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Ohi Nuclear Power Plant, Units 3 and 4, Japan

## Contributing to the Effective Implementation of the IAEA Action Plan on Nuclear Safety

The IAEA Action Plan on Nuclear Safety (the Action Plan) was adopted by the IAEA's Board of Governors a year ago and subsequently unanimously endorsed by the 55th IAEA General Conference. Strengthening nuclear safety in light of the accident at TEPCO's Fukushima Daiichi Nuclear Power Station (the Fukushima accident) is addressed through a number of measures covered in this Action Plan, including 12 main actions, each with corresponding sub-actions.

The IAEA and its Member States are now implementing the Action Plan to further strengthen the global nuclear safety framework. The Division of Nuclear Power (NENP) has established good cooperation with the IAEA Nuclear Safety Action Team, identified all activities within the scope of its responsibilities related to the implementation of the Action Plan as its first priority, and is contributing to the majority of the action items. This article highlights some of the important events implemented with NENP's contribution.

### IAEA International Comprehensive Safety Assessment Review Mission

At the request of the Government of Japan, the IAEA reviewed the approach of the Nuclear and Industrial Safety Agency (NISA) to the *Comprehensive Assessments for the Safety of Existing Power Reactor Facilities* in January 2012 and concluded that NISA's instructions and review process for the comprehensive safety assessments are generally consistent with IAEA Safety Standards.

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*Division of Nuclear Power*

*Department of Nuclear Energy, IAEA*

*PO Box 100, Vienna International Centre*

*1400 Vienna, Austria*

*Tel : +43 1 2600 25718*

*Fax: +43 1 2600 -7*

*Email: E.Dyck@iaea.org*

## Message from the Director



Over the past months, we have been busy preparing for the 56th IAEA General Conference, to be held from 17 to 21 September 2012. This year, the Division of Nuclear Power is organizing five side events to brief the delegates of the General Conference about our manifold activities, including those related to the implementation of the *IAEA Action Plan on Nuclear Safety*. The programme of our events can be seen below, and more information on each event is included in this Newsletter.

An Integrated Nuclear Infrastructure Review (INIR) mission was conducted in Belarus from 18–29 June 2012. The mission team reviewed Phases 1 and 2 of the IAEA ‘Milestones’ approach for nuclear infrastructure development, and concluded that Belarus has made important progress in the development of its nuclear power programme.

Among other activities, the Division continued to implement the projects related to the IAEA Action Plan on Nuclear Safety and started preparations for the programme and budget cycle for the next biennium (2014–2015).

Two Practical Arrangements related to nuclear power were signed in July 2012, with the Ministry of Knowledge Economy (MKE), Republic of Korea, and with the International Nuclear Graduate School (KINGS) of the Korea Electric Power Corporation (KEPCO). MKE pledged an extrabudgetary contribution of 2.5 million dollars for the Peaceful Uses Initiative for the period 2012–2014. The IAEA’s human resources development programme for nuclear power will benefit from the Practical Arrangement with KINGS, and will be effectively implemented by utilizing KINGS’ curricula, faculty members and facilities.

We welcome several new colleagues to the Division, who have joined us as cost-free experts provided by Member States: Mr Keeyoung Kim from the Republic of Korea is now contributing to the work of the Nuclear Power Engineering Section, and Ms Christina Johari and Mr Susyadi, both from Indonesia, have joined INPRO. We also had to say ‘good bye’ to Mr Seong Duek Jo from the Republic of Korea, who worked as a cost-free expert in the Nuclear Power Technology Development Section, and to Mr Randy Beatty, INPRO Group Leader, who will return to the USA at the end of September. We wish both colleagues all the best for their future careers and thank them for their contributions to the Division’s work.

I extend my best wishes to all readers of this newsletter.

Jong Kyun Park  
[J.Park@iaea.org](mailto:J.Park@iaea.org)

## Programme of GC Side Events on Nuclear Power Issues

During the 56th IAEA General Conference (17–21 September 2012), the Division of Nuclear Power is holding several side events to brief delegates from Member States on key activities, including those related to the implementation of the **IAEA Action Plan on Nuclear Safety\***:

### **Nuclear Energy for Energy Security**

*Tuesday, 18 September, 13:00 to 15:00 h, IAEA Library (F0146)*

### **Enhancing Global Nuclear Energy Sustainability:**

#### **Briefing on INPRO**

*Wednesday, 19 September, 09:15 to 11:00 h, M4 (M0E140)*

### **Nuclear Operator Organization Cooperation Forum\***

*Tuesday, 18 September, 15:30 to 18:00 h, IAEA Library (F0146)*

### **Integrated Approaches to Nuclear Work Force Development, Wednesday, 19 September, 11:30 to 13:00 h, M4 (M0E140)**

### **Roles and Challenges of Future Owners/Operators in Countries Embarking on Nuclear Power\***

*Wednesday, 19 September, 13:00 to 14:00 h, Austria Centre*

**The articles on pages 4–7 provide more information on the individual events.**

Using the IAEA document *A Methodology to Assess the Safety Vulnerabilities of Nuclear Power Plants against Site Specific Extreme Natural Hazards* and the associated IAEA Safety Standards, the mission team's objective was to identify whether NISA's Comprehensive Safety Assessment process appropriately considers external hazards, evaluation of safety margins, plant vulnerabilities and severe accident management. The IAEA review mission received excellent cooperation from all parties in Japan.

The mission team identified a number of good practices, and also made recommendations and suggestions to enhance the effectiveness of the Comprehensive Safety Assessments. The final report, presented to NISA, is available at [www.iaea.org/newscenter/focus/actionplan/reports/nisa-mission-report0312.pdf](http://www.iaea.org/newscenter/focus/actionplan/reports/nisa-mission-report0312.pdf)

### Reactor and spent fuel safety in the light of the Fukushima accident

In March 2012, the IAEA convened an International Experts' Meeting (IEM) which addressed issues of reactor and spent fuel safety. The primary objectives of the IEM were to analyse relevant technical aspects of reactor and spent nuclear fuel management safety and performance related to severe accidents; to review what is known to date about the Fukushima accident in order to understand more fully its root causes; and to share the lessons learned from the accident.

The meeting provided a forum for discussions and exchange of information on reactor and spent nuclear fuel safety and performance under severe conditions. Technical experts from utilities, research and design organizations, regulatory bodies, manufacturing and service companies and other stakeholders from Member States participated and identified priorities for further actions related to different power reactor types, focusing in particular on boiling water reactors (BWRs) and pressurized water reactors (PWRs). More information is available at [www-pub.iaea.org/iaemeetings/](http://www-pub.iaea.org/iaemeetings/).

### Lessons learned from the Fukushima accident in the area of reactor technologies

Based on incident reports and recommendations from numerous organizations, the IAEA compiled a comprehensive list of lessons learned with emphasis on technical issues. This list was used to discuss preventive and mitigation measures of 'Fukushima-type' accidents caused by extreme external events and the needs for developing safer technologies.

Over the past months, several technical meetings, workshops and consultants meetings in which technology holders and users participated, addressed these issues: first, activities were prioritized, in which international collaboration and IAEA leadership are essential. Then, experts discussed and analysed those technologies which would cope with Fukushima-type accidents, including existing designs, e.g. filtered containment venting systems, and those being developed, e.g.

passive containment cooling systems. Small and medium sized reactor (SMR) technology was also addressed, and this has enabled the IAEA to identify near term and long term international R&D activities in SMR technology development, in particular in the area of advanced engineered safety features designs. The Division of Nuclear Power is planning a series of technical meetings and workshop to disseminate the results to Member States.

