**INNOVATIVE FINANCING SOLUTION TO SCALE NUCLEAR INVESTMENTS**

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**Abstract**

The Conference of the Contracting Parties (COP28) to the UNFCC held in Dubai Nov-Dec 2023 has become the “Nuclear COP” as displayed in the media. The reason for that informal title was the unprecedented reference to nuclear in the Global Stocktake document known as “UAE consensus”. More than 25 countries signed the Ministerial declaration setting the goal for tripling nuclear capacity by 2050 from the current 372 GW. The Nuclear industry as part of the Net Zero Nuclear initiative launched by WNA and ENEC, made Net Zero Nuclear Industry Pledge supported by more than 120 companies. Achieving these ambitious goals, requires adequate financing mechanisms for scaling nuclear investments. The lending policies of IFIs as the World Bank and other MDBs are lacking behind from the policies in support to all low carbon sources including nuclear. This alignment stays priority for scaling nuclear, however additional innovative financing mechanisms are critical for mobilizing the investments and supporting the nuclear market expansion through the development of enabling infrastructure in countries embarking on nuclear power. This importance has been recently underlined in the IEA Electricity 2024, report [1]. The article offers analytical view based on the initiative to set up a multilateral international financing institution (“IFI”), named the International Bank for Nuclear Infrastructure (IBNI). The case study elaborates on the use of different financing tools foreseen in IBNI structure to demonstrate the SMR designs in the technology exporting countries as well as developing or adapting the nuclear infrastructure in technology importing countries and ensure the potential order book for serial SMRs deployment. The article will further elaborate on the way the Special Operation Fund is designed to address the funding gaps in countries embarking or expanding nuclear power. In conclusion the study advocates for establishing IBNI as the way to improve nuclear competitiveness and achieving scale.

## INTRODUCTION

The global quest for decarbonization and the transition to cleaner and more sustainable energy sources have brought nuclear power back into the spotlight. The Conference of the Contracting Parties (COP28) held in Dubai in November-December 2023, became known as the "Nuclear COP" due to the Global Stocktake document which for the first time recognizes nuclear as contributor to the need for “deep, rapid and sustained reductions in greenhouse gas emissions in line with 1.5 °C pathways” and calls for global efforts to accelerate zero- and low-emission technologies, including nuclear and other clean technologies Also a declaration signed by over 20 countries, including the United States, France, UK and Canada pledging to triple the global nuclear capacity by 2050.

The increasing recognition of nuclear power's potential to provide a low-carbon and reliable source of electricity has paved the way for discussions around its role in combating climate change and meeting the growing global energy demand. The COP28 declaration, signed by over 25 countries, reflected the shared vision of tripling nuclear capacity by 2050 from the current 372 GW. This ambitious goal needs not only technological advancements but also the availability of adequate financing mechanisms to support this nuclear scale up globally.

Nuclear power has long been recognized as a viable option for reducing greenhouse gas emissions, providing continuous clean power supply, and ensuring energy security. However, the lending policies of traditional International Financial Institutions (IFIs) and Multilateral Development Banks (MDBs) have not always aligned with the need to support all low carbon sources, including nuclear. This misalignment has created challenges for countries looking to invest in nuclear energy projects, especially in emerging markets.

This study aims to explore the background and significance of the "Nuclear COP" and the UAE consensus, considering the goals and implications of tripling nuclear capacity by 2050. Furthermore, the study looks to highlight the importance of innovative financing mechanisms in scaling nuclear investments and enabling infrastructure development, with a specific focus on the establishment of the International Bank for Nuclear Infrastructure (IBNI) as a significant change in the financing landscape.

By examining the funding and financing challenges faced by nuclear projects and the potential role of IBNI's financing tools, this research intends to shed light on the significance of aligning financial mechanisms with the evolving needs of the nuclear market. Additionally, the study aims to highlight IBNI's ability to support technology exporting countries in showcasing Small Modular Reactor (SMR) designs and helping technology importing nations in developing and adapting nuclear infrastructure.

## THE GLoBAL CLIMATE AGENDA AND NUCLEAR

### Overview of COP28, the UAE Consensus and their implications

COP28 held in Dubai in 2023 brought together delegates from around the world to discuss and negotiate climate-related issues, with a particular focus on the transition to low-carbon energy sources and the reduction of greenhouse gas emissions. While nuclear power had been a topic of discussion in previous COP meetings, COP28 placed even more emphasis on its potential contribution to sustainable development and climate change mitigation.

