23rd WiN Global Annual Conference

Women in Nuclear meet Atoms for Peace

24–28 August 2015
Vienna, Austria

PROGRAMME and ABSTRACTS

Organized by WiN Global and WiN IAEA

In cooperation with the IAEA

23rd WiN Global Annual Conference:

Women in Nuclear Meet Atoms for Peace

24–28 August 2015

Vienna, Austria

Programme
&
Book of Abstracts
&
Posters

Version: August 30, 2015, web enabled

Scan relevant QR to download the "Conference 4me" application.

Android

iPhone

Windows

Mobile Conference App for smartphones and tablets

Participants may wish to download the conference application (app) available at Google Play and the iTunes Store. Use the above QR core, or, once in the app store, simply search for "Conference 4me", and install the app. Once installed and running, search and download the WiN 2015 conference. The app allows you to:

- customise your own schedule and view last-minute programme changes;
- view powerpoint presentations of those speakers who have permitted their release after the presentation;

If you have questions or require assistance on the app, please contact the Registration Desk.

Colophon

This book has been assembled from the abstract sources submitted by the contributing authors via the Indico conference management platform. Layout, editing, and customized TEX & LATEX macros used to typeset the book were developed by Dr. P. Knowles, LogrusData, Vienna, Austria.

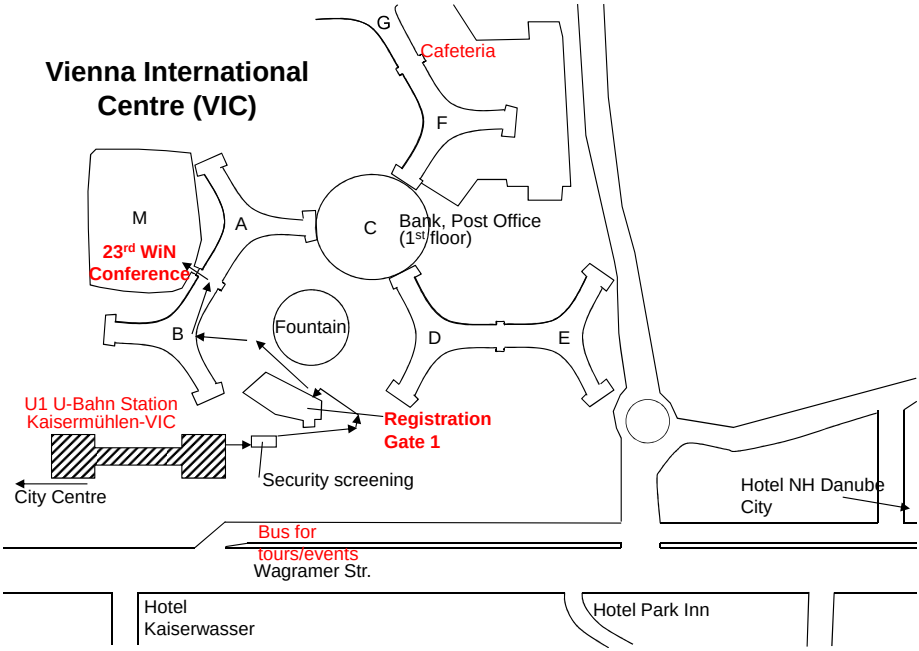
Introduction

Women in Nuclear (WiN) Global is a worldwide non-profit-making association made up mostly of female professionals working in the various fields of nuclear energy and radiation applications. WiN Global aims to promote understanding and public awareness of the benefits of nuclear and radiation applications through a series of active networks, both national and international. It has approximately 25 000 members from more than 100 countries, organized in national, regional and international chapters. Every year, a chapter of WiN Global organizes the annual conference, which is a unique occasion for the WiN Global community to meet.

The 23rd WiN Global Annual Conference will highlight the vital role women play in all applications of nuclear science and technology. At the same time, it will provide opportunities for networking, exchanging ideas, technical visits and obtaining the most up-to-date information on the nuclear programmes and facilities around the world as well as on employment opportunities at the International Atomic Energy Agency (IAEA).

Conference Location

International Atomic Energy Agency (IAEA)
Vienna International Centre (VIC)



Security and Registration

Participants will be issued photo badges by the UN Security and Safety Service (UNSSS), at the Gate One entrance, on Monday 24 August 2015, 09:00–16:00 or Tuesday 25 August, again from 08:00–16:00. An official photo identification document (e.g., passport) is necessary for the creation of your pass, and the pass is required to access the VIC.

The conference registration desk (where participants will complete a short registration form, and receive their conference back pack with material) is located at the ground floor entrance of the M–Building. No registration fee is charged.

Information for Participants

The conference website contains links to many helpful guides. Notably, the Indico conference system is used for all correspondence concerning contributions. Follow us on twitter @WiN IAEA Chapter.

Presentations and Abstracts Book

This book contains all abstracts accepted by the conference programme committee. Abstracts have been edited for style uniformity. The views expressed remain the responsibility of the named authors. No responsibility is held by the organizers for any material reproduced, or linked, in this book. Presentations, as far as they are available, will be posted on the conference website after the conference.

Best Poster Awards

Prizes for best posters in each poster session will be awarded during the closing session on Thursday, starting at 16:00. All participants can cast votes for best poster via the Indico Voting system (account creation required).

Reception

Participants are cordially invited to an Evening Reception on Tuesday 25 August 2015 from 18:00 to 20:00 in the M–Building.

Hosted Coffee Breaks

Hosted coffee breaks are offered both mornings and afternoons from Tuesday until Thursday on the M–Building First Floor (M01) and Ground Floor (M0E).

Coffee, tea, and snacks can be purchased at any time from the M–Building snack bar on the ground floor (M0E).

Conference Secretariat

WiN–2015 Scientific Secretaries:

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Ms Françoise Muelhauser
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Organizing Committee

Organized by the WiN IAEA Chapter.

Eva Gyane	WiN IAEA President (Bio)
Françoise Muelhauser	WiN IAEA Vice President (Bio)
Gabriele Voigt	WiN IAEA Vice President (Bio)

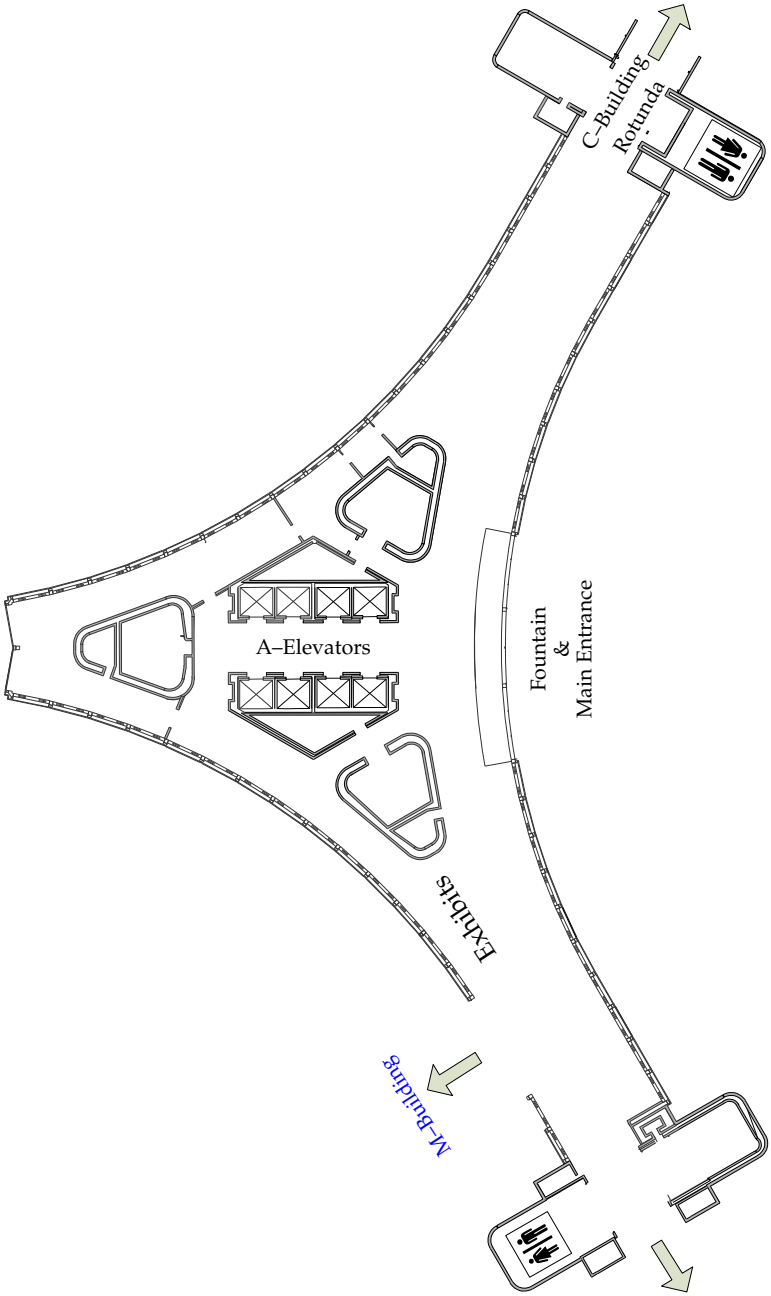
Monika Adamczyk	IAEA
Zhanar Bayazitova	IAEA
Katharina Breitenecker	IAEA
Elena Buglova	IAEA
Susan Cohen-Unger	IAEA
Janette Donner	IAEA
Janice Dunn Lee	IAEA
Alessia Durczok	IAEA
Naida Dzigal	IAEA
Julie Ford	IAEA
Julie Geoffrey	IAEA
Jane Kim	IAEA
Kerry McCormack	IAEA
Luisa Milani	IAEA
Karen Morrison	IAEA
Patricia Musoke-Zawedde	IAEA
Barbra Nambuusi	IAEA
Didem Oguz Haydn	IAEA
Eloïse Roos	IAEA
Monica Sbaffoni	IAEA
Elisabeth Swoboda	IAEA
Meera Venkatesh	IAEA

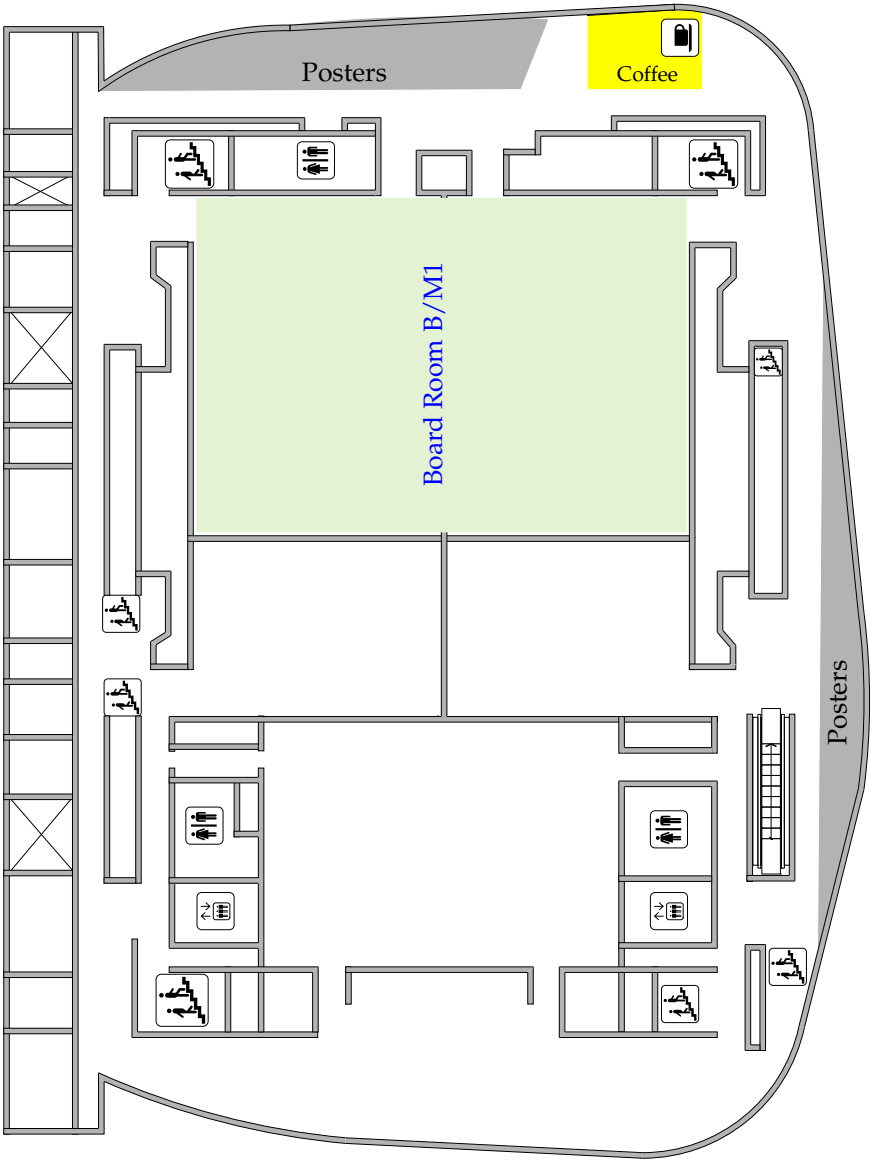
With thanks to all the other volunteers who have helped to organize this event.

Abbreviations

ABACC	Brazilian–Argentine Agency for Accounting and Control of Nuclear Materials
AR	Atomic Reporters
CTBTO	Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization
EC	European Commission
ESARDA	European Safeguards Research and Development Association
EU	European Union
IAEA	International Atomic Energy Agency
INMM	Institute of Nuclear Materials Management
IRPA	International Radiation Protection Association
IYNC	International Youth Nuclear Congress
JRC	Joint Research Centre
MSSP	Member State Support Programmes
OECD	Organisation for Economic Co-operation and Development
UNODA	United Nations Office for Disarmament Affairs
UNODC	United Nations Office on Drugs and Crime
UNOV	United Nations Office in Vienna
UNSSS	UN Security and Safety Service
VCDNP	Vienna Center for Disarmament and Non-Proliferation
WNA	World Nuclear Association
WiN	Women in Nuclear
WINS	World Institute for Nuclear Security


Room M5 Side Events
Coffee
Exhibits
M0E 70 Conference Secretariat
M0E 69 Briefing Room
M0E 68 Side Events
M0E 67 Side Events
Snack Bar
Registration & Information
A–Building & Rotunda
M0E 70: Conference Secretariat
M0E 69: Briefing Room


C–Building
Rotunda
Fountain
&
Main Entrance
A–Elevators
Exhibits
M–Buildings


Posters
Coffee
Board Room B/M1
Posters

Day / Date	Monday 24 August 2015	Tuesday 25 August 2015	Wednesday 26 August 2015	Thursday 27 August 2015	Friday 28 August 2015
09:00 — 10:30	Registration: 09:00 – 16:00; Screening: Pandora's Promise; Visits to Zwentendorf Nuclear Power Plant	S01: Opening	S05: Career Development for Women	S09: IAEA Department Presentations	Diverse Technical and Cultural Tours: Details Participants interested in these tours should request info sheets and maps for the tours from the conference reception desk (M–Building).
		Coffee 10:30 – 11:00	Coffee 10:30 – 11:00	Coffee 10:30 – 11:00	
11:00 — 12:30		S02: Keynote Speakers 12:00: Photo	S06: Radiation in Medicine	S10: Nuclear Security	
		Lunch 12:30 – 14:00	Lunch 12:30 – 13:30	Lunch 12:30 – 14:00	
14:00 — 15:00		S03: WiN Global General Assembly	S07: Energy Environment Climate	Posters: S11a S11b S11c S11d	
15:00 — 16:00		Coffee: 15:00 – 15:30	Coffee: 15:00 – 15:30	Coffee 15:30 – 16:00	
16:00 — 18:00		S04: WiN Global Chapter Reports	S08: Safeguards and Non-Proliferation	S12: Closing	
18:00 — 20:00	Heurigen Dinner	Welcome Reception	Conference Dinner		

Executive and Board Meetings

Meeting Location: **Hotel NH Danube City**
Wagramer Strasse 21
Tel: (+43 1 260200)
1220 Vienna, Austria

Metro, U–Bahn: **U1**: "Kaisermühlen-VIC"

Meeting Agenda:

- 10:00 – 12:00: WiN Global Executive Meeting
- 12:00 – 13:30: Lunch
- 13:30 – 16:00: WiN Global Board Meeting
- 16:00 – 18:00: WiN Europe Board Meeting
- 18:00 – 18:30: WiN Europe General Assembly Meeting

09:00 – 16:00: **Conference Registration**

08:30 – 13:45: **Zwentendorf Nuclear Power Plant Visits**
10:45 – 16:00: Registration obligatory for all three tour times.
13:00 – 18:15: Busses leave from the Airport Bus Station on Wagramer Strasse down the stairs from the VIC, Gate 1 (see map p.1).

Zwentendorf Nuclear Power Plant — the reactor that never went into operation

The Zwentendorf Nuclear Power Plant was the first nuclear plant built in Austria, of six nuclear plants originally envisaged. Construction of the plant began in April 1972, as a boiling-water reactor rated at 692 MW power output. The plant was finished, but never went into operation. The startup of the Zwentendorf plant, and also the construction of the other five plants, was vetoed by a referendum on 5 November 1978. A narrow majority of 50.47% (i.e., with a margin of less than 1%) voted against the startup.

Since then, the plant has been partly dismantled. Today, the reactor is used to provide spare parts to three similar German reactors and to train foreign operators. Also, a solar power plant has been constructed on the premises. Since 1978, Austria has had a law prohibiting fission reactors for electrical power generation.

During the tour, visitors will have the unique opportunity to see the reactor internals (including the core, control rod mechanism, detectors), which is no longer possible once a reactor becomes operational.

10:00 – 16:00: **Screening of Pandora's Promise**

Location: Board Room B/M1 Summary from the Internet Movie Data Base (IMDB): "A feature-length documentary about the history and future of nuclear power. The film explores how and why mankind's most feared and controversial technological discovery is now passionately embraced by many of those who once led the charge against it. Operating as history, cultural meditation and contemporary exploration, Pandora's Promise aims to inspire a serious and realistic debate over what is without question the most important question of our time: how do we continue to power modern civilization without destroying it?"

19:00 – 23:00: **Buffet Dinner at Viennese Heurigen Zum Martin Sepp**

Eastern Austria boasts thousands of Heurigens, which are wine taverns nestling at the foot of the slopes where wine has been grown since Roman times. After a busy day on pre-conference excursions, we invite you to relax and enjoy typical local fare at one of these taverns, the delightful Heurigen — Zum Martin Sepp — in the Vienna suburb of Grinzing, a former village, at the edge of the Vienna Woods (Wienerwald). The typical local food — served as a buffet — is tasty and simple, with plenty of vegetarian options, and the wine is dry and delicious (non-alcoholic drinks are also available). You'll hear some traditional Wienerlieder played by the tavern musicians at some point during the evening.

Location: Cobenzlgasse 34, 1190 Wien
U-Bahn U4 to Heiligenstadt, Autobus 38A to "Wien Grinzing".

Tue

Registration: 08:00 – 16:00

S01: Session: Opening and Welcome Remarks

Chair: G. Voigt (WiN IAEA) *Board Room B/M1* **(09:30 – 10:30)**

Time	Id	Presenter		Title
09:30	S01–01	E. Gyane	WiN IAEA	Welcome
09:40	S01–02	S.-M. Park	WiN Global	Opening
09:50	S01–03	J. Dunn Lee	IAEA	Opening Remarks

Coffee 10:30 – 11:00

S02: Session: Keynote Presentations

Chair: L. Rockwood (VCDNP) *Board Room B/M1* **(11:00 – 12:00)**

Time	Id	Presenter		Title
11:00	S02–01	C. Hinderstein	USA	The Evolution of Nuclear Security: From Sites to Summitry
11:20	S02–02	M. Schwaiger	Austria	Radiation Protection Training
11:40	S02–03	O. Algayerová	Slovakia	Nuclear Applications and Human Health — Importance of International Cooperation

Conference Photo 12:00 (Rotunda)

Lunch 12:30 – 14:00

X01: Side Event: Particular Examples, Good Practices, Recruitment Strategy

Chair: J. Kim (IAEA) *Conference Room M5* **(12:30 – 14:30)**

Time	Id	Presenter		Title
12:30	X01–01	C. Thomas	Netherlands	What Can We Learn from Similar Male Dominated Industries?
12:50	X01–02	E. Brutschin	Austria	How to Inspire Female Students to Study Energy Security
13:10	X01–03	V. Segovia	USA	POWER SET: Empowering Young Women to Assume their Role in Nuclear Science
13:30	X01–04	N. Bichler-Bell G. Araujo	IAEA IAEA	Candidate & Recruitment Sourcing Plan

S03: Session: WiN Global General Assembly

Chair: E. Gyane (WiN IAEA) *Board Room B/M1* **(14:00 – 15:00)**

Time	Id	Presenter	Title
14:00	S03–01	S.-M. Park	WiN Global General Assembly
14:50	S03–02	D. Mouillot	WiN Declaration for the Earth Climate

Coffee 15:00 – 15:30

S04: Session: WiN Chapter Reports

Chair: F. Muelhauser (WiN IAEA) *Board Room B/M1* **(15:30 – 18:00)**

Time	Indico	Presenter	
15:30	WiN–2015–180	J. Sayan	Argentina
15:35	WiN–2015–181	J. Craufurd-Hill	Australia
15:40	WiN–2015–183	N. Del Mastro	Brazil
15:45	WiN–2015–182	R. Ivanova	Bulgaria
15:50	WiN–2015–263	H. Kleb	Canada
15:55	WiN–2015–184	C. Pan	China
16:00	WiN–2015–185	L. Dubska	Czech Republic
16:05	WiN–2015–188	D. Mouillot	Europe
16:10	WiN–2015–286	K. Sarparanta	Finland
16:15	WiN–2015–187	D. Mouillot	France
16:20	WiN–2015–189	Y. Broy	Germany
16:25	WiN–2015–190	Á. Szabó	Hungary
16:30	WiN–2015–192	T. M. Soedyartomo	Indonesia
16:35	WiN–2015–191	E. Gyane	IAEA
16:40	WiN–2015–193	R. Nunome	Japan
16:45	WiN–2015–194	E. O. Han	Republic of Korea
16:50	WiN–2015–261	N. H. Mohamed Khairullah	Malaysia
16:55	WiN–2015–195	K. A. Gill	Pakistan
17:05	WiN–2015–196	M. Mančíková	Slovakia
17:10	WiN–2015–267	N. Zeleznik	Slovenia
17:15	WiN–2015–197	M. Mkhosi-Motsaathebe	South Africa
17:20	WiN–2015–269	M. Pelegri	Spain
17:25	WiN–2015–198	M. Nilsson	Sweden
17:30	WiN–2015–199	H. Loner	Switzerland
17:35	WiN–2015–200	S. H. Fan	
17:40	WiN–2015–266	B. G. Göktepe	Turkey
17:45	WiN–2015–201	H. Al Blooshi	UAE
17:50	WiN–2015–202	M. Kray	USA

Tue

Reception: Welcome Reception

Entrance M-Building **(18:00 – 20:00)**

18:30	F. Muelhauser	Welcome Remarks
		A word from our Sponsors:
	F. Oshinowo	Presenting Edlow
	L. Ramsdale	Presenting UNFCU
	C. Mathews	Presenting INMM
		Evening Entertainment provided by:
	J. Ogawa	Japanese Dance Performance: "Pine Tree"
	C. Kombotis	Wiener Frauen Schrammeln

S05: Session: Career Development for Women in the Nuclear Field, including Communications

Chair: J. Dunn Lee (IAEA) *Board Room B/M1* **(09:00 – 10:30)**

Time	Id	Presenter		Title
09:00	S05–01	G. Ramos	OECD	Breaking Gender Stereotypes: Encouraging more Women to Study Science, Technology and Mathematics
09:10	S05–02	P. Rickwood	AR	Unclear Nuclear
09:17	S05–03	S. Locatelli	Canada	Vision, Intuition and Smarts: Succeeding in Nuclear Communications
09:24	S05–04	E. Radde	Austria	Career Development in a Challenging Environment — Why Young Generation Networks are Essential
09:31	S05–05	J. Craufurd-Hill	Australia	Leveraging Diversity in the Nuclear Workforce: An Australian Perspective
09:38	S05–06	M. Singelee	UK	Future Leaders in Nuclear — Career Pathways and Developing and Raising Profiles of Young Women in Nuclear
09:45	S05–07	A. Wu	China	Public Communication on Nuclear Power
09:52	S05–08	C. Thomas	Netherlands	What Can WiN Learn From Other Male Dominated Industries

Following the above short presentations, the panel will continue with open discussions and questions from the floor.

Coffee 10:30 – 11:00

Wed

S06: Session: Use of Radiation in Medicine

Chair: F. Muelhauser (IAEA) *Board Room B/M1* **(11:00 – 12:30)**

Time	Id	Presenter		Title
11:00	S06–01	P. Xia	USA	Physicists' Roles in Medicine
11:10	S06–02	N. S. Bese	Turkey	Radiation for the Treatment of Breast Cancer: the Most Common Cancer among Women
11:17	S06–03	A. Nitzsche-Bell	IAEA	Programme of Action for Cancer Therapy:
		N. Enwerem-Bromson	IAEA	Maximizing Investments in Radiation Medicine
11:24	S06–04	M. Abdel-Wahab	IAEA	Radiotherapy in Cancer Management
11:31	S06–05	S. J. Choi	Korea, Rep. of	Radioisotope "UnClear to NuClear"
11:38	S06–06	A. Dela Rosa	Philippines	Contribution of Filipino Women Professionals in Safe and Effective Nuclear Health Care
11:45	S06–07	M. Di Giorgio	Argentina	Latin American Biological Dosimetry Network (LBDNet)

Following the above short presentations, the panel will continue with open discussions and questions from the floor.

Lunch 12:30 – 13:30

X02: Side Event: Particular Examples, Good Practices, Recruitment Strategy

Chair: P. Musoke-Zawedde (IAEA) *Conference Room M5* **(12:30 – 14:30)**

Time	Id	Presenter		Title
12:30	X02–01	P. Gasparini	UNODA	Women in Disarmament and
		J. Kohler	UNODA	Non-proliferation: Preparing for a Job Fair
13:30	X02–02	N. Bichler-Bell	IAEA	Candidate & Recruitment Sourcing Plan
		G. Araujo	IAEA	

S07: Session: Energy, Environment and Climate Change

Chair: S. Johnson (USA) *Board Room B/M1* **(13:30 – 15:00)**

Time	Id	Presenter		Title
13:30	S07–01	A. Rising	WNA	Balancing the Climate Budget — What Role Should Nuclear Energy Play?
13:40	S07–02	R. Czarwinski	Germany	Safety and Reliability — Challenges for Change and Progress: IRPA's Engagement in the System of Protection
13:47	S07–03	V. Faudon	France	The Nuclear for Climate Initiative
13:54	S07–04	M. Venkatesh	IAEA	Cleaner Environment Through Radiation Technologies
14:01	S07–05	E. Ryabiskovskaya	Russian Fed.	Environmentalists and the Anti Nuclear Movement — Understanding Communication outside the Nuclear Industry
14:08	S07–06	K. Gogan	UK	Nuclear and Environmentalism
		Following the above short presentations, the panel will continue with open discussions and questions from the floor.		

Coffee 15:00 – 15:30

S08: Session: Safeguards and Non-proliferation

Chair: T. Varjoranta (IAEA) *Board Room B/M1* **(15:30 – 17:00)**

Time	Id	Presenter		Title
15:30	S08–01	V. Z. de Villiers	IAEA	Introductory Remarks on Topical Safeguards Matters
15:35	S08–02	R. Maxwell	Canada	Safeguards from a Canadian Perspective
15:42	S08–03	M. Aparo	IAEA	Joint Comprehensive Plan of Action — What it Means to the Non-Proliferation Regime
15:49	S08–04	M. Crawford	IYNC	Safeguards and Non-proliferation — Perspectives from the Young Generation
15:56	S08–05	I. Niemeyer	Germany	Joint Research and Development — Member States Support Programmes (MSSPs) as a Vehicle for the Technical Development and Further Improvement of IAEA Safeguards
16:03	S08–06	K. Hikawa	Japan	APSN: Asia Pacific Safeguards Network — Regional Cooperation in the Field of Safeguards
		Following the above short presentations, the panel will continue with open discussions and questions from the floor.		

Evening: Conference Dinner

Vienna City Hall **(18:00 – 24:00)**

The conference banquet will be the social highlight of WiN Global 2015. In the ballroom of Vienna's magnificent neo-gothic City Hall, you will be served a four-course meal and your evening's Masters of Ceremony, Ms. Johnson and Ms. Rockwood, will guide you through the evening's speeches and entertainment, including

- Presentation of the annual WiN Award and the WiN Honorary Award;
- Speeches from the City of Vienna, and the IAEA;
- A group of dancers from Vienna's renowned dancing school — Tanzschule Elmayer — which trains the debutantes for some of Vienna's 'noble' seasonal balls;
- An ensemble from k. u. k. Wiener Regimentskapelle —one of Europe's top brass bands— playing famous waltzes and marches;
- Michael Kahr, a talented pianist, trumpet and flugelhorn player;
- Sam Allaf, who has been DJ'ing in Vienna's top clubs over the last 20 years (Take Five, The Box, Aux Gazelle, Club Palffy). His mix of 70's, 80's & 90's hits along with the most recent chart toppers will get any crowd moving.

S09: Session: Presentations by IAEA Departments

Chair: G. Voigt (WiN IAEA) *Board Room B/M1* **(09:00 – 10:30)**

Time	Id	Presenter	Title
09:00	S09–01	Press Office	IAEA in Focus
09:10	S09–02	A. Evrensel	Department of Nuclear Energy
09:20	S09–03	A. Raffo-Caiado	Department of Technical Cooperation
09:30	S09–04	J. Brittain	Department of Nuclear Sciences and Applications
09:40	S09–05	E. Buglova	Department of Nuclear Safety and Security
09:50	S09–06	C. Cook	Department of Management
10:00	S09–07	T. Renis	Department of Safeguards

Coffee 10:30 – 11:00

S10: Session: Nuclear Security

Chair: L. Rockwood (VCDNP) *Board Room B/M1* **(11:00 – 12:30)**

Time	Id	Presenter		Title
11:00	S10–01	B. Jenkins	USA	Women in Nuclear Security: Introduction
11:10	S10–02	O. K. Hakam	Morocco	Moroccan Experience in Engaging the Next Generation in Nuclear Security
11:17	S10–03	M. Lorenzo Sobrado	UNODC	An International Career in Nuclear Law
11:24	S10–04	K. Mrabit	IAEA	IAEA Nuclear Security Activities: Achievements and Challenges

Following the above short presentations, the panel will continue with open discussions and questions from the floor.

