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**Small Modular Reactor Workshop:
Practical Deployment Issues and Approaches
International Framework for Nuclear Energy Cooperation**

June 11-12, 2014

Mövenpick Hotel

Dead Sea, Jordan

Agenda

Introduction

A growing number of countries, including new embarking countries to nuclear technology are considering the deployment of Small Modular Reactors (SMRs), including a number of countries within the International Framework for Nuclear Energy Cooperation (IFNEC). As a complement to larger commercially available nuclear reactors, SMRs have the promise of offering important features compared to large nuclear reactors such as lower capital costs, reduced financial risk, greater flexibility to add additional capacity while concurrently generating electricity from the previous unit(s), enhanced safety features, industrial and co-generation applications (e.g., desalinization, process heat), greater compatibility for electricity markets with limited electricity grids, modular fabrication processes that significantly reduce onsite component assembly and associated quality assurance demands, and for off-grid and remote electricity generation needs. For the purpose of this Workshop, the focus will be on reactors with a nominal output of 300 MWe or less and are projected to be ready for deployment within the next 15 years.

Objectives of the workshop

The goal of this Workshop is to gain a better understanding from a utility, national energy planning authority, regulatory authority, and Nuclear Energy Program Implementation Organization (NEPIO) perspective of the expected activities and issues associated with the deployment of SMRs. The Workshop will address how SMRs could be deployed in markets represented by the countries of IFNEC, including countries seeking to use nuclear energy for the first time. This includes those with limited infrastructure and resources that have relatively small electric grids and insufficient capital to finance deployment of medium and large-sized reactors. To do this, the Workshop will take an enterprise-wide approach by convening a broad spectra of stakeholders and experts who would play key roles in successfully deploying an SMR (e.g., vendors, utilities, export credit agencies, insurers, nuclear safety and security regulators, market regulators, insurers, rating agencies, energy planning authorities/NEPIOs, technical and market consultants) in order to identify various SMR deployment options and approaches.

Multilateral development banks, international organizations such as the International Atomic Energy Agency (IAEA) and Nuclear Energy Agency (NEA), as well as international professional entities such as the World Nuclear Association and the World Association of Nuclear Operators (WANO) will also be invited.

Take Away

An important part of the Workshop will be to gain an understanding of what the "bottom lines" are for each of the key stakeholder groups when considering the deployment of SMRs; what are the issues and what are the approaches to addressing them?

Day 1, June 11, 2014

- 8:00-9:00 Registration/Networking**
- 9:00- 9:30 Welcome and Opening Remarks**
- Welcome and Purpose of Workshop
Steering Group Chair Ed McGinnis Welcome
 - Remarks by Chairman of the Jordan Atomic Energy Commission
H.E. Khaled Toukan
 - Keynote by Minister of Energy and Mineral Resources
H.E. Dr. Mohammed Hamed
- 9:30 - 10:00 Group Photo and Break (Photo Includes All Workshop Participants)**
- 10:00-10:15 Workshop Objectives and Scene-Setter for Workshop:** Ed McGinnis, IFNEC Steering Group Chair, Gary Leidich, SMR Workshop Moderator
This discussion will go over how the workshop will proceed, clarifying the opportunities for participation by the attendees, and outlining the specific outcomes and objectives. The moderator will explain the scenario discussion session and the role of the expert role players. The importance of the attendees active participation in the breakout sessions will be emphasized.
- 10:15-11:00 Global Nuclear Reactor Market State of Play:** Don Hoffman, President, Excel Services, and President of the American Nuclear Society
- SMR status: summary discussion of SMR development, spectrum of different approaches being developed, expected feature to be offered, timing of availability projections, etc.
 - Description of potential advantages of SMRs compared with larger reactors.
 - Status: summary of current suppliers, current and emerging customer markets, key customer market needs, key barriers/challenges to deployment (e.g., availability of equity and debt financing, limited reactor selections size-wise/lack of proven and licensed smaller reactors as an option, perceived risks by investors and planning authorities, etc).
 - Special Presentation on Findings from the *IFNEC Steering Group Finance Session held in Bucharest, Romania*: Paul Murphy, Milbank

11:00 - 12:00 National Market Perspectives Regarding SMRs

Representatives from 4 countries will discuss their different interests and perspectives on the deployment of SMRs in their country. These presentations are expected to demonstrate the wide range of applications for SMRs that are being considered.

- Dr. Kamal Araj, Jordan
- Saudi Arabia (TBC)
- NEA/China (TBC)
- Dr. Pete Lyons, U.S.

12:00 - 1:30 Lunch

1:30-3:30

Moderated Interactive Scenario Session #1: Build a Plan for Deployment of an SMR Based on Limited Capital, Credit and Infrastructure - a hypothetical scenario involving a country embarking on a nuclear power program with limited capital and infrastructure will be analysed by a stakeholder/expert panel with respect to SMR deployment. Issues and approaches to the deployment of SMR technology in the country will identified and discussed with the objective of reaching bottom line conclusions for deployment. The underlying assumption will be that the country has followed an approach similar to the IAEA Milestone Process and has concluded that they are going to pursue the deployment of SMR's. Experts playing stakeholder roles address issues raised earlier in the workshop. The moderator will walk attendees through a hypothetical case for building a viable plan to deploy an SMR.

