



IFNEC FINANCE WORKSHOP *FINAL SUMMARY REPORT*



Final Report for the IFNEC Executive Committee
October 4, 2012

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Please note that Appendix A is printed in the Report; Appendices B and C can be found on a CD that accompanies this report.

1. Executive Summary

1.1 Objectives & Goals

The IFNEC Finance Workshop, held in London, United Kingdom on May 9 and 10, 2012, brought together a broad spectrum of approximately 130 stakeholders from the IFNEC countries, including government representatives and members of the nuclear energy and the financial communities. The Workshop's goals included the following: gain a stronger understanding of the challenges and opportunities associated with the financing of nuclear power projects, create a forum in which major stakeholders are able to discuss these matters, and identify specific actions IFNEC countries could consider taking, individually or collectively. Through expert-led scenario discussions about hypothetical projects in expanding and emerging nuclear power programs and small breakout discussion sessions, Workshop attendees garnered a better understanding of each other's roles related to nuclear energy financing and the challenges and opportunities facing stakeholders interested in nuclear power finance.

1.2 IFNEC Steering Group Recommendations of Proposed Actions

Three key findings resulted from Workshop discussion:

- Importance of an Effective, Independent Regulatory Body
- Essential Role of Government Commitment and Support
- Need for a Sound Business/Project Plan

From the 41 initial observations and suggestions collected during the concluding session of the Workshop, the following 14 practical actions for IFNEC countries to take, individually or collectively, were developed for IFNEC Steering Group consideration. These proposals were presented to the IFNEC Steering Group in an *Interim Report on Key Findings and Proposed Actions* (Interim Report) at its July 2012 meeting. The recommendations presented to the Steering Group are:

1. Promote the sharing of best practices related to the organization and operation of independent regulatory agencies to facilitate the development of strong, independent regulators internationally.
2. Examine the feasibility of cooperative regulation so that emerging countries can benefit from the activities of other countries in conducting their regulatory activity.
3. Ensure adequate interaction among the various regulatory entities – e.g., safety, environmental and economic, construction code development – that impact the construction and operation of a nuclear power plant.
4. Explore benefits of a follow-on regulatory workshop to continue information sharing.
5. Support the development and promotion of frameworks that convey the integrity of the decision and the depth of support for a government's decision to build a nuclear power plant.
6. Promote awareness and acceptance of the range of international treaties in particular those related to safety and nuclear liability.
7. Develop the environment for the potential lenders to finance Nuclear Power Projects (NPPs).
8. Support infrastructure development including human resources (training and development of potential workforce) as well as electricity-related infrastructure, to enable nuclear power project development.
9. Provide guidance on the critical elements of a successful business case, including the development, operation and decommissioning phases and the long-term waste management options of the nuclear power project, in order to demonstrate that the business risks have been anticipated and identified, and will be addressed adequately in the implementation of a project.
10. Develop a comprehensive catalog and analysis of nuclear finance options and benchmark those options against options/tools used by other industries (airline, oil and gas, information technology).

11. Develop and promote a comprehensive and interactive stakeholder participation process that incorporates lessons learned and best practices.
12. Create a forum to explore new NPP case studies including discussions related to financing of proposed and historical nuclear power plants. Collect and disseminate information in a manner that can be drawn upon when other countries begin to develop NPPs.
13. Explore, with stakeholder input, the feasibility and mechanisms for alternative financing options, such as phased financing/refinancing of NPPs, separate financing of the NPP and the related infrastructure, build-own-operate, sovereign equity financing, changes in international financing regulations.
14. Evaluate the issues and opportunities associated with regional projects (these are political, technical, economic, and financial) and the opportunity to find a strategic partner, especially in newcomer countries, which will, by building on experience and commitment, contribute to making the business plan more sound and bring credibility to the project.

1.3 Recommendations for Executive Committee Consideration

Comments were sought from the IFNEC Steering Group following the presentation of the Interim Report in July 2012. The comments received included the suggestion that IFNEC actions should build upon and not duplicate the work of other entities, including the International Atomic Energy Agency (IAEA), as well as regarding resource limitations for IFNEC that suggest that only a few, high-value proposals be pursued at this time. It was also noted that some of the proposals may be best considered by the IFNEC countries individually, rather than by the IFNEC framework.

Given these comments, the 14 proposals that were presented in the Interim Report were grouped into three categories to facilitate consideration of the proposals by the IFNEC Executive Committee. The three categories are intended to indicate whether the proposal is viewed as:

- an IFNEC action that could be tabled and discussed at the IFNEC Executive Committee;
- an action that could be a national issue that IFNEC countries could consider taking individually; or,
- an action that involves the sharing of information and best practices and may also include activities or programs that are currently being pursued by other entities, including national programs, the IAEA or industry groups such as the World Association of Nuclear Operators (WANO) or the World Nuclear Association (WNA).



Some issues may fall into more than one category.

The suggested grouping of the proposals is as follows:

	IFNEC Consideration	National Issues	Best Practices
Independent Regulator	<ul style="list-style-type: none"> Follow-On Regulatory Workshop 	<ul style="list-style-type: none"> Share Best Practices – Industry and Government Examine Cooperative Regulation Interaction Among Regulatory Entities Follow-On Regulatory Workshop 	<ul style="list-style-type: none"> Share Best Practices – Industry and Government Examine Cooperative Regulation
Government Support	<ul style="list-style-type: none"> Promote Awareness and Acceptance of International Treaties – Safety & Liability Support Infrastructure Development 	<ul style="list-style-type: none"> Transparent Framework to Convey Government Policy Support for NPP Promote Awareness and Acceptance of International Treaties – Safety & Liability Develop NPP Financial Lending Environment Support Infrastructure Development 	<ul style="list-style-type: none"> Transparent Framework to Convey Government Policy Support for NPP Promote International Treaties – Safety & Liability Develop NPP Financial Lending Environment Support Infrastructure Development
Sound Business Plan		<ul style="list-style-type: none"> Develop a Business Case that Demonstrates Net Benefit Catalog and Benchmark NPP Finance Options Develop and Implement Stakeholder Participation Process Establish a Forum on New NPP Case Studies Explore Alternative Finance Options Evaluate Issues & Opportunities of Regional Projects/Strategic Partners 	<ul style="list-style-type: none"> Develop and Implement Stakeholder Participation Process

After the foregoing analysis, three actions are presented to the IFNEC Executive Committee for further consideration:

1. Explore benefits of a follow-on regulatory workshop to continue information sharing.
2. Promote awareness and acceptance of the range of international treaties in particular those related to safety and nuclear liability.
3. Support infrastructure development including human resources (training and development of potential workforce) as well as electricity-related infrastructure, to enable nuclear power project development.

2. Introduction

2.1 Background on IFNEC Finance Workshop

The International Framework for Nuclear Energy Cooperation (IFNEC) Executive Committee, at its September 29, 2011 meeting, approved a proposal made by Poland for the Steering Group to hold an expert-based stakeholders workshop on financing in 2012 in order to gain a stronger understanding of the challenges and opportunities associated with the financing of nuclear power projects, to create a forum in which major stakeholders are able to discuss these matters, and to identify specific actions IFNEC countries could consider taking.

The IFNEC Finance Workshop, held in London, United Kingdom on May 9 and 10, 2012, brought together a broad spectrum of approximately 130 stakeholders from the IFNEC countries, including government representatives and members of the nuclear energy and the financial communities. Through expert-led scenario discussions about hypothetical projects in expanding and emerging nuclear power programs and small breakout discussion sessions, Workshop attendees garnered a better understanding of each other's roles related to nuclear energy financing and the challenges and opportunities facing stakeholders interested in nuclear power finance.

The Workshop concluded with the development of a broad range of observations. Those observations, together with information presented during the scenario and breakout group sessions, were included in an Interim Workshop Summary Report that was provided to the IFNEC Steering Group for discussion at their July 2012 meeting. Based on the Interim Report and the Steering Group discussions in July, this Workshop Summary Report was prepared for delivery to the IFNEC Executive Committee at its October 2012 meeting in Marrakech, Morocco. The Executive Committee will consider the Steering Group's recommendations to provide a value-added contribution to this matter and approve a path forward and/or next steps.

2.2 Purpose of this Report

This purpose of this report is to transmit to the IFNEC Executive Committee the stakeholder-informed observations and outcomes from the IFNEC Finance Workshop regarding future IFNEC engagement in nuclear finance.

This report also presents the Steering Group recommendations to the IFNEC Executive Committee regarding specific actions for their consideration. These proposals are aimed at minimizing identified barriers to financing nuclear projects and maximizing potential opportunities related to finance that IFNEC countries may consider taking, individually or collectively. These proposals are subject to resources being made available by IFNEC countries.

3. Key Findings and Proposed Actions

3.1 Key Findings

The key findings that resulted from discussions during the scenario sessions, breakout sessions, and summary sessions of the Workshop include:

- Importance of an Effective, Independent Regulatory Body
- Essential Role of Government Commitment and Support
- Need for a Sound Business/Project Plan

3.2 Proposed actions for IFNEC Executive Committee Consideration

From the 41 initial observations and suggestions collected during the concluding session of the Workshop (see Appendix A), the Workshop Planning Committee developed a list of potential actions for consideration by the IFNEC Steering Group. These actions were reviewed at the July 2012 Steering Group meeting, and comments were sought from Steering Group Members. These proposals are subject to resources being made available by IFNEC countries. The criteria for developing these proposed actions were that they are practical, within the scope of IFNEC mission, and help facilitate the financing of nuclear power plants. The suggestions for potential actions are presented as they relate to the three main Workshop findings described above for consideration by the IFNEC Executive Committee.

3.2.1 Independent Regulator

An effective, independent regulatory body that is open and transparent is extremely important to the financial community when determining whether or not to lend, the rate at which the lending would be provided, the readiness of investors to invest and risk premiums. The regulator is important, among other reasons, because it increases assurance that the project can be confidently developed in compliance with all safety-based requirements and with effective independent oversight that is directly responsible to the public.

1. Promote the sharing of best practices related to the organization and operation of independent regulatory agencies to facilitate the development of strong, independent regulators internationally.
 - a. Work with existing systems of regulators to support the continued sharing of lessons learned and best practices and promote cross-border regulatory support and cooperation.
 - b. Develop specific initiatives, working with other groups concerned about similar issues, to facilitate the identification and dissemination of such lessons learned and best practices.
2. Examine the feasibility of cooperative regulation so that emerging countries can benefit from the activities of other countries in conducting their regulatory activity.
 - a. Identify what tasks could be reliably performed by suppliers and what tasks can only be performed by a recipient State
 - b. Explore whether countries reliably engage in regional regulation.
3. Ensure adequate interaction among the various regulatory entities – e.g., safety, environmental and economic, construction code development – that impact the construction and operation of a nuclear power plant.
4. Explore benefits of a follow-on regulatory workshop to continue information sharing.

3.2.2 Role of Government

The depth of commitment and support of the host country is the starting point for the evaluation of a project by the financial community. The quality of the commitment of the host country will be evident in

the rationale as to why a nuclear project is being proposed rather than other available energy options. Without a strong rationale that has the visible and consistent backing of the host government, it is unlikely that the interest and confidence needed in the project from the investor and financial community will develop Long-term government (and broad, all-around political) support backing that commitment is also essential for any project to go forward as planned.

5. Support the development and promotion of frameworks that convey the integrity of the decision and the depth of support for a government's decision to build a nuclear power plant.
 - a. Develop a framework that governments can utilize to evaluate the policy considerations related to a decision to construct a nuclear power plant and demonstrates the host country's ability to commit to and support that nuclear power plant.
 - i. Determine a method for identifying and quantifying the national developmental benefits of nuclear power in order to internalize these into a project's planning (i.e., determining how much more you are willing to pay for nuclear in order to further policy objectives beyond just generating electricity).
 - b. Promote transparency in decision-making to enhance the financial community's knowledge of the government commitment and support to a project.
6. Promote awareness and acceptance of the range of international treaties in particular those related to safety and nuclear liability.
 - a. Increase awareness of conventions related to the operation of nuclear power plants, including the Emergency Notification and Assistance Conventions, the Convention on Nuclear Safety, the Convention on the Physical Protection of Nuclear Material including the 2006 Amendment, and the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management and the need to ratify them and adhere to their requirements.
 - b. Emphasize the importance of participation by the host country, the neighboring countries and the countries of suppliers, investors and lenders in the same international conventions that address nuclear liability and those that address other cross-boundary activities.
 - c. Ensure an informed consideration of the benefits and costs of nuclear energy in other international conventions, e.g., those governing climate change and waste (other than the Joint Convention),
7. Develop the environment for the potential lenders to finance Nuclear Power Projects (NPPs).
 - a. Promote good communications from an early stage with the potential lenders, especially the Export Credit Agencies (ECAs), based on fair competition among the export countries.
 - b. Continue to encourage the Multilateral Development Banks (MDBs) to study NPPs so that the MDBs commence the financial support to NPPs.
8. Support infrastructure development including human resources (training and development of potential workforce) as well as electricity-related infrastructure, to enable nuclear power project development.
 - a. Evaluate issues related to cross-border use of the workforce for site and technology selection, construction, operation, regulation and decontamination/decommissioning, for example language and training standards, and potential solutions.

3.2.3 Sound Business/Project Plan

There is a need for a clear overall business plan that underpins and helps bound the project. The ability to finance a NPP will depend to a large extent on the quality of the project plan that has been developed.

The scope and content of the plan will demonstrate the extent to which critical issues have been identified and are being managed. Broad stakeholder involvement early in the planning process is crucial to project success.

9. Provide guidance on the critical elements of a successful business case, including the development, operation and decommissioning phases and the long-term waste management options of the nuclear power project, in order to demonstrate that the business risks have been anticipated and identified, and will be addressed adequately in the implementation of a project.
 - a. Ensure that economic analyses supporting a nuclear project are based upon comprehensive and defensible financial information and includes external factors such as any environmental, employment and other sovereign benefits. It should demonstrate a net benefit for a host country as compared with other generating options.
 - b. Explore further the role of energy markets; particularly off-take contracts, and how they can facilitate financing of an NPP for both regulated and unregulated markets.
 - c. Indicate the importance of addressing the financial implications of a premature NPP shut-down and whether these can be insured against or otherwise mitigated.
 - d. Note the benefits of a project plan with viable options for managing the back-end of the fuel cycle.
10. Develop a comprehensive catalog and analysis of nuclear finance options and benchmark those options against options/tools used by other industries (airline, oil and gas, information technology).
11. Develop and promote a comprehensive and interactive stakeholder participation process that incorporates lessons learned and best practices.
12. Create a forum to explore new NPP case studies including discussions related to financing of proposed and historical nuclear power plants. Collect and disseminate information in a manner that can be drawn upon when other countries begin to develop NPPs.
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14. Evaluate the issues and opportunities associated with regional projects (these are political, technical, economic, and financial) and the opportunity to find a strategic partner, especially in newcomer countries, which will, by building on experience and commitment, contribute to making the business plan more sound and bring credibility to the project.

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Government Support	<ul style="list-style-type: none"> ▪ Promote Awareness and Acceptance of International Treaties – Safety & Liability ▪ Support Infrastructure Development 	<ul style="list-style-type: none"> ▪ Transparent Framework to Convey Government Policy Support for NPP ▪ Promote Awareness and Acceptance of International Treaties – Safety & Liability ▪ Develop NPP Financial Lending Environment ▪ Support Infrastructure Development 	<ul style="list-style-type: none"> ▪ Transparent Framework to Convey Government Policy Support for NPP ▪ Promote International Treaties – Safety & Liability ▪ Develop NPP Financial Lending Environment ▪ Support Infrastructure Development
Sound Business Plan		<ul style="list-style-type: none"> ▪ Develop a Business Case that Demonstrates Net Benefit ▪ Catalog and Benchmark NPP Finance Options ▪ Develop and Implement Stakeholder Participation Process ▪ Establish a Forum on New NPP Case Studies ▪ Explore Alternative Finance Options ▪ Evaluate Issues & Opportunities of Regional Projects/Strategic Partners 	<ul style="list-style-type: none"> ▪ Develop and Implement Stakeholder Participation Process

After the foregoing analysis, three actions are presented to the IFNEC Executive Committee for further consideration:

1. **Explore benefits of a follow-on regulatory workshop to continue information sharing.** Due to the importance of an effective, independent and transparent nuclear safety regulatory regime to the ability to finance a nuclear project, discussions between the international regulatory and financial communities should be continued. An effective, independent nuclear regulatory body provides risk mitigation that could positively impact the availability of financing, commercial lending rates, ratings of nuclear project sponsors, and insurance premiums. IFNEC should consider a forum be organized with the purpose of informing the financial community about existing efforts to establish and maintain strong national regulatory infrastructure in civil nuclear countries, including those with emerging civil nuclear programs. This could include contributions from IFNEC countries as well as participation by the International Atomic Energy Agency (IAEA) and groups such as the World Association of Nuclear Operators (WANO) or the Institute of Nuclear Power Operations (INPO). Constructive dialogue between the international nuclear regulatory community and the financial community in other forums should also be pursued.
2. **Promote awareness and acceptance of the range of international treaties in particular those related to safety and nuclear liability.** The adherence to international conventions and treaties, such as the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, the Convention on Nuclear Safety and others, as well as relevant nuclear liability conventions that address a global nuclear liability regime are important factors that are evaluated by the financial community when considering support for a nuclear project. The IFNEC Joint Statement of the 2nd Executive Committee Meeting in Warsaw Poland in 2011 “Calls upon all IFNEC participants operating, commissioning, constructing or planning nuclear power plants, or considering a nuclear power programme, to become Parties to, or continue implementation of, the Convention on Nuclear Safety, Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency.” IFNEC countries could continue this advocacy effort, as laid out in the 2011 Joint Statement, to promote such treaties and conventions and encourage IFNEC participants and others considering new nuclear plants to become parties to or continue to implement important conventions.
3. **Support infrastructure development including human resources (training and development of potential workforce) as well as electricity-related infrastructure, to enable nuclear power project development.** A well-supported infrastructure program is essential for ensuring the safe, secure and responsible use of nuclear energy. This is recognized and valued by the financial community in its evaluation of support for nuclear energy projects. IFNEC’s two working groups currently focus on ensuring that different aspects of the infrastructure are being addressed appropriately. IFNEC could reaffirm the continued the work in the IFNEC Infrastructure Development Working Group (IDWG) and the Reliable Nuclear Fuel Services Working Group (RNFSWG) supporting nuclear infrastructure development, including human resources, and identifying the conditions and practical steps that enable the development of comprehensive commercially-based international nuclear fuel services, and other topics that can help enable safe and secure nuclear power project development.

4. Summary of Scene Setter Presentations

The scene-setting session was intended to provide foundational knowledge on nuclear financing to the participants. Three types of information were presented during the session by expert speakers in the nuclear field: nuclear finance basics, stakeholder perspectives, and country perspectives. The details shared were used to enhance and enable further discussions throughout the Workshop, and initiate creative thinking in the development of practical actions which IFNEC countries, individually or collectively, could take in facilitating the financing of nuclear power plants. The presentations are included in Appendix C of this report.

The scene-setting session included:

- Nuclear Finance Basics
 - International Nuclear Training, Nuclear Finance Basics: *Peter Hall, Norton Rose LLP*
 - Financing Nuclear Power Projects: Challenges and IAEA Assistance in Capacity Building: *Nadira Barkatullah, International Atomic Energy Agency (IAEA)*
- Stakeholder Perspectives
 - Finance/Commercial Banking: *James Asselstine, Barclays Capital*
 - Insurance: *Tim Fayers, Marsh Limited*
 - Export Credit Agency: *Shigehiro Yoshino, Nippon Export and Investment Insurance (NEXI)*
 - Utility: *Jacques Sacreste, Electricite de France (EdF)*
- Country Perspectives
 - Jordan: *Kamal Araj, Jordan Atomic Energy Commission*
 - China: *Hongbo Liu, China Development Bank*
 - Poland: *Tomasz Kwiatkowski, PGE Energia Jadrowa SA*
 - Finland: *Lauri Piekkari, Teollisuuden Voima Oyj (TVO)*

4.1 Nuclear Finance Basics

The Nuclear Finance Basics session included general discussion of nuclear financing to ensure that all attendees shared a basic understanding of the topic in order to facilitate collaborative participation in the Workshop. Mr. **Peter Hall** from Norton Rose LLP, brought extensive knowledge to the presentation from his considerable experience in the nuclear sector, and regular work with governments as well as utilities, developers, and contractors involved in the nuclear industry. This presentation set the stage for discussion throughout the Workshop. Mr. Hall explained and defined the complexities of nuclear finance as multiple pieces of a puzzle: off takers, regulators, developers, people, international stakeholders, government, operators, suppliers, public, legacy managers, financiers, and insurers.