Lunch 12:30 – 14:00

X03: Side Event: Particular Examples, Good Practices, Recruitment Strategy

Chair: K. Breitenecker (IAEA) *Conference Room M5* **(12:30 – 14:30)**

Time	Id	Presenter		Title
12:30	X03–01	A. Schwenk-Ferrero	Germany	R&D Activities in German Nuclear Sector
12:50	X03–02	M. Mkhosi-Motsaathebe	South Africa	Women's Participation in Africa's Nuclear Development-Challenges and Opportunities
13:10	X03–03	M. Gillogly	OECD	Looking Forward: Nuclear Energy Issues and Opportunities
13:30	X03–04	N. Bichler-Bell	IAEA	Candidate & Recruitment Sourcing Plan
		G. Araujo	IAEA	

S11a: Session: Posters: Career Development

1st Floor Concourse **(14:00 – 15:30)**

Id	Presenter		Title
NB: All posters will be on display for the full duration of the conference. Participants are asked to use coffee breaks, etc, to evaluate the posters to help in the selection of the best poster awards.			
S11a–01	B. Mudota	Zimbabwe	Challenges of Communicating Nuclear and Radiation Information: The Case of Zimbabwe
S11a–02	M. Mkhosi-Motsaathebe	South Africa	Women's Participation in Africa's Nuclear Development-Challenges and Opportunities
S11a–03	K. Sergieva	Bulgaria	The Career in Medical Physics — Profession and Vocation
S11a–04	L. Dromgoole	USA	Five Years of Women in Nuclear at Texas A&M University
S11a–05	M. Ukai	Japan	Education Programme About Radiation at School in Japan
S11a–06	F. Marshall	USA	IWiN's "My Amazing Future" Program
S11a–07	S. N. K. A.-I. Dato Syed Ahmad Idid	Malaysia	Public Acceptance on Nuclear Power: A Strategic Need to Shift to 5Ps (Politicians, Policy Makers, Professionals, Public and Press) Acceptance on Nuclear Power
S11a–08	S. N. K. A.-I. Dato Syed Ahmad Idid	Malaysia	Nuclear Education & Training — Showcasing the Best Practices of the United Kingdom and France
S11a–09	E. Han	Korea, Rep. of	Development of Nuclear Energy and Radiation Textbooks for Elementary School Students
S11a–10	J. Yoon	Korea, Rep. of	Growth of the Female Professional in the Radiation Safety Department
S11a–11	C. Bucur	Romania	Relation between Romanian NGOs Acting in Nuclear Field and Other Stakeholders
S11a–12	M. Szucsán	Hungary	Experience of the WiN Hungary in Communication with Public on a Big Social Events
S11a–13	G. Sibbens	EU	Career Development in Nuclear Engineering
S11a–14	D. N. O. Abbo	Uganda	Development of the "Approach to Critical" Experiment Simulation Model for the Consort Reactor Using LABVIEW
S11a–15	P. Boshielo	South Africa	Career Development for Women in Nuclear
S11a–16	K. Hanamitsu	Japan	Nuclear Knowledge Management

Id	Presenter		Title
S11a–17	C. Thomas	Netherlands	What Can we Learn from Similar Male Dominated Industries?
S11a–18	V. Maree	South Africa	Female Regulatory Inspectors at Nuclear Power Plants: A Constant Challenge and Opportunities
S11a–19	T. Melicherova	Slovakia	Activities of WiN Slovakia
S11a–20	D. Carrijo da Silva Dias	Brazil	Female Contributions in Nuclear Science: Experiences at the Brazilian Commission for Nuclear Energy (CNEN/LAPOC)
S11a–21	P. Sithole	Zimbabwe	The Trend of Women in Nuclear Security in Zimbabwe
S11a–22	A. L. Carreño Padilla	Mexico	Development of the Regulatory Framework in Mexico
S11a–23	F. Aina	Nigeria	The Strategic Involvement of Women in Nigeria Nuclear Industry: A Case of Nigeria Atomic Energy Commission (NAEC) and Nigerian Nuclear Regulatory Authority (NNRA)
S11a–24	J. Sayan	Argentina	WiN Argentina: Re Launch of National Chapter and New Activities
S11a–25	Y. Balashevska	Ukraine	Women in Chernobyl Exclusion Zone
S11a–26	S. Jiang	China	International Collaboration in the Development of NPP Software
S11a–27	T. N. Nyein	Myanmar	Predominance and Role of Myanmar Women in Nuclear Related Fields

Coffee 15:30 – 16:00

S11b: Session: Posters: Nuclear Applications

1st Floor Concourse **(14:00 – 15:30)**

Thu

Id	Presenter		Title
NB: All posters will be on display for the full duration of the conference. Participants are asked to use coffee breaks, etc, to evaluate the posters to help in the selection of the best poster awards.			
S11b–01	A. I. Parracho	UK	Design of a Cryogenic Distillation Column for JET Water Detritiation System for Tritium Recovery
S11b–02	P. Guerrero	Peru	Radiation Therapy in Peru: Achievements and Challenges
S11b–03	G. Lujaniene	Lithuania	Application of Radioactive and Stable Isotopes to Trace Anthropogenic Pollution in the Baltic Sea
S11b–04	K. K. Lay	Myanmar	Research and Development of Radiation Processing of Polysaccharide for Agricultural Sector in Myanmar
S11b–05	Q. Ain	Pakistan	Development of a Low Energy Compact and Portable Plasma Focus Neutron Source
S11b–06	H. Affum	Ghana	Determination of Some Flow Properties of a Clinker Grinding Mill Through Radio-Tracing and Residence Time Distribution (RTD) Modeling
S11b–07	P. Uttayarat	Thailand	Development of Gamma-H2AX Assay for Radiation Biodosimetry: A Model Study in Cell Culture
S11b–08	L. Jadoon	Pakistan	Assessment of Significance of Attenuation Correction in Myocardial Perfusion SPECT on Visual Analysis
S11b–09	M. Ilieva	Bulgaria	Enhancement of Training Capabilities in VVER Technology Through Establishment of VVER Training Academy
S11b–10	G. Mahmoud	Egypt	Effective Removal of Hazardous Dyes from Aqueous Solutions Using Starch Based Hydrogel and Gamma Radiation
S11b–11	O. Ashry	Egypt	Ameliorating Effects of Bone Marrow Transplantation and Zinc Supplementation on Physiological and Immunological Changes in Gamma-Irradiated Rats
S11b–12	W. Rosita	Indonesia	The Role of Gadjah Mada University on Forming Public's Perception About Nuclear in Indonesia Through Community Services Programs

Id	Presenter		Title
S11b–13	O. Oguejiofor	Nigeria	Overview of Nuclear Applications in Nigeria
S11b–14	E. Kairiyama	Argentina	Overview of Twenty Years of Radiation and Tissue Banking Activity in Argentina
S11b–15	K. Bergaoui	Tunisia	Development and Applications of a New Deuterium-Deuterium (D-D) Neutron Generator
S11b–16	P. Kilavi	Kenya	Application of TXRF in Assessing Trace Element Levels in Formulated Indigenous Complementary Infant Flour from Kenya
S11b–17	I. Bakiri	Albania	Assessment of Recharge in Lushnja Aquifer System Using Environmental Isotope Tracers
S11b–18	M. D. P. Salas-Chaves	Costa Rica	Body Mass Index and Body Composition with Deuterium in Costa Rican Children
S11b–19	L. Shouman	Egypt	Humidification Dehumidification Spray Column Direct Contact Condenser Part I: Countercurrent Flow
S11b–20	M. Belinco	Argentina	The IAEA Technical Cooperation Programme as a Knowledge Multiplier Mechanism for Nuclear Medicine — The Case of the Nuclear Medicine Knowledge Network in Argentina
S11b–21	T. Ngeleka	South Africa	Self-Shielding Effects in Co-60 Production
S11b–22	F. Gning	Senegal	Preliminary Diagnostic Reference Levels of Adult CT at Aristide Ledantec National Hospital
S11b–23	M. A. Pineda Tovar	Mexico	Behavior of the Cardiovascular Diseases in Women
S11b–24	V. Maree	South Africa	The Management of the Solid Radioactive Waste & Used (Spent) Fuel in South Africa: An Overview of Past, Present and Future Practices
S11b–25	M. Dimcheva	Bulgaria	Radiation Dose to Patients and Medical Staff in Different Procedures of Nuclear Medicine
S11b–26	R. Olobatoke	South Africa	Radionuclide Content of Pasteurized Milk Sold in Mafikeng, South Africa
S11b–27	E. Vataj	Albania	The Study of Byzantine Glass Mosaic Tesserae from Albania Using Nuclear Techniques
S11b–28	N. Del Mastro	Brazil	Use of Ionizing Radiation in the Production of Nanomaterials
S11b–29	B. Petrovic	Serbia	Influence of New Contrast Agent on CT Based Radiotherapy Treatment Planning

Id	Presenter		Title
S11b–30	O. Omokheyeke	Nigeria	Applying Sediment Cores and Nuclear Techniques for Pollution Assessment in the Bonny/new Calabar River Estuary, Niger Delta, Nigeria
S11b–31	H. Sayed	Sudan	Using Gamma Irradiation to Modify Properties of Polysaccharides (Guar Gum)
S11b–32	J. Seong	Korea, Rep. of	Unmet Needs in Cancer Radiotherapy in Low to Middle Income Countries
S11b–33	E. B. Ita	Nigeria	The Application of Nuclear Technology for a Better World
S11b–34	S. Şentürk Lüle	Turkey	Application of Monte Carlo Techniques to Dose Rate Calculations of Gamma Irradiation Facility

Coffee 15:30 – 16:00

S11c: Session: Posters: Energy, Environment, and Climate Change

1st Floor Concourse **(14:00 – 15:30)**

Id	Presenter		Title
NB: All posters will be on display for the full duration of the conference. Participants are asked to use coffee breaks, etc, to evaluate the posters to help in the selection of the best poster awards.			
S11c–01	A. Townsend	USA	Compartment Modeling of Cesium Movement Through Terrestrial-Aquatic Ecosystems in a Forested Headwater in Fukushima
S11c–02	E. Meneses Ruiz	Cuba	Assessing the Atmospheric Pollution of Energy Facilities for Supporting Energy Policy Decisions
S11c–03	N. Semioshkina	Germany	Radioecology and Environmental Decision Support Systems
S11c–04	H. Kuranchie-Mensah	Ghana	Effect of Body Size and Food Quality on the Assimilation of ^{65}Zn and ^{110m}Ag in Bloody Cockles (Anadara Senilis) from Ghana
S11c–05	D. Lajnef	Tunisia	How is Electricity Generated from Nuclear Power Plant
S11c–06	J. Halder	IAEA	The Global Network of Isotopes in Rivers (GNIR): Integration of Stable Water Isotopes in Riverine Research and Management
S11c–07	S. Chanyotha	Thailand	Nuclear Engineering Education in Support of Thailand's Nuclear Power Programme
S11c–08	S. Sanz	Germany	Project Experiences of the Implementation of the Primary Bleed & Feed System
S11c–09	S.-K. Lee	Korea, Rep. of	Seasonal Variations in the Structure of Phytoplankton Communities near Nuclear Power Plants
S11c–10	T. M. Soedyartomo	Indonesia	Forecast Development of Electricity Supply in the Indonesian Archipelago
S11c–11	S. Y. Choi	Korea, Rep. of	Development of Multi-Alarm Pattern Card for an Effective Selection of Abnormal Operation Procedure in MCR
S11c–12	J. Yan	China	The Investigation of NPP Control and Monitoring Functional Analysis Applied to Functional Displays' Implementation
S11c–13	L. Pham	Vietnam	Surface Decontamination Studies of Cs-137 and Sr-85 Using Polymer Gel
S11c–14	B. K. Sapra	India	Development and Application of Advanced Techniques for Inhalation Dose Assessment in Ambient and Occupational Environments

Id	Presenter		Title
S11c–15	M. Kocadag	Austria	Traces of Sr-90 in the Sediments of the Danube River
S11c–16	M. Jang	Korea, Rep. of	Safety Analysis for Marine Radiation Leakage Accidents
S11c–17	V. Cidzikienė	Lithuania	Radionuclide Release into the Underground Water from Hypothetical Reactor at the New NPP Site in Lithuania
S11c–18	H. Loner	Switzerland	World Champion in Environmental Sustainability — for How Much Longer?
S11c–19	J. Shi	China	Research on Operating Procedure Development in View of RCM Theory
S11c–20	Y. S. Sul	Korea, Rep. of	The Initial Test Programme Features for the Advanced Korean NPPs (Shin–Kori NPP Units 3&4)
S11c–21	Y.-L. Han	Korea, Rep. of	Fire Protection Regulation for NPP in Republic of Korea
S11c–22	Y. J. Choi	Korea, Rep. of	Status of Filtered Containment Venting in Republic of Korea
S11c–23	G. Dladla	South Africa	Electricity Generation Through the Koeberg Nuclear Power Station of Eskom in South Africa
S11c–24	L. Ma	China	The Experimental Study to Support IVR Strategy
S11c–25	X. Chen	China	Effective Uranium (VI) Sorption from Alkaline Solutions Using Bi-Functionalized Silica-Coated Magnetic Nanoparticles
S11c–26	E. Durand-Poudret	France	To What Extent International Law Constitutes an Appropriate Answer to Nuclear Accidents?
S11c–27	N. M. Vijaya	India	Electrical Power System Design and Station Blackout (SBO) Management in Indian Fast Breeder Reactors
S11c–28	W. Chen	China	Revolution of Nuclear Power Plant Design Through Digital Technology

Coffee 15:30 – 16:00

S11d: Session: Posters: Safeguards

1st Floor Concourse **(14:00 – 15:30)**

Id	Presenter		Title
NB: All posters will be on display for the full duration of the conference. Participants are asked to use coffee breaks, etc, to evaluate the posters to help in the selection of the best poster awards.			
S11d–01	A. Rueanngoen	Thailand	Implementation of Safeguards in Thailand
S11d–02	T.-A. Warner	Jamaica	Documentation Experiences for Jamaican SLOWPOKE-2 Conversion from HEU to LEU
S11d–03	Y. Aregbe	EU	Measurements Matter in Nuclear Safeguards & Security
S11d–04	M. George	Sierra Leone	Implementation of Safeguards and Non-Proliferation in Sierra Leone
S11d–05	I. A. Colussi	Belgium	The 'Landscape' of Nuclear Safeguards: a Comparative Analysis of the International and Regional Systems
S11d–06	J. Carrillo-de-Fischer	IAEA	Knowledge Management in the IAEA Department of Safeguards
S11d–07	E. Mursa	Moldova, Rep. of	Evaluating National Nuclear Safeguards System Implementation in the Republic of Moldova
S11d–08	M. B. Boadu	Ghana	Radiation Protection, Safety and Security Issues in Ghana
S11d–09	A. Uthman	Nigeria	Regulatory Framework for Safeguards in Nigeria
S11d–10	P. J. Imbiakpa	Nigeria	Safeguards and Non-Proliferation
S11d–11	I. Niemeyer	ESARDA	ESARDA: The European Safeguards Research and Development Association
S11d–12	E. Susilowati	Indonesia	Study for Safeguards Challenges to the Most Probably First Indonesian Future Power Plant of the Pebble Bed Modular Reactor
S11d–13	A. L. Carreño Padilla	Mexico	Points for Improvement in Mexican Legislation on Safeguards
S11d–14	A. Melkumyan	Armenia	Improvement of Safeguards Practices in Armenia Through Implementation of Advanced Software
S11d–15	B. Battistella	WINS	Measuring the Return on Investment of Nuclear Security Training: The Case of the WINS Academy Professional Society
S11d–16	O. K. Hakam	Morocco	Nuclear Security Education in Morocco

Coffee 15:30 – 16:00

S12: Session: Closing

Chair: G. Voigt (WiN IAEA) *Board Room B/M1* **(16:00 – 17:00)**

Time	Id	Presenter		Title
16:00	S12–01	S. Johnson	USA	Best Poster Awards
		L. Rockwood	VCDNP	
16:20	S12–02	E. Gyane	WiN IAEA	Closing Remarks
16:30	S12–03	J. Dunn Lee	IAEA	IAEA Remarks on the Conference
16:40	S12–04	S.-M. Park	WiN Global	Remarks and Conference Closure
16:50	S12–05	H. Al Blooshi	UAE	Flag Transfer to WiN United Arab Emirates

09:00 – 14:00: Technical visit to MedAustron Ion Beam Therapy Centre near Wiener Neustradt
Registration obligatory!

MedAustron, a centre for ion therapy and research, is located in Wiener Neustadt in Lower Austria, about 50 km south of Vienna. It is one of the most advanced centres for ion beam therapy and research in Europe. The radiation therapy applied will use protons and carbon ions. The first patient treatment is planned in 2015.

MedAustron offers an innovative form of radiation therapy (ion beam therapy) using protons and carbon ions. Compared to conventional radiation therapy, this treatment is able to reduce radiation exposure to adjacent healthy tissue and to spare the tissue behind the tumour almost entirely. Therefore, ion beam therapy is optimum treatment for tumours close to radiosensitive organs such as the brain and spinal cord, eyes, liver and lungs. Since tissue in growth is more sensitive to radiation, proton radiation is particularly suitable for cancer in children and adolescents.

At MedAustron, the protons or carbon ions are generated by three ion sources. The charged particles are pre-accelerated in a 'linac' (linear accelerator) on a straight path by electrical alternating fields and are then injected into the synchrotron. In the synchrotron, a circular accelerator with a circumference of 80 meters, the particles are further accelerated until they reach their final velocity of approximately two-thirds of the speed of light, or 200 000 km/s. Finally, the ion beam is conveyed into the irradiation rooms on an "extraction line". The particles are held in place within a vacuum tube by strong magnetic fields, generated by 300 magnets in total. The synchrotron has been developed in close cooperation with CERN.

08:00 – 15:30 Technical visit to the IAEA's Seibersdorf Laboratories and Nuclear Engineering Seibersdorf
Registration obligatory!

Conference participants will have the opportunity to visit Nuclear Engineering Seibersdorf (NES), an Austrian facility for collecting, processing, conditioning and storing radioactive waste, as well the IAEA's laboratories in Seibersdorf. The IAEA laboratories belong to the Departments of Safeguards, and Nuclear Sciences and Applications.

The IAEA laboratories, which are situated about 35 km southeast of Vienna, contribute to the organization's programmes with activities in nuclear verification and varied nuclear applications, e.g., for plant mutation breeding, food safety, animal production and health, soil and water management and crop nutrition, the sterile insect technique, nuclear spectrometry and instrumentation, medical dosimetry and terrestrial environment monitoring. The nuclear applications laboratories provide training in these areas for scientists and also analytical services to support and strengthen Member States' laboratories. In addition, the laboratories conduct applied and adaptive research to develop and improve nuclear techniques and technologies.

The Nuclear Engineering Seibersdorf is collocated on the Seibersdorf site. Its main activities, which are carried out on behalf of the Republic of Austria, are the collection, processing, conditioning and storage of radioactive waste; decontamination of the installations and laboratories from 45 years of research and development at the Seibersdorf site; and the operation of the Hot Cell Laboratory.

09:00 – 11:30: Vienna City Walk including visit to Spanish Riding School
Registration obligatory!

The Spanish Riding School in Vienna is the only institution in the world which has practiced for nearly 450 years and continues to cultivate classical equitation in the Renaissance tradition of the haute école. The objective of classical equitation is to study the way the horse naturally moves and to cultivate the highest levels of haute école elegance the horse is capable of through systematic training. The result creates an unparalleled harmony between rider and horse.

Visitors will attend the morning training of the Spanish Riding School and participate in a guided walk of central Vienna (the Hofburg and its vicinity).

09:30 – 10:30: Technical visit to IAEA Incident and Emergency Centre
10:45 – 11:45: Registration obligatory!
13:00 – 14:00:

Conference participants will have the opportunity to visit the IAEA's Incident and Emergency Centre (IEC), which is situated in the VIC. The IEC serves as the IAEA's focal point for responding to nuclear or radiological incidents and emergencies and for promoting improvement in Member States' emergency response and preparedness. The visit will present the activities, infrastructure and communication procedures of the IEC.

10:00 – 11:00: Technical visit to Comprehensive Test Ban Treaty Organization
14:00 – 15:00: Registration obligatory!

The Comprehensive Nuclear–Test–Ban Treaty (CTBT) bans nuclear explosions by everyone, everywhere: on the Earth's surface, in the atmosphere, underwater and underground. Over 2000 nuclear tests were carried out between 1945 and 1996, when the CTBT opened for signature. The CTBT is almost universal but has yet to become law. 183 countries have signed the Treaty, of which 163 have also ratified it (as of September 2014), including three of the nuclear-weapon States: France, the Russian Federation and the United Kingdom. But 44 specific nuclear technology holder countries must sign and ratify the CTBT before it can enter into force. Of these, eight are still missing: China, Egypt, India, Iran, Israel, North Korea, Pakistan and the USA. India, North Korea and Pakistan have yet to sign the CTBT. The last Annex 2 State to ratify the Treaty was Indonesia on 6 February 2012.

Since the Treaty is not yet in force, the organization is called the Preparatory Commission for the Comprehensive Nuclear–Test–Ban Treaty Organization (CTBTO). It was founded in 1996, has over 260 staff members from over 70 countries, and is based in Vienna. It is headed by the Executive Secretary, Lassina Zerbo from Burkina Faso. The CTBTO's main tasks are the promotion of the Treaty and the further development of the verification regime so that it will be operational when the Treaty enters into force.

The Treaty has a unique and comprehensive verification regime to make sure that no nuclear explosion goes undetected.

13:00 – 15:00: Technical visit to the TRIGA Mark II Reactor of the Atominstitut, Technical University of Vienna
Registration obligatory!

The TRIGA Mark–II reactor was installed by General Atomic (San Diego, California, USA) in the years 1959 through 1962, and went critical for the first time on March 7, 1962. Operation of the reactor since that time has averaged 220 days per year, without any long outages. The TRIGA reactor is a research reactor of the swimming-pool type that is used for training, research and isotope production.

The reactor has a maximum continuous power output of 250 kW (thermal). The heat produced is released into a channel of the river Danube via a primary coolant circuit (deionized distilled water at 20–40°C) and a secondary coolant circuit (ground water at 12–18°C) the two circuits being separated by a heat exchanger.

Since the moderator has the special property of moderating less efficiently at high temperatures, the TRIGA–reactor Vienna can also be operated in a pulsed mode (with a rapid power rise to 250 MW for roughly 40 milliseconds). The power rise is accompanied by an increase in the maximum neutron flux density from 1×10^{13} cm^{-2}s^{-1} (at 250 kW) to 1×10^{16} cm^{-2}s^{-1} (at 250 MW). This negative temperature coefficient of reactivity brings the power level back to approximately 250 kW after the excursion, the maximal pulse rate being 12 per hour, since the temperature of the fuel elements rises to about 360°C during the pulse and, therefore, the fuel is subjected to strong thermal stress.

07:00 – 21:00: Technical visit to the Atom Museum, Misov near Prague (Czech Republic)
Registration obligatory!

The Atom Museum Javor 51—AMI 51 is located in a former Soviet facility for storing nuclear warheads during the Cold War and has recently been restored to its original state to be preserved for posterity as a museum.

Contents

BIO

Eva Gyane

Ms. Eva Gyane has been working at the IAEA's Department of Safeguards since 1999. She became a nuclear safeguards inspector in 2006 and a member of the Iran Task Force in 2013.

Prior to becoming an inspector, Ms. Gyane worked as a Safeguards Information Analyst in the IAEA Division of Safeguards Information Technology in support of IAEA strengthened safeguards and the State evaluation process. Before joining the Department of Safeguards in 1999, Ms. Gyane worked in various other positions at the IAEA, continuously since 1986.

Ms. Gyane holds an MBA from the Economic University of Vienna, a B.Sc. in Physics and Chemistry from the Open University and a M.Sc. in Nuclear Science and Technology from Manchester University. She is a member of the Institute of Physics.

Ms. Gyane is the President of the Women in Nuclear (WiN) IAEA Chapter since 2009; Executive of WiN Global since 2012; She is the co-Scientific Secretary of WiN Global 2015.

Ms. Gyane is married and she has three grown-up children and three grandchildren.

BIO

Françoise Muelhauser

Françoise Muelhauser, Safeguards Inspector at the Safeguards Department, is a Vice President of the WiN IAEA Chapter. Francoise has a Ph.D. in Atomic, Molecular and Nuclear Experimental Physics from the University of Fribourg, Switzerland. She spent more than two decades doing research at accelerator facilities worldwide in the field of medium energy physics, a domain combining nuclear and particle physics. Based in Vancouver, Canada, then near Zurich, Switzerland, and in Urbana-Champaign, USA, her research occurred in Canada, USA, Switzerland, Japan, Italy, and Russia.

In 2005, Françoise joined the IAEA as a Nuclear Physicist in the Nuclear Science and Applications Department, in charge of promoting and supporting the application of accelerators in all possible interesting fields. While at the IAEA, she continued to collaborate with her former research. Notable milestones were a refinement in the precise value of G_{F}, the weak interaction coupling constant, and the measurement of the muonic hydrogen Lamb shift, the basis of the current proton rms charge radius puzzle ("The Size of the Proton", Pohl *et al.*, Nature, 2010). This latter result was was obtained only after 40 years of work by a collaboration whose roots trace back to proposals made in the early 1970s. In all, she is co-author of more than 200 publications.

In 2013, she joined the Department of Safeguards at the IAEA and became a nuclear safeguards inspector, visiting countries around the world to support the implementation of the Non-Proliferation Treaty signed by these countries.

Since early times in her career, Françoise has worked at universities and research institutes to promote the number and position of women in the nuclear field. In 2009, she was designated by the IAEA Director General as the alternate gender focal point at the IAEA.

Gabriele Voigt

BIO

Ms. Gabriele Voigt (Gabi), born in 1952, is a biologist and holds a doctorate in genetics, microbiology, and biochemistry. She habilitated from the University of Munich in Ecological Chemistry and lectures Radioecology at the Atominstitut of the Technical University in Vienna. Her scientific interests include; radiochemistry and radiometry, radioactivity in different ecosystems, food-chain transfer of radionuclides to humans, countermeasures and remediation strategies, dose reconstruction, and the application of radioecological models for nonradioactive pollutants. She has long served as an editor for the Journal of Environmental Radioactivity, and serves as a referee to several international journals.

She has worked as a radioecologist for more than 30 years in the field of radiation protection, nuclear sciences and environmental management and remediation, firstly in the Institute of Radiation Hygiene of the German Federal Health Office and later in the Institute of Radiation Protection in the GSFResearch Center for Environment and Health, both located in Neuherberg near Munich, Germany.

From May 2002, she served as director of the IAEA's Seibersdorf Laboratories of the Department of Nuclear Sciences and Applications, responsible for the Environment programme (terrestrial) and was the IAEA focal point for environmental issues including liaisons with other international and UN organizations. From January 2010 she was in charge of the Office of Analytical Services in the Department of Safeguards. Since retiring in 2014, Ms. Voigt has remained active in science and is a Vice President of WiN IAEA. She is in charge of the WiN mentoring programme and the WiN IAEA newsletter and active in other working groups. She is also the elected Board Member on behalf of WiN IAEA to WiN Global.

Gabi is heavily involved in activities concerning gender equality and women's networking such as WiN and WISE (Women in International Security). Since her retirement she works as a consultant in radioecology and runs her own company r.e.m. (cognitive radioecology) and continues to serve as member of several scientific societies in her field of expertise.

BIO

Se-Moon Park

Ms. Se-Moon Park has been involved with Women in Nuclear since first attending and hosting the annual conference in Seoul 2001 as Vice President of WiN Korea. Since then she has continuously increased her responsibility and participation in WiN Korea, becoming President in 2009, and in parallel, her active participation in WiN Global.

During her term she officially registered WiN Korea as a legal entity in 2003, revised the Chapter website, and initiated multiple outreach, educational and R&D programmes in her country. As a result of her motivation the WiN Korea chapter grew from 80 to 400 members, many of whom are actively involved in the Global organization.

Ms. Park gained her M.Sc. and Ph.D. from UCL, London University, and taught geology and environmental geology at Universities in Korea and Europe for seven years. Presently, with 20 years scientific experience, she is a Project leader and Principle Researcher of radioactive waste treatment processes and disposal research in the Korea Atomic Research Institute and Korea Hydro & Nuclear Power–Central Research Institute. She has contributed to the development of radioactive waste monitoring systems of disposal sites and a seismic monitoring system for NPPs. Within WiN Korea she is the research leader of nuclear knowledge transfer and human resources development projects run by WiN Korea.

Ms. Park further contributes to fostering nuclear sciences as a member or advisor to a number of governmental committees. She is a permanent member of Korea Nuclear Society, Korean Women Scientists and Engineers and a Vice President of the Korea Federation of Women Science and Technology Association.

BIO

Janice Dunn Lee

Janice Dunn Lee is the Deputy Director General and Head of the Department of Management. She was appointed to the position on 1 January 2012. Prior to this, Ms. Dunn Lee was the Deputy Director–General of the OECD Nuclear Energy Agency (OECD/NEA) in Paris, France. Earlier, Ms. Dunn Lee was the Director of International Programmes for the United States Nuclear Regulatory Commission (NRC) where she managed international cooperative programmes in nuclear safety, technology, and materials, the import and export licencing of these materials and radioactive waste safety.

Ms. Dunn Lee joined the NRC in 1975 and held a number of progressively responsible positions. These included: Senior Assistant for international nuclear policy to four successive NRC Chairmen; Licencing Review and Policy Analyst in the Office of International Programs; and Chief for International Safeguards, Office of Nuclear Materials Safety and Safeguards where she participated in programmes to assist countries to protect, control and account for nuclear materials. She was selected for the Senior Executive Service in 1998. She was appointed as the Deputy Director of the Office of International Programmes in 1998 and as Director in 1999.

Ms. Dunn Lee participated in several special assignments and programmes while at the NRC. From 1989 to 1991, she served as a Congressional Fellow in the Office of Senator James A. McClure of Idaho. In 1993, she was on assignment to the Office of Senator Alan K. Simpson of Wyoming, where she served as a staff member on the Committee on Environment and Public Works. Ms. Dunn Lee graduated from the NRC Supervisory Development Programme in 1995 and the Federal Executive Institute in 1991.

Ms. Dunn Lee received a B.A. degree in Sociology from the University of California at Berkeley in 1973 and an M.A. degree in International Relations from the Fletcher School of Law and Diplomacy, Tufts University, in 1975.

BIO

Corey Hinderstein

Corey Hinderstein joined the Department in February 2015 as the Senior Coordinator for the Nuclear Security Summit and Non-proliferation Policy Affairs at the US Department of Energy. Previously, she was vice president for international programmes at the Nuclear Threat Initiative, where she led efforts to create the World Institute for Nuclear Security and the IAEA LEU Fuel Bank. From 1996–2006, she worked at the Institute for Science and International Security, conducting open source assessments of proliferant state programs, including the first public identification of Iran's uranium enrichment facilities at Natanz.

Martina Birgit Schwaiger

BIO

Ms. Schwaiger is, since 2009, the managing director of Seibersdorf Labor, GmbH, an analysis and measurement laboratory providing EN ISO/IEC 17025 certified analytical services, notable in the domain of radiation measurement and dosimetry. She holds a Ph. D. in Physics from the TU Graz and both an M.Sc. and an MBA in Communication and Leadership from Danube–University, Krems.

Her current activities include Board membership with the Radiation Protection Association Austria (ÖVS), with Austrolab (serving as National Representative of the Austrolab in the TCQA/Europe), and with the Scientific Committee of the "Association for Radiation Research" of the Technical University Graz, Austria. She serves also as a member of the Austrian delegation to the WGB/CTBTO.

Ol'ga Algayerová

BIO

Ambassador Ol'ga Algayerová was appointed the Permanent Representative of the Slovak Republic to the International Organizations in Vienna in October 2012.

