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Nuclear Power Newsletter

News from the Division of Nuclear Power
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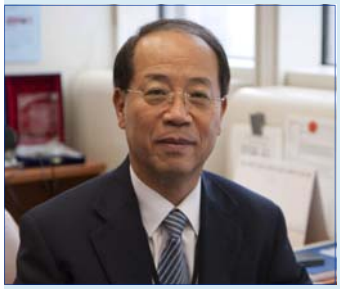
Technical Working Group on Nuclear Power Infrastructure

The Technical Working Group on Nuclear Power Infrastructure (TWG-NPI) is a group of international experts from 19 Member States and includes both nuclear power newcomer and experienced countries. The TWG is designed to provide valuable advice to the IAEA which relates to the development and implementation of national nuclear power programmes.

The second meeting of the TWG-NPI was held at the IAEA on 23-26 May 2011. Twenty-four experts discussed topics such as IAEA technical assistance to newcomers; the role of research in nuclear power infrastructure development; 'soft' coordination between bilateral assistance and IAEA assistance; and future IAEA activities for newcomers. The possible impacts of the Fukushima Daiichi accident on the *Milestone* approach (documented in IAEA Nuclear Energy Series No. NG-G-3.1) were also on the meeting's agenda.

More information on this meeting is available at
http://www.iaea.org/NuclearPower/Infrastructure/

Message from the Director



Welcome to the June 2011 newsletter of the Division of Nuclear Power. First of all, I would like to express my heart-felt condolences to the people of Japan who suffered the tragic earthquake and tsunami.

As everybody knows, a monster earthquake and an unpredictable tsunami that struck Japan on 11 March 2011 crippled Fukushima Daiichi Nuclear Power Units 1 to 4 and destroyed offsite power lines and emergency diesel generators. The IAEA Incident and Emergency Centre (IEC) immediately started its action to respond to the Fukushima accident from day 1 and the IAEA Director General, Mr Y. Amano, established the Fukushima Accident Coordination Team (FACT) to coordinate the response to the accident in-house, with the Japanese Government and Nuclear Industry Safety Authority (NISA), Member States and international organizations such as CTBTO, WMO and FAO.

Arial view of Fukushima Daichi nuclear power plant prior to 11 March 2011

Many staff members of the Division of Nuclear Power volunteered to support coordination activities of the IAEA, working day and night shifts at the IEC, the Reactor Engineering Support Team and the Fukushima Nuclear Safety Team. Special thanks go to Mr Masahiro Aoki of the Integrated Nuclear Infrastructure Group (INIG) who volunteered to join NISA in Tokyo to coordinate the IAEA activities with Japanese authorities for a month working 12 – 17 hours a day. Mr Katsumi Yamada of the Nuclear Power Technology Development Section (NPTDS) coordinated the IAEA response with experts of the Tokyo Electric Power Company (TEPCO) as well as Japanese authorities by visiting Japan including the Fukushima site.

NENP will do its best in coordination with others in the IAEA to support Japan to bring the crisis into a stable condition as announced by the TEPCO in the *Roadmap towards Restoration from the Accident at Fukushima Daiichi Nuclear Power Station* on 17 April within 6 to 9 months. I believe all the readers of this newsletter will be with us in this effort.

Among many other activities of the NENP, meetings of *Technical Working Groups* on nuclear desalination, fast reactors, NPP instrument and control and nuclear infrastructure were held in April and May. The 17th INPRO Steering Committee meeting was held in May and discussed a vision for INPRO to 2016 and the action plan for the next biennium.

Mr Alexey Kazennov, who has been working on Human Resources Development left us in mid April, and Mr Oszvald Glockler of Instrumentation and Control will leave the IAEA in late June after seven years of good services. It is a great loss of expertise for the Division. I would like to thank both of them for their excellent contributions to the IAEA and the Member States and wish them all the best in their future professional and personal future.

In this issue of the newsletters, Mr Randy Beatty from INPRO, Mr Richard Shouler from NPES, and Mr Suehiro Minemasa from NPTDS will present their home towns. I would also like to introduce two new staff members: Mr Masahiro Aoki from Japan and Mr Stefano Monti from Italy. Mr Aoki, whose status has changed from cost-free expert to regular staff, will continue to work on nuclear infrastructure for newcomer countries in INIG. Mr Monti is working on fast reactor technology development in NPTDS.

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Supporting Nuclear Infrastructure Development

INIR Evaluation Methodology

Integrated Nuclear Infrastructure Review (INIR) missions assist countries in assessing the status of the development of their national nuclear infrastructure. Recently, INIR missions took place in Thailand and in the United Arab Emirates (UAE).

International experts and the experts from Thailand and the UAE were invited to the IAEA to start the process of updating the Evaluation Methodology Document. During this consultancy meeting, held from 9-13 May in Vienna, experts from Thailand and the UAE provided their views on the Evaluation Methodology Document as it was applied during the INIR missions to their countries. They identified many possible improvements including minimization of 'overlaps' and consistency of 'depth of review', which are among the 19 issues addressed in the document.