The UAE consensus [1] appeared because of collaborative efforts by all parties led by the UAE and for the first time reached consensus on placing nuclear among clean energies contributing to climate change mitigation. It highlighted the shared vision of more than 20 countries which undersign a joint declaration to triple nuclear capacity by 2050 [2].

The UAE consensus underscored the significance of nuclear power as a reliable, low-carbon energy source. It recognized the need to prioritize investments in nuclear technology to achieve the goals set in the Paris Agreement and to meet the growing global energy demand without adversely impacting the environment. Furthermore, the consensus emphasized the importance of international cooperation, technology exchange, and financing mechanisms to support the expansion of nuclear energy.

The implications of the UAE consensus are far-reaching. It signals a collective commitment to harnessing the full potential of nuclear power, not only in terms of electricity generation but also in advancing research and development in the nuclear field. This consensus has the potential to stimulate innovation, collaboration, and investment in nuclear energy, ultimately helping countries achieve their climate mitigation goals while ensuring energy security and power reliability.

### Tripling Nuclear Capacity by 2050: Challenges and Solutions

The goal of tripling nuclear capacity by 2050 is a bold and ambitious target that aligns with the increasing need for clean, reliable, and scalable energy sources. Tripling nuclear capacity would require significant investment, technological advancements, and global cooperation.

While nuclear power offers several advantages, such as its low carbon emissions, small land footprint requirements and the ability to provide continuous and base-load electricity, it also presents challenges. These challenges include the historic high upfront costs of building nuclear infrastructure, concerns regarding waste management and decommissioning, public perception and acceptance, and the availability of financing mechanisms.

To meet the challenges in tripling nuclear capacity, innovative financing models and mechanisms need to be in place. The establishment of the International Bank for Nuclear Infrastructure (IBNI) is seen as a potential game-changer in this regard. IBNI aims to provide financial support tailored specifically for nuclear investments, facilitating the development of nuclear infrastructure and promoting the adoption of advanced nuclear technologies. IBNI will be a technology-neutral IFI, financing and supporting all nuclear technologies and related supply chain.

## FINANCING MECHANISMS EVOLUTION AND INNOVATIVE SOLUTIONS

### Scaling Nuclear Investments: Financing

COP28 declaration [2] to triple nuclear “*Invite* shareholders of the World Bank, international financial institutions, and regional development banks to encourage the inclusion of nuclear energy in their organizations’ energy lending policies as needed, and to actively support nuclear power when they have such a mandate”. Similarly the IAEA Nuclear Energy Summit which took place in Brussels, March 2024 adopted Declaration [3] on Nuclear energy which inter alia “invite multinational development banks, international financial institutions and regional bodies that have the mandate to do so to consider strengthening their support for financing nuclear energy projects and to support the establishment of a financial level playing field for all zero emission sources of energy generation." All these political declarations have a prominent place in shaping the public policies in place, however they should be further supported by specific actions.

The scale of the nuclear market, as per the IAEA and WNA is that currently 31 countries are operating 440 nuclear power plants, 61 NPP are under construction and about another 30 countries are aspiring to introduce nuclear power in their energy mix for the first time also called “nuclear newcomers”. The lead time in creating the necessary nuclear infrastructure and commissioning the first nuclear power plant is considered to be 10-15 years, proven by the recent UAE experience. Such development timeline can be expected to be much shorter with the SMR technologies under deployment.

### Financial institutions lending policies and their evolution

The recent lending policy reviews undertaken by some IFIs has not resulted in notable change in their position. For example, the European Investment Bank (EIB), with a balance sheet of more than 500 billion €, new leadership announced that SMRs can be of interest to the bank [4]. Mrs. Calviño said Europe “needs to be active because cannot be behind the curve” on “modular reactors.” EIB has a nuclear lending policy [5] in place however has not approved nuclear project since 1987, partially because of the opposing views of its major shareholders.

The European Bank for Development and Reconstruction (EBRD) is currently the single IFI which is dealing partially with nuclear projects as for example nuclear safety upgrading projects and decommissioning, in the role of fund manager for certain countries (Bulgaria, Lithuania, Slovakia and Ukrainian) and environmental remediation programs related to uranium mining activities legacy. The recent review of EBRD energy strategy shows that the Bank will “monitor developments” of nuclear new build projects.