Dr. **Nadira Barkatullah**, an energy economist in the Planning and Economic Studies Section of the International Atomic Energy Agency (IAEA) Department of Nuclear Energy, provided important insights on the financing of nuclear power projects - challenges and IAEA assistance in capacity building. She is currently working on financing and investment analysis of capital intensive infrastructure projects, and energy and sustainable development issues. Dr. Barkatullah explained the IAEA milestones in the development of national infrastructure of nuclear power, specifically related to funding and financing. Further, she presented global economic and cost data on nuclear power plants and the associated capital costs. Dr. Barkatullah also shared information on IAEA's involvement in supporting capacity building with training sessions and workshops, and the key findings that resulted from such events.

4.2 Stakeholder Perspectives

Four individual stakeholder perspectives were presented on current nuclear project financing approaches and issues. The topics covered included the identification of the various stakeholder-dependent

considerations used in making financing. The stakeholders represented the finance/commercial banking, insurance, export credit agency (ECA), and utility sectors.

Mr. **James Asselstine** is a Managing Director and senior fixed income research analyst covering the electric power industry at Barclays, and also served as a Commissioner on the U.S. Nuclear Regulatory Commission from 1982 to 1987. He presented a stakeholder perspective of commercial, investment bank considerations used in making financial decisions. Topics included the challenges/risks of new nuclear plant investment, the role of commercial and investment banks, considerations in making financing decisions, financing strategies, and two examples of new U.S. nuclear power plant projects.

The insurance stakeholder perspective was shared by Mr. **Tim Fayers**, a senior vice president in the Power Nuclear Utilities & Mining team of the Risk Management Practice of Marsh Ltd in London, and a member of the global Marsh Nuclear Practice, which advises operators, contractors and regulatory authorities on the insurance aspects of working in a nuclear environment globally. He presented information regarding insurance and risk financing considerations, and construction versus operational insurance.

Mr. **Shigehiro Yoshina**, from Nippon Export and Investment Insurance (NEXI), is responsible for a wide range of activities in project finding, business consultation, market and country risk monitoring, and the related international official framework. He provided the Export Credit Agency (ECA) stakeholder perspective on nuclear finance. The presentation included information on the current system to support the export activity of Japanese companies, the corporate profile of NEXI, the political and commercial risks covered by export credit insurance, major considerations on nuclear power plants, and the OECD rules on the export credits.

The utility stakeholder perspective was presented by Mr. **Jacques Sacreste**, the director of the Project Development Department at Electricite de France (EdF). He has occupied various management positions within the Nuclear Operation Division from 1982 to 1994, and has served as Head of Controlling in Cattenom Nuclear Power Plant (4 X 1300 MW) in eastern France. The utility viewpoint he provided first noted that a nuclear project is a long path of hurdles with no revenue, followed by an operational period that must go smoothly to justify the investment. The presentation included key points of information: banks and debt investors have a series of requirements on project sponsors before giving access to financing; there are a variety of financing models, out of which the project finance model has never been used in nuclear; recent developments in the nuclear and finance communities make it more difficult for nuclear projects to get financed; and access to capital and harnessing industrial challenge are crucial for new nuclear power plants and an essential part of the package. In some cases and especially for newcomers, choosing an experienced nuclear utility as a strategic partner can help solve both issues.

4.3 Country Perspectives

The Workshop scene-setting session included country perspectives on government financing experiences and challenges from four countries with varying degrees of civil nuclear experience: Jordan, China, Poland and Finland. The expert speakers presented the challenges to financing from a government perspective and shared their experiences. With the inclusion of four different countries' perspectives, Workshop participants were able to compare and contrast government approaches.

Dr. Kamal Araj, Vice Chairman and Commissioner for International Cooperation for the Jordan Atomic Energy Commission, presented Jordan's perspective on nuclear finance. He is responsible for all international cooperation agreements and activities and liaison with IAEA and international organizations, and is also the project manager for the Jordan Nuclear Power Plant (NPP). He explained Jordan's nuclear power program and why the country seeks nuclear power, Jordan's energy mix and electricity generated by fuel type, and available and committed capacities versus the electricity median load forecast. Dr. Araj provided the status of Jordan's plans to develop civil nuclear power as well as financing challenges for nuclear power in general, and for Jordan in particular. Further, his presentation described multiple financing options and financing sources available to Jordan. It also included elements needed for delivering a financeable project, specifically regarding infrastructure development and project structure.

The final element of the Jordan presentation shared the next steps for Jordan NPP regarding strategic partners, technology, infrastructure, project, and financing.

A perspective on nuclear power financing in China was presented by Mr. **Hongbo Liu**, the Deputy Director of Project Appraisal Department I, at the China Development Bank (CDB). Mr. Liu has been engaged in loan project evaluation for six years in the energy sector including the coal, oil, natural gas, coal chemical, and electric power industries. To date, he has conducted more than 50 loan projects evaluations. His presentation included a brief introduction of the CDB, whose goal is to strengthen China's competitiveness and improve the living standard of its people through international transactions, infrastructure, industries, and grassroots business. Mr. Liu also provided a summary of CDB's experiences in nuclear finance in serving as the lead bank of syndication loans for more than half of China's nuclear power projects, and issuing more than \$20 billion USD to nuclear power projects. Lastly, he discussed CDB's main financing method in the nuclear power area, which includes project finance, credit loan, and recourse financing.

Mr. **Tomasz Kwiatkowski**, the Director of Investment at PGE Energia Jądrowa S.A., provided Poland's country perspective on nuclear finance. He is an engineer, consultant and manager with 19 years of work experience in utility, oil & gas and heavy industry sectors, with direct experience in investment preparation and execution, both from a technical and an economic perspective. Mr. Kwiatkowski's presentation noted that the Polish government is committed to developing nuclear power in Poland and designated PGE to lead the five stages of Polish nuclear power program development; currently Poland has commenced Stage 2, in which the government creates a framework for construction and operation while PGE selects sites and awards a contract for the NPP vendor. He explained that PGE is a leading utility company in the Polish energy market in terms of production, distribution, and sales, and has strong financial position and high creditworthiness. The presentation also included key assumptions for the first NPP project in Poland, and the financing stream for NPP project development activities on the PGE side. Mr. Kwiatkowski provided two preliminary financing concepts: financing from a Special Purpose Vehicle (SPV), and corporate lending on Sponsors'/Partners' balance sheets.

The Finland country perspective was provided by Mr. **Lauri Piekkari**, Senior Vice President and Treasurer at the utility Teollisuuden Voima Oyj (TVO). Mr. Piekkari has gained in-depth knowledge of capital markets, structured finance, financial engineering and corporate treasury, and his experience of more than 20 years stems from both the banking and corporate sides of the business. The presentation began with information on TVO in general: NPPs that exist, NPPs under construction, and NPPs currently being planned, other power-generating ventures, and underlying owners with 60 off-takers. Mr. Piekkari also discussed TVO's risk allocation and financing concerns regarding nuclear investments in general. He discussed four possible financing models: base analysis, corporate model, project finance, and co-operative model. Further, TVO's operating principle was shared as well as financing alternatives for nuclear investments. The TVO model includes the following beneficial elements: small companies and utilities can invest; benefits of large scale production can be shared with more players, and risk is also shared; benefits of lower cost of nuclear power will be shared with large number of end-users; "public private partnership"; and due to risk sharing structure and excellent track record on the existing operating units, relatively low equity component is required for the investment. Mr. Piekkari also focused on the financing of the Olkiluoto 3 (OL3) Project: TVO specific concerns at the time of investment decision, and why OL3 investment has been a strong package for the financing world: stable political environment in Finland, waste management solution agreed upon, financing on a balance sheet as opposed to project financing, excellent operational performance on the two existing nuclear reactors, full turnkey delivery by high credit quality suppliers, joint liability by the suppliers, and a high investment grade credit rating (Fitch A-).

5. Overview of Expert Panel Discussions of Hypothetical Scenarios

5.1 Hypothetical Scenario Session

Expert panelists representing key stakeholders discussed a hypothetical proposal to expand an established nuclear power program or to develop a civil nuclear program in a hypothetical country that does not currently utilize nuclear power. In doing so, panelists clarified various stakeholder perspectives and identified challenges and opportunities related to financing this proposal. The moderator's focus was to get the interests of each party "on the table."



The scenarios were discussed in more depth during the small group breakout discussions that followed each scenario and information gleaned during both the expert panel discussions and the breakout groups helped inform the development of the key findings and proposed recommendations that are discussed elsewhere in this report.

Key Stakeholders Represented

- Utility
- Technology Vendor
- Bank
- Export Credit Agency
- Regulator
- Energy Planning Authority
- Rating Agency
- Insurance
- Legal Consultant
- Technical Consultant
- Market Consultant

It should be noted that each key stakeholder was represented by an expert in their respective discipline but that none of the stakeholders' views offered during the role-playing are attributed to them or to their employer. Consistent with this format, stakeholders were referred to by function: vendor, banker, legal consultant, etc. throughout the scenario exercise discussions.

5.2 Session Format

The scenario exercise framework provided a platform for multiple topics on the challenges and opportunities of nuclear finance to be addressed and provided all of the key stakeholders an opportunity to share their thoughts, perspectives, and opinions.

The interactive and unscripted scenario exercises each featured discussion around proposals to finance a hypothetical nuclear project in a hypothetical country. A specific nuclear project proposal was put forth and prompted discussion among the experts on the panels as well as questions from both the moderator and the audience. Each interaction featured detailed, realistic answers from the role-playing expert stakeholders.

Prior to the Workshop, a detailed scenario description was provided to the experts so that each had the opportunity to review the hypothetical situation and prepare for the interactive discussions. The Existing Country and Emerging Country scenario descriptions are included in Sections 5.4 and 5.5, respectively.

5.3 Overview of the Scenario Exercise Discussions

Both Expert Panel Scenario Exercises were conducted under the “Chatham House Rule” in order to encourage the most forthcoming discussions possible. Respecting that parameter, it is impossible to provide a chronological summary of the scenario exercises without compromising this Rule. However, the following overview is intended to provide sufficient information so that the depth and breadth of the Workshop scenario discussions are conveyed.

To begin the Expert Panel Scenario Discussions, each stakeholder at the table provided a short perspective on the hypothetical proposal before them that included their reaction to the nuclear project proposed and their views on whether financing could be achieved. Examples of these initial commentaries include:

- The utility is seeking to finance the power plant. There may be a relatively small amount available from the government, and that financing would compete with other infrastructure projects in the country. The utility plans to be the owner-engineer and stay directly involved and somewhat responsible for the design and construction.
- The Export Credit Agency (ECA) needs know if the utility is 100% government-owned or if there are other partnerships with local/foreign investment.
- The technical advisor acknowledged that proposals would pose a number of questions to consider across areas such as the site selection process, the ability of utility to operate different technologies if they are chosen, the ability of regulator to license those technologies, and environmental impacts associated with the new technologies
- The energy planning authority shared its objectives, most importantly to stop the lights from going out. Beyond that, objectives included a secure source of supply/electricity, meeting environmental objectives, and low cost.

The Workshop Moderator then asked detailed and pointed questions to encourage pertinent, interesting and informative discussion between the role-playing stakeholders. Such back-and-forth discussion is shown in the example below:

- **Moderator:** Mr. Banker, what do you see as some of the problems and barriers that the Mr. Utility in this country and this scenario is going to have to address?
- **Mr. Banker:** I would like to highlight three issues to get us going...
 1. Who is responsible for delivering this project on time and on budget? The current country's track record is not great. Getting confidence that it will be delivered on time and on budget is absolutely critical.
 2. Market risk – It is great that the utility is pursuing PPAs, but it is not clear for what proportion of the capacity to which the PPA applies. With huge volatility in natural gas and commodity prices, when planning for a 40-60-80 year project, getting assurance on long-term market risks being addressed is of key importance.
 3. Also we need to consider the size of the endeavor relative to the size of the utility. For a 3500 MW project, if it is a \$15-20 Billion project, it is a large size relative to the utility market cap (\$25B). The concern of banks and capital markets will be if this is a bet-the-company type of proposition for the utility.
- **Moderator:** Mr. Utility, to get things going more focused... we know that risk allocation is the key issue. Mr. Banker identified some of those risks. Who delivers the project on time and on schedule, and who takes that risk? How does risk get allocated in your scenario?

- **Mr. Utility:** Ultimately, the utility bears responsibility for the risk. We will look to pass as much risk as we can appropriately to our vendor and other contractors and suppliers. Our choice to be the owner and owner's engineer and have direct involvement in the project is so that we can, in fact, manage the risk. It bears note that while we have constructed six units, the first two did not go well, but the last four did. We believe we can build a project to time and cost, but it won't be easy... As for market risk, we are looking to put in place as many PPAs as possible. We recognize they would strengthen the business case and certainly market, and the revenue stream from the plant is important to ourselves and to those that would be financing us...
- **Moderator:** Mr. Vendor, it sounds like part of what Mr. Utility is suggesting is that you're in the business of designing and building these reactors, perhaps the ones in this country. Why shouldn't you be in the business of taking on some of the risk and helping them move this project forward?
- **Mr. Vendor:** I absolutely agree with that; we do need to take some of the risk. It is a shared-risk scenario between both the vendor and the owner, where you hold the responsibility and capability to handle that risk. For instance, with regard to licensing, if it is the current existing design that is already at the site, then the licensing risk is very small since we have already licensed the design in the country and understand the regulatory requirements. If it is a new design, then we have licensing challenges of which we may not be able to control on the basis that the independent regulator may have demands on our design that may be different from what we have designed in other places.

The continuous flow of discussion between the expert stakeholders was moderated strategically to get all significant opinions on the issues. Another example of the dialogue:

- **Moderator:** Okay, we'll circle to the legal and insurance side in just a minute, with respect to siting, being near the border, and what that might mean. Let's follow Ms. Rating Agency's admonition of "where's the money going to coming from, and how are we going to do this." Ms. ECA, you have trillions of dollars in cash sitting in your country. How do you look at this investment and the opportunity to engage with Mr. Utility and his project?
- **Ms. ECA:** In our country, some ECAs are lenders and some ECAs are insurers. Nevertheless, all ECAs cover commercial and political risks. This is a risk taken 80-100% according to the ECAs, a big risk. We need really strong government involvement and would like to have the rating of the NPP's country, and of course the rating of the debtor. This risk is taken over a very long period, with long construction and reimbursement times, so we need a reliable business plan. We would like to know how the risk is mitigated; what is the appetite of commercial banks on this risk. Another point that would be interesting is that due to the current financing crisis, it would be interesting to know if the amount would be in dollars or euros, because the appetites of the bank would not be the same.
- **Moderator:** Well, if Ms. ECA doesn't have the money, Mr. Banker, can you cobble together the money we need to help Mr. Utility get this project? After that, we might ask Mr. Utility if he has any other financial structuring thoughts.
- **Mr. Banker:** I think, in general, for well-structured projects, financing should be generally available. I apply some caveats, and with the gradual introduction of new rules such as Basel III, the cost of capital for banks themselves will go up. From my perspective, it is more of a binary issue: if the project is well-structured and if the banks are actually taking debt risk rather than equity risk, then finding \$7-8 billion dollars of debt financing to support a project like this should not be an issue. The challenge is in the allocation of the risks around EPC contracts, market risk

and so on, so that nothing falls between the cracks and comes back to the banks. It effectively means the banks are taking an equity risk for a debt rate of return.

- **Moderator:** A lot of discussion about risk allocation, Mr. Utility. Before we get to the legal and insurer perspectives, what additional thoughts do you have about how to think about the risks and the allocation of risks on the project?
- **Mr. Utility:** As indicated earlier, we recognize clearly that we need a soundly structured business case and good control over the project. As mentioned by our vendor, we are looking for a shared-risk delivery model. We believe if we provide a sound business case, the energy planning authority will allow us to recover our investment appropriately through rates. We are willing to consider other investors to share the risk with us, but that is a conceptual comment today for consideration.
- **Moderator:** Before we go on to the other investors, Mr. Legal Advisor, the technical advisor brought forth some concerns. What are your perspectives from the legal risks that you see, especially to siting, in a plant that may be near the border where there is a country on the other side not signatory to the conventions?
- **Mr. Legal Advisor:** Stepping back, you look at overall country risk. There are a lot of ways to de-risk the project from a country perspective: whether it's the governing law that's used, the dispute resolution that's used, whether are there certain procurement rules, or foreign investment rules that may affect the ability to bring the in a foreign investor. Specifically to the nuclear liability issue... while the country seems to have done the right things such as signing up to the Vienna Convention and assigning all liability to the operator from a legal channeling perspective, the problem comes in terms of cross-border damage. None of the neighbors are part of the treaty regimes that would channel liability back to the host country. Whether it's the vendor and EPC contractor team looking to avoid that risk and not willing take that risk, or if they have to price it and raising the contract price to an excessive level, or looking at the exposure to other project participants – it looks to be the case that the host government will have to do something more than just rely on having signed the Vienna convention. The more the utility balance sheet is put at project economic risks, the less attractive it becomes from a nuclear liability perspective. Having the government step up and assume some of the risk would have to be examined.
- **Moderator:** We heard risk... Mr. Insurer, can't we just buy some insurance to deal with some of these risks?
- **Mr. Insurer:** We just heard something about liability insurance - The advantage of the conventions is that the liability is clearly channeled to the responsible person. There is no problem at the moment in the insurance market to find liability insurance. The difficulty is when those liabilities are not clearly defined. That is not the responsibility of the insurer – it is the responsibility of the country itself. To be absolutely clear about the answer: nuclear liability insurance, when falling under the conventions, is no problem. Capacity is there at the disposal of the utilities. I am not talking about non-liability insurance – property damage insurance is the next step, and that step will only start when the project is more clearly defined as it depends entirely on technical matters.

Audience participants were able to ask questions, shared via index cards throughout the scenario discussion session, to further discussion and introduce topics not yet examined.

Both scenarios sparked significant discussion among all Workshop participants. The sessions were followed immediately by small group breakout discussion sessions that are summarized in Section 6 of this report.

5.4 Scenario 1, “Expanding an Established Nuclear Power Program”

Existing Country Scenario Description

Scenario Synopsis

In this scenario a mid-level existing country is in need of additional electricity base load capacity to meet projected economic growth. The country has had a good experience with its current nuclear generating plants and the nuclear regulatory authority is considered both effective and competent.

Most of the country’s power comes from an abundant supply of domestic coal and imported natural gas.

The utility would be the borrower and the owner operator of the NPP and is state-owned. The power market is regulated by an independent authority. The ability to finance the project is in question. Some financing is possible from the government. Any government financing would be competing for infrastructure funds and could only be a fraction of project cost. There is strong support in the government and among the public for adding new nuclear capacity to avoid meeting future needs with reliance on new coal plants. The ability to obtain the needed financing, despite a good bond rating and experience with nuclear power generation in the past, has been a problem that has slowed planning and is adversely impacting momentum for the project.

Country

- GDP \$1.0 Trillion
- The country has 6 operating nuclear power units on 3 sites. The first plant was commissioned 27 years ago. Last plant was commissioned 8 years ago. There have been a total of 4 events over the years reported in the national media regarding incidents at the plants but there has never been a radiation release that exceeded national standards. The first 2 units came online over 18 months late and well over budget. The other 4 units did noticeably better.
- The country has a well-educated populace, with adequate capacity to manage, operate and regulate the next 2 units. Country-wide surveys show 62% positive support for nuclear power, 19% strongly against.
- Most of the country’s power generation comes from domestic coal and imported gas. The country does not have shale gas as an option. Hydro is already built out.
- The government is working to develop a renewable energy program that has strong support but has made little recognizable progress. There is a need to comply with carbon/emissions goals, and it is projecting that they will not be met with the current profile.
- National leadership is very pro-nuclear. Over the past 30 years the nuclear stance has not been consistent but never to the point of being anti-nuclear.
- Energy projections for the country indicate a clear need for added base load capacity in the future. Existing installed electricity generation capacity is 290 GWh.
- The current grid capacity can accommodate up to 5,000 MW of additional electricity being generated without beginning a need for major capital investment.
- The country has commodities that need to be developed, and such development is energy intensive.
- Some neighbor countries are supportive of nuclear, and some are not. One existing NPP is located close to the border of one of the neighbors. Several neighboring and nearby countries, including the one just mentioned, have not adopted the 1963 Vienna Convention or the 1997 amendments.

