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The ANS Globe

…e-news from the ANS International Committee

From the editors

The ANS Globe is the Bulletin of the American Nuclear Society's International Committee. *The ANS Globe* has as its mandate the dissemination of news of international interest to International Committee members and to others.

We would like to keep *The ANS Globe* current and relevant. Please send us your letters, articles, news and/or comments for consideration towards the next issue.

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Contents

From the Chair

Dear friends:

Are we facing a nuclear "renaissance" or mostly a nuclear "naissance"?

According to IAEA Director General Yukiya Amano,
"*we now have projects on introducing nuclear power with 58 of our member states, 17 of which are actively preparing nuclear power programs. We expect between 10 and 25 new countries to bring their first nuclear power plant on line by 2030. These are momentous changes.*"

This statement was made at the International Conference on Access to Civil Nuclear Energy held in Paris in March. This major event, initiated by the French Government, in coordination with the IAEA and with the support of the OECD/NEA, gathered over 1100 participants from 62 countries, at the ministerial level from 42 countries. This conference provided a most useful platform to generate debate on every aspect of developing a nuclear program and on ways of using bilateral and multilateral cooperation to help countries willing to plan nuclear programs.

All the stakeholders had the opportunity to meet at this discussion forum: Government policy-makers, executives from regulatory institutions as well as top managers from nuclear industry and research, training bodies and financial companies.

As OECD General Secretary Angel Gurria stressed:
"Several good reasons justify the increased focus on the nuclear option: global warming... future of conventional resources... nuclear-generated electricity competitiveness in most countries", however international cooperation and relevant experience-sharing should essentially tackle **safety, financing, training and security of supply**.

Most of these objectives must continue to be mirrored in our ANS international undertakings and the ANS Globe is a most appropriate vehicle for this purpose.

For instance you will see in this issue that the Ghana Nuclear Society is willing to start cooperation with ANS and you will find as well news from our Sister Societies.

Moreover, in order to improve synergies with Professional Divisions international programs, an Ad Hoc subcommittee is working to make innovative recommendations at the upcoming Committee Meeting.

Let us meet soon in San Diego, "The Right Fit. The Right Time", to discuss these exciting projects and create new opportunities.

The ANS International Committee's Web Page

Visit the enhanced ANS International Committee's Section on the ANS website, located at http://www.ans.org/const/international. It includes:

- Background information about the ANS International Committee
- Connections to ANS International Local Sections
- An overview of Society alliances with international organizations (INEA, INSC, and PNC), along with contact information
- Connections to 30 ANS Agreement Societies/Organizations, and
- Current/back issues of *The ANS Globe*, which features ANS International Committee activities and related items.

Candidates of ANS IC for 2010 Elections to ANS Board of Directors

In the 2010 election to the Board of Directors, Dr. Dan Meneley, of Canada, was elected as non-US at-Large Director. Dr. Meneley was one of the two nominees suggested by the International Committee. Congratulations to Dr. Meneley. And thanks do Dr. V.S. Krishnan, the other candidate.

News from Sister Societies and International News

- Australian Nuclear Association (ANA)

  Report from the Australian Nuclear Association, by Dr. Clarence J. Hardy, Hon. Secretary, ANA:

  ANA National Conference: The ANA's 8th National Conference was held in Sydney on 2 October 2009 and attended by 92 persons from government, industry, universities and the public. The Opening address was given by Dr Ziggy Switkowski, Chairman, Australian Nuclear Science & Technology Organisation (ANSTO), on "When will Australia be ready for Nuclear Power". There were presentations by invited speakers on Australia's uranium resources and production; nuclear power developments worldwide; nuclear fuel cycle developments worldwide; ANSTO's programs in nuclear science and technology; the role of the Australian Institute for Nuclear Science & Engineering Ltd; the status of molybdenum-99 production, developments in non-proliferation and safeguards; and social interactions between the nuclear industry and the public.

- Austria Local Section of ANS (http://local.ans.org/austria/)

  On Tuesday February 23rd, 2010, Dr. Ross T. Thomas, Vice President and Chief Technical Officer for the B&W Technical Services Group, Inc., gave a presentation entitled "**Nuclear Initiatives by the Babcock & Wilcox Company".** Dr. Thomas discussed nuclear power and topics related to the Babcock & Wilcox Company. He provided a brief history of this 140 year-old international firm, and discussed recent

B&W developments including an advanced light-water, modular power reactor and an aqueous homogeneous reactor for the production of medical isotopes. Dr. Thomas also illustrated the demand for experienced nuclear professionals.

- Belgian Nuclear Society

The new Chair of the Belgian nuclear Society is Mr. Didier Haas (chairman@bnsorg.be).

- Canadian Nuclear Society (CNS) (http://www.cns-snc.ca)

By the date of this International Committee meeting, the officers of the CNS have changed for 2010-2011:

- President: Adriaan Buijs, McMaster University
- 1st VP: Frank Doyle, CANDU Owners' Group
- 2nd VP: John G. Roberts, Consultant
- Past President: Eleodor Nichita, University of Ontario Institute of Technology

- Ghana

The Ghana Nuclear Society (GNS) has decided to seek affiliation as an ANS agreement society. A letter dated 2010 January 20 informed France Brès-Tutino, Chair of the International Committee, of this decision of GNS.

- India (http://www.ins-india.org)

Dr. Atam Rao, Vice-Chair of the IC, sent the following newspaper clipping:
New director for Indian research centre
[The Hindu, 17 May 2010] Ratan Kumar Sinha has been appointed as the new director of the Bhabha Atomic Research Centre (BARC), succeeding Srikumar Banerjee, who became chairman of India's Atomic Energy Commission (AEC) in December 2009. Sinha, currently the director of BARC's Reactor Design and Development and Design, Manufacturing and Automation groups, is to take up his new role "in a few days".

R.K. Singh, Secretary of the Indian Nuclear Society (INS), sent the following reports:

- INS National Seminar on "Atomic Energy for National Development" was organised at Vidya Prasarak Mandal's (V.P.M.) Polytechnic, Thane on July 4, 2009. Mr.

V.K.Chadda, Outstanding Scientist & Head, Electronics & Instrumentation Services Division, B.A.R.C was the Chief Guest and Dr.Vijay Bedekar, Chairman, V.P.M., Thane presided over the inaugural function. Mrs. Kirti Agashe, H.O.D. Industrial Electronics Dept., V.P.M. Polytechnic was the Convener.

- INS National Seminar on "Nuclear Technology Fuelling the National Development" was organized at Vice Chancellor's Convention Hall, Delhi University on August 01, 2009. Dr. Anil Kakodkar, Chairman, Atomic Energy Commission & Secretary, Department of Atomic Energy was the chief-guest and Prof. Deepak Pental, Vice-Chancellor of the Delhi University presided over the inaugural function. Prof. R K Shivpuri, Director, Centre for Detector & Related Software, Technologies (CDRST) and Adviser, University of Delhi was the Convener.

- INS National Seminar on "Nuclear Technology for Nation Building (NTNB-09)" was organized at National Institute of Technology, Hamirpur, Himachal Pradesh on August 08, 2009. Prof. I. K. Bhat, Hon'ble Director NIT Hamirpur was the Chief Guest and Dr. A.K. Sharma, Head Food Technology Division, Bhabha Atomic Research Centre, Mumbai was the Guest of Honour. Dr. Kuldeep Kumar Sharma was the Convener.
- INS National Workshop on "Nuclear Energy Development in India Addressing Climate Change, Public Perception and Large Scale Deployment" was organized in New Delhi on August 13, 2009. Dr. R. Chidambaram, Principal Scientific Advisor to the Govt. of India & Former Chairman, AEC & Secretary, DAE was the Chief Guest and inaugural function was presided over by Dr. R. K Pachauri, Director General, TERI and Chairman, IPCC. Mr M P Ram Mohan, Fellow, Regulatory Studies and Governance Division, The Energy and Resources Institute (TERI) was the convener.
- INS National Seminar on "Nuclear Technology for Human Welfare" (NTHW-2009) was organized at Amrutvahini College of Engineering, Sangamner, District-Ahmednagar, Maharashtra on September 26, 2009. Shri A.V. Kharpate, Outstanding Scientist & Head, Research Reactor Maintenance Division, Bhabha Atomic Research Centre, Mumbai was the Chief Guest and the inaugural function was presided over by Prof. (Dr.) G.J. Vikhe Patil, Principal, Amrutvahini College of Engineering, Sangamner.

- The super mega event, International Conference on "Peaceful Uses of Atomic Energy 2009" was organized at Vigyan Bhavan, New Delhi during September 29-

Oct. 01, 2009. The conference was inaugurated by Dr. Manmohan Singh Honourable Prime Minister of India the largest democracy of the world. The speakers during inaugural function were: His Excellency Dr. Mohamed ElBaradei, Director General, IAEA, Shri Pranab Mukherjee Hon'ble Finance Minister of India, Dr. Anil Kakodkar, Chairman, Atomic Energy Commission & Secretary, Department of Atomic Energy, Prof. P. Rama Rao, President, Indian Nuclear Society and Dr. S. Banerjee, Director, BARC & Member Atomic Energy Commission.

- Nuclear Energy Development: Sharing Experience and Learnings Between EDF, TERI and INS, 3 February 2010, New Delhi.

