, according to a 2004 public poll, 60% of the Slovak citizens are against the shut-down of Bohunice and 80% are in favour of the operation of nuclear power plants in Slovakia", Mr. Mišák commented, raising this conclusion from Jean-Pierre Contzen: "This somehow paradoxical situation shows that the weight of politics can sometimes be stronger than the technical facts".

➤ The price of lacking public information

Adding to Jozef Mišák's statement, Mrs. Mykolaychuk drew upon the Ukrainian experience of reactor safety upgrade to show that technical improvements are not enough to attract public confidence and that more is at stake: *"By the end of the 90s, a comprehensive programme for the safety upgrading of the Ukrainian reactor fleet was developed and implemented with the assistance of EU experts. Unaware of these improvements, Ukrainian citizens raised a protest against the government for violation of their constitutional right to live in a safe environment. Most complaints were dismissed, but it became obvious that the government should not only monitor the status of implementation of safety upgrades, but also make the results of this monitoring available to the general public at least quarterly".* Obviously, the first condition to public trust is timely information.



Jean-Pierre Contzen

Chair, Professor at
Technical University of Lisbon

“As the chairman of the current EUROSAFE forum's debate, I was impressed by the determination of NPP designers, operators, safety bodies and technical support authorities to work together and jointly contribute to ever higher nuclear safety conditions. I think TSOs have a particular part to play in this domain to synthesise knowledge and bridge the gap between the technology push and the safety demand pull. I also felt that the tangible progress conducive to safety improvements was not perceived by the public. Conveying the message to the politicians, the public at large, and all the stakeholders in the safety debate remains therefore a major issue, and I consider that the EUROSAFE fora should be attended by a broader audience including in particular a wide spectrum of media. Perhaps safety topics should be selected so as to attract journalists and get them to express their views during the debates, as they are unrivalled opinion leaders.”

➤ Three major knowledge 'generators'

Addressing the reasons for improving safety, Seppo Vuori emphasised the development of a high-level safety culture in Finland based on a concept named SAHARA (Safety As High As Reasonably Achievable) as a tribute to the famous ALARA (As Low As Reasonably Achievable) principle. *"SAHARA draws upon the three major knowledge 'generators' necessary to characterise, assess and manage risk: firstly, the findings from safety analyses performed by technical safety organizations and the results of nuclear safety research programmes in general; secondly, the licensee's own initiatives to improve the reliability and performance of plants in connection with the power upgrades; thirdly, regular test requirements based on operating experience and on various safety reviews performed notably when the NPPs' temporary operating licenses have to be renewed",* Mr. Vuori explained. Adding to this comment, Jean-Paul Samain stressed: *"The first way to get the knowledge for improving safety is the systematic review – we have in Belgium a decennial safety review; the second one is an analysis of the experience feedback".* These two input sources triggered the strong evolution of the safety rules from the late 70s onwards. Thus, as early as the beginning of the 80s, the safety review carried out at the Belgian NPPs became very exhaustive, with a wide spectrum of aspects taken into consideration, such as external accidents, with a view to bringing the first plants put into operation to the level of the most recent unit built since the beginning of the 80s. *"For instance, resistance to earthquake became a major requirement and the design of buildings and equipment had to be reassessed using more elaborate methods and criteria",* Mr. Samain pointed out. In this process, the standing dialogue between all the stake-

holders plays a pivotal part to deeply root the safety concern into their respective culture.

› Talking to informed citizens

Invited to express her views on the information conveyed to the public, Anne-Marie Lizin conceded that there has been a change: *"I fully support it, but it is not enough because we are living in a global world where people are clever enough to get the information they want. Therefore you cannot come into an information meeting and say, 'This is not dangerous'. You cannot take informed citizens for ignorant people. They ask questions and you have to provide information."* In this respect, drawing upon her experience as the Mayor of Huy, a city located near the Tihange NPP in Belgium, Mrs. Lizin regards safety plans as the first evolution towards a better level of information to the population. The ageing of the fleet in operation makes this information issue even more acute, as the public understands it as increased profit to the owner, but not as additional investments dedicated to maintenance and safety. For Mrs. Lizin, the population is quite satisfied on the one hand with the fact that operation is continuing with positive messages about safety. But, on the other hand, the feeling growing with time is that operation is not safer and safer, but less and less safe. *"One very negative message associated with the nuclear plants' ageing is that the older the plant, the larger the owner's profit. The feeling of the population is that companies get a lot of money out of it... but is this really enough to ensure safety?"* Anne-Marie Lizin questioned.