Based on the conclusions of this consultancy meeting, work at INIG has started to update the Document.

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Nuclear Power Engineering

Hands-on Experience in Developing and Managing Nuclear Power Programmes

A technical meeting was held in April at the Seoul National University, in cooperation with the Korean Nuclear Society (KNS), in which 17 participants from 11 countries took part.

The purpose of this meeting was to provide an international forum to review and exchange information on technologies and tools needed for a successful cooperation with selected suppliers in activities ranging from bidding preparation to the construction of nuclear power plants. Participants and invited experts addressed how to select engineering, procurement and construction (EPC) contractors, and shared insights and lessons learned during past construction projects.

In particular, the objectives of this meeting were to expand opportunities for 'hands-on' experience in developing and managing nuclear power programmes; and improve information sharing among Member States to promote sustainability of support programmes.

A panel discussion recommended that:

- A database of EPC contractors with proven track records be maintained for reference by countries embarking on nuclear projects;
- A higher level management seminar be organized on quality assurance and quality control, which offers hands-on and practical exercises rather than theoretical discussions.

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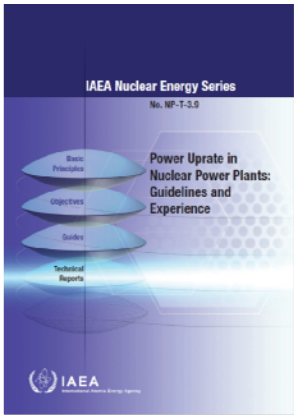
Power Uprate in Nuclear Power Plants: Guidelines and Experiences

In general, it is in the interest of owners of nuclear power plants to keep their plants operating at high levels and in service as long as they can be maintained safely and it is economically viable to do so. Implementing a power uprate programme is one method to achieve this.



This report, published in the IAEA Nuclear Energy Series (No. NP-T-3.9), provides information on current trends, guidance, licensing aspects, monitoring, lessons learned, verification technology, and associated side effects in power uprate programmes. It covers various types of power uprates from small to large for pressurized and boiling water reactors. A successful power uprate may include a combination of utilizing a portion of the existing design margins, using improved analytical techniques, improving material conditions, and developing advanced fuel management.

The process of power uprate varies among countries due to differences in reactor design and type, regulatory processes, and plant life management programmes. To enhance and ensure that a wide range of information is presented, country reports are attached in the Appendices. These reports are intended to promote the exchange of experience and lessons learned from countries which have implemented power uprate programmes.

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Instrumentation, Control and Cyber Security Issues

Modernization of Instrumentation and Control (I&C) Systems in NPPs: this workshop of the Technical Cooperation Project for Europe (RER/4/030) held in Portoroz, Slovenia, in May 2011 was attended by 25 participants from 10 Member States, who addressed:

- Cybersecurity of digital I&C Systems in NPPs;
- Performance of I&C systems under accident conditions;
- I&C codes and standards used in NPP modernization and new build projects;
- The role of I&C systems in power uprating and license renewal projects.

Newly Arising Threats in Cybersecurity of Nuclear Facilities: this Technical Meeting was held from 16-20 May 2011 in Vienna. Organized jointly by the Office of Nuclear Security, the Division of Nuclear Installation Safety and the Division of Nuclear Power, the objectives of the meeting were to help shape IAEA's response to its Member States' concerns about new threats to nuclear power plants in the field of cybersecurity, and to provide an international forum for presentations and discussions to support the IAEA in defining future activities in the field of computer security such as:

- Assess and propose possible revisions and additions to existing international guidance on the computer security of nuclear facilities with a specific focus on IAEA guidance;
- Review computer security through missions and offer training courses with expanded curriculum;
- Raise awareness of changing cyberthreats;
- Promote the establishment of a cybersecurity culture;
- Establish a community of practice (networks) and discuss practical cooperation issues.

Technical Working Group of Nuclear Power Plant Instrumentation and Control (TWG-NPPIC): The 23rd biennial meeting of this TWG was held on 24-26 May 2011 in Vienna. Fortyfive participants from 23 Member States attended the meeting. In addition to presenting country reports and providing recommendations to the IAEA, the meeting included discussions on three special topics: (1) I&C performance under accident conditions, (2) cybersecurity of digital I&C systems in NPPs, and (3) establishing a network of I&C experts.

Two new Coordinated Research Projects (CRPs) have been launched:

- Qualification, Condition Monitoring, and Management of Aging of Low Voltage Cables in Nuclear Power Plants;
- Design and Engineering Aspects of the Robustness of Digital Instrumentation and Control Systems in Nuclear Power Plants Against Malicious Acts.

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PRIS Development

A consultants meeting on the Development of the Power Reactor Information System (PRIS), held in May 2011, came at a good time because of the recent events at Fukushima. Nuclear power plant delegates from around the world met to discuss how PRIS reports can support the nuclear industry and the general public with technical information on nuclear power plants. After the events at Fukushima, the number of requests for PRIS outputs has increased significantly.