- The nuclear regulatory agency is part of the national energy office. By international standards it is generally considered to be competent and effective. It operates with government funds, and the government collects fees from the NPP operators to support the regulatory budget.
- Private and public owned heavy industries in the country purchase 27% of the electricity domestically produced.
- The government regime is stable; there is a recent (last 15 years) history of foreign investment; they have a reliable legal system with respect for rule of law; they have signed all relevant international nuclear treaties including the NPT, and 1963 Vienna Convention and 1997 amendments.
- The national nuclear liability law places all of the liability for operation of the NPP on the licensed operator.
- The power market is regulated by an independent economic regulator.

Utility

- The utility is government owned, economically regulated, and financially independent.
- The utility has a bond rating of A prior to any consideration of the project.
- The utility owns and operates all of the nuclear plants in the country. The company market cap is \$25B.
- The other plants were mostly government financed under a number of different financing arrangements – there has been little private investment in the past in these plants.
- The utility is seeking to finance the NPP. Some financing is possible from the government. Any such financing would be competing for infrastructure funds and in any case would only be a fraction of project cost.
- The utility intends to pursue a contracting structure for the proposed project with owner/owner's engineer directly involved and keeping some responsibility for design/construction.
- Although the country has ocean coastline, all existing NPP's are located on major rivers.

Project

- The proposed 2-3 unit plant is to have a generating capacity of up to 3,500 total MW
- Long-term power purchase agreements for the project are being pursued. It is clear that there will be a number of agreements completed, but it is not clear for what portion of the capacity.
- Sites being considered include two greenfield sites with one on the coast and one on a major river. A third existing site was previously laid out for an expansion that could accommodate the proposed project. It is expected that the expansion site will be chosen. This site is the existing site mentioned earlier that is close to the border.
- There is small but well organized nuclear opposition supported by national/international organizations.
- Local residents in the vicinity of proposed existing sites seem to be about 75% supportive. Residents around the two greenfield sites show about 50% support.
- Local governments are generally supportive of project.
- Reactor designs that are the same as those of other operating reactors in the country are being considered, along with current generation reactor designs.

5.5 Scenario 2, “Developing an Emerging Nuclear Power Program”

Emerging Country Scenario Description

IAEA Milestone 1 completed, currently working on Milestone 2

Scenario Synopsis

In this scenario a mid-level emerging country is struggling to meet its electricity demand. This situation is hampering its economic growth. Although a newcomer, the country does have some experience in nuclear technology with the existence of a research reactor, an independent nuclear regulatory body in place, and most of the necessary regulatory framework in the legislative pipeline.

The country has no easy access to natural gas (no existing gas pipeline, limited access to the sea and no LNG harbor) but might have shale gas (unexplored). Coal is abundant and is currently used in power generation.

The State-owned utility would be the borrower and owner operator of the NPP and has some experience in managing complex projects, although not nuclear ones. Its tariffs are regulated and the State has recently approved a very unpopular increase in tariffs.

The utility is exploring options for financing the proposed NPP. Although the utility has full support from the government for developing nuclear power, alternative generation is looking easier to finance.

Country

- Population of 30 million, growing steadily (+2%)
- GDP of USD 200 billion, growing by +3-5% a year
- Good political stability over past 20 years, with no foreseeable changes in the future
- Country bond rated BBB, positive outlook
- Electricity generation relies heavily (90%) on coal and lignite, abundant in the country. Current reserve studies show project supply for approximately 100 years. Mining industry is important in the economy. Projected growth shows a need for significant additional electricity generating capacity in the future
- Neighboring countries are less economically developed with limited interconnection capacity. This limited capacity has been used in the past to import hydro power. No joint development is realistic at this stage.
- The government is committed to attract foreign investment and financing since (i) the state owned utility developing the nuclear project is unable to finance the NPP on its balance sheet, and (ii) the size of the local banking industry is not sufficient to support the necessary financing.
- Because of national sovereignty and energy independence guaranty, the country wants to keep shareholding majority of the future nuclear power plants.
- The national research reactor has been operating for over 15 years.
- The country has put in place most of the necessary regulation regarding nuclear energy. It has communicated its plans for the development of nuclear power with the enhancement of nuclear safety as the foremost criteria for technology selection and has gathered reasonably good public support. The independent nuclear regulator, although modest in size, is adequate and consistent for the control activities of the national research reactor. Nuclear waste management policy is still under discussion.

- The country has a national law that channels all of the liability for operation of the nuclear plant to the licensed operator. The country has signed the 1963 Vienna Convention on Civil Liability for Nuclear Damage, but not the 1997 amendments. None of the surrounding countries have signed the Vienna Convention.
- The country has signed the Treaty on the Non-Proliferation of Nuclear Weapons (NPT).
- The higher education system provides a good baseline but is not sufficient to develop the human resources required to support the NPP and supporting activities. The current nuclear professionals have been trained overseas. The vocational/technical education system also provides a good baseline but is not sufficient to meet nuclear technician development needs. The country, however, wants to develop its own expertise through knowledge transfer. The main goal is to guaranty in the long run a high level of safety culture for the future NPP with well qualified nuclear regulator staffs in order to be able to operate and regulate the plant without a heavy reliance on foreign expertise.
- The country is very interested in developing nuclear power because it sees this as the power technology of the future and wants to begin its participation. The country expects the NPP project to bring economic growth through the significant development of industrial capabilities nationally and locally. Construction of additional NPPs is an option in the country's future energy plan that recognizes the need for alternatives to fossil fuels.
- Nonetheless, there is a need for nuclear power development to be competitive on cost. The fossil fuel alternatives to nuclear, although not providing diversity and involving unwanted emissions, could also provide the basis for growing the electricity generating capacity in the country, especially in terms of time.

Utility

- The utility is 100% state-owned and is economically regulated (monopoly with tariffs approved by Ministry of Energy).
- The state-owned utility will be the borrower for the development of the NPP.
- The regulated tariffs are based on the average cost of producing electricity. The large capital costs associated with an NPP are not expected to be able to be added to the tariff base. A very unpopular tariff increases has recently been approved and the utility is under pressure to bring new capacity on the grid.
- The utility has some experience in managing complex projects (coal generation) but lacks financial expertise. Recent construction projects have encountered some delays and associated cost overruns due to more stringent security and environmental regulations making it more difficult to get permits from public agencies. The utility is planning on a contracting structure that is a full turn-key EPC contract where the vendor team is responsible for the entire project until commissioning.
- There is good operational experience with fossil-fired power plants although existing assets could be optimized.

Project

- The proposed project would be the first NPP in the country and have a capacity of up to 3,500 MW (2-3 reactors). The plant location is proposed on a suitable coastal site that has gone through full characterization. The site is suitable for 2 additional reactors. Three other potential suitable sites have been identified in the event of a decision to develop more nuclear generation capacity in the future. These other sites do not have detailed site characterization.

6. Record of the Breakout Groups

Workshop Participants were divided into six small groups that met concurrently for approximately 90 minutes in facilitated discussions following each scenario.

The breakout group discussions provided an important contribution to the Workshop by creating a forum in which public and private sector expert stakeholders from governments, the nuclear energy industry and the financial community could share their views and engage in direct dialogue on the relevant issues. These discussions were critical in developing the key findings and outcomes of the IFNEC Finance Workshop.

Each breakout group was asked to:

- Critique the scenario discussion, identify the challenges encountered in trying to finance the hypothetical project being proposed and review lessons learned;
- Explore one specific policy topic related to nuclear project development and financing in-depth; and,
- Offer opportunities to overcome identified financing-related challenges, including what IFNEC countries can consider doing individually and/or collectively.

Each breakout group was assigned to explore one of the following topics:

- Role of Government Funding for Infrastructure versus Financing of Nuclear Project
- Technology Choices and Risk
- Role of Regulation (Nuclear Liability, Safety, Market, Environmental, Non-proliferation) in Supporting the Civil Nuclear Industry
- Partnerships to Support Nuclear Development
- Energy Market Considerations (Merchant Market, Regulated Market, Power Purchase Agreement, etc.)
- Importance of a Fuel Back-end Plan

This section includes a summary of the discussions that occurred during the Workshop breakout sessions on both days, organized by topic.

6.1 Role of Government Funding for Infrastructure versus Financing of Nuclear Project

The goal of the breakout group was to identify and address the characteristics and level of government involvement and/or support necessary to enable financing. Breakout leaders were Nadira Barkatullah from the International Atomic Energy Agency (IAEA) and Al Burkart from the U.S. Department of State, who is also an IFNEC Infrastructure Development Working Group Co-Chair.



6.1.1 Expanding Market Scenario

The fundamental role of the regulator was noted and it was observed that this stakeholder had the most to say in the scenario. However, it was pointed out that government support must include the entire government – the energy planning authority, regulator, treasury and other ministries – and they must be coordinated to bring all elements of a project together in order for the project to be successful.

Group members noted the importance of risk allocation. It was observed that at the beginning of the scenario discussion, all stakeholders were agreeing that it was a good project. However, as the discussion continued and risks were identified that were not fully mitigated, all scenario stakeholders were less confident about financing the hypothetical nuclear project. It was observed that the ultimate risk often falls to governments.

The role of public approval was discussed. It was pointed out that there was no discussion of public approval for the proposed nuclear project in the host country or in neighboring countries during the scenario exercise. Moreover, it was noted that for democracies, there is a political risk created when public approval is not present. It was also noted that the presence of political risk in a project, which implies that a government's position on the project could change, impedes significantly the ability to finance the project.

An understanding of the driving force behind the project (the government or the utility), as well as having additional details on the proposed financing method, would have helped make the hypothetical project more bankable.

The question of whether nuclear energy can be financed in liberalized electricity markets was raised. Some argued that incentive-based rates of return on equity provide the necessary financial regulatory certainty (as compared with safety regulatory certainty), while others noted that structures should be put in place to mitigate the risks in liberalized markets, including long-term power purchase agreements (PPAs). However, there were concerns expressed that there was too much volatility in a 20-year loan to address both volume and price risks of these PPA contracts. The TVO model was held out as a successful model for hybrid financing in liberalized markets.

An additional observation from the Scenario discussion was that any financing plan must address all project risks, including risks that are outside the control of the utility.

On the focus topic of government funding for infrastructure versus financing of a nuclear project, funding was defined as what a government has to do to build physical infrastructure, human resources and the laws and regulations needed to implement its policy choice. Financing was confined to money needed to build a nuclear power project.

The conversation had already noted that there was a public good element to electricity generation projects such as nuclear power, so that needed to be considered. When the government helps develop

an industry to support a project or funds the physical infrastructure, such as roads, it indirectly supports financing.

Government funding for human infrastructure development, such as training, was deemed to be very important. It was expected that workforce issues could be addressed by consultations with universities, community colleges and industry.

The importance of strategic partners in risk sharing was discussed. However, it was observed that financial parties and technical stakeholders often work in parallel to plan their respective roles in a project. It was noted that a banker's desire for the least expensive path forward might conflict with the technical stakeholder's safety and reliability requirements. Close cooperation between the financial sector and the project developer, owner, and operator early in the planning stages increases the likelihood of success in financing the project.

One of the breakout group participants, a banker, noted that a sovereign guarantee is important: if more government support is present, there is less risk analysis necessary, and if less government support is present, more risk analysis is needed.

The role of government in technology selection for a nuclear project was discussed. It was agreed that the government has a role in setting "standards" for technology and that these standards were not to be driven primarily by financial considerations, but rather by safety and reliability concerns. However, it was pointed out that supplier governments can also support particular technologies in export markets through the use of Export Credit Agency (ECA) guarantees, which do affect financing.

The role of government in guaranteeing revenue in liberalized markets was raised. One suggestion was levying an "energy security fee" in the event market-based tariffs were not sufficient. Also raised was the role of governments in managing construction risk, market risk and risks related to waste management and decommissioning. The government could increase the prices (electricity tariff) to cover the cost of interest that accrues during construction, before any revenue is generated by the plant. Within the discussion about financing the full life-cycle of a NPP, it was noted that a government-backed early rate of recovery would assist in managing financing costs, and that planning for decommissioning is required, perhaps with the establishment of a separate decommissioning fund (which some countries have).

This issue of nuclear liability was discussed, and the importance of a cap on nuclear liability to the financial community was raised. An additional concern about whether a financier can be held liable for a project they financed was also discussed.

It was noted that every decision the government makes involving nuclear has some impact on financing. This underscored the importance of a stable and clear policy on nuclear energy, as well as the need for full government support for a project.

Regarding government support for electricity generating technologies, it was suggested that financial incentives (and disincentives) be the same across all energy types (wind, solar and other renewable, and nuclear). It was also noted that there should be parity regarding infrastructure cost in comparisons across technologies, with the observation that costs related to grid connection are rarely considered when evaluating the costs of wind energy technologies.

This breakout group ran out of time and did not directly discuss potential actions to recommend to the IFNEC Executive Committee.

6.1.2 Emerging Market Scenario

The importance of an emerging nuclear country leveraging existing information from a variety of sources was noted. This includes best practices from other countries, as well as information from the IAEA, World

Association of Nuclear Operators (WANO) and others. It would be helpful to understand what worked and what challenges were present in other situations. The discussion group noted that this was not sufficiently factored into the Workshop scenario discussion.

The importance of focused planning early in the project was also raised. The IAEA was described as an excellent “first stop” for newcomer countries, with its Nuclear Energy Program Implementing Organization (NEPIO) approach highlighted as a tool to begin integrated planning since NEPIO provides a means to coordinate across stakeholders as it informs a government’s decision.

Discussion group members also commented that there was little discussion about the impact of geopolitics on planning, including technology selection. It was noted that a solid, thorough planning process must include consideration of many factors, including geopolitics. The planning process should inform the timing and structure of the procurement process and must also reflect the culture of the host country.

The planning process should also work to align stakeholders early on and thus requires the government to be able to explain its interest in the civil nuclear option. This is especially true when gas prices are low. The decision to pursue nuclear energy for environmental or energy security reasons must be well-articulated so that the message is received by the financiers and the rating agencies.

In the scenario, the hypothetical government did not seem to understand and address the extent of government equity support that was needed. It was pointed out that the hypothetical government in the scenario had concerns about tying the capital cost from its proposed nuclear power plant to retail electric rates, which raised the question of what guarantees the government would be willing to provide. It was pointed out that in the United Arab Emirates (UAE), the cost passed to the consumer does not reflect the entire cost of the project, but that resources for guarantees were not a large obstacle in UAE. It was observed that while the economies in many emerging markets are not large, there is still a need for sovereign guarantees.

The question was posed about who was to pay for the electric grid upgrades if there was no increase in rates; the group thought of this as a procurement choice and that the government ultimately has to support the grid upgrades. Such support could include direct capital expenditures by the government, or the costs could be rolled into the purchase price of a NPP. The question of whether infrastructure investments, such as those related to grid updates, are assigned to a particular project or considered a general governmental expenditure was raised. It was pointed out that separating these expenditures may allow access to additional financing sources, such as multilateral development banks, who might be willing to finance infrastructure investments, but not a nuclear plant.

The mismatch in time horizons between the need to amortize a project over less than 20 years while it is expected to produce 40 years or more of benefits was raised. It was emphasized that planning a long-term capital-intensive project at a time of low natural gas prices was also a challenge. Due to the long-term payoff from these projects as compared with near-term costs, it is even more important (and challenging) for the government to justify the desire for nuclear power to the public. A strong policy statement also helps in de-risking for the vendor.

Other ways in which governments can provide direct or indirect support to nuclear energy projects were listed. These included: production tax credits, carbon floors, completion guarantees, or accounting changes regarding depreciation.

Discussion group members noted that the current global economic situation, which limits access to capital and increases the bank requirements for lending, serves to increase the cost of financing, was not adequately discussed during the scenario.

The breakout group moved on to the primary topic: the role of government funding in infrastructure versus financing of a plant. On the infrastructure side, it was emphasized that a good education program helps a government promote localization, which could be important for political support. Investment in education by the government and/or project partners should incorporate university programs, language and technical skills, and regulatory information exchanges. It was noted that education that supports both the planning and the safety regulatory processes and helps create an environment that can be viewed as pro-investment. A climate that is perceived as pro-investment is important to a country seeking help from international markets, but less so for one that is funded domestically (such as China). It was noted that some countries allocate money specifically for education and also reward students with guaranteed jobs.

The question of currency hedges built into power purchase agreements as a risk mitigation tool was raised and it was noted that this could bring big exposures.

The importance of the regulator having its own budget and not being under the economic control of any ministry was highlighted. The transparency of an independent safety regulator is important for building the public trust.

A discussion of the varied sources of money that could be available to a newcomer country followed. The categories of funding that could be available included: Sovereign wealth funds, SUKUK (Islamic financing), and, potentially, funds that had been frozen for political reasons. Many noted that the latter source could be politically-charged. It was noted that regional development banks may be able to fund human resource needs but not the nuclear plant itself.

Discussion also covered the role of the vendor related to localization of a first project. It was observed that some items, such as concrete and other construction materials could be sourced from within a country but other more design-dependent inputs may need to be produced abroad (such as steam generators), at least initially. Contracts should include contingencies related to localization. It was also suggested that other infrastructure projects be undertaken in a country to get foreign investors comfortable with doing business in that country.

The notion of sovereign guarantees was put forward again, with the thought that they depend upon the economic capacity of the country in both absolute terms as well as a percentage of debt. Some suggested that it is the role of the State to guarantee political risk while it is the role of industry to cover the business risk.

The breakout group concluded with ideas for further consideration, including that financing can be done sequentially and financing/refinancing mechanisms utilized to match the precise phase of the nuclear project (development to the first re-load versus on-going operations, for example) to investor appetites. The mechanism can then be tailored to the state of the project – and governments would need to promote this idea. It was also noted that governments can promote capital growth with local investors and pension funds, who could be attracted to this type of long-term investment. The group thought there should be encouragement of development from local capital markets. Finally, impediments to investment from banking regulation such as Basel III should be revisited, particularly its application to export credits.

6.2 Technology Choices and Risk

The goal of the breakout group was to understand how technology choices affect the risk profile and identify options for managing technology risk. The breakout leaders were Adrian Collings from the World Nuclear Association (WNA) and Jean-Hugues Perreard from AREVA.



6.2.1 Expanding Market Scenario

A key point from the scenario discussion is the absolute need for clarity in the regulatory process.

This presupposes a properly trained regulator and quality staff with sound knowledge and understanding of the technology they are examining, or the ability to develop knowledge quickly if it is a new technology. The regulator needs clarity in design from the vendor as much as possible. Further, the regulator needs knowledge of the sovereign and local regulations, including those outside the nuclear area that still affect the project. Ensuring regulatory stability was defined as a governmental role and it was noted that governments play a larger role in emerging markets.

There was a discussion about the possibility of global unified reactor design regulation. Some thought that, similar to the airplane industry, there could be an international licensing process formulated that would be acceptable for the nuclear industry. Others said that it would require regulators to forgo some level of national interest and for regulations potentially to become more strict and complex, which could increase the regulatory timeline for projects, or that they would fall to the least common denominator, which may have safety consequences.

It was noted that a decision about the technology choice should occur early on in the planning process, so the technical risks can be considered by all stakeholders. It was noted that a certain degree of design completion is desirable prior to beginning the licensing process. This does not necessarily need to be 100%, but it was considered impossible to give a simple percentage figure for this. However, it was noted that the desire to compress construction timelines can lead to construction before a design is 100% complete and this has risks. Much would depend on whether the selected technology is an established technology with operating power plants that have a track record or whether it is an innovative design. It was agreed that technology will also be evolving, especially in the Post-Fukushima environment.

The tradeoffs between the selection of innovative versus proven technology were discussed. While the innovative reactors such as Gen III+ may be viewed as the best available technology with the latest improvements, including safety improvements, the proven technology, such as Gen III reactors, is well-known and has a strong track record to be built upon. Although there was no single answer in terms of technology choice, a key point made was that different technology choices require different risk mitigations. The group emphasized the importance of a well-established licensing process in the established country scenario. The importance of regulators sharing best practices was also highlighted.

The question of how “first-of-a-kind” (FOAK) was viewed by the financial community was raised. It was agreed that, by definition, any new nuclear plant of any kind in a new country is considered FOAK. Further, current usage of the term could be misleading, since so many plants are first-of-a-kind by this definition, which goes beyond technology choice. The use of the FOAK label could affect public perception by inadvertently promoting the idea that choosing nuclear is an experiment.

When the group talked about project management, they recognized that it is a partnership between many entities. It is not just the vendor selling and the utility buying, but it also includes the government policy

makers and the safety regulator. All parties working together successfully -- and early on -- is necessary to provide an environment that would make financial institutions less concerned with the risk. A firm contractual model must be developed that clearly defines the role of all parties in the project. Finally, what is regarded as a poorly-managed project in any dimension will not attract the necessary financing; the more successful the project management, the more comfortable financial institutions will be.