› Transparency in the age of terror

The third issue addressed by Mrs. Lizin concerned the transparency problem linked to

the delicate balance between safety and security. *"There were not only Three Mile Island and Chernobyl, but also 9/11"*, she emphasised *"and if an airplane coming from you do not know where crashes against a nuclear plant, what will happen? What explanation can be given to the population?"* These questions are a clear illustration of the dilemma linked to the safety vs. security balance. By increasing the awareness of all stakeholders, transparent information contributes to higher safety, but it may be detrimental to security: what if detailed explanations on practical safety and security measures implemented in some nuclear plant happen to come within the reach of malevolent people? Thus, the most interesting part of security measures are classified for... security reasons.

› Safety improvements: a matter of concern for local operators... and for corporate executives?

"The people at local level have no doubt that nuclear plant managers are involved in safety. There is clearly a general, positive analysis about that. But what if you go to Brussels and talk to the company executives? Moreover, what if you go to Paris and talk to the holding's board? Are they all still so interested in safety? We, as citizens, and also the people working at the nuclear plants want to be reinsured that the necessary investments for improving safety are performed as long as plants continue to operate", Anne-Marie Lizin concluded. ■

- (1) Former Director General of the JRC of the European Commission, Professor at the Instituto Técnico de Lisbon.
- (2) Ústav jaderného Výzkumu Řež a.s.
- (3) World Association of Nuclear Operators.
- (4) Western European Nuclear Regulators' Association.



ADDRESS BY COMMISSIONER PIEBALGS

The Six Pillars of the European Commission's nuclear energy policy

■ As the guardian of the EURATOM treaty, the European Commission addresses extensively the different issues associated with nuclear safety at each step of the lifecycle of nuclear facilities, from design through to decommissioning and radioactive waste management. Guest lecturer at the Brussels EUROSAFE Forum, Energy Commissioner Andris Piebalgs summarised the European Commission's policy and action in major domains.

› Foster convergence of nuclear safety practices in Europe

To achieve the goal assigned by the Treaty, namely of creating '*the conditions of safety, necessary to eliminate hazards to the life and health of the public*', the Community advocates that it must fully exercise its competence in the field of nuclear safety in close co-operation with EU Member States, as no community legal framework establishes to date common safety standards for the design, construction and operation of nuclear reactors in the EU. In this respect, the Commission welcomes the aim of EUROSAFE to foster the convergence of safety practices in Europe.

› Upgrade plants or close them

A high level of nuclear safety in the enlarged European Union requires nuclear

reactors that cannot be upgraded in an economical manner to be closed and decommissioned safely. To ensure this, the Commission supports acceding countries and new Member States in two ways: the financial assistance allocated through the nuclear safety component of the PHARE programme on the one hand; the Community's Transitional Facility on the other hand. The latter is aimed at helping new Member States strengthen their respective institutional capacities, nuclear regulatory authorities and waste management agencies until 2007.

› Ensure the timely availability of financial resources for decommissioning

On the basis of the EURATOM Treaty, the Commission will issue a recommendation on the financing of decommission-

ing. It will ask Member States to take the necessary measures to ensure that financial resources are set aside during the operating period of the nuclear facilities. These resources should be available and be sufficient to cover the cost of the decommissioning work when the time comes.

› Manage radioactive waste and spent fuel in a sustainable manner

The Commission would like all members to adopt a national waste management programme for all forms of radioactive waste. A national disposal plan would reduce the need to transport radioactive waste and reinforce physical protection and security against illicit use of such materials, reducing further any risks to both the public and the environment.

On the research side, the Commission is considering ways to pool resources and available knowledge, in order to tackle the scientific and technical challenges posed by the management of long-lived high level waste and spent fuel.

› Strengthen physical protection of nuclear facilities and material

EURATOM⁽¹⁾ safeguards are carried out by the Commission's controlling authority to verify that nuclear materials are not diverted from their intended uses and that obligations with a third state or an international organisation are complied with. A new safeguards regulation introduces new requirements on reporting to the IAEA for which the Commission carries legal responsibility under the Additional Protocols to the Safeguards Agreements concluded between the Member States, the Community and the IAEA. Moreover, a directive on the control of high-activity sealed radioactive

sources and orphan sources, to be transposed into national legislation by the end of 2006, will ensure that the provisions of the IAEA Code of Conduct are legally binding in the Community.