### Capacity building in Member States with a nuclear power programme and embarking countries

One of the actions in the Action Plan is to strengthen, develop, maintain and implement capacity building programmes in Member States with existing nuclear power programmes and those planning to embark on a new programme. Although the Member States themselves are responsible for the action, in order to support them the IAEA has produced a document comprising a methodology and a self-assessment questionnaire for Member States to enable them to conduct an assessment of their capacity building activities. This activity has been a joint effort between the Departments of Nuclear Energy and Nuclear Safety and Security, with the involvement of staff from across the IAEA.

The document was presented to representatives from 23 Member States at a technical meeting in April 2012. Finland has already conducted a national capacity

building self-assessment as part of their preparations for constructing new nuclear power units, and Spain carried out an assessment to identify their national capability for industrial involvement in any future new building programme in Spain.

### Incorporating lessons from the Fukushima accident in nuclear infrastructure development programmes

The IAEA has strengthened the Safety Standards and other guidance relating to infrastructure development for embarking countries. The Division of Nuclear Power is revising the publications on *Evaluation of the Status of National Nuclear Infrastructure Development* (IAEA Nuclear Energy Series No. NG-T-3.2) and *Milestones in the Development of a National Infrastructure for Nuclear Power* (IAEA Nuclear Energy Series No. NG-G-3.1) to take into account lessons learned from the Fukushima accident. The drafts were discussed and supported by Member States in a technical meeting in June 2012 and will soon be available as working material.

The IAEA hosted a workshop on nuclear power infrastructure development in January 2012 to share Member States' experiences in building the necessary infrastructure for a nuclear power programme and to incorporate the lessons learned from the Fukushima accident into their planning process. The workshop highlighted the importance of following the IAEA guidance for infrastructure development. Participating Member States emphasized their need to communicate and inform the public about national plans for nuclear power and about the lessons learned to date from the Fukushima accident.



A draft guidance document on *Building a National Position for a Nuclear Power Programme* was reviewed by Member States at a Technical Meeting in July 2012. The document provides Member States with additional information on the development of national policies and the decision making process to start a nuclear power programme, in line with the Milestones approach.

The IAEA has developed assistance packages specifically designed to strengthen the technical and managerial competences for safety in embarking countries. These packages include tutorial material, workshops and expert missions and are available to Member States.

Contact: P. Vincze, NPES; [P.Vincze@iaea.org](mailto:P.Vincze@iaea.org)

## IAEA Action Plan on Nuclear Safety

- Undertake assessment of the safety vulnerabilities of nuclear power plants in the light of lessons learned to date from the accident at TEPCO's Fukushima Daiichi Nuclear Power Station
- Strengthen IAEA peer reviews in order to maximize the benefits to Member States
- Strengthen emergency preparedness and response
- Strengthen the effectiveness of national regulatory bodies
- Strengthen the effectiveness of operating organizations with respect to nuclear safety
- Review and strengthen IAEA Safety Standards and improve their implementation
- Improve the effectiveness of the international legal framework
- Facilitate the development of the infrastructure necessary for Member States embarking on a nuclear power programme .
- Strengthen and maintain capacity building
- Ensure the on-going protection of people and the environment from ionizing radiation following a nuclear emergency
- Enhance transparency and effectiveness of communication and improve dissemination of information
- Effectively utilize research and development.

Up-to-date information on the progress in implementing the IAEA Action Plan on Nuclear Safety is also available at: [www.iaea.org/newscenter/focus/actionplan](http://www.iaea.org/newscenter/focus/actionplan).

## Nuclear Energy for Energy Security

**GC Side Event, Tuesday, 18 September 2012, 13:00 – 15:00 h, IAEA Library (F0146)**

The availability of reliable and clean energy is essential for the socio-economic development of every person in every country in the world. However, the growth in energy demand is currently being met by unsustainable energy supply options predominantly based on fossil fuel combustion. The world must consider low carbon sources of electricity that are widely available over the long term at reasonable and stable prices.

The World Energy Council defines the current situation as a 'trilemma' which implies meeting at the same time the challenges of growing energy demand or energy security, the protection of the environment especially preventing climate change, and the fight against energy poverty to provide a socially equitable energy system. Such concerns over energy resource availability, climate change, air quality and energy security suggest an important role for nuclear power in supplying energy in the 21st century.

This side event is presenting the integrated services of the IAEA Department of Nuclear Energy to Member States which are considering the development of nuclear energy programmes. Member State representatives will share recent experiences in applying IAEA services, tools and methodologies.

The services offered by the **Planning and Economic Studies Section (PESS)**, the **Integrated Nuclear Infrastructure**

**Group (INIG) and the International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO)** include:

- Helping Member States to make knowledgeable decisions on energy supply options with the help of energy planning so they can independently chart their national energy future (PESS);
- Supporting Member States in building the necessary infrastructure for the development of the nuclear power option, which begins with the establishment of a strong national position on the potential role of nuclear energy in the national energy mix (INIG);
- Assisting Member States in assessing proposed nuclear energy systems holistically and from a long term perspective to confirm their sustainability and to develop long range strategic plans for nuclear energy systems including technical and institutional innovations (INPRO).

**PESS** assists Member States in building domestic capacities in energy analyses and planning, to conduct studies on long term energy demand and supply alternatives and associated energy-economic-environmental implications and to assess the potential contribution of nuclear energy in securing affordable and clean supplies of energy. A comprehensive energy demand and supply study of all currently available and future energy resources and technology options is a prerequi-

site for nuclear power planning, both from the perspective of informed decision making and as a communication tool with stakeholders.

PESS will present approaches to assessing the potential role of nuclear power in securing affordable, safe and clean energy services for sustainable development with special emphasis on energy security and climate change mitigation. Some recent applications of these approaches to analyse the need for nuclear power in Member States will also be presented.

**INIG:** Embarking on a new nuclear power programme requires a knowledgeable national position on nuclear power: “*why nuclear in our country?*”. The Member State must also build the appropriate infrastructure in order to launch this programme under the best conditions of safety, security and sustainability.

The IAEA has developed a methodology known as the ‘Milestones approach’ which defines 19 issues to be considered in building a national nuclear infrastructure. The first milestone of this process is the ability of the country to “take a knowledgeable decision on a nuclear power programme.” INIG will present the challenges of building a national position including drivers and constraints. Poland, which is developing its nuclear energy sector, will illustrate that a strong and well defined national position is necessary in the process.

## Nuclear Operator Organization Cooperation Forum

**GC Side Event, Tuesday, 18 September 2012, 15:30 – 18:00 h, IAEA Library (F0146)**

**This forum, related to the IAEA Nuclear Safety Action Plan,** intends to enhance cooperation among nuclear organizations and will focus on strengthening the effectiveness of operating organizations. The forum will identify and share, from the perspective of owners and operators of nuclear power plants, recent experiences, relevant factors and approaches influencing the safety and performance improvements of nuclear installations, as well as long term strategies emerging after the Fukushima accident.

Senior managers from utilities or technical and scientific support organizations in Member States will discuss follow-up actions and plans following the completion of stress tests or integrated safety tests. Invited keynote speakers will present resulting ‘roadmaps’ to guide an effective global effort of addressing lessons learned. These roadmaps may include several elements, such as (1) national response, (2) current and future cooperation with the IAEA and (3) cooperation with other countries or international organizations. The focus will be on the following topics:

- Staffing and competence of the operator organization
- Results of stress tests and their implementation
- Removal of residual heat from the core, emergency core cooling and transfer to an ultimate heat sink
- Periodic safety review from a performance management perspective
- Requisites for training, drills and exercises
- General functional requirements for emergency preparedness and response.

