NUCLEAR SEMINAR

Aim of the seminar

To present and to discuss the nuclear energy and its applications (well-established or innovative) in order to provide or to improve access to this energy (in particular for power generation: electricity, water desalination, heat, hydrogen) as a key solution for sustainable development (i.e. security of supply, predictable cost, pollution-free), in close collaboration with European & African Institutions.

Duration

Two sessions (first 75 min, break 15 min, second 90 min) then a Q&A discussion (30 min) duration.

Expected audience

Energy decision-makers, industrialists, R&D sector (including PhD young applicants), academic & university world, high ranking officials, public and private investors, financial institutions, foundations, development agencies, business development support funds, consultants, energy related NGO's.

Approach:

- Present to African participants the state of the art of nuclear energy solutions: basic physics, advantages and limitations / disadvantages, characteristics;
- Show the value of specific regulations necessary for the use of nuclear power;
- Emphasize the importance of accompaniment and support from the IAEA

Chairpersons and Moderator:

Chair: Prof. Rajaâ Cherkaoui El Moursli, Hassan II Academy of Science and Technology, Morocco

Co-chair: Ir Bernard Mairy, Executive Director of the European Society for Engineers and Industrialists (SEII).

Moderator: Prof. Dr. Hamid Aït Abderrahim, Deputy Director General of SCK CEN, the Belgian nuclear research center, Director of MYRRHA.

Nuclear Energy and Nuclear Applications

Part 1: Nuclear energy for power generation:

Nuclear power is one of the most attractive options when considering a clean, reliable and cost-effective source of energy. This nuclear power was previously a sophisticated option reserved for the industrialized world. But it could be a source of energy for most African countries. This does not come without its challenges. Going nuclear does not happen overnight. In addition to the large capital investments, in particular for large units, required by nuclear power plants, between the launch of a nuclear program and the commissioning of the first plant, years can pass. The creation of the necessary conditions and regulatory frame and the connection to the grid of the first plant will take at least 10 to 15 years. Safety, security training of human resources and upgrading of the electricity network if needed are important pillars in such a choice. In addition, before building commercial nuclear power plants, countries should develop policies to support nuclear development by putting in adequate regulatory frameworks.

As per today, more than 20 African countries are considering the nuclear energy as part of their future electricity mix. Among them 10 countries are evaluated with a high potential of success, a few of them are already equipped with nuclear research reactors. Also, it is very important to stress that the African continent has more than 20% of the world's uranium reserves.

Part 2. Other applications of nuclear energy:

Moreover, nuclear technologies have useful and often unrecognized applications in peaceful areas. Nuclear power offers the possibility of increasing energy and water security in the world through its non-electrical applications, such as seawater desalination, hydrogen production, district heating and various industrial applications. This technology is also used in electronics: silicon, doped in a research reactor, is used as an ideal semiconductor. Today, these nuclear applications cover broad socio-economic fields such as industry, health, food, agriculture, water, museology, geology and mining.

These techniques make it possible, for example, to determine and evaluate the properties of various materials, to measure pollution levels, to sterilize and disinfect components, to control and optimize industrial processes, or even to create new materials. modifying the chemical, physical and biological properties of existing materials. Radiation can be used for the analysis and processing of various substances.

In agriculture, apart from the conservation of foodstuffs, research and development work on the applications of nuclear techniques to animal reproduction, the improvement of plants by radio-mutagenesis, the fight against insect pests is underway in the world, especially in a few African countries.

In the medical sector, thanks to nuclear power, the specialist can go beyond the stage of pure morphological imaging to access functional and metabolic imaging allowing detailed detection of deep lesions, monitoring of their development as well as precise guidance of

the surgical procedure. if necessary. Nuclear medicine also uses radiopharmaceuticals to treat certain tumors in a targeted manner. In the field of radiopharmaceuticals, the development and production of radioisotopes and radiopharmaceuticals has been carried out. In radiotherapy, whether external or internal: X-rays or photons or particles (electrons, protons, carbon, etc.) in high doses will destroy cancer cells by fragmenting their DNA. In most of the African countries, the medical sector is usually the first one to use nuclear based technologies.