› Facilitate consultation and public information

Public acceptance is a prerequisite for further development of nuclear energy. The EU citizen, concerned about the safety of nuclear facilities and the safe management of radioactive waste, must be properly addressed. As the guardian of the EURATOM treaty, the Commission strives to inform the public, promote its welfare and protect its safety and security. In this respect, continuing consultations with all stakeholders, nuclear operators, Member States and the IAEA allowed reactions and opinions to be collected, thus helping clarify certain aspects and make their implementation successful. ■

(1) EURATOM participated recently – as a contracting party – in the review of the Convention on the Physical Protection of Nuclear Materials.

“Provided that an adequate level of safety and security is ensured, I believe that nuclear energy will continue to play a role in the EU, supported by a continued commitment in research and promotion of technological development aimed at further enhancing the safety and security of nuclear energy.”

Andris Piebalgs
EC Energy Commissioner



TOWARDS THE EUROSAFE NETWORK

Union Makes Strength

■ Besides having inspired the motto of the Belgian Crown⁽¹⁾, the idea that an ever closer integration of resources and competences remains the safest way to respond to an increasingly challenging environment is pivotal to making the EUROSAFE initiative a fully-fledged network, capable of interacting with the organisations and stakeholders involved in nuclear safety within the EU and internationally. The EUROSAFE Network of AVN, GRS and IRSN was born in May 2006.

› Time for truly European policy making

While the number of nuclear reactors and other nuclear facilities operating in the European Union remains almost unchanged, the continuous evolution of the political, societal and economic context in the region poses new challenges, calling for all parties in charge of nuclear safety – operators, safety authorities and technical support organisations – to strive for adaptation.

- The first major change is the enlargement of the European Union. With now 13 Member States relying upon nuclear power, nuclear safety is a requirement for Europe as a whole, not just a national issue, since any large or severe accident in a nuclear power station or installation anywhere in Europe could potentially affect the entire continent.

- The second mutation is sustainable development. Compliance with the quantified objectives of the Kyoto Protocol impacts the energy policy which is being pursued in Europe, making the place of nuclear

energy in this energy mix – and the related safety requirements – an issue of vital importance.

- A third challenge is Europe's industrial competitiveness. Nuclear technology and industry is part of global competition, and the way European players are organised continent-wide, notably in terms of nuclear safety and reliability, has direct consequences on the competitive edge of Europe-based technology.

Obviously, all these changes call for truly European policy making and the Nuclear Package launched by the European Commission several years ago can be regarded as a sound initiative, even if it raised some scepticism among several Member States.

› Three objectives for uniting TSOs

Technical safety organisations doubtlessly have a part to play in this European policy making, and the choice of Brussels to host the 2005 EUROSAFE Forum is by no means fortuity. Beyond the symbol, the

seven organisations⁽²⁾ which are developing the EUROSAFE approach supported the creation of the EUROSAFE Network, a new, formal structure aimed at being an active partner in policy development in pursuance of three objectives:

- contributing actively to the convergence of safety practices in Europe. Beyond standards, regulations and directives, the practice in safety assessment is a fundamental issue, which needs to be dealt with jointly and not separately. Therefore, active contribution to technical convergence in safety assessment is needed;

- bringing together safety practices and research. The EUROSAFE Network would support increased convergence between the research needs, the research capacities and the practitioners' priorities. It would help bridge the gap between research and the implementation of research results in codes, good practice, and the management of knowledge;

- being an active partner for the management of knowledge, inside Europe and internationally. A key issue for the future, when the operating life of reactors based on ageing nuclear technologies will be extended for economic reasons and the people who designed them will have retired, the management of knowledge cannot be left any longer to each country on its own but must be pooled. The EUROSAFE Network would promote the sharing of good practices as well as joint training.

Beyond the founding members AVN, GRS and IRSN, the EUROSAFE Network will be open to new members with a view to:

- interacting with the European Union Institutions, national institutions of countries not represented in the EUROSAFE Network, the IAEA, NEA and non governmental organisations about specific issues or findings generated by the EUROSAFE Network on a case-by-case basis;
- considering requests from these institutions and states for advice on technical nuclear safety matters;
- meeting with other organisations having capabilities in the field of nuclear safety research or assessment to discuss specific issues.

The network's priorities will be:

- to further develop the joint *Safety Assessment Guide*;
- to contribute to the framing of the priorities for the seventh European Framework Programme for Research in EURATOM and to make sure that research is linked to practice afterwards;
- to be active in the creation of the knowledge management philosophy and network at the European level so as to meet an urgent need;
- last but not least, to play some role internationally in the organising of the conference on TSOs scheduled by the IAEA for April 2007.