During her career she served in various capacities, among them the Foreign Policy Advisor to the Prime Minister of the Slovak Republic (2012–present); President of the Slovak Millennium Development Goals (2010–2012); State Secretary of the Ministry of Foreign Affairs of the Slovak Republic (2006–2010); Corporate Manager of Opportunity Export & Contract Manufacturing & Licensing–out Business Unit, Zentiva International a.s. Hlohovec, Slovakia (2004–2006); Head of Export Department Financial and Tax Adviser to the CEO, Slovakofarma a.s. Hlohovec, Slovakia (1995–2003); Statutory Representative and CEO, Transtrade s.r.o. Bratislava, Slovakia (1993–1995); Head of the Representation Office in Slovakia, Compensacion y Comercio S.A. Barcelona, Spain (1991–1993); Deputy Head of Department, Foreign Trade Company Drevounia Bratislava, Slovakia (1982–1991).

Ambassador Algayerová holds Master in Contemporary Diplomacy from University of Malta; Master of Business Administration from the Open University Business School, Milton Keynes, United Kingdom; Engineer of Economy from University of Economics, Bratislava, Slovakia.

Gabriela Ramos

BIO

Gabriela Ramos is Chief of Staff of the OECD, Sherpa to the G20 and Special Counsellor to the Secretary-General. In this position, and since 2006, she has been advising and supporting the Secretary-General's strategic agenda to reinforce the impact of the work of the OECD, both at the international governance sphere, and at the domestic level in OECD member and partner countries. She developed the targeted policy advice through the "Better Policies series", and the "Getting it Right" publications (in particular, "Getting it Right: Mexico Competitiveness Agenda"), that present the most relevant and timely OECD views on the challenges countries are confronting, as well as its main recommendations. She also supports the Secretary General when launching major OECD initiatives such as the Gender initiative, the Development Strategy and the Skills strategy and is now overseeing "New Approaches to Economic Challenges" a whole of the house reflection started in 2012 to distil the lessons from the economic crisis, and to upgrade the analytical frameworks that underpin the OECD policy advice.

In addition, she oversees OECD's work on Financial and Enterprise Affairs. Previous to this position, Ms. Ramos was the Head of the OECD Office for Mexico and Latin American, where she promoted OECD policy recommendations in several areas, particularly education, competition and health. She collaborated in the preparation of several OECD reports, developed the OECD Forum in Mexico and launched the Latin American Program. Before joining the OECD, Ms. Ramos held several positions in the Mexican government, including the Director of Economic Analysis in the Foreign Affairs Ministry and Advisor to the Budget and Planning Minister, among others. In 1995, she earned a MA on Public Policy from the John F. Kennedy School of Government, Harvard University, where she was a Fulbright and Ford-MacArthur scholar. More recently, the President of France, François Hollande, granted her the recognition of member of the Order of Merit, in the grade of Chevalier, due to her contributions to strengthen the relationship between the OECD and France.

Peter Rickwood

BIO

Peter Rickwood is the founder of Atomic Reporters, a Canadian non-profit with international NGO status in Austria where its operation is based. It provides workshops and acts as an information broker offering journalists globally the opportunity to bring more knowledge to coverage of nuclear news. Rickwood worked for most of his life as a journalist before joining the International Atomic Energy Agency in 2001 where he was a press officer for more than 10 years. He also acted as information adviser to the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty organization (CTBTO) and to the UN Scientific Committee on the Effects of Atomic Radiation (UNSCEAR). Atomic Reporters is nonpartisan and independent.

BIO

Sunni Locatelli

Sunni Locatelli is an established communications leader with broad experience in the political, central agency, line department and regulatory communications disciplines. Highly skilled in communicating/interpreting sensitive policy and programme issues to a broad range of government, NGO and private sector stakeholders, as well as national and specialty media, she brings wide-ranging experiences to her current role as Director General of the Strategic Communications Directorate at the Canadian Nuclear Safety Commission (CNSC). She has been a media and government relations spokesperson for more than 30 years, dealing with a variety of sensitive issues at both the government and political levels. Educated at Carleton University in her native Ottawa, she began her public service career in the Prime Minister's Office, which included a three-year term as Deputy Press Secretary to Prime Minister of Canada, Brian Mulroney.

BIO

Eileen Radde

Eileen Radde is the chair of the European Nuclear Society – Young Generation Network and works currently as an engineer at the Nuclear Engineering Seibersdorf, and is managing the interim storage of Austrian radioactive wastes. Before that she was employed by the IAEA and Westinghouse Electric Germany. She obtained her Master's degree in Technical physics in 2011 from the University of Technology Graz and Vienna. Her main research and working fields are Nuclear Security, Safeguards as well as Waste and Decommissioning with a special interest in gamma spectroscopy. She has developed a Nuclear Security Master's Programme in a EU funded project, which started in March 2013.

Together with several colleagues she published a book in 2011, which explains basic nuclear principles and various nuclear technologies in layman language ("Pinning down nuclear — To the core of the matter, Vienna 2011").

Jasmin Craufurd-Hill

BIO

Jasmin Craufurd-Hill is a Management lecturer with more than a decade experience in senior management and project management roles within the government and emergency services sectors.

The current President of WiN Australia and a WiN Global Executive, her technical background has included roles with the Australian Nuclear Science and Technology Organization (ANSTO), where she served as a member of the OPAL Reactor's commissioning team and as a Senior Systems Engineer in its subsequent Reactor Operations and Engineering sections.

Ms. Craufurd-Hill has received an Early Career Symposium Fellowship from the Academy of Technological Sciences and Engineering (ATSE) and addressed the Prime Minister's Council on Science, Engineering and Innovation (PMSEIC) on the challenges of pursuing careers in nuclear science and technology.

BIO

Meena Singelee

Meena Singelee is the Executive Director of INENS. Her responsibilities include overseeing external relations, managing the Steering Committee and staff, the network and the research projects. She is one of the founding members of INENS.

She has previously consulted for London-based NGOs and not-for-profit organizations on nuclear issues. She has worked for the European Commission and the South Korean Embassy in London. She has also interned for Mark Fitzpatrick at the International Institute for Strategic Studies (IISS) and volunteered at the Verification Research, Training and Information Centre (VERTIC).

Meena holds an MPhil in International Law from the University of Bristol (UK), specialising on managing compliance within the NPT. She also holds an M.Sc. in International Relations and B.Sc. in Politics, also from Bristol.

Aihong Wu

BIO

Ms. Wu received her Master degree in Law from Peking University. She is now the General Counsel of State Power Investment Corporation of China.

From 1994 to 2002, Ms. Wu was the Director of legal affair department of China National Nuclear Corporation (CNNC). From 2003 to 2008, she served as the Deputy Director of legal department of China Power Investment Corporation (CPI). From 2008 to the end of June 2015, Ms. Wu is the General Counsel of SNPTC and in charge of Department of the policy study and legal affairs. She was appointed as the General Counsel of State Power Investment Corporation in the end of July, 2015. In these roles, she led and organized related legal affairs in related corporations.

Ms. Wu has accumulated abundant experience in the fields of nuclear industry legislation, reform and restructuring of stated-owned enterprises, corporate legal risk prevention and legal system construction.

BIO

Callum Thomas

Callum Thomas is the founder and CEO of Thomas Thor Associates, the leading executive search, recruitment and consulting business in the global nuclear industry. Thomas Thor Associates provides recruitment and HR consulting services to organizations in the nuclear industry across more than 20 countries. Callum's experience includes 16 years in executive search and recruitment in high safety culture industries. He has been involved in supporting HR initiatives for the IAEA and European Commission, as well as presenting at many nuclear industry conferences and events on HR and people related topics.

Ping Xia

BIO

Ms. Ping Xia is the Head of Medical Physics in the Department of Radiation Oncology and holds The Don DiGeronimo Chair in Medical Physics. She is a Professor of Molecular Medicine, Cleveland Clinic Lerner College of Medicine of Case Western Reserve University. Ms. Xia received her undergraduate degree in physics from Beijing Normal University and her doctorate in physics from the University of Virginia in Charlottesville, VA, USA. Ms. Xia has published more than 100 peer-reviewed articles and nine book chapters. She received research grants from Department of Defence and National Cancer Institution. She is a follow of The American Association of Physicists in Medicine (AAPM).

Nuran Bese

BIO

Ms. Bese's training as a M.D. and radiation oncologist was completed in Istanbul University, Cerrahpasa Medical School. After the completion of her training, she worked as a specialist in the department of Radiation Oncology of the same medical school. She became an Associate Professor in 2000 and Professor in 2006. During her education, she was awarded British Council Scholarship and worked as a visiting clinician in Royal Marsden Hospital, Sutton. She also worked as a consultant in International Atomic Energy Agency, Vienna, in 2006.

Since December 2011, she has been working in the Breast Health Unit of Acibadem Maslak Hospital which was established to offer a multidisciplinary approach including all steps from early diagnose to long term follow-up with high standard diagnostic and treatment procedures in the field of breast cancer. She is particularly interested in breast cancer and participated in the development of national and international breast cancer treatment guidelines.

Ms. Bese is a member of American Society of Breast Disease (ASBD), European Society for Therapeutic Radiology and Oncology (ESTRO), Arome (Radiation Therapy, Oncology, Mediterranean area-executive board member-president of the scientific committee), Breast Health Global Initiative (BHGI), Turkish Radiation Oncology Society, Turkish Oncology Group and Turkish Multidisciplinary Oncology Society (Secretary).

BIO

Anja Nitzsche-Bell

Anja Nitzsche-Bell is the Head of Resource Mobilization and Strategic Partnerships at the Programme of Action for Cancer Therapy at the International Atomic Energy Agency. She has over 20 years of experience of working in global health, social protection and development with a strong focus on HIV/AIDS, NCDs, gender, Monitoring and Evaluation, health systems management and financing.

Before joining IAEA, Anja Nitzsche-Bell was Division Chief of Global Financing Mechanisms and Partner Collaboration at UNAIDS, Geneva. Having worked with UNAIDS for over a decade, she held various positions, including interim Director of the Executive Office, Head of the Global Fund and Country Impact Unit and Senior Monitoring and Evaluation Advisor. She was also Lead Manager for Social and Health Sector Reform at the Delegation of the European Commission to Ukraine, Moldova and Belarus. She has worked on long-term assignments in several Eastern European and Central Asian countries and in South East Asia.

Anja Nitzsche-Bell holds Master degrees in International Health Systems Management, Political Science and International Relations. Trained as a journalist, she has published a range of peer-reviewed articles and publications.

Nelly Enwerem-Bromson

BIO

Ms Nelly Enwerem-Bromson — Director of the Division of Programme of Action for Cancer Therapy at the International Atomic Energy Agency. Maria Manuela (Nelly) Enwerem-Bromson holds a Bachelor of Arts Degrees in Political Science and African Studies from Wellesley College, USA and a Master of Arts Degree from the Fletcher School of Law and Diplomacy, also in the USA.

Prior to joining the IAEA in January 2014, Nelly Enwerem-Bromson worked in strategic policy development, partnerships and resource mobilisation at the World Health Organization for 11 years, in its regional offices for Africa and South-East Asia, as well as at Headquarters in Geneva. Nelly Enwerem-Bromson came to the United Nations after years in national service, as adviser to the President, the Attorney-General and the Minister of State Reform of Portugal. She has also worked as an international investment banker in London and a Professor of International Relations and Development.

May Abdel-Wahab

BIO

May Abdel-Wahab, MD, Ph.D. is the current Director of the Division of Human Health at the International Atomic Energy Agency, Vienna Austria. She has over 30 years of patient care, teaching and research experience in the field of radiation medicine.

Before joining IAEA she was section head of GI Radiation Oncology at the Cleveland Clinic, USA and Professor at the Cleveland Clinic Lerner School of Medicine, Case Western University. She has served, both as a member and chair, on various National and International committees. She has also served on advisory boards and professional journal editorial boards She is a fellow of the American board of Radiology and is on the Best doctors in America listing, among other honors.

Ms. Wahab has been an avid lecturer and participant on scientific panels. She has also served on expert panels for treatment guidelines and published widely (over 150 publications). She has a special interest in education and curriculum development as a former residency programme director and has organized numerous symposia and scientific meetings. In addition, she has an interest in healthcare access and training, as well as novel solutions to address disparity and diversity issues.

SunJu Choi

BIO

Ms. SunJu Choi is a specialist in radioisotope production and its application, especially in the development of radioisotope production, of diagnostic & therapeutic radiopharmaceuticals.

Until 2014, Ms. Choi was director of Radioisotope Research Division at the Nuclear Basic Research Department, Korea Atomic Energy Research Institute. Since 2009, she is the Korean delegat at the OECD/NEA–High Level Group on Medical Radioisotope. Starting in 2010, she is Adjunct Professor at Seoul National University College of Medicine in Nuclear Medicine.

Ms. Choi is expert in the Committee Expert Mission for the Regional Green Growth Technology Promotion Council, since 2010. In addition, she is the vic president of the Promotion of Non-Nuclear Activity in the Nuclear Medical Science & Clean Environment Promotion Association, Inc.

Alumanda Dela Rosa

BIO

Ms. Alumanda M. Dela Rosa joined the Philippine Atomic Energy Commission (PAEC), presently the Philippine Nuclear Research Institute (PNRI) in September 1968 after graduation from the College of the Holy Spirit with a B.S. in Chemistry. She rose from the ranks, starting as a Nuclear Research Assistant, a Nuclear Research Specialist, Division Chief, Career Scientist IV, and Director IV of the PNRI. Her Ph.D. dissertation at the University of Hawaii which started her scientific career dealt with the effects of high energy radiation on the transport systems of biological membranes, one of the few studies then on the radiation effects in biomembranes.

Upon her return to the Philippines in 1977, she applied her knowledge and skills in radiation chemistry to the development of products/processes from indigenous natural polymers using radiation. Her research interest also covers environmental chemistry and studied coastal pollution due to heavy metals and harmful algal blooms. She has published/presented 45 papers and trained young scientists. Her scientific work and contribution to the pool of knowledge was recognised by the Scientific Career Council with her conferment of the rank of Career Scientist IV in 1991.

As PNRI Director, Ms. Dela Rosa has worked to provide such enabling environment and challenge the PNRI scientists to higher levels of excellence and pursue new fields of endeavour. She has worked for a more active participation of the Institute in the R&D, technology transfer, and normative activities of the IAEA coupled with strategic planning in using the IAEA technical cooperation fund to establish/upgrade nuclear and radiation facilities, and develop new competencies in PNRI and its collaborators. This initiative has opened up greater opportunities to more PNRI researchers and regulatory staff in developing their areas of specialisation and cultivating regional and international linkages with their peers.

Marina Di Giorgio

BIO

Marina Di Giorgio graduated in Biological Science from the Faculty of Exact and Natural Sciences – Buenos Aires University (UBA) Argentina and post graduated in Radiation Protection and Nuclear Safety from the Faculty of Engineering — UBA. She specialised on genetics, radiobiology and cytogenetic dosimetry.

Currently, Ms. Di Giorgio is responsible for the biological dosimetry, radiopathology and internal dosimetry laboratories at the Nuclear Regulatory Authority of Argentina (ARN) and is the technical director of the biological dosimetry laboratory.

She is the team leader of the Argentinean expert team for the assistance in Biodosimetry in case of radiological accidents/incidents under the IAEA–RANET system, the Latin American Biological Dosimetry Network and WHO-BioDose Network.

Ms. Di Giorgio is a reviewer for Radiation Measurements Journal (ELSEVIER) and for Royal Society Proceedings A. She joined the National Atomic Energy Commission of Argentina in 1986 and the Nuclear Regulatory Authority in 1997. She is a regular lecturer, on Biodosimetry and Radiobiology subjects, at the international IAEA Postgraduate Educational Course in Radiation Protection and the Safety of Radiation Sources and Postgraduate Course in Nuclear Safety.

Agneta Rising

BIO

Agneta Rising became Director General of the World Nuclear Association on 1 January 2013, having previously held the position of Vice President Environment at Vattenfall AB. In this post Ms. Rising headed a pan-European department focused on energy, environment and sustainability. Previously, Ms. Rising was Director for Nuclear Business Development at Vattenfall Generation. Ms. Rising joined Vattenfall AB (then Swedish State Power Board) in 1980. Her career there centred on radiological protection. Within the Vattenfall Group, Ms. Rising was the leading specialist on nuclear energy and the environment.

Agneta Rising became chairman of the Uranium Institute in May 2000, and presided over its transformation into the World Nuclear Association in 2001. Ms. Rising is co-founder and former president of Women in Nuclear. During her WiN presidency, the organization quadrupled in size. Ms. Rising has also been president of the European Nuclear Society and president of the Swedish Nuclear Society.

Over the past two decades, Agneta Rising has been appointed by the Swedish government, the EU Commission and the International Atomic Energy Agency to several significant expert and advisory positions relevant to the safety and future development of nuclear power. Among these, Ms. Rising served for four years on the IAEA's International Nuclear Safety Group. She was awarded the Atoms for Peace Prize in 2013.

Renate Czarwinski

BIO

Renate Czarwinski began her career in Health Physics in 1971 with the study of Experimental Physics and Radiation Protection Physics at Technical University of Dresden finalised in 1975. She graduated a postgraduate study from 1982 to 1984 in Nuclear Safety. In 1996 Ms Czarwinski was appointed as Head of Radiation Protection at Workplaces Section in the German Federal Office for Radiation Protection.

From 2007 to 2012 Ms. Czarwinski acted as Head of Radiation Safety and Monitoring Section of the International Atomic Energy Agency in Vienna. Under her leadership the revision of the International Basic Safety Standards for Protection against Ionizing Radiation and Safety of Radiation Sources was finalised as General Safety Requirements Part 3 (interim).

Since June 2012 Ms. Czarwinski is Head of Section on "Safety and Security of Radiation Sources; Radiation Incidents; Type Approvals" in the Federal Office for Radiation Protection in Berlin/Germany.

In July 2012 Ms. Czarwinski received the HPS Landauer Lecturer Award which is to honour individuals who have made significant contributions to the field of radiation research and protection.

She is active working voluntarily in national and international NGO's. Since 2004 she is Member of the Executive Council of the International Radiation Protection Association (IRPA) and was elected as President of IRPA in 2012.

Valérie Faudon

BIO

Valérie Faudon has been the Executive Director for the French Nuclear Energy Association (SFEN) since 2013. Previously, she was Senior Vice President Marketing at AREVA since December 2009, heading Strategic, Product, Sales Support Marketing and Customer Communications activities for all AREVA nuclear and renewable businesses. Valérie holds a MS from the Ecole Polytechnique in France, a MS in Civil Engineering from the Ecole Nationale des Ponts et Chaussées, a MA in Political Science from the Institut d'Etudes Politiques de Paris, and a MS from Stanford University in California.

BIO

Meera Venkatesh

Meera Venkatesh is currently serving as the Director, Division of Physical and Chemical Sciences at the Department of Nuclear Sciences and Applications, overseeing activities in nuclear sciences, radioisotope production and radiation technology applications.

In the past, Ms. Venkatesh worked at the Indian Atomic Research Organization, Bhabha Atomic Research Centre for 35 years, in the area of radioisotope production and their various applications, especially radiopharmaceuticals. The last ten years led the programmes on production, supply and applications of radioisotopes.

She won awards for the excellency in promoting nuclear applications from the Department of Atomic Energy (India) and Indian Nuclear Association. In her career, she published more than 200 research papers and presented more than 150 papers in conferences/symposia, guided 12 students in their work to get doctorate degrees in chemistry and applied biology. Ms. Venkatesh is also an honorary editor in 2 journals in the field of radiation and applications.

Ekaterina Ryabikovskaya

BIO

Ekaterina Ryabikovskaya is the Vice president of the International Youth Nuclear Congress (IYNC Network).

Ms. Ryabikovskaya works as a Managing Editor at ROSATOM newspaper in Moscow. She has a Diploma in Nuclear Engineering and Computer Science. Her field of scientific interest comprises high-temperature-reactor fuel and the mathematical modeling of the processes occurring in it during irradiation. Ekaterina has been involved in IYNC Network since 2006.

Kirsty Gogan

BIO

Kirsty Gogan is an established expert in climate and energy communications with extensive experience as a senior advisor to UK Government, industry, academic networks and non-profit organizations. She created the Low Carbon Alliance between the nuclear and renewables industries, representing more than 1,000 businesses and welcomed by Greenpeace. Leading the Government's public consultation into the UK's new build programme she addressed public concerns about nuclear power and engaged anti-nuclear campaigners in a constructive dialogue process with Government that continues to this day. Kirsty created the first UK chapter of the global Women in Nuclear network, is a visiting researcher at Manchester University, and is an independent advisor to Government.

She is co-founder executive director of Energy for Humanity, a new NGO working to meet the goal of universal access to clean and cheap energy.

Tero Varjoranta

BIO

Tero Varjoranta assumed the post of Deputy Director General and Head of the Department of Safeguards on 1 October 2013. Prior to this, he was the Director General of the Radiation and Nuclear Safety Authority, STUK, in Finland. Between 2010 and 2012, Mr. Varjoranta served as a Director in the IAEA Department of Nuclear Energy, having previously worked as Division Manager in the International Science and Technology Centre in Moscow. Mr. Varjoranta has served as President of ESARDA, President of the European Nuclear Regulators Group (ENSREG) and as a member of SAGSI for seven years. He is a physicist by education (M.Sc. and Ph.L.) from Helsinki University.

Van Zyl de Villiers

BIO

Mr. Van Zyl de Villiers hold a Ph.D. in chemistry from former Rand Afrikaans University (now University of Johannesburg) in South Africa.

Mr. de Villiers was employed by the South African Nuclear Energy Corporation (Necsa) and its predecessors from 1979 to 2013 in various roles: initially research scientist and later a range of senior and executive management positions. The latter included R&D, nuclear services, business development, international collaboration, performance and strategy. (Safeguards were part of my portfolio at various stages.)

He participated as technical and management expert in many IAEA activities since 1995. Mr. de Villiers joined the IAEA as Director: Division of Operations B, Department of Safeguards in September 2013.

Rowena Maxwell

BIO

Rowena Maxwell has worked for the Canadian Nuclear Safety Commission (CNSC) for 31 years and has been involved in safeguards for the last 14 years. During her time at the CNSC Rowena has worked as a Senior Laboratory Technologist; a Licence Assessment Officer for nuclear substances in the medical, academic and research sectors; and a Canadian Safeguards Support Programme Officer. Rowena is currently working as a Senior Safeguards Advisor in the International Safeguards Division. Her safeguards experience ranges from fuel fabrication plants to nuclear power reactors to her current position as the Senior Safeguards Advisor for a large research facility, namely Canadian Nuclear Laboratories.

BIO

Massimo Aparo

Massimo Aparo graduated from La Sapienza University of Rome. He subsequently worked in ENEA's Nuclear Fuel Cycle Department as an Instrumentation Engineer and as an engineer and manager at different Italian and international agencies. He joined the IAEA in 1997 and has since worked as a Section Head in different IAEA Safeguards Divisions. After spending two years at the IAEA's Tokyo Regional Office, he became the Section Head of the Division of Operations B in 2008 and the Principal Officer of the Iran Task Force, created in August 2012 in order to work on the Iran nuclear file.

Melissa Crawford

BIO

Melissa Crawford is the President of International Youth Nuclear Congress and hold a B.S. in Nuclear Engineering from University of Florida.

In university Melissa participated in internships at Oak Ridge National Laboratory in the USA in 2005 and 2006. Her work was focused on non-destructive identification of the mass and enrichment of Plutonium isotopes in oxide samples.This was performed as a joint project between ORNL and the Joint Research Center in Italy. After university, Melissa began work on Instrumentation and Control projects with Siemens in the power industry. She worked on analog to digital modernisation projects in existing plants and digital design for new build nuclear power plants. Melissa is currently working on commisioning procedures for AREVA's Taishan and OL3 EPR Instrumentation & Control systems with INP-e engineering firm in Erlangen, Germany.

Melissa has been working with IYNC for over four years and is happy to lead this term as IYNC President and General Co-Chair of IYNC2016 in Hangzhou, China. Melissa's work with IYNC provides an international perspective from the young professionals in the nuclear industry.

BIO

Irmgard Niemeyer

Ms. Irmgard Niemeyer is the Head of the International Safeguards Group in the Institute of Nuclear Waste Management and Reactor Safety at Forschungszentrum Juelich (FZJ), Germany, since 2010, where she is responsible for the scientific coordination of the German Member States Support Programme for the IAEA. Besides, her group conducts research & developments related to safeguards and non-proliferation for the IAEA, the European Commission and the German Government.

Following her Ph.D. in Geography from University of Bonn, Germany, in 2000, for her thesis on the use of multispectral satellite imagery for nuclear verification, she became a consultant of the German IAEA Safeguards Support Programme on this topic. Between 2002 and 2008 she was assistant professor for Photogrammetry & Geomonitoring at Freiberg University of Mining & Technology. She has received several university teaching assignments on remote sensing and geospatial information, as well as safeguards and non-proliferation. Ms. Niemeyer is a member of the Editorial Boards of the Journal of Nuclear Materials Management (JNMM) and the new journal entitled “Global Security —- Health, Science, Policy”.

Since end of 2013, she is serving as the German member on the Standing Advisory Group on Safeguards Implementation (SAGSI). Since 2015, she is also the Vice President of the European Safeguards Research and Development Association (ESARDA).

Kazuko Hikawa

BIO

Kazuko Hikawa is a Japanese diplomat, currently working as First Secretary at the Japanese Embassy in Baghdad.

She has been involved in non-proliferation and disarmament issues continuously throughout her career. She served at the Disarmament and Arms Control Division in Tokyo, at the Permanent Mission of Japan to the International Organizations in Vienna where she covered IAEA safeguards issues, and at the Japanese Embassy in Washington DC. Before her current posting, she was Deputy Director of the Non-proliferation, Science and Nuclear Energy Division in 2013–2015, where she was in charge of safeguards issues.

In 2013, she was appointed as Special Assistant for Disarmament, Arms Control and Non-proliferation Issues in the Ministry, based on her extensive background and expertise. Hikawa has played active roles at many international or multilateral conferences and meetings, including the Asia Pacific Safeguards Network, the NPT Review Process, the G8, the IAEA, as well as the Nuclear Suppliers Group (NSG).

BIO

Bonnie Jenkins

Ambassador Bonnie Jenkins was nominated by President Barack Obama in April 2009 as the Department of State's Coordinator for Threat Reduction Programmes in the Bureau of International Security and Non-proliferation. Ambassador Jenkins promotes the coordination of Department of State Cooperative Threat Reduction and US government programmes in chemical, biological, nuclear and radiological security. She is the State Department's lead on the Nuclear Security Summit, and coordinates their activities related to the efforts to secure all vulnerable nuclear material. Ambassador Jenkins is engaged in the Global Health Security Agenda, a multisectoral initiative dedicated to reducing global infectious disease threats. She works closely on this initiative with domestic and international partners in the security (with a focus on biosecurity), animal and human health, development, and law enforcement sectors and leads US government outreach to domestic and international nongovernmental organizations. Ambassador Jenkins also works closely with the Department of Homeland Security and the US chemical Industry in strengthening global security and safety of chemical weapons precursors. Ambassador Jenkins is Chair of the IAEA Nuclear Security Training and Support Center Network, is on the Scientific Committee of the Annual International Symposium on Biosecurity and Biosafety, and is on the Steering Committee of the Emerging Leaders in Biosecurity. Ambassador Jenkins is also the Department of State's Leadership Liaison for the Veterans at State affinity group, and is a member of the Department's Diversity Governance Council.

Ambassador Jenkins has been an adjunct professor at Georgetown University Law School. She was a fellow at the Belfer Center for Science and International Affairs at the John F. Kennedy School of Government, Harvard University. During her years at the Belfer Center, she worked at Harvard Law School in the Bernard Koteen Office of Public Interest Advising as an advisor to law students on legal jobs in the public sector. Ambassador Jenkins has a Ph.D. in International Relations from the University of Virginia an LL.M. in International and Comparative Law from the Georgetown University Law Center an M.P.A. from the State University of New York at Albany a J.D. from Albany Law School and a B.A. from Amherst College. She attended The Hague Academy for International Law.

Oum Keltoum Hakam

BIO

Ms. Oum Keltoum Hakam is a Professor at University of Ibn Tofail (UIT), Morocco. She had her Ph.D. in Nuclear Physics in 2000. She is the Director of Nuclear Physics and Techniques Research Unit and Head of a Master Programme in Nuclear Physics and Radiation Protection.

She is member of several national and international societies in nuclear field such as Women in Nuclear (WiN), International Radiation Protection Association (IRPA), World Institute for Nuclear Security (WINS), Institute of Nuclear Materials Managements (INMM), IAEA-African Network for Education in Nuclear Science and Technology (AFRA-NEST). She is Vice President of Moroccan Radiation Protection Association.

Ms. Hakam serves currently as the Chair of the IAEA-International Nuclear Security Education Network (INSEN) Working Group II "Faculty Development and Cooperation among Educational Institutions". She conducts and animates several Workshops and Seminars related to nuclear security at national, regional and international levels. She is also the Founder and Faculty Advisor of the Institute of Nuclear Materials Management (INMM) University of Ibn Tofail Student Chapter, the first INMM Student Chapter in Africa.

BIO

Maria Lorenzo Sobrado

Maria Lorenzo Sobrado works as a Programme Officer at the United Nations Office on Drugs and Crime (UNODC) and is UNODC's focal point for CBRN terrorism. Her duties include the provision of legislative assistance for the national implementation of the seven international conventions dealing with CBRN terrorism and the promotion of the ratification and implementation of these instruments through the organization of national and regional workshops and liaison with Member States. She has participated in missions to more than 60 countries on CBRN-related legislative assistance matters.

From 2005 to 2009 she was a Legal Officer in the Office of Legal Affairs (OLA) of the IAEA, where she worked on non-proliferation/safeguards matters and was OLA's focal point for nuclear security. She served as a Team Leader for the implementation of OLA's projects under three EU Council Joint Actions on support for IAEA activities in the areas of nuclear security and verification, and in the framework of the implementation of the EU Strategy against the proliferation of WMD.

She has a Degree in Law from Spain, a Master on Advanced International Studies from the Diplomatic Academy/University of Vienna, a Master in International Policy Studies with a Certificate in Non-proliferation Studies from the Monterey's Center for Non-proliferation Studies — where she was also a research associate- and a Diploma on Nuclear Law from the University of Montpellier.

Khammar Mrabit

BIO

Mr. Mrabit was appointed Director, Division of Nuclear Security, within the Department of Nuclear Safety and Security, on 1 April 2011, responsible for planning and implementing the IAEA Nuclear Security Plan and Programmes approved by the IAEA's Board of Governors and endorsed by the General Conference. This includes, inter alia, development of Nuclear Security Guidance publications and provision for their use and application through education and training courses, Coordinated Research Contracts, Peer Reviews and Advisory Services. The IAEA's Division of Nuclear Security leads international cooperation activities in nuclear security and liaises with States and other International Organizations, Summits, and Initiatives, to enhance coordination, cooperation and outreach of nuclear security activities.

Mr. Mrabit has more than 30 years' experience in nuclear and radiation safety, and nuclear security. He spent about five years working at the French Operating Organization (Electricity of France) and the Moroccan Ministry of Energy and Mines (the Regulatory Body for Nuclear Safety). He joined the IAEA in 1986, where he has been involved in and assumed responsibility for many safety and security programmes.