  Nuclear power development has gained significant importance for India due to the growing need for energy and the limited energy resource options. And with climate-change science pointing to unsustainable patterns arising from conventional fuel usage, there are very few choices that remain for India to take in order to meet its large-scale energy demands. Nuclear energy remains as one of the mature and reliable options that India would like to tap for large-scale deployment. India plans to install 20,000 MW of capacity from nuclear power plants by 2020. With the operation of the Rajasthan Atomic Power Plant (RAPP-unit 6) achieving criticality, the 19th reactor of the Nuclear Power Corporation India Limited (NPCIL) took the total existing tally of installed capacity to 4560 MW in January 2010. The total nuclear power capacity is planned to be increased to 7,280 MW by completion of projects under construction in Karnataka and Tamil Nadu.

  And in the long term, India intends to augment installed capacity to 60,000 MW by 2032. As the Indian nuclear power programme grows in scale and complexity of technologies, there is a need for comprehensive planning and linking all aspects of the fuel cycle so that the atomic energy establishments in the country are in a position to cater to be able to the industry. In this regard, the French experience with nuclear power can be one of the most pertinent examples for India to learn from.

  To facilitate this platform for sharing experiences, The Energy and Resources Institute (TERI) and Electricité de France (EDF-India) along with the Indian Nuclear Society (INS) organized a one-day workshop titled "Nuclear Energy Development in France and India: sharing experiences and learnings between EDF, INS and TERI". The workshop was divided into three sessions, "Regulation of Nuclear Energy", "Environment, waste and safety aspects of nuclear energy", and "Public engagement and consultation while setting up nuclear power projects".

  Each session had speakers from the Indian atomic agencies and from EDF who presented their country perspectives and organization perspectives respectively. When admiring the French nuclear program in his initial remarks, Dr. R.K. Pachauri, Director General, TERI and Chairman, IPCC1, said that India had a lot to learn from EDF "in the field of management of this whole program", especially in the area of creating public awareness. Dr. Bikash Sinha, Homi Bhabha Professor (DAE's distinguished chair) in his inaugural address pointed

out that a paradigm change was required in our mindset to address the challenges of climate change through nuclear energy and effective knowledge campaigns. His Excellency Ambassador Jerome Bonnafont of the French Embassy during his special address said that "there has to be commitment 1 IPCC – UNFCCC's Intergovernmental Panel on Climate Change to safety and security and our countries are convinced that nuclear energy can be sustained only if these nuclear plants are operated in safe manner and were accepted by the public especially public living in the vicinity".

The workshop started with a review of nuclear regulatory mechanisms across the world that was presented by Ms. Ruchika Chawla, Associate Fellow, TERI. Following this, the nuclear regulatory representatives from India and EDF compared and debated the two country mechanisms. Similarly, latter sessions included stimulating analogies and discussions.

- UBM India is organizing its second edition of India Nuclear Energy 2010 from the 7-9th October 2010 at the Bombay Exhibition Center Mumbai / India. A one-day India Nuclear Energy Summit is also being organized on the 8th of October 2010 in Mumbai. The event is being endorsed and co-sponsored by the Department of Atomic Energy, Government of India. The first edition of this event was organized in Mumbai from 13th-15th November at the same venue. The event saw major corporates from India and abroad participating. There were two country pavilions, from Russia and Finland respectively. The concurrent India Nuclear Energy Summit saw 200 delegates participating. The keynote address in this summit was given by Dr. Anil Kakodkar, the then Chief of Atomic Energy Commission of India. The event saw the display of the latest technology and products by companies from India and overseas for the growing Nuclear Energy Space in India.

- Italy

ANS Globe Co-Editor Mauro Bonardi provides some news from Italy:

At the moment all Italian NPPs and other nuclear facilities belong to Sogin SpA. None of them is operating. The small NPP in Latina is used for visits by the public and other visitors. An agreement for four EPRs was signed by the Italian and French Governments. A contract for the four EPRs was signed by ENEL and EdF, and the first plant is to be commissioned by 2020, the others at 18-month intervals. Another four units (AP1000) are planned to be purchased in the USA (Westinghouse-Toshiba and Ansaldo Nucleare).

Following is an interesting article by Dr. Roberto Adinolfi, Administratore Delegato (Deputy CEO) of Ansaldo Nucleare:

ANSALDO NUCLEARE is a relatively new brand in the nuclear industry, as it was established as such at the end of 2005. Indeed our company has a much longer history that goes back to the referendum which in 1987, in the wake of the Chernobyl accident, fostered the termination of all nuclear activities in Italy and the

shutdown of the 4 operating plants in the country.

At that time, ANSALDO was working on seven power plants, at different stages of implementation, with more than 2000 technicians and a dedicated factory for heavy nuclear components; all of a sudden, all these projects disappeared and people had to be reconverted to other power generation activities, with significant problems that are easily imaginable.

However, the management, together with the shareholder Finmeccanica, took a brave decision: they decided that those competences should not be totally disbanded, after all there was a possibility that Italy may have reconsidered its decision after the five-year moratorium announced by the Government as a result of the referendum. So, a nuclear division was created inside ANSALDO, and later inside Ansaldo Energia, by uniting some 200 experienced, but quite young, engineers who pursued the challenging task to maintain the core competencies by participating in the projects of 3rd-generation reactors that were just appearing on the boards in those years.

The events went in a very different way than had been foreseen: it took twenty years, instead of five, for the Italian Government to go back reconsidering a nuclear option. Even more, the 200 employees, instead of remaining devoted only to studies, went abroad and implemented projects in many European Countries and even overseas.

Finally, when in 2005 the Nuclear Renaissance started to affect also our country, Finmeccanica was able to establish ANSALDO Nucleare as a dedicated company with the task of pursuing growth in the international, and national, nuclear market.
The reason for me to go through this story is not just for the pride of having survived through a very unique business experience, but also for the sake of better explaining what is ANSALDO Nucleare today.

Indeed, ANSALDO Nucleare today is a company working in many branches of the nuclear sector: from new power-plant design and supply up to decommissioning, it is focused both on engineering and design but also deeply involved in R&D and in construction activities. Let us have a look to the most significant activities we are currently developing.

In the area of new power plants, we are currently busy supporting Westinghouse in its first AP1000 projects around the world. We have been cooperating with Westinghouse in the development of Passive Plants technology since the inception of the AP600 Design Certification Program, in late ‘80s, and then through the development of the European Passive Plant up to the AP1000 Design Certification Program. We are presently developing engineering studies to support the COLs in the United States as well as to deliver the first units in China. Our main tasks are related to layout studies inside the Reactor Building, including piping and support analysis, modularization, structural analysis, etc. We are also involved in the detailed design of fluid systems, shielding, shield building structures, as well as in transient and safety analyses. Ansaldo Nucleare has also the responsibility for the design and delivery of the Metal Containment for the first unit of Sanmen, as well as for the supply of the innovative Passive Residual Heat Exchanger, designed by us and manufactured by our partner Mangiarotti Nuclear.

A more traditional activity is the one we are performing on behalf of ENEL to complete the two VVER 440 units of Mochovce in Slovakia: in this project we are mainly involved with checking the existing equipment, qualification of components, supervision and quality management of local manufacturers and erection companies. An activity where we can draw largely on the experience and capabilities we developed in completing the two CANDU units in Cernavoda, Romania, where we also acted as designers of Balance of Nuclear Island and Balance of Plant. We take also pride in the fact that Cernavoda 2, the last project we delivered on schedule in 2007, has been the only plant put in operation in Europe in the last decade. The Cernavoda NPP is pictured below.

On the other hand, we maintain our commitment in the development of new designs: presently, we are deeply involved in the European Programs linked to the Generation IV Initiative, specifically we are leading the European project on Lead-cooled Fast reactor (the LEADER program).

Through this wide range of activities, we are maintaining an up-to-date set of competences as designers and suppliers of components and systems, being able to propose ourselves as EPC contractors for future nuclear power plants in Europe and elsewhere.

In the area of decommissioning and waste management, we are extensively cooperating with the Italian Agency SOGIN, which is in charge of the decommissioning of the four national power plants as well as of the fuel cycle facilities in 3 sites. Most of the activities implemented up to now are related to the conditioning and final disposal of the existing wastes, both liquid and solid. A quite innovative project is the one related to the conditioning of spent resins through a wet-oxidation process, developed together with our Swiss partner Granit. Other challenging activities, successfully managed by our team, are related to the handling of spent fuel from damaged pools, which required the design and development of special tools capable of

EUREX Facility safe removal of spent fuel from cooling pools

disposing the fuel without water shielding.

SOGIN's programs foresee the dismantling of all the old plants by 2020, even if accelerated programs are being currently evaluated on those sites which are candidate to host the new power plants.

In addition to domestic activities, Ansaldo Nucleare looks also to European markets for decommissioning, pursuing proper qualification by participating to innovative projects: we are currently engaged in Lithuania, for the decommissioning of Ignalina RBMKs, and we are making proposals both in the UK and in Bulgaria.

Our last segment of activity is assistance to plant operation, mainly with the purpose of improving plant performance and/or of extending the plant life.

Of course, we are present on those plants that we cooperated to design and build, like Cernavoda PHWRs in Romania and Superphenix SFR in France. Especially, in the latter, we actively support through NNS, our joint company with AREVA, the post-operation activities precedent to plant decommissioning, namely the discharge and disposition of the sodium coolant.

Another important project that we are presently implementing is the Plant Life Extension of Embalse PHWR in Argentina, where we are involved in the assessment and refurbishment of BONI/BOP systems, ranging from the turbo generator set to the electrical distribution and other safety support systems.

So, as you can see, we are trying to expand our range of activities both in terms of products and of markets. Such an effort is required by a long-term strategy, for our group, to return to play a significant role in the renewed nuclear market of the next decade. Essential to this strategy is our human capital: Ansaldo is presently engaged in a huge effort to recruit new engineers and to transfer to them all the competences coming from our history.

