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The ANS Globe

…e-news from the ANS International Committee

From the editor

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 your letters, articles, news and/or comments for consideration towards the next issue.

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From the Chair

IC Chair's Column for *The ANS Globe.*

Welcome to the ANS Globe!

As we enter the summer, there is good news about nuclear energy in much of the world. During the last two years, twenty new reactors began operation, the highest number since the 1980s, according to the International Atomic Energy Agency (IAEA). The highest number of reactors were in operation as of December 31, 2016 – 448, with a capacity of 391 GW – in 30 countries. In addition, 60 new nuclear plants were under construction in 15 countries; unfortunately, three were permanently shut down.

In the U.S., although four new nuclear plants are under construction, low-cost electricity threatens many operating nuclear plants in deregulated markets. On the bright side, advanced reactors are coming closer to fruition, and the nuclear energy national labs are providing excellent support to advanced reactor and fuel development efforts.

This backdrop gives ANS members a real opportunity to make a difference in their respective nations.

The ANS International Committee (IC) is focused on making a positive difference. At our last meeting in November 2016 in Las Vegas, three subcommittees were formed: Communications, Operations/Commercial Engagement and Professional Development.

Each established a strategic objective:

- Communications: Increase the visibility of the IC and of international opportunities to ANS members.
- Operations/Commercial Engagement: Address key issues and opportunities for nuclear energy internationally.
- Professional Development: Identify and communicate best practices on Professional Engineer licensure practices in key countries.

Over the course of the coming year, the IC will be working on achieving these objectives. As a result, you may be asked by IC members to provide information and insights in one or all of these areas. If you are, I hope you'll give them their time and attention!

All the best!

Mimi Holland Limbach, Chair
ANS International Committee

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.

International Membership of ANS

The ANS Office has done an analysis of the international membership of the ANS. IC Vice-Chair **Luc G.G. Van Den Durpel** has provided this analysis to *The ANS Globe*. This analysis is reproduced here in Appendix 1.

News from Sister Societies and International News

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

The CNS is excited to be co-organising with the ANS Accelerator Applications Division the 13th International Topical Meeting on Nuclear Applications of Accelerators, which is coming up very soon in charming Québec City, Québec, Canada, 2017 July 31-August 4. The conference promises to have an excellent success.

Other CNS events in the next 12 months:

- 2017 September 17-22, 2nd International Meeting on Fire Safety and Emergency Preparedness for the Nuclear Industry (FSEP-2017), Toronto, Ontario, Canada, https://www.cns-snc.ca
- 2017 October 1-4, 11th International Conference on CANDU Maintenance and Nuclear Components (CMNCC-2017), Toronto, Ontario, Canada, https://cns-snc.ca/events/cmncc-2017/
- 2017 October 12-13, CNS CANDU Fuel Technology Course, Ajax, Ontario, Canada
- 2017 December 4-5, CNS Thermalhydraulics Course, Toronto, Ontario, Canada
- 2018 (exact date and venue to be determined): Nuclear-101 Course
- 2018 June 3-6, 38th Annual Conference of the CNS and 42nd CNS/CNA Student

Conference, with a component in Small Modular Reactors, Saskatoon, Saskatchewan, Canada

The most recent development in the Canadian nuclear-power industry is the refurbishment of the Darlington Nuclear Generating Station (4 CANDU 900-MWe reactors). This is a major, 10-year, project, with the reactors to be refurbished one at a time.

New CNS Executive: One week before the ANS meeting in San Francisco, there was the annual turnover in the CNS Executive. The new CNS President is **Daniel Gammage, of Amec Foster Wheeler**, and the First Vice President is **John Luxat, of McMaster University**. **Peter Ozemoyah, of Tyne Engineering**, becomes the immediate Past President.

- **Germany**

IC Member Arkady Serikov sent the following report on fusion neutronics news and on recent ITER neutronics meetings:

ITER Neutronics Meeting at Karlsruhe in 2016

The XIth ITER neutronics meeting was held in Karlsruhe, May 23-27, 2016. It was devoted to neutronics issues of the ITER tokamak machine under construction in France: http://www.iter.org. The meeting was organised by the Fusion Neutronics Group of the Institute for Neutron Physics and Reactor Technology (INR), Karlsruhe Institute of Technology (KIT), Germany: http://www.inr.kit.edu/english/index.php. There were 50 participants from the ITER partners China, EU, India, Japan, Russia, South Korea, the US, the ITER organisation and Europe's domestic agency Fusion for Energy (F4E), attending the meeting in person. Remote participation enabled an additional 20 scientists abroad to take an active part in the meeting. The meeting website URL was: http://www.inr.kit.edu/english/733.php.

The main aims of the meeting were to present and discuss recent results of ITER neutronics analyses, nuclear integration issues, developments in radiation transport simulation and modelling as well as neutronic experiments, measurements, and related issues relevant to ITER.

The meeting was opened by Dr. Klaus Hesch, head of KIT's fusion programme, who presented an introduction to KIT and its fusion programme. Dr. Mike Loughlin, nuclear analysis co-ordinator of the ITER organisation, provided an overview of the nuclear integration activities at ITER detailing the organisation, tasks and the strategy of the newly formed Nuclear Integration Unit (NIU).

A major part of the meeting was devoted to the recent achievements in the field of advanced computational methods and tools dealing with various aspects of the radiation transport simulation. Several codes have been developed to enable the use of CAD geometry data in Monte Carlo transport calculations including MCAM of the FDS team, Hefei/China,

McCad of KIT and DAG-MCNP of the University of Wisconsin, Madison/USA. A trend became evident to make use of meshed or facetted geometry models in Monte Carlo transport calculations. The main Monte Carlo code used for ITER nuclear analyses is MCNP5/6 developed by LANL, Los Alamos, USA. Other advanced Monte Carlo codes include FDS' SuperMC and TRIPOLI-4 developed by CEA, France, the open source codes SERPENT, developed by VTT, Finland, and GEANT-4, developed by CERN. The ADVANTG approach, developed by ORNL, Tennessee/USA, provides a very efficient scheme for the automated calculation of weight windows maps which can be used by MCNP for the calculation of global distributions including deep penetration transport.

Nuclear analyses results were reported on several systems and issues, including calculations of radiation maps through the Tokamak complex, the effect of the activated cooling water and the torus dust filter system, shielding analyses for the bio-shield, port plugs and related radiation cross-talks, heating of the vacuum vessel and the shield blanket modules, as well as analyses of special diagnostic systems such as the radial neutron camera, the x-ray crystal spectrometer, the collective Thompson scattering system, ECH and CXRS launcher systems. In addition, analyses were presented on the effect of runaway electrons with the subsequent emission of x-rays and neutrons.

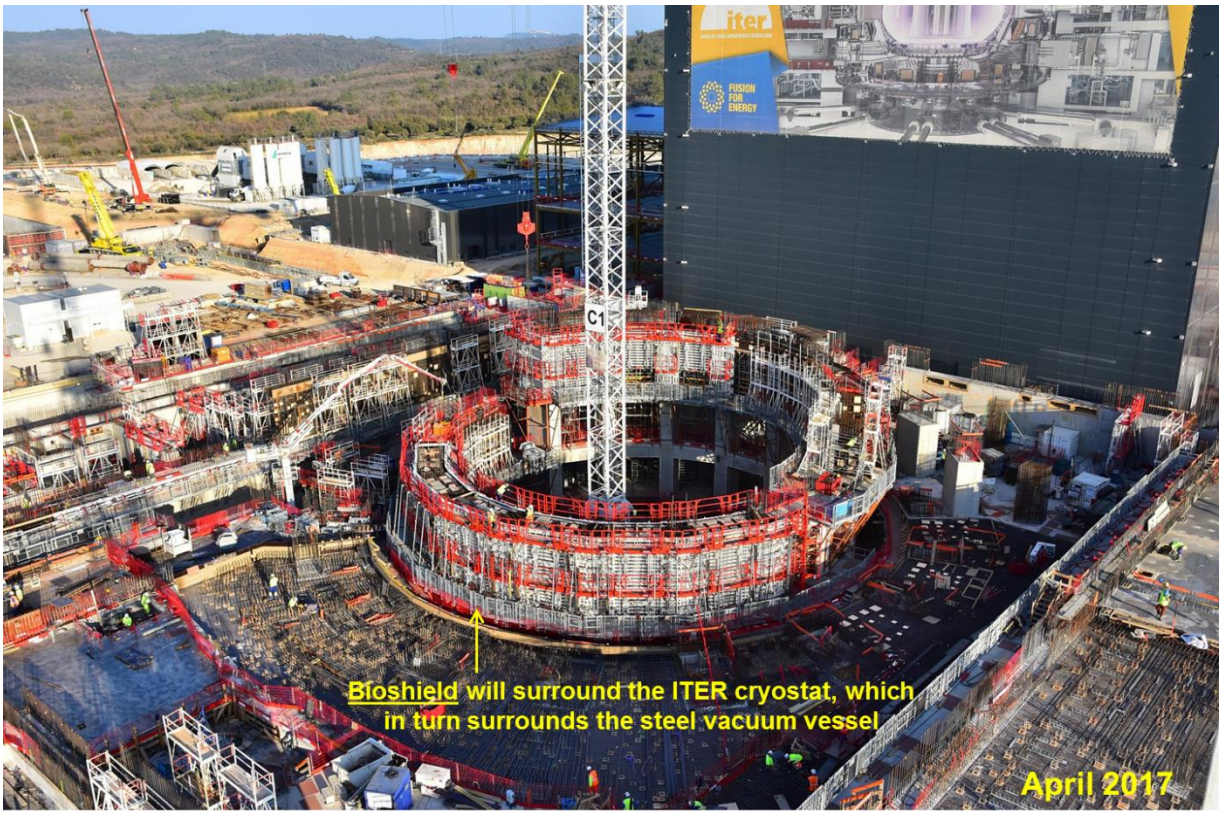
Participants of the XIth ITER neutronics meeting held in Karlsruhe, May 23-27, 2016.

ITER Neutronics Meeting at Cadarache in 2017

The XIIth ITER neutronics meeting will be held this year on ITER site (Cadarache, France)

from 10 to 12 October 2017. The aims of the meeting are concentrated firmly on ITER related issues in the following fields:

1. Analyses on the ITER tokamak and machine systems;
2. Analyses on buildings and integrated systems (electronics, diagnostic, etc.);
3. Safety, contamination, materials, radwaste;
4. Methodologies and code developments;
5. ITER related experiments on other fusion facilities (JET tokamak in UK, etc.), possible benchmarks, and fusion related nuclear cross-section libraries.