Mr. Mrabit was Head of the Safety and Security Coordination Section and Chairman of the Coordination Committee from August 2008 to March 2011, within which, programmes for the IAEA Safety Standards and Security Guidance were coordinated for their establishment, use and application, and for capacity building in Member States.

Mr. Mrabit hold a Ph.D. in Nuclear physics applied to nuclear power, presented at the University of Strasbourg, France and some Engineer degrees from the National Institute of Nuclear Sciences and Techniques (INSTN), Saclay, CEA, and the National School of Physics, Strasbourg, France.

BIO

Laura Rockwood

Ms. Rockwood is the Executive Director of the Vienna Center for Disarmament and Non-Proliferation. She recently assumed this position following a year and a half at Harvard University's Kennedy School Belfer Center Managing the Atom Project as a resident Senior Research Fellow.

In November 2013, she retired from the International Atomic Energy Agency as the Section Head for Non-Proliferation and Policy Making in the Office of Legal Affairs, where she had served since 1985. During her employment with the IAEA, she was involved in all aspects of the negotiation, interpretation and implementation of IAEA safeguards, and was the principal author of the document that became the Model Additional Protocol. She participated in high-level negotiations on Iran, Iraq and the DPRK and in the IAEA/US/Russian Federation negotiations on the Trilateral Initiative and the Plutonium Management and Disposition Agreement. She has also participated in three NPT Review Conferences.

In July 2012, Ms. Rockwood was honoured with the receipt of the Distinguished Service Award from the Institute of Nuclear Materials Management (INMM), which is awarded for long-term noteworthy accomplishments in, and service to, the nuclear materials management profession.

Prior to working for the IAEA she was employed by the US Department of Energy as a trial attorney in radiation injury cases, and as counsel in general legal matters. She received her BA degree from the University of California, Berkeley, and her Juris Doctor degree from the University of California's Hastings College of Law in San Francisco. She is a member of the State Bar of California and of the Washington DC Bar Association.

Shirley Johnson

BIO

Ms. Johnson completed her B.Sc. in Chemistry at Gonzaga University in 1969. Her graduate studies focused on Separations Chemistry, and Laboratory instrumentation and methodology at the Hanford Graduate Center from 1969–1972. Her career as an Analytical Chemist started with separation systems at the Hanford Nuclear Site between 1969–1980. Ms. Johnson provided R&D separation process support, at the Purex Reprocessing Plant, the Hanford Plutonium Purification and Conversion Facility and the Cesium and Strontium Separation and Isolation Plant. In 1980 she moved to the Idaho National Engineering Laboratory where she worked on sampling and measurement methodology in order to perform speciation studies that would help define the transport mechanisms of nuclear material during and after the Three-Mile-Island incident.

In 1982, Ms. Johnson joined the IAEA as a safeguards inspector, where her work was focused toward the implementation of safeguards at reprocessing plants, primarily in Germany and Japan. She was Group Leader and then Section Head in SGOA Division for reprocessing and research facilities in Japan. In 1991 she was a member of the 4th IAEA inspection team to Iraq. Ms. Johnson was Head of the JNFL Project from 2001 to 2006 and then Section Head of SGOB1 (India, Pakistan, Africa, Canada, and Switzerland) until she retired in April 2007.

Since retirement from the IAEA Ms. Johnson has established her own consulting business, Tucker Creek Consulting, PLLC, with a focus on nuclear non-proliferation and disarmament issues. She provides expert assistance in the areas of safeguards approaches and implementation, safeguards by design, process monitoring and system authentication. She is also working to develop safeguards approaches for verification of an FMCT. In addition, she provides support to BNL in their exhibit booth at technical meetings to recruit candidates for the IAEA in safeguards. Ms. Johnson has also been actively involved in lecturing at various US national laboratory intern courses and international non-proliferation courses.

Ms. Johnson has produced numerous papers on reprocessing safeguards, analytical chemistry techniques, facility design verification, and verification of an FMCT. She has held office positions within the American Nuclear Society, the American Chemical Society, and the Institute for Nuclear Materials Management.

S05: Career Development for Women in the Nuclear Field, including Communications

This session will highlight the challenges and opportunities for women working in the nuclear field to identify and share insights, experiences and best practices in professional development. The session will also discuss the need to raise awareness of possible employment opportunities in the peaceful use of nuclear sciences among female experts working in healthcare, environment, finance, law etc., including young students to increase their interest and commitment to this field.

Breaking Gender Stereotypes: Encouraging more Women to Study Science, Technology and Mathematics

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Why aren't there more women working in the Nuclear field? OECD data can reveal some of the answers: when students are asked about the kind of career they expect to pursue as young adults even those girls who envision pursuing scientific careers expect to work in fields that are different from boys. Girls are over-represented among students who expect to work in the health and social fields; boys are over-represented among 15-year-olds who expect to work as engineers or computer scientists, despite the fact that girls and boys show similar performance in science at school. Parents are also much more likely to expect their sons rather than their daughters to pursue these careers, even when their performance in mathematics is equally good. This has direct consequences: 14% of young women who entered university for the first time in 2012 chose science related fields, including engineering, manufacturing and construction. By contrast, 39% of young men who entered university that year chose to pursue one of those fields of study. These findings have serious implications not only for higher education, where young women are already under-represented in the science, technology, engineering and mathematics fields of study, but also later on, when these young women enter the labour market.

Unclear Nuclear

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Providing support for journalists to penetrate the nuclear fog of confusion and keep the public better informed.

What Can WiN Learn From Other Male Dominated Industries

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Thomas Thor Associates is an Executive Recruitment company solely dedicated to the Nuclear industry. We have been involved with WiN UK in 2014–2015 to help them develop their own organization, this research was part of our partnership.

The main purpose of this paper is to provide a clear picture of the techniques that are used by organizations similar to WiN, and business in other industries that are similar to Nuclear, to attract more women to pursue a career in a particular industry, and to support retention and career progression of women in these industries.

This paper has taken a look at all industries that require technical and engineering staff, after which the Mining, Oil & Gas, Petro-chemicals, Rail, Renewable Energy, Technology and Construction industries were found to show most similarities with Nuclear, in terms of the technical staff required and their structure on gender diversity. From here, case studies of industry organizations and professional business have been prepared in order to inform WiN of best practice in these industries and provide a benchmark for future WiN operations.

Finally, the report results into giving recommendations on projects WiN could add to their current approach to achieve their objectives. The recommendations are based on the results from the case studies, focusing on attracting, recruiting, retaining and developing female professionals. In summary, the recommendations are to: highlight potential career paths for women in Nuclear, educate women on Nuclear, support the development of women and to help companies to increase their bottom line by getting WiN certified.

S06: Use of Radiation in Medicine

This session will highlight the countless areas where the power of radiation and nuclear techniques has been harnessed for societal benefits, specifically in medical applications. The benefits to patients in terms of lives saved through improved medical diagnosis and treatment techniques are important and the well-trained and controlled use of radiation has become a key part of modern medical treatment, especially for certain forms of cancer. The panel will discuss recently achieved goals and implementation of radiation medicine around the world.

Physicists' Roles in Medicine

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Not many people know of a field called "medical physics" and that there are physicists working in hospitals. The roles of physicists in medicine include: 1) developing x-ray images for disease diagnosis; 2) ensuring radiation safety for patients and hospital workers; 3) ensuring accurate and precise radiation therapy delivery. X-rays have been used in medicine since their discovery more than a hundred years ago. In imaging, medical physicists use x-rays to construct three dimensional anatomic images, assisting physicians to see the internal anatomy of a patient without cutting the patient open. In therapy, medical physicists ensure the powerful x-ray aim toward to cancer site, killing the cancer cells. With these medical applications, medical physicists apply their knowledge in nuclear physics and modern physics to play the essential roles. In this presentation, we will show some examples of specific physicist's roles in medicine.

Programme of Action for Cancer Therapy: Maximizing Investments in Radiation Medicine

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In the presentation, Ms Nelly Enwerem-Bromson will present her work as Director of the Programme of Action for Cancer Therapy (PACT) and the crucial role of nuclear techniques in cancer control. She will review the key drivers for increasing demand for technical support on cancer control from low and middle income (LMI) Member States to the UN system in general, and the IAEA in particular. She will further elaborate on IAEA's Programme of Action for Cancer Therapy (PACT) main products and services and how they are having a positive impact on assessing national capacities and needs, supporting Member States in identifying key priority interventions and translating them into action through the IAEA Technical Cooperation Programme. Ms Enwerem-Bromson will also address innovative approaches on distance learning and international collaboration to increase the quantity and quality of oncology related human resources as well as in the establishment of sustainable radiation medicines services in LMI countries.

Radiotherapy in Cancer Management

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Radiotherapy has been used for curative or palliative treatment of cancer, either alone or increasingly as part of a multimodality approach in conjunction with chemotherapy, immunotherapy or surgery. Radiation must be delivered in the safest and most effective way. The use of radiologic and nuclear medicine diagnostic techniques, e.g., the use of CT (Computerized Tomography) and PET/CT allow better detection and staging of diseases by displaying both morphological and functional abnormalities within the affected organs and are essential in the process of radiotherapy planning. Technical advances in radiotherapy have allowed better targeting of tumors, sparing of normal tissue and, in the case of radiosurgery, a decrease in the number of treatments. The IAEA Programme in Human Health aims to enhance the capabilities in Member States to address needs related to the treatment of diseases, including cancer, through the application of nuclear techniques. The Programme supports quality assurance in radiation medicine; DIRAC, the only radiation oncology-specific resource database world-wide; significant, innovative education and training programmes through telemedicine and e-learning accessible via the human health campus website. Technical expertise for country– and region–specific technical cooperation radiation-medicine projects is provided to establish or enhance radiation medicine world-wide.

Latin American Biological Dosimetry Network (LBDNet)

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Presenting the Latin American Biologica Dosimetry Network (LBDNet), established in 2007 as a regional project aimed at strengthing the service capacities of existing regional laboratories, providing dosimetry support to other Latin American countries, establishing an emergency response methodology, and fostering contacts with the world at large.

S07: Energy, Environment, and Climate Change

The session on Energy, Environment and Climate Change will focus on how nuclear energy and nuclear technologies are contributing to a better — cleaner, greener and more efficient — world. Specifically, the various advantageous aspects of nuclear energy which contribute directly and indirectly to a cleaner environment, the benefits of nuclear techniques in industrial processes and the use of radiation technologies in mitigation of environmental pollution will be highlighted.

Safety and Reliability — Challenges for Change and Progress: IRPA's Engagement in the System of Protection

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Energy, environment and climate are seen by the public as essential elements for a secure, affordable and socially acceptable future. Whereas the climate is seen in a more distance, the impact of energy and environment is highly present in the daily life today and tomorrow. Particularly evident is the lively debate on nuclear energy, and also on other nuclear applications which show clear benefits for society, e.g., in the medical application. The use of ionizing radiation in industry, medicine and research is increasing remarkably throughout the world and is involving more and more complex systems. We are now facing a situation which offers challenges in radiation protection in a wide range of applications. Many factors influence this situation such as the growing globalisation, which is escalating the importance of economic cross linking, the global proliferation of new and more complex technologies, as well as living in a changing society which poses new challenges for the implementation of an effective protection system. Also the System of Protection with the three fundamental radiation protection principles justification, optimization and application of dose limits as recommended by the International Commission on Radiological Protection (ICRP) has become more and more complex and its' effective implementation needs an increasing governmental and professional attention. A clear understanding of radiation risks is an increasingly emerging concern. Today, people are more concerned on the same level of risk even with low level of risk! Particularly the lessons to be learned after the Fukushima accident have demonstrated the necessity to review the system of protection and taking into account that an alignment on today's societal conditions is essential. The practicability of the system of protection depends not only on its' scientific stringency but also on the extent to which it is in line with accepted ethical values in society as well as with given political and social values which is a primary issue for the sustainability of the system of protection. IRPA is working closely with ICRP and other international organizations on these experiences, e.g., on the underpinning ethical basis of the system which includes a series of IRPA-sponsored workshops around the world. Conclusions from the views of practitioners will be presented. Emerging aspects are communication and understanding of radiation risks in context to other risks (technical, environmental, economic, political, social,...) by professionals and public. Based on the above mentioned considerations IRPA started a discussion on how could the system be improved to meet the challenges and keeping the system fit for purpose, ethically based and appropriately comprehensive. Potential core questions will be presented for discussion.

The Nuclear for Climate Initiative

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At least 80% of the world's electricity must be low carbon by 2050 to keep the world within 2°C of warming, according to the IPCC. This is a massive global challenge that requires the use of all available low-carbon energy technologies. Nuclear energy is recognized by the IPCC as "an effective greenhouse gas mitigation option" with life cycle emissions "comparable to most renewables". We need to take immediate steps towards reducing greenhouse gas emissions, as the world has already used up most of its carbon budget. Nuclear energy is low-carbon, available and competitive in the time frame required. It has avoided the release of 56 gigatonnes of CO_2 since 1971, two years' worth of emissions at current rates. Additional nuclear energy capacity can be built up in the world's largest emitting countries: there are more reactors under construction today than at any time in the last 25 years, with BRICS countries leading the way. Existing nuclear power plants are the largest low-carbon electricity source in OECD countries. Operating them for longer is one of the most effective ways to keep greenhouse gas emissions down. Moreover, nuclear generation can operate with renewables energy in order to adapt generation to electricity demand, taking into account variability of certain renewable energy sources. As countries are pursuing different energy policy goals, with different constraints, they should be free to choose from the full portfolio of energy technologies, including renewable energies and nuclear energy, to reduce CO_2 and meet other energy objectives. Very few scenarios have been investigated with mitigation requirements to limit warming to 2°C and implementation of a nuclear phase out. While they need the largest portfolio now, countries will also need the largest portfolio tomorrow: nuclear research should receive support to develop future reactors (generation 4) that will make better use of the Uranium resources, will operate in a safer way, and produce less waste. Renewable energies and Nuclear have to be considered together as part of the electricity mix on the low carbon pathways.

Cleaner Environment Through Radiation Technologies

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Radioisotopes and radiation based technologies are widely used in a huge variety of industries to improve efficiency, enhance quality, optimize processes, achieve high performance materials, increase safety, for trouble shooting and so on. Many such applications are not known even to professionals with scientific background. This presentation is aimed at outlining some of these technologies which influence our daily life and contribute to better quality of life. In particular, the role of radiation based techniques in providing better environment through mitigation pollutants in industrial effluents as well as being a clean technology will be highlighted.

S11a: Posters: Career Development

All posters will be displayed for the entire duration of the conference. As far as possible, authors are requested to be present at their posters during the coffee breaks as well as during the poster session for discussion with interested participants.

Challenges of Communicating Nuclear and Radiation Information: The Case of Zimbabwe

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Communication is paramount in all human activities and appears to be a very easy subject. But in actual fact it is a complicated process with a capacity to change perceptions from being negative to positive or vice versa. The issue of communication becomes even more challenging when it involves issues or topics which are generally perceived as complex in various societies. A case in point involves the communication challenges faced in communicating radiation/nuclear issues especially to third world country audiences where the concept is still in its infancy and therefore not well understood by the public. Increasing awareness to the public on issues to do with nuclear/radiation is critical especially in terms of developing and building future competencies which are currently skewed towards males in Zimbabwe. The ratio of female citizens engaged in nuclear/radiation fields is still very low in Zimbabwe. There is therefore need to start communicating nuclear/radiation issues from an early age with a focus on changing women's perceptions over such issues. The Radiation Protection Authority of Zimbabwe's Corporate Communications Department presents a study based on the experiences of the Corporate Communications Officer over a period of four years in that capacity. This study provides reasons why third world country publics, especially in Zimbabwe s are showing little interest in nuclear/radiation issues. Experiences are also shared on how the Corporate Communications Officer has managed to increase awareness of /nuclear issues from two percent to five percent over the last four years. The different methods of communication used are also detailed together with the accompanying challenges.

Women's Participation in Africa's Nuclear Development-Challenges and Opportunities

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Expansion of nuclear technologies and plans for new plants in Africa makes this an exciting time for more women to be involved in the nuclear sector and there are lots of opportunities across the nuclear value chain for women to be involved. In recent decades, more and more women are are now entering the nuclear field and many people are starting to recognise opportunities for women, since the role played by women in the nuclear field enhances the development goals for many countries. In developing countries and in Africa in particular, however, there is a greater need for awareness of women's involvement in STEM fields in general, and to change prevailing attitudes about women's participation in the nuclear science and technology in particular. This paper will look at various opportunities women have in the expanding nuclear sector in the continent, and how these opportunities can be utilised, not only for those in sciences but also in business disciplines. The approaches organizations and countries can take in broadening participation of the female gender in the nuclear development in Africa; will also be presented, as well as how to address the challenges faced by women in the dynamic nuclear field.

The Career in Medical Physics — Profession and Vocation

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The purpose is to present the career development in medical physics in sense of motto of conference: Women in Nuclear Meet Atoms for Peace.

All of us have someone, who has treated for cancer at some moment in his life. Only one knows that between most visible healthcare staff in radiotherapy (clinicians, nurses and radiographers) have medical physicists. The main objective of duties of medical physicists is to ensure, that the equipment and processes using in treatment planning and delivery will produce the desire dose distribution in the patients with acceptable accuracy. I have studied physics in the University as a favorite subject. The key moment to find medical physics as my profession was training sessions on dosimetry conducted in Radiotherapy Department. The critical role and importance of the work doing by medical physicists have made a big impression on me. I have become a volunteer and later on I have received a position as a medical physicist in hospital. The training period as a fellow in IAEA Dosimetry Laboratory was important period, which gave me that close connection to people, that I need at that time and become a milestone in my carrier. I learned a lot and felt an enormous motivation to improve myself. Today I am familiar with most innovative radiotherapy techniques using for treatment of cancer and gratitude of patients make me more and more confident, that medical physics is not only my profession but and my vocation.

The motto of conference sound actually, when the most disputable problem is: “It’s crucial to get more women in nuclear science, because the gender gap persists”. The efforts of IAEA Director General Yukiya Amano to create gender balance should be highly appreciated: “As Director General, I will do my best during my tenure to improve this situation”.

Five Years of Women in Nuclear at Texas A&M University

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Texas A&M University Women in Nuclear (WiN–TAMU) seeks to provide professional development opportunities for its members while also reaching out to the public both on the university campus and the surrounding local community. The purpose of this poster is to share best practices and learning experiences promoting the career development and education of women in nuclear-related fields acquired over five years of existence as a chapter.

Since its reestablishment in 2010, WiN–TAMU has hosted events for women in disciplines related to nuclear technology, including presentations from experts in the nuclear field, Q&A sessions with nuclear engineering faculty, workshops on communicating technical issues about nuclear to the public, public screenings of nuclear films, technical tours of nuclear power plants, medical facilities and regulatory bodies, and socials to build camaraderie among members.

WiN–TAMU collaborates with the Nuclear Power Institute (NPI) by interacting with high school students in NPI's POWER SET programmes. POWER SET (Powerful Opportunities for Women Eager and Ready for Science, Engineering, and Technology) provides young women with the educational tools and support to pursue education and careers in science, technology, engineering, and math (STEM). The POWER SET students also interact with members of WiN at Texas's two nuclear power plants, Comanche Peak and South Texas Project. This tiered approach provides the students with the perspectives of WiN members at various stages in their education and careers. As of the end of the 2014 school year, 81% of the students self-identified that they will pursue STEM course of study (as opposed to the U.S. average of 15–17%). The POWER SET model has recently been implemented internationally in the Philippines with a new programme of 50 young women and is being considered for implementation at the Vienna International School as well.

Education Programme About Radiation at School in Japan

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After Fukushima–Daiichi Nuclear Power Plant accident Japanese have thought "Basic radiation knowledge for school education" is very important. Ministry of Education, Culture, Sports, Science and Technology of Japan published supplemental learning textbooks on radiation for school students and teachers written in Japanese in October 2011 just after the accident. These textbooks show the clear explanation of radiation and cover the various topics especially on the accident. Japan Atomic Energy Agency has also published new textbook for secondary school students and teachers written in English in January 2015. English version textbooks are very useful for Japanese students who want be a teacher and also for students from foreign countries in our University. Using these textbooks new class have stated at our University. In this presentation the education programmes at school in Japan and the effects of these textbooks as a practical tool will be discussed.

IWiN's "My Amazing Future" Program

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In 2007, the Idaho Women in Nuclear (IWiN) chapter was asked to host a junior high school group of girls for "Girls in Technology," a programme to introduce eighth grade girls to science and technology career opportunities. The following year, the programme was renamed "My Amazing Future," and it has grown steadily from a very modest beginning, hosting only 35 girls and four workshops, to a much more diverse program, sponsored by over ten southeast Idaho organizations, and offering 15 different workshops to over 120 girls, from ten different junior high schools in southeast Idaho. The objective of the programme has not wavered from its initial aim of encouraging girls to explore their interests in science, technology, engineering, and mathematics (STEM), and to consider STEM careers.

Initially, Idaho National Laboratory (INL), a US Department of Energy (DOE) laboratory, was asked to be the single sponsor of this program, and all the workshops were presented by INL scientists, engineers, and technicians, most of them women. This aligned well with one of the laboratory missions to support K–12 educational programmes. As other organizations in southeast Idaho heard about the program, they asked to participate and the variety of the technical workshops expanded. Workshops topics are radiation science ("You are Radioactive!"), volcanoes, physics of carnival games, robotics, chemistry (solving crimes using chemistry), cyber security (how easy it is for someone to spy on you using your cell phone), hydrology of the Snake River Aquifer, and many others. Additionally, IWiN has sought sponsors from the private sector, state government, and from several professional engineering organizations.

This presentation will provide more details of the program, and some suggestions on how similar organizations can create programmes that are suited to their specific organizational aims meeting the needs in their individual communities.

Public Acceptance on Nuclear Power: A Strategic Need to Shift to 5Ps (Politicians, Policy Makers, Professionals, Public and Press) Acceptance on Nuclear Power

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Business should not be as usual in formulating strategies and plans to enhance awareness regarding the benefits of nuclear power as an option for energy mix.

Although, presently 435 nuclear power reactors in operation in 30 countries are delivering cost competitive electricity to consumers, creating significant job, investment and business opportunities, supporting enterprises, contributing significantly to these nations economic growth, however these positive impacts and benefits have not be sufficiently transmitted to the various stakeholders and population, who have until recently only received unbalanced views and news from an uninformed press.

Negative and generally unbalanced press coverage of isolated nuclear incidents and accidents such as TMI, Chernobyl and most recently Fukushima has resulted in public protests to nuclear power, contributing to several nuclear power programmes being delayed or not able to take off. This situation is further exacerbated by uninformed politicians and policy makers who have the influence but were not able to harness their positions to assure the public due to lack of knowledge regarding the economic and social benefits of nuclear power.

As the challenges to the nuclear industry presently also include ageing nuclear professionals, lack of updates regarding business and financing opportunities to business and financing professionals, thus the benefits of career, business and financing opportunities must also be disseminated to these Professionals.

This paper aims to highlight the fundamental need to expand present Public Awareness Programme to become the 5Ps (Politicians, Policy makers, Professionals, Public and Press) Awareness Programme on Nuclear Power.

Nuclear Education & Training — Showcasing the Best Practices of the United Kingdom and France

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Skilled, competent and sufficient human resources is fundamental for the safe and successful implementation and expansion of a nuclear power programme (NPP).

As nuclear education and training (E&T) stakeholders deliberate and discuss to identify suitable syllabus and courses to offer for education and training to support NPP, it is critical that the nuclear fuel cycle as well as the nuclear power value-chain is taken into consideration in the selection and introduction of relevant courses by Universities and Institutions to nurture and educate skilled manpower for the nuclear power industry.

This paper strives to share with the education and training stakeholders, that the task of educating and training students is not solely to prepare them to work in a nuclear power plant, but importantly also to train human resources to support other organizations that require skilled and competent personnel in nuclear related field including Government agencies and Ministries, Business and Industry, Financial sector, International agencies and media agencies, amongst others.

Additionally this paper aims to dovetail that a critical mass of skilled manpower along the entire value-chain or scope of nuclear power sector covering planning, construction, manufacturing, commissioning, operation and maintenance and decommissioning must be trained to implement the related tasks required to support NPP competently.

Thus, it is within this context, that this paper will outline best practices in nuclear education and training offered by the United Kingdom and France which trains students, professionals, technicians as well as craftsmen not only for employment in a nuclear power plant but also for supporting the nuclear policy formulation in Government Agencies and for supporting nuclear power industry sectors including engineering, construction, manufacturing and services.

This paper will offer recommendations for enhancing cooperation in nuclear education and training aimed at building synergy amongst the international member countries.

Development of Nuclear Energy and Radiation Textbooks for Elementary School Students

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The textbooks for elementary school students were developed to help future generations make value judgments based on appropriate information about nuclear energy and radiation. The themes and educational contents of the 13 lessons, to be delivered in one semester at elementary school level, were selected by the educational requirements of students, science teachers, and experts. The "Radiation and Life" textbook for elementary school students consists of the following chapters:

- Chapter 1. What is nuclear energy and radiation?,
- Chapter 2. Who discovered the nuclear energy and radiation?,
- Chapter 3. Why is nuclear energy and radiation important?,
- Chapter 4. Is nuclear energy and radiation dangerous?,
- Chapter 5. Let's learn about what to do when an accident occurs,
- Chapter 6. How are nuclear energy and radiation used?,
- Chapter 7. What is nuclear power generation?,
- Chapter 8. Why is radiation used for food?,
- Chapter 9. What is medical radiation?,
- Chapter 10. What kind of irradiated products are in our daily lives?,
- Chapter 11. What jobs are related to nuclear energy and radiation?,
- Chapter 12. What are energies of future?,
- Chapter 13. Concept of Talk-talk (a study review game).

The general trend in recent educational curriculum development suppresses national education course organizations and authorities and expands the autonomy and authority of regions and schools. The derived textbook contents are expected to be helpful as first textbooks for the autonomous selection of education about nuclear energy and radiation for use in creative experiences developed at the school level.

Growth of the Female Professional in the Radiation Safety Department

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Currently in Korea's Nuclear Power Plants (KHNP), the number of the female staffs has been increased as planned construction of new NPPs. However the role of the female staffs in NPPs is still limited as before. Because there is the prejudice which the operating and the maintenance work is unsuitable for female owing to the risk of the radiation exposure and the physical weakness. So female staffs mostly belong to the supporting departments.

In particular, the proportion of the female staffs is significantly higher in the radiation safety department among those. The ratio is 15% and is twice higher, whereas the total percentage of the female workers in KHNP is 8%.

In the past, the women staffs in the radiation safety department were usually charge of the non-technical duties like the radiation exposure dose management and the education for radiation workers.

Although the ratio of the women about that is still higher, nowadays, the role of the female workers tends to diversify to technical supports like the radiation protection and the radioactive waste management while increased the proportion of female employees.

This trend is expected to continue for many years to come. Thus, in Korea's NPPs, it is expected that many women will demonstrate their professionalism especially in the radiation safety department than any other departments.

This presentation contains the detailed duty and trend about female staffs in the radiation safety department in Korea's NPPs.

Relation between Romanian NGOs Acting in Nuclear Field and Other Stakeholders

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In Romania, three main NGOs act in promoting peaceful use of nuclear energy.

The organization with the longest road is the Romanian Association for Nuclear Energy (AREN), created by individual persons acting in nuclear field in 1990. In 2001, a number of Romanian and foreign legal entities having core competence or unfolding nuclear energy related industrial and research activities created the Romanian Industrial Forum (Romatom).

Both AREN and Romatom are active parts of European nuclear world: AREN is European Nuclear Society member and Romatom is Foratom member.

The 3rd NGO is Women in Nuclear Romania (WiNRo) which registered in 2011. However, the women acting in nuclear field have become earlier active independent voices particularly in public communication on nuclear field matters. The debut was in 1993 when the women group acting in AREN became members of WiN Global, the organization that they trust would become a real opportunity to share their professional competences and improve their communication knowledge and skills in the light of the mission they decided to embrace, namely, that of clear, transparent and trustful communication with stakeholders, particularly the general public on peaceful use of nuclear energy. Today, WiN Ro is also part of WiN Europe where common European desiderates aim to establish and achieve.

Today, Romanian NGOs act to continue the trustful relations they have built with a large portfolio of stakeholders adapting their endeavors for answering to various stakeholders needs for transparency and effective communication on nuclear matters at national level.

At international level, the Romanian NGOs aim to register benefic experience for their organizational works and opportunities for promotion of the national good approaches, from relations with stakeholders acting in the international arena of nuclear world.

Relevant aspects on how the Romanian NGOs have approached relations with stakeholders will be presented.

Experience of the WiN Hungary in Communication with Public on a Big Social Events

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My poster presentation is about a process of communication with public during big social events like festivals, open days and sport's competitions. The technique is: we make a WiN stand on the frequent place of events, invite visitors and kindly ask them to fill our questionnaire about nuclear industry in Hungary. The questionnaire contents 15 questions about Hungarian NPP (how many units we have, what is electrical output). We communicate with visitors during the filling a questionnaire and after that we check the result. We can see the level of knowledge of our guest and give them the appropriate information on their level. Usually every participant takes a small present with the emblem of WiN Hungary. This form of communication has tested many times in our activity. It works very effectively. The form of poster is a chart flow of the process illustrated with photos.

Career Development in Nuclear Engineering

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In the eighties it was not common for girls to study engineering. But a few young girls have always been fascinated by science and technical applications and dared to go for a gender untypical education. What are these female engineers doing today?

This paper describes the career development of a woman, who completed her Master of Science in Nuclear Engineering, found first a job in an international company as co-operator in the research group of radiation physics and later as head of technical support and quality assurance of medical systems and then succeeded in a competition to be recruited at the European Commission (EC). There she started as an assistant for the primary standardisation of radionuclides and high-resolution alpha-particle spectrometry including the preparation of radioactive sources in the radionuclide metrology sector at the Institute for Reference Materials and Measurements of the European Commission's Joint Research Centre and consequently published her work in scientific journals.

Today, 29 years later, I am the laboratory responsible for the preparation and characterisation of nuclear targets at EC-JRC-IRMM, leading a team that has unique know-how in the preparation of thin film deposits (called targets) tailor-made for nuclear physics measurements at the EC–JRC–IRMM and international accelerator sites. High quality measurements of nuclear data and materials are being asked for in the context of nuclear safety, minimisation of high level nuclear waste and safeguards and security. The different steps of my career development and the repeated process of managing learning, work, family and leisure are presented. The career path across different jobs and responsibilities and the career progress via a certification training programme are also explained to encourage the next generation of female professionals to continue playing a vital role in nuclear science and technology.

Development of the "Approach to Critical" Experiment Simulation Model for the Consort Reactor Using LABVIEW

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Following the shutdown of the CONSORT reactor, the "Approach to Critical" experiment which allowed students to observe and understand the procedure for taking the reactor to critical, balancing the system at low power and increasing the power over a range of powers levels and eventual reactor shutdown, would no longer be possible. It was therefore important to develop a simulation model of the experiment that would enable future students to have comparable training.

An "Approach to Critical" Experiment Simulation model for the CONSORT Reactor was developed using Lab-VIEW software to simulate the "Students" experiment version. Lab–VIEW software was chosen due to its good user graphical user interface, offers ready to start functions and also the possibility of improving on the system with new algorithms. The modulation process was used to develop mathematical codes from equations using Lab–VIEW 2012 based on the CONSORT historical experimental data and known literature.