By doing so, we pave the way to the renaissance of nuclear energy even in Italy, as in the rest of Western countries.

- Japan

Dr. Kazuaki Matsui, Executive Director of The Institute of Applied Energy, has sent the following report on the New Nuclear Build Plan in Japan:

The Japanese government (METI) has proposed a following new target for nuclear in April 2010, to address an ambitious carbon-emission reduction policy by the new administration, which is to reduce by 25% by 2020 based on the emission rate in 1990.

- By 2020, there will be nine new nuclear units. With the existing 54 in the present fleet, the total will then be 63. An average capacity factor of 85% is targeted.
- By 2030, at least 5 more NPPs than the number in 2010, i.e., a total of at least 68. An average capacity factor of 90% is targeted.

Dr. Matsui also sent details on the very successful ICAPP '09, held in Tokyo, Shinjuku:

The ICAPP '09 in Figures

Items		Figure
Conference day	May 11-13	3
Country/Region	Countries/regions where the participants come from	28
Participant	Conference participants in total	580
	Participants in the Welcome Reception (May 10)	250
	Participants in the Opening	410
	Participants in the Banquet	400
Staff	Local Organizers	78
	Local Operation Staff	50
Participants in Tours	Kashiwazaki-Kariwa Nuclear Power Station (May 14)	36
Presentation papers	2 Plenary Session	8
	7 Panel Sessions	37
	13 Technical Sessions	377
Session rooms	Main hall (Plenary session)	1
	Panel session rooms	2
	Technical session rooms	10
Technical exhibition Booths	- Toshiba & Westinghouse, - Hitachi-GE Nuclear Energy, - Mitsubishi Heavy Industries, - Korea Hydro & Nuclear Power, - CD-adapco	5

And information on the sessions at ICAPP -09:

Number of Presentations at ICAPP2009
(Classified by Technical Track)

Plenary Sessions	8
Panel Sessions	37
Technical Sessions	377 in total

Tracks		Technical
1	Water-Cooled Reactor Programs and Issues	25
2	High Temperature Gas Cooled Reactors and Hydrogen Production	33
3	LMFR & Longer Term Reactor Programs	55
4	Operation, Performance & Reliability Management	29
5	Plants Safety Assessment and Regulatory Issues	39
6	Reactor Physics and Analysis	27
7	Thermal Hydraulic Analysis & Testing	50
8	Fuel Cycle and Waste Management	32
9	Materials and Structural Issues	56
10	Nuclear Energy and Global Environment	8
11	Near Term Deployment	6
12	Innovative and Space Reactor Systems	11
13	Infrastructure to deploy World Nuclear	6
Total		377

Dr. Hisashi Ninokata, IC member and Professor of Nuclear Technology at the Tokyo Institute of Technology, sent the following report on Monju.

Monju restarted on May 6 after 14-year 5-month-suspension

Monju, a Japanese 280MWe prototype of sodium cooled fast breeder reactor, restarted on May 6. After withdrawal of 19 control rods, it reached to the criticality after a 14-year and 5-month suspension since December 1995.

Despite the few effects on the plant safety, the 0.7t secondary sodium leakage in 1995 arose many disputes and national concern: the necessity of FBR development in Japan with large budged spending, accountability of the plant administrator, the current Japan Atomic Energy Agency (JAEA), and the central government commitment to boost the industrial prosperity of hosting local prefecture

that accepts the national project. After whole Japan debates, the government recognized the FBR development as a Science and Technology of National Importance in 2006, the JAEA was reorganized, and the prefectural energy R&D centralization plan has been launched as a collaboration result of the local and central governments. Then, the Monju plant was modified against sodium leakage and earthquake, and eventually restarted.

Mr. M. Nakagawa, Vice Minister of MEXT reported the Monju criticality to the Minister on May 8 witnessed by oversea researchers.

The Monju System Startup Test (SST) begun on May 6 will be continued for three years. At the first Core Confirmation Test at zero power, the core characteristics containing americium accumulated in the long term plant lay down, sodium purity and activity measurement and others will be conducted. After a refueling, the turbine /generator system will be connected and the entire plant performance will be confirmed in the 40% output Confirmation Test. The stable rated power operation will be attained in 2013 following the second refueling and the Power Rising Test that is the final step of the SST.

- Latin American Section (www.las-ans.org.br)

Jan van Erp represented the LAS, and by the same token the INSC, at COP-15 in Copenhagen. Following is an interesting report which Jan wrote following COP-15:

Introduction:

The COP-15 conference was conducted as part of the United Nations Framework Convention on Climate Change (UNFCCC). It was hosted in Copenhagen by the government of Denmark during 5-19 December 2009. Reportedly the total number of persons registered for COP-15 was around 30,000, representing 193 nations. The maximum allowable occupancy of the conference venue (the Bella Center) was 15,000 persons (for reasons of fire safety), and access restrictions had to be imposed on persons with observer status, i.e., those representing non-governmental organizations (NGOs). Many large national delegations arrived during the second week, so that access restrictions and security procedures for observers became considerably more severe. Access for observers to the official inter-governmental meetings was limited and often not permitted for security reasons.

In addition to the official intergovernmental meetings, a large number of open side meetings were held. These side meetings were sponsored by various organizations, including: (1) government agencies (Brazil, China, U.S.A., etc), (2) inter-governmental organizations (e.g., European Union, IAEA, OECD-IEA), (3) national

and international organizations, etc. Also, numerous national and international organizations were represented by booths providing information on their climate-related activities.

Many issues concerning climate change are being addressed as part of the UNFCCC. Among these are (a) energy, (b) agriculture and forestry, (c) deforestation and forest degradation, (d) financial support for developing countries, (e) measurement and verification of CO_2 emissions. For reasons of space, the present brief review will be limited primarily to energy-related issues.

Comments:

One of the striking aspects of the conference was the composition of the official delegations, which consisted predominantly of persons coming from governmental environmental agencies and/or ministries. Similarly, a large majority of the NGO observers were sponsored by environmental organizations. Since the declared aim of COP-15 was to reach international agreements on matters having major worldwide economic consequences, one would hope that the delegations would also have included an adequate number of persons with backgrounds in economics and science or engineering. Perhaps such persons were present, but if so, they were not much in evidence. It seems that the technical feasibility and economic consequences of the proposed measures were not considered subjects of high relevance.

The danger of making long-term agreements affecting the world economy without in-depth consultation with, and vetting by, persons with solid technical and economics backgrounds is that the unintended consequences may be worse than climate change. For instance, it is possible that switching (within a relatively short time period) a major part of the world energy supply system to predominant dependence on heavily subsidized renewable energy sources (as is advocated by most environmental organizations) could result in a long-lasting worldwide economic depression with associated severe human suffering and serious socio-political consequences.

A certain aura of 'unreality' prevailed at the conference, as illustrated by these examples of questionable consistency:

- Rejecting consideration of proven important mitigation technologies (such as nuclear energy and hydro power) on the ground of their not being acceptable Clean Development Mechanisms (CDMs). This while forecasting dire consequences if no immediate drastic actions are taken;
- Setting a limit on the world temperature rise (2.0° C), while deriving the associated required reduction in CO_2 emissions by means of climate models of unproven validity (uncertainties in accounting for cloud effects, solar activity, etc.);
- Blaming some undesirable natural events on climate change even when they are largely attributable to other anthropogenic causes (e.g., increased population in coastal areas, human encroachment upon low-lying flood plains, fast rain run-off caused by deforestation, desertification in arid regions due to inappropriate agriculture and/or over-grazing by cattle, etc);
- Advocating a heavy dependence on renewable energy sources (mainly wind, solar and biomass), without accounting for the inherent limitations, including:

- intermittency in electrical energy production for wind and solar energy,
- permanent dependence on fossil-fueled back-up power,
- large area requirements (land and/or sea),
- need for double investment in power plants (each of them only partially utilized),
- need for heavy investment in transmission systems (only partially utilized),
- permanent need for heavy government subsidies,
- destabilization of the electric grid, increasing the probability of supply interruptions with serious social and economic consequences (blackouts, brownouts, etc.).

The above observations are not intended to suggest that COP-15 served no useful purpose, nor that no action is needed. *Reducing reliance on fossil fuels for energy production is certainly advisable, not only to combat possible climate change but also to conserve finite natural resources for future generations*. The world has indeed warmed in recent decades, as is shown, for example, by the receding glaciers in Greenland (and in many other places), as well as by the diminished area of arctic ice. This was clearly illustrated during the conference by presentations of excellent time-lapse photography. However, that the current melting of glaciers is outside the range of historical climatic variations is not clear.

What is necessary above all is to examine the matter on a rational basis and to take the debate out of the emotional atmosphere. The principal questions that need to be addressed are:

- Does the current global warming have an anthropogenic component or are other non-anthropogenic causes dominant (e.g. varying solar activity)?
- If anthropogenic components dominate, is greenhouse gas of anthropogenic origin (mainly CO_2, methane) the principal cause of global warming or are other important anthropogenic causes present, including for instance the large demographic expansion (in many regions by a factor of four in less than a century) leading to (a) rapid growth of urban areas, (b) extensive deforestation, (c) desertification, etc?
- If indeed anthropogenic greenhouse gas is the predominant cause of global warming, what actions can be undertaken without causing more human suffering than is intended to be avoided?
- Above all, why does UNFCCC exclude proven technologies, such as nuclear energy, from consideration? This while nuclear energy offers the most promising way for industrial nations to reduce their CO_2 emissions, as recognized by many national governments.