The main task of the meeting was to develop an outline for a PRIS-Statistics manual that will help end-users in extracting information and statistics that include NPP specification and design characteristics, production data and detailed outage statistics and benchmarking data from all 443 nuclear units worldwide.

The PRIS database houses data collected from the beginning of construction, through commercial operation, and finally decommissioning of nuclear power plants. The PRIS-Statistics application makes it easy to generate reports and extract the relevant data and information from nuclear power plants. The recommendation for a PRIS manual came from the Technical Meeting held last fall in 2010. Several members of the Technical Meeting were also in attendance at the Consultancy Meeting, and they all had valuable contributions to the manual. The manual is set to be finalized in July. In addition to the manual, there will be an information pamphlet that will include a brief introduction to the PRIS-Statistics application.

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PRIS Training for KHNP

A PRIS training was held from 12-13 April in Seoul, Republic of Korea for PRIS data reporters from Korean nuclear power plants. The training was organized to explain, in detail, the PRIS database and data requirements. The training course was hosted by Korea Hydro and Nuclear Power (KHNP) headquarters in Seoul and attended by data reporters from all the Korean nuclear power plants. During the two day training, participants attended lectures on the PRIS data collection system and generating PRIS-Statistics reports. During working group sessions, participants practised data entry using actual data from the first quarter of 2011.

Training of PRIS data providers and active discussion of problems encountered during data reporting is the most efficient way to improve the quality of data in PRIS. This is also a good opportunity to educate operating utilities about the PRIS database and its associated report capabilities.

PRIS training course at KHNP, Seoul, April 2011

INPRO

Jordan Becomes 33rd INPRO Member

The Jordan Atomic Energy Commission (JAEC) conveyed to the IAEA the request of the Government of Jordan to become a full member of INPRO. This also includes Jordan's plans to undertake a nuclear energy system assessment (NESA) using the INPRO methodology to support the country's strategic planning and decision making on long term nuclear energy deployment.

IAEA Deputy Director General Mr A. Bychkov welcomed Jordan as a member of INPRO and expressed the IAEA appreciation for the interest and expression of support for INPRO. Jordan's membership brings the number of INPRO members to a total of 33.

As a newcomer country, Jordan will benefit from increasing its energy mix and from INPRO's expertise in the areas of long-range nuclear energy planning to support sustainable nuclear energy deployment and technical innovations. The country launched its nuclear power programme in response to challenges such as growing energy demand, increasing energy costs, lack of conventional energy resources, increasing dependence on imported fuel, scarcity of water resources and environmental degradation due to increasing consumption of fossil fuels. Currently, Jordan almost entirely relies on foreign energy sources (oil and gas) as 96% of the country's energy needs are imported.

Performing a NESA may be very useful for Jordan to compare different nuclear energy systems and find the optimal one consistent with the country's objective of sustainable development. The NESA will be performed by a team of experts from several institutions involved in the Jordan nuclear energy programme including governmental institutions, research centers, academia, universities and national industry. It is planned to start the assessment in the second half of 2011 and finish it by the end of 2012.

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Benchmarking the Environmental Impact of Radionuclides

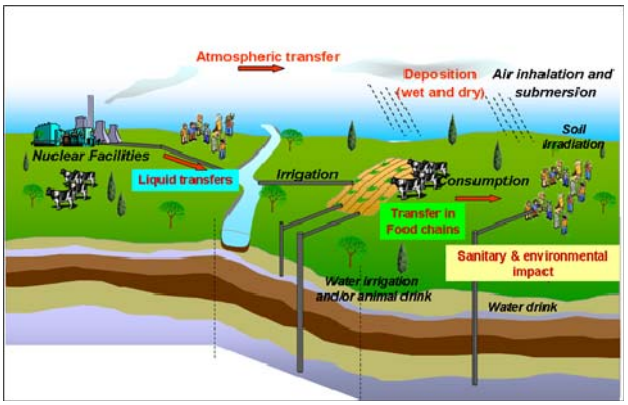
Progress in the INPRO Collaborative Project (CP) on Environmental Impact Benchmarking Applicable for Nuclear Energy System under Normal Operation (ENV) was discussed at a meeting held at CEA in Paris, France, from 23-25 March 2011. Participants from eight countries attended the third meeting of the ENV project.

In the environmental assessment area of the INPRO methodology, the acceptability of environmental effects must be considered. As some hundred radionuclides may be present in releases from nuclear facilities, the number of calculations could be relatively high. Therefore, a ranking methodology for their environmental impact on human health is necessary.

Third meeting of the ENV CP, Paris, March 2011

In this project, participating INPRO Members compare existing methodologies available for assessing environmental impacts of nuclear energy systems under normal operation. The results of this CP will also provide feedback for the practical application of the INPRO methodology in the area of environment.

The harmonized methodology will fit into INPRO's spectrum in terms of development of new technologies. The ranking methodology could be applied to a scenario including projected releases from a given new technology. The results of the methodology would indicate which radionuclides would potentially cause problems or elevated risk to human health. The developers could then return to the design of the technology and modify it to mitigate or eliminate those specific risks, thus meeting the goal of keeping exposures as low as reasonably achievable (ALARA).