At the level of export credit agencies of OECD countries several positive developments have been reported with regards to financing nuclear new builds, including SMRs. For example, in July 2023, as part of the modernization of the OECD Arrangement package reform, the Nuclear Sector Understanding was amended to provide more flexible terms and conditions by increasing the maximum repayment terms allowed (up to 22 years instead of 18 years post plant construction) and adding further repayment flexibilities (frequency, size and pattern or repayment of principal and interest) [6].

These recent developments are steps in the right direction in aligning the instruments to the policy goals and political commitments, however scaling nuclear and tripling the capacity will require further efforts and additional, innovative funding and financing instruments.

### Innovative Financing Mechanisms for scaling nuclear investments

The role of catalyst for scaling nuclear capacity globally can be played by the proposed International Bank for Nuclear Infrastructure (IBNI). This new international financial institution is intended to use the proven model of MDBs with two important novelties:

* It will be solely focused on supporting its member countries (IBNI shareholders), nuclear industries and financial markets therein, in developing nuclear energy infrastructure projects.
* It will provide financing and other support available to all its member countries - expected to range across all geographies, income levels and developmental status.

IBNI will supplement and enhance, not replace the existing nuclear programs and initiatives – including export credits, bilateral development and trade finance, green and sustainable financing and domestic nuclear energy incentive/support initiatives. IBNI will develop in-house the expertise necessary to review and evaluate nuclear projects. The experience shows that, such expertise cannot be acquired and maintained on the long run by commercial banks. IBNI will act as a bridge to the market and an accelerator bringing economic transparency and fairness through benchmarking, standard checking, independent reviews of nuclear infrastructure taking into account best practices. IBNI will have a multiplier effect on nuclear projects financing by giving confidence to other financing institutions to co-finance projects and through its own capacity to launch debt on the financial markets. Over time, IBNI will act as a catalyst to mobilize the financing necessary to developing nuclear at the required scale and pace.

#### IBNI design principles

IBNI balance sheet support and financing (whether through the Ordinary Operation Fund (OOF) or Special Operations Fund (SOF) [8]) for an investment proposal represents the culmination of the Bank’s intervention strategy. Prior to deploying financial resources, IBNI would engage in policy dialogue with the Member State and preliminary structuring work with the prospective applicant to ensure that the investment would meet IBNI criteria. IBNI eligibility criteria shall include usual compliance with relevant international and domestic legal commitments, as well as existing IAEA guidelines with respect to nuclear safety, security and safeguards. In addition, IBNI shall develop financial criteria and benchmarks for financial intervention/support. These benchmarks are expected to be developed in close collaboration with other IFIs and the commercial finance market, to ensure financial sustainability and compatibility. Investments that meet IBNI’s full criteria would catalyse the market additionality effect, whereby IBNI financing is seen to “crowd in” private finance. IBNI interventions would require careful screening and consideration, as well as ex-post monitoring appropriate for similar risk assets in other IFIs. Metrics are likely to be implemented at national as well as project levels, with respect to economic value added, social and environmental costs/benefits (and other ESG criteria and Equator principal alignment), IBNI risk and reward, and investability/bankability of the project.

#### IBNI Financing instruments

IBNI financing instruments would include a combination of the traditional IFI liquidity and risk products, such as: A/B term loans on a secured, sovereign or corporate basis, Holdco (structurally subordinated) debt and equity, Pre-FID (pre-final investment decision development) finance, Currency, interest rate and commodity hedging, Pre-payment finance, Asset-backed finance,Syndicated and club loans, Revolving credit facilities, Acquisition and refinancing facilities

IBNI resources and balance sheet (OOF or SOF) would be deployed subject to pre-conditions and usual documentary conditions precedent, such as: Market additionality; Value added and other economic criteria; ESG criteria; Sustainability criteria, 3S criteria with respect to international obligations and IAEA safety standards and security guidance. On the basis of the above tool kit, IBNI is expected to emerge as a deal hub and aggregator for market financiers to achieve exposure to nuclear investment under acceptable market standards. Equally, IBNI would be expected to fund itself (and refinance itself) over time through the Green Bond and ESG finance market, offering corporate and/or structured notes to investors seeking to support nuclear deployment. IBNI bonds would offer high-grade credit quality and istant diversification for investors keen to enter the nuclear market but insufficiently experienced or confident to undertake their own screening and diligence.