Horse shoe table with role players:

- Moderator: Gary Leidich
- Utility: ENEC/Tom Samson, COO
- Energy Planning Authority: Dr. Kamal Araj, JAEC
- Vendor: John Hopkins, NuScale (TBC)
- Commercial Banker: (TBD)
- Rating Agency: Andrew Steel, Fitch
- Export Credit Agency (ECA): Regine Schapiro, COFACE
- Legal Consultant: George Borovas, Shearman and Sterling
- EPC: Myron Kaczmarzsky, CBI
- Insurer: (TBD)
- Safety & Security Regulator: Stewart Magruder, U.S. NRC
- Electricity Market Regulatory: Nadira Barkatullah, RSB, UAE

3:30 - 4:00 Break

- 4:00 – 5:00 Breakout Session 1: Workshop attendees will be divided into groups of approximately 20 each and will participate in breakout sessions led by subject matter experts. The group discussions will further develop approaches to specific critical SMR deployment issues identified in the previous scenario discussion.
- Breakout Session to Evaluate Scenario #1 Exercise
 - Co-Chairs and Rapporteur will be assigned to conduct each breakout group discussion: assuming 4 groups, 8 co-chairs will be needed and 4 rapporteurs
 - Breakout group topics to be developed
- 5:00 – 5:30 Breakout reports led by Moderator
- 5:30-5:45 Wrap-up of Day 1/Preview of Day 2: Chair and Moderator
- 5:45 – 5:50 Closing Remarks from Host, Dr. Kamal Araj
- 6:15-8:45 Dinner/Networking Opportunity

Day 2, June, 12, 2014

- 8:30 – 8:40 Opening Remarks from Host, Dr. Kamal Araj
- 8:30 -10:10 **Small Modular Reactor Descriptions – Facilitated by Workshop Moderator**
A ten minute description of their SMR design will be provided by each vendor. The vendors will be asked to address a specific list of questions regarding the development of their particular technology. The presentations are intended to provide the attendees with an overview of the various approaches to SMR design. Presenters will be asked to address the status of design development and regulatory review, and a general description of the design features that affect key deployment areas such as schedule, financing, and safety.
- Presentation A – NuScale, John Hopkins
 - Presentation B – SMART, Keung Koo Kim
 - Presentation C – OKBM/KLT40S, Milko Kovachev
 - Presentation D – ACP100, XU Bin
 - Presentation E – Toshiba/4S (TBC)
 - Presentation F – CAREM (TBC)
 - Presentation G – mPower, Chris Mowry
 - Presentation H – AKME/SVBR-100 (TBD)

- Presentation I -- INET/HTR-PM (TBD)

10:10 – 10:30 Break

10:30 – 12:00 Moderated Interactive Scenario Session #2: Build a Plan for Deployment of an SMR Based on Substantial Capital, Credit, and Infrastructure - a hypothetical scenario involving a country with an established nuclear power program and substantial capital and infrastructure will be analysed by a stakeholder/expert panel with respect to SMR deployment. Issues and approaches to the deployment of SMR technology in the country will identified and discussed with the objective of reaching bottom line conclusions for deployment. The underlying assumption will be that the country has concluded that they are going to pursue the deployment of SMRs. Experts playing stakeholder roles address issues raised earlier in the workshop. The moderator will walk attendees through a hypothetical case for building a viable plan to deploy an SMR.

Horse shoe table with role players:

- Moderator: Gary Leidich
- Utility: (TBD)
- Energy Planning Authority: (TBD)
- Vendor: Keung Koo Kim, SMART
- Commercial Banker: Carl Cho, Citibank (TBC)
- Rating Agency: Paul Lund, Moody's (TBC)
- Export Credit Agency (ECA): KIM Youngkee, The Export-Import Bank of Korea
- Legal Consultant: George Borovas, Shearman and Sterling
- Insurer: (TBD)
- EPC: Myron Kaczmarzsky, CBI
- Safety & Security Regulator: (TBD)
- Electricity Market Regulatory: Nadira Barkatullah, RSB, UAE

12:00-1:30 LUNCH

1:30 – 2:30 Breakout Session 2: Workshop attendees will be divided into groups of approximately 20 each and will participate in breakout sessions led by subject matter experts. The group discussions will further develop approaches to specific critical SMR deployment issues identified in the previous scenario discussion.

- Breakout Session to Evaluate Scenario #1 Exercise
- Co-Chairs and Rapporteur will be assigned to conduct each breakout group discussion: assuming 4 groups, 8 co-chairs will be needed and 4 rapporteurs
- Breakout-group topics to be developed

2:30 – 3:00 Breakout Session Reports led by Moderator

3:00 – 3:30 BREAK

3:30 – 4:30 Plenary Session and Summary of Findings/Recommendations and Conclusions

- Co-Chairs Report on their answers/findings
- Moderator and Chair facilitate development of summary findings.

4:30 – 5:00 Wrap up by Steering Group Chair and Moderator

7:30 -9:00 Gala Dinner