RFI Response: Nuclear New Build Power Procurement Programme

The Republic of South Africa
Department of Mineral Resources and Energy

14 Sep 2020

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Context of this Submission

Nuclear Economics Consulting Group (NECG) submits this response to the RFI on Nuclear New Build Power Procurement Programme.

NECG is interested in assisting the South African Department of Mineral Resources and Energy (DMRE) in establishing a South African Nuclear New Build Programme.

NECG provides practical professional expertise related to the global nuclear power industry, as discussed in more detail in Section III below.

This submission outlines our understanding of DMRE's needs and NECG's capabilities to help meet those needs.

NECG is offering support to DMRE on:

- *Nuclear power project business models;*
- *Procurement strategy;*
- *Contracting approach;*
- *Funding/financing issues;*
- *Interaction with the electricity industry in South Africa; and*
- *"Lessons learned" on "best practices" from other nuclear power projects.*

I. Value Proposition

A. Issues for DMRE and South Africa

The information requested by the DMRE RFI is focused on information from nuclear power plant vendors.

These vendors will likely provide information that is intended to influence decision-makers in South Africa to move forward with a new nuclear build programme that is based on that vendor's technology and on geopolitical objectives of the vendor's home country.

However, nuclear power plant vendor information submitted in response to this RFI will not constitute binding commitments or actionable offers.

B. How NECG can Help

NECG strongly believes that the South African DMRE will benefit greatly from having advice from an independent firm that is not linked to any nuclear power plant vendor or vendor consortium.

NECG will combine its deep experience in the entire lifecycle of nuclear power plant projects and programmes worldwide with its role as an objective, third-party analyst, and its vendor agnosticism to provide DMRE with fact-based decision support and operational guidance in its pursuit of a new nuclear power plant build programme.

In this submittal to the RFI, we would like to highlight three contributions NECG can deliver to help DMRE create a viable nuclear new build programme for South Africa:

- **Client Perspective:** Provide DMRE with context for a nuclear program, based on experience in other national new build efforts, on what has been successful or not, on strengths and weaknesses, and on other lessons learned;

- **Supplier Perspective:** Support DMRE in analysis of vendor RFI submittals and provide benchmarks against approaches that vendors have taken in other international nuclear programmes, with a focus on promises made, conditions required, and issues to be considered; and

- **Organizational challenges:** Assist DMRE define and create the organization required to undertake a national nuclear new build program. Up to a certain point this can be a loose project set-up, in accordance with IAEA's Nuclear Energy Programme Implementing Organization (NEPIO) concept. However, at some point in the future there will be a need for corporate structures to deal with investment, liability, contracting, financing, and other aspects of a very large enterprise.

  This nuclear "Holding Company" structure might be placed under the umbrella of Eskom, or it may be a new special purpose vehicle (SPV) ("SPV"), with or without

foreign (vendor) investment. In the transition from DMRE, to a NEPIO, to a Holding Company, to nuclear new build project implementation, progressive organizational structures will be needed for internal governance as well as external interfaces.

Further details on how NECG can assist are provided below.

A nuclear plant project requires a long-term commitment from multiple parties that is supported by a clear view of economic issues early in the project development process to ensure success – NECG can help provide that view.

C. Overall Purpose of RFI

Section 3.7 outlines the overall purpose of the RFI.

> *3.7 The purpose of this Request for Information (RFI) document is to provide an improved understanding of the experience of different Nuclear Power Plant vendors and obtain information from NPP vendors relating the financial and technical aspects. These will include costing and financing of respective NPP technologies; plant design features; license ability of plant design in South Africa; feasibility for construction at sites in South Africa; and a detailed project management plan; as well as indicative contracting models, such as Engineering Procurement Contract (EPC), Engineering Procurement Contract Management (EPCM), Build Own and Operate (BOO), Build Own and Transfer (BOT) and Build Own Operate and Transfer (BOOT).*

The key areas in Section 3.7 where NECG can help DMRE are in providing an assessment and evaluation of comparative contracting and financing approaches, cost outcomes in other projects, and alternative contracting/ownership models. NECG is uniquely qualified to provide insights from the perspectives of economic regulators, lenders, investors, suppliers, host governments, and project companies. We can also add insights into areas not listed, such as partnering and localization strategies or long-term supply-chain development strategies and contracts for spare parts, services, and fuel.

Most importantly, NECG team members will provide "lessons learned" and "best practices" analyses and examples in our advice, consulting reports and other work products, and in training/discussion sessions.

D. Funding and Financing Models

Section 4.3.6 covers funding and financing models for new nuclear power plants.