The Simulation models the kinetics of a sub-critical reactor with a start-up neutron source, such that control rods are used to increase the power, then achieve power balance and finally shutting down the reactor. Reactivity changes due to temperature effects were neglected.

The model was validated by testing the code through performing the three parts of the experiment; Approach to Critical, Doubling time method and Rod drop method, and results compared to the historical experimental data.

The results were in agreement with historical data. However the negligible variations were obtained in the Rod drop method due to the reactivity values used to generate the code.

Career Development for Women in Nuclear

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Nuclear technology is a highly specialised field that requires a variety of professionals. Nuclear engineers, statisticians, physicists, information technology professionals, analysts, policy makers, scientists and other professionals. Because of the variety of backgrounds, many young female professionals need training and professional development opportunities to become well rounded in these disciplines.

There has been a rising awareness of the need for development of the women professionals across the international field of the nuclear industry. Due to growth and expansion of nuclear power worldwide, a strong community of skilled next generation women professionals is required. Developing women professionals to fill this challenging need can first be addressed by making university students and young female professionals already working in the industry aware of the nuclear community and the unique career opportunities it encompasses. Once the decision is made to pursue a career in the nuclear community, professional development opportunities are an essential building block to becoming a more effective member of the international nuclear community. Current opportunities available to be discussed include international training, internships and fellowships, graduate degrees and professional networks. Present needs and gaps in the current professional development offerings will be identified as well as suggested ways they can be filled. In conclusion, programmes still needed in support of the career development of the female professionals will be addressed.

Nuclear Knowledge Management

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Knowledge is a strategic asset in every business. It should be actively managed by creating, acquiring, sharing, transferring and retaining among workers. Leaders and managers have to understand the significance of knowledge management (KM), recognise the risks of knowledge loss and gaps, and its impact on their working environment.

Nuclear industry appears to be behind other industries in KM. This is firstly attributed to the nature of business which deals with sensitive data on nuclear materials and prioritises safety and security over information sharing. Second, it faces strong competition over the operational life-cycle, which discourages to exchange know-how and experiences. Third, nuclear industry is highly technology-oriented with homogeneous form, which misleads people to believe that KM has been already in place. Those factors could be barriers to establish nuclear KM culture on the basis of corporate core value and safety culture.

Practical example of KM in business includes codification of particular skills into knowledge repository such as manual, handbook and database, and implicit knowledge transfer from experts to successors through apprenticeship and mentoring programmes. The examples suggest that KM applications closely link to information technology (IT) and human resource development (HRD) strategies, which results in effective integration of all available resources: people, process, and technology.

Globalization and diversity is another dimension where KM can contribute to the solution. Global companies have to achieve a common goal beyond cultural, racial and gender differences. KM helps reduce the gaps, identify the core competence, and increase flexibility in workplace.

Workingwomen have been developing their professional career while adapting to situational changes in their lives. It might be easier for them to understand the importance of KM and develop KM practices in the organizations. KM will help nuclear industry to respond to the changing environment from homogeneous culture to diversity.

What Can we Learn from Similar Male Dominated Industries?

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Thomas Thor Associates is an Executive Recruitment company solely dedicated to the Nuclear industry. We have been involved with WiN UK in 2014–2015 to help them develop their own organization, this research was part of our partnership.

The main purpose of this paper is to provide a clear picture of the techniques that are used by organizations similar to WiN, and business in other industries that are similar to Nuclear, to attract more women to pursue a career in a particular industry, and to support retention and career progression of women in these industries.

This paper has taken a look at all industries that require technical and engineering staff, after which the Mining, Oil & Gas, Petro-chemicals, Rail, Renewable Energy, Technology and Construction industries were found to show most similarities with Nuclear, in terms of the technical staff required and their structure on gender diversity. From here, case studies of industry organizations and professional business have been prepared in order to inform WiN of best practice in these industries and provide a benchmark for future WiN operations.

Finally, the report results into giving recommendations on projects WiN could add to their current approach to achieve their objectives. The recommendations are based on the results from the case studies, focusing on attracting, recruiting, retaining and developing female professionals. In summary, the recommendations are to: highlight potential career paths for women in Nuclear, educate women on Nuclear, support the development of women and to help companies to increase their bottom line by getting WiN certified.

Female Regulatory Inspectors at Nuclear Power Plants: A Constant Challenge and Opportunities

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The South African National Nuclear Regulator (NNR) was established in 1999 to provide for the protection of persons, environment and properties from the harmful effects arising from ionizing radiation produced by radioactive materials.

It is the responsibility of the licencee to have in place the necessary safety measures and resources in order to protect the public, workers and the environment against possible harmful effects of ionizing radiation caused by the operations of the Nuclear Power Stations.

To fulfill its mission, the NNR employs 61 females with scientific and engineering qualifications to support and perform compliance assurance activities at the Nuclear Power Plant in accordance with the National Nuclear Regulator Act, 1999 (Act No. 47 of 1999). This Act describes the following in terms of duties of an inspector: "An Inspector may carry out inspections and use any applicable equipment during such inspections at any of the nuclear installations, sites or places and conduct such investigations as are necessary for the purpose of monitoring or enforcing compliance with this Act".

The Regulator has two offices, the Head office is located in Pretoria and the Site office is located in Cape Town. Regulatory Inspectors at the Site Office are responsible for performing compliance inspections at Nuclear Power Plant. Women at the Site office play an important role in fulfilling the mandate of the NNR, 3/5 inspectors are women. One is The Chief Inspector responsible for executing the compliance assurance programme and one of the female Inspectors is the South Africa Lead Representative at the International Atomic Energy Agency Waste Safety Standards Committee (IAEA–WASSC).

This poster addresses the following challenges:

- Plant facilities and personnel protective equipment
- Environment created by historical male domination
- Overcoming conscious and unconscious biases against women (by both genders)

Activities of WiN Slovakia

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WiN Slovakia activities of the last two years are presented. We always try to join professional and social aspects of events to improve not only our knowledge but mutual relationship and cooperation.

List of activities:

- The technical visit in the contaminated areas in Belarus.
- The excursion to the chemical and radiation laboratories of Slovak Army and the biological and radiation department of Veterinary University in Kosice.
- The Open Days in the Slovak Hydrometeorological Institute in Bratislava.
- The course on radiation protection in Casta-Papiernicka.

All such activities are appreciated by our members and create good platform for next professional and personal relationship.

Female Contributions in Nuclear Science: Experiences at the Brazilian Commission for Nuclear Energy (CNEN/LAPOC)

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Female professional contributions in nuclear science and technology are no longer a novelty. Names such as Marie Curie, Chen Shiung Wu and Rosalyn Yalow are evidence of the incessant, worldwide efforts of women to take part in fields largely reserved for men. Although society has witnessed high level female achievements as early as in the 1800s, female scientists and technicians still face a long journey ahead in empowering themselves into full and equal participation in these areas. Today, the Laboratory of Poços de Caldas of the Brazilian Commission for Nuclear Energy (CNEN/LAPOC) experiences a process of women empowerment at all levels of the institution. At the Technical Section, two of the seven research departments are headed by female researchers who play essential roles in the institution's quest for excellence. Today, their work include coordination of a major environmental research project involving most researchers at LAPOC, successful participations on international intercomparisons of radiometric analysis and development of new methodologies in nuclear field applications. At the administrative level, female collaborators lead the Administration Section, improving several aspects of internal management, promoting further interaction at the workplace and strengthening cooperation among all departments. Regarding the capacitation level, the Commission has a long tradition of welcoming students and junior researchers through institutional programmes of training and collaboration in several projects. Today CNEN/LAPOC works with twenty scholarship grantees — half of which are women. Not only the Laboratory has reached equality in participation, but unarguably the female participants have demonstrated the most remarkable achievements among the group, attested by their continuous academic pursuit through Master's and Doctoral degrees, full collaboration in scientific publishing and attendance in training programmes at international level. The purpose here is to present in detail the achievements mentioned, demonstrating the relevance of female contribution in Nuclear Science.

The Trend of Women in Nuclear Security in Zimbabwe

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With the increase in the use of radiation technologies, each country now has a potential risk from nuclear related offenses or malicious use of radioactive material. Despite the major advancements women have made in becoming a significant part of the workforce in all the other fields, women in the field of Nuclear Security are underrepresented in Zimbabwe.

Nuclear security contributes to global security and there are a number of things that constitute this field. In the past 10 years, in developing countries, a few women have been taking part in Nuclear Security activities at Major Public events. Less than 1% of women in Zimbabwe are employed and take part in Nuclear Security related work. This study provides the trend in statistics of women employed in the field of Nuclear Security in Zimbabwe and it has identified possible factors why women are underrepresented in that field. It shows the trend of women taking part in Nuclear Security related activities for the past 10 years. Women's experiences of employment and career development in nuclear security were studied. The factors which hinder or support the career development of women employees in Nuclear Security or related work were identified. Practices which encourage and support women's involvement in Nuclear Security were explored.

A statistical analysis of local authority employment, using the Ministry of Labour, census of women in science and nuclear security related studies in the Population of Zimbabwe, and other relevant sources was carried out. This was to describe the wider context of women's employment in Nuclear Security. A self-completion questionnaire to get information on personal attributes, age and preferred career paths for women was used. Solutions to the trend are suggested in the study.

Development of the Regulatory Framework in Mexico

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The present study describes and introduces in a simplified way the process for issuing a Mexican Official Standard of Nuclear series, setting out the departments and agencies involved in this process, and also describing the main challenges identified for preparation, issuance and review of them. Furthermore, topics that are currently in the process of standardisation in Mexico in radiation and nuclear safety are mentioned.

The National Commission for Nuclear Safety and Safeguards is the regulatory body empowered and commissioned in Mexico to issue and amends the Official Mexican Standards in nuclear and radiation safety, whose duties and responsibilities are set out in the Regulatory Law on Nuclear Matters of Article 27. The Mexican Standards are of social kind because they are focused to prevent risks that could affect human been health, animal or plants damages, and are also associated to safety in the workplaces, to avoid damages which may be irreparable to the environment and population.

Normalization is the process by which all the activities concerning public health, environment protection, labor protection, among others, are ruled on in both, private and public sectors. Through this process, the rules, features or products specifications are set for a product or a regulated service. The objective of a standard is to get an optimum degree of order in a given activity. The objective of creating a regulation is to develop legal certainty, to avoid imminent harm or to reduce existing damages on health, the environment and the Economy.

Currently, the regulation for nuclear and radiological safety, physical security, as well as for safeguards in Mexico, is under constant development, looking for to cover the safety needs of employees, licencees, environment and society in a whole; many of these needs are supported by the international recommendations of the IAEA.

The Strategic Involvement of Women in Nigeria Nuclear Industry: A Case of Nigeria Atomic Energy Commission (NAEC) and Nigerian Nuclear Regulatory Authority (NNRA)

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The involvement of women in the nuclear industry can not be over emphasised as the western world has gone beyond the barrier of gender imbalance. This barrier, I think should be abolished in developing countries so as to help encourage more women to contribute and help build a strong nuclear industry.

In Nigeria, the Nigeria Atomic Energy Commission executes a deliberate strategy to address gender imbalance in its activities. Although the nuclear industry is just beginning to evolve, the major organizations namely Nigeria Atomic Energy Commission (NAEC) and Nigerian Nuclear Regulatory Authority (NNRA) have encouraged females to take key positions in the organizations. NAEC has performed better than the national average in achieving gender balance.

In a country that has a goal of having women in 35% of her elective and appointed offices, the legal department of NAEC is 100% female. Women have been educated and trained in technical areas such as nuclear engineering, nuclear law, nuclear security, radiation protection and non-proliferation.

This paper reviews the strategic approach of these Commissions in engaging women, the profile of some of the leading women and the contribution of the female dominated departments to male dominated departments.

WiN Argentina: Re Launch of National Chapter and New Activities

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Women of the Argentinian Nuclear Sector have shared WiN Global's vision since its birth in 1992. Many have become active members and participated in its Annual Conferences, by presenting papers or country reports (Sweden, 1995 and Russia 1996, Taiwan 1998). Due to several drastic changes in the Sector, such as projects cancellations and reduction of personnel, occurred during the late 1990's, the National Chapter reduced its activities.

Thanks to the restless work of its founder, Dr. Maela Viirsoo, and a group of new Members, the Chapter has been recently re-launched at the 40th Annual Meeting of the Argentinian Nuclear Technology Association (AATN) and new adherents have represented the country in last year's WiN Global Annual Conference held in Australia.

In this presentation, we will show our new membership and governing structure in order to fulfill the WiN Charter's obligations and WiN Global "Rules and Procedures".

We will also present the planned activities to promote the benefits of nuclear technologies from women's perspective. Professional women working in several nuclear fields, such as: science and technology, health, cultural, educational and social will improve the community perception towards nuclear technology by organizing lectures, exchanging ideas and stimulating joint initiatives in the educational local system.

Women in Chernobyl Exclusion Zone

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Today, 29 years after the Chernobyl accident, the Exclusion Zone still remains an areal unsealed radiation source of around 2600 km^2. It is not just a gigantic radioactive waste storage facility (the amount of radioactive waste accumulated within the Zone, except for the Shelter, is estimated at about 2.8 million m^3), but also a unique research and engineering platform for biologists, radiologists, chemists and physicists.

Taking into account the amount of the radionuclides released during the accident, it becomes quite understood that the radiological environment in the Exclusion Zone is far from favorable. However, among the Exclusion Zone personnel who numbers 5000, there are female workers.

The poster represents the results of the research performed among the female employees of the largest enterprise of the Exclusion Zone, "Chornobyl Spetskombinat". The survey was performed with the view to knowing what makes women work in the most radioactively contaminated area in Europe, and what their role is, to revealing their fears and hopes, and to estimating the chances of the brave women of Chernobyl Exclusion Zone to succeed in their careers.

International Collaboration in the Development of NPP Software

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In this paper, we first review the progress and current status of international collaboration and technical exchange in the development of nuclear power plant (NPP) software by The State Nuclear Power Software Development Center (SNPSDC) in China. Then we discuss the importance of the international collaboration and exchange in the trend of globalisation of NPP technology. We also identify the role and contribution of professional women in this process.

SNPSDC, the first professional software development centre for NPP in China, has been developing COSINE — a self-reliance NPP design and analysis software product with China brand — since 2010. Through participating in OECD/NEA's joint projects, such as ROSA-2 Project, PKL–3 Project, HYMERES Project and ATLAS Project, SNPSDC shared data with other countries involved with respect to particular areas, such as high quality reactor thermal hydraulics test data. SNPSDC's engineers have also been actively participating in international technical and research exchange for presenting their innovative work to the community while learning from peers. Our record shows that over 30 papers have been presented in international conferences with respect to nuclear reactor thermal hydraulics, safety analysis, reactor physics and software engineering within the past 4 years.

The above international collaboration and technical exchange helped SNPSDC's engineers to keep up with the state-of-art technology in this field. The large amount of valuable experimental data transferred to SNPSDC ensured the functionality, usability and reliability of software while greatly reduced the cost and shortened the cycle of development.

Female engineers and other employees of SNPSDC either drove or got actively involved in a lot of aspects of the above collaboration and exchange, such as technical communication, business negotiation and overseas affairs management. These professional women played an irreplaceable role in this project by their carefulness, patience and flexibleness.

Predominance and Role of Myanmar Women in Nuclear Related Fields

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This poster reflects the current and future endeavor of Myanmar women in nuclear science and technology related fields. Though Myanmar has not yet planned for nuclear power program, but strongly interested in nuclear energy due to rising awareness of future energy demand. The DAE is central in conducting career development, (E&T) as well as (R&D) in nuclear application fields, cooperating with the international societies and local institutions. According to survey, the status of women power in administration, rule and regulation sector is 62%, that in research, 34%, that in radiation application and protection, 57% and that in education and training, 46%.

The current trend indicates that female are perceptibly wider participants in DAE. Qualified personnel and sufficient human resource are of essence in nuclear engineering and science. Thus, so as not to face the shortage of personnel, we aim to promote the interest of young generation ,to make competent and efficient manpower based on current and future national nuclear programmes since the parliament agreed on decision for acceleration of human resource development in nuclear field in order to urge government on June 23, 2014. Moreover, activities should be undertaken by the government and associated departments to persuade the interest of secondary and high school level student, to enhance academic programme for nuclear engineering and other sciences in private and government technical schools and training centre, to develop infrastructure according to near future nuclear programs, to enlighten people the benefits of nuclear science and technology and applications, and to raise public awareness of zero carbon emitting energy resource. These potential efforts should be extended, upgraded and encouraged not only by government, stakeholders and also by the help of nuclear network of other international organizations, since larger numbers of WiN Myanmar are required to access practically and globally integrated experiences more.

S11b: Posters: Nuclear Applications

All posters will be displayed for the entire duration of the conference. As far as possible, authors are requested to be present at their posters during the coffee breaks as well as during the poster session for discussion with interested participants.

Design of a Cryogenic Distillation Column for JET Water Detritiation System for Tritium Recovery

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A Water Detritiation System (WDS) is currently being designed and manufactured to be installed in the Active Gas Handling System (AGHS) of JET, currently the largest magnetic fusion experiment in the world. JET has been designed and built to study fusion operating conditions with the plasma fuelling done by means of a deuterium-tritium gas mixture.

AGHS is a plant designed and built to safely process gas mixtures and impurities containing tritium recovered from the JET torus exhaust gases. Tritium is removed from these gas mixtures and recycled. Tritium depleted gases are sent to Exhaust Detritiation System (EDS) for final tritium removal prior to discharge into the environment. In EDS, tritium and tritiated species are catalytically oxidized into water, this tritiated water is then adsorbed onto molecular sieve beds (MSB). After saturation the MSBs are heated and the water is desorbed and collected for tritium recovery. The WDS facility is designed to recover tritium from water with an average activity of 1.9 GBq/ℓ, and is able to process water with activities of 85 GBq/ℓ and higher.

Tritiated water is filtered and supplied to the electrolyser where the water is converted into gaseous oxygen and tritiated hydrogen. The hydrogen stream is first purified by selective diffusion through membranes of palladium alloy and then is fed to two cryogenic distillation columns (CD). These operate in parallel or in series depending on the water activity. In the CD columns, hydrogen isotopes containing tritium are recovered as the bottom product and hydrogen, the top product, is safely discarded to a stack. The CD columns are foreseen to have a throughput between 200 and 300 mole/h of hydrogen isotopes vapour and they operate at approximately $\approx$ 21.2K and 105 kPa. The design of the CD columns will be presented in this work.

This work has been carried out within the framework of the Contract for the Operation of the JET Facilities and has received funding from the European Union's Horizon 2020 research and innovation programme. The views and opinions expressed herein do not necessarily reflect those of the European Commission.

Radiation Therapy in Peru: Achievements and Challenges

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Peru is the fastest growing economy in Latin America (sustained increase in GDP, low inflation and poverty reduction). The health system is fragmented and until 2012, almost half of the population had no health insurance. The current government poses: Improved access to health and education, employment and social security, reducing extreme poverty, within a context of social inclusion. The Plan for Prevention and Control of Cancer ("Plan Esperanza") was established in 2012 in order to reduce cancer mortality and morbidity, with greater access to oncology services (promotion, prevention, early diagnosis, treatment and palliative care).

With an area of 1 285 216 square kilometers and almost 30 million inhabitants, cancer treatment resources are scarce. Regarding Radiation Therapy, until 2007, it existed only in Lima, the capital city (over 9 million inhabitants). Later, another services were established in two more regions. At present, there is 23 radiotherapy machines in whole country. In this regard, Plan Esperanza is working on strengthening Radiation Therapy Services nationwide.

Considering the population demand and availability of other cancer services (chemotherapy, oncologic surgery), the regions where need create new radiotherapy services were identified: 3 Hospitals in Lima (in peripheral areas: Cayetano Heredia at the North, Hipólito Unanue at East and Maria Auxiliadora at South). Also, other Regions of the country: Piura, Lambayeque, La Libertad at North; Junín in the Central Highland, Cusco in the Southern Highland, and Loreto in the Northern Forest. Each with 2 linear accelerators, except Loreto, where they will consider two 60 Cobalt bomb instead, due to the geographical conditions. Moreover, one linear accelerator in Arequipa Region will be acquired.

In Lima, the Hospitals are projected to become operational in 2016, while in the Regions, the Ministry of Health is providing them technical assistance in needs identification, planning and implementation of their projects.

Application of Radioactive and Stable Isotopes to Trace Anthropogenic Pollution in the Baltic Sea

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The Baltic Sea is one of the seas most contaminated by various pollutants including the chemical munitions dumped after the Second World War. Pu isotopes, Δ^{14}C and δ^{13}C of total organic carbon (TOC) as well as lipid and phospholipids (PL) fractions of the sediments were applied to study sources of pollutants including chemical warfare agents (CWA). The compound-specific δ^{13}C analysis, PL–derived fatty acid biomarkers and an end-member mixing model were used to estimate a relative contribution of the marine, terrestrial and fossil as well as petroleum hydrocarbons (measured directly) sources to organic carbon in the sediments, to assess a possible effect of petroleum hydrocarbon contamination on radiocarbon signatures and to elucidate a possible leakage of CWA at the Gotland Deep dumpsite. Data on spatial distribution of As, Zn, Ni, Cr, Hg, Cd, Cu and Pb concentrations as well as ^{206}Pb/^{207}Pb and ^{208}Pb/^{207}Pb ratios in the surface sediments indicated the highest concentrations of Pb with their different pattern of distribution and insignificant variations of ^{206}Pb/^{207}Pb and ^{208}Pb/^{207}Pb ratios. The obtained data revealed the possible application of the Chernobyl-derived Pu to trace the pollutants of the terrestrial origin. Wide TOC variations with the strong impact of the terrestrial and fresh waters in the coastal areas were observed. Variations of Δ^{14}C and δ^{13}C values with the most depleted values of the Δ^{14}C TOC ($-453‰$) and Δ^{14}C of total lipid extracts ($-812.4‰$) at the CWA dumpsite were found. An excess (after subtracting the petroleum hydrocarbon) of fossil sources at the CWA dumpsite as compared to those at other stations in the Baltic Sea was detected. The obtained results indicated a possible effect of CWA on depleted Δ^{14}C and δ^{13}C values.

This study was supported by the Research Council of Lithuania, contract No. MIP-080/2012.

S11b

Research and Development of Radiation Processing of Polysaccharide for Agricultural Sector in Myanmar

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Myanmar is an agricultural-based country in which rice is the main staple food and present agricultural systems still follow the traditional methods that utilise the available natural resources combined with improved cultural practices. To fulfil the major needs for improving safety agricultural productivity in the country, and to apply radiation technology for useful products in agriculture, current research is based on radiation processing of polysaccharide for production of super water absorbents and plant growth promoter (liquid fertilizer) using Gamma Radiation. Corn starch, Brown seaweed and Rice straw cellulose were used as polysaccharide in this research work. Morphological structures of products super water absorbents from corn starch and rice straw cellulose were analyzed by Scanning Electron Microscope (SEM). Fourier Transfer Infrared (FTIR) was used to analyze the changes of chemical structure of the original polysaccharides and products (super water absorbents and plant growth promoter). The effect of radiation dose and monomer concentration on grafting efficiency, gel fraction, crosslink density, and swelling degree were studied for two types of super water absorbent. It was found that the grafting efficiency and gel fraction increased with increasing in radiation dose as well as the higher in crosslink density, which is directly proportional to increasing in radiation dose, led to decreasing in swelling degree. Decreasing molecular weights of the irradiated seaweed liquid fertilizer (SLF) were generally found with increasing radiation doses. To study the water retention properties of super water absorbents and growth promotion effect of seaweed liquid fertilizer (SLF), field tests were done. This research showed that radiation technology is very useful not only for agriculture sector but also for environmental monitoring since the agricultural waste such as rice straw was used as polysaccharide in this research work.

Development of a Low Energy Compact and Portable Plasma Focus Neutron Source

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We have developed a portable plasma focus neutron source of 302 J energy operated by a single Maxwell capacitor (20 μF, 6 kV). The device is mounted on the capacitor through a ground coupling cup leaving an air gap between the anode bottom and charging terminal of the capacitor for energy transfer to the system. The device together with the capacitor has a diameter of 10 cm, height of 37 cm and a weight of 3.78 kg. It is capable of delivering a neutron yield of the order of 10^5 neutrons per pulse with Deuterium as fuel gas. The FWHM of the neutron pulse is around 30 ns. The anode used as a feed through is composed of a kovar rod brazed with Alumina insulator sleeve which is further brazed with a rotatable kovar flange. The anode feed through is coupled to the vacuum chamber and cathode through a copper gasket. For a single gas fill the device had a shelf life of 3000 shots recorded over a period of three years. Afterwards the yield was gradually deteriorated due to the deposition of sputtered kovar material on the insulator sleeve. However with a fresh gas fill the device is still serving as a source of neutrons in the lower edge of 10^4 neutrons per shot.

Determination of Some Flow Properties of a Clinker Grinding Mill Through Radio-Tracing and Residence Time Distribution (RTD) Modeling

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Some flow properties of a cement mill have been determined using radio-tracing with liquid tracer Gold chloride, AuCl-198. Analysis of the response curve with appropriate software indicated an experimental mill mean residence time of 833.4 seconds. The experimental Peclet number calculated as a function of the mean residence time and the variance was 1.65×10^{-3} corresponding to a dispersion coefficient of 0.8 m^2/s. The dispersion of the flow was further investigated by curve-fitting the experimental results with the simple axial dispersion model. A mean residence time of 967 seconds and a Peclet number of 30 gave the best fit with a diffusivity of 5×10^{-4} m^2/s.

Development of Gamma-H2AX Assay for Radiation Biodosimetry: A Model Study in Cell Culture

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Double-strand break (DSB) of DNA is considered one of the most detrimental damage caused by ionizing radiation on organisms as it can induce genetic instability, mutation, and cell death. The ability to readily assess the extent of damage and potential health risks associated with both accidental and therapeutic exposures to radiation can better serve the patients with proper medical treatments. In this present study, we aimed to develop a biodosemetric measure based on the quantification of phosphorylated variant histone H2AX (gamma-H2AX) formed at DSB sites as part of the biodosimetry project initiated by the OAP in Thailand. Human dermal fibroblasts were used as a cell culture model to be exposed to gamma radiation from a Co-60 source in a custom-made lead chamber at doses 0, 0.2, 1, 2 and 4 Gy and a dose rate of 0.21 Gy/min. The cells were fixed and immunofluorescently labeled with antibody for gamma-H2AX proteins within 30 min post exposure before evaluated by confocal microscopy and flow cytometry. The phosphorylated gamma-H2AX proteins accumulated at DSB sites appear as nuclear foci with the most prominent intensity at 4 Gy. A dose response curve constructed by flow cytometric data also showed a linear response ($R2 = 0.9862$) of foci intensity in proportion to irradiation dose. In terms of cell viability, trypan blue assay showed that the fraction of viable cell decreased after exposure to irradiation at 4 Gy compared to 0.2 Gy and sham control. This gamma-H2AX assay can be further developed and implemented along with other established biodosimetric measures to assess the extent of biological damage in individuals.

Assessment of Significance of Attenuation Correction in Myocardial Perfusion SPECT on Visual Analysis

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Purpose: To assess the significance of attenuation correction on sensitivity, specificity and diagnostic accuracy of myocardial perfusion SPECT.

Methods: 102 patients referred for MPI were divided into two groups; 42 patients (mean age: 54.6 ± 12.6) were enrolled in the group A, who had undergone coronay artery angiography, within three months of the scan. 60 patients (mean age: 49.79 ± 11.3) were placed in the group B who had a $< 15\%$ pretest likelihood of CAD. Both non-corrected (NC) and attenuation corrected (AC) images were visually analyzed according to 17-segment model of the left ventricular cavity. Visual assessment derived sensitivity, specificity and diagnostic accuracy of NC and AC sets of images was compared using McNemar test.

Results: Sensitivity, specificity and diagnostic accuracy for detection of coronary artery disease was found to be 100%, 11% and 79% respectively for NC images and 66%, 78% and 68% for AC images. The p value was found to be significant in only the RCA territory. Normalcy rates in the group B population were 19% for NC image set and 74% for the AC image set. No significant difference on basis of BMI was observed in either gender.

Conclusion: This study demonstrates that CT based attenuation corrected ^{99m}Tc sestamibi SPECT myocardial perfusion imaging demonstrate significant improvement in specificity in the RCA territory compared with non-attenuation corrected ^{99m}Tc sestamibi SPECT myocardial perfusion imaging in both genders irrespective of BMI.

Enhancement of Training Capabilities in VVER Technology Through Establishment of VVER Training Academy

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Education and training (E&T) have always been key factor to the sustainability of the nuclear industry. With regard to E&T it is still the challenge to raise the interest of qualified young people of studies and professions related to nuclear technologies.

CORONA Project is established to provide a special purpose structure for training and for gathering the existing and generating new knowledge in the VVER area as well as to contribute to transnational mobility and lifelong learning amongst VVER operating countries.

CORONA Project consists of two parts: CORONA I (2011–2014) "Establishment of a regional centre of competence for VVER technology and Nuclear Applications", co-financed by the EC Framework Programme 7 and CORONA II "Enhancement of training capabilities in VVER technology through establishment of VVER training academy", co-financed by the EURATOM 2014-2015 Working programme of HORIZON 2020.

The project is focused on development of training schemes for VVER nuclear professionals, subcontractors, students and for non-nuclear specialists working in support of nuclear applications as civil engineers, physical protection employees, government employees, secondary school teachers, journalists. Safety culture and soft skills training are incorporated as an integral part of all training schemes because they require continuous consideration. It is vital for the acceptance of nuclear energy by the public and for the safe performance of the nuclear installations.

CORONA II project is to proceed with the development of state-of-the-art virtual training centre — CORONA Academy. This objective will be realised through networking between universities, research organizations, regulatory bodies, industry and any other organizations involved in the application of nuclear science, ionising radiation and nuclear safety. It will bring together the most experienced trainers and will allow trainees from different locations to access the needed knowledge on demand.

Effective Removal of Hazardous Dyes from Aqueous Solutions Using Starch Based Hydrogel and Gamma Radiation

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Many treatment processes have been applied for the removal of dyes from waste water such as physical, chemical and biological treatments. Hydrogels are suitable for the removal of dyes due to their hydrophilic nature and three-dimensional polymeric network which can imbibe large amounts of water. This study is divided into three points, the first one was preparation of (acrylamide/ starch) hydrogel by gamma radiation for removal of direct congo red (DCR) and direct blue (DB) dyes. The ionizing radiation technique is seems an excellent method for the preparation of hydrogels, it is clean and more efficient than other techniques. We report the influence of different parameters that affecting the adsorption. It was found that favorable adsorption was occured at pH 3 for DCR and pH 10 for DB. The adsorption of dyes onto AAm/starch hydrogels is an endothermic process. Experimental data have been modeled by Freundlich isotherm. The second point was removal of the two dyes by degradation under the effect of gamma radiation. The degradation test of dyes was performed in aqueous solution under various radiation doses and pH and G-value was calculated. Destruction of 70% and 75% of the dye colour solutions was succeeded at radiation dose 40 and 30 kGy for DCR and DB, respectively. Comparing the removal percent of DCR and DB dyes by radiation degradation with that done by AAm/starch hydrogel adsorption was investigated. It was found that preferring removal of DCR and DB dyes by gamma radiation degradation. The novelty of the present study lays on the third point, where, adsorption of remaining dyes after their degradation to complete removal of direct red and direct blue dyes.