Further developments of the EUROSAFE Network will be reported in future issues of the EUROSAFE Tribune. ■



(1) Union makes strength (L'union fait la force/ Eenheid maakt macht).

(2) AVN (Belgium), CSN (Spain), GRS (Germany), HSE (United Kingdom), IRSN (France), SKI (Sweden), VTT (Finland).

Nuclear Installation Safety Assessment & Analysis: safety has no price... but it has a cost

■ Co-chaired by Heinz Liemersdorf (GRS) and Thierry Foulst (IRSN), the seminar dealing with the safety assessment of nuclear facilities was largely devoted to the impacts of technical, economic and societal evolutions on the operating conditions of power plants. From instrumentation and control (I&C) upgrades through to higher fuel burn-ups and cost-benefit analyses aimed at ranking plant modifications, the major ongoing changes and related safety challenges were addressed to provide a broad picture of how safety is to be improved... and current regulatory requirements are to be complied with.



This 2005 seminar is a real success as the audience is composed, beyond members of technical support organisations, of representatives from the nuclear industry and, in particular, from utilities", Heinz Liemersdorf stressed with satisfaction. To attract this broader audience, the various lectures gave a panorama of the technical aspects of safety from different perspectives: demonstration methods, operational experience feedback, etc. Now, what

important messages are to be conveyed to the parties involved in policy making and safety assessment?

➤ Focus first on conformity prior to talking about improvements

Safety improvements, which are the central theme of this 2005 EUROSAFE Forum, are often envisaged as steps exceeding the current regulatory safety requirements. However, conformity with present safety standards is to be considered as an improvement, since it is conducive to corrective actions on reactors in operation, to mitigate hidden defects for instance (see paper titled: **Periodic Safety Review: modifications resulting from the second ten-yearly outages of the French 1300 MWe PWRs**).

➤ Get the broader picture of safety issues

Beyond regulatory aspects of nuclear safety issues, it is relevant to take into account other perspectives – e.g. technical, societal,

competitive, etc. – to get a better understanding of safety challenges, as those different drivers interact and impact safety. In this respect, emphasis should be placed on getting the safety culture to thrive among all the parties involved: designers, licensors, operators, etc (see paper titled: **Safety evaluation of the Finnish EPR project**).

➤ Anticipate and monitor major changes

A driving force towards cost improvements, the opening of the electricity markets encourages utilities to perform cost-benefit analyses pertaining to safety enhancements. The aim is largely to anticipate and monitor such changes as power upgrading through higher fuel burn-up rates which require the development of technical improvements (see paper titled: **The technical-economic optimisation of the improvement of the safety level of the PWR 900 MWe units for their third ten-yearly outage thanks to the cost-benefit analysis**).

➤ Dedicate enough resources to catch up with technological changes

Assessing the impact of constantly devel-

oping technologies on safety requires ever larger amounts of work from TSOs to acquire the necessary knowledge and experience. It is for instance the case with safety-critical software used by NPP operators which grows in complexity by a factor of ten at each generation (see paper titled: **Assessment of safety-critical software**).

➤ Pool resources to increase efficiency

In line with the framework of the AIDA/MOX programme aimed at transforming weapons grade plutonium into mixed oxide fuel (MOX) usable in Russian reactors (WWER or fast-breeder reactors), a collaboration has been launched under the leadership of the nuclear safety authority of Russia (Rostekhnadzor) to develop a set of state regulation documents. This programme is a good example of international collaboration, as several European TSOs and safety bodies are involved in providing the Russian regulators with very important support (see paper titled: **Support of the Russian Nuclear Safety Authority in developing the regulatory basis for dealing with ex-weapons plutonium**). ■



Seppo Vuori

*Customer Manager,
Nuclear Energy
VTT Technical Research Centre
of Finland*

“To meet higher power demands, Finns are faced with major challenges:

the country's strong commitment to achieve emission reduction targets for carbon dioxide and other greenhouse effect enhancing gases necessitates an energy mix compatible with these targets. Besides other sources, nuclear power is part of this energy mix. This is why the Finnish Parliament approved in 2002 the construction of

a new reactor. A decisive cornerstone for this decision was the Parliament's approval of the spent fuel disposal facility in 2001. A vast majority of Finns consider that nuclear safety is in good hands, under the control of competent authorities and of utilities who are required to participate actively in safety assessments. On their side, communities close to NPPs are quite positive towards accepting nuclear facilities

such as a geological repository for radwaste. Some were even competing to have the facility on their territory. This widespread confidence results from the open attitude of the government and politicians, who do not present nuclear power as an absolute necessity, as well as the neutral attitude of utilities who put emphasis on the right energy mix rather than pushing for additional nuclear power”.