Exposure pathways for atmospheric and river discharges

The focus of the study is on testing an approach that uses *one source term*, namely a nuclear power plant at normal operation, three *release scenarios*, that is a release to the atmosphere, to surface water and to marine water, and the impact on humans as a *target group*. The

source term for atmospheric and marine releases comes from an operating nuclear power plant in the Republic of Korea, and the source term for discharges to freshwater (riverine) stems from an operating nuclear power plant in Ukraine.

So far, the project participants have undertaken three case studies; their preliminary findings were presented and discussed at the meeting:

- In the first case, all parameters such as meteorological data, transfer coefficients, exposure pathways, and consumption rates were predefined;
- In the second case, atmospheric releases were studied, using the same fixed parameters but varying only the meteorological data to see how local data would affect the ranking of radionuclides; preliminary results indicate that the use of local meteorological data does not significantly change the ranking of radionuclides;
- The third case study included diverse natural and cultural living conditions, such as country specific food chains. Here, preliminary results indicate that these variations do have an effect on radionuclide ranking, particularly in terms of the type of consumed food. This result reflects the importance of differing environmental behavior of the various radionuclides, including transfer in different media and accumulation in different food types.

Participants will now fine-tune their respective methodologies accordingly. This collated information will then be distributed to the participants, so as to enable them to adjust their respective methodologies again.

The 4th meeting is scheduled for October 2011, with the goal to harmonize the different approaches in order to produce a single methodology. The results of the ranking of radionuclides regarding their impact on human health will be summarized in a standardized form for publication in a final report. The project is expected to be completed by mid-2012. Future work in this area could include similar projects for different scenarios such as nuclear fuel reprocessing and waste storage facilities during normal operation, as well as accident scenarios.

Initiated by France, other participating countries in the project are Brazil, India, Indonesia, the Republic of Korea, the Russian Federation and Ukraine. Within the IAEA, the Terrestrial Environment Laboratory of the Department of Nuclear Sciences and Applications and the Wastes and Environment Safety Section of the Department of Nuclear Safety and Security are cooperating in this INPRO Collaborative Project.

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Continued Cooperation between INPRO and GIF

The objectives and mission of the Generation IV International Forum (GIF) and INPRO are synergistic and complementary and are discussed during regular interface meetings. Both projects are collaborating to ensure good coordination of their efforts towards the common goal of contributing to the global sustainable development of nuclear energy in the 21st century. GIF is focused on the design and development of six Generation IV reactor concepts to make them available for commercial operation in the second quarter of the 21st century.

5th GIF/INPRO meeting, IAEA, March 2011

INPRO's aim is to help countries develop and deploy sustainable nuclear energy systems, which will depend on the availability of the technologies covered by GIF.

The 5th GIF/INPRO interface meeting took place in March 2011 at the IAEA in Vienna and was attended by 50 representatives from GIF and the IAEA. "At present, INPRO and GIF are the only multilateral international cooperative frameworks for R&D of next generation nuclear reactors" Mr Y. Sagayama, Chairman of GIF, pointed out, emphasizing the significance of a cooperative partnership between INPRO and GIF. Mr Bychkov, IAEA Deputy Director for Nuclear Energy and INPRO Project Manager stressed that "international cooperation and collaboration are instrumental to both GIF's and INPRO's missions and objectives".

Key items for discussion were the progress status of the six reactor concepts covered by GIF and the progress made in the three main areas of cooperation with the IAEA/INPRO, established several years ago: proliferation resistance, safety and economics. Cooperation in other areas was also discussed, such as the development of nuclear infrastructure in newcomer countries that is being performed by INIG; human resources development, stakeholder involvement and education and training performed by NPES; the opportunities and challenges that represent the use of advanced fuel cycles and small and medium sized reactors performed by the Division of Nuclear Fuel Cycle and Waste Technology and NPTDS; the area of modeling and simulation planned at

INPRO and activities on non-electrical applications of nuclear energy undertaken by NPTDS. The new activities were divided between the two initiatives and specific actions and corresponding responsibilities were agreed upon.

The second day was devoted to the discussion of topics for subsequent workshops on sodium cooled fast reactors. Results from the first workshop, held at the IAEA in June 2010, were shared with the participants. France, India, Japan, the Russian Federation and the USA presented key issues and priorities in the development of this technology. It was agreed to select two main topics for further examination: harmonization of safety approaches and reliability of sodium cooled fast reactors, taking into account the specifities of the use of this coolant. These two topics and preparations for a second workshop on sodium cooled fast reactors will be further addressed by GIF in its Policy Group Meeting in May 2011 and during the meeting of the IAEA Technical Working Group on Fast Reactors (TWG-FR), to be held from 23-27 May 2011 in Beijing.