Progress on the ITER tokamak complex construction: April 2017 at ITER site (Cadarache, France)

Fusion Neutronics Session at ANS Annual 2017

A combination of strategic and technical aspects of fusion neutronics progress mostly related to ITER will be presented on two sessions "Neutronics Challenges of Fusion Facilities - I and II" of the 2017 Annual Meeting at the Hyatt Regency, San Francisco on June 11-15, 2017. The sessions' content include achievements in code developments for coupling of radiation transport with activation analysis in 3D CAD geometry, and fusion neutronics applications. Taking advantage of the meeting venue, a technical tour to National Ignition Facility (NIF) at Lawrence Livermore National Laboratory is organized as well.

- **Japan**

Kiyoshi Yamauchi, ANS Japan Local Section and IC member, sent the following report from Japan, which I have edited slightly:

1. Energy Policy and Activities of Ministry of Economy, Trade and Industry (METI)

The revised "Energy Basic Plan", approved by the Cabinet on April 11, 2014, emphasized that nuclear energy would be one of the important base load power and that dependency on nuclear power generation would be reduced as much as reasonably possible. Consistent with the above energy basic plan, METI, decided the desirable "power best mix" in 2,030, as electric power base, on July 2015, features 20-22 % of nuclear, down from about 30 % before "the Great earthquake disaster" of 2011. The "Energy basic Plan" is expected to be revised this year.

2. Nuclear Regulation

(1)Nuclear Regulatory Authority

We have five Commissioners in the NRA and the term of Shunichi Tanaka, as Chairman will expire in September 2017. Toyoshi Fuketa, current Commissioner, is expected to take over this position for the next term of 5 years.

(2) Fracture Zone Issue

Although the "Knowledgeable Specialist Sub-Committee" formed by the NRA, concluded that the fracture zones at Tsuruga-site, Higashidori-site and Shika-site should be treated as active faults, final decision has not been made in the plant re-start application review. Concerning Mihama-site and Monju-sate, Sub-Committee reported to NRA that the possibility of activity after Late Pleistocene would not be recognized.

(3) Monju (Prototype FBR) Issue

NRA issued a recommendation that the existences of Monju (Prototype FBR) should be reviewed unless an alternate organization having the capability to perform safety power operation of Monju be identified in place of JAEA on Nov. 13, 2015. After receiving the MEXT (Ministry of Education, Culture, Sports, Science and Technology) final report to the above request, the Government decided that Monju will be decommissioned, whereas the promotion of the fuel cycle and the development of fast reactors will be pursued. The Road Map will be made by 2018.

(4) Review of Current Inspection System

In order to respond to the IAEA Integrated Regulatory Review Service (IRRS) held in January 2016, the NRA formed the "Study Team to Review the Current Inspection System" on May 11, 2016. The intermediate proposal for the revised system incorporating the concept of "Reactor Oversight Process" (ROP) currently used in the US, was formulated on November 18. The Revised Nuclear Reactor Regulation Law reflecting this issue was approved by the Cabinet on February 7, 2017 and was approved by the Parliament on April 7. A discussion on making a detailed rule will proceed.

3. Status of LWRs Restart

The new safety regulation for commercial LWRs was enforced in July 2013, and applications for NRA review on conformity with new safety standard for restart were started. Applications as of April 2017 are still 26 reactors at 16 sites (16 PWR, 4ABWR, 6 BWR). Most recently, Genkai 3&4 granted approval of restart in January 2017 and the total number of approved plants is 9, all of which are PWRs. 3 plants among 9 approved plants have already been restarted. Also, plant life extension approval was granted for Takahama 1&2 in June 2016 and Mihama-3 in November 2016.

Applicant	NPP	Type	Commercial Operation start	Application
Hokkaido	Tomari 1 Tomari 2 Tomari 3	PWR PWR PWR	1989 1991 2009	July, 2013
Kansai	Ohi 3 Ohi 4	PWR PWR	1991 1993	July, 2013
	Mihama 3	PWR	1976	March, 2015 (Life Extension Approved, November 2016)
	Takahama1 Takahama2	PWR PWR	1974 1975	Approval Obtained (June ,2016) (Life Extension Approved, June 2016)
	Takahama 3	PWR	1985	Restarted(January2016) but shut down(March2016) *
	Takahama 4	PWR	1985	Approval obtained (February 2015)
Shikoku	Ikata 3	PWR	1994	Restarted (September, 2016)
Kyushu	Sendai 1	PWR	1984	Restarted (September,2015)
	Sendai 2	PWR	1985	Restarted (November, 2015)
	Genkai 3 Genkai 4	PWR PWR	1994 1997	Approval Obtained (December, 2017)
Tokyo	Kashiwazaki-Kariwa 6 Kashiwazaki-Kariwa 7	ABWR ABWR	1996 1997	Sept. 2013
Chugoku	Shimane 2	BWR	1989	Dec. 2013
Tohoku	Onagawa 2 Higashidori 1	BWR BWR	1995 2005	Dec. 2013 June 2014
Chubu	Hamaoka 3 Hamaoka 4	BWR BWR	1987 1993	June 2015 Feb. 2014

Hokuriku	Shika 2	ABWR	2006	Aug. 2014
JAPC	Tokai 2 Tsuruga 2	BWR PWR	1978 1987	May 2014 Nov 2015
EPDC	Ohma (Full Mox)	ABWR	Not yet	Dec.2014

* Although Takahama unit 3 was shut down due to Otsu District Court, Judgement on March 10, 2016, High Court approved KEPCO's appeal on pertaining to temporary restrarting on March 28, 2017. Takahama Unit3 is expected to be restarted in May 2017.

4. Juridicial Issue (Related to the plants already restarted)

(1) Takahama Units 3&4

After restart of Takahama Unit 3, Otsu District Court issued provisional disposition to prevent the restart and Takahama unit 3 turned to shutdown on March 10, 2016. KEPCO raised objections, but Otsu District Court rejected this objection in July 2016. KEPCO raised appeal pertaining to temporary restarting order to Osaka High Court in July 2016 and the High Court approved KEPCO's appeal on March 28, 2017. Takahama Unit3 is expected to be restarted in May 2017.

(2) Sendai Units 1&2

On April 22, 2015, Kagoshima District Court rejected a request by a group of local antinuclear residents for a temporary injunction to prohibit the restart of the Sendai 1&2 of Kyushu Electric Power Company. Although anti-nuclear residents raised immediate appear against this decision, Fukuoka High Court rejected this request in the Immediate Appeal Court on April 6, 2016. Anti-nuclear group requested to Fukuoka District Court to cancel the approval of reactor permit on June 10, 2016.

(3) Ikata Unit 3

Temporary injunction to prohibit the restart of the Ikata Unit 3 by anti-nuclear group was raised to Hiroshima District Court on March 11, 2016, to Matsuyama District Court on May 13, 2016 and to Oita District Court on June 24, 2016. On March 30, 2017, Hiroshima District Court rejected the injunction request.

5. Activities of the Nuclear Risk Reserch Center (NRRC)

(1) NRRC was formed in the Central Research Institute of Electric Power Industry (CRIEPI) on October 1, 2014 for research and development of the comprehensive risk assessment utilizing PRA based on the lessons learned from Fukushima Daiichi Nuclear Power Station Accident. Dr. George Apostolakis, the former NRC Commissioner is the Head and Dr. Richard A. Meserve, the former NRC Chairman is the Executive Adviser. Technical Advisory Committee has been held every three to six months.

(2) Ikata unit 3 of Shikoku Electric Power Company was already selected as a PWR pilot plant and Kashiwazaki Kariha unit 6 &7 as a BWR pilot plant. "Risk Informed Decision Making(RIDM) Promotion Team", formed in July 2016, has been working to support utilities' to establish the process of risk-informed decision making. Dr. Apostolakis has been continuing to see CEOs of Electric Power Companies and to visit plant sites. CRIEPI will have an annual Research Report Symposium 2017 focused on NRRC activities on May 18 this year.

6. Activities of Atomic Energy Society of Japan (AESJ) (http://www.aesj.or.jp/en/)

ANS and Atomic Energy Society of Japan (AESJ) have established a bilateral agreement in 1999 to provide a mutual cooperation and since then AESJ is one of the so-called "sister-societies" of ANS.

Atomic Energy Society of Japan (AESJ, established in 1959) and AESJ have been promoted our activities for the purpose of the public safety with priority, the promotion of the science and technology in nuclear energy and radiation for the peaceful use, the utilization and widespread thereof, and hence the environmental preservation and the contribution to the development of society, following the Articles of Incorporation, which was amended in 2013, out of regret that the Fukushima Accident was not prevented beforehand.

(1) Domestic Activities

In 2016, as a Fukushima-related activity, the Fukushima Decommissioning Committee of AESJ continues a scientific advice activity for the decommissioning of the Fukushima Daiichi plant and a follow-up activity of about fifty suggestions in the "The Fukushima Daiichi Nuclear Accident", a report compiled by the AESJ Investigation Committee.

Also, the Fukushima Special Project of AESJ has continued activities such as Symposium or a support to Fukushima resident in conjunction with both domestic and international organizations. In 2016, AESJ held two Symposiums in Iwaki-city, Fukushima and Tokyo as well as several residential talk forums in various places in Fukushima area, support activities for decontamination facilitation, and making suggestions for middle-long term measures for environmental remedy activities.

Moreover, as an academic activity, AESJ had a "Investigative Advisory Committee on Seismic Activity of Faults and Engineering Risk Assessment", where many experts from other academic societies joins, and AESJ hosted an information exchange meeting and promoted a activity as a host society in "the Academia Network to Contribute to Fukushima Recovery and Decommissioning Promotion", where more than 30 academic societies join.

For annual conference and meetings, 2016 Fall Meeting was held at Kurume-city in Kyushu and 2017 Spring Annual Meeting at Tokai University in Hiratsuka-city, Kanagawa, where many special plenaries and sessions, such as post-Fukushima session, are organized and implemented successfully under cooperation with the Local Section of AESJ and a local organising committee.

For presentation of Awards, AESJ Society's Award, Follow Award, Local section Award, Sub-committee Award and others are presented at the Annual Meeting. In addition, in order to promote efficient management and to improve financial basis of AESJ, a special "Management Improvement Committee" continues its activity. The current number of members is 7,297. There are also 230 corporate members.