**INPRO:** The IAEA supports Member States in long term strategic planning and decision making on nuclear power programmes. A nuclear energy system assessment (NESA) using an internationally validated tool, the INPRO Methodology, helps energy planners understand the sustainability of a nuclear energy system as it evolves over time, and make informed decisions on the choice of the most appropriate system as a key element of an energy supply strategy. A NESA evaluates the complete lifecycle of all nuclear facilities (‘cradle to grave’) in seven assessment areas: economics, infrastructure, waste management, proliferation resistance, physical protection, environment and safety. Newcomer countries use the INPRO methodology to increase their awareness of all long term issues associated with implementing a sustainable nuclear energy system.

The INPRO Group will start the discussion with an introduction of INPRO’s approach to confirm the long term sustainability of a nuclear energy system. Indonesia, which is planning to include nuclear power in its energy mix to strengthen the country’s energy security and mitigate climate change, will present its recent experience in performing a NESA.

**Scientific Secretaries:** A.I. Jalal, PESS, [A.Jalal@iaea.org](mailto:A.Jalal@iaea.org); F. Bazile, INIG, [F.Bazile@iaea.org](mailto:F.Bazile@iaea.org); R. Beatty, INPRO, [R.Beatty@iaea.org](mailto:R.Beatty@iaea.org)

Invited speakers include high level representatives of China, Japan, the USA, the World Association of Nuclear Operators (WANO) and the Chairperson of the IAEA Technical Working Group on Life Management of Nuclear Power Plants.

The first forum to enhance cooperation among nuclear organizations (‘Nuclear Industry Cooperation Forum’) was held during the IAEA General Conference in September 2011 (see Nuclear Power Newsletter, Vol. 9, No. 1, January 2012, p.3). It was the first of its kind and was established to allow senior officials to “*share operating experiences and management strategies to enhance safety and improve performance*” in the wake of the Fukushima accident.

**Scientific Secretaries:** P. Vincze, NPES, [P.Vincze@iaea.org](mailto:P.Vincze@iaea.org); K.S. Kang, NPES, [K-S.Kang@iaea.org](mailto:K-S.Kang@iaea.org)



## Enhancing Global Nuclear Energy Sustainability: Briefing on INPRO

GC Side Event, Wednesday, 19 September 2012, 09:15 – 11:00 h, Room M4 (M0E)

The world needs to produce huge quantities of energy in the coming decades to meet the needs of a growing population and, at the same time, raise the living standards of billions of people who do not have access to cheap, plentiful electricity. The production of this energy at a reasonable cost, without environmental damage and in a safe and secure manner, will be one of this century's most challenging undertakings. Nuclear energy has the potential to make a significant contribution to meeting the world's growing energy needs.

For nuclear energy to play a substantial role in a sustainable global energy supply, both technical and institutional innovations need to be developed. The results of studies and projects carried out under the **International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO)** can make a contribution and provide added value to a wide range of stakeholders and the nuclear and scientific communities in IAEA Member States.

INPRO has a successful history as a collaborative and international project, resulting in a continuously growing membership, which now includes 38 Members, and acknowledged in numerous IAEA General Conference Resolutions. The INPRO Methodology, INPRO collaborative projects in the

areas of innovation and global nuclear energy sustainability and the INPRO Dialogue Forum are ongoing achievements providing a solid foundation for INPRO's activities.

This side event, to be chaired by the Director of the Bhabha Atomic Research Centre (BARC), India, Mr Sekhar Basu, will focus on:

- **Benefits of INPRO Membership** – an INPRO Member's perspective: India;
- **Global Nuclear Energy Scenarios**, including new collaborative projects (SYNERGIES, ROADMAPS) that focus on the transition to sustainable nuclear energy systems, and results from a recent INPRO Dialogue Forum which discussed drivers and impediments to regional cooperation in this area;
- **Long Range Nuclear Energy Strategies**, including a Member State's experience in assessing the sustainability of its national nuclear energy system using the INPRO methodology, and results from a recent INPRO Dialogue Forum hosted by the Republic of Korea on long term prospects for nuclear energy in the post-Fukushima era.

Scientific Secretary: R. Beatty, INPRO, [R.Beatty@iaea.org](mailto:R.Beatty@iaea.org)

## Integrated Approaches in Nuclear Work Force Development

GC Side Event, Wednesday, 19 September 2012, 11:30 – 13:00 h, Room M4 (M0E)

As the global demand for energy continues to grow along with the urgent need to counteract environmental degradation, many Member States have committed themselves to exploring or expanding their interest in environmentally benign sources of energy, including nuclear power programmes.

Both developed and developing countries continue to express interest in, and make plans to pursue a nuclear power programme or continue their existing ones. Following the Fukushima accident, many countries have reviewed their nuclear policy, and most have decided to continue with the

policy of developing and implementing safe, secure and sustainable nuclear power programmes.

The increasing number of new building projects, especially in developing countries, will require the highest level of diligence and oversight in design, delivery, and supply as it already exists today in the countries with mature nuclear power programmes.

However, many embarking States and operating countries, particularly those with smaller programmes or those which have not commissioned a new nuclear power plant for a long time, face a major challenge in developing or maintaining an adequate nuclear workforce with sufficient levels of nuclear experience and expertise essential to guarantee the highest level of safety and security, or the required legal and regulatory frameworks necessary to support their growth in this area.

A major influencing factor in localizing nuclear power technology and building an efficient safety infrastructure will be education, training and mentoring of a new, competent nuclear workforce, capable of implementing technology transfer and absorbing the 'know why', 'know what' and 'know how' in nuclear facility operations.

Capacity building and nuclear workforce development are becoming the critical element in these efforts. In addressing these issues, a number of countries have developed integrated approaches where all involved organizations from government, industry and academia work towards the common goal of building a competent nuclear workforce and a robust safety culture.



*IAEA training courses support Member States in building a competent nuclear workforce.*

The nuclear community cannot tolerate a double standard in competence, operational performance and safety culture. It is critically important to make available the best practices in nuclear workforce development to the new nuclear countries and transfer educational and training know-how in full.

Today, the role of technology suppliers (vendors) is more critical than ever, since they will be the main influencing factor in creating competence, capability and safety culture in the new nuclear power countries, mainly from the developing world. While the existing operating countries may also play a positive role in this process by providing support and assistance in competence development, the critical role will stay

with the vendor countries since they will provide primary support for education, training and capacity building in recipient countries.

The side event on 'Integrated approaches for nuclear workforce development' will present different approaches to this challenge in an integrated manner and will provide success stories in different countries and organizations.

**Scientific Secretaries:**

B. Molloy, NPES, [B.Molloy@iaea.org](mailto:B.Molloy@iaea.org); Z. Pasztory, [Z.Pasztory@iaea.org](mailto:Z.Pasztory@iaea.org) and T. Karseka, [T.Karseka@iaea.org](mailto:T.Karseka@iaea.org), both Nuclear Knowledge Management Section; Y. Yanev, Consultant, [Y.Yanev@iaea.org](mailto:Y.Yanev@iaea.org)

## Roles and Challenges of Future Owners/Operators

**GC Side Event, Wednesday, 19 September 2012, 13:00 – 14:00 h, Austria Centre**

Member States, which have made a national commitment to the introduction of nuclear power continue to advance their national nuclear energy programmes despite the Fukushima accident. These Member States have already decided on a future owner/operator for their first nuclear power plant. Future owners/operators play a central role in preparing the new nuclear power project in coordination with the national government.

Future owners/operators have a number of roles to play and face challenges, including preparation and implementation of the nuclear power plant project; interaction with the government, which will plan and decide on the national policy related to nuclear power, e.g. energy planning, human resource development policy and national industrial involvement policy; interaction with the nuclear power plant suppliers; and interactions with the general public and residents near the nuclear power plant site.

Furthermore, after the Fukushima accident it has been particularly emphasized that the primary responsibility for nuclear safety lies with operator, as stipulated in the IAEA Safety

Fundamentals. Safety regulations by the nuclear regulators must not only be followed. The operator should also commit to a continuous improvement of safety, facilitated through lessons learned.