> *4.3.6 **Financing solutions and related conditions.** Provide detailed information on the possible permutations and conditions related to funding and financing models and mechanisms for the Conventional Power Reactors, taking into account the need to cushion capital costs whilst ensuring affordable tariffs to be passed on to the consumer. Lessons learnt from current and past NPP projects (successes and failures of the model*

and mechanism) should be shared, and recommendations on most optimal models and mechanisms should be justified in detail.

NECG has extensive experience with actual nuclear power plants, multiple nuclear power plant projects, nuclear power feasibility studies, and various approaches to funding and financing schemes for new nuclear power projects. NECG experts regularly teach these subjects for IAEA training courses and have assisted with the development of guidance by the IAEA, NEA, and IFNEC. As an example, DMRE can refer to the 2019 article authored by Fabienne PEHUET, "Conditions and possibilities for financing new nuclear power plants."[1]

We can provide DMRE with lessons learned and well-supported tailored recommendations on funding and financing approaches for a new nuclear power plant project in South Africa.

E. Localisation and Skills Development in South Africa

Section 4.3.7 covers the related issues of localization, industrial development, I.P. and technology transfer, and skills development.

4.3.7 ***Localisation, Industrialisation, I.P. and technology transfer, and Skills development model****. Demonstrate the I.P. and technology transfer extent, skills development and localization content, and industrialisation commensurate with the envisaged Conventional Power Reactor as well as examples of same implemented in other foreign NPP projects. Further, outline enablers to the realisation of localisation, industrialisation, I.P. and technology transfer and skills development within the South African context.*

Any country that is looking to make the enormous investment in one or more nuclear power plants would like for the nuclear power project to be more than a one-way transfer of wealth to a set of foreign vendors.

Using a new nuclear power build programme to utilize existing relevant South African expertise and industrial capacity will be important, as will using the new nuclear power build programme to extend and enhance that expertise and capability.

NECG can help DMRE analyze how to do this by laying out the inherent conflicts and competing demands between a country's new nuclear power project (i.e., cost, schedule, and quality), the extent of localization, and export credit financing from supplier countries.

NECG would map out stakeholder perspectives, including from the buying country, the nuclear power project developer/owner, the vendor, the vendor's home country, and the international financial community. NECG experts will also specifically draw upon their prior experience in the South African context and apply it towards this analysis.

[1] See https://doi.org/10.1093/jwelb/jwy032

NECG can enable DMRE to command a 360-degree view of the nuclear power new build requirements and considerations.

F. Contracting Approach

Section 4.3.8 covers the contracting approach and models for a South African nuclear new build programme.

> *4.3.8* ***Contracting Approach.*** *Please provide a detailed analysis (including pros and cons) of contracting models for the Conventional Power Reactor with recommendations for the most feasible approach and justifications thereto given the South African context.*

Section 3.7 in the RFI refers to several new nuclear power project contracting models:

- Engineering Procurement Contract (EPC);
- Engineering Procurement Contract Management (EPCM);
- Build Own and Operate (BOO);
- Build Own and Transfer (BOT); and
- Build Own Operate and Transfer (BOOT).

This list of contracting approaches includes nuclear power plant ownership and operation approaches that go well beyond the procurement of the nuclear power plant. Contracting approaches that incorporate long-term ownership and operation by a third party (e.g., BOO) will require the resolution of more, and more difficult, issues before the actual development of the new nuclear power plant is started.

An additional key consideration is the inevitable link between a new nuclear power project and the geopolitical objectives of potential nuclear power plant vendors.

Some of these contracting and project structure approaches are consistent with stated intent in name only (e.g., EPC) or are somewhat theoretical and remain untested.

NECG notes that other contracting and project ownership models are available that could be feasible in the South African context. NECG would provide a more comprehensive set of contracting and project ownership structure options to DMRE, to include target price / fee-at-risk, cost reimbursable, hybrid, phased, and collaborative contracting models.

NECG would assist DMRE with an assessment of the strategic and operational costs, benefits, risks, and feasibility of the different contracting and project structure approaches. We would also provide real-world lessons about where and how these models have worked and why these models have worked, both in actual and proposed nuclear power projects and in conventional power projects.

For example, a BOO model will require a long-term power contract between the nuclear power plant owner and a large credit-worthy power buyer, probably Eskom, with National Treasury guarantees that may impose high costs and risks on South Africa compared to other approaches.