(2) International Activities

(2-1) International Conferences

- AESJ hosted:
  - Asia Nuclear Prospects International Conference 2016 (ANUP2016), October 24-17 at Sendai-city.
  - 10th Japan-Korea Symposium on Nuclear Thermal Hydraulics and Safety (NTHAS-10), November 21-30 at Kyoto.
  - Also, started preparation for ICAPP2017 in April, 2017, where AESJ is a host organizer.
- AESJ co-hosted:
  - 2016 International Congress on Advances in Nuclear Power Plants (ICAPP2016) , April 17-20 at San Francisco.
  - 11th International Conference on Tritium Science and Technology, April 17-22 at Charleston.
  - PHYSOR2016, May 1-5, at Sun Valley.
  - PATRAM2016, September 18-23 at Kobe.
  - 11th International Topical meeting on Nuclear Thermal Hydraulics, Operation and Safety (NUTHOS11), October 9-11 at Gyeongju.
- AESJ sponsored or supported:
  - OPTICS & PHOTONICS International Congress 2016, May 17-20, Yokohama.
  - The 24th International Conference on Nuclear Engineering (ICONE24), June 26-30, Charlotte.
  - Decommissioning and Remote Systems (D&RS 2016), July 31-August 4, Pittsburgh.
  - Joint 8th Intelligent Systems and 17th International Symposium on Advanced Intelligent System (SCIS&ISIS2016), August 25-28, Sapporo.
  - TopFuel 2016, September 11-16, Idaho.
  - 13th International Conference on Probabilistic Safety Assessment (PSAM13), October 2-7, Seoul.
  - The 20th Nuclear Plant Chemistry Conference (NPC 2016), October 2-7, Brighton.

(2-2) International Exchange Programs

- As a Japan-US-Europa Nuclear Student International Exchange Program, two students are despatched.
- As a Japan-Korea Nuclear Student and Young Generation Researcher Exchange, five Subcommittee groups of AESJ held Student Seminars.
- AESJ supported activities of INSC (International Nuclear Societies Council) and PNC (Pacific Nuclear Council). AESJ attended two INSC's Meetings, at April 19 in San Francisco and at September 27 in Vienna, respectively, where a statemant "The Path Forward After COP-21", which announces the effectiveness of nuclear power generation for the COP21 statement in 2015 and COP22 statement in 2016, was declared.

- Articles of "Nuclear Power in Japan" was submitted for ANS Globe in April and September, respectively, where brief description of energy policy in Japan, restart of nuclear power plants, Fukushima recovery and AESJ's activities, was provided.
- AESJ sent three YGN committee members to IYNC2016 (International Youth Nuclear Congress 2016) in July 2016.

7. Activities of ANS Japan Section (http://aesj.or.jp/kaigai/en/index.html)

ANS Japan Section is managed by the International Nuclear Information Network (ININ) of AESJ.

The members about 190 and among them, the number of ANS national members is about 20. There are ten officers in the Executive Committee. Besides semi-annual Members General Meeting, and Executive Committee Meeting, seven times per year, major activities were four lecture meetings with invited lecturers:

- "The Nuclear Development in China" by Dr. Fengjun Duan, Senior Research Fellow in the Canon Institute for Global Studies, at June 30,
- "The UK Nuclear Industry, Past, Present and Future" by Dr. Keith Franklin, First Secretary(Nuclear), British Embassy Tokyo, at September 9,
- "Looking Forward: Nuclear energy Issues and Opportunities" by Mr. William D. Magwood IV, Director-General, OECD/NEA, at December 1,
- "OECD/NEA Databank: History, Current status, Future challenges and Relation with Japan" by Mr. Kiyoshi Matsumoto, Fellow at the Waseda University/ ex-Head of OECD/NEA Databank, at March 28.

One special activity is that we had an opinion-survey on the activities and the value on ANS Japan Section, as well as AESJ ININ's activities and we had both positive comments and negative comments on our activities from our members. This will be an effective action for vitalization of local section activities. Also, the chair and the executive committee members had opportunities to meet Ms. Gale Hauck, a member of Board of Directors of ANS, in Japan and we got valuable advices on the our activities.

The Second General Meeting for Section members was held in the AESJ's Spring Meeting in March 2017 at the Tokai University at Hiratsuka-city, Japan. The Officers for 2017 was elected in March 2017 and Mr. Hamamoto of Hitachi-GE Nuclear Energy, Ltd, become a new Chair of The Executive Committee for 2017, which is effective April 2017 to March 2018, and started activities for 2017.

8. Recent Status of Fukushima Daiichi NPP Restoration

(1) Means for Contaminated Water Treatment

"Fukushima Daiichi Decontamination and Decommissioning Engineering Company" has been working to cope with the contaminated water based on the three strategies, i.e., "removal of contaminated source", "keeping of ground water away from the contaminated source", and "preclusion of the contaminated water leakage". The extraction of contaminated water and the blockage of the Sea Water piping trench was completed in March 2017. Freezing operation of water shielding

wall at the mountain side has been started on March 2016 and freezing to 0℃was achieved on October 2016.

(2) Fuel Removal from Spent Fuel Pit
As for Unit 4, all spent fuel was already removed by December 22, 2014. As for Unit 1, the reactor building cover dismantle has been started in March 2017 and fuel removal is expected to be started in 2020. As for Unit 2, fuel removal is expected to be started in 2020. As for Unit 3, removal of large rubble in the spent fuel pit was completed and fuel removal is expected to be started late this year.

(3) Investigation of in-core monitoring
Investigation by camera inside the containment vessel (PCV) of Unit 2 was conducted in March 2017. This is the first trial of taking pictures by camera inside the PCV. Debria appeared on the grating under the reactor vessel (RPV) and it is expected that this could be fuel debria with structures, melt through the RPV. This information could be important input to decide the technical method to taking out the fuel debris.

(4) Radioactive Waste Management
As of December 2016, the volume of contaminated water stored in the tanks is one million m^3 and the volume of solid radioactive waste is 0.35million m^3.

(5) Work Environment
According to the progress of radiation dose reduction means inside the site, areas around the reactor building were categorized based on the radiation level and the radiation protection burden during work activities at the low level radiation area could be relaxed. Limited trial has been started on Match 8, 2016 and the expanded application has been started on March 30, 2017.

(6) Research and Development
"International Research Institute for Nuclear Decomissioning" (IRID) has been working for research and development of decomissioning of Fukushima Daiichi using the fund from Ministry of Economy, Technology and Industry (METI) in accordance with the road map described below.
Major areas of research and development are as follows;
・Removal of spent fuel
・Preparation of fuel debris removal (Investigation technology inside PCV, Investigation
- technology inside RPV, Monitoring technology of fuel debris, Fundamental technology for removal of fuel debris and reactor internal structure, etc.

(7) Road Map and Technical Strategic Plan
"The Intermediate and Long Term Road Map for Fukushima Decommissioning and Contaminated Water Removal", originally issued on December 2011 and most recently revised, reflecting the progress of the recovery work at the site, comments from the Fukushima Council, and the strategic study by NDF, was approved by the Ministerial Meeting on June 12, 2015. Major points of this road map are "emphasis

on risk reduction rather than speed", "explicit schedule of near time frame". In order to provide the technical basis to the above road map, NDF issued "The Technical Strategic Plan 2015" on April 30, 2015 and "The Technical Strategic Plan 2016" on July 23, 2016. The policy on how to take out the fuel debris is expected to be determinsd in the middle of 2017 and the procedure how to take out the first fuel debris in the first half of 2018.

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

The following articles are gleaned from OECD NEA monthly reports.

Advancing to address Fukushima Daiichi Remediation

On 23 April 2017, Japan Atomic Energy Agency (JAEA) held the opening ceremony of the new Collaborative Laboratories for Advanced Decommissioning Science (CLADS) research centre in Tomioka, Fukushima. NEA Director-General Mr William D. Magwood, IV delivered remarks at the ceremony, alongside Ministry of Foreign Affairs, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) State Minister Toshiei Mizuochi, Fukushima Governor Masao Uchibori, Minister for Reconstruction and Minister in charge of Comprehensive Policy Coordination for Revival from the Nuclear Accident at Fukushima Masayoshi Yoshino, and other high-level participants. During his speech, Mr. Magwood underlined the importance of JAEA/CLADS as both an international research hub and a symbol of the shared international interest in safely decommissioning the Fukushima Daiichi site. The CLADS was established in 2015 to advance research needed to decommission the Fukushima Daiichi site. The NEA has a number of current and proposed joint projects working with the JAEA/CLADS in the areas of accident analysis, fuel debris characterisation and radioactive waste management.

Optimising Safety and Efficiency in Nuclear Decommissioning

On 7-9 February 2017, the NEA in collaboration with the International Atomic Energy Agency (IAEA) held a Workshop on Current and Emerging Methods for Optimising Safety and Efficiency in Nuclear Decommissioning, an issue of growing importance for many countries worldwide. Hosted in Norway by the Institute for Energy Technology (IFE) on behalf of the **NEA Halden Reactor Project**, the workshop was attended by more than 100 participants from 25 countries, representing a wide range of stakeholders, including operators, regulators, scientists, consultants and contractors. It

provided an opportunity for the participating experts to exchange information and views on lessons learnt from ongoing and completed decommissioning projects; ongoing and future R&D and collaboration needs; and methods for improving decommissioning strategies. The workshop programme also featured demonstrations of advanced computer-aided technologies in support of decommissioning planning. Participants concluded that the sharing of knowledge and experiences and technology demonstrations at the workshop would be useful for many nuclear facilities worldwide in addressing the existing decommissioning challenges.

Nuclear Skills and Education in NEA Member Countries

On 4 November 2016, the NEA Steering Committee held a policy debate on nuclear skills and education in NEA member countries, an increasingly important challenge concerning not only countries that rely on nuclear power, but also newcomer countries and those countries that have decided to phase out its use. Speakers included Dr. F. Rayment of the UK National Nuclear Laboratory (NNL), Prof. P. Wilson of the University of Wisconsin-Madison, Mr. A. Kordas of the Polish Ministry of Energy, Mr. J. Schmid of the Swiss Federal Nuclear Safety Inspectorate (ENSI) and Dr. S. Oh of the Korea Electric Power Corporation (KEPCO) International Nuclear Graduate School. Participants in the debate noted that there has been a long-standing trend in many countries where the increasing age of experts in the nuclear field and the closure of experimental facilities are eroding the nuclear skills base and the infrastructure needed to renew these capabilities. They acknowledged that a partnership approach that includes government, industry, academia and training providers can contribute significantly to addressing the skills challenge by ensuring better co-ordination, attractiveness of education programmes and the funding of such programmes. The potential benefits of a co-ordinated international response to help maintain nuclear skills and education was also highlighted.