In this side event, future owners/operators will present their views on their responsibilities and the commitment to a successful introduction of nuclear power. The session also addresses how future operators can be knowledgeable customers in their interactions with the nuclear power plant supplier, and how national policy can support the nuclear power plant project. The IAEA will present its views on key issues faced by future owners/operators and highlight assistance offered to Member States, such as guidance and assistance packages based on IAEA documents.

This side event relates to two actions of the **IAEA Nuclear Safety Action Plan: Strengthening nuclear safety through facilitating infrastructure development, and building capacity necessary for Member States embarking on nuclear power.**

**Scientific Secretary:** M. Aoki, INIG, [M.Aoki@iaea.org](mailto:M.Aoki@iaea.org)

## Nuclear Power Engineering

### Extending Nuclear Power Plants' Operation

Over 350 nuclear energy experts from 38 countries and three international organizations met in May 2012 in Salt Lake City, Utah, USA, to discuss ways to extend the life of many of the world's operating nuclear power plants safely and cost-effectively. The experts also explored how existing reactors can effectively deal with increased safety expectations in a post-Fukushima world.

The **3rd International Conference on Nuclear Power Plant Life Management (PLiM) for Long Term Operations** was organized by the IAEA and hosted by the U.S. Government through its Nuclear Regulatory Commission and Department of Energy, in cooperation with the European Commission and



*Over 350 experts met in Salt Lake City, USA, to discuss nuclear power plant life management.*

the OECD/Nuclear Energy Agency. Two previous PLiM conferences were held in November 2002 in Budapest, Hungary, and in October 2007 in Shanghai, China.

This year's conference was larger than the previous two, indicating the growing importance of this area, especially after the severe Fukushima accident.



*IAEA Deputy Director General for Nuclear Energy Alexander Bychkov (left) and Idaho Governor C.L. 'Butch' Otter (middle) were among the invited speakers at the PLiM conference.*

IAEA Deputy Director General for Nuclear Energy Alexander Bychkov emphasized the need to respond urgently to public concerns, caused by the accident, with seriousness and professionalism, while maintaining a firm long term commitment to continuously improving and strengthening nuclear safety.

"This Conference brings together researchers, designers, engineers, utility representatives, manufacturers and regulators from around the world to share information on technical issues that can lead to safe and reliable long term operation of nuclear power plants," said Mr Bychkov

"Building and maintaining public trust and confidence is central to the future of nuclear energy", stressed C.L. 'Butch' Otter, Governor of Idaho, in his opening statement. "We need to deal with these difficult and challenging issues in a way that the public can embrace, and we need more of that in public policy — people who can effectively combine their passion with what's practical", he added.

Echoes from this technical conference have extended into the political realm. In the US Senate, a draft resolution was presented on 17 May 2012, commending the IAEA for organizing the International Conference on Nuclear Power Plant Life Management for the first time in the United States.

The resolution also encouraged IAEA Member States to take advantage of the latest available technology to further develop licensing programmes, promote safety and secure the long term success of commercial nuclear power generation.

According to the IAEA Power Reactor Information System (PRIS), there are currently 436 commercial nuclear power reactors operating worldwide, providing about 13% of the world's electricity. Another 62 plants are under construction.

The 3rd International Conference on Nuclear Power Plant Life Management (PLiM) for Long Term Operations was held from 14 to 18 May 2012 in Salt Lake City, Utah, USA.

**Contact:** K.S. Kang, NPES; [K-S.Kang@iaea.org](mailto:K-S.Kang@iaea.org)

## Malaysia hosts Regional Training Course on HR Modelling Tool

Planning a sustainable and skilled workforce is one very important aspect for the successful development of a national nuclear power programme. This includes estimating the human resources required for nuclear power plant construction, commissioning and operation, planning and establishing human resource training programmes, a national nuclear technical qualification system, succession planning and skills retention schemes, and nuclear knowledge management and preservation processes. Planning is thus essential to ensuring that the necessary educational programmes are in place to provide qualified personnel. Work force planning is an important component in the overall strategy for national nuclear infrastructural development.

In April 2012, the IAEA and *Nuclear Malaysia*, the Malaysian Nuclear Agency, jointly organized the first regional training course on the IAEA's nuclear power human resource (NPHR) modelling tool. The NPHR modelling tool was provided cost free to the IAEA by the US Government. Experts and participants from countries in the region that are considering new nuclear power programmes, i.e. Bangladesh, Indonesia, Malaysia, Thailand and Vietnam, as well as Poland, shared their perspectives, experience and knowledge specific to workforce planning and human resource development for a nuclear power programme.

"The creation of competent, specialised, highly trained and motivated human resources in nuclear power is particularly important at the planning stage of a nuclear power programme, because this will form the backbone of the national body of knowledge that Malaysia will need to oversee a national nuclear power programme", said Ms Saliza Jam from the Planning and International Relations Division of Nuclear Malaysia.

For the model to be used effectively in individual countries, it needs to be customized to reflect national resources, needs and plans. During the course, participants were able to adapt the model to their country's individual needs, with support of the instructors.

"We had two groups of participants: decision makers who may benefit from the outputs of the NPHR model. They



*The IAEA regional training course on the NPHR modelling tool was hosted by Nuclear Malaysia.*



discussed HR and programmatic issues related to planning nuclear power programmes”, explained Jaana Isotalo, a training specialist in the Nuclear Power Engineering Section. “The other group were the modellers, who were trained on using and revising the model to their countries’ needs”, she added. This approach was considered to work well, as it facilitated understanding by both groups about their mutual needs and constraints.

During the next months, the participants will continue to work on their own country models. “It’s a good initiative that the IAEA is facilitating communication, so that the participants can stay actively connected and discuss their concerns and problems with the international experts”, said Ms Jam. A follow-up workshop is planned for October to share the lessons learned from using the modelling tool.

**Contacts:** B. Molloy, NPES, [B.Molloy@iaea.org](mailto:B.Molloy@iaea.org);  
J. Isotalo, NPES, [J.Isotalo@iaea.org](mailto:J.Isotalo@iaea.org)

## Training Managers of Nuclear Power Programmes

With the support of the French Government through the International Institute for Nuclear Energy, the IAEA organized an Interregional Training Course on Leadership and Management of Nuclear Power Programmes at the *Institut National des Sciences et Techniques Nucléaires* (INSTN), at CEA Saclay, France, from 25 June to 6 July 2012. The training course aimed to support decision makers and senior managers in developing the required skills and abilities, and thus to promote the safe and responsible use of nuclear power worldwide.

This intensive learning course gathered 20 managers from 15 countries that are embarking on, or expanding their national infrastructure for nuclear power. Three major topics were addressed:



*INSTN hosted the Interregional Training Course on Leadership and Management in Nuclear Power Programmes in France.*

- (i) providing the relevant knowledge related to building knowledgeable customer capacity in these States;
- (ii) informing participants of the specific processes, organization and management systems related to the nuclear power business and projects;
- (iii) further strengthening networking among emerging nuclear power countries and sharing international experience, with special emphasis on safety.

This training course provided guidance on the preparations needed to develop and implement a nuclear power programme with special emphasis on the nuclear power project, knowledge and management processes and organizations required to manage nuclear power plant development. The course was also an excellent mechanism for supporting networking among participating countries.

**Contacts:** J. Parlange, NPES; [J.Parlange@iaea.org](mailto:J.Parlange@iaea.org);  
V. Nkong-Njock, INIG; [V.Nkong-Njock@iaea.org](mailto:V.Nkong-Njock@iaea.org)

## Supporting Nuclear Infrastructure Development

### Two Years of Integrated Services in Nuclear Infrastructure Development

**The Integrated Nuclear Infrastructure Group (INIG)** was established by the IAEA Director General on 1 July 2010, with the objective of coordinating IAEA services to Member States that are considering the introduction of nuclear power and thus improving the effectiveness of IAEA support.

