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The Eastern Atomic Rise:
Defining Nuclear Hegemony in a Multi-lateral World

Capstone Paper for Global Master of Diplomacy and International Relations

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Table of Contents

ABSTRACT	II
ACKNOWLEDGEMENTS	III
OVERVIEW	1
POSITIONALITY	3
LITERATURE REVIEW	4
RESEARCH DESIGN AND METHODOLOGY	8
DISCUSSION	10
HEGEMONY CONCEIVED	10
INTERNATIONAL RELATIONS THEORY: REALISM, LIBERALISM, AND CONSTRUCTIVISM	12
PERSPECTIVES ON NUCLEAR ENERGY	14
THE INTERNATIONAL ATOMIC ENERGY AGENCY: A NUCLEAR HEGEMON?	17
RUSSIA: THE WORLD'S ONE-STOP NUCLEAR SHOP	19
CHINA: FINANCING THE GLOBAL NUCLEAR BELT	23
THE UNITED STATES: THE ORIGINAL NUCLEAR HEGEMON	27
NUCLEAR HEGEMONY DEFINED	30
DIMENSIONS OF NUCLEAR HEGEMONY	32
LIMITATIONS, APPLICATIONS, AND FUTURE AREAS FOR STUDY	34
LIMITATIONS	34
APPLICATIONS	35
AREAS FOR FUTURE STUDY	39
CONCLUSION	42
REFERENCES	45

ABSTRACT

Most existing literature in the field of international relations on the hegemonic dimension of nuclear technology is written from a realist, western perspective within the context of the Cold War. It focuses on its military, defense, and security dimensions, non-proliferation and safety, and some analyses of hegemony from a cultural media perspective. This theory-building paper offers contrasting understanding of nuclear hegemony, which recognizes three recent developments: 1) diminished Western Hegemony in nuclear technology; 2) growing Chinese nuclear capacity in energy geopolitics; and 3) growing concerns about global energy security. This paper begins with an overview of these developments and a review of the current state of literature on the concept of nuclear hegemony. The paper then reviews the research methodology employed by the author to interrogate conventional understandings of nuclear hegemony. A discussion section then identifies the extent to which current thinking on nuclear hegemony reflects current geopolitical realities. This section includes a proposed new definition of nuclear hegemony. The paper concludes by examining the implications of this study and recommendations for application and further study.

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OVERVIEW

Recent global developments such as the crisis in Ukraine have been sobering reminders of the threat of global energy insecurity. As Budinger & Bauman (2022) recently stated, “the Russian invasion of Ukraine has underscored the importance of energy independence and reliability.” Beyond the immediate impact of rising energy costs, the lack of capacity for states to produce their own energy has impacted many other sectors of society, from health to food security. (Benton et al., 2022; Ori, 2022; Phoumin, 2022)

While some scholars and experts project that this crisis will accelerate the global transition to renewable energy (Fetzek, 2022; Psaropoulos, 2022; Tharoor, 2022), there is concern that despite the growth of the renewable energy sector, growing global demand will not be met. (Hosseini, 2022; Lopez, 2015; World Nuclear Association, 2021) The International Energy Agency (2021) projects that best-case scenario, renewable energy will only be able to meet half of the global energy demand in the upcoming years. Additionally, with climate-exacerbated drought and flooding threatening hydroelectric output worldwide, (Bernstein et al., 2021; Dong et al., 2018; Hiar, 2021) the argument for including nuclear energy in diversification strategies by the International Atomic Energy Agency and other energy agencies is receiving more attention. (El Baradei, 2007) Clifford (2022) likewise argues that the urgency of reducing carbon emissions, which is being compounded by Russia’s reduction of natural gas flows Europe, has increased the appeal of nuclear energy. Even Japan, in the wake of the 2011 Fukushima accident, is pursuing nuclear energy, with Minister for Economy, Trade, and Industry Koichi Hagiuda stating in 2021, “Nuclear power is indispensable when we think about how we can ensure a stable and affordable electricity supply while addressing climate change.” (Nikkei Asia, 2021) Sadiq et al. (2022) likewise note that “Nuclear energy has the potential to play an influential role in energy transition efforts that are now [sic] anticipated by many countries.”

Many states in the non-western aligned Global South are in various stages of implementing nuclear power in their energy programs. Sadiq et al. note that a significant increase in nuclear power will be required to sustainably realize human development while mitigating the effects of climate change. Some developed nations are likewise reconsidering their plans to abandon nuclear energy. (Budinger & Bauman, 2022; Caballero-Anthony & Trajano, 2015; Goldemberg, 2009; Pombo-Van Zyl, 2021) Citing recent initiatives to construct nuclear reactors in South Carolina and Georgia, Feldman (2017) argues that a “rebirth of commercial nuclear power” is potentially underway in the United States. He notes several reasons for the U.S.’s renewed interest in nuclear energy, including the volatility of energy commodities, environmental protection, and the projected increase in electrical demand, which is expected to grow by 28% by 2040, according to the U.S. Department of Energy. (2017)