G. Organizational Design

As mentioned above, DEMR will need to develop an organizational framework to progress from NEPIO (essentially Government acting in its sovereign capacity) to an ultimate corporate structure to implement the nuclear new build project. Even if a 100%-foreign owned BOO model were selected, there would still be South African interfaces needed (at a minimum, power offtake and credit support). Until the final decision is made and implemented, intermediate structures will be needed. These require decisions on:

- Organizational structure and governance;
- Human Capital Management;
- Roles and responsibilities, processes, systems, procedures;
- Interface with South African counterparties (regulatory, asset owners, suppliers, and other parties) as well as foreign contractors (nuclear vendors and others); and
- Other relevant issues (e.g, fuel cycle, spare parts and maintenance support, back-end liability responsibilities, and funding).

NECG has supported major international state-owned entities in these questions, both directly and indirectly (e.g. via renowned international strategy consulting firms and law firms) as well as through first hand participation in such programs by NECG Affiliated experts.

H. Electricity Industry Issues

Any new nuclear power plant project in South Africa will need to address issues in the South African electricity industry. These issues include a move to independent power projects, long-standing proposals to de-integrate Eskom, and bulk power system reliability.

Eskom will likely either be the owner/operator of a new nuclear power plant or the counterparty to a long-term power off-take contract with another nuclear power plant owner/operator. Important parties to a new nuclear power plant project, including vendors, lenders, investors, and ECAs, will focus on the creditworthiness of Eskom as an owner or as the counterparty to a power contract.

NECG is keenly aware that Eskom faces challenges in multiple areas that will need to be addressed or resolved as a part of a new nuclear power build programme.

NECG will draw on our earlier work in South Africa (e.g., the 2008 Nuclear One procurement project) and our work in multiple other countries on the interaction between the electricity industry and a new nuclear power plant project to assist DMRE on these important topics.

II. NECG

Nuclear Economics Consulting Group (NECG; www.nuclear-economics.com) provides strategic, practical, and actionable advice on complex economic, business, and legal issues facing the nuclear industry. Our work is based on analytical rigor and objectivity that is tempered by extensive real-world industry experience in both the electricity industry and the nuclear power industry.

NECG experts and industry practitioners bring wide and deep expertise and first-hand experience working with public and private sector clients on nuclear power projects and programmes. NECG's experience includes advising clients on successful nuclear power projects and programmes and analyses of unsuccessful or failed nuclear power projects and programmes. NECG experts have also been engaged in litigation and arbitration cases related to failed nuclear power projects and programmes.

The lessons from both successful and failed projects and programmes, as allowed by non-disclosure agreements, will inform our work on this engagement.

NECG capabilities range from nuclear power project procurement and financing to nuclear waste strategies. We help clients with insightful analyses of nuclear project economics, including how to:

- Evaluate new nuclear project business models and identify financing sources and map out approaches to achieve an optimal financing structure;
- Structure nuclear projects, PPAs, and related arrangements;
- Support positions in nuclear industry legal and regulatory disputes;
- Review government and regulator decisions about nuclear power projects;
- Develop project risk registers to identify and assess risks, and then develop risk allocation, mitigation, and management approaches;
- Develop and implement effective nuclear industry strategies;
- Realize/ maximize localization, industrialization, IP and TT and skills development in South Africa; and
- Provide advice on the electricity industry and electricity industry restructuring issues related to the new nuclear build programme.

NECG assists companies and governments in evaluating options and making thoughtful and effective decisions related to the nuclear power industry. By applying proven and innovative approaches, clearly and convincingly communicating evidence-based, independent findings and results to clients, we have been successful working with sellers, buyers, regulators, law firms, debt and equity fund providers, and other nuclear project stakeholders on a range of issues.

NECG experts have worked on nuclear projects around the world at all stages. A key part of our work is our extensive experience in the electricity industry and electricity industry restructuring. Our insights into nuclear economics and electricity industry issues help clients understand how nuclear power projects fit into various electricity industry structures, markets, and approaches.

Several NECG experts worked on previous South African nuclear power plant development activities since 2007, providing us with an understanding of the South African nuclear power plant context and possibilities.

Finally, we note that the NECG team comes from a variety of professional, national, and jurisdictional backgrounds, giving us a global, multi-cultural and comprehensive approach to the provision of nuclear power industry advisory services.

III. Conclusion

NECG has the expertise and qualifications to provide advice and recommendations to DMRE. We can provide an objective and unbiased review of the submissions by other parties and help DMRE reflect this in the South African nuclear new build programme.

We will be happy to provide more information on NECG's capabilities or other issues.

If requested, NECG will prepare a detailed proposal, with commercial arrangements, on how we would assist DMRE.