Ensuring Food Safety in a Post-Accident Situation

On 8-10 November 2016, the NEA held an international workshop on "Post-accident Food Safety Science" in Fukushima, Japan. Hosted by the Cabinet Office of the Government of Japan, the workshop brought together 137 participants, including experts and scientists from ten countries and local residents, to discuss the state of the art in post-accident food safety science; the local, national and international management of post-accident food safety; and approaches for addressing associated challenges. The workshop started with two sessions describing the current state of food and agriculture in Japan and the extensive work done in the aftermath of the Fukushima Daiichi nuclear power plant accident by farmers, distributors, prefectures and the central government to ensure that marketed products meet rigorous national standards. The final two sessions addressed the international standards, decontamination and measurement science, as well as the post-Chernobyl food management experience of Belarus, Norway and the United Kingdom. The workshop, which also featured a technical site visit to several food monitoring facilities, concluded that food

management efforts of Japan were excellent and represented a good technical example for other countries.

- **Spain**

IC Member Santiago San Antonio sent the following contribution from the Spanish Nuclear Society, Sociedad Nuclear Española (SNE)

Spanish Nuclear Power Plants in 2016; Experiences and Prospects

A new edition of the Conference *"Nuclear Power Plant in 2016. Experiences and Perspectives"* was held at the School of Industrial Engineers of the Polytechnic University of Madrid. More than 250 delegates from the Spanish nuclear industry dealt with relevant issues of the operation of nuclear power plants in the last year and the future of the nuclear sector. The conference was also attended by teachers and students of the masters of nuclear energy programmed in the country.

The "Nuclear España 2016" awards were given out. The prize for the best article of the magazine published by Nuclear Spanish Society was awarded to José Antonio Blanco Rodríguez, Ana Isabel Calín Lorca and Rafael Herranz Crespo for their article "Radiotherapy. A constant therapeutic procedure for cancer treatment". The best Nuclear España 2016 issue was awarded to "Medical applications of radiation".

The SNE award for the best doctoral thesis in 2016 was given out to Marcelo Roldán Blanco, student of Rey Juan Carlos University in Madrid, for his work "Characterization of the effects of He implanted in the fusion materials EUROFER97 and EU-ODS EUROFER through nanoindentation and transmission electron microscopy".

cont'd

Finally, the award to the best nuclear master project 2016 was given out to Jara Turégano for his work "Simulation of the HPGe detector for laboratory gamma spectrometry measurement and model verification ".

ONE-DAY TECHNICAL MEETING ON "RENEWAL OF LICENSE FOR LONG-TERM OPERATION"

The "SNE One-Day Technical Meeting" was held on April 6**th** at the headquarters of Tecnatom in Madrid with the participation of 60 professionals from the nuclear sector. The session addressed the issue "Renewal of license for the long-term operation", stating that the long-term operation of nuclear power plants is a feasible possibility while maintaining the same or greater levels of safety and reliability.

43ª SNE ANNUAL MEETING

The 43rd (changed) Annual Meeting of the Spanish Nuclear Society will take place on

Málaga
SOCIEDAD NUCLEAR ESPAÑOLA
43 REUNIÓN ANUAL
4-6 Octubre 2017

October 4th, 5th and 6th in the city of Málaga, in the south of Spain, with the motto "We contribute to sustainability". ENDESA will be the host company of the meeting. Two plenary sessions have been scheduled, as well as several workshops and monographic, oral and poster sessions. More than 600 delegates are expected to attend the Meeting. All the information about SNE Annual Meeting can be found on the website (www.reunionanualsne.es).

NEW BOARD OF DIRECTORS OF THE SNE

The General Assembly of the SNE has elected the new Board of Directors, chaired by José Antonio Gago. Javier Guerra is the new Vice President, Rafael Vargas the General Secretary, Francisco García Acosta the Treasurer, and Mariano Carreter, Miguel Ángel Cortés and Franscisco Tarín are new members.

EMPLOYMENT AND PROFESSIONAL DEVELOPMENT COMMISSION

The new Employment and Professional Development Commission of SNE has the mission to promote and manage the Talent Attraction Project. The aim is to encourage students, in the last year of their career or recent graduates, to be interested in nuclear technology and to be aware of the attractiveness of nuclear industry.

HISTORIOGRAPHIC PUBLICATIONS PLAN OF SNE

The SNE has prepared a Historiographic Publications Plan on the Spanish nuclear development and its protagonists. Three books have already been published about the life and work of Enrico Fermi, Lise Meitner and Otero Navascués, pioneer of nuclear energy in Spain. The next publications will be "Advancement of Nuclear Science and Technology in Spain, 1948-1960", "First Generation of Nuclear Power Plants" and "Uranium Mining".

SNE POSITION PAPERS

The Spanish Nuclear Society is releasing position papers on topical issues in Spain. These documents are more accessible than other technical publications of the Society. The first two position papers have already been published about "The Useful Life of a Nuclear Power Plant" and "The Management of Radioactive Waste".

SPANISH NUCLEAR SECTOR NEWS
SPANISH NUCLEAR GENERATION IN 2016

The contribution of Spanish nuclear power plants in 2016 to the production of electric energy was equivalent to 22.9 % of the country's total consumption. Nuclear generation was in fact the top-ranking energy source in Spain, followed by wind 19.3 %; hydraulic 14.6 %; coal 14.3 %; cogeneration 10.5 %; gas combined cycle 10.5 % and the remaining renewable 7.9 %.

The current political situation, where the conservative party has to rule in the minority in parliament since October 2016, has opened an intense debate on the renewal of operating licenses for Spanish nuclear power plants.

The Spanish Nuclear Safety Council has approved the restart of the Santa Maria de Garoña nuclear power plant, with the commitment to make some investments. Now, the Government and the owners must decide before August 2017.

In the next few years, the licensees will have to request to the CSN the operation license for their nuclear power plants, to operate beyond the 40 years of its design life. Almaraz I, this year, will be the first Spanish NPP to request a new license. Ignacio Araluce, former Director of WANO in Paris, has been appointed President of the Spanish Nuclear Industry Forum.

- ## Taiwan

IC Member Wei-Wu Chao sent a presentation on an Overview of the Regulatory Program in Taiwan, which he presented at the NRC Regulatory Information Conference in 2017 March.

Because of the format of the presentation, I am attaching it in Appendix 2.

- ## United Kingdom

Adrian Bull, Director of External Relations at the National Nuclear Laboratory, UK, sent the following report.

Nuclear and the UK's Industrial Strategy

In January 2017 the UK Government launched a policy review on the nation's Industrial Strategy. This review is likely to be highly influential in determining the British Government's approach to how it acts to encourage business growth over the coming years.

The nuclear industry was singled out as one of a handful of sectors where intervention by Government - in the form of a "sector deal" - was likely to be beneficial. The policy review therefore represented an excellent opportunity for the nuclear industry to set out the scale and scope of the opportunity facing the sector to contribute to the overall UK economy.

Whilst a General Election was subsequently called in Britain, to take place in June (still to take place at the time of writing this article), there remains an expectation that the Industrial Strategy work will be picked up again by the incoming administration.

The policy review asks a number of specific questions, not all of which are relevant to nuclear matters, but the overall approach is structured under 10 key "pillars", as listed below, and it is notable that the nuclear sector has something substantive to contribute

under each one of these.

1. *Investing in science, research and innovation*

   Not only is the nuclear industry founded on a base of science, technology and innovation, but there is work going on continuously across industry, national labs and academia to bring new, innovative technologies through to commercialisation – in areas such as cleanup and decommissioning as well as reactor design and advanced fuels.

2. *Developing skills*

   As the UK moves forward with its new build programme, whilst simultaneously pushing forward with operation of the existing fleet and the legacy cleanup programme, there is a substantial demand for new recruits to the sector as well as a need to re-skill some existing employees. Encouragement of young people to follow science and engineering subjects in school and university is a particular challenge.

3. *Upgrading infrastructure*

   The UK's new build programme will deliver substantial new power generation infrastructure for the nation, whilst other parts of the sector – such as R&D – are enhancing critical national infrastructure in their own fields.

4. *Supporting businesses to start and grow*

   The UK nuclear supply chain reaches down into hundreds of small and medium-sized enterprises and there is a strong drive – at both national and regional level – to encourage these and similar businesses to enter the sector and to seize the current opportunities as a means of securing growth.

5. *Improving procurement*

   The scale of new build projects reaches into tens of billions of dollars and the UK cleanup programme is funded on the scale of $4 billion per year. Ensuring that procurement on this scale delivers the best value to the industry and to the nation is therefore critical.

6. *Encouraging trade and inward investment*

   The UK has broad and deep experience and capability across the whole nuclear sector, and the opportunity to attract inward investment to Britain whilst simultaneously exploiting the UK's offering on the international stage could deliver tremendous economic benefits.

7. *Delivering affordable energy and clean growth*

   Nuclear already delivers around one quarter of UK electricity – the opportunity is there to increase that proportion whilst reducing generation costs through series build and helping to grow the overall economy.

8. *Cultivating world-leading sectors*

   The UK's nuclear sector is already recognised and respected on the world stage, so

there is a chance to capitalise on that strong position and strengthen a world-leading role for the industry through global collaboration and international trade.

9. *Driving growth across the whole country*
   The UK's nuclear industry has its centre of gravity in the North West of the country and virtually all of the major sites are some distance from centres of population. Nuclear, therefore, is ideally placed to help re-balance the UK economy to be less dependent on London and the South East of England.

10. *Creating the right institutions to bring together sectors and places*
    Through the Nuclear Industry Council – which brings industry, Government, the R&D sector, labour unions and the regulator together – there is an oversight body well placed to deliver the strategy. There are also a number of well-established regional clusters and networks.

It is evident that the UK's nuclear industry is well-placed to contribute to the development of overall Industrial Strategy, and the opportunity to establish a nuclear sector deal is one which the industry will be keen to take and develop. The Government's initiative in this area is most welcome.

- ## United States of America

Patricia Paviet, Chair of the GIF Education and Training Task Force, sent the following report on the launching of a series of webinars on advanced reactor systems. All the webinars are archived and can be found at www.gen-4.org.

GEN IV Education and Training Initiative via Public Webinars on Advanced Reactor Systems

The Generation IV International Forum (GIF) Education and Training Task Force (GIF-ETTF) was established in 2015 to respond to the challenge of maintaining a well-educated advanced reactor systems workforce and to meet the projected growth in this field. The GIF-ETTF serves as a platform to enhance open education and training as well as communication and networking in support of GIF. One of the objectives of the GIF-ETTF is to develop a webinar series dedicated to Gen IV systems and related cross-cutting topics and to advertise these at the national and international level.