On a global scale, nuclear energy is “already playing a role in energy geopolitics”, (U.S. Senate, 2019) characterized by the “decline of U.S. nuclear export competitiveness” (Nakano, 2020) over the last two decades while Russia and China have been aggressively pursuing nuclear exports. Sallee (2021) notes that with minimal uranium production, an aging nuclear reactor fleet, and diminishing technological and professional capacity, the U.S. “has relinquished its competitive global position as the world leader in nuclear energy to Russian and Chinese state-owned enterprises.” According to Mazarr et al. (2018) of the RAND Corporation, Russia’s “energy diplomacy” of supplying technology and nuclear fuel, and China’s Belt and Road Initiative (BRI), which includes a strong emphasis on nuclear energy exports, are evidence not only of Russia and China’s emergence as key players in the energy landscape but also a renewed global focus on nuclear energy. Sallee argues that the U.S.’s withdrawal from the global nuclear energy market has created a power vacuum in which rivals such as Russia and China are in a capacity to fill, with alarming implications for

foreign policy. Poneman et al. are more blunt, declaring that the U.S. “has lost its leadership – and is on the precipice of losing it permanently.”

The potential of nuclear energy to help combat climate change and mitigate the challenge of what is likely to be a global energy crisis (Gilbert et al., 2021; Helman, 2022; Horowitz, 2021; Zakaria, 2021), and China and Russia’s move to fill the power vacuum left by the western retreat from this sector represent a critical dimension of the dramatically shifting geopolitical landscape.

Therefore, within the theoretical framework of a renewed competition for geopolitical dominance between nuclear states driven by a global energy crisis, this paper aims to contribute to the existing body of knowledge on nuclear energy by answering the question: “What is Nuclear Hegemony?” and developing a working definition that can be used in future research. It is hoped that this definition will assist in gauging how emerging dominant states will leverage their nuclear prowess over their allies and competitors, how that power will be accepted and challenged by other states, and how the interaction of these actors will shape international relations.

POSITIONALITY

The underlying foundation and motivation for this paper are that while the world must transition away from fossil fuels, the current capacity of renewable energy to meet global energy needs, especially as the current instability in Ukraine constrains natural gas flows to Europe, is insufficient. Therefore, incorporating nuclear energy is crucial for combating climate change and achieving greater security.

My positionality is inspired by Director General Rafael Mariano Grossi of the International Atomic Energy Agency (IAEA), whose discussion on nuclear energy I attended at the Annual Graduate Institute Alumni Reunion in Geneva in 2021. At that discussion, Director General Rossi emphasized that while nuclear energy will not solve the current

climate crisis, it is an integral part of a practical energy diversification strategy to reduce carbon emissions.

The European energy crisis, driven by diminished Russian natural gas supplies amidst the Ukraine conflict, and observing, close-up, the need for reliable, affordable, and adaptable low-carbon energy solutions while studying in Africa further solidified my conviction that nuclear power will become an increasingly important source of global energy. My intent here is not to necessarily advocate for or against nuclear energy. However, the ways in which the trajectory of hegemonic influence and power in global nuclear energy governance are being influenced by Russia and China's advances in nuclear technology absent western capacity and leadership are of great interest to me.

LITERATURE REVIEW

Despite the controversial nature of nuclear technology and the global concern over proliferation and safety, as well as its potential for peaceful use, there are strikingly few instances of the terminology "Nuclear Hegemony" in existing literature. Most research on nuclear power and hegemony is written from a western, realist, Cold War perspective (Deudney, 2014) that focuses on its military and security applications. Hayes (1988), for example, one of the few scholars who actually uses the term, defines "Nuclear Hegemony" as "an international political-military system in which nuclear weapons and strategy play a central role in the military power, institutions, and ideologies which underlie that order." His analysis focuses primarily on the defense and military dimensions of nuclear technology, which reflect the traditional realist foundation of Schurmann's (1974) Political-Military Hegemony Theory. However, he also acknowledges the complementarity of Cox's (1981, 1987) liberal-oriented Political-Economy Hegemony theory and thus conceives Nuclear Hegemony as a fusion of the two theories. Tomotsugu (2016) substantiates that latter theory by emphasizing American use of nuclear cooperation as a diplomatic tool to augment its

allies' capacity to deter its Communist adversaries and contain the spread of nuclear weapons technology to other undesirable actors.

Although Hayes (2018) goes on to further clarify the fusion of realist and liberal approaches by characterizing Nuclear Hegemony as “American nuclear leadership” that is based on both its superior nuclear arsenal and a “shared vision of liberal international order”, he reiterates the underlying aim of “strategic nuclear deterrence aimed at containing illiberal states, most importantly the former Soviet Union.” Sechser & Furhmann (2013) likewise employ a traditional realist approach to nuclear technology and power, stating that “nuclear weapons allow states to protect their territorial sovereignty and autonomy through deterrence rather than more traditional security strategies, including defense, power projection, and compellence.” More recently, Bin (2018) revisits the hegemonic use of nuclear weapons during the Cold War to rebuff the Trump administration’s call for the need to counter the perceived threat of China’s “Nuclear and non-nuclear capabilities.”

