1. Introduction

Key Points

- The Paris Agreement compels countries to pledge certain commitments toward Net Zero GHG emissions (in the form of National Determined Contributions or "NDCSs").
- Nations of the world will be required to transition their economic systems and energy infrastructure away from fossil fuels and towards clean energy generation sources such as nuclear and renewables.
- Nuclear is a low carbon, affordable, reliable and safe source of generation that can be widely deployed throughout the world as part of nations' strategies and policies to achieve 2050 Net Zero.
- IBNI support is essential for those nations pursuing nuclear projects and programs (including all IBNI Member States, ranging from developing countries to highly developed countries).

Since the 2015 Paris Agreement (the "Paris Agreement"), the vast majority of the nations of the world have already made significant commitments toward reducing their greenhouse gas (GHG) emissions in efforts to limit the maximum average global temperature increase to no more than 1.5°C by 2050. The Paris Agreement requires the United Nations Framework Convention on Climate Change (UNFCCC) signatories to submit National Determined Contributions (NDCs) which establish individual nations' commitments and policy frameworks oriented toward ambitious limitations on increased GHG atmospheric concentrations. Approximately 97% (191 out of 197)[6] UNFCC signatory members have submitted initial NDCs. Furthermore, the Paris Agreement[7] requests that each country's NDCs be updated every five years and should reflect a "ratcheting effect" providing successively more ambitious policy targets in terms of national GHG reductions.

Based on the 2018 United Nations Intergovernmental Panel on Climate Change (IPCC) report *Special Report on the impacts of global warming of 1.5°C (IPCC Special Report – 15 or IPCC SR 15)*, it has been recommended that UNFCCC members enact policies to achieve net zero GHG emissions by 2050[8]. As of 23 April 2021, some 80 countries have already submitted new NDCs or updated their initial NDC's to reflect more ambitious targets. Additionally, 44 countries and the European Union have pledged to meet net zero GHG emissions targets (with 10 of these having already made their net zero pledges a form of legal obligation)[9]. Unfortunately, the NDCs and net zero pledges submitted, and the underlying national decarbonization plans

[6] Source: https://unfccc.int/process-and-meetings/the-paris-agreement/nationally-determined-contributions-ndcs/nationally-determined-contributions-ndcs#eq-4

[7] Article 4 of the Paris Agreement (https://unfccc.int/files/meetings/paris_nov_2015/application/pdf/paris_agreement_english_.pdf) sets forth procedures for NDCs.

[8] Source: [5] - Summary for Policymakers, Section C

[9] Source: [6] - Section 1.2

and policies in place to date are insufficient to achieve even < 2°C warming. This suggests that there is still a great deal of hard work ahead of the nations of the world. Many difficult policy decisions are still ahead of many governments. Most nations still need to work out the question of *how* they will each achieve 2050 net zero in an economically and politically sustainable manner. It is widely anticipated that a significantly higher number of UNFCCC members will soon emerge with their own successively ambitious net zero pledges. The upcoming annual 2021 United Nations Climate Change Conference (COP26) in Glasgow, Scotland held in November 2021 will be a major forum for the UNPCCC signatory countries to discuss and agree on a global consensus toward the next level of ambitious NDC and net zero commitments amongst the individual member countries.

As progressively more countries evaluate their own NDC's and the degree to which they able and are willing to commit to aggressive and obligatory net zero pledges, it is critical to understand the economic and geopolitical realities and constraints facing each country. It is clear that any country who commits to achieving 2050 net zero will be required to enact politically difficult policies that are sociologically and economically transformative and are aimed at achieving the following by 2050:

- Complete transition away from fossil fuels (coal, oil and natural gas) and fossil fuel-based infrastructure and economic systems;
- Complete decarbonization of energy generation, industrial and transportation sectors and the built environments;
- Intensive electrification (also including hydrogen and electrofuels production and distribution systems) of industrial and transportation sectors and the built environment;
- Progressive re-balancing of agricultural, forestry and land-use (AFLU) systems to promote carbon sink offsets of residual GHG emissions from AFLU activities and GHG emissions from other non-energy sectors that may prove difficult or impossible to fully decarbonize in a practical and economically viable manner;
- Energy efficiency and a significant degree of "de-coupling" of economic development and energy consumption and carbon intensity per unit of economic output; and,
- Systemic and individual behavioral changes, with respect to governmental, commercial/corporate and individual/consumer energy consumption, carbon and other GHG intensive activities and behaviors.