At no point during the official sessions did COP-15 address the controversial relationship between demographic expansion and global warming. Only in an out-of-the-way corner of the Bella Center were some courageous women working on behalf of the United Nations Population Fund (UNFPA) by 'manning' a small information booth. "Women are central to efforts to deal with climate change," was stated in a flyer that was handed out by them. This organization certainly needs to be supported in view of its cause's overriding importance. Information may be obtained at kollodge@unfpa.org. It is difficult to understand how UNFCCC intends to address climate change without addressing demographic expansion. One can only hope that

during the next UNFCCC conference (COP-16) this issue will receive an important place on the agenda.

During informal discussions with meeting participants (both delegates and observers), it became clear that many of them have unrealistically high expectations concerning the capability of 'renewable energy' sources to provide reliably the large amounts of needed energy. This is because most participants are environmentalists without the technical background to make proper evaluations. They reject a role for nuclear energy off-hand, on the ground that it is not an acceptable Clean Development Mechanism (CDM), as was decided in 2001 during COP-6-II in Bonn, Germany. It was also obvious that most meeting participants are not interested in being informed about the important contribution that nuclear energy can make, nor about the limitations of renewable energy. This situation is attributable in large measure to the fact that the environmental organizations that sponsor the participants have become predominantly political organizations that appear to be as interested in promoting worldwide socio-political change as they are in advancing their environmental objectives. Regrettably, the public media are not helpful in providing a more realistic perspective.

Among the good points of COP-15 that should be mentioned are the informative side meetings, including these:

- Brazil made interesting presentations on its efforts to save the Amazon rain forest and to strive towards an equilibrium between trees harvested and trees planted by reforesting areas that have been deforested and by involving indigenous peoples in the planning of dual-purpose regions. Excellent presentations were also offered on Brazil's production of biofuels (primarily alcohol from sugar cane and sweet sorghum). It was mentioned that the production of alcohol from sugar cane delivers an overall positive energy balance having a factor of nine (accounting for all energy used in the process (plowing agricultural land, fertilizer production, etc). This is considerably better than the energy balance for production of alcohol from corn, as is practiced in the U.S.A. It was stated that Brazil still has many millions of hectares of low-carbon-containing land available for additional biofuel production (1 hectare = 2.47 acre). Brazil is making this technology available to developing countries (principally in Africa) for the purpose of replacing inefficient, unhealthy cooking practices based on the use of charcoal which is the source of emission of much CO_2 and 'black carbon'.
- Informative presentations were also given in the U.S.A. pavilion, covering many topics, including (a) time-lapse photography concerning the rapid melting (calving) of ice glaciers in Greenland, (b) the effect on climate change and glacier melting of 'black carbon' due to the large quantities of carbon particles (from incomplete combustion) that are being deposited worldwide), (c) the influence of aeronautics that leave combustion trails (contrails) at high altitude, etc.
- Interesting presentations were given in the pavilion of the Netherlands concerning advanced meteorological measurement techniques and on the increasing need for proper fresh water management.
- Various organizations prepared and manned booths concerning numerous topics, providing useful information.

COP-15 observers were able to obtain during the conference highly appreciated

assistance and useful information concerning the daily meeting proceedings from the following two non-UNFCCC organizations:

- RINGO constituency, dealing with the research aspects of climate change,
- BINGO constituency, dealing with the business aspects of climate change.

Observer-members of both constituencies were invited to submit questions to be addressed by the conference President. After some discussion, the following question was submitted by the RINGO constituency:

"What do you think are the chances that technologies previously excluded from the CDM - nuclear energy and CCS - are now allowed in, and what are the considerations for reopening the debate on nuclear in the CDM?"

The justifications that were offered for suggesting a change in the UNFCCC position relative to nuclear energy are as follows:

- In 2001 during COP-6-II in Bonn, the UNFCCC delegates decided by vote that nuclear energy is not an acceptable CDM. This vote, which was strongly influenced by the President of COP-6 and by the Environment Minister of the host country, was taken notwithstanding the fact that many delegates from developing countries had little or no knowledge of nuclear energy and even though no opportunity was given for an open unbiased discussion on the subject.
- Nuclear fission is the only available energy technology that is capable of delivering with very low CO_2 emission the large quantities of reliable energy needed by industrial nations
- Future applications of nuclear energy are not limited to electricity production but may cover a wide spectrum of other uses, including: production of hydrogen, production of carbon-neutral synthetic fuels, production of process heat for chemical and metallurgical industries, desalination, etc.
- Reduction in the use of fossil fuels by industrial countries, and increased reliance on nuclear energy, would leave more (and less costly) fossil fuel available for developing countries, and valuable limited resources would be conserved for future generations.
- France has led the world with about 80% of electricity from nuclear power plants. Among other countries with actively expanding nuclear power programs are Argentina, Brazil, Canada, China, Czech Republic, Finland, India, Japan, Korea, Mexico, Rumania, Russia, Slovakia, South Africa, and USA. Many other countries have also indicated an interest in future deployment of peaceful clean nuclear power plants.

Unfortunately, even though the question was posed to the COP-15 President, it was not answered in any meaningful way. The result is that nuclear energy will remain on the UNFCCC list of unacceptable technologies. The ANS, in combination with other national and international engineering societies, should work to assure that this issue will have an important place on the agenda of the next UNFCCC conference.

During lengthy inter-governmental negotiations, disagreements surfaced concerning outside verification of national commitments to reduce CO_2 emissions and the level of financial assistance to be offered by developed nations to developing nations. In the end, and with great effort, a non-binding accord was reached in which some developed and developing countries agreed to publish their national actions and commitments to reduce greenhouse gas emissions. A mechanism is to be created to provide financial assistance for developing nations to cope with the consequences of climate change and to help them in their effort to reduce CO_2 emission. A target of

two degrees centigrade was set for the average increase in global temperature. Whether or not the Copenhagen Accord needs to be signed is not clear because it is legally non-binding and does not include a mandatory outside verification regime.

Concluding Remarks:

The Copenhagen Accord became only a step on the road towards reaching binding agreements with outside verification. The next UNFCCC conference (COP-16), scheduled for 2010 in Mexico City, is intended to advance further towards that end. It should, however, be mentioned that suggestions have been made that (in view of the COP-15 experience) the UNFCCC may not be the most effective forum to advance the goal of achieving global reductions in emissions of greenhouse gasses.

It became clear during COP-15 that the delegates and observers from environmental organizations continue to have a dominant role in the UNFCCC decision-making process, without much consideration for technical feasibility or economic consequences. They are supported to a large extent by the media in promoting a socio-political agenda that has, in many cases, only a tenuous bearing on environmental issues.

UNFCCC continues to consider nuclear energy an undesirable option, keeping it off the list of acceptable Clean Development Mechanisms (CDMs). Emphasis continues to be placed on 'renewable energy' technologies with unrealistic expectations, disregarding the inherent limitations. This course of action, if followed, can be expected to lead to large-scale misallocation of resources, both financial and human.

Industrial nations should ignore the position of UNFCCC concerning nuclear energy and proceed with a large building program of nuclear power plants of the current advanced thermal type. In parallel, an international program should be initiated aimed at developing and commercializing fast-neutron reactors, which are capable of extending the availability of nuclear fuels by tens of thousands of years. Considerable work in this area is being done already in France, India, Japan, Korea, Russia and USA. In this respect, a promising option that should be mentioned is the Integral Fast Reactor (IFR) with on-site pyro-electrolytic recycling of fuel, which offers great advantages concerning proliferation resistance and radioactive waste disposal.

It is to be hoped that UNFCCC will eventually change its position regarding nuclear energy, i.e., rescind its 2001 vote that excluded nuclear energy from the Clean Development Mechanisms (CDMs). As long as UNFCCC persists in its current position, its objectives for marked reduction in the use of fossil fuels cannot be reached without severe economic and socio-political consequences worldwide.

- México

The Sociedad Nuclear Mexicana is busy with final preparations for the 17th Pacific Basin Nuclear Conference, to be held in Cancún, México, October 24-30, 2010. The Pacific Basin Nuclear Conference (PBNC) has become one of the most important international events in the nuclear industry, and not only for the countries sharing the

Pacific Rim. PBNC covers all areas in the nuclear power industry, plus research and development activities directed to the application of nuclear energy. The 17th PBNC has as theme "Nuclear Energy – An Environmentally Sound Option". For more information please visit the conference website, http://www.pbnc2010.org.mx.

- OECD Nuclear Energy Agency (http://www.nea.fr)

Serge Gas, Head, Central Secretariat, External Relations and Public Affairs, OECD Nuclear Energy Agency, sends the following report:

The NEA and the OECD participated in the organisation of the International Conference on Access to Civil Nuclear Energy, held at the OECD Conference Centre on 8-9 March 2010. The conference, initiated by the French government to open a dialogue with countries wishing to establish nuclear power programmes, attracted over 1100 participants and 150 journalists. A total of 62 countries were represented, with 40 attending at ministerial level. French President Nicolas Sarkozy opened the conference with OECD Secretary-General Angel Gurría and IAEA Director General Yukiya Amano. Luis Echávarri moderated a roundtable on financing a nuclear programme. Angel Gurría and French Prime Minister François Fillon closed the conference. The right for countries to have access to the peaceful use of nuclear energy was reaffirmed and the need for responsible co-operation between new entrants and mature nuclear countries was stressed. Consensus emerged on the need for international financial institutions to be more pro-active in financing nuclear plants. Strong media coverage ensured high visibility for the OECD and the NEA.