Participants to the INPRO retreat

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INPRO Retreat

The picturesque town of Neusiedl in Burgenland hosted the 3rd INPRO retreat which took place on 8-9 April 2011. Mr Bychkov, INPRO's Project Manager and IAEA Deputy Director General for Nuclear Energy, together with participants from the INPRO Group and other IAEA programmes discussed INPRO's future and brainstormed on an INPRO vision for 2016 and beyond during the two day meeting.

Mr Alan McDonald of the NE Department's Programme Coordination Group of the Department of Nuclear Energy facilitated the retreat. The intensive brainstorming sessions were preceded by a fun-filled, interactive teambuilding exercise where the participants learned more of how to facilitate cooperation, teamwork and appreciation for each person's contribution to the overall goal.

Cooperation with other IAEA programmes was reviewed during the second day, when representatives from the Departments of Nuclear Applications, Nuclear Safety, Safeguards and Technical Cooperation and from the NE Department's Division of Nuclear Fuel Cycle and Waste Technology, the Planning and Economic Study Section and the Nuclear Power Technology Development Section joined the retreat. They provided a valuable insight into ways of facilitating a better integration of INPRO into the IAEA and presented their view on INPRO's overall direction for the future.

The outcomes of the retreat will contribute to the development of a vision of INPRO's Phase 3, incorporating the ideas and recommendations formulated during the ample discussions.

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(article written by T. Miliovska, INPRO Intern)

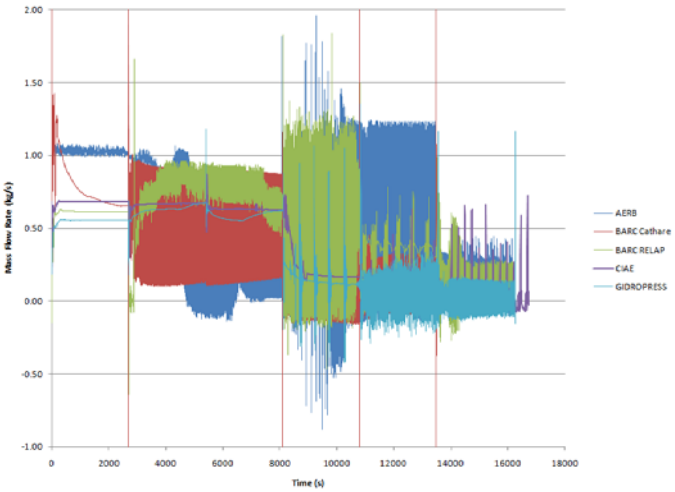
Technology Development of Nuclear Power Reactors

ICSP on Integral PWR Design

Most advanced water cooled reactors incorporate several kinds of passive systems based on natural circulation. The integral PWR concept, which contains the nuclear steam supply systems within the reactor vessel, is one of the innovative reactor types. The IAEA International Collaborative Standard Problem (ICSP) on Integral PWR Design Natural Circulation Flow Stability and Thermo-hydraulic Coupling of Primary System and Containment during Accidents has been prepared to improve understanding of natural circulation phenomena expected to occur in integral type PWRs, to evaluate system code capabilities to predict natural circulation phenomena for integral type PWRs, their practicality and efficiency, by simulating an integrated experiment, to supply experimental data for single/two-phase flow natural circulation instability and long term cooling by natural circulation through coupled primary systems and containment, and to suggest necessary code improvements or new experiments to reduce uncertainties.

Oregon State University (OSU) has offered their experimental facility, which was built to demonstrate the feasibility of MASLWR design. The scope of the ICSP includes two types of experiments: 1) single and two phase natural circulation flow stability test with stepwise reduction of primary inventory, and 2) loss of feedwater transient with subsequent ADS blowdown and long term cooling by primary containment coupling. The ICSP has been conducted in three phases: double-blind (with designed initial & boundary conditions before the conduction of the experiment), blind (with real initial & boundary conditions after the conduction of the experiment) and open simulation (with real experimental data after the conduction of the experiment).

The second workshop was held at the IAEA in Vienna, Austria from 21-23 March 2011. ICSP participants delivered presentations on double blind calculation results. Results were compared between participants and active discussion were held for better prediction during the workshop. Review/update of ICSP specification document and ground rules for blind calculations were discussed and agreed by the participants during the second workshop.



Comparison of natural circulation flow (double-blind calculation)

Sharing Operating Experience for Heavy Water Reactors

Heavy water reactors (HWRs) are the second most common type of nuclear reactor installation in the world, second only to light water reactors (LWRs). At present 47 HWRs are operating in 7 countries and 3 HWRs are under construction. Member States operating HWRs are interested in exchanging information with other experienced operators to improve the performance of their own reactors. Korea Hydro and Nuclear Power Co., Ltd (KHNP) kindly offered to host the second workshop on Good Practices in HWR Operation in Gyeongju, Republic of Korea, near the Wolsong NPP site from 12-14 April 2011.

The purpose of this workshop is to provide a platform for detailed presentations and technical discussions leading to exchange of experience and fostering worldwide collaboration between utilities and designers. The Workshop was attended by 19 international participants and 23 local participants.