Appendix A: NECG Capabilities

A. NECG Capabilities

NECG has expertise and capability in areas that will be important as South Africa considers a nuclear new build programme:

- **Structuring nuclear projects** – Our work with new nuclear (and non-nuclear) energy infrastructure projects is based on decades of work with power projects and the electricity industry. Our work with conventional IPPs and merchant power projects over several decades gives us insight into issues faced by merchant nuclear projects.
- **Analyzing electricity markets** – The most important issue for any power plant investment is the future value of nuclear electricity. The value of nuclear electricity may be related to electricity market prices or capacity expansion alternatives for traditional regulated and government utilities. Nuclear power plants, with long development periods and even longer operating lives, require a long-term analysis of the value of nuclear electricity.
- **Advising on new nuclear power projects** – The owners, investors, lenders, vendors, and other parties involved in a new nuclear power project need sound advice on a range of issues. NECG provides advice on appropriate financial and contractual structures and assessments of risk. NECG Team members will deploy their extensive project finance experience and bring that discipline to assessing risks and recommending mitigation strategies.
- **Nuclear legal, project development, and project structuring:** NECG provides rigorous independent review of these areas based on a well-rounded understanding of these areas honed over hundreds of engagements. We have provided expert opinions on related issues countless times.
- **Financial analysis and modelling** – NECG experts have developed and reviewed the complex financial analyses and models used in nuclear power plant projects. A well-developed financial model is a key tool that will allow nuclear project participants to assess risk and return and to support decisions to participate in the project.
- **Procurement programmes** – Developing and implementing strategies for nuclear procurement programmes is critical. NECG has helped in tender development, bid evaluation, and negotiation of key terms for nuclear tenders. We can work for investors, vendors, or regulators on these issues.
- **Conducting due diligence for nuclear investments and transactions** – Detailed, quantitative, and independent assessment of nuclear power projects is needed by owners, investors, lenders, regulators, and other parties in a nuclear power plant project or transaction. NECG provides assessments of the financial, regulatory, and market issues facing nuclear projects.
- **Risk assessment** - NECG provides risk assessments and advice on how to operationalize the financial, regulatory, and market issues facing nuclear projects.

- **Supporting regulatory approvals and rate cases** – Nuclear power investments are recovered through rates by traditional regulated and government utilities. NECG assists in the regulatory approval process by providing analyses of prudence and economic soundness of a nuclear power project investment.
- **Providing advice and expert testimony in litigation and arbitration** – NECG provides consulting and testifying experts in nuclear regulatory disputes, litigation cases, and international arbitration cases.

B. NECG as nuclear power industry expert

The global nuclear power industry is highly fragmented. This industry involves many technical issues, diverse reactor and power plant designs, engineering and manufacturing issues, and resource options. The nuclear power industry is closely regulated from public health, safety, and security perspectives, including oversight of technology export given the dual-use (i.e., some aspects of civilian nuclear power may have nuclear weapons applications) nature of the technology. Additionally, there are ongoing risk and strategic communications considerations that accompany all nuclear-related decisions internal to DMRE and across other governmental, public, and private stakeholders.

The nuclear industry is in a period of industry consolidation as new international market entrants are vying for market share and increasingly competing with established industry incumbents. The presence of large state-owned nuclear power plant vendors is a reality, with these national nuclear vendors bringing capabilities and funding that are linked to their broader geopolitical objectives, presenting options and issues for nuclear power plant buyers.

The nuclear industry, more than other industries, may present data gaps, inadequate availability of information, and a need for experienced judgment that adds to the complexity of conducting a commercial/business/ market due diligence analysis of any nuclear new build proposal.

In our view, a team of dedicated and experienced nuclear industry professionals who work with DMRE and other South African entities providing decision support on an intensive basis during the entire process is needed to ensure success in a nuclear new build programme. The complexities of the nuclear power industry, its incumbent and emerging players, geopolitical maneuvering, and demands for energy diversification, resilience, and sustainability increase the need for advice.

NECG provides such a team of **highly qualified and respected** nuclear industry professionals.

C. NECG Values

NECG's values support our capability to support clients.

1. Credibility

NECG's stature, integrity, and tenure in the industry and our deep industry business/market knowledge bring structure, focus, and gravitas to our work. Interacting with a small number of

very experienced and knowledgeable NECG industry experts will be more efficient and effective than approaching a wide range of nuclear industry contacts.

NECG's team has most of their careers in one or more aspects of the nuclear industry and has an excellent degree of knowledge about relevant issues.

2. Timely Advice

The deep and current knowledge base of the NECG team will allow us to provide quick and thoughtful answers to key questions and insights into strategic issues.

NECG can provide a rapid response to questions that would take weeks for a generalist consulting firm to research and answer. Even better, we can help frame questions that are relevant, rather than starting with a blank slate and using the client engagement to develop an understanding of the industry like some generalist consulting firms do. Understanding the complicated nuclear industry jargon and terminology, and reading between the lines, is also important to framing proper questions and getting answers quickly.