The services the IAEA offers to countries embarking on a nuclear power programme include advice on the development of a comprehensive nuclear power infrastructure, thorough energy planning, building the required human resources and infrastructure, establishing legal and regulatory frameworks, ensuring the highest standards of safety and security, and minimizing proliferation risks. The IAEA also offers independent know how on the construction, commissioning, startup and operation of nuclear reactors. Through the Technical Cooperation (TC) programme, the IAEA provides targeted support to Member States in response to national development needs.

Today, INIG can look back at two years of achievements and successful activities. “One of our major achievements is the establishment of ‘Integrated Work Plans’ for ‘embarking’ countries by combining support through IAEA TC projects and other means in the IAEA”, said Anne Starz, Group Head of INIG. A comprehensive catalogue of IAEA services, available through INIG, assists Member States in designing TC projects and helps them to identify IAEA services that are applicable for their specific needs.

**A Technical Working Group on Nuclear Power Infrastructure (TWG-NPI)** was set up and includes a group of international experts which represent both countries with established national nuclear power programmes and countries considering starting such programmes. The TWG-NPI meets annually to provide advice to the IAEA related to the development and implementation of national nuclear power programmes. In addition, annual workshops offer an opportunity for embarking countries to share their experience with each other and with countries currently operating nuclear power plants.

**Integrated Nuclear Infrastructure Review (INIR) missions** are a key service for Member States. INIR missions are designed to assist Member States, at their request, in evaluating the status of their national infrastructure for the introduction of a nuclear power programme.

“Each INIR mission is conducted by a team of international experts, drawn from Member States who have experience in different aspects of developing and deploying nuclear infrastructure, and specialized IAEA staff. The mission team conducts interviews, visits sites chosen for building the first nuclear power plant and reviews documents. Suggestions and recommendations are provided in a report to the Member State, enabling it to update its national action plan accordingly”, explained JK Park, Director of the Division of Nuclear Power, who has been the team leader for INIR missions to countries such as Bangladesh, Belarus, Jordan, Thailand, the United Arab Emirates and Vietnam.

INIG also developed a ‘**soft coordination**’ mechanism to facilitate exchange of information and coordination between newcomers and bilateral donors. For example, country-specific soft coordination arrangements were established between Jordan, France and the IAEA.

The IAEA is placing special emphasis **on management and leadership in new nuclear power programmes**. In a mentoring programme organized in cooperation with France, the Republic of Korea and the USA, over 150 managers and leaders from new nuclear power programmes have been trained and mentored so far.

INIG has also participated in the development of a comprehensive package of proposals for the **Peaceful Uses Initiative (PUI)**, supported by Japan, the Republic of Korea and the USA, which will provide funding for new nuclear infrastructure development projects.

Since its establishment, INIG staff has tripled and includes regular IAEA staff and cost-free experts provided by Member States. The INIG team contributes to the many activities that support the establishment of new nuclear power programmes that are economically beneficial as well as safe, secure, and peaceful.

**Contact:** A. Starz, INIG, [A.Starz@iaea.org](mailto:A.Starz@iaea.org)

## International Team Reviews Progress in Belarus’ Nuclear Energy Programme

An Integrated Nuclear Infrastructure Review (INIR) was conducted in Belarus from 18 to 29 June 2012 to evaluate the development status of Belarus’s infrastructure for its nuclear power programme. “An INIR is an international peer review of the comprehensive integrated infrastructure needed to introduce a national nuclear programme”, explained JK Park, Director of the Division of Nuclear Power and INIR mission team leader.

The INIR mission team consisted of twelve IAEA staff and international experts and evaluated the nineteen infrastructure issues described in the document: *Milestones in the Development of a National Infrastructure for Nuclear Power* (IAEA Nuclear Energy Series No. NG-G-3.1). The methodology used for the evaluation is described in the document *Evaluation of the Status of National Nuclear Infrastructure Development* (IAEA Nuclear Energy Series No. NG-T-3.2).

The mission was conducted via a series of interviews with key representatives from national organizations responsible for current and future nuclear activities. The mission reviewed the self-evaluation report completed by Belarus as part of its request for the INIR mission. The review mission also included a visit to the site of the future nuclear power plant to observe firsthand the preparatory activities.

The INIR team concluded that Belarus has made important progress in its development of nuclear infrastructure for a nuclear power programme and that it is on its way to being well prepared with its infrastructure to support the construction of a nuclear power plant.

“The results of the INIR mission will be useful to us as we progress to strengthen the national nuclear infrastructure,” said Mikhail Mikhadiuk, Deputy Minister of the Belarus Ministry of Energy.

“The mission team made 17 recommendations and 25 specific suggestions to assist the national authorities in preparing the infrastructure necessary to implement the project”, said



Members of the IAEA team and their counterparts from Belarus during the INIR mission to Belarus, June 2012.

Mr Park. The recommendations included further legislative steps that should be considered by Belarus, as well as other recommendations and suggestions specific to the nineteen issues. "We also recognized that Belarus has strong expertise, especially in radiation protection and environmental monitoring", Mr Park said. The team also identified several good practices in the programme, such as good national coordination among the organizations involved in the development of the Belarus nuclear power programme.

Belarus began considering nuclear power in the 1980s and recently renewed its efforts. The *Concept of Energy Security of the Republic of Belarus*, promulgated in September 2007, called for the commissioning of two nuclear power plant units by 2020. Belarus has signed intergovernmental agreements with the Russian Federation for two 1,170 MW(e) units in the Ostrovets site as well as for fuel supply, take-back of spent fuel, training and other services. The final contract with Rosatom to build the units on a turnkey basis was signed on 19 July 2012, with the first unit expected to begin electricity production by 2018.

The Ministry of Energy has been assigned responsibility for implementation of the nuclear power project through the Directorate for Nuclear Power Plant Construction. The Directorate will also be the operator of the nuclear plant. The regulatory body in Belarus is the Ministry of Emergency



*The INIR mission team visited the future site of the nuclear power plant in Ostrovets in the north west of Belarus.*

Situations, which is responsible for state supervision of nuclear and radioactive safety, security, and safeguards.

This was the 7th INIR mission to a Member State, and it was conducted under an IAEA TC project.

**Contacts:** JK Park, NENP, [J.Park@iaea.org](mailto:J.Park@iaea.org);  
D. Kovacic, INIG, [D.Kovacic@iaea.org](mailto:D.Kovacic@iaea.org);  
A. Starz, INIG, [A.Starz@iaea.org](mailto:A.Starz@iaea.org)

## International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO)

### INPRO Steering Committee Meeting

The 41 representatives from INPRO Members who attended the 19<sup>th</sup> INPRO Steering Committee Meeting on 11 to 13 July 2012, confirmed good progress in implementing the INPRO Action Plan 2012–2013, identified Member States' priorities and support for individual INPRO projects, and made recommendations for current and future activities. They also highlighted the importance of cooperation with other international organizations and initiatives. "We commend the IAEA Secretariat and the INPRO Group for delivery of high quality work with limited resources", said Robert Speranzini, the Canadian representative, who served as Chairperson of the meeting.

In opening the meeting, Alexander Bychkov, IAEA Deputy Director General for Nuclear Energy and INPRO Project Manager, welcomed Malaysia and Vietnam as new Members of INPRO. Shortly after the meeting, Romania applied for membership. INPRO now has 38 members, 37 countries and the European Commission (EC).