Nuclear Installation Safety Research:

The emergence of 'soft' issues

■ Two major trends characterise the evolution of research in the field of nuclear installation safety, as shown through the lectures given at the seminar devoted to this domain during the Brussels EUROSAFE Forum. The first one is a more rational use of research means – beginning with experimental facilities – thanks to international co-operation programmes. The second is the recognition of knowledge as a major source of nuclear safety improvements, evidenced by the emergence of knowledge management as a 'soft' topic in the research scope, besides traditional 'hard' sciences.



Co-chairman of the seminar, Victor Teschendorff (GRS), pointed out how difficult it may be to get enough public money dedicated to nuclear safety research in countries engaged in a phase-out process or in situations where the fleet in operation is claimed to be safe, no new reactors are built and some of the existing plants are closed. *“Still, research is important as one of the main pillars of nuclear safety alongside operational feedback and safety studies. It is necessary when it comes to evolutions pertaining to operating modes implemented by utilities, materials used for fuel cladding, fuel burn-up, the digitalisation of P&ID”*, he advocated.

In spite of these difficulties, research remains vivid thanks to enlarged co-operation between EU Member States and third countries like Russia, or at OECD level. *“There are more and more international projects because we can share the costs and prepare jointly the experiments, calculations and comparisons with the models”*, co-chairman Michel de Franco (IRSN) stressed.

A few examples of significant research programmes carried out under international co-operation are provided below.

► Joint programmes to share research infrastructure

Several lectures showed that international programmes enable experimental infrastructures to be maintained, whereas they would be mothballed if left to one country alone. It is the case of the *Panda* facility (located in Switzerland) where investigation of gas mixing and stratification is performed. The experimental programmes conducted in these facilities are aimed at solving still open safety questions or at validating complex 3D codes. For instance, the *Seth* OECD project focused on boron dilution events will enable thermal-hydraulic codes to be validated by means of experiments (see papers titled: *Investigation of gas mixing and stratification in the Panda Facility* and *Validation of thermal-hydraulic codes for boron dilution events in the context of the OECD/Seth project*).

› Univocal understanding of experimental results through joint analysis

It was also evidenced in this seminar that some experiments of utmost interest are too complex or insufficiently instrumented to enable useful outcomes to be derived. The joint analysis of outcomes and test computer codes by pre- and post-test calculations is a new approach meant for obtaining an unambiguous understanding of those experiments' results.

› Availability of easily usable information

In the field of knowledge management, the progress achieved over the last couple of years bears witness to the increased attention from the nuclear community – safety authorities, industry, etc. – faced with considerable amounts of complex information to be processed by reduced workforce. Therefore, the research programmes are chiefly aimed at making information available online in an adapted structure.

Moreover, new questions arise with the progressive retirement of the generation in charge of designing and commissioning most of the plants: where can those who will take over find the experience and knowledge gained by their seniors? How is safety culture transmissible to newcomers?

As knowledge conservation becomes an ever more acute issue, research strives to find ways to produce and structure information in an easily usable digital form. This task is quite a challenge, since it is not easy to describe as simple facts the way each individual chooses to proceed (see paper titled: **An approach to knowledge management for EUROSAFE projects**).

› Precise experimental data to validate complex calculation codes

A demand for more accurate 3D calculation codes emerges with such new phenomena as power upgrades which bring nuclear plants closer to the limits of their safety margins. Subsequently, the need for specific experiments aimed at providing more precise and complex validation data grows as 3D codes become more and more complex. The better quantification of accuracy resulting from present research programmes is highlighted through the lecture titled “**Validation of coupled thermal-hydraulic and neutronics codes in international co-operation**”. ■



Environment & Radiation Protection:

Preventing potential accidents, mitigating their consequences

■ As the eventuality of nuclear terrorism and sabotage attacks is taken more and more seriously into consideration, work aimed at mitigating the consequences of radioactive releases in the environment intensifies, based on improvements in the modelling of aerosol dispersion, radioactivity measurements, remediation of contaminated areas and organisation of agricultural activities. The lectures given at the seminar on environment and radiation protection co-chaired by Gunter Pretzsch (GRS) and André Oudiz (IRSN) provided information on the latest developments in this domain.