Clearly, not every nation will implement the same, or even similar, sets of solutions and means toward achieving 2050 net zero and the rapid and progressive achievements of the above objectives. Each and every nation will face their own unique circumstances, limitations and realities which will impact which sets of solutions and pathways will be determined to be feasible and preferable with respect to the specific decisions and policies undertaken in their quests to commit to and achieve 2050 net zero. The international community should remain agnostic as to specifically *how* any particular nation chooses to achieve 2050 net zero. What is important is that each nation develops its own unique solutions and policies that will enable that country to achieve 2050 net zero on-time, and without any material adverse economic consequence or other adverse political, socioeconomic and environmental repercussions.

In this IRAP, our main focus is with respect to *how* nations will achieve full decarbonization of their energy sectors by 2050 (and with due consideration to the interrelated and incremental electricity demands that will be placed upon the energy generation, transmission and distribution sectors, through transition away from fossil fuels and intensive electrification of the industrial and transport sectors and the built environment). Under any analysis, it will be a monumental task for the nations of the world to collectively transform the world's current fossil fuel dominated, carbon-intensive economic foundations and infrastructures in order to supply up to 95 PWh's/year of global electricity demand from clean, low-carbon sources of energy by 2050, and without undermining global economic development. Each nation has a unique set of "tools in their toolkits" which they will take upon themselves to determine which solutions are economically, politically, socially, environmentally and technically feasible, acceptable and accessible for the achievement of 2050 net zero pledges. Some nations – particularly those that are particularly well-endowed with significant developable renewable energy resources (and coupled with energy storage and electricity grid investments and solutions) relative to their energy demands – may determine that it is technically feasible and practical for them to achieve 2050 net zero, including a complete transition away from fossil fuels, with full or an almost entire reliance upon renewable energy solutions. However, a near-100% renewables solution will not be feasible for every country and in many other cases may be neither practical, acceptable nor affordable even in situations where near-100% renewables may be technically feasible. The most likely scenario is that many nations will determine that a range of low-carbon energy technologies and strategies (including applications of various combinations of low-carbon generations technologies, including renewables and nuclear generation, storage, intelligent grid and demand-side management) will be necessary to achieve 2050 net zero in a long-run sustainable manner.

As a complement to renewable energy sources, nuclear may be considered as one of several viable low carbon generation technology options available for many nations to achieve their 2050 net zero pledges. Clearly, nuclear energy may be considered controversial by certain nations and their citizens, and therefore nuclear may not be considered a viable and acceptable low-carbon generation solution for those specific countries. However, for many countries, nuclear generation is and will remain an existing and proven, low carbon, dispatchable, affordable, safe and scalable energy generation technology option that is accepted by their governments and citizenry. As additional countries examine their specific options available and weigh the risks of climate change versus the benefits of nuclear as a low carbon dispatchable generation technology applicable to the decarbonization of their energy sectors, it is predictable that many more nations will consider nuclear as one of their low-carbon generation options.

Currently there are 30 countries that have already included nuclear power in their generation mix and have operating commercial nuclear reactors. According to the IAEA, the world currently operates a fleet of 443 commercial reactors, with a total installed capacity of 393.2 gigawatts, electrical output (GW_e). This existing global fleet of nuclear reactors provides reliable and low-carbon power generation equal to approximately 10% of total annual worldwide electricity generation. In addition, there are 51 additional nuclear reactors currently under construction in 19 countries, which will provide an additional 53.9 GW_e of installed

capacity[10]. Furthermore, there are currently 21 counties in the IAEA's Integrated Nuclear Infrastructure Review (INIR) program, which includes countries that are at various stages of planning and developing either new nuclear power programs or expanding existing nuclear programs. Moreover, there are currently approximately 50 countries that have existing or planned civilian nuclear power programs.