6.2.2 Emerging Market Scenario

A strong opinion was offered that new entrants to the civil nuclear market should think in terms of more mature technologies rather than take the additional risks that might be present with newer technologies. In doing this, they should first set the safety criteria, and then look at the reactors technologies that meet their safety criteria, as opposed designing regulations around a selected technology.

The importance of becoming an “intelligent customer” was discussed and it was noted that this was a good investment that will payoff not only during the planning process, but also afterwards. It will also help to ensure that a realistic timeline for project development is set.

It was proposed that newcomer countries consider splitting their licensing into separate construction and operating licenses so that the construction process can begin while the capability to address operating issues is being built. It was noted that it may take 10-15 years to work through the IAEA milestones for a newcomer country.

Also, the breakout group highlighted the need to pay particular attention to opportunities for international partnerships, on both the regulatory/governmental side and on the industrial/vendor side. By definition, this is easier to do where there is a reactor that has already been licensed in one or more countries and the vendor has experience constructing/operating it.

It was noted that emerging countries should be aware of and participate in important conventions on waste management, safety and liability if they are considering nuclear.

There was also a consensus that newcomer countries may want to consider reactors that are already “design-certified” in other countries. There are plenty of opportunities for countries to plug-in to the work that has already been done, and draw from it. This allows them to devote more time to potential first-of-a-kind (FOAK) activities. The group noted a caveat: in talking about the regulatory side, a great emphasis was placed on the fact that working with regulatory organizations in established countries must not become a substitute for the national regulator. National regulators can draw on the expertise of their international counterparts, but the regulatory decisions are ultimately those of the host country. The independence of the regulator was also noted as a very important factor from the perspective of the financial community.

Another point made was that there needs to be a more holistic view of the technology. The technology is not independent of the equipment supply chain, and you need the highest possible safety and reliability standards throughout. Similarly, the reactor is not independent of the quality of people operating it. The qualifications and professionalism of the staff operating the reactor are important. The existence of established reactors and established supply chains for a particular type of reactor could be helpful for a country moving to nuclear for the first time.

The need for excellence in project management and for the partnership of the operator/customer, vendor, and regulator (government) to work well together to ensure that the project goes through at cost and on schedule was again highlighted.

The unique timeline for nuclear projects was raised: 60+ years of reactor life, plus 8 to 15 years of preparatory time. It was recognized that there is little that could be done to actually shorten this development period. The need for great patience and understanding by newcomer countries of that

timeline was discussed, as was the need for support by government. There was a perception that some countries lack an understanding about what is involved in the very early process before you actually embark on a civil nuclear program. IFNEC could consider facilitating efforts to make emerging countries more aware of the breadth of knowledge needed before embarking on a project in the nuclear market. This includes the full range of financial, regulatory, PR, human resources and technology-related issues.

The group noted that while every country has the right to develop nuclear power, not all countries meet the conditions necessary to support its introduction.

6.3 Role of Regulation (Nuclear Liability, Safety, Market, Environmental, Non-proliferation) in Supporting the Civil Nuclear Industry

The goal of the breakout group was to explore the importance of a wide range of regulation, the role that regulatory regimes play in supporting the civil nuclear industry, and the importance of these regulatory regimes in financial markets. It included discussion about regulations that are focused domestically, as well as those that support export markets. The breakout leaders were Anita Capoferri from the U.S. Department of Energy and Claire Harvey from Prospect Law.



6.3.1 Expanding Market Scenario

The group agreed strongly that the licensing and related regulatory process needs to be a very clear, internationally benchmarked process, so the parties can have predictability.

Discussion points emphasized the need for adequate and independent resourcing to ensure that regulators are able to carry out their responsibilities.

The question of whether previous regulatory experiences, including international experiences, could be used as a “reference” so the regulator would only have to focus on concerns that were site-specific or proposal specific was raised. It was noted that this would allow things such as the design basis for a generic design to be used and then adapted to site-specific situation and national priorities. This use of international regulatory experiences would not take the place of sovereign responsibilities related to safety. Further, it was noted that best practices are collected at the IAEA.

The regulatory process should be open and transparent with public acceptance and also take into account the procurement style and culture of the host country. This is to ensure that any regulatory turbulence/changes are minimized, which gives the finance houses a degree of confidence that supports funding.

The group also looked at electricity market regulation and noted that a new nuclear project starts with well-justified demand. It was recognized that the cheapest generating option is not always the best value for a country and that choices can reflect other national priorities (such as those related to carbon mitigation and energy security). Investors seek a guaranteed rate of return on their investment and may seek this through power purchase agreements (PPAs) or with government guarantees of revenue.

On the issue of nuclear liability, the breakout group noted the importance of regional adherence to a nuclear liability regime. It was also observed that current conventions have gaps, including some related to trans-boundary issues that investors will care about. In the end, the utility or the government must provide a solution or indemnification.

The group felt that waste management and decommissioning should have been given higher prominence in the scenario discussions. It was noted that predictability related to waste management was perceived to be higher in a regulated electricity market as compared with a liberalized electricity market. The costs of waste storage during and at the end of the life cycle should be factored into the equation and included as a clear and prominent part of planning. The nuclear liability scheme does apply to waste, so the group considered waste as a very important part of working out the finances. If waste management is not properly addressed, the finance community may not have enough confidence in the project to support it.

Regulations must be fully transparent, with public acceptance, environmental issues, transmission and other infrastructure issues, and the waste issue fully-addressed. Nuclear material control, safeguards,

export controls and other non-proliferation issues also need to be addressed by regulation to provide assurances for the financial community. It was noted that most environmental impact statement processes include an opportunity for public comment.

The recommendations summarized the points that a well-resourced, clearly-defined regulatory process is necessary, that international cooperation can lead to the sharing of best practices, and that the transparency and stability of all regulations help make the entire project, including its financing, proceed more smoothly and safely.

6.3.2 Emerging Market Scenario

The group emphasized that the presence of a strong and stable regulator is needed to provide assurances to the financiers. That means paying attention to regulator and training and education programs to ensure that schools are geared up to bring more regulators into the market. It was recommended that IFNEC could promote government sponsorship for training, technical development, educational incentives and scholarships, and joining up with universities in emerging countries.

Also discussed was whether a regulator should have a specialized knowledge of a particular technology, but the overall feeling was that the regulator should have a well-rounded view and be competent on many possible technologies and participate in cross-training. It was noted that the regulator should be able to react in a timely way and be suitably resourced to get things cleared quickly if need be. Also mentioned was the importance of funding independence and funding guarantees so that the regulator can be free of any external influences.

Regulations address both the financial structure and technical criteria that are necessary to enable nuclear development. Early establishment of these laws and regulations, as well as addressing the details of other international obligations, such as those related to the Vienna Convention or other liability conventions, should be decided early on. Collaboration with international counterparts was raised, and it was recommended that IFNEC could facilitate engagement of local and international stakeholders in shaping laws for emerging countries.

The group talked about how regulatory lessons learned from other countries could be factored into a country's planning. It was suggested that perhaps the IAEA could take a broader role. It was noted that IFNEC should strive to avoid duplication of efforts in regulation. OECD and WNA have been looking into regulatory issues for a while, and IFNEC could support these efforts and help carry them forward. It was observed that all elements of regulation need to be a good cultural fit for a host country: you can't just fly in a regulatory regime from another country, including elements such as the financial, environmental, security, and public acceptance. Those elements would need to be looked at and developed in a culturally-sensitive way. Bankers said that all of these elements must be addressed, and financing will be considered on the basis that all of these have been taken into account.

During the discussion, bankers noted that the pool of financiers available for nuclear financing has shrunk. It was suggested that countries need to make themselves as attractive for financiers as possible by ensuring there is a stable government and regulatory scheme that utilizes international benchmarking, and is well-supported financially and by the public. It was suggested that some emerging countries are exploring nuclear energy because they want to decouple their energy security from the vagaries of commodity markets. Further, it was suggested that this could be a selling point for investment since the financial risks do not correlate to these markets.

The impact of regulatory delays on cost and financing was discussed. It was noted that delays in licensing increase the cost and also delays the commencement of revenue generation for the utility. Bankers worry about managing completion risk.

The group suggested that multilateral development banks are best structured to work with emerging countries but noted their lack of interest in nuclear energy. The need was recognized for government and other external support, possibly including multilateral support. The Export Credit Agencies (ECA) approach is something the group would like to focus more on and hoped that IFNEC could facilitate regarding connections with ECAs. It was noted that both ECAs and other financial institutions have country lending limits, so sometimes decisions can be based on country considerations. It was pointed out that parts, such as turbines, valves and fuel, can come from different countries, so financing each of these from different sources could be explored.

Cooperative agreements between regulators help emerging countries understand what it takes to be a competent regulator and should be encouraged. It was also observed that not many in the private sector are aware of the significant efforts of the IAEA in support of emerging country nuclear development, including through its “milestones” approach. Gaining that understanding should provide an additional degree of confidence to the financial community and IFNEC should explore helping to make this important connection.

6.4 Partnerships to Support Nuclear Development

The goal of the breakout group was to explore the use of partnerships (formed for either risk-sharing or promotional reasons) to allocate and manage risks across a variety of interests. The breakout leaders were Daniel Grosvenor from Deloitte and Fiona Reilly from Norton Rose.



6.4.1 Expanding Market Scenario

Focusing on the scenario discussion, breakout group participants discussed the impact of the tenor (tenure) of debt on a project. In particular, it was noted that the OECD Arrangement, with its the 15-18 year debt repayment requirement does not match or recognize the useful life of the asset (60 years for NPP). A compressed payback period results in higher consumer tariffs in the early years. The group discussed whether the IFNEC members can do more to extend the tenure of debt, and make the market for long tenures more attractive. The notion of a multilateral solution was raised and participants suggested looking at the European Bank for Reconstruction and Development (EBRD) as a possible model. The question of when the debt repayment period begins was raised as well as questions regarding how development and constructions costs are addressed and when they are passed through. All of these details help set the environment that will or will not encourage partnerships.

It was pointed out that the government's role in markets is driven, in part, by its degree of interest and involvement in energy policy. In areas where there is a public good such as in electricity markets, the government is frequently involved and industry will partner with them, rather than addressing the issue on its own. Strong government backing for a civil nuclear policy and will be evaluated by Export Credit Agencies (ECAs) as they determine whether and at what level they will accept political risks.

The scenario discussion touched upon the idea of international repositories and also on the notion of greater cooperation between countries to deal with back-end issues. This latter issue is important because it may provide lenders comfort in financing and was not discussed sufficiently during the scenario session.

The role of technology choice in determining partnerships was also discussed. The level of maturity of a selected technology, as well as its size (and potential for electricity sales), helps determine partnership opportunities. There was a long discussion on whether the technology providers/vendors/construction companies are being asked to take on too much risk. The idea of financing a project in phases, with a mechanism for passing along development costs early on was raised.

The group considered the question of who are the potential strategic investors. This includes not only governments, especially when a supplier is government-backed, but also investors that participate through both equity and off-take contracts. The TVO model may be worth exploring. Having multiple off-takers serves to lower credit risk.

The role of government and how much risk it should take was discussed. Discussants noted that governments need to create certainty and predictably for a nuclear project and work to have the policy logic behind why nuclear is selected as a part of its energy mix recognized. Additionally, government needs to provide support to stimulate a nuclear industry within country, but sovereign support for this aspect may be less necessary in an established market.

It was noted that the independence of the regulator is key to any financing structure, including ECAs, debt financing and equity investment. The group felt that this was not emphasized enough in the scenario. It would be useful to have regulatory certainty, with a clear process and established milestones to help investors understand the path forward. Changing regulations and regulatory views present great risks from a cost and feasibility of financing perspective, and could affect the overall success of a project. Another topic discussed was that of education and training, including public education. It was noted that there needs a coordinated training and education plan to ensure that jobs are filled locally. More emphasis on the international applicability of the education and training would be beneficial – the idea of an international skills passport should continue to be pursued.

6.4.2 Emerging Market Scenario

The participants in this breakout session observed that the Emerging Country Scenario session did not allow for a thorough discussion of geopolitics and the role of political alliances. Further, it was observed that developing country politics may be different than other places in the world, so understanding the politics and other parameters of the host country is important. But regardless of which country the proposed hypothetical plant was intended for during the scenario, it was noted that regional and international buy-in could be as important as local buy-in. Partnering among countries is difficult to execute, but allows for nuclear power to be developed where it otherwise might not be achievable. However, group members acknowledged that there may be places in the world where nuclear power should not be built.

Project sponsors must make an economic case for a partner to consider joining a project, it was asserted. Many believed that ownership issues, the regulatory structure and a construction plan, including approved (regulatory) standards need to be in place before financial partnerships can be forged. In addition, understanding the project structure related to revenue generation is important. Both the government and the project sponsor need to think about how to incentivize a partner to join a project and do this early in the planning stages.

Financial markets have changed since the financial crisis began four years ago, so the approach to finding a financial partner needs to change as well. One example is that ECAs are placing a greater priority on sovereign support. Sovereign support and guarantees can also be used to backstop PPAs or a loan itself. It was noted that the government role is so important that sometimes bilateral relationships help determine project technology partners

It was agreed that if you want external financing from public financial markets or ECAs, then you need a very strong alignment between the utility and the sovereign to put forth the economic case in support of a project. Financial markets will consider the economic condition and credit quality of the sovereign, as well as that of the utility. It was noted that a utility that takes on a large project may experience an issue with its credit rating as a result of taking on that project.

Given the perception of risk surrounding nuclear energy, especially after the Fukushima accident, financial institutions may be concerned about the impact on their reputation from participating with such a project. The project sponsor and the sovereign need to address this issue in order to incentivize lenders to lend to nuclear. Things like ensuring that there is an experienced, competent safety regulator, that the technology is mature enough to be deployed and that the operator is either experienced or can leverage other experienced operators, all help mitigate this reputational risk. Public acceptance is also a key point for lenders. There is a role for government in educating the public about the nuclear project, as well as all the societal benefits stemming from that project.

The concept of risk sharing through a type of pool financing was discussed. It was noted that some big hydroelectric projects may provide a model to build from, but that the successful projects were completed by all government parties, without much, if any, private sector participation.

Discussions about pooling continued as the concept of regional fuel centers to address both front-end and back-end needs of the reactors was mentioned.

There was a lot of discussion about the importance of international regulatory cooperation with the idea that regulators from experienced nuclear countries can help an emerging country develop their regulatory systems and practices. The idea of leveraging a generic design assessment or design certification from another country was also discussed. This would not supplant the national regulatory review, but rather give the regulator something to build upon. It was believed that this could facilitate lending.

The role of the IAEA was discussed. It was noted that the financial community looks to the IAEA to help it understand whether a regulator in an emerging country is ready and properly resourced to regulate a new nuclear plant. The financial community would find specific benchmarks and a clear understanding of the pathway to an effective, competent regulator to be of assistance. It was believed that this could help mitigate concerns stemming from uncertainty about the regulatory process as well as about safety in general. A question was raised about whether the IAEA missions under the milestones process could be made public. This would help give the bankers additional confidence that the regulator is ready to take on its responsibilities.

The role of off-take contracts as a form of partnership was raised quickly at the end of the discussion. The concern was raised that some developing countries may not have large enough industries to have a strong off-take partner candidate. Regional cooperation may help with this challenge

6.5 Energy Market Considerations

The goal of the breakout group was to explore the role of energy market considerations in the financial risk profile for nuclear projects. The breakout leaders were George Borovas from Pillsbury Law and Karen Dawson from Pricewaterhouse Coopers.



6.5.1 Expanding Market Scenario

The group opined that a key role of government in the scenario was to provide implicit and explicit support for financing the hypothetical project. The non-power related objectives of the government, such as energy security, industrial development and job creation, were also discussed. It was acknowledged that these policy objectives are important, but they are hard for the utility or project sponsor to capture and “sell” to private investors. It is clearly the role of government to sell its package of objectives for a project. Other issues that the government could address includes rate setting, determining the point at which the government needs to take a share of risk in order to attract financing, and when and whether to provide sovereign guarantees.

It was noted that electricity is sometimes considered a public good and must compete for limited government resources. It was further suggested that nuclear is sometimes viewed as uneconomic, but perhaps it is not because it is nuclear but rather because it is nuclear that is not done the right way. A government role could be to announce the public benefits of nuclear and work to align varied interests. This is difficult because each market participant looks at a project from his or her own perspective.

The group discussed the uncertainty of who bears the market risk: is it the consumers or the taxpayers? And are they one and the same? The sharing of risk between the public and the private sector was also discussed. It was unclear in this scenario how that risk allocation would be done as well as who ultimately would backstop that risk. It was important to note that these distinctions refer not only to risk allocation, but also to benefit allocation. To address these issues, it was suggested that involvement of an entity with a long-term perspective is essential since the large capital investments will need to be recovered over the long-term. A non-governmental entity may be better suited for this role. Also, since governments are often comprised of multiple organizations/departments, the specific role of each entity within government needs to be defined.

The role of tariffs and off-take contracts for risk management was discussed. The first concern regarding off-take contracts or Power Purchase Agreements (PPAs) is determining whether the counterparty is creditworthy. Another concern is ensuring that risks have been estimated correctly so that the electricity is priced correctly. Tools like cost and revenue sharing are often employed. A regulator’s role is in assessing the capital and operating costs to be recovered. The PPA must also address how construction/completion risks and cost overruns will be addressed. Additionally, the length of contracts is important within the PPA, as it needs to be long enough to satisfy the bank and short enough to satisfy an ECA, with terms that are comparable to other electricity-generating competition.

The TVO arrangement in Finland sparked discussion about industry’s participation in the financing of a NPP. Members of the TVO consortia share both costs and output and therefore the arrangement is not a PPA since it involves ownership arrangements. However, Finland and France both utilize forward sales of electricity to help pay for capital costs.

The question of who bears completion risk was raised when participants explored whether vendors could offer fixed price contracts. The vendor cannot take all of the risk, but neither can governments.

There may be a role for governments to assist with liquidity before revenues can be used to amortize large capital investment. It was noted that perhaps some of the risks, such as licensing risks, can be transferred to the government. Further, if there are plant shut-downs or other business interruptions, insurance for that would be considered beneficial. It was briefly mentioned that it might be interesting to invite neighboring countries to partner, or sell electricity generated to them.

Another discussion point revolved around financing in merchant markets. The group agreed on a combination of characteristics necessary to create demand for a NPP: High fuel prices, high carbon costs, limits on other electric generators, and the need for more power generation. Even so, there can still be financing issues.

Some suggestions for IFNEC were discussed as well. One thought was that construction could be financed by government and then converted to permanent financing. To accomplish this, it would be necessary to explain the societal benefits of nuclear, including for jobs, energy security and carbon dioxide emissions. A solid government commitment to nuclear is important for its success, and a decision by a government to shut its nuclear program for any reason can have negative consequences globally.

6.5.2 Emerging Market Scenario

It was observed that the emerging markets can be more challenging to finance. One point made by the group was the importance of a country's financial capacity and what financial packages it might be able to put on the table. This involves an understanding of the commercial cost of electricity (COE), priorities for the country going forward, and a tariff policy. It was suggested that a country first identify a technology and understand its costs and then address financing. While emerging nations often conduct feasibility studies regarding technology and site selection, it was observed that financing could also benefit by an early and in-depth look. This too should be considered a deliverable for the nuclear program.

It was noted that there was no discussion in the scenario about the TVO financing model, which may have been helpful. It was also noted that it is important to educate and discuss the structuring of liabilities, including nuclear liability in the discussion. Further, it was noted that legislation can deal with national nuclear liability issues but cannot address cross-border issues.

Another issue raised in the breakout group discussion was finding a way to get the appropriate cash flow to offset the high capital costs and low operating costs. The initial capital costs are daunting and the long-term payback for such investments serves to diminish the interest in nuclear in many, if not most cases, the tenor (tenure) of the loan is much shorter than the operating life of the reactor. This mismatch implies high financing costs up-front.

Electricity tariffs are viewed to have a short-term focus and are not a good tool for managing longer-term issues. It was also noted that there is a lot of uncertainty over long term policy and especially regarding the potential for changes. One idea was for governments to connect the market strategy with the policy strategy. It was also observed that the transparency of the real cost to the consumer for many generating technologies, including the cost of grid and backup power has not been communicated well. A cost-benefit analysis may help identify both costs and benefits that should then be built into commercial contracts and business models.