Ameliorating Effects of Bone Marrow Transplantation and Zinc Supplementation on Physiological and Immunological Changes in Gamma-Irradiated Rats

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Purpose: The present study was carried out to determine the prophylactic impact of zinc sulphate administration to irradiated rats treated with bone marrow transplantation (BMT) as indicated by the hematological and immunologic response as well as oxidative stress.

Material and methods: Rats were injected orally with zinc sulphate, 10 mg/kg body wt, daily for 2 weeks before whole body 5 Gy gamma irradiation and intravenous injection of bone marrow cells, one hour post irradiation.

Results: The results revealed a significant decrease in red blood cells (RBC), white blood cells (WBC), glutathione (GSH) and zinc superoxide dismutase (Zn/SOD), splenocyte count as well as bone marrow lymphocyte count and viability of irradiated rats. Regarding immunological data: tumor necrosis factor alpha (TNF–α) and interleukin 2 (IL–2) recorded a significant decrease while interleukin 6 (IL–6) and lipid peroxidation product (MDA) in the serum and spleen were conversely elevated. Zn supplementation before irradiation and BMT and showed significant decrease of serum and tissue MDA compared to the irradiated group. Lymphocytes, bone marrow viability percentage, splenocytes percentage, IL–2, IL–6 and GSH were significantly elevated compared to irradiated group.

Conclusion: Protection with Zn, enforcing significant innate response, could trigger and augment adaptive immune response by BMT which suggests its use to protect against radiation hazards.

The Role of Gadjah Mada University on Forming Public's Perception About Nuclear in Indonesia Through Community Services Programs

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The plan for building Nuclear Power Plant in Indonesia have been announced since 1956, but it is always postponed until now. One of these reasons is public's perception about nuclear technology. In Indonesia, information about nuclear technology is still limited although we have used this technology in health and agriculture area. There were some reasons why this is happened. The first is insufficient introduction about nuclear chapter for our primary, secondary and high school students. Second is there are many rural community that is spread in thousand islands which has different education level compared to urban community. We thought that these two main reasons which affect people opinions about nuclear in Indonesia. So innovative ways to educate people about nuclear programme in Indonesia are needed. Gadjah Mada University, having the only Nuclear Engineering Department in Indonesia, has community services programmes that could be used for dissemination nuclear technologies and nuclear application in schools, rural and urban communities. Through these activities, we did several ways to promote nuclear which depends on the participant's education level and observe people's opinions about it. We hope these programmes could make better perception about nuclear.

Overview of Nuclear Applications in Nigeria

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Nigeria is the largest oil producer in Africa and is currently the world's 12th largest oil producer, pumping 2.25 million barrels per day.

According to the U.S. government's Energy Information Administration, "Nigeria has one of the lowest net electricity generation per capita rates in the world. Electricity generation falls short of demand, resulting in load shedding, blackouts and a reliance on private generators. Nigeria has privatized its state-owned Power Holding Company of Nigeria (PHCN) with aim of greater investment and increased power generation".

On 24th March 2014, Nigerian President Goodluck Jonathan at the Nuclear Security Summit (NSS) in The Hague said that Nigeria will develop a nuclear energy industry. Most Nigerians see nuclear power as a means of providing electricity. He also told the NSS audience that Nigeria is committed to negotiations on a multilateral, internationally and effectively verifiable treaty banning the production of fissile materials for nuclear weapons. While the Nigerian Nuclear Programme was founded in 1976, Nigeria's civilian nuclear energy aspirations began in 2007, when the then-President Umaru Yar'Adua said the country planned to add nuclear power to the national grid by 2017. After the accident at the nuclear power plant Fukushima some countries have decided on the gradual closure of nuclear power plants. However, the world is not going to give up the peaceful atom.

Nigeria's interest in nuclear applications for energy generation is not without fear of nuclear and radiological accidents which primarily involves nuclear power plant leaks, should be seriously tackled with as more developing countries nurtures its interest in nuclear technology and applications.

Overview of Twenty Years of Radiation and Tissue Banking Activity in Argentina

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Radiation sterilization of human tissues in Argentina was a consequence of health care products sterilization by gamma radiation. Radiation technology was implemented in 1970 when the first multipurpose gamma facility was built at the Ezeiza Atomic Centre of CNEA.

Organ and tissue transplantation is a well established effective therapy that saves lives and significantly improves the quality of life. Ionizing radiation is used for sterilization in order to provide clinically safe tissue for therapeutic purposes of implantation in every patient in need. Argentina radiation and tissue banking activity started in 1993 with the establishment of two tissue banks using radiation under the IAEA programme of technical cooperation, a skin bank and a bone one. Additionally to this start, other tissue banks have adopted tissue sterilization by irradiation. The compatible tissues sterilized with this methodology are mainly skin (frozen, glycerolized), bone (lyophilized, frozen), and amniotic membrane (glycerolized, frozen, dehydrated). The donation and transplant of human organ, tissue and cells is regulated and coordinated by the National Institute Unique Central Coordinator of Ablation and Implant (INCUCAI). In regards to radiation and nuclear safety, physical protection and nuclear non-proliferation issues are regulated and contorted by the Nuclear Regulatory Authority (ARN). Eight tissue banks use gamma radiation for sterilization of human tissues (6 musculoskeletal, 1 skin and 1 amniotic membrane).

Argentina has participated actively in several IAEA projects regarding radiation and tissue banking program, and it has been selected by the IAEA to host the Regional Training Centre for the Latin American region. The following activities were implemented: regional training courses in Buenos Aires, face to face (five) and virtual (four) modalities; collaboration on several materials related to tissue banking and radiation sterilization of tissue allograft, codes of practice for radiation sterilization of human tissues and recommendations for the operation of tissue banks.

Development and Applications of a New Deuterium-Deuterium (D-D) Neutron Generator

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A new deuterium-deuterium (D–D) neutron generator has been developed for non-destructive neutron inspection techniques. The neutron generator is composed of three major components: An RF–Induction Ion Source, the Secondary Electron Shroud, and the Diode Accelerator Structure and Target. The generator produces monoenergetic neutrons (2.5 MeV) with a yield of 10^{10} n/s using $25 - 50$ mA of beam current and 125 kV of acceleration voltage. Three nuclear analytical technique were tested and optimized to be used with the neutron generator:

1. Prompt γ–ray neutron activation analysis (PGNAA) of ^{10}B concentrations in Si and SiO_2 matrices was carried out using a germanium detector (HPGe) and the results obtained are compared with a PGNAA system using a NaI detector.
2. The radiography facility used in the measurements and simulations employs a fully high-voltage-shielded, D–D neutron generator. Both fast and thermal neutron images were acquired with the generator and a Charge Coupled Devices camera. To shorten the imaging time and decrease the noise from gamma radiation, various collimator designs were proposed and simulated using MCNPX. Design considerations included the choice of material, thickness, position and aperture for the collimator.
3. Optimization of a D–D neutron generator based explosive detection system (EDS) was performed using Monte-Carlo simulation. The shape and the thickness of the moderators and shields are optimised to produce the highest thermal neutron flux at explosive position and the minimum total dose at the outer surfaces of the explosive detection system walls.

In addition simulation of the response functions of NaI, BGO, and LaBr3-based γ–ray detectors to pure chemical elements is described.

Application of TXRF in Assessing Trace Element Levels in Formulated Indigenous Complementary Infant Flour from Kenya

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Trace element levels in several formulated indigenous complementary infant flours were assessed using Total-reflection X-Ray Fluorescence (TXRF). An analytical procedure for extraction of the elements was developed and validated by subjecting a certified reference material to the same procedure. Statistical analysis was performed using cluster analysis and principal component analysis. The concentration levels of the investigated essential trace elements depended strongly on the type of ingredients used, the proportions of these ingredients in the sample and the origin of the samples. The bioavailable portion of the studied essential trace elements in the complementary infant food samples has been assessed using data from literature on estimated daily intake and bioavailability levels of trace elements in plant-based complementary food. Our results have shown that the investigated samples have a high potential to meet the requirements on recommended daily intake of copper, iron, zinc and manganese, provided that individual ingredients from the studied areas are carefully selected and combined.

Assessment of Recharge in Lushnja Aquifer System Using Environmental Isotope Tracers

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The water supply in the region of Myzeqeja are dependent on groundwater reserves, contained mainly in quaternary gravel formations. The aquifer of Lushnja lowland, located between the river Shkumbin and the river Seman seems to shelter groundwater reserves that are of great importance for the population of the city of Lushnja. The first studies for Lushnja aquifer date from 1965. They were based only on hydrochemical and geological studies. The development of the area, population growth and the variation use of the water in intensive farming and climate changes that have occurred during these years have increased the demand of water supply. In these conditions was necessary to expand the studies on the assessment of this aquifer. In this paper it is discussed about the origin of the Lushnja aquifer groundwater by environmental isotopes measurements. In addition to the hydrochemical analyses, were determined the isotopic composition of the stable isotopes of hydrogen and oxygen. This study was conducted on water samples collected from boreholes, private wells and precipitations. The isotopic composition interval of the measurements of δ^2H ranges from $-48.00‰$ to $-28.79‰$ and for δ^{18}O the isotopic composition interval of the measurements ranges from $-7.11‰$ to $-4.37‰$.

Body Mass Index and Body Composition with Deuterium in Costa Rican Children

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Body Mass Index (BMI) has been adopted as international measure for measuring adiposity in children with the disadvantage that it varies with age, sex and sexual maturation with no differentiation between fat mass and mass free of grease. The analysis of body composition allow to know if the overweight is due to fatty tissue being the deuterium isotope dilution a validated reference method using Infrared Spectrometry Transformed of Fourier (FTIR).

We studied a total 118 boys and girls from 6 to 9 years old getting the values of z score of BMI for age and percentage of fat mass by FTIR.

The results obtained in this study demonstrated that Costa Rica does not escape to the global problem of childhood obesity founding by BMI 18.6% of overweight and 10% of obesity and by body composition 9% of overweight and 57% of obesity.

Isotopic deuterium dilution method demonstrated in this study to be more suitable for the analysis of obesity and overweight in children since BMI presented false positive and false negative results giving less accurate information of adiposity of the subject.

Humidification Dehumidification Spray Column Direct Contact Condenser Part I: Countercurrent Flow

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Humidification-dehumidification (HDH) is a low grade energy desalination technology. The waste heat from power plant (such NPP) can be used as heat source to preheat water (in evaporator) and air (in condenser) . Hot humid air and cooled spray water in counter current flow with direct contact is theoretically analyzing in the present work. Direct contact spray condenser is studied to provide the effect of various parameters on its performance. A computer programme describing the theoretical model is designed to solve a one-dimensional differential equations by using Rung–Kutta method. The programme predicts the droplet radius, velocity and temperature, besides, the humidity and temperature of air.

The results show that, the length of column has great effect on the performance of spray condenser. At column height of 0.762, 2, 5, 10, and 20 m the humidity of the output air decreases by 50%, 72%, 89%, 97%, and 99% respectively. The condensate increases about 35% when the length increase from 5 to 10 m at $\Delta T = 15^{\circ}$C while increase only 18% at $\Delta T = 30^{\circ}$C. Also, it is found that, at $\Delta T = 25^{\circ}$C the condensate decrease from $H = 10$ to 5 m about 31% and increases from 10 to 20 m about 32%. While these results for $\Delta T = 15^{\circ}$C are 32% from $H = 10$ to 5 m and 36% from 10 to 20 m.The increase of both water and air mass fluxes increases the condensate mass flow rate.

The IAEA Technical Cooperation Programme as a Knowledge Multiplier Mechanism for Nuclear Medicine — The Case of the Nuclear Medicine Knowledge Network in Argentina

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This poster aims at:

- Highlighting the relevance of the conformation of a Nuclear Medicine (NM) Network;
- Shedding light on the influence of the IAEA TCP on the Network;
- Emphasizing on the role of women as decision-makers in NM.

CNEA together with the MINPLAN led the creation of the NM Network which now assembles 20 institutions. Its main purposes are: to strengthen ties among institutions; to federalize, spread and exchange knowledge in NM; to standardise protocols; to enhance interdisciplinary work and to harmonise the levels of capacity building nationally. These goals are reached through collaboration, teaching and research activities; already being attained through training in new Centers and the expansion of NM poles throughout the country within the framework of the National Programme of NM.

NM has been a strategic area of the nuclear sector in Argentina since its beginning. There are three essential milestones for this continuity and for the establishment of this Network: NM as a state policy; the institutional policy within CNEA and the permanent support and acknowledgment from the IAEA.

The geographic and demographic features of Argentina call for a federal working scheme such as the one carried out by CNEA; this has been replicated in a six-decade-networking among NM institutions and enhanced by including NM in the Public Health agenda.

The IAEA TCP plays a key role as a knowledge multiplier mechanism in NM by supporting the creation of networks and endorsing the CPF 2014–2021 which fosters this cooperation link. Since 1976, thanks to the TCP, 456 people were trained and over 40 projects were financed in this area.

Regarding female participation in NM, no gender barriers were observed, since the main decision-makers in this field are women, who handle issues sensitively, considering the direct impact NM has on people's daily lives.

Self-Shielding Effects in Co-60 Production

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Cobalt-60 sources are widely used for medical equipment and pest insect sterilization, as radiation source for radiotherapy and industrial radiography. Co-60 is produced by neutron activation of Co-59. The challenge during the activation process is the self-shielding effects. Self-shielding is the reduction of neutron flux in the energy range of the resonances resulting in reduction in resonance absorption relative to what it would be if the resonance were not present. This work evaluates the self-shielding effects on a selected range of Co-59 pellets specifications for the production of Co-60. The first approach was to develop a simple Monte Carlo Neutron Particle (MCNP) model of a Co-59 cylindrical pellet, surrounded by a relative big amount of water sphere. Isotropic source was assumed and the cylindrical pellet was segmented based on mean free path (the average distance that a neutron can travel between collisions). The flux spectrum for each segment of a cylindrical pellet and for the whole cylindrical pellet was sampled. The spectrum obtained from MCNP was then used in FISPACT (inventory code) to calculate the activity (Bq) of the Co-60 sample. FISPACT calculations were based on each cylindrical segment, and then the average (whole pellet). The activities for each segment were summed up and compared to the average value. Secondly, the Co-59 cylindrical pellets were also inserted into a canister for placement into the MCNP SAFARI-1 model for activation process in a position of interest for self-shielding effects analysis.

Preliminary Diagnostic Reference Levels of Adult CT at Aristide Ledantec National Hospital

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The number of Computed Tomography (CT) procedures performed in Senegal has widely increased as the CT is a powerful tool for the accurate and effective diagnosis. CT is a diagnostic imaging modality giving higher patient dose in comparison with other radiological procedures. The establishing of diagnostic reference levels (DRLs) is a way to optimize the radiation arising from CT procedures to as low as reasonable (ALARA) and to ensure good practice.

Objective: The purpose of this study is to establish Local Diagnostic Reference Levels (LDRLs) at the University Hospital of Aristide LeDantec for CT examinations and to compare these values with the international Diagnostic Reference Levels (DRLs) to benchmark the local practice.

Materials/Methods: This was a cross-sectional survey carried out in HALD between August 2014 and January 2015. Demographic data and acquisition parameters of 700 CT scan examinations performed on adult patients were collected from request forms and CT scan consoles. The values of CTDIw, CTDIvol and DLP were calculated using ImPACT (Imaging Performance and Assessment of Computed Tomography) software for Siemens Definition AS scanner of HALD.

This was done by correlating the measurements from the National Radiological Protection Board (NRPB–R250) scanners with the effective dose calculated, using the CT–EXPO software. Data was analyzed using mean, range, 3rd quartile, as well as mean. Frequency tables and histogrammes were used to summarise the data.

Results: The 3rd quartile doses in this study for head, chest, abdomen and pelvis were 89 mGy, 12 mGy, 16.5 mGy, and 15 mGy, respectively. These values were in good agreement with the values reported from the literature.

Behavior of the Cardiovascular Diseases in Women

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Background: Coronary artery disease (CAD) remains the leading cause of death in Mexico and Western world. Symptoms in women are more subtle. Women usually feel general tiredness and lack of energy, in contrast to men having chest pain. This implies that women do not receive a timely and early diagnosis. According to the National Health Information System, 20 of 100 Mexican women die of cardiovascular disease, 68.5% of Mexicans have problems of obesity, overweight, diabetes, high blood pressure, conditions that increase the risk of CAD. SPECT myocardial perfusion scintigraphy (MPS) is currently appropriate for diagnosis, risk assessment, stratification, myocardial viability, evaluation of left ventricular function. The Objective of this investigation is to show that SPECT MPS is a noninvasive diagnostic test that identify women with increased CAD risk.

Method: A 60 years old female patient with diabetes, high blood pressure and overweight was referred for a cardiac scan, for suspicion of ischemia. Her symptoms were general tiredness, lack of energy and occasionally light chest pain. A SPECT-gated myocardial perfusion test was done. The images where acquired with a gamma camera after the injection of 10 mCi (stress) and 20 mCi (Rest) of ^{99m}Tc-Tetrofosmin. Images were reconstructed using Emory toolbox.

Results: The images showed light hypoperfusion septal and inferior walls, and a small left ventricular chamber size with thickened walls. Angiography showed significant diffuse coronary stenosis in the three vessels.

Conclusion: Women suffering CAD constitute a high-risk group that potentially poses a diagnostic and therapeutic challenge. Cardiac SPECT MPS is a noninvasive diagnostic and prognostic test that identify women with high CAD risk and establish timely and early the therapeutic interventions.

The Management of the Solid Radioactive Waste & Used (Spent) Fuel in South Africa: An Overview of Past, Present and Future Practices

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As a country with a nuclear program, the Republic of South Africa (RSA) generates radioactive waste through numerous activities. Radioactive waste, for legal and regulatory purposes, is defined as "material that contains or is contaminated with radio-nuclides at concentrations or activities greater than clearance levels as established by the regulatory body and for which no use is foreseen".

The RSA recognises the importance of the safe management of spent fuel and radioactive waste, for this reason the country is a contracting party to the International Atomic Energy Agency (IAEA) Joint Convention on the Safety of Spent Nuclear Fuel Management and Safety of Radioactive Waste Management. South Africa fulfils its obligations under the Joint Convention by the establishment of a Radioactive Waste Management Policy and Strategy for the Republic of South Africa (Policy and Strategy). It lists the principles and provides direction relating to solid radioactive waste management. Although all key players i.e. government agencies and the private sector are participating to implement the national commitment in a coordinated and cooperative manner, huge uncertainty remains.

This poster presents the South African National Radioactive Waste Management Model with a description of

- the radioactive waste generated,
- the hierarchy of waste management options,
- the waste classification scheme adopted,
- the current disposal option,
- the current management of used (spent) fuel.

Good intentions have not always been matched by action and measures are still needed to improve safety especially to integrate the lessons learnt from the Fukushima accident, management of legacy waste, monitoring of disused sealed sources, recovery of orphan sources and additional waste due to operation of potential new nuclear power plants etc. This poster also addresses current discussions and ideas relating to the above challenges.

Radiation Dose to Patients and Medical Staff in Different Procedures of Nuclear Medicine

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The aim of this study is to provide information on developing technologies and clinical techniques for Hybrid SPECT/CT imaging using ionizing radiation and their associated radiation dose to patients and medical staff. A thermoluminescent dosimeters (TLD) was used in this study to analyze the historic records of the external radiation doses to staff members working in our nuclear medicine department in 7 procedures, including elution of 99mTc from ^{99m}Mo/^{99m}Tc generators, syringe preparation, radiopharmacy kit preparation, injection, accompanying patients, SPECT/CT scan, oral ^{131}I preparation. These dosimeters was worn by the staff members at the level of the chest on the front part of the body. A retrospective review of 110 clinical studies of various nuclear medicine procedures (^{99m}Tc–MIBI–Tetrofosmin, ^{99m}Tc–MDP bone scan, ^{99m}Tc–Tektrotyd, ^{99m}Tc–Thyroid imaging, ^{99m}Tc–Nanocoll, ^{131}I–Nal (diagnostic application 185 MBq) obtained on hybrid SPECT/CT systems was performed to calculate the effective radiation dose to patients. The results from this study showed that annual effective radiation doses to nuclear medicine department staff members were within permissible levels. The contribution of total effective radiation dose from SPECT component were calculated using the activity of the injected radiopharmaceutical and dose tables published by the conversion factors listed in ICRP 53 and ICRP 80. The radiation dose for CT was calculated by Dose Length Product method. According to the results of this study the dose in each procedure depends on different factors such as the education and experience of the staff members, usage of shielding and taking the radiation protection requirements into consideration. When SPECT–CT is being performed, all measures should be taken to reduce both the radiopharmaceutical dose and the CT effective dose following the ALARA principle.

Radionuclide Content of Pasteurized Milk Sold in Mafikeng, South Africa

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Many food animals which are important components of human food chain are effective collectors of radionuclides from the environment particularly contaminated forages, and therefore represent a significant pathway for the transfer of radionuclides to humans. Many important radionuclides are readily transferred to milk thus the product is considered as one of the basic food items recommended for the assessment of radionuclide exposure within a population. The current study aimed at assessing the radionuclide content of commercial milk commonly sold in South Africa in other to set a baseline data for radionuclide concentration of the products.

Three popular brands of commercial milk (A, B and C) were sampled, with two samples obtained for each brand. The concentration of individual radionuclide in the milk samples, particularly ^{131}I, ^{137}Cs and ^{235}U was measured by gamma spectroscopy. The results showed that brand A had the highest concentrations of ^{235}U and ^{137}Cs (203 and 324 mBq/ℓ respectively) but the lowest concentration of ^{131}I (6.4 mBq/ℓ). The highest concentration of ^{131}I (148 mBq/ℓ) was detected in brand B whereas both ^{235}U and ^{131}I were not detected in brand C. All the values however were well below the new standard limits for individual radionuclides in milk established by the Japanese Ministry of Health, Labour and Welfare. This study indicates that the commercial milk brands assessed pose no radiation health threat to the consumers.

The Study of Byzantine Glass Mosaic Tesserae from Albania Using Nuclear Techniques

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In this paper are presented some results of an archaeometric investigation performed on several glass mosaic tesserae from Early Christian basilicas from different sites in Albania, belonging to V–VI century AD.

While, during the last years there has been an increasing interest from both archaeologists and scientists for the study of glass archaeological artifacts found in Albania, the present study constitutes the first attempt to study the glass mosaic tesserae.

A multi analytical approach, which includes optical microscopy, scanning electron microscopy equipped with energy dispersive spectrometer (SEM–EDS), micro X–ray fluorescence and Raman spectroscopy, is used during the investigation.

The main objective of the study is the characterisation of the type of materials, glass matrix and coloring and opacifying agents, used for their production as well as the investigation of the microstructures of opaque coloured glass mosaics tesserae.

Most of the glass tesserae have the characteristic soda-lime-silica composition typical for the Roman glass. Compounds of Mn, Fe, Cu, Pb, Sn, Co were used as colorants in tesserae of different colours, while apart from bubbles and mineral inclusions SnO_2 has been used as opacifier. Thin Au foils were used for the gold coloured tesserae.

Use of Ionizing Radiation in the Production of Nanomaterials

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The potential of nanomaterials technology have some very real and useful outcomes: production of materials and products with new properties, contribution to solutions of environmental problems, improvement of existing technologies and development of new applications. Due to the materials very small size ($1 - 100$ nm), they have some remarkable, and in some cases, novel properties like significant enhancement of mechanical, structural and magnetic properties. A wide array of nanosystems are produced biologically that can be used for the design of functional materials [1]. The use of ionizing radiation technology seems very promising for the modification of protein films. On the other hand, there are various known methods to produce nanomaterials. Stable gelatin nanohydrogel can be prepared by irradiation providing concentration, temperature, physical confinement, dose, and dose rate effects were properly established [2]. Silica-gelatin bio-hybrid and transparent nano-coatings can be prepared through sol gel technique [3]. Nanostructural characterisation of some type of gelatin had already performed showing a high potential for proteins in the field of nanotechnology [4].

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Influence of New Contrast Agent on CT Based Radiotherapy Treatment Planning

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Backgound.The patient is often given a contrast agent in radiotherapy.The contrast agent must reflect the density of organ,but also allow better visualisation.This study was done to determine the appropriate concentration of a new contrast agent used in our clinic for radiotherapy treatment planning.

Materials.The newly purchased contrast agent was used to mark vagina in gyneacological patients, in the same manner and prescription as for an old type of contrast agent. The first patient scanned on CT gave extremly glowing white area instead of vagina, after which the investigation and study were done. The cylindrical phantom with inserts was CT scanned and analyzed. The inserts were filled with contrast agent of different concentrations.

Results.The concentrations od 100%, 50%, 25%, 12.5%, 6.25%, 5%, 2.5%, 1.25%, 0.65% and 0.325% were made and CT scanned. The HU values accordingly were obtained: 3071 HU, 3071 HU, 1822 HU, 117 HU, 668 HU, 440 HU, 356 HU, 291 HU, 123 HU and 56 HU. The prescription given for the new contrast was set to 1.25%, that is 12.5 ml to 1 ℓ of water. The prescription for previous contrast agent was 25 ml to 1 ℓ of water (twice as new) which explained the glowing of organ with contrast.

Conclusion. Concentration of a contrast agent must be a low as possible, so that its influence on treatment planning result is minimised, but also visibility enhanced.It was concluded in this case that the high concentration of contrast agent in the treatment planning system, may influence up to 6% on the time of irradiation, depending on the concentration of an agent. High concentration of the agent causes underestimation of a dose, and consequtively overirradiation of a patient.

Applying Sediment Cores and Nuclear Techniques for Pollution Assessment in the Bonny/new Calabar River Estuary, Niger Delta, Nigeria

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Sediment cores were collected from the Bonny Estuary in August 2011 to archive pollution records over the last 80 years. Three sampling locations were selected and used for assessing the extent of pollution in the estuary. Alpha and gamma spectrometer in conjunction with the constant rate of supply (CRS) model were deployed to establish the age of the sediment and the data were validated using ^{137}Cs profiles and events that occurred within the region. The results of the activities of naturally occurring radionuclides (^{226}Ra, ^{228}Ra and ^{40}K) ranged between 15 ± 2 and 34 ± 3 Bq kg^{-1}; 32 ± 5 and 48 ± 6 Bq kg^{-1}; 264 ± 29 and 462 ± 36 Bq kg^{-1}, respectively. The profiles of stations 1 and 2 exhibited a relatively constant activity but that of station 3 showed significant decrease with depth which was appropriate for radiometric dating. CRS model displayed an increase in the bulk sediment accumulation over the past 80 years, with special reference to 1938, 1955, 1973 1997 and 2004. The cesium-137 profile was in agreement with the CRS established ages. The sedimentation rates obtained ranged from 0.019 to 0.034 gcm^{-2}y^{-1}. The data further revealed that minor and major environmental perturbations occurred in the early 1970s and late 1990s respectively. Core profiles of total hydrocarbon content ranged from 0.001 to 130.80 ppm and total phosphorus 0.01 to 0.499 mg/g. The observed profiles had peaks corresponding chronologically to severe environmental perturbations resulting from massive oil spills and substantial delivery of phosphorus from agricultural runoffs between early 1970s and early 2000s. It is therefore surmised that since the advent of industrial activities the estuary has been subject to perturbations and contamination from human activities which has resulted in adverse fluctuations in environment conditions.

Using Gamma Irradiation to Modify Properties of Polysaccharides (Guar Gum)

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Radiation processing of material is one of most recent technology used in modification of material properties. The aim of this work was to determine the effect of gamma irradiation on the Polysaccharides Viscosity and Molecular Weight, as definition of Guar Gum. Its series of glactomanene (glactos + manose). (1-2-,3). Guar Gum powder was the main material and Co-60 irradiator facility as main Tequineque. For gamma–ray source of required doses, 2.5, 5, 7.5, 10, 20, 30, 40 and 50 kGy. Viscosity of the aqueous suspensions of irradiated Guar Gum at different concentrations (0.1–0.5%) was measured, also it measured for solutions made of irradiated powder. Results used to calculate the difference occur in molecular weight, in order to determine the irradiation effect in the material. The monitored rheological parameters showed (non-Newtonian Behavior) of the samples which processed by gamma irradiation. The decrease tendency of the viscosity by irradiation of samples under study (different concentrations) and compared with control also for irradiated powder decrease of the concentration as well has been noticed.

From results evaluation concluded that the viscosity values for all studied concentrations decreased by irradiation. This aspect suggests a depolymerization phenomenon of the aqueous Guar Gum solutions. This study contributes to the knowledge of the viscoelastic properties of Guar Gum as powder or aqueous solution, with application for food, agriculture, medical products, Petroleum and construction.

Unmet Needs in Cancer Radiotherapy in Low to Middle Income Countries

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Global incidence of malignant disease is increasing without exception. Unfortunately, the rate of increase seems much higher in low to middle income (LMI) countries comparing to that in high income countries. Despite this fact, current global health interest and the support accordingly has been mostly focused on eradicating communicable disease. How do we approach to non-communicable disease in those countries? First, a nationwide and in-depth investigation is required to identify the most urgent need in the country. Second, a cancer control capacity needs to be investigated. Third, substantial solution needs to be provided.

The first issue can rather be easy to be accomplished. The second issue of cancer control capacity in each country needs in-depth discussion; the most important elements are how to train and maintain health professionals in cancer therapy and whether the facility-radiotherapy machine can be eligible. According to International Atomic Energy Agency Report, the number of radiotherapy machines is far less in LMI countries comparing to that in high income countries. Increasing rate of non-communicable disease, cancer, and far less number of cancer control facility creates unmet needs in cancer radiotherapy in those countries. This is a striking contrast to current situation in most high income countries, where cutting-edge radiotherapy technology, such as intensity modulated radiotherapy, image guided radiotherapy, as well as particle radiotherapy, is frequently used in daily practice of cancer therapy despite of the high cost of the equipment.

Now it is time to show our interest to eradiating non-communicable disease in LMI countries. To fulfill this goal, comprehensive approach seems to be essential with the experts in diverse specialty in health science, particularly in radiotherapy and nuclear technology field. The WiN-global is expected to contribute to this issue.

The Application of Nuclear Technology for a Better World

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Nuclear Technology is widely used in different areas and sector of our economy to better man kind and his environment. Peaceful applications of nuclear technology have several benefits to the world today. It is widely believed that nuclear technology is mainly used mainly for the production of electricity (Nuclear Power Plants – NPPs). Many are not aware of the other numerous benefits of nuclear technology. Nuclear technology can be applied in different fields for numerous benefits.

Different sectors Nuclear Technology application can improve the living standard of man and his environment:

- Food and Agriculture
- Medicine
- Industrial
- Energy
- Education — Research and Development
- Environment

The benefits of the application of nuclear technology cannot be over emphasised. These benefits range from the improved quality of purified water we drink, the textiles we wear, improved quality of stored grains for preservation of foods, water analyses, improved transportation system work, drugs production, medical tests and analysis, clean environment through radioisotope techniques etc.

The application of nuclear technology also gives a safer, greener, healthier and pollution free environment and atmosphere for human habitation.

In my poster, the numerous benefits of the various applications of Nuclear Technology will be clearly enumerated and heighted.