3. Deep Knowledge

We have, through a combination of direct work experience, previous consulting client projects, research for papers and reports, and litigation cases, cultivated information about relevant nuclear power industry issues. NECG's experience allows us to provide quick, but well-informed and well-supported, views and recommendations on relevant issues for DMRE. Moreover, our experiences are not limited to one jurisdiction – we are an international team, bringing a global perspective to our analysis and advisory services.

4. Higher Value

In getting a faster result from our deep knowledge base, NECG experts will be less expensive than generalist consultants. If we need to conduct additional research to support our views and opinions, we focus that research in a way that a generalist consultant cannot do. Rather than going down dead ends, we can focus on relevant areas.

5. Objective and unbiased

NECG is not linked to any nuclear power plant vendor or to any business model, allowing us to provide DMRE with objective and unbiased advice. We can also help DMRE assess the objectivity and factual basis of responses of other parties (e.g., nuclear power plant vendors).

Appendix B: NECG experts

Nuclear Economics Consulting Group (NECG) has assembled a team of nuclear industry experts. The members of this group of NECG experts are prepared to act as an independent nuclear industry expert team to assist DMRE.

NECG will also draw on its entire group of Affiliated Experts (i.e., see https://nuclear-economics.com/expertise/) to carry out the work of the Industry Expert Panel as required. We can add more and different NECG experts as needed.

D. Edward Kee

Edward Kee is the CEO and founder of Nuclear Economics Consulting Group (NECG) based in Washington DC.

Mr. Kee is an expert on nuclear power economics and provides strategic and economic advice to companies and governments on nuclear power and electricity industry issues. He has testified as an expert witness in U.S. and international legal and arbitration cases.

Edward Kee detailed CV (PDF)

Edward has been focused on nuclear industry and economics issues for most of his consulting career. He has successfully managed NECG affiliate teams in multiple client engagements to provide credible and comprehensive analyses to clients on nuclear industry issues.

Mr. Kee has provided advice to multiple countries hoping to establish a nuclear power programme, including Malaysia, Singapore, Turkey, and Saudi Arabia. He was a subject matter expert and client advisor in multiple nuclear power industry due diligence, project development, programme development, and financing engagements. Mr. Kee has authored numerous articles on nuclear power and the electricity industry in publications including World Nuclear News, Nuclear Engineering International, ANS Nuclear News, Nuclear Power International, Bulletin of the Atomic Scientists, The Electricity Journal, and Public Utilities Fortnightly.

There are several areas of Mr. Kee's expertise/experience that are directly applicable to this engagement:

- Retained to provide an independent review of the due diligence effort for one of the potential buyers of Westinghouse and, when his client was selected as the preferred bidder, shifted to a strategic advisor role during the lengthy government approval process.

- Joined a leading U.S. investment bank to offer financial and industry expert advice to the Unsecured Creditor Committee in the Westinghouse bankruptcy process

- Conducted recent detailed economic analyses of U.S. nuclear power plants, focused on the causes of and potential for early retirement; NECG has a detailed reactor-by-reactor

database; NECG was retained by US DOE to prepare a detailed report on this topic that will be released on about 20 October 2017

- Testifying and consulting expert in a Canadian uranium tax matter that involved preparation of a detailed analysis of the global nuclear fuel markets and the factors driving demand and supply in those markets

- Part of the team providing the US DOE Loan Guarantee Office with a detailed due diligence report on state regulatory and electricity market risks for Vogtle (application funded) and Summer (application suspended) nuclear power projects

- Involved in new nuclear programmes and procurement efforts outside the U.S., many of which have involved assessment of reactor designs available in the market (e.g., Saudi Arabia, South Africa, Singapore, U.K., Turkey, Malaysia, Vietnam, Lithuania, Finland, Czech Republic, and Poland)

- Has written and published papers and given presentations on relevant topics including early retirement of U.S. nuclear plants, global nuclear power plant markets and shift to national companies, and the role of government in the nuclear power industry

E. Ruediger Koenig

Ruediger (Rudy) Koenig is an NECG Affiliate based in Germany.

Rudy works as an independent advisor and interim manager serving investors and suppliers in the clean energy industrial value chain.

Ruediger Koenig detailed CV (PDF)

He has 30 years of executive experience in the international nuclear industry and is familiar with the key issues, players, and programmes worldwide, as well as their historical context. Rudy has held multiple executive responsibilities, structuring complex business transactions in large capital projects, and managing lean business operations.