It was noted that after the 2008 financial crisis, commercial entities will not provide loans for periods longer than 15 or 18 years. Most ECAs have similar restrictions. Host government involvement is very important to ECAs, especially for emerging countries and for determining the tenor of its loans. The presence of a sovereign guarantee allows for greater ECA participation in the project finance plan. To mitigate risk, there needs to be government-to-government support at a high level.

A Power Purchase Agreement (PPA) can be used to help ensure financeability since it may help with cash flow. There was much discussion about the selling of nuclear power on a regulated versus unregulated (liberalized market) basis. It was noted that incentives such as a feed-in-tariff are sometimes necessary for nuclear to compete in an unregulated market. When considering the tenure of the PPA, it was noted that there is a lower PPA price after the financing period. The owners may want to link the PPA tenure to the tenure of its debt. It is also important to consider the credit quality of off-takers over the long term, as well as alternative off-takers.

Attracting investors for NPP financing was also discussed. If certain conditions are present, such as the competitor generation is old or export opportunities exist, there may be large consumers who might be interested in being NPP shareholders. However, it was noted that there are not always enough companies who can afford implementation of the Finnish TVO ownership/off-take model.

The bigger issue is getting investors comfortable with nuclear liabilities and the importance of a global nuclear liability regime was raised.

It was observed that regulatory allowances for the recovery of costs related to construction-work-in-progress (CWIP) is a tool that can be used to minimize consumer rate shock when a new plant is added to the rate base, but that this may be more difficult for emerging counties because the rate base resources may not exist. CWIP is a means of risk-shifting.

Some suggestions for IFNEC to consider were developed as well. One idea is for IFNEC to focus on educating the population about the not so easily quantified benefits of nuclear, including security of supply, national security, role in industrial development and innovation and environmental benefits. Other ideas centered around exploring other financing models for ideas, such as Delta going into the oil refining market or the idea of matching PPA off-take contracts with new technologies such as SMRs.

6.6 Importance of a Fuel Back-end Plan

The goal of the breakout group was to address the interaction between industry and government/national policy on the back-end plan and the impact on financial risk. It also focused on the risks and risk mitigation for a project if there is not an agreed upon back-end plan. Breakout leaders were Yves Kaluzny, from the French Atomic Energy and Alternative Energies Commission (CEA) and an IFNEC Reliable Nuclear Fuel Services Working Group co-chair, and John Mathieson, from the UK Nuclear Decommissioning Authority (NDA) and an IFNEC Infrastructure Development Working Group co-chair.



6.6.1 Expanding Market Scenario

It was observed that there was not a lot discussion on the back-end plan during the scenario session. The group noted the importance of having a back-end strategy in place because the back-end plan has a large impact on financial risk. The question arose about the appropriate time in the planning period to develop a back-end plan and it was suggested that it is best to have a strategy in-place when embarking on any nuclear project. A number of countries thought you could put it off until many decades into the life cycle of a reactor, but it was suggested that some countries have learned the hard way that you need the back-end plan at the outset, if not before.

It was suggested that countries are currently considering waste management strategies that utilize three different models: “conventional” reprocessing, where ultimate high-level waste disposal still needs to be addressed; a take-back scheme that involves temporary storage at an unspecified location and may involve regional storage plans; and, geologic disposal, which could also include consideration of a regional repository. It was noted that storage is different is different than ultimate disposal, and both aspects usually need to be addressed.

Different models and arrangements were put forward including regional repositories. It was noted that if several countries join together to finance a repository, the costs are likely cheaper, but there are political and social details in identifying a host location that must be worked out to take that forward. Another model that was discussed focused on the role of the vendor (and/or fuel supplier) in which the vendor takes the spent fuel back to its own country. The remaining questions include waste ownership, responsibility for that waste, and the associated liabilities.

The group discussed the minimum back-end strategy that must be in place to give enough comfort to satisfy the financial community. Some suggested that reprocessing works because of its waste minimization characteristics, while others suggested that an interim storage plan should suffice because it allows the country to wait to identify the best long-term solution, which may be evolving.

It was noted that early shutdown of a reactor poses a challenge in that adequate financial resources may not yet have been set aside. This could affect both waste management as well as decommissioning plans. It was viewed that costs resulting from early shutdown for policy/political reasons be borne by the government.

Decommissioning funding was also discussed and it was viewed that this may be easier to address than funding for waste management. Many countries utilize a sinking fund to cover decommissioning costs and build it up over time by setting aside a small portion of revenues from electricity sales as the reactors

operate. Others build the estimated costs of decommissioning into the initial financial package for the reactor. In both models, ensuring that there are built-in contingencies that deal with changing cost estimates and timeframes is a challenge. Financial risks related to decommissioning are highly dependent on who manages the fund and how it is managed.

It was noted that some countries have two separate funds: one to cover decommissioning and another to cover waste management. The question of how to address new entrants to the market was posed noting that in the United Kingdom, the existing waste generators are contributing money to build a waste management facility but it is not clear how to include new market entrants equitably under this plan. There is a desire by some new entrants to have a guaranteed waste disposal fee going forward, but this is proving problematic because the costs are dependent on volume, which continues to change.

It was noted that the mechanics of funding for waste management varies across countries and some countries, such as the U.S. do not allow for direct access to the funds collected but rather require a Congressional appropriation, which injects a certain degree of politics into the funding profile. Sweden and Finland were put forth as examples of countries where the waste disposal fund is more accessible when it is needed.

It was viewed that the banking community was concerned primarily that a project is in compliance with national and international policies and regulations, and that back-end risks were covered for at least the tenor of the loan (their exposure).

While physical decommissioning responsibilities usually fall to the operator/licensee of a reactor, waste management and related non-proliferation responsibilities usually fall to governments.

6.6.2 Emerging Market Scenario

Participants in this breakout session discussed their observations regarding the preceding Emerging Country Scenario session and its relation to back-end planning, including decommissioning. It was agreed that a newcomer country must develop a plan for waste management of spent fuel in both the near and longer terms. They must also address decommissioning, including funding. The back-end plan needs to be developed early on, but not necessarily made final at that stage. It must address how the issues are going to be managed, who is going to manage them, and how the activities will be funded. It was suggested that an approach be defined before the procurement phase of a project, which would be before the financing stage.

A question was raised about whether the approach needs to be a “million-year” solution, which implies planning for a repository that holds fuel assemblies, or a 100-year solution, which allows a country to consider other alternatives, such as reprocessing, for the spent fuel and alters the characteristics of the future repository. It was agreed that this is a policy decision that needs to be made by each nation, but that it should be addressed early on.

It was suggested that newcomer countries join the Joint Convention on Spent Fuel Management and the Safety of Radioactive Waste Management and the Nuclear Safety Convention.

The vendor role in back-end plan development includes not only the provision of an initial decommissioning cost estimate, but also creation of a design that should be capable of taking all of the spent fuel from the reactor for the entire lifetime of the reactor. It was postulated that innovative reactor designs may pose challenges to waste management in terms of cost and waste form that are not fully appreciated at this point in time.

The group agreed that a repository project cost includes a fixed component with a large, initial cost and a variable component that is based largely on volume. It was debated how the risks related to cost uncertainties should be allocated between governments or utilities and the industry. A question was

raised but not answered of whether a government that steps up to meet a gap between projected and actual costs for waste management is providing a subsidy, which is a troublesome proposition in some countries, such as the UK.

The issue of regional, multinational facilities was discussed. It was postulated that the regional repository concept would allow small nations to address waste management without having to build their own repository, which could have a very high per unit cost (due to the anticipated low volume of waste it would receive). However, there are many policy issues that must be addressed when considering moving waste across country boundaries. Chief among these are the public acceptance issues and the adherence to potentially different environmental standards and regulations.

It was observed that some emerging countries are hoping to address the waste management issue through their fuel supply contract, but we are not at that level of maturity with this concept yet. There are many policy and legal issues still to be ironed out with the fuel leasing approach. It was pointed out that a successful fuel leasing model would be a competitive advantage for any vendor who could offer it.

Two examples of countries with that have worked together to resolve mutual waste management challenges are: Croatia and Slovenia, who share responsibilities for a reactor they both enjoy electricity from, and England and Scotland, who have struggled to address the question of legacy waste that predates Scotland's independence on the waste management issue. Ultimately, the UK government has taken responsibility for these legacy wastes.

Questions to be considered when looking at funding for decommissioning and waste management include an examination of generational issues related to costs and benefits, as well as any substantial differences between taxpayers and customers of the nuclear plant.

It was noted that banks and export credit agencies each have internal requirements – their nuclear lending principles – that they must adhere to and that require a certain maturity in the decommissioning and waste management approach.

Many countries set aside funding for decommissioning during plant operations using the “pension plan” model. However, an early shutdown of the plant poses challenges to this model as it is likely that not enough money has been collected yet. In most cases, it is expected that the government would need to backstop the funding. The notion of early shutdown insurance was discussed, but an insurance expert said that this sort of insurance could probably not be devised due to uncertainties in bounding and quantifying the risks.

An important recommendation for IFNEC to consider was that the Joint Convention and bank rules be used as a forcing function for newcomers to address waste management and decommissioning early on. It was also recommended that the concept of regional repositories and other multinational models be discussed using IFNEC as a forum for such discussions.

7. Acknowledgements

The IFNEC Finance Workshop was the result of significant creativity and contributions from many individuals and organizations. A broad spectrum of stakeholders were brought together from the IFNEC countries as well as the nuclear energy and financial communities to gain a better understanding of each other's roles and approaches to nuclear financing. Every Workshop participant contributed his/her expertise, professional insights, and recommendations to the discussion.

The IFNEC Steering Group formed a Workshop Planning Committee, whose members supported all stages of Workshop development from developing the agenda to contributing to the scenario details and breakout topic identification. The Planning Committee was also key to ensuring that diverse experts were represented at the Workshop.

Members of the Workshop Planning Committee included:

- Kamal Araj, Jordan
- Alex Burkart, U.S. and IFNEC Infrastructure Development Working Group Co-chair
- Adrian Collings, World Nuclear Association
- Lauren Joyce, IFNEC Secretariat
- Yves Kaluzny, France and IFNEC Reliable Nuclear Fuel Service Working Group Co-chair
- Hisashi Kanamori, Japan
- Hirobumi Kayama, Japan
- Steve Kidd, World Nuclear Association
- Julien Marchal, France
- John Mathieson, United Kingdom and IFNEC Infrastructure Development Working Group Co-chair
- Cheryl Moss Herman, IFNEC Secretariat
- Marta Milan, Booz Allen Hamilton, supporting IFNEC Secretariat
- Bob Mussler, Booz Allen Hamilton, supporting IFNEC Secretariat
- Vincent Ruinet, France
- Michelle Scott, IFNEC Secretariat
- Rui Suzuki, Japan
- Sean Tyson, IFNEC Secretariat

This Workshop would not have been successful without the diverse array of presenters, panelists and breakout leaders lending us their expertise and enthusiasm during the Workshop. A special acknowledgement is due to the Workshop moderator, Mike Wallace, for encouraging and enabling the captivating scenario discussions.

Special appreciation is given to the United Kingdom, who served as host country for the Workshop, in particular the efforts of Peter Carter of the Department of Energy and Climate Change (DECC) and John Mathieson of the Nuclear Decommissioning Authority (NDA) and the staffs of both organizations.

Additional thanks goes to the Lancaster House and the opening and closing speakers, Lord O'Neill of Clackmannan and Pat Upson, CBE.

Significant contributions to the Workshop were provided by the World Nuclear Association, who contributed to the Workshop Planning Committee efforts, as well as provided staff to support the Workshop.

Appendix A: Workshop Agenda, Registration List, and Speaker Biographies

A.1 Workshop Agenda

Day One -- May 9, 2012

8:00 – 9:00 **Registration**
Lancaster House - Ground Floor

Welcome and Introduction
Lancaster House – Long Gallery, 1st Floor

9:00 – 9:10 **Welcome Address**
Lord O’Neill of Clackmannan
Former Member of Parliament of the United Kingdom and
former Chairman of the Nuclear Industries Association

9:10 – 9:20 **IFNEC Steer Group Chair Welcome, Goals and Objectives of Workshop**
Edward McGinnis
IFNEC Steering Group Chair

Scene- Setting Session
Lancaster House – Long Gallery, 1st Floor

9:20 – 9:50 **Nuclear Finance Basics**
General discussion of nuclear financing to facilitate collaborative participation in the Workshop
Peter Hall
Norton Rose LLP

9:50 – 10:10 **Financing Nuclear Power Projects: Challenges and the IAEA Assistance in Capacity Building**
Nadira Barkatullah
International Atomic Energy Agency (IAEA)

10:10 – 11:00 **Stakeholder Perspectives**

Finance/Commercial Banking
James Asselstine
Barclays Capital

Insurance
Tim Fayers
Marsh Limited

Export Credit Agency
Shigehiro Yoshino
Nippon Export and Investment Insurance (NEXI)

Utility
Jacques Sacreste
Electricie de France (EdF)

11:00 – 11:20 **Break**

11:20 – 12:10 **Country Perspectives** -- Financing Experiences and Challenges

Jordan

*Kamal Araj
Jordan Atomic Energy Commission*

China

*Honbo Liu
China Development Bank*

Poland

*Tomasz Kwiatkowski
PGE Energia Jadrowa SA*

Finland

*Lauri Piekkari
Teollisuuden Voima Oyj (TVO)*

12:10 – 1:10

Lunch

Lancaster House – Grand Hall, Ground Floor

Expert Panel Discussion - Scenario Exercise One

Lancaster House – Long Gallery, 1st Floor

1:10 – 2:40

“Expanding an Established Nuclear Power Program”

Scenario Moderator: Michael Wallace, Center for Strategic and International Studies

Expert panelists representing key stakeholders will discuss a hypothetical proposal to expand an established nuclear power program, and in doing so, clarify various stakeholder perspectives and identify challenges and opportunities related to financing this proposal. The moderator’s focus will be to get the interests of each party “on the table.”

Panelists include experts representing the following stakeholder categories; the views expressed will be those of the stakeholder category but not attributed to the individual or his/her organization.

Utility

*Chris Bakken
EDF Energy*

Rating Agency

*Tania Tsoneva
Standard & Poors*

Technology Vendor

*Michael Kirst
Westinghouse*

Insurance

*Alec van den Abeele
Overseas Nuclear Electric Insurance
Limited (NEIL)*

Bank

*Roger Wood
Moelis*

Legal Consultant

*Paul Murphy
Milbank, Tweed, Hadley & McCloy LLP*

Export Credit Agency

*Maelia Dufour
Coface*

Technical Consultant

*Chris Conboy
Atkins Global*

Regulator

*Charlie Miller
U.S. Nuclear Regulatory Commission*

Market Consultant

*Edward Kee
National Economic Research
Associates (NERA)*

Energy Planning Authority

*Stephen Kidd
World Nuclear Association (WNA)*

-
- 2:40 – 3:00 **Break/Walk to Breakout Rooms**
Room assignments will be shown on monitors in Long Gallery
- 3:00 – 4:30 **Breakout Group Session**
Breakout Rooms - 1st Floor
Workshop Participants will be divided into small groups that will, in facilitated discussions, review lessons learned from the scenario exercise, identify the challenges encountered, discuss one specific topic in more depth, and offer opportunities to overcome identified challenges, including what IFNEC countries can do individually and collectively.
- Topics:**
- Role of Government Funding for Infrastructure versus Financing of Nuclear Project
 - Technology Choices and Risk
 - Role of Regulation (Nuclear Liability, Safety, Market, Environmental, Non-proliferation) in Supporting the Civil Nuclear Industry
 - Partnerships to Support Nuclear Development
 - Energy Market Considerations (Merchant Market, Regulated Market, Power Purchase Agreement, etc.)
 - Importance of a Fuel Back-end Plan
- Breakout Leaders:**
Nadira Barkatullah, International Atomic Energy Agency
George Borovas, Pillsbury Law
Al Burkart, U.S. Department of State
Anita Capoferri, U.S. Department of Energy
Adrian Collings, World Nuclear Association
Karen Dawson, Pricewaterhouse Coopers
Daniel Grosvenor, Deloitte
Claire Harvey, Prospect Law
Yves Kaluzny, France Atomic Energy and Alternative Energies Commission (CEA)
John Mathieson, UK Nuclear Decommissioning Authority
Jean-Hugues Perreard, AREVA
Fiona Reilly, Norton Rose
- 4:30 – 4:40 **Return to Plenary Session, Long Gallery – 1st Floor**
- 4:40 – 5:50 **Plenary Session: Report of Breakout Group Discussions**
A representative from each Breakout Group will present the results of their discussions.
- 5:50 – 6:00 **Summary of Day 1 and Introduction to Day 2/Adjournment and Group Photo**
*Edward McGinnis, IFNEC Steering Group Chair and
Michael Wallace, Scenario Moderator*
- The outcomes of Day 1 will be summarized and an introduction to Day 2, including a preview of the second scenario, will be shared. All participants are encouraged to stay after adjournment for a group photograph in the Grand Hall.
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Day Two -- Thursday, May 10

8:00 – 8:30 **Registration**
Lancaster House – Ground Floor

Plenary Welcome
Lancaster House – Long Gallery, 1st Floor

8:30 – 8:35 **Plenary: Welcome**
Edward McGinnis
IFNEC Steering Group Chair

Expert Panel Discussion – Scenario Exercise Two
Lancaster House – Long Gallery, 1st Floor

8:35 – 10:05 **“Developing an Emerging Nuclear Power Program”**
Scenario Moderator: Michael Wallace, Center for Strategic and International Studies

Expert panelists representing key stakeholders will discuss a hypothetical proposal to develop a civil nuclear program in a hypothetical country that does not currently utilize nuclear power, and in doing so, clarify various stakeholder perspectives and identify challenges and opportunities related to financing this proposal. The moderator’s focus will be to get the interests of each party “on the table.”

Panelists include experts representing the following stakeholder categories; the views expressed will be those of the stakeholder category but not attributed to the individual or his/her organization.

Utility Jacques Sacreste Electricite de France	Energy Planning Authority David Scott Executive Affairs Authority of the United Arab Emirates
Technology Vendor Ichiro Asazuma Hitachi-GE Nuclear Energy, Ltd.	Rating Agency Paul Lund Moody’s
Bank Carl Cho Citigroup Global Markets, Inc.	Insurance Paul Holliday Marsh Limited
Export Credit Agency Jessica Farmer Export-Import Bank of the United States	Legal Consultant Gareth Price Allen & Overy
Regulator Charlie Miller U.S. Nuclear Regulatory Commission	Technical Consultant Jay Brister CH2MHill
Market Consultant Edward Kee National Economic Research Associates (NERA)	

10:05 – 10:25 **Break/Walk to Breakout Rooms**
Room assignments will be shown on monitors in Long Gallery

10:25 – 11:50 **Breakout Group Session**
Breakout Rooms
Workshop Participants will be divided into small groups that will, in facilitated discussions, review lessons learned from the scenario exercise, identify the challenges encountered, discuss one specific topic in more depth, and offer opportunities to overcome identified challenges, including what IFNEC countries can do individually and collectively.

Topics:

- Role of Government Funding for Infrastructure versus Financing of Nuclear Project
- Technology Choices and Risk
- Role of Regulation (Nuclear Liability, Safety, Market, Environmental, Non-proliferation) in Supporting the Civil Nuclear Industry
- Partnerships to Support Nuclear Development
- Energy Market Considerations (Merchant Market, Regulated Market, Power Purchase Agreement, etc.)
- Importance of a Fuel Back-end Plan

Breakout Leaders:

Nadira Barkatullah, International Atomic Energy Agency
George Borovas, Pillsbury Law
Al Burkart, U.S. Department of State
Anita Capoferri, U.S. Department of Energy
Adrian Collings, World Nuclear Association
Karen Dawson, Pricewaterhouse Coopers
Daniel Grosvenor, Deloitte
Claire Harvey, Prospect Law
Yves Kaluzny, France Atomic Energy and Alternative Energies Commission (CEA)
John Mathieson, UK Nuclear Decommissioning Authority
Jean-Hugues Perreard, AREVA
Fiona Reilly, Norton Rose

11:50 – 12:00 **Return to Plenary Session, Long Gallery – 1st Floor**

12:00 – 1:00 **Plenary Session: Report of Breakout Group Discussions**
A representative from each Breakout Group will present the results of their discussions.

1:00 – 2:00 **Lunch**
Lancaster House – Grand Hall, Ground Floor

Summary Session

Lancaster House – Long Gallery, 1st Floor

2:00 – 2:45 **Plenary Session: Summarize list of actions for IFNEC consideration**

Edward McGinnis

IFNEC Steering Group Chair

The session chair will combine results of breakout groups for discussion. Observations and remarks will be noted and be included in the record of the Workshop, without attribution. The IFNEC Steering Group Chair will solicit any final observations or remarks from both the expert panels and the Plenary.