On 25 March, the NEA and the IEA launched the 2010 edition of *Projected Costs of Generating Electricity*. NEA Director-General Luis Echávarri and IEA Executive Director Nobuo Tanaka chaired the joint press conference at the OECD Conference Centre, which was attended by some 20 international journalists. The study provides comparative cost data for a wide variety of fuels and technologies, including coal and gas (with and without carbon capture), nuclear, hydro, onshore and offshore wind, biomass, solar, wave and tidal as well as combined heat and power (CHP). It provides cost information for almost 200 plants in 21 countries (including four major non-OECD countries). Overall, nuclear energy is found to be a competitive source of baseload electricity. It is the most competitive when discount (interest) rates are low and a moderate price is placed on carbon emissions. Further information and the Executive summary are available on the NEA website at www.nea.fr/pub/egc/

The NEA Legal Affairs Division is proud to announce the 10th anniversary session of the International School of Nuclear Law (ISNL) which will take place from 23 August to 3 September 2010 at the University of Montpellier, France. The ISNL has trained more than 500 participants from all around the world, with each session bringing together up to 60 participants and about 25 highly renowned lecturers. The ISNL is a unique combination of both an academic and practical training programme which guarantees an overview of virtually all aspects of international nuclear law. Besides the intensive learning programme, Montpellier provides a pleasant and convivial atmosphere to study in one of the oldest law faculties of Europe. Following the sessions, students stay in touch through social networking websites and the NEA facilitates communication among all past participants through the distribution of

alumni lists. The NEA will release a special publication on international nuclear law on the occasion of the 10th anniversary of the school.

- Pacific Nuclear Council (http://www.pacificnuclear.net/pnc/)

The Pacific Nuclear Council is looking forward to its17th Pacific Basin Nuclear Conference, which will be hosted in 2010 October in Cancún by the Sociedad Nuclear Mexicana.

- Sociedad Nuclear Española

José Luis Elviro Peña, SNE Secretary General, send the following news.

SNE issued a new logo (see above) that replaces the original since its founding in 1974. The Spanish government has nine candidates to hold the **Centralised Temporary Storage Facility** that will be built in Spain. The Centralised Temporary Storage facility is an installation designed to house the spent fuel from the nuclear power plants and the high level wastes produced in Spain (total material to be stored 12,816 m^3) at a single location. The facility does not generate energy, and produces no contamination. The facility will be built above ground and will house these materials under dry conditions for a period of 60 years by means of a system of modular spaces. The processes required for the interim management of all the high level radioactive wastes will be centralized at this facility. For more information about this topic visit www.enresa.es/actividades_y_proyectos.

"Issue 300: Directory 2009" was published last October to celebrate this important issue and includes interviews with the first and actual presidents of the Publications Commission of the SNE, Rogelio del Haro and José López and also an article about the history of the Nuclear España Magazine.

The **Nuclear España Best Article Prize** has been awarded this year to a paper entitled *Desarrollo normativo y nuevas prácticas reguladoras del CSN* (Development of regulations and new regulatory practices at CSN), Isabel Mellado from CSN. The runner-up prize was awarded for the paper: *La operación del sistema eléctrico español. Contribución de la generación nuclear* (The operation of the Spanish

electric system, Contribution of nuclear generation), Miguel de la Torre y Miguel R. Duvison from REE.

The Commission also awarded, as was the case in the previous years, an "Honorific Mention" for the magazine for its "distinguished technical quality and presentation". This award was attributed to monographic issue *CN Cofrentes*.

The **36th Annual Meeting of the Spanish Nuclear Society (SNE)** will be held in Santiago de Compostela from 6th to 8th of October of 2010. This periodical encounter of the industry, companies and high representatives of the national and international nuclear and electric energy sector means also an interesting excuse to know and enjoy the culture, landscape or gastronomy of the different Spanish regions. On this occasion, the city selected is Santiago de Compostela, where the delegates (around 500 are expected) and their companions (always more than 200), will attend the special celebrations which will be held in the city due to the Compostela Holy Year.

It has been thought that Galicia and Xacobeo 2010 can be a great incentive for the numerous attendees as an excellent opportunity to know this community. The abstracts and papers will be sent to ponencias@sne.es indicating in the subject the topic selected. Special mentions will be given to selected papers at the closing session that will receive also a diploma. Thematic areas, rules for presentation and other information may be obtained from the meeting web site at www.reuninanualsne.es.

The Spanish nuclear power plants representatives attended the 2nd of March of 2010 the **Winter Annual Session "Experiences and Perspectives. The nuclear power plants in 2009"** at the *Escuela Técnica Superior de Ingenieros Industriales* of the *Universidad Politécnica de Madrid* (Industrial Engineering School) to analyze the nuclear energy situation in the last year.

- Taiwan

Dr. Jec-Kong Gone, Chief, International Affairs Section, Atomic Energy Council, Taiwan, sends the following report

Taiwan's nuclear power plants continued to set new records in 2009. Power consumption dropped 3.6% across Taiwan during 2009 as a result of the global recession, with industrial electricity use down 6.3%. However, 2009 was a record

year for nuclear power, which contributed 18.1% to the total supply – compared to 17.1% in 2008. The three nuclear power plants at Chinshan, Kuosheng and Maanshan, with two operating units at each site, generated 41.57 terawatt-hours (TWh) of electricity (gross) in 2009 – setting a new record high for the third consecutive year.

Performance wise, the average capacity factor for all six units in 2009 was 92.17%, also best record ever in Taiwan's nuclear power operation. The annual average number of abnormal events per unit was 1.33 (or 8 events for all six units), and the average number of automatic scrams per unit was 0.17 (or only 1 scrams for all six units) in 2009. New records were also set at Unit 2 of Maanshan plant for a refueling outage of 28.48 days, a full day shorter than the record set at Unit 2 of Kuosheng in 2008, and for continuous operation of 542 days, breaking the old mark of 538 days set at Unit 1 of Chinshan plant in 2005.

During the two-year period from July 2007 to July 2009, power uprates of the MUR (Measurement Uncertainty Recapture) type were accomplished on all six units, adding 56 MWe to the existing installed capacity of 5,144MWe, which amounts to an annual increase of 0.44 TWh in electricity generation, equivalent to 0.28 million metric tons of CO2 emissions reduction.

Han-Shen Lee, President of Taiwan Power Company, sent the following news item:

"On the occasion of the partial change of the managing directors of Taiwan Power Company, I have succeeded Mr. C. Y. Tu as President of the company, effective 2010 April 30. Meanwhile, Mr. Tu assumes the office of Chairman of Taiwan Electric Research & Testing Center. As there have been tough challenges and volatile uncertainties in the business environment, I believe that a dynamic strategy and well-organized plans for entrepreneurial operation will be key to overcoming the emerging difficulties and hindrances we face and ensuring that our company keeps boldly moving forward."

- World Nuclear University (WNU)

The World Nuclear University (WNU) is organizing the 6th Annual WNU Summer Institute in 2010, to be held at the University of Oxford for six weeks, from 3 July to 14 August.

Each year the Institute selects approximately 100 WNU Fellows from some 35 countries. These young, nuclear professionals are tutored by some of the world´s notable experts in the field and will receive instruction in a broad range of issues, including nuclear energy, team-building and leadership.

Since 2005, more than 300 Fellows from dozens of countries have completed this WNU initiative and have become part of an expanding global network of future leaders in the nuclear field.

News from ANS Divisions

To further the implementation of the Joint Protocol between the IC and the Professional Divisions Committee, we are pleased to include in the Globe some newsworthy Division items, typically gleaned from the Divisions' web pages.

- Reactor Physics Division (RPD) (http://rpd.ans.org)

RPD has just held the PHYSOR-2010 Topical Meeting in Pittsburgh, May 9-14, 2010. This conference is co-sponsored by the ANS Mathematics and Computation Division and the American Society of Mechanical Engineers (ASME), has had much success.

- Thermal Hydraulics Division (THD) (http://thd.ans.org)

THD is now looking forward to NURETH-14, which will be organized by the Canadian Nuclear Society and will be held in Toronto, Ontario, Canada, 2011 September 25-29. The theme of NURETH-14 will be "Helping the Environment with Advances in Thermalhydraulics".

Highlights from the 2009 November Meeting in Washington, D.C.

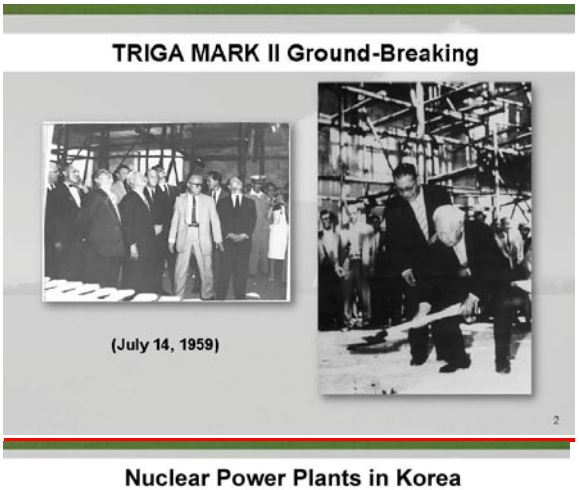
Photo taken during the 2009 November International Committee meeting in Washington, DC. From left to right, co-Vice Chair Hamad Alkaabi, co-Vice Chair Atam Rao, Chair France Brès-Tutino, Editor Ben Rouben, Board member Dominique Grenèche, Dr. V.S. "Krish" Krishnan of Canada