It is envisaged that IBNI will offer financing and other forms of support for qualified nuclear projects within its member countries that are either currently operating existing nuclear reactors or have plans to add nuclear generation in the future, plus a potentially large influx of additional newcomer nuclear energy states over the next 30 years. IBNI's programs will be expressly aimed at expanding, renewing and extending each member country's (and therefore the world's) nuclear generation capacities, in the safest, most efficient and affordable manner possible. IBNI's core mission will be to empower each of its member/shareholder states to access affordable nuclear energy as a key component of their initiatives to achieve the *twin goals* of: a) 2050 net zero; and, b) sustainable economic development and prosperity for their people. IBNI's membership (shareholding) is envisaged to include a voluntary and diverse coalition of member nations, ranging from developing and industrializing countries to advanced, highly developed economies. IBNI will provide much needed non-discriminatory financing and other support available to nuclear project sponsors in all IBNI member states, tailored to the specific economic and developmental conditions within each specific country and regional markets.

On a non-discriminatory and on a technology-neutral basis, IBNI will provide financing and other forms of support for civilian nuclear projects in the following five categories:

- New build projects (including large reactors, advanced / small modular reactors, micro reactors and potentially nuclear fusion technologies in the future);
- Reactor life-extensions and re-start projects;
- Refinancing and financial restructuring projects;
- Fuel cycle projects; and,
- Decommissioning projects.

IBNI's capitalization and governance structure is envisaged to be based on a model, which is similar to the major multilateral IFIs that have been in existence and have successfully fulfilled their missions for many decades (such as the World Bank Group/International Bank for Reconstruction and Development, the European Bank for Reconstruction and Development, Asian Development Bank, Inter-American Development Bank, African Development Bank, etc.). Similar to the existing multilateral IFI models, IBNI's controlling (common) shareholders are envisaged to be comprised of a coalition of sovereign nations. In addition to the government coalition's role as governing shareholders in IBNI, the Bank will also be positioned to attract direct investment from the global capital markets, in the form of debt capital (bonds and other debt

[10] Source: [15].

securities issued by IBNI)[11]. One of the key objectives of IBNI will be to increasingly drive the global capital markets into the nuclear sectors. This will be achieved by attracting capital markets investors directly into the Bank, as well as catalyzing participation from the global markets in qualified nuclear projects alongside IBNI. Consistent with the existing multilateral IFI models, IBNI will strive to create a "multiplier impact", whereas for every dollar of government equity investment in the Bank, IBNI's support will affect many multiples of investment volumes in qualified nuclear energy projects, globally. Equally important to availing significant quantums of global capital investment to nuclear projects, IBNI also will effectively drive-down the cost of capital for Bank supported nuclear projects, through both direct support from IBNI's financing programs and indirectly by creating acceptable project investment risk profiles whereby sources of lower-cost long-term capital (such as pension funds, infrastructure funds, insurance companies, sovereign wealth funds, etc.) will participate directly in projects alongside of IBNI.

IBNI will adopt, evaluate and enforce a rigorous set of universal, nuclear specific standards and criteria applicable to the nuclear projects and programs that it supports. Currently, amongst other challenges in the nuclear finance space, there is no universally accepted set of "nuclear specific Equator Principles" or "nuclear specific World Bank / International Finance Corporation Environmental & Social Performance Standards" which, in nearly all other infrastructure sectors, serve as standard benchmarks for international investors and lenders. IBNI will serve as the benchmarking institution and a data aggregator in global nuclear finance.

IBNI's programs will be competitively administered. While the IBNI "standards" will be binary (pass or fail), the "criteria" will be competitively evaluated and scored, which creates a market-based mechanism for nuclear project sponsors to compete for scarce IBNI financing and support. In effort to achieve most favorable consideration for IBNI support, the competing project sponsors and their national governments (IBNI member states) will therefore be compelled to adopt and enact policies and appropriate market and regulatory frameworks that are supportive of sustainable long-term nuclear generation programs, which complement renewables and other low-carbon generation supporting of overall net zero commitments. Given that IBNI's financing and support programs will be finite and competitively sourced, in situations where project applicants are unable or unwilling to enact policies and undertake the tough political decisions and regulatory reforms measures which will allow for nuclear power to be fairly and sustainably supported within their energy markets, such countries will find themselves at a competitive disadvantage for receiving IBNI support to advance their nuclear programs. Therefore, IBNI will provide a very effective competitive and market-based incentive structure for governments and project sponsors to enact policies and frameworks that create a "level playing field" and enable nuclear generation to be competitive with respect to other low-carbon technologies, and ultimately result in projects sustainable from a financing and investment perspective.