2:45 – 2:55 **Closing Remarks**

Pat Upton, CBE

Non-executive Director of Northcourt

2:55 – 3:00 **Summary and Workshop Conclusion**

Edward McGinnis, IFNEC Steering Group Chair

Michael Wallace, Scenario Moderator

The Chair will summarize the product of the Workshop: the list of practical steps recommended by the Workshop attendees to the IFNEC Steering Group for their consideration.

A.2 Registration List



REGISTRANTS

	Name	Organization/Company	Title
Armenia			
Industry	Hayk HARUTYUNYAN	MetsamorEnergAtom CJSC	Acting Director
Australia			
Government	Michael SHELDRIK	Department of Resources, Energy & Tourism	General Manager, Fuels and Uranium Branch
Belgium			
Industry	Alec VAN DEN ABEELE	AVDA Consult Ltd	Director
Bulgaria			
Government	Tanya KOICHEVA	Embassy of Bulgaria	Economic and Commercial Counsellor
	Lyuben MARINOV	Bulgaria Ministry of Economy, Energy and Tourism	Expert
Industry	Ivan ANDREEV	Kozloduy Nuclear Power Plant PLC	Director of Development and Modernizations Directorate
	Anton SIMEONOV	Bulgarian Energy Holding EAD	Senior Expert
	Svilen SPASSOV	SP Intl	Westinghouse Consultant for Bulgaria
China			
Government	Hui CHEN	National Energy Administration	Director
	Hongbo LIU	China Development Bank	Deputy Director
	Jian RONG	National Energy Administration	Director
	Yunping ZHANG	China Institute of Nuclear Information and Economics	Assistant Researcher
Industry	Can ZHOU	China Power Investment Company	Deputy Department Manager
Egypt			
Government	Khaled SHAALAN	Embassy of Egypt	Second Secretary
Euratom			
Organization	Marc DEFFRENNES	European Commission	International Relations
Finland			
Industry	Lauri PIEKKARI	Teollisuuden Voima Oyj (TVO)	SVP and Treasurer
France			
Government	Jean-Marc CAPDEVILA	Embassy of France	Nuclear Advisor
	Yves KALUZNY	Commissariat à l'énergie atomique (CEA)	Senior Advisor
	Thibaud LABALETTE	ANDRA - National Radioactive Waste Management Agency	Program Division Director
	Erol OK	France Ministry of Finance	Head of Export Credit Unit
	Vincent RUINET	France Treasury	Deputy Head of Export Credits and International Guarantees
	Carole WAHIDE	Commissariat à l'énergie atomique (CEA)	International Strategy
Industry	Vincent BOUCHARD	Electricité de France (EDF)	Group Investments Analyst
	Anne CREPIN	AREVA	Deputy VP Project & Export Finance
	Alain DARDY	AREVA	Vice-President New Build Marketing
	Olivier DE GOURSAC	Natixis	Director Nuclear Energy, Structured Export Finance
	Xavier DE ROLLAT	Société Générale Corporate & Investment Banking	Director, Origination
	Maëlla DUFOUR	Coface	Head of Department Key Accounts
	Benoit LEPOUZE	Electricité de France (EDF)	Senior Project Manager
	Marie-Christine MOULIN-DEWALD	ALSTOM	Project & Export Finance Director
Olivier PAUL	BNP Paribas	Global Head of Export Finance	

	Name	Organization/Company	Title
	Jean-Hugues PERREARD	AREVA	Vice President Head of Project & Export Finance
	Jacques SACRESTE	Electricité de France (EDF)	Director, Project Development Department

Hungary

Government	Pal KOVACS	Hungary Ministry of National Development	Minister of State for Climate Change and Energy
Industry	Gabor LAVICH	Magyar Villamos Művek Zrt.	Finance Director
	Csilla TOTH	Magyar Villamos Művek Zrt.	Project Director

International Atomic Energy Agency (IAEA)

Organization	Nadira BARKATULLAH	International Atomic Energy Agency	Economist
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Japan

Government	Toshihiko FUJII	Japan Ministry of Economy, Trade and Industry	Deputy Director General, Global Energy Policy
	Hisashi KANAMORI	Japan Ministry of Economy, Trade and Industry	Deputy Director
Industry	Ichiro ASAZUMA	Hitachi-GE Nuclear Energy, Ltd.	General Manager
	Yoshinori FUJIWARA	Mitsubishi Heavy Industries, Ltd.	Vice President & Group Manager
	Ken FURUKAWA	Nippon Export and Investment Insurance	Director
	Tetsuhei IKEDA	Nippon Export and Investment Insurance	Vice President
	Yutaka INABA	Japan Bank for International Cooperation	Director
	Kenji KANO	Toshiba Corporation	Group Manager
	Hitoshi MIYAKE	Sumitomo Mitsui Banking Corporation Europe Limited	Joint General Manager, Advisory, ECA and Environmental Projects, Structured Finance Department
	Kensuke NISHIJI	The Bank of Tokyo-Mitsubishi UFJ, Ltd.	Manager
	Yoshinobu SHIBATA	Mizuho Corporate Bank, Ltd	SVP and Head of Renewable Energy and Carbon Business Team
	Shigehiro YOSHINO	Nippon Export and Investment Insurance	Chief Representative for EMEA Region

Jordan

Government	Kamal ARAJ	Jordan Atomic Energy Commission	Vice Chairman
Industry	Khalil NASR	Financial Consultant	Financial Consultant

Kenya

Government	George OCHILO AYACKO	Kenya Nuclear Electricity Project Committee, Ministry of Energy	Executive Chairman
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Latvia

Government	Dins MERIRANDS	Latvia Ministry of Economics	Director, Energy Department
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Lithuania

Government	Ona KOSTINAITE-GRINKEVICIENE	Permanent Representation of Lithuania to the European Union	Energy Attaché
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Netherlands

Industry	Dietrik EMMENS	Nuclear Research and consultancy Group (NRG)	Finance Manager
	René WILDEROM	DELTA NV	Treasury Advisor

Nigeria

Government	F. Erepamo OSAISAI	Nigeria Atomic Energy Commission	Chairman/Chief Executive
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Poland

Government	Zbigniew KUBACKI	Poland Ministry of Economy, Nuclear Energy Department	Director
Industry	Zofia JASKULA	PGE Energia Jądrowa S.A.	Project Manager
	Tomasz KWIAŃKOWSKI	PGE Energia Jądrowa S.A.	Director of Investment

Republic of Korea

Industry	Ki-Dong SONG	Korea Atomic Energy Research Institute	Vice President, Nuclear Policy Development
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	Name	Organization/Company	Title
Romania			
Government	Cristian Paul MACOVEI	Romania Nuclear Agency & Radioactive Waste Management Organization	Vice President
	Dragos Bogdan RUSU	Romania Nuclear Agency & Radioactive Waste Management Organization	Deputy Director
Industry	Mircea GHEORGHE	ErgoNuclear	Chief Technical Officer
	Mircea METES	Nuclearelectrica SA	Chief Engineer
	John SAROUDIS	Candu Energy Inc.	Regional Vice President
Russian Federation			
Government	Polina LION	Rosatom	Deputy Head of International Business
Saudi Arabia			
Government	Hatem ALAHMAD	King Abdullah City for Atomic & Renewable Energy	Consultant
Senegal			
Government	Mamadou KANOUTE	Senegal Ministry of Energy	Chief of Division
Singapore			
Government	Chow Ming WONG	Singapore Ministry of Foreign Affairs	Director/Special Duties (Energy)
Ukraine			
Government	Oleksii MATOV	Ergoatom	Lead Engineer
	Maksym NEZHURA	Ergoatom	Head of Section
United Arab Emirates			
Government	David SCOTT	Executive Affairs Authority	Executive Director
Industry	Charlotte BRUYER	HSBC	Director, Project Finance
United Kingdom			
Government	Jo GUTHRIE	UK Department of Energy and Climate Change	Technical Policy Adviser
	Hergen HAYE	UK Department of Energy and Climate Change	Head of New Nuclear
	John MATHIESON	Nuclear Decommissioning Authority	Head of International Relations
	Edward OAKDEN	UK Trade and Investment	Managing Director, Strategic Trade
Industry	Chris BAKKEN	EDF Energy	Project Director - Hinkley Point C, Nuclear New Build UK
	George BOROVAS	Pillsbury Law	Partner-Head of International Nuclear
	Philip BREE	Global Vision 2000	Legal Advisor
	Adrian COLLINGS	World Nuclear Association	Senior Adviser
	Chris CONBOY	Atkins Global	Regional Head of Nuclear
	Karen DAWSON	PricewaterhouseCoopers	Director, Energy & Utilities
	Arnaud DE GIOVANNI	Royal Bank of Scotland	Managing Director, Power and Utilities Investment Banking
	Edward DE LA BILLIERE	Prospect Law Ltd	Director
	John DEWAR	Milbank, Tweed, Hadley & McCloy LLP	Partner
	Reg EDWARDS	Shaw Power Group	Director of UK & European Sales
	Graham FAGENCE	Hitachi-GE Nuclear Energy, Ltd.	Business Development
	Tim FAYERS	Marsh Limited	Client Executive
	Frederic GATTE	Imperial College	Executive MBA
	Daniel GROSVENOR	Deloitte	Partner
	Peter HALL	Norton Rose LLP	Partner
	Claire HARVEY	Prospect Law Ltd	Consultant
	Peter HASLAM	Nuclear Industry Association	Public Policy Advisor
	Paul HOLLIDAY	Marsh Limited	Managing Director, Construction and Real Estate Practice
	Dominic HOLT	KPMG	Associate Director
	Steve KIDD	World Nuclear Association	Deputy Director General

Name	Organization/Company	Title
Paul LUND	Moody's Investors Service	Vice President, Senior Credit Officer
Lord O'NEILL of Clackmannan	UK Nuclear Industry Association (NIA); Former Member of Parliament	Former Chairman
Gareth PRICE	Allen & Overy LLP	Partner, Global Head of Projects
Alain-Pierre RAYNAUD	AREVA UK	Chairman & CEO
Fiona REILLY	Norton Rose LLP	Partner & Head of Nuclear Services
Grant ROGAN	Blenheim Capital	CEO
Terry SELBY	Nugeneration Ltd	Senior Adviser
Tania TSONEVA	Standard & Poor's	Associate Director
Pat UPSON	Northcourt	Non-Executive Director
Abdul WAHEED	Global Vision 2000	Nuclear Advisor
Simon WALKER	Imperial College	Head, Nuclear Research Group, Mechanical Engineering Department
Moeen YASEEN	Global Vision 2000	Managing Director

USA

Government	Alex BURKART	U.S. Department of State	Deputy Director, Office of Nuclear Energy, Safety and Security
	Anita CAPOFERRI	U.S. Department of Energy	Deputy Assistant General Counsel
	Burrus CARNAHAN	U.S. Department of State	Foreign Affairs Officer
	Claudia COLOMBO	U.S. Embassy London	Energy Commercial Specialist
	Jessica FARMER	Export-Import Bank of the United States	Director
	Stephen GOLDBERG	Argonne National Laboratory	Special Assistant to the Director
	Janet GORN	U.S. Department of State	Senior Foreign Affairs Officer
	Lauren JOYCE	U.S. Department of Energy	International Desk Officer
	David KINCAID	U.S. Department of Commerce, International Trade Administration	Nuclear Trade Specialist
	Edward MCGINNIS	U.S. Department of Energy	IFNEC Steering Group Chair
	Grant MOONEY	U.S. Department of Commerce, International Trade Administration	International Trade Specialist
	Cheryl MOSS HERMAN	U.S. Department of Energy	IFNEC Secretariat/Foreign Affairs Specialist
	Michael WAUTLET	U.S. Embassy London	ESTH Officer - Nuclear
Industry	James ASSELSTINE	Barclays	Managing Director
	Jay BRISTER	CH2MHILL	Vice President, Global Business Development Nuclear Power
	Carl CHO	Citigroup Global Markets, Inc.	Industry Specialist - Power & Utilities
	Edward KEE	NERA Economic Consulting	Vice President
	Michael KIRST	Westinghouse	Vice President, Strategy & External Affairs, EMEA
	Marta MILAN	Booz Allen Hamilton	Consultant
	Charles MILLER	Advanced Systems Technology & Management, Inc.	Principal Nuclear Safety Consultant
	Scott MORGAN	Energetics Incorporated	Analyst
	Paul MURPHY	Milbank, Tweed, Hadley & McCloy LLP	Senior Attorney
	Robert MUSSLER	Booz Allen Hamilton	Associate
	David POWELL	GE Hitachi	Vice President, Europe Region
	Michael WALLACE	Center for Strategic and International Studies (CSIS)	Strategic Advisor
Roger WOOD	Moelis & Company	Managing Director	

World Bank

Organization	Barbara REID	World Bank	Associate Consultant - External Affairs
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A.3 Speaker Biographies

Speaker/Expert Biographies



Prof. Kamal J. ARAJ

Vice Chairman & Commissioner for International Cooperation, Jordan Atomic Energy Commission

In this position, Dr. Kamal Araj is responsible for all international cooperation agreements and activities and liaison with IAEA and international organizations. He is also the project manager for the Jordan Nuclear Power Plant. Prior to his current role, Dr Araj served as the Government Advisor for Nuclear Energy and as the scientific advisor for King Abdullah Development Bureau (KADDB).

Before returning to Jordan in 2006, Dr. Araj worked as a senior policy and planning advisor at the IAEA in Vienna for five years. Prior to that, Dr. Araj was an international consultant in energy and advanced technology in Washington, DC. Among his clients were the management consulting firm, RCG/Hagler, Bailly, Inc., XERAD, Inc., the BDM Corporation, Argonne National Laboratory, and the U.S. ACDA. Prior to that, Dr. Araj held academic and research appointments at MIT, Harvard University, Brookhaven National Laboratory and U.S. National Academy of Sciences.

Dr. Araj received both his B.S. in physics and B.S.E. in nuclear engineering from the University of Michigan, Ann Arbor. He obtained his Ph.D. at M.I.T. in nuclear engineering with a minor in energy technology and policy.



Mr. Ichiro ASAZUMA

General Manager, Hitachi-GE Nuclear Energy, Ltd.

Mr. Ichiro Asazuma has more than 20 years' experience with nuclear related business. He was responsible for the procurement of nuclear fuel, such as uranium concentrates, enrichment services, and fabrication services, representing a Japanese utility. For three years, he was based in London and reported to Tokyo on European Power Business, including climate change and energy security issues.

Now, Mr. Asazuma works for Global Business Operations Division, Hitachi-GE Nuclear Energy Ltd. located in Tokyo.

He has a Bachelor's degree of Commerce & Business, Keio University, and a Master's Degree of International Relations, International University of Japan.



Mr. James ASSELSTINE

Managing Director, Barclays

Mr. James Asselstine is a Managing Director and senior fixed income research analyst covering the electric power industry at Barclays. Mr. Asselstine is responsible for fixed income research coverage of more than 100 investment grade-rated electric utility holding companies, operating companies, and independent power producers. Mr. Asselstine also serves as a member of the Nuclear Advisory Committee for Constellation Energy Nuclear Group, a joint venture of Exelon Corp. and Electricité de France, and a member of the Nuclear Advisory Committee for UniStar Nuclear Energy, LLC, a subsidiary of Electricité de France established to develop new nuclear power plants in the United States.

Prior to joining Barclays in September 2008, Mr. Asselstine was a senior fixed income research analyst covering the power industry at Lehman Brothers for more than 18 years. While at Lehman Brothers, Mr. Asselstine was the global head of high grade credit research for six years, and was a member of the firm's Investment Banking Division Commitment and Bridge Loan Committees for two years.

Mr. Asselstine served as a Commissioner on the U.S. Nuclear Regulatory Commission from 1982 to 1987. From 1978 to 1982, he served as Associate Counsel

for the U.S. Senate Committee on Environment and Public Works. While on the staff of the committee, Mr. Asselstine also served as a Co-Director of the committee's investigation of the Three Mile Island nuclear power plant accident.

From 1977 to 1978 and from 1973 to 1975, Mr. Asselstine served as a Staff Attorney with the U.S. Nuclear Regulatory Commission, and from 1975 to 1977, he served as Assistant Counsel for the Joint Committee on Atomic Energy of the U.S. Congress.

Mr. Asselstine holds a B.A. degree in Political Science from Virginia Polytechnic Institute, and a J.D. degree from the University of Virginia.



Mr. Chris BAKKEN

Project Director – Hinkley Point C, Nuclear New Build UK, EDF Energy

Mr. Chris Bakken was appointed as project director – Hinkley Point C, Nuclear New Build in March 2011. Prior to that Mr. Bakken held the position of director of operations, safety and licensing for EDF Energy in June 2009, coming from British Energy where he was chief nuclear officer region 1 since June 2006. Mr. Bakken was formerly president and chief nuclear officer of PSEG Nuclear in the U.S. and prior to that, senior vice president and chief nuclear officer at American Electric Power (AEP) in Michigan. Chris earned a master's degree in industrial administration from Carnegie Mellon University, and a Bachelor's degree in electrical engineering from Grove City College. He also obtained his senior reactor operator license during his service at the Beaver Valley power station in the U.S.



Dr. Nadira BARKATULLAH

Energy Economist, Planning and Economic Studies Section, Department of Nuclear Energy, International Atomic Energy Agency (IAEA)

Dr. Nadira Barkatullah has Masters in Economics from Carnegie Mellon University, USA and a PhD in Economics from the University of Sydney, Australia. Dr. Barkatullah is a specialist economist in infrastructure financing and regulated utility industries, having more than fifteen years of experience in applying economic concept and conducting quantitative analysis while working on projects around the globe, advising both governments and major organization. Dr. Barkatullah is currently working for the International Atomic Energy Agency (IAEA), where she is working on financing and investment analysis of capital intensive infrastructure projects, energy and sustainable development issues. She is also representing the Agency at various expert advisory committees, like the OECD Working Party on Nuclear Energy Economics.

Prior to joining the IAEA she was the former Divisional Director of London Economic's London-based international utilities practice and London Economics' associate practice for the Asia Pacific region, leading local and international projects in the infrastructure industries in relation to various issues, including, cost of capital analysis, evaluations of various funding options, tariff design, market reform, efficiency analysis, market performance, third party access, competition and liberalization. She also has several years of experience as an economist while working as Senior Manager for KPMG Australia and ACIL Consulting, as well as for Sydney Water and Energy Australia.



Mr. George BOROVAS

Partner, Head of International Nuclear, Pillsbury Winthrop Shaw Pittman LLP

Mr. George Borovas heads Pillsbury's international nuclear projects team and is based in London.

Mr. Borovas concentrates his practice on international nuclear transactions and the development of new nuclear energy projects. He is currently advising governments on the development of civilian nuclear power programs. He has worked in projects and transactions in the U.S., Europe, the Middle East, Japan, South Korea, Southeast Asia, Australia, China, Russia and South Africa and frequently lectures in

conferences worldwide with respect to the global nuclear industry.

His clients include electric utilities, governments, nuclear power plant vendors and equipment suppliers, investment banks, universities, trading companies and other major companies involved in the energy industry. He regularly negotiates contracts and advises companies on the establishment of joint ventures relating to the global nuclear industry as well as on transactions for the trading of fuel, equipment and services for nuclear power plants. He advises companies on international nuclear liability and export compliance issues and has represented buyers in transactions involving the acquisition of nuclear power plants.

Mr. Borovas has also advised U.S. and foreign companies on the U.S. Department of Energy (DOE) loan guarantee program for new nuclear power construction.

Before attending law school, Mr. Borovas was a chemical engineer for a power plant engineering firm.



Mr. Jay BRISTER

Vice President of Global Business Development, Nuclear Business Group, CH2M HILL

Mr. Jay Brister is the Vice President for CH2M HILL's nuclear power organization. With over 31 years of experience in a broad range of domestic and international civil nuclear power activities, Mr. Brister is currently responsible for CH2M HILL's nuclear power global business development. Previously, Mr. Brister provided corporate development support (operational and maintenance joint ventures, financing support), developed the operational components of the \$20B USD procurement and was responsible for assisting the Emirates Nuclear Energy Corporation (ENEC) Program for the United Arab Emirates (UAE) in the development of its capacity building strategy and educational infrastructure for Abu Dhabi to support a new nuclear industry. His recent leadership support to the ENEC provided invaluable support to the initiation of its multi-unit civil nuclear power program, with an initial complement of four NPPs by 2020, and potential expansion over the next two decades.