For industrial applications, gamma metrology for welds control in pipe line is a major application as well as oil-logging for oil and gas prospection in the petrochemical sector.

With regard to water resources, techniques using natural isotopes make it possible to generate precise data on the basis of which strategic plans for the management of water resources can be developed.

Radionuclides have many uses in geology, oceanography and climatology. In particular, they have helped determine the age of the Earth and uncover the history of the climate. Radioactivity is also a way of predicting volcanic eruptions and earthquakes, and tracking ocean currents.

Finally, museography uses the properties of radioactive atoms to identify, date and process all kinds of items and remains.

Objective of the seminar & potential impact:

- Present and discuss the different requirements to be taken into account when choosing nuclear power and the various options that can be considered.
- Also focus on non-electrical applications, such as seawater desalination, hydrogen production, district heating and various applications in the industrial and medical sectors.
- Show the importance of a regulatory framework and the role of an independent regulatory agency ~~whose role~~ which is to ensure compliance with nuclear and radiological safety and security, activities and facilities involving sources of ionizing radiations: case of the Moroccan Agency AMSSNuR.
- Emphasize the role and support of the International Atomic Energy Agency on the continent.

Speakers at the seminar:

1. IAEA Direction Afrique: Dr Shaukat ABDULRAZAK
2. AMSSNuR : Dr. KHAMMAR MRABIT, Directeur Général
3. UAC : Professeur Dr Marcellin AMOUSSU, Médecine nucléaire à UAC (Université d' Abomey Calavi)
4. AFCONE/UA : Representative
5. IAEA RDC : Commissaire Professeur Vincent LUKANDA MWAMBA

6. ENGIE : Anicet TOURE (SMR's)
7. NUCADVISOR: Jan BARTAK et Laurent JERRIGE (SMR's)
8. JRC/EURATOM: Dr. Ir. Pierre KOCKEROLS (déchets du nucléaire)
9. Road-to-Nuclear/ Nuclear -21 : Henri ZACCAI
10. Independent Expert : Marc DEFFRESNNES (ex OECD⁄NEA)

Active attendants: Paul ASSOGBA and Mamadi TRAORE **(EIFFAGE)** with no contribution.

Agenda of the seminar to take place on 11/11 morning: (11 x 10 minutes slots + 1 Q&A slot)

Short introduction: Prof Rajaâ Cherkaoui El Moursli , Ir Bernard Mairy and Prof. Dr. Hamid Aït Abderrahim

9:00-10:15: **Applications of nuclear energy & regulations**

1. "IAEA's contribution to capacity building in Africa for sustainable nuclear energy solutions", Prof. Shaukat Abdulrazak, Director for the Division for Africa at the IAEA
2. « The Moroccan experience », Dr. Khammar Mrabit, Directeur Général (AMSSNuR)
3. « Médecine nucléaire à l'Université d'Abomey Calavi), Professeur Dr Marcellin AMOUSSU
4. Representative of AFCONE
5. « A propos de l'Électronucléaire en Afrique »", Professeur Vincent Lukanda Mwamba, IAEA

10:15-10:30 : Break

10:30-12:00 : Nuclear Reactors : electricity, heat, desalination & other usages

6. "Small Modular Reactors: A tool to re-shape African energy ecosystems of tomorrow" Anicet TOURE (SMR's), ENGIE
7. « Small Modular Reactors – Economics, Safety, Advantages and Challenges ", Jan Bartak, Gianni Bruna, Gérard Cognet
8. "Que faire des déchets du nucléaire ? L'expérience et le savoir faire européens en la matière », Dr. Ir. Pierre KOCKEROLS (JRC/EURATOM)
9. "De-risking the road to nuclear: how to deploy your nuclear energy options?", Henri Zaccai
10. " Lessons learned from Euratom to foster a successful African nuclear collaboration", Marc DEFFRENNES

12:00-12:30 : Q&A discussion and conclusions