He has been a key player in the European new build programme where he helped develop, implement, and ultimately sell several new build projects in different countries for a European utility investor, RWE. This included roles as Alternate Executive Director at Horizon Nuclear Power Ltd. (U.K.) and as Chairman of the New Build Task Force at FORATOM, the European nuclear industry association. Between 2008 and 2012 his responsibilities included the procurement for a large nuclear new build programme in the U.K. where Westinghouse, Areva, and (initially) GE presented EPC bids (RFI, RFP, BAFO) for up to six reactors at 2 sites. This involved vendor assessments of their technical, commercial, managerial, and other competencies. He also gained first-hand insights in nuclear new build projects involving suppliers from Russia, Japan, and China.

Rudy also has extensive supply-side experience in the front- and back-end of the nuclear fuel cycle and in decommissioning and remediation.

In his advisory capacity Mr. Koenig has supported various international new build and other nuclear projects. He is Advisory Board Member of Asia Nuclear Business Platform, PowerGen Europe, and other industry panels. He serves as an independent expert on a nuclear programme board of the European Commission.

In 2014, Rudy was independent lead negotiator for ESKOM (South Africa) in the final contract negotiations in a competitive tender for the replacement of the Koeberg steam generators (a $600 mm project).

F. Paul Murphy

Paul Murphy is an NECG Affiliate based in the U.S.

Paul is also the Managing Director of Murphy Energy & Infrastructure Consulting, LLC.

Paul 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 and financing nuclear power programmes and the identification and mitigation of associated risks – representing developers/owners, investors, lenders, and contractors on nuclear projects internationally.

Paul Murphy detailed CV (PDF)

Paul is recognized as an expert in the development and financing of nuclear power programmes by the International Atomic Energy Agency (IAEA), the OECD's Nuclear Energy Agency (NEA), the International Framework for Nuclear Energy Cooperation (IFNEC), and the U.S. government. Paul currently serves on the IAEA's Technical Cooperation Program team, which assists member states in developing civilian nuclear power programmes.

Paul regularly teaches financing, contracting, and project development for the IAEA, Argonne National Laboratory, and Texas A&M University for their international training programmes, and serves as a guest lecturer at the U.S. National Defense University. Paul has served (as a five-time appointee) to the U.S. Secretary of Commerce's Civilian Nuclear Trade Advisory Committee, and he serves on ASME's Clean Energy Technology Advisory Panel. He is a three-time selection to the Who's Who Legal / Energy and a member of the International Nuclear Law Association. He serves as a consultant to the U.S. Department of Energy (DOE) for international projects. Paul also currently serves as Special Advisor to The Nuclear Alternative Project, which undertook a DOE-funded feasibility study of SMR's for Puerto Rico.

Paul is a graduate of Princeton University's Woodrow Wilson School for Public and International Affairs and a graduate of Harvard Law School.

G. Fabienne Pehuet

Fabienne Pehuet Lucet is an NECG Affiliate based in France.

Fabienne provides consulting Strategy and Development Services to companies in various industries; a sizeable part of her work relates to the nuclear and other power generation industry value chain. She is a Nuclear Markets and Projects Expert with 30 years' experience in the industry.

Fabienne Pehuet detailed CV (PDF)

Fabienne's experience in the nuclear power industry business dates from 1990 when she joined Cogema. With AREVA until 2012, she held senior management positions with global responsibilities in Strategy, Finance, Marketing, Large Projects and Offers, and International Partnerships. She developed a keen expertise in energy policies and all areas of nuclear industry, fuel cycle, nuclear power projects and the related supply chain.

Financing Energy infrastructure Projects is a mature area of her expertise.

From 1990 until 2001, she contributed to all strategic issues related to COGEMA main business lines, including uranium mines closures (France) or development (Canada, Kazakhstan), change of industrial process for uranium enrichment, back end strategies for Spent Nuclear Fuel, fuel manufacturing plants etc…

From 2003 until 2008, she led the Marketing of new group AREVA formed in 2001 with COGEMA, Framatome, Siemens nuclear, Technicatome and T&D as CMO (with a 200 staff globally). Her action was decisive in positioning AREVA as a global player on the international nuclear markets: nuclear technology and fuel cycle industry.

In 2007 she initiated the AREVA Partnership proposition for large nuclear projects. She led the extensive localization and partnership program presented to South Africa as part of the 2007 (Nuclear One and fleet) tender. Similar programs were developed with the UK and other countries, all adapted to the local context for the nuclear project development; Fabienne became more familiar with the nuclear industry supply chain and institutional players in many countries and internationally.

After 2012, she provided advice in areas directly related to this engagement, of which: several assignments on nuclear waste and Decommissioning and Dismantling markets in France and in the EU (27 countries) and for new build nuclear projects (UAE, Saudi Arabia) as NECG team member.