#### Expanding the market – supporting nuclear infrastructure development

IBNI design foresees instruments to address potential funding gaps in the National Infrastructure for nuclear power and financing gaps for Site Evaluation and Early Works Activities. Developing soft and hard nuclear infrastructure include adhering to the international nuclear legal regime, establishing key institutions as Independent Nuclear Regulator, Owner/Operator and discharging government coordinating function through Nuclear Power Implementing Organisation (NEPIO), putting in place national Legal and Regulatory frameworks and many more as described in the IAEA publication “Milestones in the development of a National Infrastructure for Nuclear Power” [7]. This is necessary prerequisite for responsible introduction of nuclear energy. Funding such soft and hard infrastructure is obligation of the host country, however in several cases vendor countries are offering financial support in different forms. However, the existence of specialised IFI would ensure standardisation and harmonisation across the countries, important prerequisite for serial SMRs deployment. The Bank can finance Early Works Activities (EWA) including site selection on a technology neutral basis. With its SOF and OOF, IBNI is designed to address those funding and financing gaps as required.

#### Generic case study 1 – large-scale reactor developer

When external finance has been sought, the nuclear project development timeline from vendor selection to FID has ranged from 5 to 8 years for most owner/developers in the OECD. In the case of the UAE, the Prime Contract was signed in 2009 and financial close (involving external finance from commercial banks and ECAs) was achieved in 2016.

The common cause for delays to FID are the misestimating of activities, costs and time to de-risk newbuild projects to a level that is acceptable to external finance (commonly defined as passive, low-cost professional investment and loans). In the right context, development finance is justifiable, but not necessarily available to the owner/developer.

A knowledgeable IFI such as IBNI would provide support during the development phase to enable achievement of the pre-conditions for FID, from framework-level support above the project, to risk reduction and allocation across partners and stakeholders at the project level. IBNI interventions during the development phase would consist of policy-level dialogue, nuclear infrastructure review and assessment, and structuring support at the project level, prior to making available commitments or funding in support of the project.

Funding, when appropriate, could consist of pre-FID shareholder loans, subordinated loans, guarantees and secured loans. IBNI facilities could be structured in any combination of tenors and repayment profiles, from early-availability, long-term amortizing loans (“first-in, last-out) to late-availability balloon repayment loans (“last-in, first-out”).

#### Generic case study – SMR developer

SMR designs face the unique challenge of “economies of multiples”, meaning that full economic value cannot be achieved until a design has been delivered and replicated to a very high level of cost/schedule/performance certainty. SMR developers cannot therefore deliver long-term value unless/until they benefit from an order book that provides the opportunity to achieve learning curve benefits across multiple units. This re quires a client or clients (whether owners, offtakers or both) to agree to partner on a series of units without meaningful control over economic outcomes for the future fleet.

An IFI such as IBNI could approach the challenge at a higher, aggregated level, by assessing value above the individual projects/units, at the fleet level and over the fleet’s lifetime. Such a holistic approach is not available for normal commercial financiers or even individual governments.

#### Generic case study 3 – SMR offtaker

Similarly to the SMR developer in the previous scenario, an SMR offtaker faces considerable risks in making commitments on units that are not considered “nth-of-a-kind”. The NuScale/UAMPS project abandonment is an example of an offtaker group realizing they are unable to bear first-of-a-kind project risks beyond a certain threshold. An IFI such as IBNI could however assess the future value of a potential fleet of units (whether with one or several client/offtaker groups). IBNI could provide tariff protection to the offtaker/s through cost-overrun and/or PPA protection. In combination with other measures (such as government incentives for SMR offtakers), IBNI would fund overruns on the initial units and amortize its excess exposure through clawbacks on ensuing units. By shifting pain/gain-share across projects, offtakers and owners, IBNI could support SMR designs at a fleet level. The current approach, whereby each first-of-a-kind SMR project must achieve investability and bankability, sets an unreasonably high standard on an industry that legitimately requires an order book to achieve least-cost economics.

### Conclusion

The initiative to create a new IFI addresses the urgency of addressing climate change with all available low carbon technologies. IBNI will be nuclear specific covering the whole range of nuclear projects and value chain; It will operate in emerging economies or nuclear newcomers as well as in advanced economies providing technologies. IBNI is designed to fill the exciting gaps and support scaling nuclear globally through: Strengthening the global nuclear finance expertise and repository of lessons learned; Contributing to the harmonization and standardization of the regulatory and industrial practices; Accelerating the development of enabling nuclear infrastructure through policy dialog and filling the potential funding gaps; Acting as point of reference for commercial banks and private investors and additional to crowding in private investments.

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