Referring to the IAEA Action Plan on Nuclear Safety, which was devised in response to the Fukushima accident, Mr Bychkov pointed out that "the Plan impacts on the activities of the Department of Nuclear Safety and the Department of Nuclear Energy as we focus our work on strengthening safety". Of the 12 main actions in the Plan, INPRO is particularly involved in the effective utilization of research and development.

The presentations of Member representatives indicated active participation in all INPRO activities and collaborative

projects, in particular the new project on 'Proliferation Resistance and Safeguardability Assessment' (PROSA) and the SYNERGIES project, for which 27 participants from 17 Member States have signed the Terms of Reference so far.

### INPRO Methodology Update

The representatives of Belarus, Indonesia and Ukraine reported on the progress of national nuclear energy system assessments (NESAs) using the INPRO methodology. This methodology will now be upgraded and revised over the next year. "There was strong support for the general outline of the 2nd edition of the INPRO methodology, provided in a White Paper to the Steering Committee", explained Randy Beatty, INPRO Group Leader.

"INPRO has an important role to play in helping Member States to develop innovations that can be incorporated into a nuclear energy system to reduce the risk of severe accidents during natural disasters. As INPRO updates the methodology for NESAs, it should be adjusted in each technical area to include lessons learned from Fukushima. This will be a great challenge for INPRO and for the entire Agency in the coming months and years" emphasized Mr Bychkov.

### International Cooperation

A special session was devoted to cooperation with international organizations and initiatives. Representatives from the EC, the European Sustainable Nuclear Energy Technology Platform (SNETP), the Generation IV International Forum (GIF), the International Framework for Nuclear Energy Cooperation (IFNEC), OECD's Nuclear Energy Agency (OECD/NEA), and the World Nuclear Association (WNA)



*Delegates to the 19th INPRO Steering Committee Meeting and IAEA staff, July 2012.*

reported on activities of common interest and ongoing or potential cooperation.

“Collaboration with other international initiatives is welcome. One of the recommendations of the Steering Committee is to ensure good coordination with GIF, OECD/NEA and other international activities, as well as with other IAEA programmes”, said Chairperson Speranzini. The 20th meeting of the INPRO Steering Committee will be held at the IAEA in May 2013.

**Contacts:** R. Beatty, INPRO, [R.Beatty@iaea.org](mailto:R.Beatty@iaea.org);  
P. Gowin, INPRO, [P.Gowin@iaea.org](mailto:P.Gowin@iaea.org)

## INPRO Dialogue Forum on Nuclear Energy Sustainability

The INPRO Dialogue Forum brings together nuclear technology holders, technology users and other stakeholders from all interested IAEA Member States and facilitates the sharing of information, perspectives and knowledge on issues related to the development and deployment of innovative nuclear energy systems.

In July and August, two forums were held at the IAEA in Vienna and in Seoul, Republic of Korea. Both meetings were activities in the IAEA TC Project INT/2/017: ‘Capacity building in long range strategic nuclear energy planning for global sustainability’.

### Regional Cooperation in Building Sustainable Nuclear Energy Systems

[www.iaea.org/INPRO/4th\\_Dialogue\\_Forum/](http://www.iaea.org/INPRO/4th_Dialogue_Forum/)

The 4th INPRO Dialogue Forum on Drivers and Impediments for Regional Cooperation on the Way to Sustainable Nuclear Energy Systems was held from 30 July to 3 August 2012 at the IAEA. Some 40 technology holders and technology users from 28 Member States exchanged views on the benefits and issues associated with regional cooperation in building sustainable nuclear energy systems and the driving forces and impediments to such cooperation.

“This Dialogue Forum addressed how international cooperation can facilitate the sustainable development of nuclear energy programmes in both nuclear newcomers and experienced nuclear countries”, said Luc Van den Durpel (France), Co-Chairperson of the meeting. “This covers multiple facets such as R&D, security of fuel supply, human resource planning, ultimate waste management and many more”, he added.

This Dialogue Forum covered a wide range of topics, including the INPRO concept of a sustainable nuclear energy system and using the INPRO Methodology in a NESAs; transitioning scenarios to sustainable nuclear energy systems, approaches to their assessment and the role of collaboration among countries; roles of, and benefits from, innovative nuclear technologies; issues of proliferation resistance and long term human resource planning; technology holders’ perspective on fuel cycle services in international markets; experience of multi-national cooperation in the fuel cycle back-end; safety issues for future nuclear energy systems and economic indicators to measure benefits from cooperation among countries.

Participants presented and prioritized national perspectives on many relevant issues, including status and prospects of their national nuclear energy programme; driving forces and impediments for considering, or embarking upon, or expanding a national nuclear energy programme; projections on how national nuclear energy systems could look like by 2030 and 2050; back-end fuel cycle services and sustainable nuclear energy systems; experience of, and plans for, cooperation with other countries in nuclear and non-nuclear energy projects; security of supply and energy independence and how they could benefit from cooperation with other countries; considerations on drivers and impediments for cooperation with other countries in nuclear energy projects; and possible indicators to measure the benefits and disadvantages of cooperation with other countries in such projects.

The participants stressed that the IAEA is playing a crucial role in providing services on nuclear energy planning, nuclear energy system assessments using the INPRO methodology, and applying the Milestones approach for nuclear infrastructure development and encouraged Member States to request IAEA assistance, as appropriate. They also recommended enhancing cooperation within the groups of technology holders and technology users, and between both groups and proposed several topics for future discussions, including energy



*The 4th INPRO Dialogue Forum focused on regional cooperation in building sustainable nuclear energy systems.*

and nuclear energy planning for regional cooperation, public communication and involvement, the role of partners and regional capabilities. “This Forum has helped us to understand how to progress to secure a ‘win-win’ situation for technology suppliers and users” said Vladimir Kuznetsov, Scientific Secretary of the meeting. “It also provided valuable inputs to the INPRO-SYNERGIES project in determining how practicable a particular strategy of collaboration is”, Mr Kuznetsov explained.

**Contacts:** V. Kuznetsov, INPRO, [V.Kuznetsov@iaea.org](mailto:V.Kuznetsov@iaea.org);  
Y. Busurin, INPRO, [Y.Busurin@iaea.org](mailto:Y.Busurin@iaea.org)

## Long term Prospects for Nuclear Energy in the Post-Fukushima Era

[www.iaea.org/INPRO/5th\\_Dialogue\\_Forum/](http://www.iaea.org/INPRO/5th_Dialogue_Forum/)

For the first time, an INPRO Member, the Republic of Korea, hosted an INPRO Dialogue Forum. Some 80 participants from 30 Member States and three international organizations participated in the 5th Dialogue Forum on ‘**Long Term Prospects for Nuclear Energy in the Post-Fukushima Era**’, held in Seoul on 27–31 August 2012, and organized by the IAEA and the Korea Atomic Energy Research Institute (KAERI).

“Nuclear energy has the potential to make a significant contribution to meeting the world’s growing energy needs and to sustainable development. But to be such viable contributor, nuclear power must be safe”, said Alexander Bychkov, Deputy Director General for Nuclear Energy and INPRO

Project Manager, in opening the meeting. “Nuclear safety will be further strengthened, as we learn the lessons from Fukushima”, he added.

“The presentations and discussions at this forum will be a further contribution as we work towards ensuring the long range sustainability of nuclear energy on the national, regional and global level, in the light of lessons learned from the Fukushima accident” Mr Bychkov stressed. “The outcome of this Dialogue Forum will provide an important input to INPRO’s programme and assist us in further identifying areas of focus and opportunities”.

The Vice Minister of the Ministry of Education, Science and Technology, Mr Yul-Rae Cho, and Mr Youn Ho Jung, President of KAERI, welcomed the participants.