► Dealing with emergency and post-accidental situations

The management of emergency situations and of post-accidental situations are two distinct issues. The experience gained in the first area shows that the role of radioactivity measurements in the environment is sometimes subject to misappraisal. A necessary step to assess precisely the extent of contamination in a given area, radioactivity measurements are not the basis of the first steps taken to protect the population and its environment, those being derived much more from the modelling of the damaged facility and from the weather conditions at the time of the release (see paper titled: **Crisis management: respective roles of radiological consequences calculations and of radioactivity measurements in the environment**).

The second important feature pertains to a barely explored domain to date, i.e. the ways to structure the measures taken, during the very first days following an accidental release of radioactive particles, to provide assistance to urban dwellers, farmers and people in charge of environmental protection. An innovative contribution is proposed in the paper titled: **Decision-aiding tool for the first countermeasures to be implemented in the intermediate phase**.



› Working with NGOs to collect first-hand, in situ information

The attempt to establish a link between environmental contamination, the internal contamination of children and the health status of those children living in contaminated areas in Belarus is a major contribution from the CORE⁽¹⁾ project which involves the participation of NGOs such as *Médecins du monde* and ACRO⁽²⁾. In close co-operation with medical experts from Belarus, ACRO teams performed radiological measurements in the environment, *Médecins du monde* physicians worked on improving the health status of children and IRSN teams attempted to establish a correlation between contamination data and data pertaining to the description of the children's health conditions. The CORE project highlights the significance of data collected in situ on the radiological status of a contaminated area and of the information obtained from the local population (see paper titled: **CORE Health project : production and use of environmental radioactivity measurements data and internal contamination data for the health status follow-up of children in Belarus**).

› Getting better understanding of source terms and events of radiological hazards

Important experiments were conducted in Germany to help analyse the dispersion of radioactive material during the transport and storage of waste containers. These experiments were intended at evidencing that aerosol dispersion and the quantity of radioactive dust released differ according to the conditioned waste. These experiments show that the various source terms produced by the various types of waste should be taken into consideration when analysing transport accidents (see papers titled: **Experiments**



to quantify airborne release from packages with dispersible radioactive materials under accident conditions and Radiological consequence analysis in case of fire impact).

› Enhancing the safety level of nuclear facilities and material in Russia

Several initiatives are taken by Germany, France and other countries within the framework of the G8 Global Partnership aimed at enhancing the safety level of nuclear facilities and material in Russia. In this respect, the safety of Russian radioisotope thermoelectric generator (RTG) sources used to power Russian lighthouses and marine sites, e.g. in Baltic Sea areas, is a matter of concern, as they are a source of potential radioactive hazard to be taken into account in the event of nuclear terrorism and sabotage attacks. In the frame of the Global Partnership project, Germany took over the replacement of 93 radioisotope generators used to power 75 lighthouses on the Baltic Sea area by alternative energy sources. This project includes the removal of the radioactive sources, their transportation to the interim storage facility near Sosnovy Bor and the physical protection of the storage. Another aspect of the Global Partnership project deals with the dismantling of the Mayak reprocessing plant, the vitrification of waste and its storage in near-surface repositories. GRS performed field calculations aimed at planning radiological protection measures, especially during the removal, storage and handling of the waste in the hot cell (see paper titled: **Radiation field calculation in the vicinity of Russian radioisotope generator sources**). ■

- (1) Co-operation for Rehabilitation of living conditions in Chernobyl affected areas in Belarus.
- (2) Association pour le contrôle de la radioactivité de l'Ouest / Association for the Control of Radioactivity in the Western part of France.

Nuclear Material & Nuclear Facilities Security: A fast growing concern

■ With the increased pressure of global terrorism, the protection of nuclear materials, and more specifically of nuclear fuel, is becoming more and more a matter of concern. The EUROSAFE Forum seminar devoted to nuclear material & nuclear facilities' security highlighted the two fundamental principles of fuel protection: the security culture and defence in depth. Would new nuclear safety prospects emerge from the combination of defence in depth and fuel protection? How do organisations such as ENSRA⁽¹⁾ contribute to increased safety and security? What is the right complementary between both objectives? These topics were debated as shown below.