Participants in the workshop on Good Practices in HWR

In total 21 specific good experiences were presented and discussed at the workshop. Some noticeable experiences were summarized here:

- The outage cycle of HWRs has great flexibility because of on-power refueling. Refuelling is one of the main activities to be done during the outage in LWRs. The Darlington plant of OPG in Canada has been implementing a 36 month outage cycle since 2006. A number of challenging issues were identified and resolved prior to starting the 3 year runs. KHNP of the Republic of Korea uses 15 month outage cycle currently, but plans to use 21 month cycle, which is almost at the end of the approval process with the regulatory body. NPCIL of India is using a 21 month outage cycle.
- TQNPC of China has lowered the excess reactivity to 1.5 mk and is trying to lower it further to 1 mk in order to increase the burnup of discharge fuel. The reduction of excess reactivity increases the fuel economy but reduces the operational flexibility. KHNP and NPCIL are using 2 mk and 3 mk of excess reactivity respectively.
- The tight fitting garter spring (TFGS) is the newer design replacing the loose fitting garter spring. TFGS was not designed to be detected and relocated by the conventional tool, SLAR (spacer location and repositioning). Bruce Power and AECL developed a tool, MODAR (MOdel Detection And Repositioning), in order to accomplish detection and repositioning of TFGS. It is based on the effects of controlled vibrations of a short length of pressure tube. Much work is still needed for in-situ application.
- KHNP recently completed the 11th planned outage of Wolsong Unit 2 with the period of 25.36 days

earlier than the plan of 26.3 days. There were 17 incidences of good practices including 4 incidences of refurbishment and 13 items for improvement in operational procedures.

- TQNPC has been suffered from a dose rate higher than the limit specified in FSAR in a new fuel loading area since commissioning. An investigation group was established to find the root cause and solve the problem. After the failure of several attempts they finally found that the majority of ambient radioactivity is from the short lived radionuclides in the moderator by the difference of measurements between on-site portable gamma spectrometer and sample analysis. Further experimentation and calculation showed it is F-17, on activated product in the moderator with a very short half life of 66 seconds. The root cause was the shorter duration in the decay tank and was solved by adjusting the valve opening to reduce the flow rate.

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Non-Electric Applications of Nuclear Power

Technical Working Group on Nuclear Desalination (TWG-ND)

The TWG-ND held its technical meeting in April 2011 at the VIC which was attended by 14 members of the group as well as 3 more Member States as observers. The objectives of the meeting were to provide a forum for the exchange of information on nuclear desalination activities in Member States, identify important topics for discussion at SAGNE, review the progress of the IAEA's activities in nuclear desalination and to provide advice on preparatory action by Member States for implementing nuclear desalination demonstration projects. The TWG-ND reiterated its support for activities in nuclear desalination and other non-electric applications and congratulated it for the successful release of DEEP and DE-TOP. Among others it was recommended to:

Members of the TWG-ND

- Enhance the scope of TWG-ND to address the challenges related to integrated water resources management in efficient use of water in nuclear facilities.
- In the light of the Fukushima event and the apparent need for on-site fresh water for operational purposes, it is recommended that the use of nuclear desalination be evaluated as an additional fresh water supply source for nuclear power plants.
- Enhance communication with the public on nuclear desalination, possibly through increased contact with other international desalination workshops/ conferences/networks.
- Emphasize the added value of nuclear energy through cogeneration aspects and co-products (e.g. biofuels, hydrogen production, district heating, high value chemicals, oil extraction/enhancement)
- Consider the organization of a CRP on recovery of valuables from seawater desalination systems i.e. discharge brine and seawater feed to enhance the economics and favorable environmental impacts of brine discharge.
- Emphasize the need to update and reference input data and relevant formulas in IAEA tools, i.e. DEEP and DE-TOP.

An Internship on Thermodynamic Analysis of Nuclear Desalination

Mr Ignacio Garcia Sanchez-Cervera, a MSc in mechanical engineering from Spain, has successfully completed his 6 month internship on nuclear desalination in the NENP/ NPTDS. His main tasks were focused on analyzing optimal thermodynamic concepts for coupling desalination plants to nuclear reactors. His valuable contribution was culminated with the release of DE-TOP, a new nuclear desalination tool.

A Fellowship Training

Ms Dewita Erlan from Indonesia completed a fellowship focusing on economic evaluation of desalination systems using DEEP 4, and analyses of thermodynamic cycles of cogeneration systems using DE-TOP. Hands-on exercises and well supervised training was provided by NPTDS staff. The IAEA fellowship programme has improved this fellow's competence so she can contribute to the preparation of pre-feasibility studies for the national nuclear programme in Indonesia, which is now in progress.

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My Hometown

Oak Ridge, USA - A Secret City

*By **Randy Beatty***

My home town is Oak Ridge, Tennessee, in the USA, a city born as part of the war effort in 1942, which existed for seven years as a truly secret city. The city was not shown on any maps, did not allow any visitors other than by special approval and a signed pass, had guards posted at the entrances to the city and required all residents to wear badges at all times when outside their homes.