Experts from countries with and without nuclear power programmes presented national perspectives for future nuclear energy development given the changed policy environment after the Fukushima accident. Nuclear safety, the role of innovations and effective stakeholder involvement and public communication were among the key issues, challenges, and opportunities identified in the context of sustainability of future nuclear energy systems. The proceedings of this Dialogue Forum will be available soon after the meeting.

A technical tour to KAERI, the Korea Electric Power Corporation (KEPCO NF) and the Korea Institute for Nuclear Safety (KINS) concluded the 5th INPRO Dialogue Forum.

**Contacts:** P.H. Park, INPRO, [P.Park@iaea.org](mailto:P.Park@iaea.org);  
P. Gowin, INPRO, [P.Gowin@iaea.org](mailto:P.Gowin@iaea.org)

# Nuclear Power Technology Development

## JAEA/IAEA International Workshop on Sodium-Cooled Fast Reactors

In cooperation with the IAEA, the Japan Atomic Energy Agency (JAEA) held an **International Workshop on Prevention and Mitigation of Severe Accidents in Sodium-cooled Fast Reactors (SFR)** on 12–13 June 2012 in Tsuruga, Japan.

About 100 experts from research institutions, regulatory organizations, electric power companies, industries, universities and governments from countries with SFR programmes and from the IAEA, discussed the safety goals and measures to maintain and improve the safety of this reactor technology, including research and development activities and safety regulations to provide SFRs with enhanced safety features.

“Fast reactors in a closed fuel cycle are recognized as an efficient and effective energy resource. In particular, sodium-cooled fast reactors play an important role in the sustainability of nuclear energy systems”, said Alexander Bychkov, IAEA Deputy Director General for Nuclear Energy in his keynote address. “If we consider the general framework of safety of fast reactors, current and future fast neutron reactors have to take into account the main lessons learned from the accident at TEPCO’s Fukushima Daiichi Nuclear Power Station”, Mr Bychkov observed and noted that “advanced technologies and the closing of the fuel cycle through a transition from thermal to fast reactors will remain a priority for the Agency”.

## Key Messages

The results of the workshop were summarized in nine key messages identified by developers, research organizations and operators. They were presented at a press conference organized by JAEA in Tokyo on 14 June 2012:

- SFRs used in a closed fuel cycle can dramatically improve the sustainability of nuclear energy, when compared with the present light water reactors in an open fuel cycle, through a better use of the natural resources (multiplication by a factor 50 to 100 of the energy produced by a given amount of uranium) and the minimization of the radiotoxicity, volume, and thermal load of the wastes.
- Deployment of SFR is a promising sustainable option to meet the increasing global energy demand, and the maturity and reliability of this technology is proven by an operating experience of more than 400 reactor years accumulated in many countries (China, France, Germany, India, Japan, Russian Federation, UK, and USA).
- Even though the accident at TEPCO’s Fukushima Daiichi Nuclear Power Station has raised concerns on severe accidents at nuclear installations, several countries are maintaining their effort in developing and deploying SFRs as a very promising option to meet the increasing global energy demand.
- In order to achieve the highest safety levels, it is of paramount importance to gather the operational experience

accumulated by countries which have been operating SFRs over the last decades, as well as to share the lessons learned from the Fukushima accident. Further research and development have to be carried out starting from this operational experience and lessons learned.

- The safety approach and associated safety measures should be based on the favourable safety characteristics of the SFR, e.g. core reactivity feedbacks, low pressure coolant, large thermal inertia, high boiling point, air as an ultimate heat sink, natural circulation, etc.
- Safety design criteria should be harmonized at the international level in order to achieve concurrently the most advanced safety goals. A common effort has already started on this subject under the auspices of the Generation IV International Forum, also in interaction with the IAEA.
- Safety-related research and development carried out at national and international level will contribute to enhancing the safety level of SFRs globally.
- In light of the Fukushima accident, the meeting participants reconfirmed the crucial importance of incorporating into SFR designs innovative approaches for prevention and mitigation of severe accidents, as well as improvement of severe accident management.
- The design of the prototype fast breeder reactor Monju already incorporates evaluations of, and measures against, severe accidents based on the safety characteristics of SFRs. The restart and operation of Monju will provide the international SFR community with very useful experience to pave the way towards Generation IV SFRs.

All presentations are available at:

<http://www.jaea.go.jp/04/turuga/internationalworkshop/>

**Contact:** S. Monti, NPTDS, [S.Monti@iaea.org](mailto:S.Monti@iaea.org)

## Benchmark Analyses of an EBR-II Shutdown Heat Removal Test

In cooperation with Member States, a new coordinated research project (CRP) aims at improving design capabilities in the areas of FR neutronics, thermal hydraulics, plant dynamics and safety analyses. In particular, the CRP plans to perform a benchmark analysis of protected and unprotected loss of flow tests, conducted on the EBR-II reactor during an extensive testing programme of the US Department of Energy in the years 1984–1987, to demonstrate the inherently safety features of SFRs.

“The Argonne National Laboratory plays a key role in the US programme on fast reactors and has a strong commitment to this technology”, said Robert Hill, Technical Director of the Nuclear Engineering Division of the Argonne National Laboratory (ANL), during the opening of the first meeting of this CRP, held at ANL from 18–19 June 2012.

“The interest in this project is very high, since we have already 18 organizations from 11 Member States participating in the study”, explained Stefano Monti, IAEA Team Leader for Fast Reactor Technology Development.

The participants reviewed the CRP objectives and expected outcomes, discussed the review of experimental and other

relevant data for the benchmark exercises and benchmark specifications and agreed on the way forward in terms of tasks, work package leaders, work plan and other activities. Launched in early 2012, this CRP is expected to conclude in 2016.

Contact: S. Monti, NPTDS, [S.Monti@iaea.org](mailto:S.Monti@iaea.org)

## IAEA Technical Working Groups on Reactor Technologies

Technical Working Groups (TWGs) are groups of experts, nominated by their governments, who provide advice and support for the implementation of various IAEA programmes. They represent a global network of excellence and expertise.

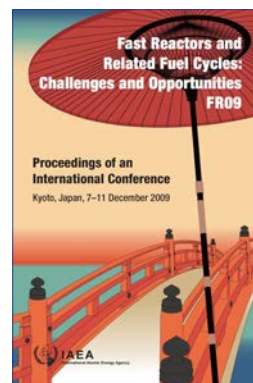
### 45th Meeting of the TWG on Fast Reactors

At this year’s annual meeting, held from 20–22 June 2012 at the ANL in Chicago, USA, and chaired by Robert Hill of ANL, representatives from 14 Member States and the OECD/NEA participated and presented the national FR programmes of their countries.

“The annual meetings of this technical working group represent the most important occasion to exchange information on national programmes on fast reactors and discuss technology advances and gaps in order to propose future collaborative research activities” said JK Park, Director of the Division of Nuclear Power, in opening the meeting.

The meeting was also an occasion to review several on-going CRPs, including projects on benchmark analyses of sodium natural convection in the upper plenum of the Monju reactor vessel; control rod withdrawal and sodium natural circulation tests performed during the PHENIX end-of-life experiments; analyses of and lessons learned from operational experiences with fast reactor equipment and systems, and the benchmark analysis of an EBR-II shutdown heat removal test. Some Member States also presented proposals for new collaborative activities.

“A number of fast reactor related IAEA publications are in progress”, Mr Park informed the participants. “In particular, we soon expect the publication of the *Status Report on FR Research and Technology Development*, a 850-page document, to which you have contributed during the last few years, and which summarizes the state-of-the-art and future developments of this nuclear technology”, Mr Park said.



Mr Park also presented the Proceedings of the **International Conference on Fast Reactors and Related Fuel Cycles (FR09)**, held in Tokyo in 2009, available at [www-pub.iaea.org/MTCD/Publications/PDF/Pub1444\\_web.pdf](http://www-pub.iaea.org/MTCD/Publications/PDF/Pub1444_web.pdf).