Fabienne provides expertise and training to IISS, the IAEA (of which Financial Analysis of Energy Projects) and teaches the Master's Course "Nuclear Economics" at University Paris Dauphine. She authored reference articles about "Financing nuclear power projects", published by IFRI (2015) and JWELB (2019) and gave multiple presentations for a variety of audiences (IAEA, SFEN, OECD/NEA, FRS…).

H. Daniel Lipman

Daniel Lipman is an NECG Affiliate based in the U.S.

Dan Lipman is a career nuclear industry professional, the last twenty-three years at an executive level, heading the new reactor business for Westinghouse Electric Company (WEC) and servings as Vice President – Suppliers & International Division at the Nuclear Energy Institute (NEI).

Dan Lipman's detailed CV (PDF)

He recently has undertaken assignments as strategic advisor, board member, operating partner, and executive in support of new reactor and fuel-cycle projects, working both domestically and internationally, including with both emerging and existing nuclear technology developers. He has lived and worked in multiple countries and U.S. locations.

Dan began his career in the last new build era as a start-up and construction site staffer. He worked to bring units in Korea and the U.S. into initial operations. He has worked in the operating fleet as site manager, service provider, and fleet advisor, focusing on engineering, outage, and renewal parts support, as well as on-site problem-solving under operating limits. More recently, Dan has supported fleet operators through his tenure on the IAEA's new technical working group on operations, which advises on best practices to fleets around the world. In his tenure at NEI, Dan has worked on supply chain, fuel cycle, and market solutions impacting the U.S. operating fleet, including public acceptance, media, and communications campaigns.

The bulk of Dan's recent experience is in international civil nuclear trade and cooperation, reactor sales, new technology development, R&D, technology transfer, and organizational development related to companies dedicated to this space. He has a particular interest in emerging nuclear markets, having led trade missions to several countries; performed due diligence on nuclear companies; participated in pertinent multi-lateral negotiations and government-related meetings; and has served four years on the advisory committee on international nuclear trade to the U.S. Secretary of Commerce, spanning the last two Administrations.

Dan led the new reactor business for Westinghouse Electric Co. During his tenure, the AP1000 received its design certification in the U.S. and he initiated licensing applications in several countries and new R&D projects. During this time, WEC obtained contracts for all AP1000's in China and the U.S., plus other commitments for AP1000 deployment. He has developed global organizations to deliver equipment, engineering, supply management, and construction services. He is experienced in a variety of types of EPC contracts and delivery options and global plant sales, including the negotiation of technology transfer, joint ventures, and plant partnerships in a variety of countries. Dan subsequently led a large organization, including supply chain, strategic planning, quality management, and sustainability activities. These organizations were newly established, growing to contain several thousand staff, including organized labor.

At NEI, Dan focused on nuclear energy policies benefiting the U.S. supplier community through international trade. He has testified before Congress five times on U.S. treaties. Dan has played an important role in advancing the Gen IV reactor development agenda with branches of the U.S. government, the U.S. Congress and with international organizations. International cooperation has been a specialty during his tenure at NEI, including as chair of the Nuclear Security Industry Summit, WNA working group participation, and numerous trade and industry meetings.

I. Amjad Ghori

Amjad Ghori is an NECG Affiliate based in the U.K.

Amjad is a seasoned Financial Advisory Executive with more than 25 years of banking and development finance experience gained from leading and closing multiple "First-of-a-Kind" power and social infrastructure projects on a global basis. His extensive experience traverses roles as a Corporate and Project Finance Banker, a Power Developer, a Financial Advisor and, most recently, a recognized expert in Nuclear financing and SMRs lecturing and leading workshops under the aegis of the IAEA, IFNEC, and USTDA.

Amjad Ghori detailed CV (PDF)

Amjad has been an active player in the nuclear sector dating back to 2008, having lead Financial Advisory teams working on behalf of public and private sector clients developing NPP transactions in Bulgaria, Lithuania and Finland during his 11-years as a Managing Director in Credit Agricole – CIB's ("CACIB") Structured Finance Advisory Group based in London. The Advisory teams were tasked with reviewing and recommending changes to draft Project Agreements and initial Financial Models of the proposed transactions. In TVO's OL4, Amjad and his team were asked to specifically craft the appropriate financing-related clauses in the Bid documents to ensure that Bidders understood the importance of including a bankable financing framework as part of their overall Bid submission.