His broad experience in the nuclear industry ranges from nuclear operations (a former licensed operator) to acquisition of nuclear generation assets for utilities. He has been very involved in the development of new nuclear generation opportunities domestically and internationally. He has conducted nuclear power feasibility studies, risk analyses, reactor vendor negotiations, cost analysis of competing nuclear technologies, coordination of activities between nuclear and generation planning, and state and federal regulatory strategy development.

He has a B.S. degree from Thomas Edison State College in Trenton, N.J with a major in Nuclear Engineering Technology.



Dr. Al BURKART

Deputy Director, Office of Nuclear Energy, Safety and Security, Bureau of International Security and Nonproliferation, U.S. Department of State

Dr. Al Burkart is Deputy Director of the Office of Nuclear Energy, Safety and Security, Bureau of International Security and Nonproliferation, Department of State. He has been with the U.S. Government for over 35 years in a variety of positions related to nuclear weapons, nuclear energy and nuclear nonproliferation. His particular current areas of focus are international nuclear cooperation, proliferation resistance and advanced nuclear technologies. He currently serves as Co-Chairman of the Infrastructure Development Working Group of the International Framework on Nuclear Energy Cooperation (IFNEC) and is a member of the IAEA's Technical Working Group on Nuclear Power Infrastructure. He is a member of the American Nuclear Society and has served on the Special Committee on Nuclear Nonproliferation and the International Committee.

Dr. Burkart has a B.S. and a Ph.D. in Nuclear Engineering from North Carolina State

University. He is also a Distinguished Graduate of the Industrial College of the Armed Forces. He is a licensed Professional Engineer in the State of Virginia.



Ms. Anita CAPOFERRI

Deputy Assistant General Counsel for Civilian Nuclear Programs, Office of General Counsel, U.S. Department of Energy

Ms. Anita Capoferri has over 20 years of experience with the U.S. Department of Energy in the field of energy law, with an emphasis on areas related to nuclear energy programs and regulation, radioactive waste management, nuclear liability, nuclear nonproliferation, environment, administrative procedure, and litigation.

Ms. Capoferri holds a B.A. degree in Philosophy from the University of Pittsburgh and a J.D. degree from the University of North Carolina.



Mr. Carl CHO

Industry Specialist - Power & Utilities, Citigroup Global Markets, Inc.

Mr. Carl Cho provides Power-related industry content and client relationship support to Citi's Corporate and Investment Banking regional offices, most recently in South Africa, Latin America, Southeast Asia, Hong Kong, mainland China, and Central and Eastern Europe. Recent topics of discussion with clients have included: cross-border investment in thermal and renewable generation, regulatory and power market criteria conducive to outside capital, new nuclear financing considerations, and rating agency and funding capacity analysis.

Mr. Cho is also responsible for Specialized Industry approval on corporate and project financings in the Power & Alternative Energy sectors, opining on the financial, technical, regulatory, market and environmental aspects of corporate debt, project finance, leveraged finance, leasing, tax equity and structured commodities transactions.

Prior to assuming the Industry Specialist role in 2011, Mr. Cho was a Senior Credit Officer and the Portfolio Manager for the Power sector in North America. He also spent 12 years in Structured Finance developing, marketing and executing joint venture and lease financings primarily for Energy and Power clients.

Mr. Cho attended the University of Pennsylvania, where he graduated with a BA in Sociology in 1986.



Mr. Adrian COLLINGS

Senior Adviser, World Nuclear Association & Director, World Nuclear University Summer Institute

Mr. Adrian Collings has worked on international matters in the nuclear industry for the past twenty-five years. Between 1987 and 1997 he was Head of International Relations in the Central Electricity Generating Board and Nuclear Electric (subsequently British Energy). Between 1987 and 1990 he worked closely with the late Lord Marshall on the establishment of the World Association of Nuclear Operators (WANO). He was also responsible for establishing and managing the Nuclear Electric/British Energy Office in Brussels. From 1997-2000, he worked as an independent consultant, advising Japanese and UK companies on European energy policy developments.

At the end of 2000, he joined the World Nuclear Association, as Director of Policy Development. Since 2010, he has been Senior Adviser at the World Nuclear Association and Director of the World Nuclear University Summer Institute.



Mr. Chris CONBOY

Regional Head of Nuclear, Middle East, Atkins Global

Mr. Chris Conboy is a Chartered Chemical Engineer and Regional Head of Nuclear for Atkins in the Middle East. His responsibilities encompass all aspects of the Atkins nuclear business in the region, including strategy setting, business development, bidding, client relationship management and project delivery.

Mr. Conboy is also a member of the UAE-UK Joint Economic Committee sitting on the Energy Working Group.

Mr. Conboy is an experienced leader and project manager with a proven track record in the delivery of projects to cost, quality and schedule.

Prior to his role in the Middle East Mr. Conboy was a senior member of the Atkins nuclear business in the UK where he ran one of their operations. He was responsible for leading a multimillion pound business comprising a multidisciplinary team of engineers, scientists and project managers delivering projects to nuclear new build, generation, decommissioning and cleanup, and defence clients.



Ms. Karen DAWSON

Director, Energy & Utilities, PricewaterhouseCoopers

Karen Dawson is a Director in PricewaterhouseCoopers London based Energy & Utilities Strategy centre of excellence. She has over 20 years of experience in the provision of strategic, commercial and financial advice to participants and stakeholders in the sector. She specializes in leading large, complex assignments covering restructuring, market development, regulatory change and IPP transactions and has worked in over 30 countries worldwide.

In the nuclear sector, her clients have included Government, regulators, nuclear generators and nuclear service companies across Europe and further afield. She has advised on a wide range of issues relating to the position of nuclear generation in changing markets and on issues impacting different components of the nuclear life cycle. Examples include advising utilities on the development of new approaches to contracting, risk assessment and risk mitigation for new nuclear build, the role of existing nuclear plant as competitive generation markets develop over time and the determination of appropriate contracting, pricing and bidding strategies to achieve company objectives. She has advised on the issues associated with setting up funded decommissioning plans, adaptation of performance measurement strategies as regulatory and market conditions change and on the valuation of nuclear assets and contract portfolios.

Karen is a mathematician by background with a degree in Mathematics with French from London University, Westfield College and an MSc in Management Science from London University, Imperial College.



Ms. Maëlia DUFOUR

Head of Department Key Accounts, State Guarantees Directorate, Coface

Ms. Maëlia Dufour has been working in Coface State Guarantees Department since 1984 and has a worldwide experience working on export credit guarantees and dealing with exporters, banks and foreign buyers on commercial and financial projects.

Ms. Dufour has worked in all the geographic departments of Coface as well as in the Military Affairs Department.

She was the Head of Certification ISO 9001 project for Coface State Guarantees Department and then became Head of the Clients requests, Quality and Statistics Department.

In 2006, Ms. Dufour rose to the position of Head of Division of Paris Club Rescheduling Agreements.

In 2007, she became the Head of Division of geographic desks (Africa, Americas, Asia, Europe and Oceania), and since 2008 is Head of Division of Key Accounts (Energy and nuclear power, Telecom, Space, Project Finance, Engineering, Buildings, Public works and Capital goods).

She has represented Coface in several missions in China, Russia, Brazil, and Iran and since 2008 has participated as a speaker in several international conferences including Trade and Project Finance in Moscow, Middle East Project Finance in Manama and Dubai, Exporta Conference in Cape Town and Global Annual Export Finance Conference in Berlin. She has participated in the Bern Union Workshop on Project Finance in Amsterdam and a specific nuclear business trip in South Africa.

She holds a Master Degree in Economics and International Business obtained from Paris-Sorbonne University, France.



Ms. Jessica FARMER

Director, Structured Finance Division, Export-Import Bank of the United States

Ms. Jessica Farmer joined Ex-Im Bank in 2000 under a year-long Associate program. In 2001 she joined the Bank's Asset Management Division as a Loan Officer, and in 2003, Ms. Farmer joined the Project Finance Division, now known as the Project and Structured Finance Division. She was promoted to Director, Project and Structured Finance Division in March of 2011.

In her time in the Project and Structured Finance Division, Ms. Farmer has worked on a range of project structures in a host of industries and countries. In 2006 she received Board approval for a \$500 million Ex-Im Bank loan guarantee to support the construction of the Reliance Petroleum Ltd. refinery project in Jamnagar, India, which is now part of largest refinery complex in the world. Ms. Farmer also currently manages the Bank's exposure to its largest borrower, Petróleos Mexicanos (Pemex) of Mexico, and has underwritten over \$6.4 billion in loans and guarantees to assist in Pemex's oil and gas exploration, production and refining processes.

Today, in addition to negotiating loans for the Bank's largest customers, and creating responsive credit structures for target markets and customers, Ms. Farmer also supervises underwriting of project and structured financings across a staff of eight.

Before joining Ex-Im Bank, Ms. Farmer served for two years as a Peace Corps volunteer in Mauritania, West Africa. She holds a Bachelor of Arts degree in French Literature, Cum Laude, from the University of Colorado at Boulder and a Master in International Affairs, specializing in Economic and Political Development and International Finance, from the School of International and Public Affairs at Columbia University in New York.



Mr. Tim FAYERS

Senior Vice President, Risk Management Practice, Marsh Limited

Mr. Tim Fayers is a senior vice president in the Power Nuclear Utilities & Mining team of the Risk Management Practice of Marsh Ltd in London and a member of the global Marsh Nuclear Practice, advising operators, contractors and regulatory authorities on the insurance aspects of working in a nuclear environment globally.

Mr. Fayers is a Fellow of the Chartered Insurance Institute and a Chartered Insurance Practitioner with over 40 years insurance industry experience. Mr. Fayers has worked in the UK, Jamaica, Botswana, Indonesia and Japan, on a wide range of complex multinational insurance programmes.



Mr. Daniel GROSVENOR

Partner, Head of Nuclear, Deloitte UK

Mr. Daniel Grosvenor leads the UK firm's work in the nuclear sector and is a partner in Deloitte's Corporate Finance Energy and Resources team. During his career Mr. Grosvenor has advised Governments, utilities and the supply chain in the international nuclear industry throughout the nuclear life cycle from nuclear new build to decommissioning and waste management. His work has included feasibility studies, funded decommissioning programmes, financing plans, M&A transactions as well as advising the UK Government on the restructuring of the civil nuclear industry. Mr. Grosvenor's work has involved advising clients in the UK, Middle East, Japan, Poland, Slovakia, China and USA.



Mr. Peter HALL

Partner, Norton Rose LLP

Mr. Peter Hall is based in London but his projects portfolio is global. Mr. Hall has extensive legal experience in the nuclear sector. He regularly acts for governments and government agencies as well as utilities, developers and contractors involved in the nuclear industry. His work in the nuclear industry covers the nuclear lifecycle from new build to decommissioning and waste management; including advising on nuclear feasibility studies; financing; contract structures and terms and conditions; nuclear liabilities and insurance; waste management; environmental concerns and advice on regulatory regimes.

Mr. Hall read law at Bristol University and joined Norton Rose in 1985. He obtained an Msc in Construction Law and Arbitration from Kings College, London in 1992 before becoming a partner in 1994. Mr. Hall is a past lecturer at the Centre of Construction Law and Management at Kings College, University of London and a member of the International Nuclear Lawyers Association.



Ms. Claire HARVEY

Consultant, Prospect Law Ltd

Ms. Claire Harvey joined Prospect Law from US firm Squire Sanders Hammond. She was formerly head of legal at United Kingdom NIREX Limited (formerly the Nuclear Industry Radioactive Waste Executive). Ms. Harvey has specialist expertise of domestic and international Nuclear Regulatory Law including the transport and storage of radioactive substances. She has wide experience advising on the regulatory aspects of Nuclear New Build (including the NPS) and nuclear supply contracts, and of advising Tier 1 contractors in Nuclear Decommissioning. Ms. Harvey also advises on International Law and the application of International Treaties including Nuclear Liability Conventions. She has presented at International Nuclear Lawyers (INLA) Congress, industry and intergovernmental meetings and is a Member of the International Nuclear Law Association and the Nuclear Institute (Management Committees). Ms. Harvey works with INLA, the Nuclear Industry Association, the World Nuclear Association, Ciria and UKELA.



Mr. Paul HOLLIDAY

Managing Director, Construction and Real Estate Practice, Marsh Limited

Mr. Paul Holliday is Managing Director within the Construction and Real Estate Practice of Marsh and has day to day responsibility for the London International Construction Division. He is a specialist in the Power sector with current responsibility for the nuclear sector. Mr. Holliday supplies support to Marsh offices globally and to clients directly in the development, placement and subsequent management of nuclear construction projects.

Mr. Holliday first joined Marsh in 1986 from Gulf Oil Corporation where he had spent 8 years in their Risk and Insurance Division in London handling their onshore and

offshore energy risks in Europe, North Sea and Africa. Previously, Mr. Holliday spent 5 years at British Petroleum's captive insurance company specializing in marine and offshore insurance.

Since joining Marsh, Mr. Holliday has been exclusively involved in Energy Construction insurance, latterly specializing in insurance requirements for limited recourse financed, Independent Power Projects. Since 1991, his involvement in the IPP field has encompassed advising Project Developers and Contractors, placement in the insurance market, and acting as Lenders Insurance Advisor.



Dr. Yves KALUZNY

Senior Advisor, International Relations, Commissariat à l'énergie atomique (CEA)

Dr. Yves Kaluzny has held the position of Senior Advisor to the International Relations director of the CEA since 2009, contributing in particular on the nuclear fuel cycle issues. He is currently co-chair of the Reliable Nuclear Fuel Services of IFNEC. Previously, he held several positions in the French Administration and in the nuclear industry. From 1987 to 1991, Dr. Kaluzny worked in the Safety Authority in charge of the licensing of facilities of the fuel cycle and of facilities for radioactive waste management; from 1991 to 1994, he managed the Nuclear Affair Department in the General Directorate for Energy. He was CEO of ANDRA (National Agency for Radioactive Waste Management) from 1994 to 2000 when he joined AREVA in the nuclear fuel division and then as R&D VP of AREVA NP. In 2007, he was appointed as VP in charge of international affairs in the Nuclear Energy Division of the CEA.

Dr. Kaluzny is a graduate of the Ecole Normale Supérieure, and holds a PhD in quantum optic Physic.



Mr. Edward KEE

Vice President, NERA Economic Consulting

Mr. Edward Kee is an expert on nuclear power economics. He provides strategic advice to companies and governments on issues related to nuclear power and the electricity industry.

He has also provided testimony as an expert witness in US state and federal court, before the Federal Energy Regulatory Commission, in international arbitration cases and before other legal and regulatory bodies.

He previously held consulting positions at CRA International; PA Consulting Group; Putnam, Hayes & Bartlett; and McKinsey & Company.

He was a merchant power plant developer before becoming a consultant. During his service as a Naval Officer, he was on the construction/commissioning crew of the USS Carl Vinson (CVN-70) and was qualified as chief engineering officer on Nimitz-class nuclear aircraft carriers.

Mr. Kee holds an MBA from Harvard University and a BS in Systems Engineering (Distinction; Trident Scholar) from the U.S. Naval Academy.



Mr. Michael E. KIRST

Vice President, Strategy and External Relations, Europe, Middle East and Africa, Westinghouse Electric Company

Mr. Michael E. Kirst is the Vice President for Strategy and External Affairs for Europe, the Middle East and Africa. Prior roles in Westinghouse include Vice President for Central and Eastern Europe; Director, Central and Eastern European Fuel for Westinghouse's European Fuel Business and Director, Government and International Affairs for Westinghouse in Washington D.C.

Prior to joining Westinghouse in 1996, Mr. Kirst was Director of the Economic Committee of the NATO Parliamentary Assembly in Brussels, Belgium responsible for advising members of parliament from the NATO member nations and representing the Atlantic Alliance in international fora and throughout the former Soviet Union. Mr.

Kirst began his career as a Legislative Aide to Congressman Leon E. Panetta where he was responsible for issues within the jurisdictions of the Budget, Banking and Energy and Commerce Committees.

He is a member of the Executive Committee and Board of Directors of the US-Ukraine Business Council and a member of the Nuclear New Build Working Group of FORATOM in Brussels.



Mr. Tomasz KWIATKOWSKI

Director of Investment, PGE Energia Jądrowa S.A.

Mr. Tomasz Kwiatkowski is an engineer, consultant and manager with 19 years of work experience in utility, oil & gas and heavy industry sectors. He has direct experience in investment preparation and execution, both from technical and economic perspective. Significant knowledge of Polish utility market and issues faced by companies operating in this sector. In the past, Mr. Kwiatkowski was director at PwC Poland, responsible for Polish Utility Sector. Currently, he is an Investment Director at PGE Nuclear.

Mr. Kwiatkowski earned his MBA qualification from Warwick University and B. Eng. in Mechanical Engineering from Newcastle University.



Mr. Hongbo LIU

Deputy Director, Project Appraisal Department I, China Development Bank

Mr. Hongbo Liu, now is the Deputy Director of Division I(one), Project Appraisal Department I(one), China Development Bank. He graduated from Tsinghua University with a bachelor degree in Energy, Power System and Automation and then obtained his master degree in Engineering Thermal Physics in 2006.

Mr. Liu has been engaged in loan project evaluation for six years in the energy sector including the coal, oil, natural gas, coal chemical, and electric power industries. To date, he has conducted more than 50 loan projects evaluations. More than 50 billion USD long-term and medium-term loans were examined and approved within these projects.



Mr. Paul LUND

Vice President, Senior Credit Officer, Moody's Investors Service

Mr. Paul Lund is a senior analyst in Moody's Project and Infrastructure Finance Group, which he joined in May 2011. He is lead analyst for the Scandinavia based utilities, and is involved in seaport ratings, complex infrastructure transactions and project finance.

Before joining Moody's, Mr. Lund was at Standard & Poor's Ratings Services, where he was a senior analyst, covering utilities, infrastructure companies and project finance transactions. During his career there, Mr. Lund coordinated global utilities outreach, and spearheaded the credit analysis of renewable energy regulation, before becoming team leader for the cross practice Whole Business Securitisation and Real Estate groups.

Prior to that, Mr. Lund worked at The Long-Term Credit Bank of Japan as a utility and project finance analyst, and in the capital management function at NatWest Markets corporate banking group.



Mr. Cristian MACOVEI

Vice President, Nuclear Agency & Radioactive Waste, Romania

Mr. Cristian Macovei was appointed as Vice President of Nuclear Agency & Radioactive Waste on December 23, 2010. Previously, between April 10, 2009 and the date of appointment to current position, he was Director of Cabinet of the President of Nuclear Agency President.

Chemist by profession, Cristian Macovei graduated “High School of Informatics” in Bucharest (1992-1996), and the Chemistry Faculty at Polytechnic University of Bucharest (general studies from 1996 to 1998).

Between 1999-2002 he attended the Faculty of Chemistry at the University “Pierre et Marie Curie Paris VI”, where he earned successive degrees of BSc, MSc and diplôme d’études approfondies in the field. In 2008 he earned a PhD in chemistry at Paris Sud Orsay University.

Between 2005 and 2008 he worked as a researcher at the Atomic Energy and Alternative Energies Commission (CEA) in Saclay, France.

He speaks English and French fluently.



Mr. John MATHIESON

Head of International Relations, UK Nuclear Decommissioning Authority (NDA)

Mr. John Mathieson is the Head of International Relations with the UK’s Nuclear Decommissioning Authority (NDA) accountable for developing and implementing its international relations strategy. He is responsible for understanding the nuclear power and radioactive waste management policies and programmes in other countries and identifying opportunities for technical co-operation. He is further responsible for managing the relationships with counterpart organisations such as the USDOE.

Mr. Mathieson is co-chair of the Infrastructure Development Working Group of the International Framework for Nuclear Energy Cooperation. He also works closely with the IAEA and OECD / NEA, participating in a number of expert missions, technical meetings and working groups. Mr. Mathieson is the UK representative on the European Union’s Club of Waste Management Agencies.

Mr. Mathieson has also worked with other EU nuclear and radioactive waste management organisations in assisting the governments of many Central and Eastern European countries, and Russia and Ukraine, develop their financing, decommissioning and radioactive waste management strategies.

He is a Board Director and Secretary of Waste Management Symposia Inc. which runs the annual Waste Management conference in Phoenix.

Before joining the NDA in 2007, Mr. Mathieson worked with Nirex for 17 years in several roles, including business development and international relations. Prior to that he was with CEGB / Nuclear Electric (now EDF Energy) for 14 years as a health physicist, working initially at Dungeness B nuclear power station and then the Health and Safety Department.