He also announced the **2nd International Conference on Fast Reactors (FR13)**, scheduled for 4–7 March 2013 in Paris, France (see poster, p. 15).

Further information on the activities of the TWG-FR is available at: <http://www.iaea.org/NuclearPower/FR/>.

**Contact:** S. Monti, NPTDS, [S.Monti@iaea.org](mailto:S.Monti@iaea.org)

**International Conference on  
FAST REACTORS AND  
RELATED FUEL CYCLES:  
Safe Technologies and  
Sustainable Scenarios  
FR13**

**4-7 March 2013  
Paris, France**

Organized by the  
**IAEA**  
International Atomic Energy Agency

Hosted by the  
Government of France

Through the  
**CEA** French Alternative Energies and  
Atomic Energy Commission (CEA)

**SFEN** French Nuclear Energy  
Society (SFEN)

[www.iaea.org/meetings/2013/13](http://www.iaea.org/meetings/2013/13)

**For more information go to:  
[www-pub.iaea.org/iaea meetings/41987/FR13](http://www-pub.iaea.org/iaea meetings/41987/FR13)**

## Annual Meeting of Technical Working Groups on Water Cooled Reactors

The TWGs for Light Water Reactors (TWG-LWR) and and for Heavy Water Reactors (TWG-HWR) met jointly and also in separate sessions during their annual meetings in June 2012. They discussed current issues related to nuclear power plants and strategies for future IAEA activities in this area.

“More than 90% of the world’s nuclear power reactors are light water and heavy water reactors, and water cooled reactors will continue to play a major role in nuclear electricity generation for the rest of this century”, said Alexander Bychkov, IAEA Deputy Director General for Nuclear Energy, in opening the joint meeting. “Nuclear power is suitable for today and sustainable for tomorrow”, Mr Bychkov added.

Among the work carried out since last year’s TWG meetings were the publication of a report on *Construction Technologies for Nuclear Power Plants* (IAEA Nuclear Energy Series No. NP-T-2.5), and workshops to share the results with countries planning to construct new plants; investigation of natural circulation in water cooled reactors, both experimentally and analytically, for a thorough understanding of the performance of passive safety systems based on natural circulation; a compilation of information on good practices in HWR operation; and coordinated research on key technology areas for super-critical water-cooled reactors.

More information about the meetings is available at [www.iaea.org/NuclearPower/Technology/](http://www.iaea.org/NuclearPower/Technology/).

**Contacts:** M. Harper, NPTDS, [M.Harper@iaea.org](mailto:M.Harper@iaea.org); J.H. Choi, NPTDS, [J.H.Choi@iaea.org](mailto:J.H.Choi@iaea.org)

## Recently Published

- Advances in High Temperature Gas Cooled Reactor Fuel Technology (IAEA-TECDOC-1674)
- Advances in Nuclear Power Process Heat Applications (IAEA-TECDOC-1682)
- Assessing and Managing Cable Ageing in Nuclear Power Plants (NP-T-3.6)
- Electric Grid Reliability and Interface with Nuclear Power Plants (NG-T-3.8)
- INPRO Collaborative Project: Proliferation Resistance: Acquisition/Diversion Pathway Analysis (PRADA) (IAEA-TECDOC-1684)
- Knowledge Management for Nuclear Research and Development Organizations (IAEA-TECDOC-1675)
- Managing Siting Activities for Nuclear Power Plants (NG-T-3.7)
- Management System Standards: Comparison between IAEA GS-R-3 and ASME NQA-1-2008 and NQA-1a-2009 Addenda (Safety Reports Series No. 70)
- Management System Standards: Comparison between IAEA GS-R-3 and ISO 9001:2008 (Safety Reports Series No. 69)
- Modelling of Transport of Radioactive Substances in the Primary Circuit of Water Cooled Reactors (IAEA-TECDOC-1672)
- Natural Circulation Phenomena and Modelling for Advanced Water Cooled Reactors (IAEA-TECDOC-1677)
- Nuclear Power Reactors in the World, 2012 Edition (IAEA-RDS-2/32)
- Nuclear Technology Review 2011 (IAEA/NTR/2011)
- Project Management in Nuclear Power Plant Construction: Guidelines and Experiences (NP-T-2.7)
- Role of Thorium to Supplement Fuel Cycles of Future Nuclear Energy Systems (NF-T-2.4)
- Specific Considerations and Milestones for a Research Reactor Project (NP-T-5.1)

## Upcoming Events 2012

Date	Title	Location	Contact
1–5 Oct	Technical Meeting on Siting Selection and Technology Solutions	IAEA, Vienna	V.Nkong-Njock@iaea.org
1–5 Oct	Education & Training Seminar on Fast Reactor Science and Technology	Bariloche, Argentina	S.Monti@iaea.org
2–5 Oct	Workshop on Advanced Code Suite for Design, Safety Analysis and Operation of Heavy Water Reactors	Ottawa, Canada	J.H.Choi@iaea.org
8–11 Oct	Technical Meeting on the Maintenance and Operation of the Power Reactor Information System (PRIS) Database	IAEA, Vienna	J.Mandula@iaea.org
8–12 Oct	5th International Workshop on the Application of FPGAs in Nuclear Power Plants	Beijing, China	J.Eiler@iaea.org
8–12 Oct	INPRO Dialogue Forum on Nuclear Energy Sustainability	IAEA, Vienna	P.Villalibre@iaea.org
9–11 Oct	Technical Meeting on Stakeholder Involvement in Nuclear Power: Developing Sustainable Relationships, Expanding Resources and Creating Value	IAEA, Vienna	B. Pagannone@iaea.org
9–12 Oct	Technical Meeting on Capacity Building and Human Resources Development for New and Expanding Nuclear Programmes	IAEA, Vienna	B. Molloy@iaea.org
10–12 Oct	1st Meeting of the INPRO Collaborative Project on Environmental Impact of Potential Accidental Releases from Nuclear Energy Systems (ENV-PE)	IAEA, Vienna	L.Meyer@iaea.org
16–18 Oct	Technical Meeting on Information Exchange among Experienced and Future Operators	IAEA, Vienna	Y.Troshchenko@iaea.org
16–19 Oct	Technical Meeting on Strategies for the Expansion of Nuclear Power Programmes	Beijing, China	X.Li@iaea.org
22–26 Oct	Training Course/Workshop on HTGR Technology: Challenges for Future Deployment	Beijing, China	B.M.Tyobeka@iaea.org
5–9 Nov	Regional Workshop on New Nuclear Power Programmes: Becoming a Knowledgeable Customer	Paris, France	D.Kovacic@iaea.org
5–16 Nov	Training Course on Management Systems for Nuclear Power Programmes and Safety Culture for Member States Introducing and Expanding Nuclear Power	Argonne, USA	J. Boogaard@iaea.org
12–16 Nov	2nd Meeting of the INPRO Collaborative Project SYNERGIES	IAEA, Vienna	V.Kuznetsov@iaea.org
12–16 Nov	Technical Meeting on Hands-on Experience in Developing and Managing Nuclear Power Programmes	Ulsan, Republic of Korea	K-S.Kang@iaea.org
12–16 Nov	Technical Meeting/Workshop on Management of Efficient Water Use and Consumption in Nuclear Power Plants	IAEA, Vienna	I.Khamis@iaea.org
26–29 Nov	Technical Meeting on Safety, Security and Safeguards: Interfaces and Synergies in the Development of a Nuclear Power Programme	IAEA, Vienna	D.Kovacic@iaea.org
3–5 Dec	Joint IAEA-JRC/EC Technical Meeting on the Assessment of Safety of Operating Nuclear Power Plants	Petten, Netherlands	K-S.Kang@iaea.org

### Impressum

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