A billboard encouraging secrecy among Oak Ridge workers.
Photo by James E. Westcott, Official US Army Photographer for the Manhattan Project
American Museum of Science and Energy • www.amse.org

Oak Ridge was set up as a direct result of the letter written by Albert Einstein to then President Roosevelt in 1939 citing the urgent need to develop the capability to sustain a chain reaction using uranium. As a result, the Manhattan Project was created to develop the first atomic weapon in the history of the world. Gradually the secret city grew to a population of 75,000 and became the fifth largest city in Tennessee. Still, it was not shown on the map. Some 60,000 acres of valleys and ridges were chosen as a major site for the now historic Manhattan Project because of the close proximity to the new TVA dam at Norris, Tennessee, for electrical power, the availability of skilled construction labour in nearby Knoxville and the relatively sparse population, and because of the lay of the land which also afforded the valleys for the plants and the ridges to contain any accidents.

In 1943, Y-12, the nuclear weapons complex, was built in Bear Creek valley. It was constructed in 18 months with nine huge buildings and all the necessary support facilities. The uranium-235 needed for the first atomic bomb was produced there that led to the end of World War II. The city of Oak Ridge was built on Black Oak Ridge.

Oak Ridge is now a thriving community of 27,000 residents with substantial impact on national and even international issues. It is the home of Oak Ridge National Laboratory which is my home lab. It is also home to the American Museum of Science and Energy which I directed for 6 years. A wide range of activities are contributing to Oak Ridge's future: from the Spallation Neutron Source (the single largest basic science project in the world) to the creation of the world's fastest computer, Oak Ridge is a town where much of the world's nuclear history has been written and further developments still take place. The city hosts the storage of the Nation's supply of weapons grade enriched uranium. It remanufactures the nation's nuclear stockpile, and produces medical isotopes that are being used worldwide.

The World War II historical legacy that is unique to Oak Ridge is symbolically commemorated with the International Friendship Bell (also known as Peace Bell) located in the town square which is the first monument between a U.S. Manhattan Project city and Japan. It features the dates of the attack on Pearl Harbour as well as the dates of the bombs dropped on Hiroshima and Nagasaki. It reminds us to never repeat history.

***Randy Beatty** is the INPRO Group Leader.*

Rio de Janeiro, Brazil

*By **Richard Tadeu Shouler***

I am very lucky because my home city is one of the most beautiful cities in the world, and I am very proud of being a native *Carioca.* I have tried to put together some historical and cultural aspects of the city.

Rio de Janeiro, was discovered on January (Janeiro) 1, 1502 by Portuguese navigators who mistook the entrance of Guanabara Bay for the mouth of a river (*Rio*). The area was at that time occupied by Tupi Indians. Sixty years later because French traders in search of *pau-brasil* (Brazilwood) were routinely visiting the area the Portuguese crown established the city of *Sao Sebastiao do Rio de Janeiro*. After 2 years of bloody conflict the French were expelled and settlers began to cultivate the surrounding fertile lands.

In the beginning of the 18th century the city's importance and population increased immensely as it became the main shipping port for gold and diamonds that came from *Minas Gerais*. In 1763 the colonial capital of Brazil was transferred from *Salvador, Bahia* to Rio.

A special view of the statue of Corcovado, with its arms open blessing the city

In 1808, as Napoleon's armies began the invasion of Portugal, the decision was made to transfer the monarch and his court to Rio de Janeiro, where he would remain until 1821. During this time Brazil was elevated in status from a colony to United Kingdom with Portugal. With the advent of independence Rio became the capital of the new empire. The city prospered economically, and by 1891 it had a population of over 500,000 inhabitants ranking it one of the largest cities in the world. As the city grew in prominence, mountains were removed, bay water reclaimed, and skyscrapers constructed.

With the inauguration of Brasilia in 1960, Rio de Janeiro ceased to be Brazil's capital. Even today discussion is rife concerning whether Rio was improved or hurt by the transfer of the government. In any event, this second largest city in Brazil is still a major cultural capital and, to some extent, its emotional capital as well. It is also the home of the world's greatest soccer stadium, *Maracana*. Rio de Janeiro has a majestic beauty, with built-up areas nestled between a magnificent bay and dazzling beaches on one side and an abruptly rising mountain range, covered by a luxuriant tropical forest, on the other. This unique landscape makes Rio one of the most beautiful cities in the world, the resident *Cariocas*, affectionately refer to Rio as the marvelous City, (*Cidade Maravilhosa*).

Rio's cultural life is intense and varied. Perhaps at no time is the city's festive reputation better displayed than during the annual carnival which enlivens the city for 3 solid days with music, singing, parties, balls, and desfiles (street parades of brilliantly costumed dancers performing the samba). Economically it is a service industry centre, a key financial centre, and the producer of foodstuffs, building materials, electrical equipment, chemicals, pharmaceuticals, beverages, and textiles. But it is in the pursuit of leisure that Rio is outstanding. With its world famous beaches free to all (such as *Copacabana and Ipanema*), its splendid bay, one of the loveliest in the world, and its wonderful climate, a blend of summer and springtime, Rio de Janeiro is a city that lives in and for the sun. Its population is around 6,000,000 inhabitants.