► Promoting a European approach in the field of security

“After the 9/11 terrorist attacks, the threats linked to global terrorism emerged as a new concern in Germany, with a particular focus on fuel protection, an issue safety people didn’t deal with historically, and on sabo-

tage using information technologies”, co-chairman Wolf-Dieter Gutschmidt (GRS) stressed. The ongoing discussions clearly show the need for intensified interaction and exchange among regulators, TSOs and nuclear facility operators, thus putting emphasis on the role of such organisations as EUROSAFE and ENSRA besides international institutions, primarily the IAEA. “Europe should promote a harmonised position in this domain, just as the USA do and, in this respect, EUROSAFE should help harmonise fuel protection policies by fostering a common understanding and approach of security issues”, co-chairman Jean Jalouneix (IRSN) advocated, reminding that only four countries attended the Forum at the beginning, whereas at least eight countries are participating now. “We strive to get colleagues from other countries to join us”, Mr. Jalouneix emphasised (see papers titled: The ENSRA organisation and The Spanish security system).

➤ Security vs. safety: trying to square the circle

"Physical security is deeply related to safety. Moreover, both aspects largely overlap", Mr. Gutschmidt pointed out. "To provide efficient security, one must have a deep knowledge of the safety features. This is why TSOs such as GRS and IRSN are involved in both areas and handle them as a whole." Sometimes, finding the optimum balance between security and safety is like trying to square a circle, since each aspect may imply contradictory policies. Whereas safety is strengthened by the open circulation of transparent information on nuclear facilities, security is based on confidentiality: what would detailed security measures be worth, if discussed outside very restricted committees? In the same way, accessibility to nuclear facilities clearly shows contradictory imperatives: safety usually requires easy escape, which is the absolute opposite to security. *"The only way to place the cursor is to analyse in details the consequences of any scenario", Jean Jalouneix concluded (see papers titled: Security culture and Exercises in the field of security).*

➤ Probabilistic vs. deterministic approaches

Another aspect dealt with by the participants in the EUROSAFE Forum seminar devoted to nuclear material & nuclear facilities was the usability of probabilistic safety assessments (PSAs) to analyse the consequences of malevolent actions, their occurrence being deterministic. It was pointed out that PSAs are applied in the USA to external events, but not in Germany or France where fuel protection is considered much more as a deterministic issue (see paper titled: **Defense in depth used in the physical protection of NPPs**). ■

(1) European Nuclear Security Regulators Association.



Carl Paperiello

Director, Office of Nuclear Regulatory Research, US Nuclear Regulatory Commission

“There are several major differences between Europe and the US as regards nuclear energy and I am

interested in participating in international venues such as EUROSAFE to share information about these differences. If one considers the systems of regulation for instance, America does not have 10-year safety reviews, but an annual assessment called *Reactor Oversight Program* and two resident inspectors at some nuclear facilities.

I am also interested in hearing about public perception, as it reflects the way things are working in a democracy. I have been personally involved in a lot of public meetings particularly in radiation protection, which is my speciality. I know from these meetings with people that they hardly believe me, and I consider it is more my fault than theirs, if I am not able to change their mind. I think policy makers have to balance public acceptance with ‘*absolute levels of safety*’. Nuclear energy has to be safe and people have to accept it when it is safe”.



Waste Management: From pure science to overall approaches

■ *“From previous EUROSAFE conferences, we got the experience that the audience is far less interested in pure research topics than in strategic, policy orientated developments pertaining to waste disposal and safety as well as in performance assessment strategies”, co-chairman Jean-Claude Barrescut (IRSN) assessed. Based on this experience feedback, it was therefore decided for the EUROSAFE Forum 2005 that the seminar dedicated to waste management would focus on subjects, such as deep geological disposal, closely related to public acceptance and licensing requirements.*

➤ Waste disposal research: two significant trends

If waste disposal research is still based on experiments, analytical research and safety assessment, the traditional way to carry out research work, i.e. working on separate projects, sites or issues tends to be replaced by joint programmes performed under guidance of the European Commission (DG X).

“The second trend is the intent to respond to widely scoped issues with solutions based on “the broader picture”, i.e. a comprehensive understanding of problems”, co-chairman Wernt Brewitz (GRS) indicated. As radioactive waste disposals might impact the biosphere in case of a leak for instance, the entire problem encompassing geology and the biosphere has to be considered to design disposal solutions suitable to prevent and mitigate environmental impacts (see papers titled: Activities of AVN in the Belgian context of safety assessment of radioactive waste disposal and Geological disposal of radioactive waste: elements of a safety approach).