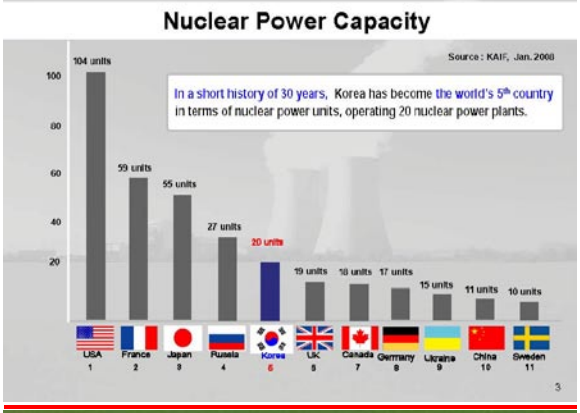
Chair Bres-Tutino introduced Professor KunMo Chung, Advisor to the Korea Electric Power Corporation and Distinguished Visiting Professor at George Mason University. Prof. Chung was a co-founder of the Pacific Nuclear Council. He served as Minister of

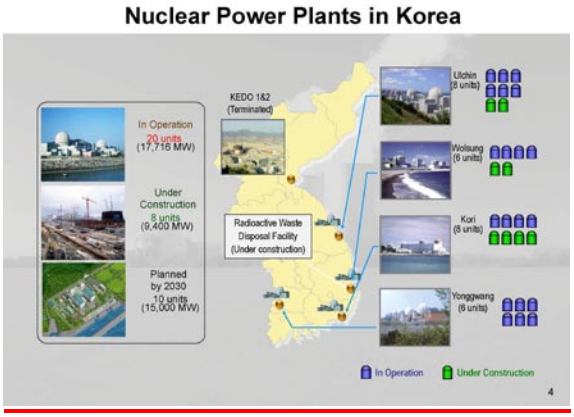
Nuclear Science and Technology twice, and was President of two universities in the Republic of Korea.

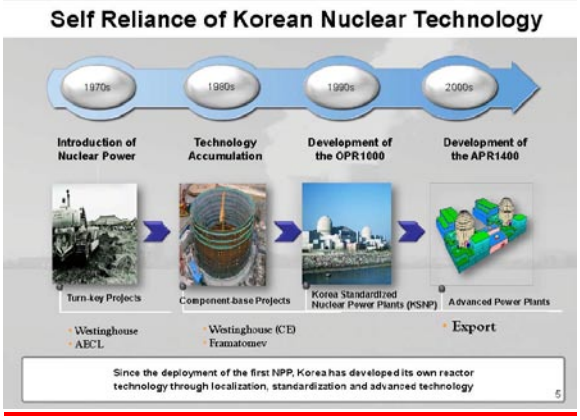
Prof. Chung made a presentation on the newly created KEPCO International Nuclear Graduate School, to be sited in the KORI nuclear complex, the center of the Republic of Korea's nuclear industry. The School will have students from KEPCO group and international students, and it will have international cooperation programs with IAEA, INPO, WANO, etc.

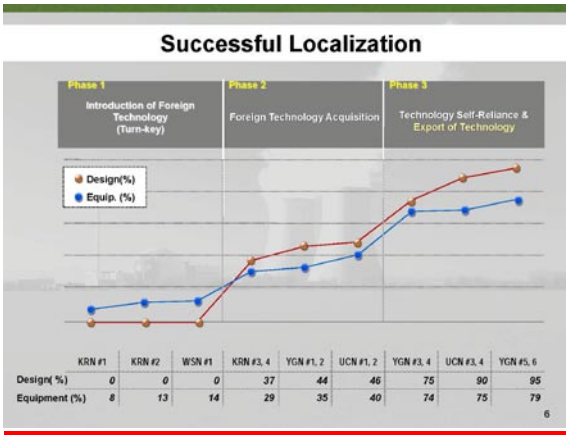
Prof. Chung's presentation is reproduced below.



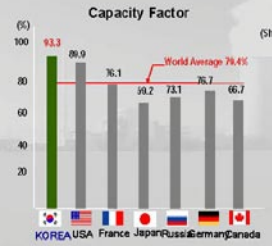




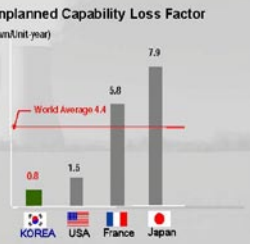




Korea's capacity factor recorded the world's No.1
which is about 14% higher than the world average



Source: Nucleonics Week (Mar. 2009)



Source: IAEA (2008)

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Korean Nuclear Industry

Manufacturing	Construction	Design & Engineering
HYUNDAI, HYOSUNG	SAMSUNG, GS E&C, HYUNDAI, DOOSAN	KOPEC

KEPCO has a robust supply chain covering entire nuclear life cycles

Operation & Maintenance	Nuclear Fuel	Commissioning
KHNP	KNF	KPS

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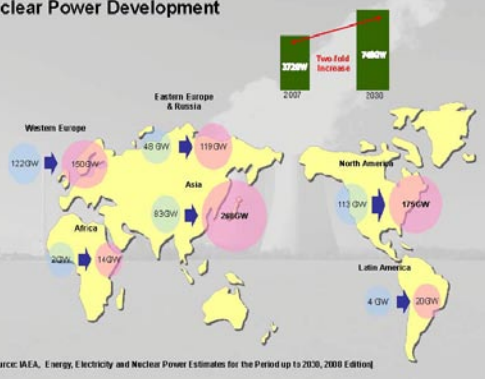
Nuclear Power Development



[Source: IAEA, Energy, Electricity and Nuclear Power Estimates for the Period up to 2030, 2008 Edition]

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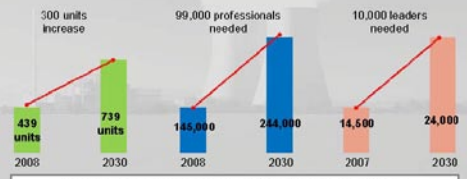
Forecast of Nuclear Human Resources

100,000 professionals needed by 2030

10,000 leadership professionals needed



330 professionals per plant, 10% leadership professionals

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KEPCO-INGS

Establishment of the International Graduate School for Nuclear Power Plants Professionals

- **On-site, Hands-on, Practical Curriculum**
  "Learning by designing" system on the site of Nuclear Power Plants
- **Leading the World NPP Export Market**
  KEPCO is one of the leading nuclear electric power builder and operator.
  and establishing the international nuclear professional school (KEPCO-INGS)
  using the existing infrastructure of KEPCO.
- **Contribution to Korea's NPP Export**
  NPP export with a powerful motive power for Green Growth.
  Building the global nuclear network of NPP experts through KEPCO INGS.

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Plan of KEPCO-INGS

- To be sited in KORI nuclear complex, the center of Korea nuclear industry
- Supported by the nuclear related companies of the KEPCO group
  - KEPCO (Korea Electric Power Corporation)
  - KHNP (Korea Hydro & Nuclear Power)
  - KOPEC (Korea Power Engineering Company)
  - KEPCO-KPS (Korea Plant Service & Engineering)
  - KNF (Korea Nuclear Fuel)
- Training human resources of potential nations importing Korean NPPs
  - Students from KEPCO group and international students
- World's best in all aspects
  - International cooperation programs with IAEA, INPO, WANO, etc,.

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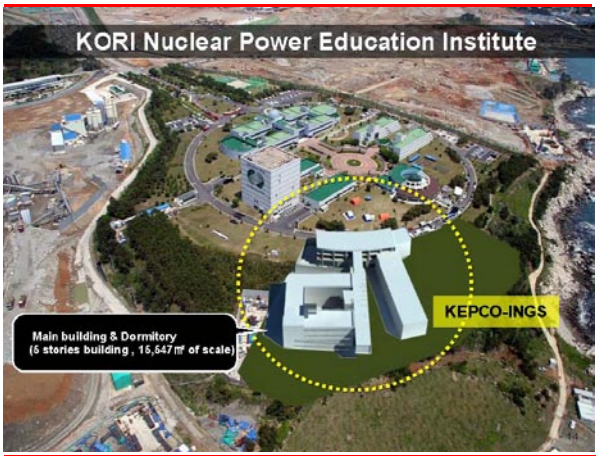

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An Independent Graduate School Licensed by the Korean Government

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Characteristic of K-INGS

	Existing program	K-INGS
Orientation	Academic program	**Professional program**
Program	MS PhD., ScD	**Master Engineer TD (Doctor of Technology)**
Methodology	Analysis	**Synthesis**
Academic Unit	Disciplinary credits	**Systems & Modules**
Career	Researcher/Professor	**Engineer/Practitioner**
Contents	Learning	**Design**
Scope	Disciplinary	**Inter-disciplinary**
Student	Individual	**Team**
Product	Papers, reports	**Patents, projects**
Community	Academia, research community	**Industry**
Activity Site	Laboratory	**Job-site**
Target	Domestic-Market	**Export-Market**
Residence	Optional Residency	**Full Residency**
Faculty	Individual	**Team**

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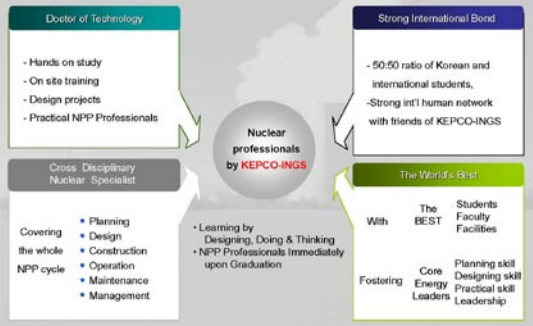
Strengths and Features of K-INGS



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Graduates and Career Paths

KEPCO International Nuclear Graduate School

Professionals to lead Nuclear Renaissance

INGS Graduates

- Graduates will serve as nuclear experts and leaders in different nuclear power sectors and global centers.
- Graduates will have the following 3 traits;
  1) Creativity: Developing technical innovations and forward-looking strategies
  2) Comprehensiveness: Making a decision based on cross-disciplinary information and integrated knowledge of the NPP's technology and system.
  3) Specialization: Career development with distinctive area-specific professionalism.