Mr. Edward MCGINNIS

Deputy Assistant Secretary, International Nuclear Energy Policy And Cooperation, Office of Nuclear Energy, U.S. Department of Energy

Mr. Edward McGinnis is responsible for the Department of Energy’s international civilian nuclear energy activities, including international nuclear energy research, development and demonstration cooperation, international framework and partnership development, international nuclear energy policy, and other international civilian nuclear energy-related activities carried out by the Department of Energy’s Office of Nuclear Energy. As part of these responsibilities, Mr. McGinnis serves as Steering Group Chairman of the International Framework for Nuclear Energy Cooperation that consists of more than 60 countries and serves as the Departmental

Representative to the U.S. Trade and Promotion Coordination Committee on civil nuclear energy matters. Within the Office of Nuclear Energy, Mr. McGinnis has also served as a Vice Chairman and Principal U.S. Representative to the Generation IV International Forum and was responsible for US domestic nuclear fuel assurance matters, including technical oversight activities regarding the United States Enrichment Corporation, uranium inventory management matters, as well as US nuclear energy security matters.

Prior to working in the Office of Nuclear Energy, Mr. McGinnis led a number of other high priority United States Government initiatives at the Department of Energy, including having served as the senior Director for the office of Global Radiological Threat Reduction where he managed global operations involving the search, recovery, security and disposal of high-risk radiological and nuclear sources in cooperation with over 40 countries, including within the U.S. These activities included recovery of high-risk radiological sources from Iraq, establishment of a Global Radiological Regional Partnership Program, and the first-of-its-kind repatriation of high-risk U.S.-origin plutonium-239 sources. Mr. McGinnis also established and served as the Director of the Nuclear and Radiological Threat Reduction Task Force which was created to carry out a number of key Secretarial national security initiatives, including the development of a global nuclear materials removal and research reactor security study that included the identification of nuclear research reactors throughout the world by level of vulnerability and an action plan to effectively mitigate such vulnerabilities.

Prior this, Mr. McGinnis served as senior advisor and special assistant to four Assistant Secretaries and Deputy Administrators for nonproliferation and national security at the Department of Energy where he served as a senior advisor for all aspects of the Department's nonproliferation missions, including nonproliferation research and development, materials protection, control and accounting, and warhead security.

Mr. McGinnis holds a master's degree from The American University's School of International Service in Washington, D.C., and is a graduate of the Kennedy School's Senior Executive Fellows Program as well as the Program for Senior Executives in National and International Security at Harvard University.



Dr. Charles MILLER

Principal Nuclear Safety Consultant, Advanced Systems Technology & Management, Inc.

Dr. Charles Miller has 38 years of experience in the nuclear field including a number of executive positions held at the NRC over his 31 year tenure. His most recent position was the Director of the Office of Federal and State Materials and Environmental Management Programs where he had responsibility for nuclear materials safety and security, decommissioning of nuclear facilities, uranium recovery, agreement state programs, environmental impact analysis, and associated rulemaking activities. His career at NRC encompassed all aspects of the agency's regulatory duties including extensive licensing experience in both reactors and materials as well as emergency planning and response. Following the accident at Fukushima, Dr. Miller led the NRC near term task force which provided recommendations to the Commission for enhancing safety in the 21st century. Prior to joining NRC, he worked in commercial industry in the areas of nuclear fuel cycle and reactor design.

Dr. Miller is currently a senior nuclear safety consultant with AdSTM, where he is focused on human resource development and Fukushima lessons learned for the International Regulatory Development Program (IRDP) for regulatory bodies in emerging nuclear countries. He has currently conducted sessions in Asia.



Mr. Paul MURPHY

Senior Attorney, Milbank, Tweed, Hadley & McCloy LLP

Mr. Paul Murphy's practice focuses on multiple aspects of the nuclear industry – from legal and policy matters, including international regulatory and treaty frameworks and issues regarding nuclear liability, to strategies for creating viable nuclear power programs and the identification and mitigation of associated risks – representing developers/owners, investors, and contractors on nuclear projects internationally. Mr. Murphy is recognized as an expert in the development and financing of nuclear power programs by the International Atomic Energy Agency (IAEA), the OECD's Nuclear Energy Agency (NEA) and the US government. Mr. Murphy currently serves on the IAEA's Technical Cooperation Program team, which assists member states in developing civilian nuclear power programs. Mr. Murphy has served as a designated expert, chairman, and author at several special meetings and for multiple working groups of the IAEA, primarily involving the development, financing, and structuring of nuclear power projects. He continues to work with the IAEA in a number of key areas, including a current revision of the IAEA's *Handbook on Nuclear Law* and as lead author for a new report to be released in the next few months, entitled, *"Alternative Contracting and Ownership Practices for Nuclear Power Plants"*.

Mr. Murphy serves on the US Secretary of Commerce's Civilian Nuclear Trade Advisory Committee, and he chairs its Finance subcommittee. In addition, Mr. Murphy recently served as the US Government's sole representative on an NEA working group on *"Financing of Nuclear Power Plants"*, acting as chairman for the working group. Mr. Murphy also chaired the IAEA working group that issued, *"Issues to Improve the Prospects of Financing Nuclear Power Projects."* For the last three years, Mr. Murphy served as a faculty member for the *"Training Course on Nuclear Power Infrastructure Programs and Related Projects in Emerging Nuclear States"*, held on behalf of the US State Department and the IAEA at the Argonne National Laboratory and attended by representatives of over 20 foreign governments.



Lord O'NEILL of Clackmannan

Former Member of Parliament and Former Chairman, UK Nuclear Industry Association (NIA)

Martin O'Neill was a Labour Member of Parliament from 1979 to 2005, for constituencies located in the Forth Valley and the Ochils. His posts included Spokesman on Scottish Affairs; Shadow Defense Secretary; and Shadow Minister for Energy. In 1995 he began a ten-year stint as Chairman of the influential Trade and Industry Select Committee.

Lord O'Neill was educated in Edinburgh and went on to Heriot-Watt University where he gained a BA degree in Economics. Before becoming an MP, he worked as a High School teacher in Edinburgh and was a Social Science tutor at the Open University. At the May 2005 general election Lord O'Neill retired from the House of Commons, and was subsequently created a life peer, Baron O'Neill of Clackmannan. He served on the House of Lords Science and Technology Select Committee for three years. Lord O'Neill recently came to the end of a four-year stint as Chairman of the Nuclear Industry Association. He is currently President of the Specialist Engineering Contractors Group. He is also honorary President of Energy Action Scotland and an honorary Vice-President of National Energy Action, and acts as consultant to a number of engineering and construction industry trade associations. In 2011 he received an honorary degree from Heriot-Watt University.



Mr. Lauri PIEKKARI

Senior Vice President & Treasurer, Teollisuuden Voima Oyj (TVO)

Mr. Lauri Piekkari is Senior Vice President and Treasurer of TVO. He has a M.Sc. degree from the Helsinki School of Economics, Finland. He joined TVO in 2002. Before joining TVO, he has gained in-depth knowledge of capital markets, structured finance, financial engineering and corporate treasury. His experience of more than 20 years stems from both banking and corporate sides of the business.



Mr. Gareth PRICE

Partner, Global Co-Head of Energy and Global Head of Projects. Allen & Overy LLP

Mr. Gareth Price is Allen & Overy's Global Co-Head of Energy and Global Head of Projects. Mr. Price has a particular interest in low carbon energy solutions, including transactions in the renewables and nuclear sectors. Mr. Price advises all participants, including governments, lenders, developers, contractors and secondary market purchasers, on all aspects of energy and infrastructure assets around the world. Mr. Price also has a wealth of structured finance experience and is able to draw on this in assisting clients in putting together financing proposals, from the most simple senior debt offerings through to multi-source financings involving some or all of ECA finance, senior and mezzanine bank debt, PIK, PIYC and debt capital markets issues (wrapped and unwrapped, listed and unlisted).



Mr. Alain-Pierre RAYNAUD

Chairman & CEO, AREVA UK

Mr. Alain-Pierre Raynaud has been Chairman of AREVA UK since 2011. He is a graduate of the Institut d'Etudes Politiques in Paris and holds a doctorate in Economics. He began his career as a financial analyst and was head of the Italian subsidiary of the Worms Bank before moving to Renault in 1987. He became Head of Financial Operations, and subsequently Chief Controller Officer and a member of the group's Management Committee.

In 2003, he moved to Japan as a member of the Executive Committee of Nissan, where he was in charge of the Cost Control and IT Services Departments and of the group's financial operations. In September 2006, he became AREVA's Chief Financial Officer.



Ms. Fiona REILLY

Partner & Head of Nuclear Services, Norton Rose LLP

For over 15 years, Ms. Fiona Reilly has been involved with projects in the nuclear industry. She remains a highly regarded specialist in the nuclear market. She is familiar with and has worked on all aspects of the nuclear cycle from new build and licensing to decommissioning, fuel storage and waste management.

She has a detailed understanding of the international regulatory framework within which the nuclear industry works and frequently advises on liability regimes and nuclear insurance, regulatory and reporting requirements, the development of regulatory regimes, feasibility studies and structuring as well as contracts and relating to the financing, development, construction, operation and maintenance of nuclear stations and the fabrication, reprocessing and storage of nuclear fuel and waste.

In the last year she has advised on, among other matters: (i) the investment and financing of a nuclear new build project in the UK; (ii) a banking/ investment feasibility study to attract international investment into the development, construction and operation of the Baltic nuclear power project; (iii) detailed technical contracts on the reprocessing of nuclear fuel, the fabrication of nuclear fuel and the transfer of the right to use plutonium; and (iv) bidding structures and bidding as a consortium for the

EPC new build and Fuel Supply for a new nuclear power plant in the Central Europe. Prior to joining Norton Rose, Ms. Reilly worked for ALSTOM. While there she was seconded to Sizewell B Nuclear Power Station as Contracts Manager for a joint venture of ALSTOM and Framatome and she also spent time working on nuclear projects at the Wylfa site in the UK.

She is a Solicitor Advocate, holds an LLB in Law and an LLM in International Business Law. She is also a MCI Arb, a member and former Committee member of Technology and Construction Solicitor's Association and a member of the IBA, International Nuclear Lawyers Association and Women in Nuclear.



Mr. Jacques SACRESTE

Director, Project Development Department, Electricité de France (EDF)

Mr. Jacques Sacreste has occupied from 1982 to 1994 various management positions within the Nuclear Operation Division.

Among other positions he served as Head of Controlling in Cattenom Nuclear Power Plant (4 X 1300 MW) in eastern of France. He has been nominated at Corporate Level in charge of the implementation of the EDF nuclear fleet controlling, benchmarking and performance information system.

From 1994 to 1997 he was assigned to China in the first sino-foreign 3000 MW green field coal power project developed successfully in Shandong province in cooperation with a Chinese partner. Within this international project team he was EDF O&M project manager responsible for the negotiation of O&M, Fuel Supply, and Power Purchase agreements.

Back in France and after 2 years in the Finance Division he was nominated as member of the EDF Nuclear Generation Division Executive Committee in charge of Economy and Controlling.

In 2002 and up to 2005 he was General Manager of EC Krakow in Poland (a 1260 MWth / 460MWe cogeneration plant owned by EDF).

Mr. Sacreste is now in EDF International Development as Director, Projects Development Department, in charge of the development of the EDF international nuclear projects.



Mr. David SCOTT

Executive Director of Economic Affairs, Executive Affairs Authority, United Arab Emirates

As Executive Director of Economic affairs for the Executive Affairs Authority, Mr. Scott provides strategic economic policy advice Abu Dhabi's Executive Council Chairman.

Mr. Scott has worked in the Middle East region bringing a unique policy perspective based upon combined government and private sector work experience.

Mr. Scott worked as regional VP for Occidental. He also served at the White House as the National Security Council's Director for Arabian Peninsula and North Africa.

He graduated from Brigham Young University and is a former graduate fellow with the Center for Arabic Studies at American University of Cairo.



Ms. Tania TSONEVA

Associate Director, Standard & Poor's

Ms. Tania Tsoneva is an Associate Director in the Utilities team, Corporate Ratings at Standard & Poor's. She covers as a credit analyst a portfolio of mid- and large-scale utilities among which nuclear operators in Central, Eastern and Southern Europe. She is also a specialist in the U.K. regulation for the gas, electricity and water sectors, and U.K. renewable energy generation.

Ms. Tsoneva holds an MBA degree from Sir John Cass Business School, City University and is a CFA charter holder.



Dr. Pat UPSON, CBE

Former Managing Director, Enrichment Technology Corporation (ETC)

Dr. Pat Upson started work for BNFL at Sellafield in 1973, after graduating from Imperial College with a degree in Chemical Engineering and PhD.

Dr. Upson has served the UK Nuclear Industry in a number of Executive roles over the past 25 years, in BNFL, then the Urenco Group, finally retiring in 2010 from the role of CEO in the Enrichment Technology Company. He now works as a Nuclear Consultant, working in various sectors, including non-proliferation, Nuclear Insurance and Decommissioning.

In the Early 2000s, Dr. Upson was Chairman of the LES Partnership and oversaw their successful application for a license to build a uranium enrichment plant in New Mexico.

Dr. Upson served as President of the British Nuclear Energy Society from 1994 to 1997 and as President of the European Nuclear Society in 1999 and 2000. Currently he serves as Chairman of the National Skills Academy, Nuclear for the South and South East of England and has served as Chairman of the WNA Working Group on Security of Supply in the Nuclear Fuel Cycle since 2004.



Mr. Alec VAN DEN ABEELE

Director, AVDA Consult Ltd; Former Director, Corporate Insurance Department Group, GDF SUEZ sa; Representative of ONEIL/NEIL Ltd

Mr. Alec van den Abeele began his career in London, in 1966, when he joined the Lloyd's Broker, Bland Welch Ltd. In 1970, he joined the Group Fester & Mund – Henrijean – Marsh & McLennan as a Director in Antwerp, Kinshasa and Brussels.

In 1986, he moved to the Utility INTERCOM as head of the Insurance Department. In 1990, INTERCOM merged with the other Belgian Utilities EBES and UNERG to form ELECTRABEL, and Mr. van den Abeele became the Insurance Manager of the new company.

In 1995, ELECTRABEL and TRACTEBEL, its mother company, created a common insurance department under Mr. van den Abeele's leadership; his responsibilities were then extended to the Real Estate Activities of the Group. In 2003, following the merger of TRACTEBEL with the French Group SUEZ, Mr. van den Abeele was named Corporate Insurance Director of the SUEZ Group.

In July 2008, when SUEZ merged with GAZ DE FRANCE to become GDF SUEZ s.a., Mr. van den Abeele was appointed Director Corporate Insurance Department consisting of 45 Insurance Specialists located mainly in Brussels, Paris, Houston, Luxembourg, Buenos Aires, Dubai, Bangkok and several other European and U.S. locations.

Mr. van den Abeele who was also Managing Director of the Group's reinsurance captive, now called GDF SUEZ RE, retired from the Group in March 2010; he then formed AvdA Consult Ltd. active as a specialized Insurance and Reinsurance Consultant.



Mr. Michael WALLACE

Senior Advisor, Center for Strategic and International Studies (CSIS); Former Vice Chairman and COO, Constellation Energy

Mr. Michael "Mike" J. Wallace retired in April, 2011 as Vice Chairman and COO of Constellation Energy and Chairman of Constellation Energy Nuclear Group, which includes nuclear generation of 3,869 megawatts, three sites, and five units in two states. In addition, in his capacity as COO, Mr. Wallace had direct responsibility for several different business groups including the wholly owned subsidiary, Baltimore Gas and Electric (BGE), and the company security organization; moreover, he had responsibility for a number of corporate wide operational activities from 2008 until retirement.

Prior to joining Constellation Energy Group, Mr. Wallace was Managing Director of Barrington Energy Partners, LLC, a strategic consulting firm specializing in energy industry transactions and advisory services. He co-founded the firm in 1998 and has advised energy company executives on mergers and acquisitions, transaction financing, and market and investment opportunities.

Before joining Barrington Energy, Mr. Wallace had 25 years of senior executive and utility operations experience. From 1993 to 1999, he was Senior Vice President with Unicom/ComEd of Illinois, a \$7 billion utility serving 3.4 million customers. He was also ComEd's Chief Nuclear Officer, responsible for the operation of the company's 12 nuclear generating units at six power plant sites.

Mr. Wallace began with Unicom/ComEd in 1974 as a principal engineer, managing various responsibilities associated with the design, procurement, and construction of power plants. He became Plant Manager in 1979, then Executive and Manager in 1982, and Vice President in 1990. In his tenure he had responsibility for the completion of the Braidwood and Byron Nuclear Stations of Commonwealth Edison.

Mr. Wallace has a Bachelor's in Science in Electrical Engineering from Marquette University and a Masters of Business Administration from the University of Chicago, with a specialization in finance. He also served as a naval officer in the U.S. Navy nuclear submarine force.

In recent years he held positions as Chairman of the Nuclear Energy Institute's (NEI) Security Working Group, Chairman of the Nuclear Sector Coordinating Council under the Department of Homeland Security's National Infrastructure Protection Plan, has served as Chairman of the Partnership for Critical Infrastructure Security (PCIS), Member of NEI's New Plant Oversight Steering Committee, Director of Nuclear Electric Insurance Limited (NEIL), and Chairman of UniStar Nuclear Energy.

Since June, 2011, Mr. Wallace has served as a Senior Advisor for the Center for Strategic and International Studies (CSIS), and as co-chairman of the Commission on Nuclear Energy in the U.S.



Mr. Roger WOOD

Managing Director, Moelis & Company

Mr. Roger Wood is a Managing Director at Moelis & Company, focused on Power and Infrastructure. He joined Moelis & Company in 2010 after 5 years as Head of North American Utilities and Infrastructure, and Global Co-Head of both Utilities and Infrastructure at Rothschild. Prior to this he was a Managing Director in the Mergers & Acquisitions Group at Citigroup, and he previously worked in Energy Investment Banking at JP Morgan in New York and London. He began his professional career in the 1980s as a member of JP Morgan's Mergers and Acquisitions Group in London. His nuclear-related experience includes advising the Government of Canada on the restructuring of Atomic Energy of Canada Limited; Constellation Energy on the sale of 49.9% of Constellation Energy Nuclear Group to EDF; Constellation Energy on the formation of its UniStar Nuclear Energy joint venture to develop and build new nuclear plants in North America; British Energy on the sale of Bruce Power (Canada)

and AmerGen (U.S.); and New York Power Authority on the sale of its Indian Point 3 and FitzPatrick power plants. He holds a first class degree in Modern History from University College, Oxford.



Mr. Shigehiro YOSHINO

Head of Paris Office, Chief Representative for Europe, Middle East and Africa Region, Nippon Export & Investment Insurance (NEXI)

Mr. Shigehiro Yoshino has occupied his current position since August 2009, and is responsible for a wide range of activities in the regions, including project finding, business consultation, market & country risk monitoring, and the related international official framework (OECD, Paris Club, etc.). In the past (1994-1995), he has experience in trade insurance and was involved in several Paris Club rescheduling of South America, Russia and Eastern European countries.

Prior to joining NEXI, he was an official at the Ministry of Economy, Trade and Industry (METI) for many years (1992-2008). There he was involved in various policy fields, especially in the general policy planning of natural resources and energy as a head of the Deputy Director. This quite long experience in the energy field brings him to play a potent role in NEXI's policy and business.

He has a degree in Economics in Tokyo University. He was an exchanged official in the Ministry for Economy and Technology of the Federal Government of Germany.

Appendices B and C can be found on a CD that accompanies this report.

Appendix B: Other Meeting Materials and Supporting Documents

- B.1 Breakout Topic Agendas**
- B.2 List of 41 Initial Observations**
- B.3 IFNEC Joint Statement**
- B.4 IFNEC Mission Statement**
- B.5 IFNEC Participant and Observer Countries**
- B.6 IAEA Milestones in the Development of a National Infrastructure for Nuclear Power**
- B.7 NEA - The Financing of Nuclear Power Plants**
- B.8 Norton Rose Finance 101 Materials**
- B.9 Norton Rose Finance Glossary**

Appendix C: Presentations

- C.1 Norton Rose Nuclear Finance Basics**
 - C.2 Financing Nuclear Power Projects: Challenges and the IAEA Assistance in Capacity Building**
 - C.3 Finance/Commercial Banking Stakeholder Perspective**
 - C.4 Insurance Stakeholder Perspective**
 - C.5 Export Credit Agency Stakeholder Perspective**
 - C.6 Utility Stakeholder Perspective**
 - C.7 Jordan Country Perspective**
 - C.8 China Country Perspective**
 - C.9 Poland Country Perspective**
 - C.10 Finland Country Perspective**
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