Amjad's Transaction Advisory background and experience is deeply rooted in Project Finance, which provides the perfect platform from which to analyze project specific risks and recommend mitigation strategies to ultimately achieve bankability. Conversely, while a truly non-recourse project financing has yet to be achieved for a nuclear NPP, Amjad's recent collaboration with the UK Government's Business, Energy and Industrial Strategy ("BEIS") as part of an Expert Finance Working Group ("EFWG") resulted in identifying a handful of limited-recourse options that could potentially be deployed for financing new nuclear projects that were then recommended to Parliament and published in the attached: Market framework for financing small nuclear.

Amjad's extensive power and infrastructure project development experience also gives him the skills to identify and assess qualitative and quantitative "Must-Haves" that an equity investor requires. The combination of advisory and development experience allows Amjad to assess the viability of a transaction's proposed commercial, contractual, and financing structure and probability of success.

Amjad is also a frequent lecturer on nuclear financing and has conducted workshops in nuclear financing under the IAEA umbrella in the US, France, and Sri Lanka. He is also increasingly sought out to participate in Workshops and Panel discussions on SMRs in person (IFNEC in November 2019 and Abu Dhabi in February 2020) or in Webinars (June 2020 and September 2020).

Prior to joining CACIB, Amjad spent 10-years as a Senior member of CMS Energy's in-house Financial and Strategic Advisory group that raised in excess of US$ 5.0 bn in financing for several ground-breaking, "Pathfinder" IPP and IWPP projects in Abu Dhabi, Morocco, and India. Amjad was also a key member of the Development Teams entrusted with investing CMS's equity in these landmark transaction

Amjad has a B.A. in Economics from Boston College and completed his coursework towards a M.A. from the Johns Hopkins School of Advanced International Studies (SAIS) with an emphasis in U.S. Foreign Policy.

J. Melissa Hersh

Melissa Hersh is an NECG Affiliate based in the U.S.

Melissa (Mel) Hersh is a global strategy and risk expert who regularly advises governments, international organizations, federally funded research and development centers (FFRDCs), and Fortune 500 companies on enterprise risk and strategic communications across a variety of security and defense, energy, agricultural and global health issues.

Melissa Hersh detailed CV (PDF)

Besides being an Affiliate of the Nuclear Economic Consulting Group she is also a Research Associate at the Center for Emergency Management & Homeland Security in the Watts College of Public Service and Community Solutions at Arizona State University (ASU) where the curricula she developed and taught as a Faculty Associate on U.S. Cyber and Information Security is still being taught as part of ASU's online MA degree-granting program in Homeland Security & Emergency Management. She is currently a Member of the Board on U.S. Army RDT&E, Systems Acquisition, and Logistics (BARSL).

Mel has been a consultant to the U.S. Department of Energy's Idaho National Lab, NATO Centres of Excellence, as well as non-profit and development organizations. She is currently focusing on hybrid threats to the energy and supporting electricity sub-sector including cyber-physical systems security and information influence operations, the role of nuclear power and geopolitics, the use of unmanned and counter-unmanned systems, and third-party risk management related to supply chain security.

Previously held positions include VP, Supply Chain Risk Management, Marsh Risk Consulting; Technical Expert on CBRNe issues, United Nations and the World Health Organization; and researcher and consultant to various international think tanks.

She frequently contributes with articles to publications such as The National Interest, Defense News, Defense One, European Energy Review, The Hill, and The Diplomat. She was educated at The London School of Hygiene & Tropical Medicine, The Medical College of Wisconsin, and Skidmore College.

Areas where Mel's expertise can contribute to strengthening DMRE's nuclear new build power procurement programme include:

- Strategy and Enterprise Risk Consulting
- Non-and Counterproliferation
- Investment Screening and Contract Structuring
- Third-Party Risk and Supply Chain Security
- Geopolitical Risk Analysis
- Strategic Communications
- Building Communities of Interest and International partnerships
- Cyber-Informed Decision-Making and Securing Energy Infrastructure

K. Edward Davis

Edward Davis is an NECG Affiliate based in the U.S.

Edward Davis is a senior nuclear industry consultant with over 40 years of nuclear industry experience in a number of senior management roles, including engineering, business development, project finance, marketing, strategic planning as well as governmental affairs.

Edward Davis detailed CV (PDF)

In his long career, Mr. Davis has developed a wide range of knowledge on energy and environmental issues both domestic and internationally and has a keen understanding of governmental policymaking, regulatory compliance, state rate making, as well as legislative and political affairs.

Currently, Mr. Davis serves as President and Managing Director of the Pegasus Group where he is responsible for providing strategic consulting services to a wide range of clients in the energy and electric utility industries as well as Federal agencies in a number of strategic areas. Mr. Davis is a subject matter expert in his field and has testified before US Congress and State Public Utility Commissions on nuclear energy issues.

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