Application of Monte Carlo Techniques to Dose Rate Calculations of Gamma Irradiation Facility

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Monte Carlo simulations for a gamma irradiation facility of Turkish Atomic Energy Authority's Sarayköy Nuclear Research and Training Center (SANAEM) in Ankara, Turkey are carried out to calculate dose rate inside and outside of the irradiation room. MCNP Monte Carlo code is employed. Various variance reduction techniques that are effective not only on random walk sampling but also on calculation results are investigated to improve analog Monte Carlo results which have large relative errors and failed statistical checks of the MCNP code. Several variance reduction techniques are introduced and key points on their applications are discussed. It is observed that variance reduction techniques are very effective enhancing the calculation results with a reasonable number of particles so that time consuming simulations are avoided. All simulations are completed with results having a relative error less than 5%, a variance of the variance less than 10%, and all statistical checks being passed. The dose rate calculations show that 200 cm concrete wall results in very low dose rates outside of the irradiation room therefore proposed gamma irradiation facility is very well shielded.

S11c: Posters: Energy, Environment, and Climate Change

All posters will be displayed for the entire duration of the conference. As far as possible, authors are requested to be present at their posters during the coffee breaks as well as during the poster session for discussion with interested participants.

Compartment Modeling of Cesium Movement Through Terrestrial-Aquatic Ecosystems in a Forested Headwater in Fukushima

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The 2011 accident at the Fukushima-Daiichi nuclear reactor in Japan caused large areas to be contaminated with reactor fission products–the most dominant of these being cesium-137. Widespread contamination of cesium-137, and other radionuclides, gave rise to concerns about radiological protection of local residents and the environment. Cesium fate and transport in headwaters of forested ecosystems, which comprise over 70% of the contaminated region, is one of the key factors for long-term risk assessment in downstream agricultural and residential areas. This presentation describes the results of a dynamic compartment model developed to predict the fate and transport of cesium in Tokyo University of Agriculture and Technology's research forest. The compartment model has been benchmarked on field data from the same research forest, collected over a two–year period from 2012 to 2014. We have evaluated the transfer of cesium through this environment, including identifying where the majority of cesium is deposited and how concentrations vary over time. Future work includes evaluating the models fit and making adjustments to include any further changes to the environment, such as additional depositions, clean up efforts, or the inclusion (or exclusion) of a species.

Assessing the Atmospheric Pollution of Energy Facilities for Supporting Energy Policy Decisions

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The impacts of different energy facilities on the environment and human health are a matter of interest and concern throughout the world. For example, fossil fuels are one of the energy sources of more undesirable effects on the environment, but this energy is still one of the most competitive at the market, especially for the developing countries. However, it is necessary to find out a balance between the costs of achieving a lower level of environmental and health injury and the benefits of providing electricity at a reasonable cost.

With a view to solving the current deficit in energy production (mainly in electricity generation) in the light of major transformations in the energy sector, the Cuban Government is evaluating ways of incorporating new sources and technologies and the expansion of existing capabilities. In this context non-fossil energy sources will play an increasingly important role.

The present work shows the results obtained in the frame of the IAEA Technical Cooperation Project CUB7007. The project integrated several tools and methodologies in the field of air quality modelling and its assessment, emissions measurement and nuclear techniques.

The main objective was to assess atmospheric pollution from various energy facilities for supporting energy policy decisions by incorporating nuclear techniques (proton-induced X–ray emission, neutron activation and X–ray fluorescence) for estimating the elementary composition of particulate matter.

As results were consolidated national laboratories in the application of nuclear and non-nuclear techniques to support environmental studies, especially for the analysis of emissions in chimneys and ambient air sampling. Moreover, all energy technologies considered in the national strategy of development were assessed.

Radioecology and Environmental Decision Support Systems

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According to Wikipedia Radioecology is a branch of ecology, which studies how radioactive substances interact with nature; how different mechanisms affect the substances' migration and uptake in food chains and ecosystems. Investigations in radioecology might include aspects of field sampling, designed field and laboratory experiments and the development of predictive simulation models. This science combines techniques from some of the more basic, traditional fields, such as physics, chemistry, mathematics, biology, and ecology, with applied concepts in radiation protection. Radioecological studies form the basis for estimating doses and assessing the consequences of radioactive pollution for human health and the environment.

Significant economic and social disruptions arise after radioactive contamination of land as a result of releases of radioactivity into the environment be it from accidents, routine and war operations or during decommissioning and waste management of nuclear facilities. Measures carried out to reduce and minimise radiation doses to the public can give rise to even more concerns as often they are not understood and the stakeholders are often not involved into the decision making process. Countermeasures are needed to reduce population exposure, at the same time minimising economic and social costs. The effectiveness of countermeasures is not only highly dependent on factors which are connected to environmental transfer, but also to special behaviour and consumption behaviours in varying food production systems.

A central aspect of radioecology is the identification of vulnerable areas which, by virtue of the processes governing the transfer of radiocaesium through food chains, deliver high individual, or collective doses to man. Social factors (e.g. dietary preferences) and agricultural production techniques also contribute to vulnerability.

Effect of Body Size and Food Quality on the Assimilation of ^{65}Zn and ^{110m}Ag in Bloody Cockles (Anadara Senilis) from Ghana

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In coastal ecosystems where bivalves are often exposed to metal contamination, dietary exposure has been recognised as a dominant uptake pathway of trace metals in bivalves. The present study employed radiotracers (^{65}Zn and ^{110m}Ag) to assess the assimiliation efficiency (AE) of the two elements in Bloody cockles (Anadara senilis) from Narkwa Lagoon, Ghana. AE is an important parameter in determining bioavailability of trace elements from food. Zn and Ag bioavailabilty was assessed using single-feeding approach, followed by a 28–day depuration period, with two species of phytoplankton (Isochrysis galbana and Skelotonema costatum) used as food, and two different size groups of Bloody Cockles. Results indicate that AE of ^{65}Zn and ^{110m}Ag were influenced by the phytoplankton species used as food whereas, for both algal species, AE increased slightly with increasing cockle body size. Once taken up, ^{65}Zn was relatively strongly retained in cockle's flesh (biological half-live: $\approx$ 40 days) whereas ^{110m}Ag was rapidly released (biological half-live: $\approx$ 5 days). A complementary experiment -using subcellular partitioning and in vitro digestion method- was performed to provide additional information on the proportion of ^{65}Zn and ^{110m}Ag in the bloody cockle that is available for transfer to next trophic levels. Overall, this work highlighted that trace metal accumulation in marine filter feeders does depend on the metal bioavailability in food as well as on other biological factors, such as body size.

How is Electricity Generated from Nuclear Power Plant

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Nuclear power is a proven, safe and clean source of power generation. A nuclear power plant is a thermal power station in which the heat source is a nuclear reactor. As is typical in all conventional thermal power stations the heat is used to generate steam which drives a steam turbine: the energy released from continuous fission of the atoms of the fuel is harnessed as heat in either a gas or water, and is used to produce steam. Nuclear Reactors are classified by several methods. It can be classified by type of nuclear reaction, by the moderator material, by coolant or by generation. There are several components common to most types of reactors: fuel, moderator, control rods, coolant, and containment. Nuclear reactor technology has been under continuous development since the first commercial exploitation of civil nuclear power in the 1950s. We can mention seven key reactor attributes that illuminate the essential differences between the various generations of reactors: cost effectiveness, safety, security and non-proliferation, fuel cycle, grid appropriateness and Economics. Today there are about 437 nuclear power reactors that are used to generate electricity in about 30 countries around the world.

The Global Network of Isotopes in Rivers (GNIR): Integration of Stable Water Isotopes in Riverine Research and Management

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Rivers play a crucial role in the global water cycle as watershed-integrating hydrological conduits for returning terrestrial precipitation, runoff, surface and groundwater, as well as melting snow and ice back to the world's oceans. The IAEA Global Network of Isotopes in Rivers (GNIR) is the coherent extension of the IAEA Global Network for Isotopes in Precipitation (GNIP) and aims to fill the informational data gaps between rainfall and river discharge. Whereas the GNIP has been surveying the stable hydrogen and oxygen isotopes, and tritium composition in precipitation, the objective of GNIR is to accumulate and disseminate riverine isotope data.

We introduce the new global database of riverine water isotopes and evaluate its current long-term data holdings with the objective to improve the application of water isotopes and to inform water managers and researchers.

An evaluation of current GNIR database holdings confirmed that seasonal variations of the stable water isotope composition in rivers are closely coupled to precipitation and snow-melt water run-off on a global scale. Rivers could be clustered on the basis of seasonal variations in their isotope composition and latitude. Results showed furthermore, that there were periodic phases within each of these groupings and additional modelling exercises allowed a priori prediction of the seasonal variability as well as the isotopic composition of stable water isotopes in rivers. This predictive capacity will help to improve existing and new sampling strategies, help to validate and interpret riverine isotope data, and identify important catchment processes. Hence, the IAEA promulgates and supports long-term hydrological isotope observation networks and the application of isotope studies complementary with conventional hydrological, water quality, and ecological studies.

Nuclear Engineering Education in Support of Thailand's Nuclear Power Programme

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This paper aims to introduce the nuclear engineering education at the Department of Nuclear Engineering, Chulalongkon University, Bangkok Thailand. The department has been offering curriculum in nuclear engineering to support the national nuclear power programme since 1970s. It is the oldest established nuclear engineering educational programme in the South East Asia region. Nevertheless, since the nuclear power programme has been postponed several times due to various reasons, the educational programme at the department has been continuously adapted to meet the nation's needs. Several areas of study have been introduced, including nuclear power engineering, industrial applications of radioisotope, nuclear instrumentation, radioisotope production, radiation processing, environment and safety, nuclear materials, as well as the newly created nuclear security and non-proliferation. With the renewed interest in using nuclear power in Thailand in 2007, the department has been actively assisting both the government and the electric utility in preparing human resources to support the nuclear power programme through various educational and training modules. Realizing the importance of establishing and balancing all 3 aspects of the nuclear 3S (safety, security and safeguard) in Thailand and in the Southeast Asian region. The new curriculum of nuclear security and safeguard programme has been offered since 2013. Since the establishment, the department has produced hundreds of graduates (Diploma, Master's, and Ph.D. levels) to feed the continuously expanding Thai nuclear industry. The full paper will provide detailed information of the curriculum, the challenges and obstacles that the department has encountered, as well as the national and international linkages which have been established over the years.

Project Experiences of the Implementation of the Primary Bleed & Feed System

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Modernization activities play a very important role in the enhancement of the safety and reliability of nuclear power plants. The main focus is on increasing the plant availability, the operational flexibility or the integration of new, additional equipment to satisfy safety requirements, as in this case with the implementation of the design modification primary circuit "Primary Bleed & Feed" (PB&F) of the primary circuit, in the consideration of a beyond design basis accident.

Primary B&F prevents the high pressure core melt path and allows an additional alternative heat removal by depressurising the primary system and coolant injection with passive and/or active low pressure systems, when the normal core cooling is not available because of loss of water inventory in the steam generators.

The goal of this paper is to show some general good practices gained during the implementation of the Primary Bleed and Feed, System from the project conception to the system implementation. Basically, practice shows that some of the crucial factors which contributed to a successful project execution were based on (i) good interface management between the new system and the existing plant components, (ii) a close coordination of the single engineering disciplines and simultaneous activities, (iii) safety culture and quality assurance were set as priority during the entire project development.

Seasonal Variations in the Structure of Phytoplankton Communities near Nuclear Power Plants

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To investigate effects of thermal discharge effluent from nuclear power plants on the surrounding marine environment, especially on the phytoplankton community, environmental data gained by seasonal survey around Hanbit and Hanul nuclear power plants during the periods of 11 years from 1999 to 2009 were analysed. The data used were from environmental survey and assessment around Hanbit and Hanul nuclear power plants of Korea during the period of 11 years from 1999 to 2009. The purposes of this study are (1) to evaluate the effect of operation of nuclear power plants on phytoplankton community, (2) to find out whether the thermal discharge affected negatively phytoplankton community, and (3) to evaluate the difference of thermal discharge influence on phytoplankton community between West and East coastal area, Korea.

Through this study, (1) quantitative evaluation of the effect of thermal discharge effluent on marine ecology, especially on abundance and biomass of phytoplankton were performed, (2) found that depending on the season, the effect of thermal discharge effluent from nuclear power plant on the marine environment is not always negative (i.e. warm water may increase or prevent decline of abundance in seasons with low temperature such as winter in Hanbit area), and (3) found that same thermal discharge effluent rate to different marine environments, such as west and east coast of Korea, does not result in same effect on the marine ecosystem.

Forecast Development of Electricity Supply in the Indonesian Archipelago

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Indonesia is an archipelago consisting of 17 000 islands, of which some are heavily populated and others have no inhabitants or even a name. The country's population is growing by 1.1% per year, so the demand for electricity has been increasing as well. The Indonesian archipelago — as a location for renewable energy sources such as micro-hydro, wind, solar, geothermal and biomass — presents unique opportunities to invest in expanding power production.

In the industrialised regions and on large islands, such as Kalimantan, the electricity demand is highest. Most of the electricity is supplied by large power plants using fossil fuel — coal, oil and gas — which causes an increase in the volume and concentration of greenhouse gases.

Moreover, the currently installed power plants do not meet the energy needs of Indonesia's population of two hundred million. As a solution, within the next five years, the Indonesian Government plans to build power plants adding 35 000 MWe. The electricity demand forecast for 2050 will be around 200 GWe, with 160 GWe coming from renewable and conventional energy sources and 40 GWe from alternative sources such as nuclear power.

To meet the demand for electricity in Indonesia, an expansion strategy is needed for alternative sources of energy on the islands around the Java Sea and on the island of Kalimantan at locations safe from earthquakes. The Indonesian Government has provided some guidelines for commercial nuclear power plants, such as those contained in Government regulations No. 5 and No. 43 of 2006.

Development of Multi-Alarm Pattern Card for an Effective Selection of Abnormal Operation Procedure in MCR

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The number of abnormal operation procedures (AOPs) for mitigating a plant abnormal status amounts to about one hundreds for the most of 1000 MWe optimized power plant (OPR1000) and it is expected that the number of AOPs would be increased to cope with an abnormal status occurred newly. However, it is not well organized for operators to select a proper AOP from alarms occurred in main control room (MCR) during a plant abnormal status. It may be a burden to operators since the selection of AOP to respond an abnormal status is authorised by operators. When multiple alarms occur in MCR, it would take more time to respond them than a single alarm. To reduce the efforts, various MCR operation support systems have been developed. The purpose of this study was to develop a multi-alarm pattern card to select an appropriate AOP effectively when multiple alarms occur in a single upper layout (UL) of MCR. It can be applied for an operation support tool as well as an education tool.

The Investigation of NPP Control and Monitoring Functional Analysis Applied to Functional Displays' Implementation

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NPP Control and Monitoring System has been recognised as extreme and safe as well as large scale product, thus it was one of the most major design activities that fully, accurately and operationally functional analysis. The results of functional analysis would be employed as initial instruction through the whole lifecycle of NPP Control and Monitoring System. In this paper, it was discovered that several disadvantages of present functional analysis methods included FAST, The Subtract and Operate Procedure and Functional Procedure Method; owing to the identity methods enveloped here was the combination of Functional Tree and System Structure, as well as its decomposition steps; and RCS Inventory Control function which is defined as one of the most significant control functions in Advanced Light Water Reactor Utility Requirement Document has been employed to demonstrate the feasibility of this method; the analysis results of RCS Inventory function has been applied to direct the design and implementation of related displays, here the functional display of RCS Inventory Control function has been implemented on NuCON which is originated by SNPAS. Owing to the analyzing results, it would be ensured that the accuracy of information displayed to operators, thus the operator would be aware the condition of systems and then make the proper move to ensure the safety and productivity of NPP based on the received data.

Surface Decontamination Studies of Cs-137 and Sr-85 Using Polymer Gel

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Strippable polymer coating is one of the methods for effective surface decontamination to remove isotopes on the contaminated surface. This method is applying in nuclear facilities on the World. In this paper, we present the results obtained in our laboratory from product the polymer coating to apply to remove radioisotopes of ^{137}Cs and ^{85}Sr from surface of glass, stainless steel, mild steel, ceramic, PVC plastic.

This polymer gel solution consist of water soluble polymer preferably polyvinyl alcohol (PVA), plasticizing agent (glycerine) and chelating agents, (citric acid) which can be sprayed or pasted on to contaminated surface. After some hours, these gel solutions was dried to form a strong thin film and it was easily peeled off from a contaminated surface with the radioactive isotopes and can be disposed off as radioactive solid waste. In this study infrared spectrophotometry technique was used to examine the interaction of the cesium and strontium ions with polyvinyl alcohol (PVA), polymer gel and the results of the study were also presented.

The results showed that decontamination efficiency of ^{137}Cs and ^{85}Sr strongly depended on property, porosity and smoothness of the contaminated surface and obtained from $95-99\%$ on glass and stainless steel, ceramic and PVC plastic surfaces. The decontamination efficiency also depended on activity and coating thickness. Optimization of film thickness is around 0.2 mm. Decontamination efficiency of Polymer gel were compared with Decongel 1101 (product from USA) on surfaces. IR spectra studies indicated that Cs and Sr ions interacted with PVA and citric acid in Polymer gel through cacboxyl ($C = O$) group. Polymer gel could remove of ^{137}Cs and ^{85}Sr better than PVA gel does because of citric acid, which can form chelating complex with Cs and Sr ion.

Development and Application of Advanced Techniques for Inhalation Dose Assessment in Ambient and Occupational Environments

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Radon (^{222}Rn), Thoron (^{220}Rn) and their decay products (radio-isotopes of Pololnium, Bismuth and Lead in particulate form) originating from the Uranium and Thorium series, contribute to the inhalation dose to humans. These are relevant not only in the occupational environments of Uranium mines and Thorium plants, but also in High Background Radiation Areas (HBRAs) where enhanced levels of natural radioactivity are observed. Almost 50% of the total annual effective dose is contributed due to inhalation of Radon, Thoron to a minor extent and their decay products majorly. Thus, it is important to measure directly the decay product concentrations rather than computing them through the measurement of the parent gases which is the conventional methodology. In this regard, recent development of Deposition based decay product sensors at our institute, which can be used both for area as well as personnel monitoring, is a remarkable achievement, which has now been widely accepted, promoted and extensively used in various environments world-wide. In the present work, we elaborate the highlights of the work carried out using these detector systems in different occupational and indoor environments as follows:

- Direct measurement of decay products in High background radiation areas (HBRAs) and Normal background radiation areas (NBRAs) of India confirmed that, even though the gamma dose rate in HBRAs is around 10 times higher than that measured in NBRAs, the inhalation doses in both the areas are comparable.
- Direct measurements of decay products in Thorium handling facilities and uranium mines have provided an assessment of presonnel inhalation doses.
- These measurements aid in building up of a national database of indoor and outdoor deposition velocity parameters which is important for long-term characterisation of these sensors.

Traces of Sr-90 in the Sediments of the Danube River

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As part of the "Joint Danube Survey 3 (JDS 3)," a project by the International Commission for the protection of the Danube River (ICPDR), we have investigated the amount of radiostrontium (Sr-90) in sediment samples taken from the Danube river. The material was extracted from the geologic matrix chemically, separated from other radonuclides using a strontium-specific ion exchange resin (Eichrom) and quantitative measurement by liquid scintillation counting (LSC). For the most part, we found minor activities of maximum 10 Bq/kg and, overall, very low levels of Sr-90 pollution. The most contaminated of sediment was found in the upper Danube — especially near Moson and Dravski Kut, where the Drava enters the Danube and at some places near the river delta.

This survey is the first its type for ^{90}Sr and, therefore, little prior data is available for comparison.

Safety Analysis for Marine Radiation Leakage Accidents

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This study is focused on the radioactive dose assessment using KM–RAD (Korea Marine Radionuclide Transport & Dose) when the radioactive waste carrier sank in Korea seas. KM–RAD is the evaluation programme of marine radionuclide transport & dose and consists of KOSPS–RAD (Korea Radionuclide Spill Prediction System) and MARINRAD (MARINRAD that reflects the Korea marine characteristics). This programme could be utilised in other areas by improving the input data in the local data.

We carried out the dose assessment assuming that the planned load is 1000 drums and the radionuclide leakage rate from each drum is 100%. As a result, the integrated dose of coastal residents exceeded the criteria in case of the single waste loading of the spent resin or spent filter. Therefore, the spent resin or spent filter should be loaded with the concentrated waste or dry active waste, which has low radioactivity.

This study is a part of “Improvement of Impact Assessment Model in Ship Sinking Accident”, a research project supported by Korea Radioactive Waste Agency (KORAD).

Radionuclide Release into the Underground Water from Hypothetical Reactor at the New NPP Site in Lithuania

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Lithuania is planning to construct a new nuclear power plant (NPP) nearby the closed one. The proposed new NPP will be constructed and operated within Ignalina NPP industrial area. The landscape of the site is industrial and characterised by power production units and buildings related to power.

Groundwater flow and radionuclide (^{3}H, ^{14}C and ^{137}Cs) transport model was performed for model domain of new NPP site in Lithuania assuming that the radionuclides will reach groundwater straight after the new NPP operation beginning. Calculations of radionuclide transport within groundwater were performed using the computer code FEFLOW which allows modelling of groundwater flow and contaminant transport in a layered three-dimensional system. The goal of these estimations is to demonstrate possibility of radionuclide transport from hypothetical reactor of new NPP. The model was calibrated using monitoring data of water level.

The results show that tritium would have the greatest prognostic activity after 10 years and would reach 160 Bq/ℓ in groundwater and 0.4 Bq/ℓ in confined aquifer (maximum allowed tritium activity concentration in drinking water is 1.5×10^{4} Bq/ℓ). The maximum radiocarbon activity concentration will be very small, 0.5×10^{-4} Bq/ℓ in groundwater and 1×10^{-6} Bq/ℓ in confined aquifer, when the maximum allowed radiocarbon activity is 472 Bq/ℓ). ^{137}Cs transport will be observed only in the first year of NPP's operation. The highest ^{137}Cs activity concentration will be in groundwater near a hypothetical reactor and will reach 0.1 q/ℓ in groundwater and 1×10^{-6} Bq/ℓ in confined aquifer. The maximum allowable ^{137}Cs activity concentration in drinking water is 21 Bq/ℓ. It shows that the contamination in the groundwater will not be found. The data is important to solve tasks of nuclear safety.

World Champion in Environmental Sustainability — for How Much Longer?

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Thanks to its secure, affordable and environmentally sustainable domestic electricity supply, Switzerland has been rated at the top of the World Energy Council's worldwide Environmental Sustainability Index. With electricity production based on hydro (58%) and nuclear (36%, in winter up to 45%) Switzerland has earned a Triple A Index in the Energy Trilemma (security, equity, sustainability). However, the Swiss pole position is at risk: Shortly after Fukushima the Swiss government made a U-turn and switched from nuclear new-build to a nuclear phase out. New renewable energy is now meant to replace nuclear while energy saving and efficiency measures should reduce overall energy demand. At the same time CO_2-emissions are expected to be cut drastically. The unavoidable gap between the country's electricity needs on the one hand and domestic production without nuclear on the other cannot be filled by unreliable stochastic energies as suggested by the Swiss government's roadmap "Energy Strategy 2050". This strategic roadmap seems to be unrealistic as Switzerland would have to build gas fired power plants and/or import base load from the European Grid which usually is mainly fossil based. Both options will torpedo Switzerland's climate protection goals, in addition to ignoring the Swiss population's will to not increase the country's energy dependence from foreign countries. The last pristine landscapes would be strongly affected, not to mention the Swiss economy.

The main goals of our poster, therefore, are:

- Illustration of the current power generation situation;
- Life Cycle Assessment data regarding environmental effects of electricity production in Switzerland, especially CO_2;
- illustration of potential scenarios without nuclear and, instead, new renewables in the Swiss electricity supply/use.

And we want to raise our voice to the Swiss energy minister with a petition signed by as many WiNners as possible.

Research on Operating Procedure Development in View of RCM Theory

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The operation of NPPs (nuclear power plants) is closely related to SSCs (Structure, System and Component) function implementations and failure recoveries, and strictly follows operating procedure. The philosophy of RCM (Reliability Centered Maintenance) which is a widely-used systematic engineering approach in industry focusing on likewise facility functions and effectiveness of maintenance is accepted in relative analysis of NPPs operation in this paper. Based on the theory of RCM, the paper will discuss general logic of operating procedure development and framework optimization as well combining NPPs engineering design. Since the quality of operating procedures has a significant impact on the safe and reliable operation of NPPs, the paper provides a proposed operating procedure development logic diagramme for reference for the procedure optimization task ahead.

The Initial Test Programme Features for the Advanced Korean NPPs (Shin–Kori NPP Units 3&4)

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Korea has developed the Advanced Power Reactor 1400 (APR1400), an evolutionary pressurised water reactor and has obtained the standard design approval in 2002. As of 2014, eight nuclear power plants (NPPs) are in preparation for operation or under construction, four in Korea (SKN 3&4, SUN 1&2) and four in UAE (BNPP 1, 2, 3&4), and four NPPs are in planning in Korea (SKN 5&6, SUN 3&4). Especially, SKN Units 3&4 are the first construction NPPs for the APR1400 and are currently in the final stage to get Operating Licence (OL).

The initial test programme for NPPs begins as systems and components are turned over to the startup organization and ends with completion of the Power Ascension Tests (PATs).

For SKN Unit 3, the Pre-core Hot Functional Testing has been successfully completed and the initial fuel loading would proceed after getting OL. The SKN Unit 4 is preparing for the CHT (Cold Hydrostatic Test).

The SKN 3&4 has many new and advanced design features and so has developed the test programmes to demonstrate that those advanced design features can be safely operated and the performance levels can be maintained in accordance with approved safety requirements. Among those test programs, the examples of test programs, newly introduced ones compared to the previous NPPs are as follows;

- SIT (Safety Injection Tank) Blowdown Test with FD (Fluidic Device)
- IRWST (In-Containment Refuleling Water Storage Tank) In-Plant Test
- POSRV (Pilot Operated Safety Relief Valve) Test
- Low Power Physics Testing and PAT considering FOAK (First Of A Kind) unit
- Safe Shutdown Test with DCS (Distrubuted Control System) Fail and CMF (Common Mode Failure) for Safety Instrumentation and Control System

Fire Protection Regulation for NPP in Republic of Korea

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Purpose of NPP Fire protection at NPP in Korea is to minimise both probability of occurrence and consequence of fire. To meet this object, operating plants are designed to provide reasonable assurance through defence in depth. Ultimate goal is nuclear safety and Radioactive release to be minimised in the event of a fire.

The korea regulatory framework for nuclear plant is based on number for US regulations and supporting guidelines, including but not limited to General Design Criterion. Each plants has their specific licence so, they determine the applicability of a specific regulation to specific plant.

In accordance with Korea nuclear regulation Atomic Energy law include fire protection programme to protect structure, system and component important to safety. It also sates about requirement for Fire Hazard Analysis and fire prevention, fire detection system and suppression, building design and etc.

After Fukushima accident, regulation is strengthened and many amendments and modification of fire protection system is proceeding to meet the requirement.

Status of Filtered Containment Venting in Republic of Korea

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Ensuring the integrity of containment is very crucial concept of defense in depth for the public and environment. When the containment over-pressurisation may occur owing to the large amount of steam and gases during a severe accident, integrity of containment may be threatened like the Fukushima Daiichi accident. Following the Fukushima Daiichi accident, Korean government inspected all operating Nuclear Power Plants (NPPs) in Korea. As a result, they suggested action items as the Fukushima follow-up measures. Installation of filtered vent systems or depressurising facilities in containment is one of the Fukushima follow-up countermeasures against severe accidents. There are 24 operating reactors (20 PWRs, 4 PHWRs) in Korea. Among them, one PHWR has finished installing FCVS (Filtered Containment Venting System) in 2013. FCVS will be also implemented at three PHWRs in 2015. The remaining 20 PWRs are under review to take action for Fukushima follow-up measure.

Electricity Generation Through the Koeberg Nuclear Power Station of Eskom in South Africa

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The poster provides information on the process of nuclear energy generation in a nuclear power plant in order to produce electricity. Nuclear energy currently provides approximately 11% of the world's electricity needs, with Koeberg Nuclear Power Station situated in the Western Cape providing 4.4% of South Africa's electricity needs. As Africa's first nuclear power station, Koeberg has an installed capacity of 1910 MW of power. Koeberg' s total net output is 1860 MW.

While there are significant differences, there are many similarities between nuclear power plants and other electrical generating facilities. Uranium is used for fuel in nuclear power plants to make electricity. With the exception of solar, wind, and hydroelectric plants, all others including nuclear plants convert water to steam that spins the propeller-like blades of a turbine that spins the shaft of a generator. Inside the generator coils of wire and magnetic fields interact to create electricity.

The energy needed to boil water into steam is produced in one of two ways: by burning coal, oil, or gas (fossil fuels) in a furnace or by splitting certain atoms of uranium in a nuclear energy plant. The uranium fuel generates heat through a controlled fission process fission, which is described in this poster presentation.

The Koeberg Nuclear Power Station is a Pressurised water reactor (PWR). The operating method and the components of the Koeberg Power Station are also described.

The nuclear waste generated at a nuclear power station is described under three headings — low-level waste, intermediate-level waste and used or spent fuel, which can be solid, liquid or gaseous.

The Experimental Study to Support IVR Strategy

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For alleviating the severe accident damage in nuclear power plant, In-vessel retention (IVR) is used on the severe accident management strategy in light water reactor. The criterion of IVR effectiveness is the safety margin, the value that between the melt pool heat flux and the critical heat flux on the lower head, matching the design requirements. For enhance the safety margin, the melt pool heat flux and the critical heat flux should be investigated.

In the molten pool, the heat transfer behavior of metal layer is the focus problem because of the thermal focus effect. Therefore, the HELM was built to study the heat transfer correlations under the IVR conditions. The Globe–Dropkin correlation and Chu-Churchill correlation has been widely used to calculate the heat flux in the metal layer. However, the Rayleigh number (Ra) for the developed Power Plant has been shown to exceed the valid range for the G–D correlation. At the same time, other studies have shown that most correlations are far from the G–D correlation. Therefore, HELM verified the G–D correlations under the high Ra condition. The relationship between axial and radial heat transfer in the metal layer will also been studied.

The behaviors of CHF varying with angular positions and the concentrations of coolant chemistry are investigated by the FIRM facility. FIRM is built to embody some key factors that influence the CHF: the heater block is 30o arc of circle with full-scale radius, and is made of the copper block covered by a thin carbon steel layer. The test section can be positioned in three tilted angles. Also, the effect of coolant chemistry will be examined by the mixed solution of water, deionized water, boric acid and tri-sodium phosphate.

Effective Uranium (VI) Sorption from Alkaline Solutions Using Bi-Functionalized Silica-Coated Magnetic Nanoparticles

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High temperature gas reactor is one of generation IV reactors that can adapt the future energy market, of which the preparation of fuel elements will produce a large amount of radioactive wastewater with uranium and high-level ammonia. Sorption treatment is one of the most important method to recover uranium from wastewater. However, there are few report on uranium sorbent that can directly be applied in wastewater with ammonia. Therefore, the development of a sorbent that can recover uranium in basic environment will greatly decrease the cost of fuel element production and the risk of radioactive pollution. In this work, ammonium-phosphonate-bifunctionalized silica-coated magnetic nanoparticles has been developed for effective sorption of uranium from alkaline media, which are not only advantaged in the uranium separation from liquid phase, but also with satisfactory adsorption rate, amount and reusability. The as-prepared sorbent is found to show a maximum uranium sorption capacity of 70.7 mg/g and a fast equilibrium time of 2 h at pH 9.5 under room temperature. Compared with the mono-functionalized (phosphonate alone and ammonium alone) particles, the combination of the bi-functionalized groups gives rise to an excellent ability to remove uranium from basic environment. The sorbent can be used as a promising solid phase candidate for highly-efficient removal of uranium from basic solution.