Richard Shouler *is a Nuclear Engineer in the Nuclear Power Engineering Section.*

Tokyo, Japan

By ***Minemasa Suehiro***

I have just left the IAEA and returned to the Ministry of Education, Culture, Sports, Science and Technology (MEXT) of the Japanese Government at the end of March 2011.

Tokyo where I live now is a very exciting city with delicious foods, interesting places and very kind people. My family (wife and daughters) are now spending their as usual life, in Tokyo without any problems. I hope many people will come and enjoy the Japanese traditions.

During my work on Public Information (PI) support activities under the IAEA framework of the Technical Working Group on Fast Reactors (TWG-FR) for the past 3 years (the aim of my activities was to provide Member States with opportunities to exchange and share their knowledge and experience on their PI activities, share information on nuclear activities in the world and also facilitate communication between experts and the public deepening mutual understanding), one of the important things I felt is that the experts on nuclear energy sometimes do not have an interest in PI activities and hesitate to join the activities at first as if they believe PI activities are not their responsibility or someone else will do them instead of them. PI activities for nuclear energy are sometimes more difficult to carry on than those in other fields without support and commitments of nuclear experts. The result of a public survey conducted in the Tsuruga Session, the public meeting FR09 in December 2009 showed that the PI activities influence the public's mind and understanding on nuclear activities. The participation of experts was also very welcome.

In the case of the Fukushima Daiichi nuclear accident in March, not only the general public in Japan and also international communities showed the strong demand for quick and sufficient information on the accident. I believe we can learn many important lessons and gain knowledge from the accident to improve PI in an emergency, and PI activities will be more important after this accident. I personally hope that activities will be continued to encourage people in Member States to show more interest and make more efforts in finding a way for better PI on the sustainable use of nuclear energy (Better PI means here to encourage the public to have more interest in and understanding of the nuclear issue).

Minemasa Suehiro *was a cost-free expert in the Nuclear Power Technology Development Section.*

Upcoming Events

Date	Contact	Title	Venue	Country
1-3 Aug	B.M. Tyobe-ka@iaea.org	Technical Meeting on Performance of past and present HTGR Test Reactors and Critical Facilities	Vienna	Austria
8-19 Aug	F.Depisch@iaea.org I.Jalal@iaea.org	Training Course on Developing National Long-Range Nuclear Energy Strategies	Argonne, Illinois	USA
15-18 Aug	H.Subki@iaea.org	TM on Options to Incorporate Intrinsic Proliferation Resistance Features to Nuclear Power Plants with Innovative Small and Medium sized Reactors (SMRs)	Vienna	Austria
6-8 Sept	B.M. Tyobe-ka@iaea.org	Workshop on Construction Technology for New Nuclear Power Plants – Europe and Africa	Saint Denis	France
13-16 Sept	B.Molloy@iaea.org	TM on the Establishment of Strategic Partnership between Parties involved in Expansion of Nuclear Power Plants programme	Vienna	Austria
14-16 Sept	B.M. Tyobe-ka@iaea.org	TM on Licensing Experiences for past HTGRs and challenges for future HTGR Nuclear Power Plants	Vienna	Austria
3-6 Oct	I.Khamis@iaea.org	TM/Workshop on Non-Electric Applications of Nuclear Energy	Prague	Czech Republic
3-14 Oct	S.Jo@iaea.org	Workshop on Enhancing Nuclear Engineering Education through the Use of PC-based Nuclear Power Plant (NPP) Simulators	Milan	Italy
10-14 Oct	H. Khartabil @iaea.org	INPRO Dialogue Forum on Nuclear Energy Innovations	Vienna	Austria
10-14 Oct	M.Maeoka@iaea.org, K.S.Kang@iaea.org	Int. WS on Public Information and Understanding to Introduce Nuclear Power Programme	Seoul	Republic of Korea
17-21 Oct	R.Shouler@iaea.org, K.S.Kang@iaea.org	TM on Maintenance Optimization and Outage management in Nuclear Power Plants	Vienna	Austria
2-4 Nov	R. Beatty @iaea.org	18th INPRO Steering Committee Meeting	Vienna	Austria
14-18 Nov	B.Molloy@iaea.org	TM in Recruit, Selection Training and Qualification of Personnel for New Nuclear Power Plants	Vienna	Austria
16-18 Nov	J.H.Choi@iaea.org	Workshop on axial and radial creep in HWR pressure tubes	Vienna	Austria
22-25 Nov	J.Boogaard@iaea.org	TM on the Management of New Nuclear Power Plant Project	Vienna	Austria
12-14 Dec	J.H.Choi@iaea.org	TM on Fuel Design and Licensing of Mixed Core for LWRs	Vienna	Austria

Impressum

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