Since September 2016 a series of webinars has been presented to inform and stimulate not only young scientists' interest, but also managers, key decision makers, and the general public on the advantages of advanced reactors and key R&D topics to be developed. The GIF-ETTF offers free, live, interactive webinars as part of an initiative to fill the expanding need for nuclear engineers in the workforce. Each presentation is recorded and most importantly is archived as an on-line resource vital to ensuring future generations of nuclear engineers specialized in advanced reactor systems. The series of webinars presented in Figure 1 is an on-going activity and can be viewed at www.gen-4.org.

WEBINAR SERIES

September 29, 2016
Atoms for peace - The Next Generation
Dr. John Kelly, Department of Energy, USA

October 19, 2016
Closing the Fuel Cycle
Prof. Myung Seung Yang, Institute of Energy and Environment
Youngsan University
South Korea

November 22,2016
Introduction to nuclear reactor design
Dr. Claude Renault,
CEA, France

December 15, 2016
Sodium Cooled Fast Reactors
Dr. Bob Hil, ANL,
USA

January 25, 2017
Very High Temperature Reactors
Dr. Carl Sink, DOE,
USA

February22, 2017
Gas Cooled Fast Reactor
Dr. Alfredo Vasile,
CEA, France

March 28, 2017
Supercritical Water Reactors (SCWR)
Dr. Laurence Leung, CNL, Canada

April 27, 2017
Fluoride-Cooled High-Temperature reactors (FHR)
Prof. Per Peterson, UC Berkeley, USA

May 23, 2017
Molten Salt Reactors (MSR)
Dr. Elsa Merle, PHELMA, France

June12, 2017
Lead Fast Reactor (LFR)
Prof. Craig Smith, US Naval Graduate School, USA

July 18, 2017
Thorium fuel cycle
Franco Michel-Sendis, NEA/OECD

August 22, 2017
Metallic Fuels for SFRs
Dr. Steven Hayes, INL, USA

Sep 21, 2017
Energy Conversion
Dr. Richard Stainsby, NNL, UK

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	www.aatn.org.ar
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	-
Bulgarian Nuclear Society	www.bgns.bg
Canadian Nuclear Society	www.cns-snc.ca
Chinese Nuclear Society	www.ns.org.cn
Croatian Nuclear Society	www.nuklearno-drustvo.hr/en/home.html
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.nuklearmalaysia.org/index.php?id=18mnu=1
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.srrp.ro
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
United Kingdom Nuclear Institute	www.nuclearinst.com/ibis/Nuclear%20Institute/Home

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	http://www.pacificnuclear.net/pnc/
Non-U.S. Local Sections	**Website or E-Mail Address**
Austrian Section	
French Section	http://local.ans.org/france/
India Section	http://local.ans.org/india/
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.)

Legend:

✹ **ANS Event**

□ **Non-ANS event co-sponsored by ANS**

o **For all other conferences, ANS is NOT a sponsor, nor are these conferences endorsed by ANS.**

2017

- 4-7 June, 37th CNS Annual Conference and 41st CNS/CNA Conference, Niagara Falls, ON, Canada – https://cns-snc.ca/events/cns2016conference/

- 11-15 June: ANS Annual Meeting, San Francisco, CA, USA – http://www.ans.org/meetings ✹

- 11-16 June, European Nuclear Young Generation Forum (ENYGF Manchester 2017), Manchester, UK – http://www.enygf.org

- 31 July-4 August, 13th International Topical Meeting on Nuclear Applications of Accelerators (AccApp '17), Québec City, Canada – Organised jointly by ANS and CNS - http://accapp17.org/

- 27 August-2 September: 5th International Nuclear Chemistry Congress, Gothenburg, Sweden

- 3-8 September, 17th International Technical Meeting on Reactor Thermal Hydraulics (NURETH-17), Xi'an, Shaanxi, China – http://www.nureth17.com

- 17-22 September: 2nd International Meeting on Fire Safety and Emergency Preparedness for the Nuclear Industry (FSEP-2017), Toronto, Ontario, Canada – http://www.cns-snc.ca

- 24-28 September: 2017 Topical Meeting on Probabilistic Safety Assessment and Analysis (PSA-2017), Pittsburgh, PA, USA - http://psa.ans.org/

- 1-4 October: CANDU Maintenance and Nuclear Component Conference (CMNCC-2017), Toronto, Ontario, Canada – https://cns-snc.ca/events/cmncc-2017/

- 29 October -2 November: ANS Winter Meeting, Washington, DC, USA – http://www.ans.org/meetings

- 12-17 November, 9th International Conference on Isotopes (9ICI), Doha, Qatar, organized by the Qatar Physics Society, the University of Qatar, and the World Council on Isotopes – http://www.9ici.org

2018

- 22-26 April: Physics of Reactors 2018 (PHYSOR-2018), Cancún, México

- 13-18 May: ANS International Conference on Best-Estimate Plus Uncertainties Methods (BEPU-2018), Lucca, Italy – http://www.nineeng.com/bepu

- 14-16 May: PHYTRA-4, Marrakech, Morocco

- 3-6 June: 38th CNS Annual Conference and 42nd CNS/CNA Conference, Saskatoon, SKN, Canada – http://www.cns-snc.ca

- 17-21 June: ANS Annual Meeting, Philadelphia, PA, USA – http://www.ans.org/meetings

- 9-14 September: 21st International Conference on Water Chemistry in Nuclear Reactor Systems, San Francisco, CA, USA

- 23-27 September: Is the LNT Obsolete? The Linear Non-Threshold Question, Pasco, WA, USA – http://www.ans.org/meetings

- 30 September – 3 October: Pacific Basin Nuclear Conference 2018 (PBNC-2018), San Francisco, CA, USA – http://www.ans.org/meetings

- 14-18 October: NUTHOS-12, Qingdao, China

- 11-15 November: ANS Winter Meeting, Orlando, FL, USA – http://www.ans.org/meetings ✸

2019

- 15-19 April: 2019 International Congress on Advances in Nuclear Power Plants (ICAPP '19), Juan les Pins (French Riviera)

- 9-13 June: ANS Annual Meeting, Minneapolis, MN, USA – http://www.ans.org/meetings ✸

- 17-21 November: ANS Winter Meeting, Washington, DC, USA – http://www.ans.org/meetings ✸

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*Editor of the *ANS Globe*

cont'd

Appendix 1

A Survey on ANS' International Membership

Diane Cianflone, Joe Koblich, Valerie Vasilievas (ANS)
Luc Van Den Durpel (IC)

An analysis of the international membership of the American Nuclear Society (ANS) was initiated by the International Committee (IC) during the ANS Winter Meeting in Las Vegas (November 6-10th 2016). Ms. Dian Cianflone (Director Membership and Marketing) and Mr. Joe Koblich (Director of IT) with direct interaction with Ms. Valerie Vasilievas (Governance Manager) at ANS headquarters undertook an analysis of the membership of ANS over the past five years.

A very first order analysis of this international membership was presented by Luc Van Den Durpel (Vice-Chair International Committee) during the ANS Winter meeting in view of furthering the International Committee (IC) addressing the needs of international members of ANS and therefore starting at least an analysis "who these international members of ANS are?".

Based on the membership files of ANS, analysis dated December 12th 2016, the 2016 international membership in ANS represents 8.2 % of total ANS membership. 'International Membership' hereby defined as those members whose primary address is outside the United States.

The geographic spread of the 2016 international membership is show in figure 1. This international membership has been typically between 830 and 870 members during the past five years with 5 countries (Japan, Canada, The Republic of Korea, France and United Kingdom) making up half of the international members at ANS (see figure 2).

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Figure 1. 2016 International membership of ANS (838 in total)

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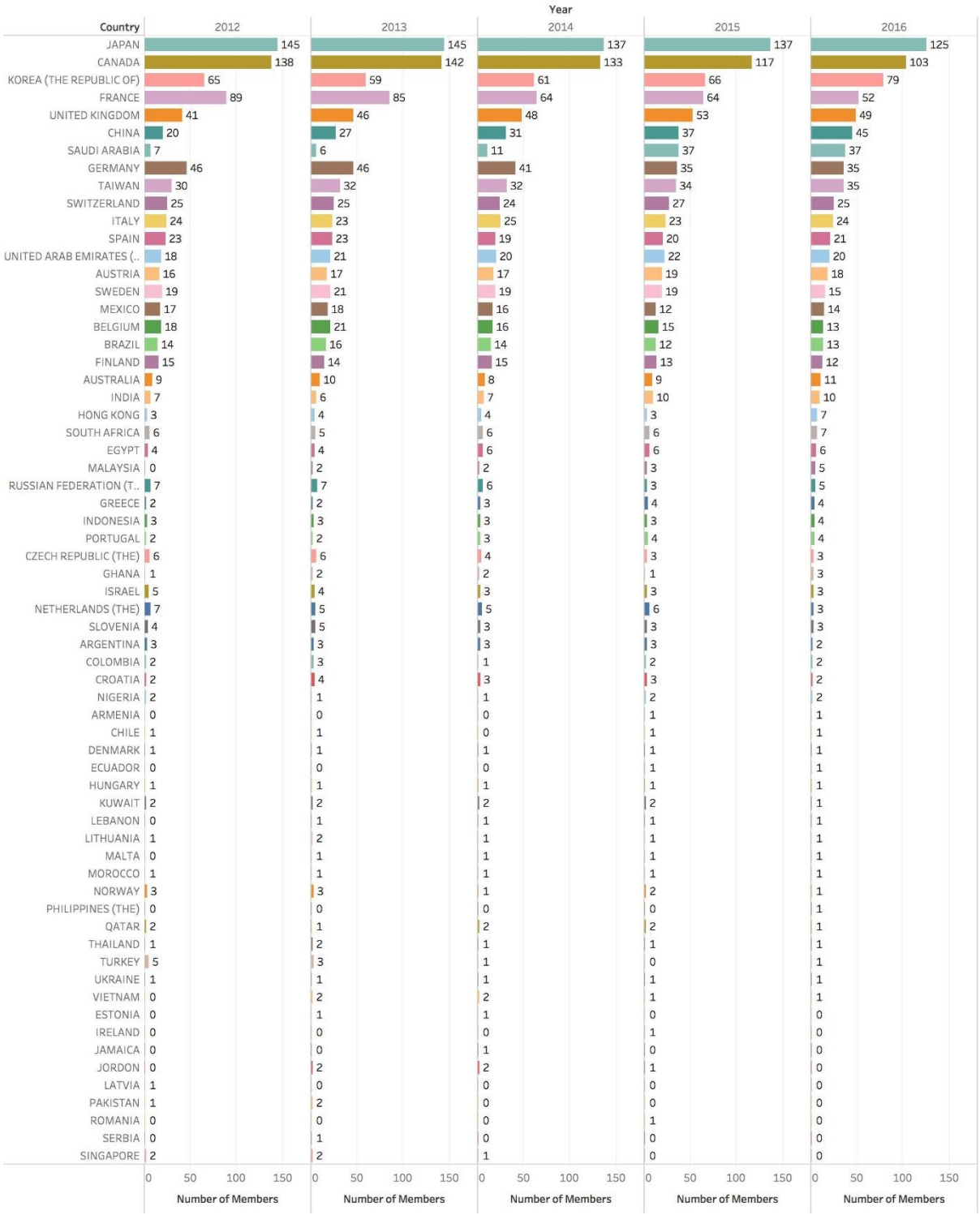
Figure 2. Evolution of International Membership ANS (countries ranked according membership in 2016)



While this international membership enriches the ANS, an interesting 'profiling' has been undertaken to analyse if the international membership of ANS is different from the US-based ANS membership?