Career Paths

- NPP Systems Engineers
- NPP Technology Professionals
- NPP Project Managers
  - Engineering Designs
  - Construction Supervision
  - NPP Operation
  - NPP Maintenance
  - NPP Management

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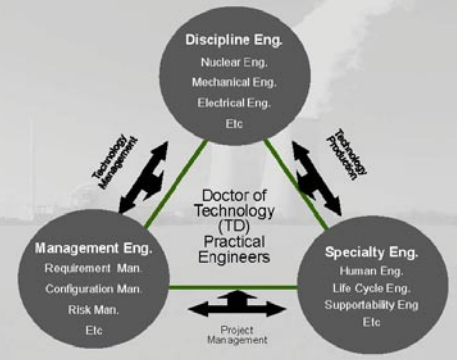
Basic Concept of K-INGS



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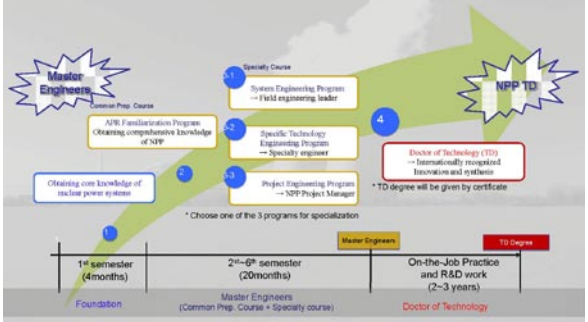
Differentiation using Practice-focused Curriculum



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1. Foundation 'Boot Camp' Program

Period	4 months (1 semester)
Objectives	1) To acquire core and overview knowledge of nuclear power generation system to build international network with overseas nuclear educational institutes and experts.
Where	George Mason University in Fairfax, VA, USA
Composition	lectures (12~13 weeks), industry field study (2~3 weeks)

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2. Master Engineers Program

Period	20 months (5 semesters)
Objectives	1) To obtain nuclear expertise by completing an integrated intensive courses that encompass the elements of architectural, technological and management engineering along with actual site practices for the design, construction, operation and maintenance engineering of nuclear power generating. To be equipped with skills and capabilities to become professional leaders of their respective engineering areas.
Where	K-INGS and Kori Nuclear Center
Composition	Common courses (30 weeks), Specialty courses (45 weeks)

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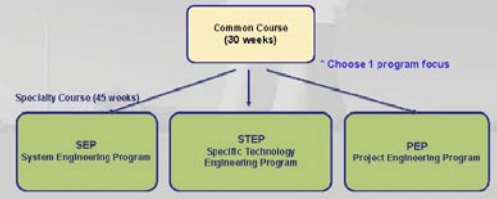
2. Master Engineers Courses

Composition of the main course



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Curriculum Design

PROJECT GENERAL	POWER BLOCK STRUCTURE	PRIMARY SYSTEM	SECONDARY SYSTEM	BOP SYSTEM	I & C SYSTEM	ELECTRICAL SYSTEM
MANAGEMENT & CONTROL	A1	B1	C1	D1	E1	F1
QUALITY MANAGEMENT		B2				
DESIGN						F3
PROCUREMENT			Specialist			
CONSTRUCTION						
START-UP			C6			
OPERATION	Engineering Leader		C7	D7		
MAINTENANCE	A8	B8	C8	D8	E8	F8

Project Manager

[Composition of D7]
Oax(Nuclear Safety) : 8 Unit
OBx(Radiation Safety) : 6 Unit
Ocx(Chemistry Tech.) : 5 Unit

Customized programs by designing and assembling 48 projects withA1 ~ F8

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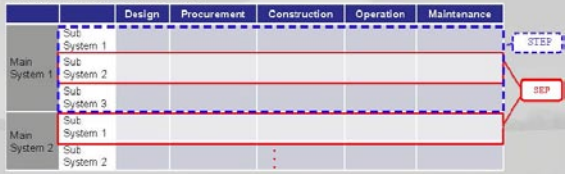
What is DPCOM Project?

- DPCOM stands for Design, Procurement, Construction, Operation & Maintenance which is a cycle of a Nuclear Power Plant.
- Every student will carry 4~5 projects according to DPCOM that concentrates on the System Engineering Design.

Curriculum Structure for SEP & STEP



* STEP deals with 1 main system with all sub systems subordinating to the main system
* STEP deals with 7~10 main systems with 1~2 sub systems subordinating to each main system

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- **Specialty Course A , B**

: System Engineering Program (SEP)
Specific Technology Engineering Program (STEP)

STEP(SEP) students will carry 1 STEP(SEP) program that consists of 4~5 projects.

STEP-A Equipments & Facilities of Reactor		STEP-B Auxiliary Equipments & Facilities of Reactor		STEP NPP Control System		program
A-1	Reactor Cooler System	B-1	Chemical and Volume Control System / Auxiliaries	J-1	Reactor Control System	SEP1
A-2	Safety Depressurization System	B-2	Cooling Water System	J-2	Control Rod Drive System	SEP2
A-3	Reactor vessel & Reactor Internals	B-3	Essential Service Water System (ESWS)	J-3	Main Feed(Water) Control System	SEP3
A-4	Fuel Assembly	B-4	Fuel Oil Storage and Handling System	J-4	Turbine steam Bypass System	SEP4
A-5	Control Element Assembly			J-5	Reactor Power Cutback System	SEP5
				J-6	Pressurizer Pressure Control System	SEP6
				J-7	Pressurizer Level Control System	SEP7

< Subject sample of SEP & STEP >

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Campus Overview

- Global reference of nuclear power plant education and training
- Best education environment at the international level
- Comfortable housing dormitory for effective study

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Campus Facilities

Campus Sites: Kori Nuclear Power Complex
4 Operation Units and 4 under-construction Units
KHNP Nuclear Training Center
Doojung & Radwaste Repository Sites at 1 hour driving distance

Main Buildings:
Education / Project /Administration Building

Ancillary Facilities:
Multi-media Information Center / Residence Halls Complex
Service Centers

Miscellaneous:
On-campus Transportations

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International Cooperation Council

KEPCO-INGS collaborates with International Cooperating Institutions,
Virginia Nuclear Group
INPO
WANO
Counterpart Educational Organizations.

KEPCO-INGS conducts International Exchanges,
International Joint Teaching,
International Joint Research,
International Projects

KEPCO-INGS cooperates with International Advisory Group,
George Mason University
Distinguished International Nuclear Energy Leaders.

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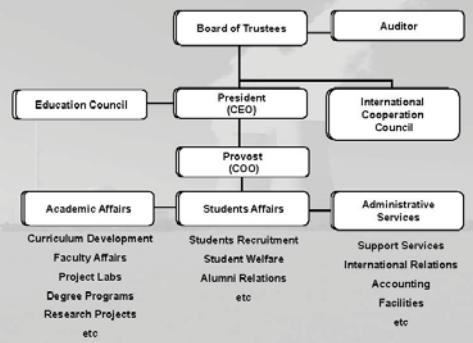
Organization



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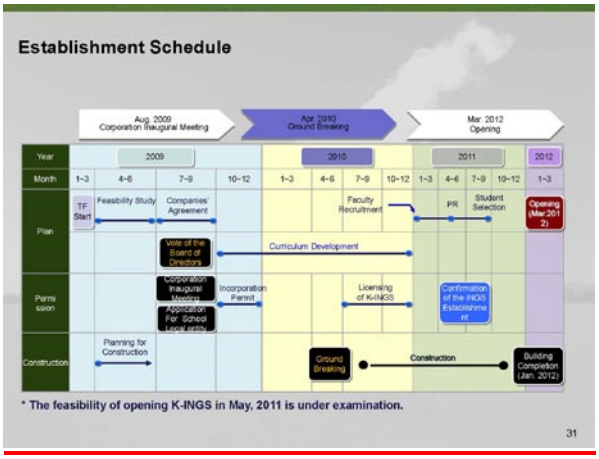


Societies with Collaboration Agreements with ANS

The following is a list of nuclear societies with collaboration agreements with the ANS, along with the corresponding website addresses. The Table contains also a few other entries of interest to ANS International Committee members.