➤ New safety criteria and guidelines for regulatory evolution in Germany

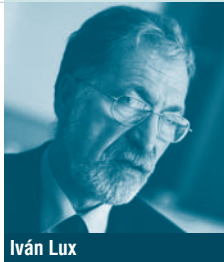
Pertaining to the current state of regulation development for deep geological dis-



posal in Germany, the first lecture reviewed the GRS proposals for revised safety criteria and guidelines placing emphasis on long-term (i.e. post-closure) safety aspects. Experience feedback on regulatory processes related to four German projects (Morsleben, Asse, Konrad and Gorleben) is also provided (see paper titled: **The safety case for deep geological disposal: GRS views on regulatory requirements and practice**).

› Considerations on the siting of a radwaste repository in Ukraine

Stating that the unsolved problem of high-level waste (HLW) and low-level waste (LLW) disposal in Ukraine is a threat to sustainable nuclear power development and national security, radio-environmental experts from the National Academy of Sciences of Ukraine present borehole-type (vs. mine-type) geological repositories as a solution to allow time optimisation and work cost cuts. Since more than 90% of waste volumes are located within the Chernobyl Exclusion Zone (ChEZ) borders, this area appears as offering optimal conditions for developing a repository from geological, economical and social perspectives (see paper titled: **Present state of the art in the development of a geological radioactive waste repository in Ukraine**). ■



Iván Lux

*Deputy Director General
Hungarian Atomic
Energy Authority*

“ Meetings such as the EUROSAFE forum are important for regulatory bodies and technical support authorities as they provide institutional and technical information as well as details on policies and strategies. Besides presentations by knowledgeable scientific and technical specialists, I think the views voiced by high ranking officials like the EU Commissioner for Energy or the Mayor of Huy on issues such as safety are a precious feedback for the nuclear community. They show how differently the public may react according to the way nuclear safety issues are presented by politicians. In this respect, it is interesting to observe that 80% of Slovaks support nuclear energy in their own country, as 80% oppose it in neighbouring Austria. It shows how much work is necessary – in terms of safety enhancements and information – to achieve public confidence ”.



VENUES & WEBSITES

UPCOMING MEETINGS

- *12-16 November 2006, Albuquerque, USA*
Ensuring the Future in Times of Change: Non-proliferation and Security
ANS Winter Meeting and Nuclear Technology Expo
Organised by the American Nuclear Society
- *17 January 2007, Paris, France*
L'harmonisation internationale de la sûreté
International symposium organised by the French Nuclear Energy Society (SFEN)
- *23-25 January 2007, Paris, France*
Safety Cases for Deep Disposal of Radioactive Waste - Where do we stand?
International symposium organised by the NEA (Radiation Protection and Radioactive Waste Management Division)
- *23-27 April 2007, Aix-en-Provence, France*
The Challenges faced by Technical and Scientific Support Organizations in Enhancing Nuclear Safety
International Conference organised by the AIEA
- *28 May-1 June 2007, St. Petersburg, Russia*
Nuclear Criticality Safety (ICNC 2007)
International Conference co-sponsored by the American Nuclear Society
- *18-21 June 2007, Vienna, Austria*
Knowledge Management in Nuclear Facilities
International Conference organised by the AIEA
- *30-31 October 2007, Daejeon, Republic of Korea*
Advanced Safety Assessment Methods for Nuclear Reactors
Co-sponsored by the American Nuclear Society

EXPERIENCE FEEDBACK ON THE WEB

- **Harmonization of Reactor Safety in WENRA Countries**
Report by WENRA Reactor Harmonization Working Group (January 2006)
Published by the Western European Nuclear Regulators' Association
<http://www.wenra.org> - click on "Publications"
- **Improving vs. Maintaining Nuclear Safety**
Published by the Nuclear Energy Agency (NEA)
http://www.gmfeurope.org/web/downloads/safety/Improving_security.pdf
- **Safety F1rst**
WANO review, October 2005
Published by the World Association of Nuclear Operators
http://www.wano.org.uk/WANO_Documents/Biennial_Review/2005/Review_2005.pdf

In the next issues:

The EUROSAFE Tribune #10
is devoted to the life-time management
of nuclear power plants

The EUROSAFE Forum 2006
will take place on 13 & 14 November
in Paris.

The corresponding debates
and seminars will be reported in
the EUROSAFE Tribune #11

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*Towards Convergence of
Technical Nuclear Safety Practices in Europe*