Who are the international members?
A first analysis addresses the question about affiliations for the two membership categories, i.e. international and US-based ANS-members.

Figure 3: Distribution of affiliations for different member categories (blue = international members; orange = US-based members)

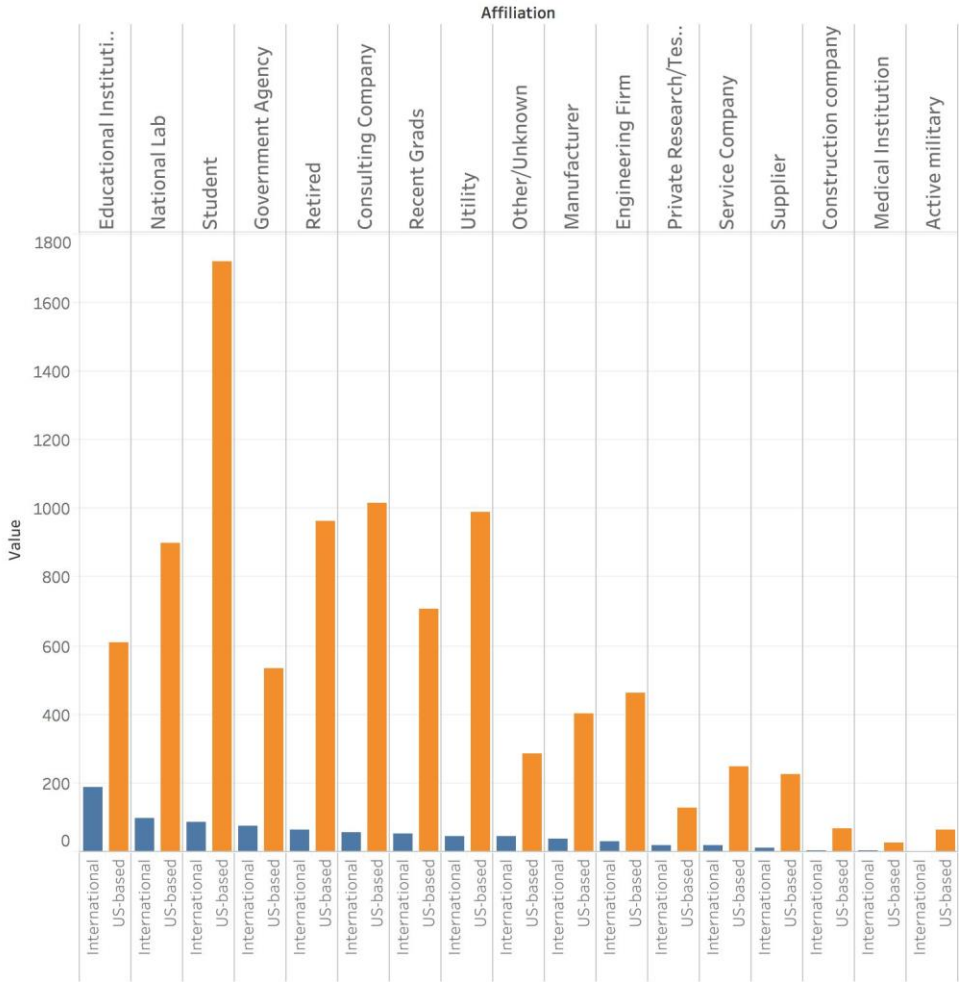


Figure 3 clearly indicates that the international members of ANS are mostly affiliated at educational institutions (22.3% of international members), followed by national laboratories (11.6%) and students (10.5%). One may remark that international nuclear industry (being it manufacturers, utilities, engineering firm) or even consulting companies. Table 1 shows percentage-wise the distribution of figure 3 per membership category over the affiliation types.

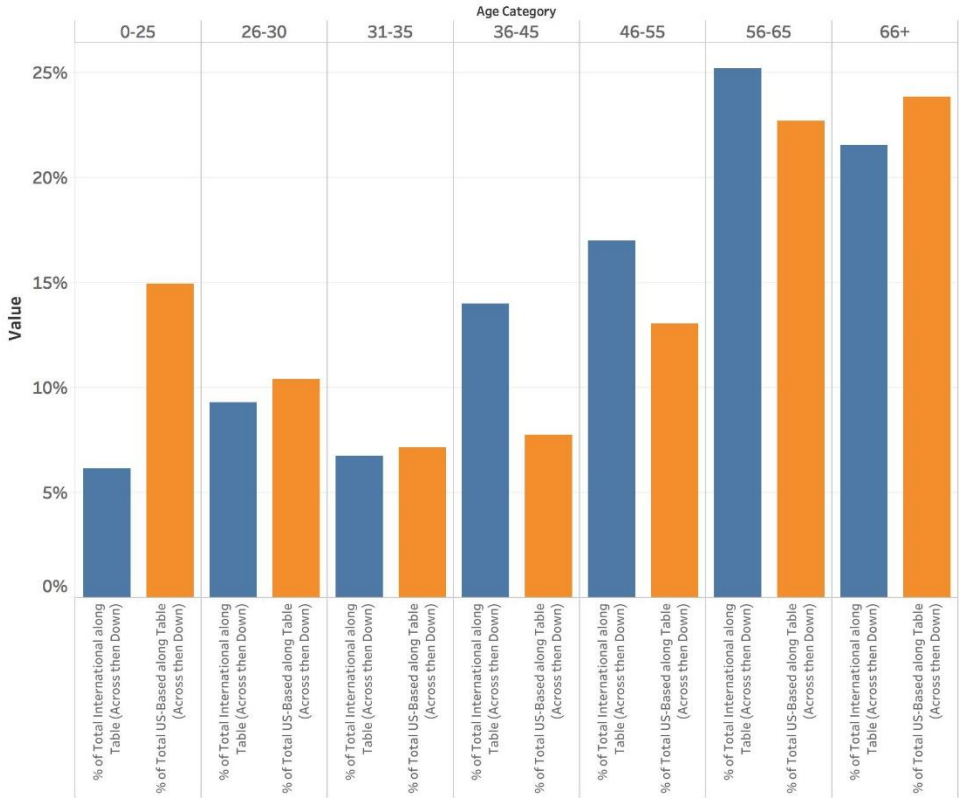
Typically, educational institute affiliation is three times more represented among international members as for US-based members while international students make only half of the typical US-based members' affiliations. The same applies for utilities' members.

Table 1: Distribution of affiliation-type per membership-category

	Affiliation																
	Educational Institution	National Lab	Student	Government Agency	Retired	Consulting Company	Recent Grads	Utility	Other/Unknown	Manufacturer	Engineering Firm	Private Research/Test Lab	Service Company	Supplier	Construction company	Medical Institution	Active military
% of Total International along Affiliation	22,32%	11,58%	10,50%	9,07%	7,76%	6,92%	6,44%	5,49%	5,37%	4,30%	3,70%	2,27%	2,15%	1,43%	0,36%	0,36%	0,00%
% of Total US-based along Affiliation	6,51%	9,62%	18,40%	5,73%	10,28%	10,86%	7,55%	10,57%	3,07%	4,30%	4,96%	1,37%	2,66%	2,41%	0,74%	0,30%	0,67%

Overall, the age-distribution of international members is significantly higher in the 36-55 age-range which may be explained by career-evolutions with higher international connectivity from the mid-30's on. Students, i.e., <= 25 years, are represented less as was also remarked in Table 1.

Figure 4: Age-distribution of ANS members (blue = international members; orange = US-based members)



There's no difference at all between the US-based and international membership with regard to gender. 88% of the ANS members at large are male.
The same applies to Professional Engineer certification where both membership-categories have some 15% of the members being PE-certified.

How is the involvement of ANS-members in ANS Professional Divisions and Committees?

On average, international members' tenure in ANS is 13.6 years, about three years less than

total ANS, with a larger percentage of members having joined recently and a smaller percentage having joined prior to 1985.

International members are less likely to be a member of a local section at 10% or 84 members. This is not surprising since few countries have the concentration of members to support a local section.

Representation in ANS leadership is on par with that of total ANS at 6.6% of international members.

International members are more likely to subscribe to at least one of the three ANS Journals as compared to the membership at large. This is consistent with the higher proportion of international members in academia.

Meeting attendance among international members is comparable to that of total membership where 17.8% have attended a national meeting at some time since 2014 and 17.2% have attended a topical meeting during that same time period.