Society	Website or E-Mail Address
Asociación Argentina de Tecnología Nuclear	-
Associação Brasileira de Energia Nuclear	www.aben.com.br
Association des Ingénieurs en génie atomique du Maroc	-
Atomic Energy Society of Japan	wwwsoc.nii.ac.jp/aesj/index-e.html
Australian Nuclear Association	www.nuclearaustralia.org.au
Bangladesh Nuclear Society	-
British Nuclear Energy Society	www.bnes.com
Bulgarian Nuclear Society	www.bgns.bg
Canadian Nuclear Society	www.cns-snc.ca
Chinese Nuclear Society	www.ns.org.cn
Croatian Nuclear Society	hnd.zvne.fer.hr
Czech Nuclear Society	www.csvts.cz/cns
European Nuclear Society	www.euronuclear.org
Hungarian Nuclear Society	www.kfki.hu/~hnucsoc/hns.htm
Indian Nuclear Society	www.indian-nuclear-society.org.in
Israel Nuclear Society	meins@tx.technion.ac.il
Korean Nuclear Society	www.nuclear.or.kr/e_introduce.php
Lithuanian Energy Institute	www.lei.lt
Malaysian Nuclear Society	www.mint.gov.my/mns
Nuclear Energy Society of Kazakhstan	www.nuclear.kz
Nuclear Energy Society of Russia	ns@kiae.ru
Nuclear Energy Society of Slovenia	www.drustvo-js.si
Nuclear Energy Society of Thailand	www.nst.or.th
OECD/Nuclear Energy Agency	www.nea.fr

Polish Nuclear Society	www.ptn.nuclear.pl
Romanian Nuclear Energy Association	www.aren.ro
Romanian Society for Radiological Protection	www.ispb.ro/rsrp.htm
Slovak Nuclear Society	www.snus.sk
Sociedad Nuclear Española (SNE)	www.sne.es
Sociedad Nuclear Mexicana	www.sociedadnuclear.org.mx
Ukrainian Nuclear Society	www.ukrns.odessa.net
Women in Nuclear – Global	www.win-global.org
Affiliated National Societies	**Website or E-Mail Address**
Belgian Nuclear Society	www.bns-org.be
Associated Nuclear Organizations	**Website or E-Mail Address**
International Nuclear Societies Council	http://insc.ans.org
Pacific Nuclear Council	www.pacificnuclear.org
Non-U.S. Local Sections	**Website or E-Mail Address**
Austrian Section	
French Section	http://local.ans.org/france/
Italian Section	
Japanese Section	
Latin American Section	www.las-ans.org.br
Korean Section	
Swiss Section	
Taiwan Section	u805301@taipower.com.tw

Calendar of Events

Some Upcoming International Conferences on Nuclear and Related Topics

(Please send us information about your upcoming conferences, for inclusion in this space.)

2010

- 24-27 May: 31st Annual Conference of the Canadian Nuclear Society and 34th CNS/CNA Student Conference, Montréal, Québec, Canada

- 26-28 May: NUCLEAR 2010, Pitești, Romania – http://www.nuclear.ro

- 30 May - 2 June: ENC 2010, European Nuclear Conference 2010, Barcelona, Spain – http://www.euronuclear.org

- 13-17 June: ANS Annual Meeting, San Diego, CA, USA – http://www.ans.org/meetings

- 20-22 June: Canadian Nuclear Society Workshop on Nuclear Education and Outreach

(NEO 2010), Calgary, Alberta, Canada; organized by Canadian Nuclear Society – http://cns-snc.ca/events/neo-2010/

- 21-25 June: LAS/ANS 2010 Symposium, "New Technologies for the Nuclear Fuel Cycle", Rio de Janeiro, Brazil – http://www.las-ans.org.br

- 12-18 July: Sixth International Youth Nuclear Congress (IYNC), Cape Town, South Africa – http://www.iync.org

- 19-20 July: Small Modular Nuclear Reactor Systems Symposium, Washington, DC - http://www.euci.com/conferences/0710-smr/

- 8-11 August: Utility Working Conference, Amelia Island, FL, USA – http://www.ans.org/meetings

- 8-13 August: ASME International Heat Transfer Conference (IHTC-14), Washington, DC, USA – http://www.ans.org/meetings

- 15-18 August: Uranium 2010, 3rd International Conference on Uranium and 40th Annual Hydrometallurgy Meeting, Saskatoon, Saskatchewan, Canada – http://www.metsoc.org/u2010/

- 29 August – 2 September: Decommissioning, Decontamination and Reutilization, DDR 2010, Idaho Falls, ID, USA – http://ddrtopical2010.org

- 19-23 September: Plutonium Futures 2010 – The Science, Bloomfield, CO, USA - http://www.ans.org/meetings

- 26-29 September: LWR Fuel Performance Meeting/ Top Fuel, Orlando, FL, USA - http://www.ans.org/meetings

- 26-30 September: Fontevraud 7, "Contribution of Materials Investigations to Improve the Safety and Performance of LWRs", Avignon, France, http://www.sfen.fr

- 3-7 October: Tenth International Topical Meeting on Nuclear Applications of Accelerators (AccApp '10), Knoxville, TN, USA – http://www.ans.org/meetings

- 3-7 October: ICEM'10, "13th International Conference on Environmental Remediation and Radioactive Waste Management", Tsukuba, Japan; contact: icem10@numo.or.jp

- 3-10 October: International Conference on Water Chemistry of Nuclear Reactor Systems (NPC 2010), Québec City, QC; organized by Canadian Nuclear Society (http://www.cns-snc.ca)

- 3-10 October: Tenth International Topical Meeting on Nuclear Applications of Accelerators (AccApp '10), Knoxville, TN – http://www.nd2010.org

- 7-10 October: India Nuclear Energy 2010, "Energy Security for the Future…", Bombay Exhibition Centre, Mumbai, India – http://www.indianuclearenergy.net.

- 10-14 October: 8th International Topical Meeting on Nuclear Reactor Thermal-Hydraulics, Operation and Safety (NUTHOS 8), Shanghai, China – http://www.nuthos-8.org

- 11-13 October: 2nd International Conference on "Asian Nuclear Prospects 2010" (ANUP 2010), Radisson Resort Temple Bay Mamallapuram, Chennai, India – http://www.anup2010.com.

- 18-20 October**:** 5th International Conference on High Temperature Reactor Technology (HTR 2010), Prague, Czech Republic – http://www.htr2010.eu

- 24-28 October: 9th International Conference on Tritium Science and Technology (TRITIUM-2010), Nara, Japan – E-mail uda.tatsuhiko@nifs.ac.jp

- 24-30 October: 17PBNC, 17th Pacific Basin Nuclear Conference, "Nuclear Energy: An Environmentally Sound Option", Cancún, México; organized by Sociedad Nuclear Mexicana - http://www.pbnc2010.org.mx

- 1-3 November: Canadian Nuclear Society Technical Meeting on Low-Power Critical Facilities, "Celebrating ZED-2's 50th Anniversary", Ottawa, ON, Canada – http://www.cns-snc.ca

- 7-11 November: ANS Winter Meeting and Nuclear Technology Expo, Las Vegas, NV, USA – http://www.ans.org/meetings

- 7-11 November: NPIC&HMIT 2010, 7th International Topical Meeting on Nuclear Plant Instrumentation, Control and Human Machine Interface Technologies, Las Vegas, NV, USA – http://www.ans.org/meetings

2011

- 13-16 March: 5th International Symposium on Supercritical-Water-Cooled Reactors, Vancouver, Canada – http://www.cns-snc.ca

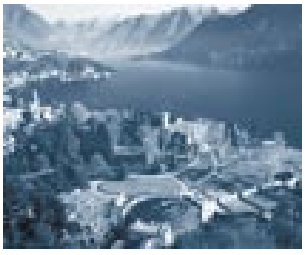
- 13-17 March: International Topical Meeting on Probabilistic Safety Assessment and Analysis (PSA 2011), Wilmington, NC, USA – http://www.ans.org/meetings

- 10-14 April: International High-Level Waste Management Conference, Albuquerque, NM – http://www.ans.org/meetings/ihlrwm.

- 8-12 May: International Conference on Mathematics and Computational Methods Applied to Nuclear Science and Engineering (M&C 2011), Rio de Janeiro, Brazil – http://www.tdn.com.br/mc2011/
- May: PHYTRA 2, Fez, Morocco
- 12-15 June: 32nd Annual Conference of the Canadian Nuclear Society and 35th CNS/CNA Student Conference, Niagara Falls, Ontario, Canada – http://www.cns-snc.ca
- 19-24 June: ICRER 2011, McMaster University (Hamilton, Ontario), Canada – http://www.ecorad2011.net
- 26-30 June: ANS Annual Meeting, Hollywood, FL, USA – http://www.ans.org/meetings
- 7-10 August: Third International Joint Topical Meeting on Emergency Preparedness and Response and Robotics and Remote Systems, Knoxville, TN, USA – http://www.ans.org/meetings
- September: Global 2011, "Innovative Nuclear Energy Systems Toward 2030 and Beyond", Japan; organized by Atomic Energy Society of Japan
- 11-15 September: Canadian Nuclear Society Waste Management Conference 2011, Toronto, Ontario, Canada - http://www.cns-snc.ca
- 18-23 September: 3rd International Nuclear Chemistry Congress (3rd-INCC), Città del Mare, Palermo, Sicily, Italy – http://3rdINCC.MI.INFN.IT
- 25-29 September: 14th International Topical Meeting on Nuclear Reactor Thermalhydraulics (NURETH-14), organized by the Canadian Nuclear Society, Toronto, Ontario, Canada – http://www.cns-snc.ca
- 30 October-3 November: ANS/ENS International Winter Meeting and Nuclear Technology Expo, Washington, DC, USA – http://www.ans.org/meetings

2012

- 24-28 June: ANS Annual Meeting, Chicago, IL, USA – http://www.ans.org/meetings
- September: 8th International Conference of Nuclear and Radiochemistry (NRC-8), Lake Area, North-East Italy, Chairman Mauro Bonardi (Mauro.Bonardi@mi.infn.it) – http://nrc8.mi.infn.it



- 11-15 November: ANS Winter Meeting and Nuclear Technology Expo, San Diego, CA, USA – http://www.ans.org/meetings

2013

- 16-20 June: ANS Annual Meeting, Atlanta, GA, USA – http://www.ans.org/meetings
- 10-14 November: ANS Winter Meeting, Washington, DC, USA – http://www.ans.org/meetings

➔Contact ANS International Committee Members by E-mail:

Please note: This list does not take into account the new appointments made by incoming ANS President Joe Colvin.

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