To What Extent International Law Constitutes an Appropriate Answer to Nuclear Accidents?

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Regulating high risks activities has always been an ambitious task as the regime shall both prevent and compensate the potential damage of such activities. It becomes even more complex with nuclear energy as radioactivity possesses this transboundary character which implies an international cooperation.

The need for an appropriate framework for nuclear energy started to raise in the 60s, when States realise that the classic liability system was not relevant for that kind of activity. The Paris and Vienna conventions were subsequently adopted in order to fill this legal gap.

Nonetheless, the real turning point remains the Chernobyl accident which resulted in a considerable number of new international instruments as 5 conventions were adopted in the fields of safety and emergency preparedness within a 11 years period: the Convention on Early Notification of a Nuclear Accident, the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, the Convention on Nuclear Safety, the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management and the Convention on Supplementary Compensation for Nuclear Damage. This catastrophe was also the occasion to identify and mitigate the shortcomings of the existing regime in undertaking a revision process through several supplementary protocols, the Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention, the Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage.

25 years after Chernobyl, another tragic nuclear event occurred in Fukushima. Once again it challenged the efficiency of the existing international regime and raises the question as to whether international law represents a relevant solution to such accident.

Electrical Power System Design and Station Blackout (SBO) Management in Indian Fast Breeder Reactors

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In the nuclear new builds and projects in design stage SBO management measures have significant role. Depending on the onsite and offsite power supply configurations, deterministic SBO duration is established. Design of systems with adequately sized battery capacities for SBO duration, special SBO Diesel Generator Sets, structured load shedding strategy to conserve battery availability to cope with SBO and to monitor the plant safety beyond SBO duration are considered as part of electrical system design now.

In the design of PFBR, SBO is given due importance right from conceptual design stage. Both deterministic SBO duration and probabilistic SBO duration versus frequency were established by detailed analysis. Dedicated DC power supply systems and additional SBO DG back-up systems are in place to cope with normal and extended SBO. After the Fukushima event, there is greater requirement to demonstrate plant safety during SBO for a long duration extended over several days. In light of this accident, thermal hydraulic synthesis of PFBR has been carried out to ascertain the capability of the plant to manage a prolonged station blackout event. This has brought out the robustness of the design. Safety design features of PFBR ensure comfortable management of extended SBO.

In the design of future FBR projects, current trends in the new nuclear builds and recommendations of international bodies considering Fukushima are duly considered. SBO measures by means of alternate AC power sources, redundant emergency power supply sources with less dependence on other auxiliary systems and dedicated DC power systems are considered to cope with normal and extended SBO beyond design basis. Right from the conceptual design, the system robustness to manage normal and extended SBO will be taken care with the related thermal hydraulic and associated analysis.

The paper highlights these SBO management strategies in PFBR and future FBRs.

Revolution of Nuclear Power Plant Design Through Digital Technology

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In the digital times, digital technology has penetrated into every industry. As the highest safety requirement standard, nuclear power industry needs digital technology more to breed high quality and efficiency. Digital power plant is derived from digital design and the digitisation of power plant transfer is an inevitable trend. This paper introduces the technical solutions and features of digital nuclear power plant construction by Shanghai Nuclear Engineering Research & Design Institute, points out the key points and technical difficulties that exist in the process of construction and can serve as references for further promoting construction of digital nuclear power plant. Digital technology is still flourishing. Although many problems will be encountered in construction, it is believed that digital technology will make nuclear power industry more safe, cost-effective and efficient.

S11d: Posters: Safeguards

All posters will be displayed for the entire duration of the conference. As far as possible, authors are requested to be present at their posters during the coffee breaks as well as during the poster session for discussion with interested participants.

Implementation of Safeguards in Thailand

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Thailand is a non-nuclear weapon state. The non-nuclear activities are mainly medical, agricultural, and industrial. Therefore, Thailand ratified the Nuclear Non-Proliferation Treaty (NPT) since 1972 and has been entry into force of the Comprehensive Safeguards Agreement (INFCIRC 241) scince 1974. Based on the INFCIRC 153, Thailand established a system of accounting for and control of all nuclear material subject to safeguards under the Agreement. In order to ensure the peaceful use of nuclear in Thailand the Nuclear-Non-Proliferation Center of Office of Atoms for Peace (NPC, OAP) was established to act as State level Safeguards. NPC is responsible for keeping records and providing information under requirement of Comprehensive Safeguards Agreement. In addition, the strengthening of cooperation and good coordination between Thailand and IAEA are indeed important and necessary to implementation safeguards in country. Based on the report of IAEA safeguards statement, there is no indication of the diversion of nuclear materials or misuse of the facility or the items in Thailand. Up to present, nuclear activities in Thailand are peaceful without diversion of using. This paper reviews the current status of the implementation Safeguards in Thailand.

Documentation Experiences for Jamaican SLOWPOKE-2 Conversion from HEU to LEU

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The Jamaican SLOWPOKE–2 (JM–1) is a 20 kW research reactor manufactured by Atomic Energy of Canada Limited and has been operating since March 1984, in the department of the International Centre for Environmental and Nuclear Sciences (ICENS), at the University of the West Indies, Mona Campus in Kingston, Jamaica. The pool type reactor has been primarily used for Neutron Activation Analysis in environmental, agricultural, geochemical, health-related studies and mineral exploration. The University, assisted by the IAEA under the GTRI/RERTR program, is currently in the process of converting from HEU to LEU. Extensive documentation on policies, general requirements, elements of the conversion quality assurance (QA) system and conversion QA administrative procedures is required for the conversion. The core conversion activities are being carried out in accordance with current international standards and regulatory guidelines of the newly established Jamaican Radiation Safety Authority (RSA) with agreement between the RSA and IAEA or DOE related to Nuclear Safety and Control. The documentation structure has taken into consideration nuclear safety and licencing, LEU fuel design and conversion analysis, LEU fuel procurement and fabrication, removal of HEU fuel and reactor maintenance and conversion and commissioning, with the conversion QA manual at the apex of the structure. To a large extent, the documentation format will adhere to that of the IAEA applicable regulatory standards and guidance documents. The major challenge of the conversion activities, it is envisioned, will come from the absence of any previous regulatory framework in Jamaica; however, a timeline for the process, which includes training and equipping of regulators, will guide operation.

Measurements Matter in Nuclear Safeguards & Security

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The deliverable of any laboratory is a measurement result with stated uncertainty and traceability (ISO/IEC 17025: 2005). Measurement results, particularly in safeguards, have to be accurate, comparable and traceable to a stated reference, preferably to the SI. Results provided by operator-, safeguards- or network laboratories have to be in compliance with specific quality goals for nuclear material and environmental sample analysis. Metrological quality control tools are prerequisites to build up confidence in measurement results that have to be translated into meaningful safeguards conclusions or to demonstrate conformity of findings with declared processes. The European Commission — Joint Research Centre (EC–JRC) has dedicated facilities, laboratories and projects to provide certified nuclear reference materials (CRM), to develop reference methods and to organize inter-laboratory comparisons (ILC) in compliance with ISO Guide 34, ISO17025 and ISO17043, including respective training.

Recent examples are:

- cooperation with the JAEA to investigate on the application of Neutron Resonance Densitometry (NRD) to quantify the amount of special nuclear material in particle-like debris of melted fuel as formed in the nuclear accident in Fukushima
- training in metrology and gamma-ray spectrometry for EURATOM safeguards inspectors
- development of uranium reference particle standards under a new EC support task to the IAEA.

Currently, the JRC puts major efforts in producing CRMs and conformity assessment tools for “age-dating” of uranium and plutonium samples. They are needed for method validation in determining the date of the last chemical separation of uranium or plutonium from their daughter nuclides. These type of CRMs are not only needed in nuclear safeguards and forensics, but could support in the future a possible new type of “verification mechanism” as part of the Fissile Material Cut-off Treaty (FMCT), since measurements and measurement standards provide the basis for any verification and detection system.

Implementation of Safeguards and Non-Proliferation in Sierra Leone

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Sierra Leone under the Comprehensive Safeguards Agreements (CSAs) has enacted the Nuclear Safety and Radiation Protection (NSRP) Act 2012 and has given numerous powers to the Authority to implement the above mentioned act fully.

The NSRP Act 2012 established the Nuclear Safety and Radiation Protection Authority which among other things to regulate, control and supervise the acquisition, importation, exportation, use, transportation and disposal of radioactive sources and devices emitting Ionizing Radiation. The Authority is bounded by law to cooperate with the International Atomic Energy Agency in the application of Safeguards Agreement and any protocol thereto between Sierra Leone and the International Atomic Energy Agency including conducting inspections and providing any assistance or information required by designated IAEA inspectors in the fulfillment of their responsibilities pursuant to Section 5, Subsection 2, Article xvi of the NSRP Act 2012. The Authority is also granted powers to adopt all necessary measures including a system of licencing to control the export, re-export, transit and transhipment of any nuclear material, equipment or technology in order to protect the safety and security of Sierra Leone.

The Regulatory Authority has established departments for the control of nuclear materials: One of which is The Regulatory Control Department; responsible for Inspections, Authorization and Enforcement actions for all radiation sources and nuclear materials.

The Authority has been conducting inspections regularly on various facilities ranging from medical radiation generating equipment to industrial radiography sources.

The methodology to be used is the issuance of the standard IAEA checklist which is consistent with the Regulatory Authority's documents for inspection of sources and is inline with the General Safety Requirements(GSR)Part III. The expected outcomes would be increasing training of regulatory authority's staff, the procurement of portal monitors by the authority and its partners.

The 'Landscape' of Nuclear Safeguards: a Comparative Analysis of the International and Regional Systems

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The notion of "nuclear non-proliferation" is twofold. It refers to: (a) reduction of the number of existing arsenals (vertical non-proliferation), and (b) containment of the number of States that possess nuclear weapons, or control of non-state actors (horizontal non-proliferation).

At the international law level, as vertical non-proliferation, there are bilateral or multilateral agreements that ban weapons of mass destruction in certain areas (e.g.: Nuclear–Weapon–Free Zones treaties).

With respect to horizontal non-proliferation, beyond the Nuclear-Weapon-Free Zones approach, the main legal text for addressing the issue is the Treaty on the Non-Proliferation of Nuclear Weapons (NPT). For the implementation of the principles contained in the NPT, a "nuclear safeguards" system has been created, and the International Atomic Energy Agency (IAEA) has been assigned the role of the nuclear "watchdog" for the NPT.

However, along with this international system of safeguards, there are regional safeguards bodies: (a) the European Atomic Energy Community (EURATOM) model is the cornerstone of non-proliferation in the EU, while (b) the Brazilian-Argentine Agency for Accounting for and Control of Nuclear Materials (ABACC) controls nuclear activities in Brazil and Argentina.

Moreover, the existing nuclear weapons free-zone treaties contain safeguards provisions that are additional or complementary to IAEA safeguards. For instance, (a) the Agency for the Prohibition of Nuclear Weapons in Latin America and the Caribbean (OPANAL) works for the implementation of Tlatelolco Treaty, (b) the African Commission on Nuclear Energy relates to Pelindaba Treaty, and (c) a Consultative Committee of the Parties is appointed in the context of Raratonga Treaty.

The paper aims at critically analysing the different safeguards systems adopted at the international and regional level, through the adoption of a comparative approach.

Knowledge Management in the IAEA Department of Safeguards

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Knowledge management is the discipline of enabling individuals and teams to collectively and systematically create, share and apply knowledge. The most important assets in the IAEA Department of Safeguards are people and their knowledge. The focus of the Department's knowledge management activities are to create an environment within which people share, learn and work together.

The efforts to manage the knowledge of an individual leaving the Department have been focused on helping the supervisor of the departing staff member to identify what critical knowledge needs to be retained, and how to retain that knowledge.

The Safeguards Knowledge Management team developed a person-centred approach. This approach involves interviews with the staff member, co-workers and/or customers to identify the critical knowledge to be transferred. Although time consuming, this method has been found to be effective in capturing the needed knowledge. This approach has four steps:

- Identify the critical knowledge to be retained;
- Select the knowledge transfer methods;
- Apply the knowledge transfer methods; and
- Assess and refine the transfer process.

The paper will describe the person-centred approach and lessons learned from implementing this programme in the Department over several years.

Evaluating National Nuclear Safeguards System Implementation in the Republic of Moldova

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Strengthening the multilateral system of Nuclear Safeguards by the International Atomic Energy Agency (IAEA), imposed by the increasing cross-border illicit trafficking of nuclear material and redirecting for military purposes has led Republic of Moldova to ratify on 1 June 2012 the Additional Protocol (INFCIRC/690) to the Agreement of Nuclear Safeguards in relation with the NPT. This was followed by the adoption in the Parliament on 8 June 2012, of the new Law no. 132 of 08.06.2012 on the safe conduct of nuclear and radiological activities, which extends the power of the National Agency for Regulation of Nuclear and Radiological Activities (NARNRA) and details the measures to strengthen the Nuclear Safeguards in the country.

The NARNRA implements safeguards measures in relation to nuclear materials by:

- normative acts development;
- establishing a system for inspecting of nuclear material;
- implementing inventory-taking and reporting procedures for quantities of nuclear material;
- implementing authorisation and monitoring procedures for the movements of nuclear material;
- implementing procedures for reporting quantities of nuclear material to the IAEA;
- maintaining and updating the national register of nuclear materials.

A very important role to achieve results is the cooperation with the IAEA. Thus, was developed and agreed the Joint Action Plan for implementing the provisions of the Additional Protocol to the Safeguards Agreement, which is an essential aid in fulfilling the country's international obligations.

In this respect have been obtained some good practices:

- Routinely performed national inspections;
- On-line information provision from the Customs check points;
- Developed special form for nuclear material in the National Register;
- Systematic interaction with Ministry of Foreign Affairs, Ministry of Internal Affairs and authorisation holders;
- Annual and quarterly presentation to the IAEA of the reports on SQP and the Additional Protocol;
- Systematic capacity building of NARNRA staff;
- Training provided to other organizations.

Radiation Protection, Safety and Security Issues in Ghana

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The Radiation Protection Board was established in 1993 by PNDC Law 308 as the National Competent Authority for the regulation of radiation sources and radioactive materials in Ghana. The mandate and responsibilities of RPB are prescribed in the legislative instrument, LI 1559 issued in 1993. The operational functions of the Board are carried out by the Radiation Protection Institute, which was established to provide technical support for the enforcement of the legislative instrument.

The regulatory activities include among others:

- Issuance permits for the import/export of any radiation producing device and radioactive materials into/out of the country. It therefore certifies the radioactivity levels in food and the environmental samples.
- Authorization and Inspection of practices using radiation sources and radioactive materials in Ghana.
- Undertakes safety assessment services and enforcement actions on practices using radiation sources and radioactive materials in line with regulations.
- Provides guidance and technical support in fulfilling regulatory requirement to users of radiation producing devices and radioactive materials nationwide by monitoring of monthly radiation absorbed doses for personnel working at radiation facilities.
- Provides support to the management of practices in respect of nuclear and radioactive waste programme.
- Calibrates radiation emitting equipment and nuclear instrumentation to ensure the safety of patients, workers and the general public.
- Establish guidelines for the mounting (non-ionizing) communication masts.
- Environmental monitoring (non-ionizing) programmes for communication masts.

With the establishment of the national competent authority, facilities using radioactive sources and radiation emitting devices have been brought under regulatory control. Effective regulatory control of radiation emitting devices are achieved through established legal framework, independent Regulatory Authority supported by the government; collaboration and establishment of good relation between Regulatory Authority and users as well as establishment of memorandum of understanding with relevant stakeholders such as the health ministry, security operatives/agencies etc.

Regulatory Framework for Safeguards in Nigeria

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Nigeria's growing interest in nuclear technology for peaceful uses raises concerns for safeguards and proliferation especially as it continues with her nuclear power program. According to the Nuclear Safety and Radiation Protection Act 19 of 1995, the Nigerian Nuclear Regulatory Authority (NNRA) shall "perform all necessary functions to enable Nigeria meet its national and international safeguards and safety obligations in the application of nuclear energy and ionizing radiation".

Nigeria is Party to the Nuclear Non Proliferation Treaty and has a Comprehensive Safeguards Agreement and an Additional Protocol in force. Furthermore, the country has a State Systems of Accounting for and Control of Nuclear Material in place.

This paper therefore seeks to provide information on the activities of the Nigerian Nuclear Regulatory Authority (NNRA), challenges and possible solutions in meeting up with the Nigeria's obligations under the nuclear non-proliferation treaty and discusses the establishment of a safeguards regulatory framework in Nigeria.

These involves the development of regulations and guidance documents and the use of the NNRA's basic tool in the implementation of safeguards at nuclear facility; the State System of Accounting for and Control of Nuclear Materials (SSAC). A complete and accurate report is sent in a timely fashion to the IAEA in a format based on subsidiary arrangement with the IAEA and Nigeria. The IAEA verifies this information by conducting an annual safeguards inspection exercise. The use of safeguards-related equipment and the knowledge and skills required by Safeguards Officers to perform their jobs are major challenges of the regulatory body.

The interaction with other countries will provide for exchange of technical expertise and knowledge that will help strengthen the capacity of NNRA in discharging its safeguards obligations.

Safeguards and Non-Proliferation

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Objective: This paper presentation highlights the importance of safeguards and non proliferation of nuclear materials, implementation of safeguards systems and challenges of safeguards and non proliferation of nuclear materials.

Safeguards and Non-proliferation of Nuclear Materials: IAEA safeguards are measures through which the IAEA seeks to verify that nuclear material is not diverted from peaceful uses. Such material includes enriched uranium, plutonium and uranium-233, which could be used directly in nuclear weapons. It also includes natural uranium and depleted uranium, the latter of which is commonly used, for instance, as shielding for radiation sources in hospitals, industry and agriculture.

Non proliferation aims at preventing the spread of nuclear weapons and weapons technology, Promoting cooperation in the peaceful uses of nuclear energy and Further the goal of achieving complete nuclear disarmament.

Conclusion: The acceptance and implementation of IAEA safeguards therefore serve as important confidence building measures, through which a State can demonstrate — and other States can be assured — that nuclear energy is being used only for peaceful purposes in promoting economic and social development. However measures are also been put in place to combat challenges resulting from full implementation of safeguards and non proliferation systems.

ESARDA: The European Safeguards Research and Development Association

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ESARDA, the European Safeguards Research and Development Association, is comprised of European organizations actively involved in the research and development (R&D) of nuclear safeguards. The control of civil nuclear material is mandatory within the EU territory in line with the Treaty establishing the European Atomic Energy Community ("Euratom Treaty", 1958) and the Treaty on the Non-Proliferation of Nuclear Weapons (1970). ESARDA was formed in 1969 with the purpose of facilitating collaboration in R&D in the field of safeguards and in the application of such R&D to the safeguarding of source and special fissile materials.

ESARDA includes regulatory authorities, facility operators, research centres and universities. The principal issues are co-ordination of research, frequent exchange of information and joint execution of R&D programmes. ESARDA also strives to fulfil an educational role and to reach the general public. To this end, the following activities take place: 1) Annual Meetings and Symposia, providing an opportunity for collaboration and information exchange. Alternating with open symposia, biennial internal meetings take place where all Working Groups (WGs) convene. 2) Dedicated WG activities. ESARDA consists of nine WGs, being the "backbone" of ESARDA, with active members and observers. 3) The one-week ESARDA Course, complementing nuclear engineering studies by including nuclear safeguards in the academic curriculum. 4) Technical publications. The ESARDA Bulletin contains scientific and technical articles relating to safeguards and verification. The ESARDA website features, inter alia, the latest issues of the Bulletin, the symposia proceedings, as well as information about WGs, symposia and other relevant events.

Today, ESARDA is more active than ever, due to lively cooperation among its members and strong linkages to other safeguards-related organizations, such as the Institute of Nuclear Materials Management (INMM), and the pro-active tackling of new emerging issues through its diverse WGs.

Study for Safeguards Challenges to the Most Probably First Indonesian Future Power Plant of the Pebble Bed Modular Reactor

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In the near future Indonesia, the fourth most populous country, plans to build a small size power plant most probably a Pebble Bed Modular Reactor PBMR. This first nuclear power plant (NPP) is aimed to provide clear picture to the society in regard to performance and safety of nuclear power plant operation. Selection to the PBMR based on several factor including the combination of small size of the reactor and type of fuel allowing the use of passive safety systems, resulting in essential advantages in nuclear plant design and less dependence on plant operators for safety. In the light of safeguards perspective this typical reactor is also quite difference with previous light water reactor (LWR) design. From the fact that there are a small size large number of elements present in the reactor produced without individual serial numbers combine to on-line refueling same as the CANDU reactor, enforcing a new challenge to safeguards approach for this typical reactor. This paper discusses a bunch of safeguards measures have to be prepared by facility operator to support successfully international nuclear material and facility verification including elements of design relevant to safeguards need to be accomplished in consultation to the regulatory body, supplier or designer and the Agency/IAEA such as nuclear material balance area and key measurement point; possible diversion scenarios and safeguards strategy; and design features relevant to the IAEA equipment have to be installed at the reactor facility. It is deemed that result of discussion will alleviate and support the Agency approaching safeguards measure that may be applied to the purpose Indonesian first power plant of PBMR construction and operation.

Points for Improvement in Mexican Legislation on Safeguards

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The main goal of this paper is to underline the specific points needed still to be improved on safeguards in the Mexican legal framework.

The problem: Mexico proposed the Tlatelolco Treaty which was before the TNP. So the Mexican legislation on safeguards should to be one of the best around the world, but there are still points to be improved, such as a specific regulation on the topic.

Justification: Remembering that the exact sciences need of the law in order to be applied in a desirable way. I mean, the safeguards could be well conceived and well worked from the physics and mathematics point of view, but in order to be followed in any country, it is necessary the right legal framework.

Hypothesis: What has Mexico now in its legislation on safeguards and what remains to be done (what is pending in the Mexican legal scope of the safeguards)?

Objectives:

- To propose legal solutions to correct the weakness of the Mexican legal framework on Safeguards; taking into account my own experience drafting the Mexican regulation on safeguards from 2008 for the Mexican Government in my nuclear law firm "Martínez & Maciel".
- To propose a legal framework on safeguards for Mexico as it is understood by the IAEA.
- To update the legal frame work on safeguards in Mexico linking it to the Back end of the spent fuel. (Considering that sooner or later the Mexican Government will have to define its politic on this topic).

Improvement of Safeguards Practices in Armenia Through Implementation of Advanced Software

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The Agreement between the Republic Armenia (RA) and the International Atomic Energy Agency (IAEA) for the Application of Safeguards in connection with Treaty on the Non-Proliferation of Nuclear Weapons was signed on 23.09.1993 and the Protocol Additional to the Safeguards Agreement was ratified on 28.06.2004.

In 2007 the RA invited the IAEA ISSAS mission that made recommendations the majority of which have been implemented.

The Law of the RA on Safe Utilization of Atomic Energy for Peaceful Purposes establishes the provisions related to the safeguards implementation on state and facility levels, as well as provisions related to preparation and conduct of SG inspections at nuclear facilities and LOFs, preparation and submission of accounting reports and other. The Armenian Nuclear Regulatory Authority is responsible for the safeguards implementation on the state level. The ANRA also maintains the general ledger for LOFs, prepares the accounting reports and submits them to the IAEA.

To improve the SG practices and provide with the efficient and continuous control over the nuclear materials, the Nuclear and Radiation Safety Center (ANRA's TSO) developed an electronic database NUCMAT to maintain an accurate inventory, record all changes and provide recoverable history of all activities related to the nuclear materials present in the RA. The NUCMAT provides with automated access to the information on NM and is aimed to assist in efficient implementation of accounting and control of NM, storing data, generating the accounting reports in the format that meets the IAEA requirements, as well tables and maps and quick access to the data. At present the NUCMAT is in trial use by the ANRA specifically in relation to implementation of the accounting and control of nuclear materials in the LOFs.

Measuring the Return on Investment of Nuclear Security Training: The Case of the WINS Academy Professional Society

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The challenges inherent in managing nuclear and radiological materials are complex and growing; ensuring that such materials remain secure requires competent management supported by ongoing training. The nuclear industry is increasingly becoming aware of the need for nuclear security: numerous dedicated training centres have been established worldwide and the IAEA holds approximately 60 international nuclear security training events annually. International training programmes have been conducted in various fields over decades but assessing their value and having the assurance that these training have had a sustainable impact remain difficult. In the field of nuclear security training, no assessment is being made of the degree to which the investment made is making a difference in building sustainable capacity and capability. This paper aims to discuss a methodology to assess the return on investment of nuclear security training. WINS has established a new professional society called the WINS Academy Alumni, for those individuals who have achieved certification through the WINS Academy. This platform proposes a structure, based on established competency frameworks, through which to measure the return on investment and performance improvement of nuclear security training. The objectives of the WINS Academy society are to stay engaged with certified Alumni, track their continued professional development progress, provide them with additional opportunities, and encourage their continued security competence through recertification. We envision that these certified practitioners will in turn promote certification and continual professional development among their peers to help build a network of security-trained professionals that will lead to meaningful and sustainable changes to security culture worldwide. In the long run (5–10 years), we envision that this group will be at the forefront of new professional requirements for nuclear security competence, with certification becoming the norm, and leading to employment benefits including increased salaries and managerial responsibilities.

Nuclear Security Education in Morocco

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Morocco has made significant progress in the field of nuclear security by supporting the efforts and activities of the International Atomic Energy Agency (IAEA), promoting nuclear security under international initiatives and continues to undertake actions aiming at strengthening capacity building in nuclear security. As well, Morocco has developed a new law on radiological and nuclear safety and security which was promulgated in 2014.

Some Moroccan universities in cooperation with the IAEA-International Nuclear Security Education Network (INSEN) and the US-DoS Partnership for Nuclear Security (PNS) are working to develop their nuclear security educational programmes. In this regard, faculties who have been involved in INSEN Professional Development Courses (PDCs) have acquired a high-quality of knowledge and teaching tools in nuclear security topics that led them to be able to develop and teach their nuclear security curriculum as is the case at the University of Ibn Tofail.

Furthermore, University of Ibn Tofail has developed in 2014 with collaboration with CRDF-Global the first Institute of Nuclear Material Management (INMM) Student Chapter in Africa. This Chapter has organized many events to promote best practices among the young generation.

Moreover, University of Ibn Tofail and Brandenburg University in Germany are working to develop a PDC on Nuclear IT/Cyber Security to be held in Kenitra, Morocco. This PDC aims at building capacity among the academic communities from Africa and MENA Region in order to further raise awareness, develop and disseminate best practices, increase professional standards and therefore enhance nuclear security culture.

So, this paper will present some nuclear security education activities in Morocco and more specifically at the University of Ibn Tofail. These activities involve women as leaders but also contribute in education and training of young generation of women in nuclear field.

X01: Side Events 1

What Can We Learn from Similar Male Dominated Industries?

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Thomas Thor Associates is an Executive Recruitment company solely dedicated to the Nuclear industry. We have been involved with WiN UK in 2014–2015 to help them develop their own organization, this research was part of our partnership.

The main purpose of this paper is to provide a clear picture of the techniques that are used by organizations similar to WiN, and business in other industries that are similar to Nuclear, to attract more women to pursue a career in a particular industry, and to support retention and career progression of women in these industries.

This paper has taken a look at all industries that require technical and engineering staff, after which the Mining, Oil & Gas, Petro-chemicals, Rail, Renewable Energy, Technology and Construction industries were found to show most similarities with Nuclear, in terms of the technical staff required and their structure on gender diversity. From here, case studies of industry organizations and professional business have been prepared in order to inform WiN of best practice in these industries and provide a benchmark for future WiN operations.

Finally, the report results into giving recommendations on projects WiN could add to their current approach to achieve their objectives. The recommendations are based on the results from the case studies, focusing on attracting, recruiting, retaining and developing female professionals. In summary, the recommendations are to: highlight potential career paths for women in Nuclear, educate women on Nuclear, support the development of women and to help companies to increase their bottom line by getting WiN certified.

X03: Side Events 3

R&D Activities in German Nuclear Sector

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Germany is phasing out its nuclear energy use. The seven oldest Light Water Reactors (taken offline in 2011 for a safety review immediately following the Fukushima accident) and the Kruemmel Nuclear Power Plant (NPP) are already shut down; six others would go offline by 2021 at the latest and the three newest by 2022. Phasing out nuclear power must not be regarded as synonymous with "phasing out" nuclear expertise. Long after Germany has completed its NPP shutdown, such skills will remain essential for activities such as ensuring reactor safety, radiation protection, decommissioning, ultimate disposal of radioactive waste and crisis management, and for maintaining a critical outlook on international developments. The German Government underlined this fact when launching the 6th Energy Research Programme entitled "Research for an Environmentally Sound, Reliable and Affordable Energy Supply" in August 2011.

The dispute on questions of nuclear waste management and disposal in Germany is not only framed by the political parties' different perspectives and conflicts between the anti-nuclear movement and official politics, but is also characterised by the dissent among experts regarding fundamental questions of nuclear waste storage. Especially for high-level radioactive waste there are still debates about the possible repository type and site.

In 2014 the study on "Partitioning and Transmutation of Nuclear Waste: benefits and Challenges in Research and Implementation" has been performed under the supervision of National Academy of Science and Engineering–acatech. Acatech recommended continuing the R&D activities on P&T in Germany within a wide European framework and examining the options for future participation of Germany in P&T oriented research in Europe in order to follow a European perspective with a possible benefit to German nuclear industry. German research should concentrate on the key areas: efficient partitioning and transmutation of transuranium elements, mainly assessing the technical safety of P&T facilities and the possible societal implications in all envisaged strategically significant steps. It was underpinned that the R&D must adopt an interdisciplinary approach and ability to communicate the scientific foundlings to the public within established research alliances.

Until 2017 the BMBF founded project "Disposal options for radioactive residues: Interdisciplinary analyses and development of evaluation principles (ENTRIA)" will analyze and assess deep geological repositories concepts with arrangements for retrieval in different host rocks and depths. The high level objectives are:

- To verify technical feasibility of these concepts, even with regards to the necessary standing time and the required lining depending on the given host rock
- To assess the geotechnical and geomechanical implementation of concepts for the operational and post-operational phases with scenario analysis
- To assess advantages and disadvantages of each concept
- To stimulate the international exchange of experiences

Women's Participation in Africa's Nuclear Development-Challenges and Opportunities

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Expansion of nuclear technologies and plans for new plants in Africa makes this an exciting time for more women to be involved in the nuclear sector and there are lots of opportunities across the nuclear value chain for women to be involved. In recent decades, more and more women are are now entering the nuclear field and many people are starting to recognise opportunities for women, since the role played by women in the nuclear field enhances the development goals for many countries. In developing countries and in Africa in particular, however, there is a greater need for awareness of women's involvement in STEM fields in general, and to change prevailing attitudes about women's participation in the nuclear science and technology in particular. This paper will look at various opportunities women have in the expanding nuclear sector in the continent, and how these opportunities can be utilised, not only for those in sciences but also in business disciplines. The approaches organizations and countries can take in broadening participation of the female gender in the nuclear development in Africa; will also be presented, as well as how to address the challenges faced by women in the dynamic nuclear field.

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