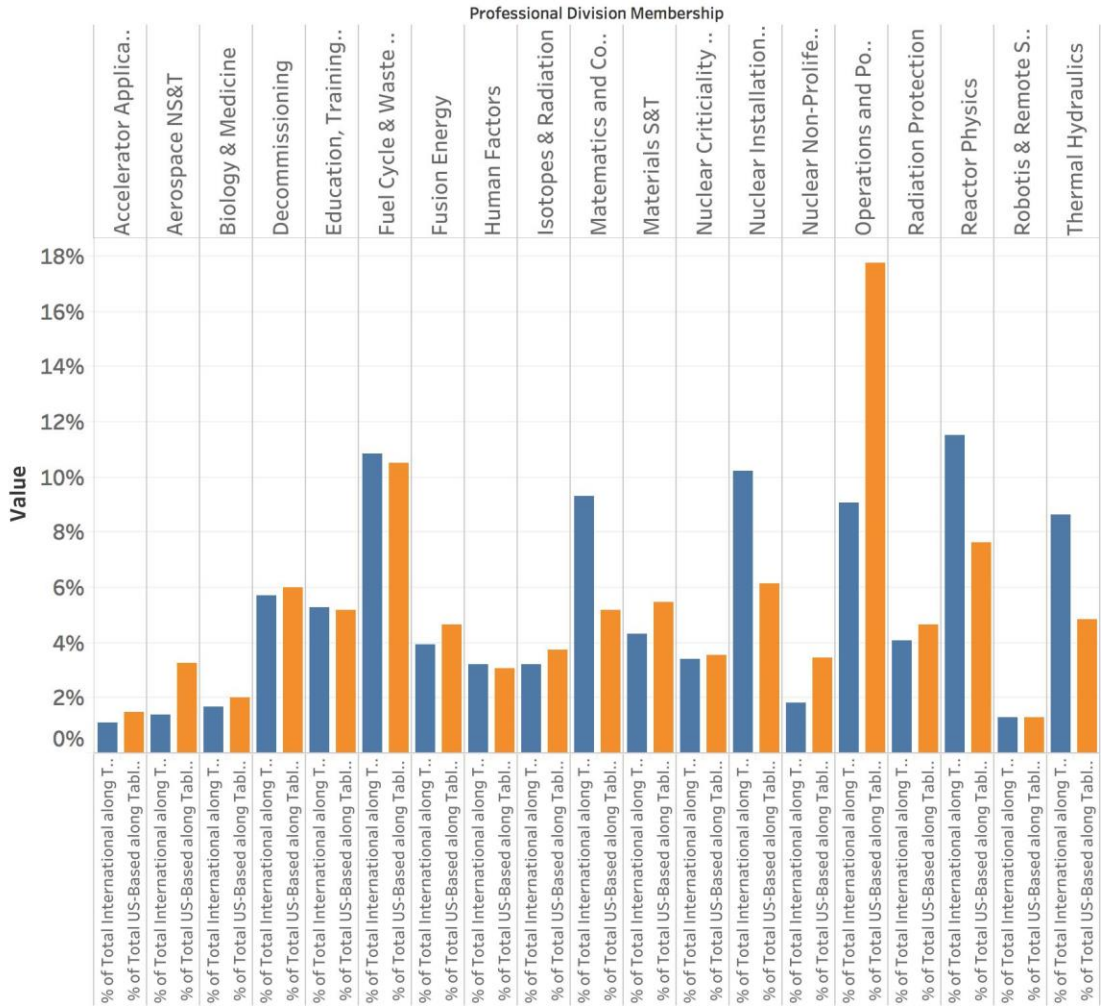
International membership to professional divisions?

International members more likely join the professional divisions generally favoured by those in academia as shown in figure 5 (for 2016 membership).

These statistics are in line with previous indications from affiliation-types (figure 3), i.e. as utilities are less represented among the international members, participation to, for instance, Operations and Power division might be expected to be lower than for US-based member as shown in this figure 5.

cont'd

Figure 5: Professional Division membership by US-Based and International ANS-members (2016 membership) (blue = international members; orange = US-based members)



Conclusions

A preliminary analysis of international membership has indicated that we're on average representing 8% of ANS-membership, i.e. in 2016 being 838 in number. Half of this 8% coming from the nuclear developed countries though with a growing international membership from countries with rapid nuclear deployment plans (e.g. China) or countries seeking to deploy nuclear energy in the foreseeable future.

About one quarter of the international ANS-members are affiliated to educational institutions and this translates also into the professional division membership within ANS with a higher than average membership in Reactor Physics, Mathematics and Computation, Thermal Hydraulics and Nuclear Installations Safety.

Also internationally, the nuclear scene remains generally a male population (88%) with a larger proportion of mid-career professionals (36-55 age) among the international membership.

Appendix 2

Overview of Taiwan's Nuclear Regulatory Program

by

Wei-Wu Chao

Taipei Economical and Cultural Representative Office in the U.S.

OVERVIEW OF TAIWAN'S NUCLEAR REGULATORY PROGRAM

Wei-Wu Chao
Taipei Economical and Cultural Representative Office in the U.S.
March 14, 2017

行政院原子能委員會
Atomic Energy Council

Outline

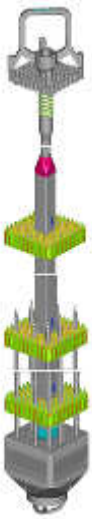
- Core Missions of Atomic Energy Council
- Energy Policy and Regulatory Structure
- Regulatory Focuses and Challenges
- Public Outreach and Transparency
- Concluding Remarks

Core Missions of Atomic Energy Council

National Nuclear Regulator

- The Atomic Energy Council (AEC) is the nuclear regulatory authority in Taiwan
- Missions include: oversee and regulate nuclear operational safety, emergency preparedness and response, radiation protection, environmental radiation monitoring, and radioactive waste management
- Regulatory research in nuclear and innovative energy
- Strive for gaining public confidence through transparency, openness, and public involvement

Oversight of Nuclear Safety



Department of Nuclear Regulation

Safety Evaluation

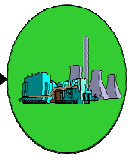
1. Transient and accident event evaluation
2. Fuel design, discharge and reload evaluation
3. Design and design change evaluation
4. Testing program and report evaluation
5. Abnormal event and accident report evaluation
6. Operating specification modification evaluation

On-Site Inspection

1. Daily inspection
2. Unit overhaul inspection
3. Regular team inspection
4. Special project inspection
5. Training practice inspection
6. Contractor verification inspection

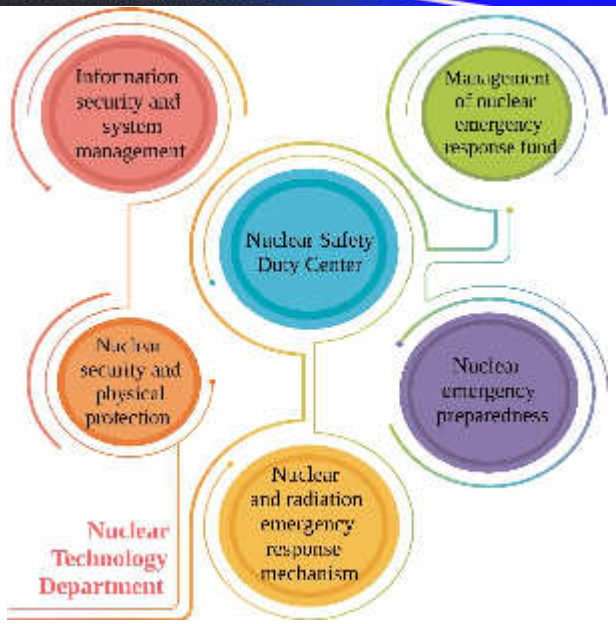
Regulatory Measures

1. Unit construction licensing
2. Unit operation licensing (renewal)
3. Licensing document change permit
4. Restart of an overhaul unit
5. Restart a unit after abnormal events or accidents
6. Reactor operator licensing (renewal)
7. Improvement to violation and attention matters



Nuclear power Plants

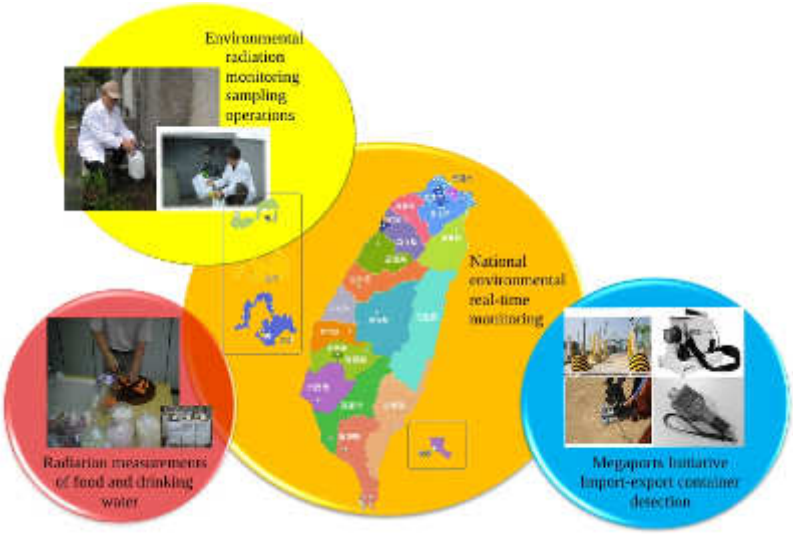
Emergency Preparedness



Radiation Protection

1. Adopt "risk classification" concept, and strengthen safety regulation of high-risk radioactive material
2. Integrate information system, and timely play a preventive regulation function
3. Promote industry "self-management", and enhance communication and advocacy

Environmental Monitoring

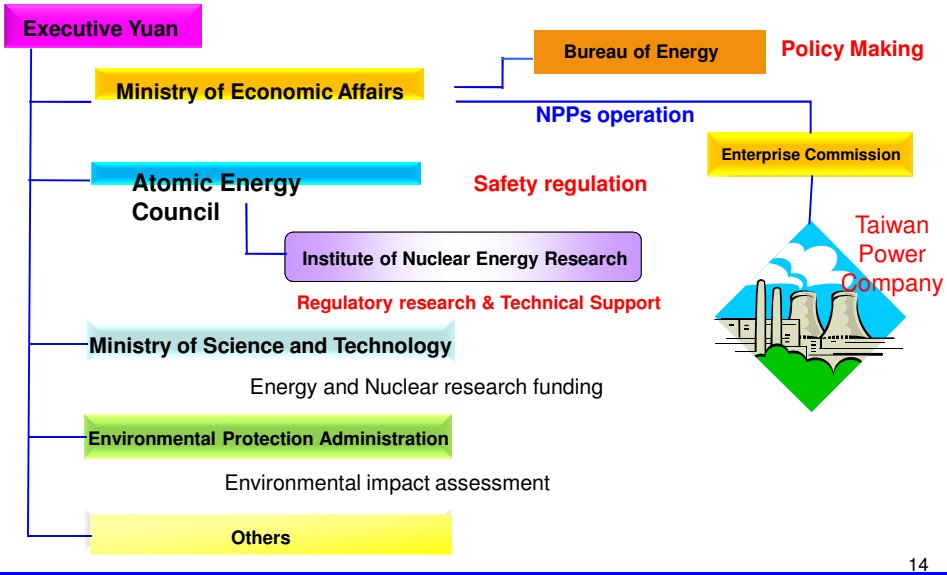


Radioactive Waste Regulation

Outline

- Core Mission of Atomic Energy Council
- **Energy Policy and Regulatory Structure**
- Regulatory Focuses and Challenges
- Public Outreach and Transparency
- Concluding Remarks

Government Structure (Nuclear related)