Evolving Environmental, Social and Governance (ESG) metrics are rapidly transforming the global financial markets. IBNI itself as well IBNI standards and criteria applied to nuclear projects that the Bank supports will

[11] In the future, after the Bank's operations have been established, a portion of the shareholder's capital (equity) may be funded through the global capital markets in the form of preferred equity shares (non-voting). This option and the details of IBNI's capitalization structure is set forth in Section 6.

be tailored to promote the most favorable reporting against these evolving ESG metrics. Consideration of ESG metrics are seen as critical "enabling criteria" for allowing a targeted rapid expansion in the participation of the global capital markets in IBNI and alongside IBNI in the nuclear projects that it supports. While ESG reporting is an enabler for capital markets participation, it will be IBNI's lead role in prudently and effectively setting and enforcing rigorous standards and conditions, project structuring and managing the unique risks and challenges inherent in financing nuclear projects, that will give third party investors and lenders necessary confidence required to invest or lend. IBNI will serve in the role of a "lead anchor investor or lender" and lead project structuring and due diligence in qualified nuclear projects (and in countries that have enacted policies and regulatory frameworks that provide the appropriate underlying conditions supporting the long-term competitiveness and sustainability of nuclear power). Serving in this capacity with the aim to stimulate capital market participation is a typical role that the existing multilateral IFIs assume in a project and which has been effectively demonstrated.

Over the past 3 decades, the development and financing of nuclear projects has been increasingly challenging in western (North American and European) markets due to the following key well-understood factors: (a) lack of constant stream of repetitive "n^{th}-of a kind" nuclear projects, which has greatly weakened the global nuclear value chains, and has diminished economies of scale, skilled human capital resources and knowledge-by-doing, and has also curtailed investment, innovation and competition – all of which has contributed toward driving up costs of nuclear power; (b) significant project cost overruns and delays; (c) unsustainable and subsidized fossil fuel policies which have unfairly depressed wholesale electricity prices; (d) deregulated energy markets and regulatory frameworks that do not support nuclear and other capital-intensive energy technologies; (e) lack of fair compensation mechanisms for reliable dispatchable capacity and valuing nuclear as a low-carbon energy source; (f) incentives, subsidies and support mechanisms offered to competing fossil fuels and renewables to the detriment of nuclear; (g) changes in nuclear regulations during project construction; (h) reliance upon utilities financing nuclear projects (increasingly operating in deregulated and unbundled markets); (i) lack of sufficient carbon pricing mechanisms and carbon price levels; (j) public opposition related to the perceived safety risks related to nuclear power generation; and, (k) lack of clear long-term government policies supporting nuclear generation. All of these factors combined, have resulted in the reduction of nuclear investment and a dramatic scaling-back of both nuclear power plant construction starts and life-extensions and re-starts of existing nuclear reactors. While nuclear capacity is still rapidly growing in markets such as China, Russia and India and other emerging markets (largely through state-sponsored nuclear financing mechanisms), the continued lack of investment in new nuclear reactors, globally coupled with the fact that world's existing nuclear fleet (which is now over 30 years old, on average) may be prematurely decommissioned, world nuclear capacities are projected to precipitously decrease, if the current trends are left unabated. Failure to address the structural problems in energy markets (such as the USA and EU) will lead to significant premature closures of many safe and reliable nuclear reactors over the next decades, resulting in very significant losses in low-carbon generation, exacerbating problem of achieving 2050 net zero in those countries.

IBNI's programs will be specifically designed to create the necessary global foundations and appropriate incentive mechanisms offered to individual members states to enable market and regulatory reforms, which

will favor large-scale nuclear deployment. These mechanisms will also enable nuclear to fairly compete with other low-carbon technologies, and therefore mitigate the above issues. The intended result is that IBNI will enable expansion of nuclear generation across both existing nuclear countries and many more 'newcomer' nuclear countries alike. Both existing and 'newcomer' nuclear states will see the development and expansion of their nuclear programs as a feasible, accessible, affordable and financeable option available as a key component of their 2050 net zero strategies. IBNI's active engagement and promotion of solutions to the current issues plaguing the current nuclear industry is intended to reverse the current global trends demonstrated in the nuclear industry, which will allow the nuclear industry to significantly expand and thrive, once again.