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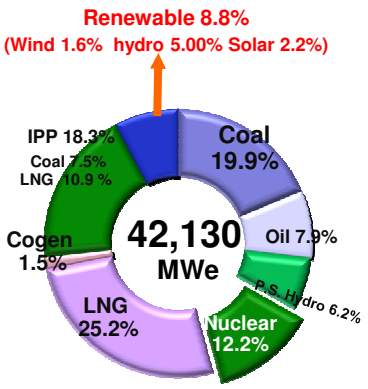
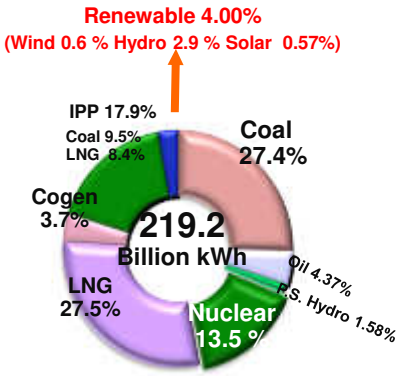
Power Generation in 2016



Installed Capacity in 2016



Electricity Generation in 2016

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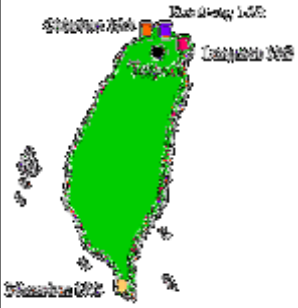
Nuclear Power Plants in Taiwan

Total generation:
36.4 BkWh in 2015



Plant	Capacity/Type	Operating License
Chinshan	1804 MWt/unit GE BWR4 X 2	*Unit 1:1978.12.06 Unit 2:1979.07.16
Kuosheng	2943 MWt/unit GE BWR6 X2	Unit 1:1981.12.28 *Unit 2:1983.03.15
Maanshan	2822 MWt/unit WH PWR X2	Unit 1:1984.07.27 Unit 2:1985.05.18
Lungmen	3926 MWt/unit GE ABWR X2	Unit 1:mothballed Unit 2:mothballed

Energy Policy

- President Tsai, Ing-wen was elected in January 2016, and the new administration was formed last May.
- The use and development of renewal energy, such as wind and solar, is expected to increase in the coming years.
- Taiwan government will strive toward its goal of nuclear power phase-out by 2025.
  - The existing 6 operating nuclear power reactors shall cease operations when their 40-year operating licenses expire
  - The currently mothballed Lungmen plant will not be activated
  - Electricity Law amendment on January 11, 2017 was passed in Legislative Yuan (Congress) to implement the policy

Outline

- Core Mission of Atomic Energy Council
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- **Regulatory Focuses and Challenges**
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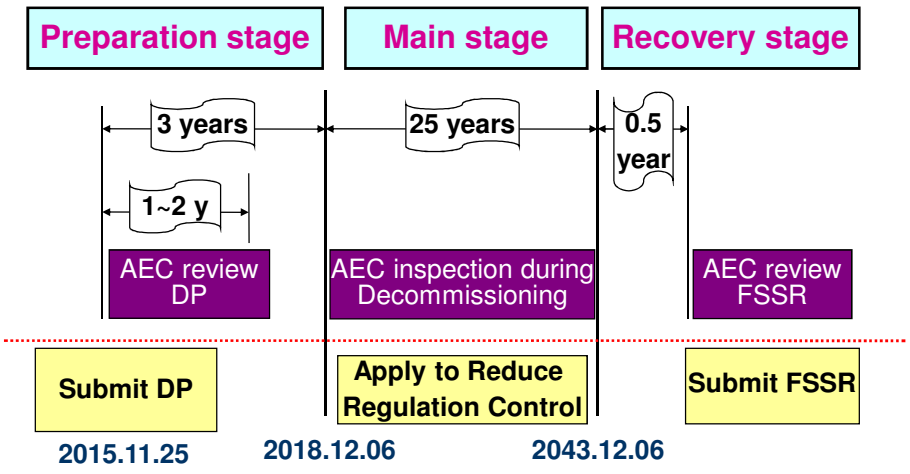
Regulatory Focuses and Challenges

- Under current energy policy, to ensure safety during "Nuclear Power Phase-Out", and to regulate decommissioning of nuclear power plant and radioactive waste management will be AEC's major tasks in near future.

Decommissioning of Nuclear Power Plant

- Taiwan Power Company officially withdrew its application for license renewal of Chinshan NPP on July 7, 2016.
- Policy of Decommissioning in Taiwan
  - The site land can be recovered and the non-radiological facility can be re-utilized.
    - For the restrictive use, the annual dose equivalent exposure to the general public shall not exceed 1 mSv.
    - For the non-restrictive use, the annual dose equivalent exposure to the general public shall not exceed 0.25 mSv.
  - The decommissioning of nuclear reactor facilities in Taiwan shall adopt dismantlement approach.

Stages of Decommissioning NPP



(For Chinshan NPP Unit 1)

Ongoing Progress on Chinshan Decommissioning Plan (DP)

- 18 months to complete three-round DP review (By June 2017):
  - AEC review and comments:12 months
  - TPC response: 6 months
- After first and second review, comments issued by AEC were forwarded to Taiwan Power Company (TPC) in March and August, 2016, respectively
- Chinshan DP is delivered to the local government for comments, and released on AEC website.
- Hearing on Chinshan decommissioning DP review in October 2016.
- Regulatory difference between US and Taiwan decommissioning :
  - US: final shutdown and remove SNF, then submit PSDAR to NRC for review;
  - Taiwan: submit DP to AEC for approval 3 years before final shutdown; start decommissioning right after final shutdown.

Low Level Waste Treatment and Storage

Treatment & Storage facility at Kousheng NPP

Lanyu LLW interim storage site

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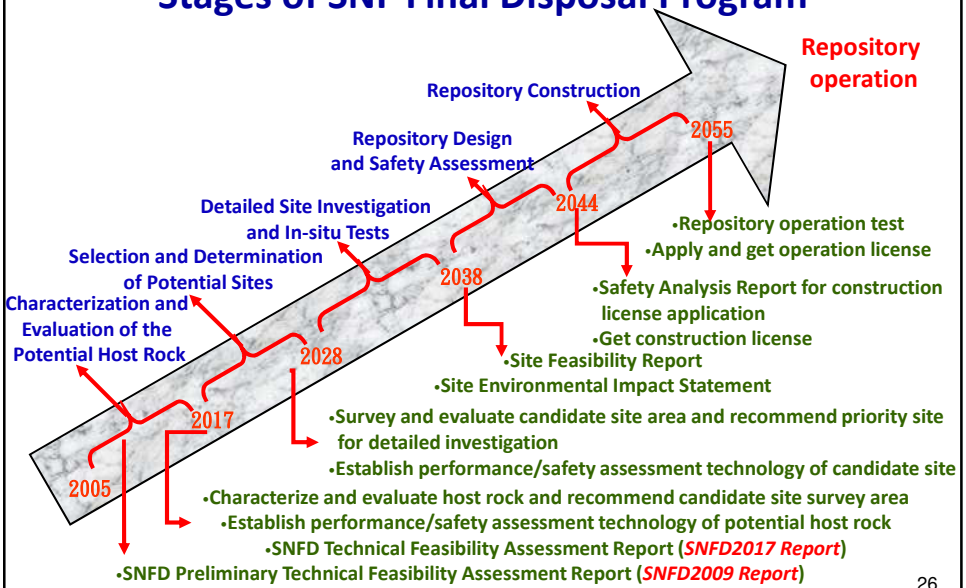
Low Level Waste Final Disposal

- LLW Final Disposal Siting Act
  - Openness and Transparency
    - Ministry of Economic Affairs publicizes a siting plan and recommended sites to invite the public's comments.
    - All public comments on the selection report of recommended sites shall be addressed.
    - Public hearing before referendum.
  - Democratic self-determination
    - Only if the recommended site has been approved by a local referendum, the site can be a candidate site.
  - Though two sites announced, neither public hearing nor referendum is scheduled at this point.

Spent Nuclear Fuel On-Site Storage

- Progress of the Chinshan Dry Storage Project
  - Construction License issued by AEC after completion of safety review in December 2008.
  - TPC has conducted hot test in September 2013; yet TPC is still waiting for the local government to issue the permit of water and soil reservation plan.
- Progress of the Kuosheng Dry Storage Project
  - AEC issued the Construction License in August 2015.
  - TPC is waiting for permit of part of water and soil reservation plan from local government before site conducting.
- Both need further communication with local government

Stages of SNF Final Disposal Program



Outline

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Public Outreach and Transparency

Public Outreach: SNF Dry Storage Facility

- 20 delegates for public observation are invited from:
  - 11 from local communities: village chiefs, directors of community associations, stakeholder representatives
  - 3 from local government
  - 2 experts
  - 4 from environmental NGOs

- Activities:
  - Visiting SNF dry storage facility at Chinshan plant
  - Observing the construction quality of the facility
  - Monitoring the environmental radiation around the facility.

Public Outreach : Environmental Monitoring Of Lanyu LLW Storage Site

- 2008 ~ 2010:
  - Invite delegates from scholars and experts to visit Lanyu storage site
  - Scholars and experts sent the visiting report to Lanyu residents
- 2011 ~ 2012:
  - Invite delegates from environmental NGO to visit Lanyu storage site
  - delegates shared the visiting findings to Lanyu residents
- 2013 ~ Current:
  - Invite Lanyu residents to participate in environmental monitoring and sampling
  - Invite legislators to visit to Lanyu storage site and inspect radwaste condition and measure radiation in a random selected trench, then observe the environmental monitoring around Lanyu
- Goal: the well-trained voluntary residents undertake radiation monitoring and sampling to have a double check by themselves

Public Participation Platform

- AEC established Public Participation Platform
  - Transparency during policy making process
  - Listening to opinions from the public/stakeholders
  - Guidelines Set by AEC for this platform
  - Participants invited from environmental NGOs and local residents near NPPs
  - Videos recorded and minutes of each meeting are uploaded on AEC website (YouTube)
  - This platform is held every two months. In 2016,
    - August: Introduction and guidelines of the platform
    - October: Regulation on decommissioning of Chinshan NPP
    - December: Emergency Preparedness and Response

Public Participation Platform

Remarks by Minister Hsieh

Representative from environmental NGO

Information released by AEC

Concluding Remarks

- Nuclear power has been as an important role in Taiwan's energy portfolio in the past, while the current administration strives for developing renewable energy in coming years
- AEC, the national regulator, will continue to oversee and ensure safe operation of nuclear plant and subsequent decommissioning and waste management
- Strengthen information disclosure and transparency, and extend public involvement to all stakeholders to gain mutual trust on regulatory decisions
- Future challenges would be on steady electricity supply as well as public's opinion on the site selections for both low and high level waste storage

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Thank you for your attention!