Although he does not specifically use the term “Nuclear Hegemony”, Medhurst (1997) offers a slightly more balanced analysis of American activities and aspirations during the “Atoms for Energy” campaign, noting that it had military/security, economic, diplomatic, and psychological dimensions. Ultimately, however, he concludes that with security and defense being the primary goal of U.S. military policy, as well as “the nuclearization of NATO forces”, the “peaceful” atom and American nuclear energy diplomacy were nothing more than public relations campaigns to divert public attention away from its military uses.” Citing the gradual scaling down of nuclear power projects during high oil prices during the 1970s, Gonzalez (2013) more bluntly argues that the U.S. nuclear energy efforts were nothing more than an attempt to “solidify its hegemonic position.” Logically, he theorizes, the energy shock should have been an impetus to intensify the development of nuclear energy

production. But the fact that nuclear projects were, in fact, reduced indicates that energy security was not a priority in the U.S.'s nuclear ambitions.

The second prevailing line of thinking concerning Nuclear Hegemony concerns disarmament and non-proliferation. In analyzing India's No First Use (NFU) policy on nuclear weapons, Kamath (2013) frames "Nuclear Hegemony" as an American global institution that must be abandoned under the encouragement of NATO within the greater context of the disarmament of the five major nuclear weapons states. Kamra (2009) compliments this perspective, defining Nuclear Hegemony as an effort by "Nuclear Haves", which Gonzalez (2018) identifies as the Western, U.S.-led "political elite" to use Non-proliferation to prevent the acquisition and manufacturing of nuclear weapons by undesirable "Nuclear Have Nots". He points to the hypocrisy of nuclear states, which, while retaining and refusing to destroy their own arsenals of nuclear weapons, promoted non-proliferation and the Comprehensive Test Ban Treaty (CTBT), which limited access of many countries to nuclear technology.

Without specifically invoking the term "Nuclear Hegemony", Ritchie (2019) discusses a global nuclear order that revolves "around the nuclear Non-Proliferation Treaty (NPT), nuclear deterrence, the possession and control of nuclear weapons and materials, and nuclear abolition", whose aim is to "delegitimize and stigmatize nuclear weapons and nuclear deterrence through a new and unequivocal legal instrument under the auspices of the United Nations". Finally, Miller (2014) analyzes how dependence on American resources, coupled with the threat of nuclear sanctions, projected American hegemony in non-proliferation efforts and containment in the 1970s in Taiwan and Pakistan.

The third line of thinking frames Nuclear Hegemony through cultural and media outlets, which are primarily oppositional narratives to nuclear war and devastation. Brink (2018) analyses public criticism of "Nuclear Hegemony" in Japan in the wake of the

Fukushima disaster through the publication of “senryu” (poetry) in Japanese media. The “Nuclear power village”, which he describes as Japan’s “energy industry equivalent of a military-industrial complex,” failed to foresee and later concealed the severity of effects that the Tohoku earthquake had on the community.

Demo et al. (2014) focus on the role of the media in projecting the image of the American nuclear elite, through which hegemony was “claimed” by America’s scientific and technological prowess, and its nuclear endeavors legitimized and justified. They, therefore, define Nuclear Hegemony as “the ongoing processes by which political, social, and cultural forces combine to establish and enforce the dominant power of the nuclear-industrial complex, which since the Manhattan Project in the 1940s has had power to command resources, protect secrets, control publicity, and establish professional and political classes and hierarchies of personal and institutional authority.” They briefly mention the U.S.’s pursuit of a non-military international atomic program during the Truman administration but maintain that it was essentially a public relations spin to manage the U.S.’s warmongering image and assuage/divert concerns away from weaponization and destruction in order to make it publicly acceptable.

Scholars such as Schwartz (2021) and Alexis-Martin (2019) frame the hegemonic nature of nuclear technology within the devastation from nuclear testing on communities in the Pacific Islands and the neo-colonial exploitation of uranium miners in Africa. Hogg (2016) notes the emergence of “nuclear criticism” in popular culture in the 1980s in the United Kingdom, which focused on the prospects of prolonged nuclear engagement as well as the destructive capacity of nuclear technology that western Nuclear Hegemony fostered.

Despite these identifiable narratives, Deudney nonetheless notes that “extensive literatures on hegemony and nuclear weapons...have surprisingly little overlap”. Beyond these three narratives, many contemporary scholars (Harnisch, 2014; Horsburgh, 2015;

Ritchie, 2019; Walker, 2012) acknowledge that power and hegemony have not received sufficient consideration within the energy dimension of global nuclear governance.

This review of the existing literature has established that the academic framework to evaluate and study the utility of nuclear energy as a diplomatic and hegemonic tool does not exist. The geopolitical landscape continues to shift, most notably with the emergence of the BRICS (Brazil, Russia, India, China, South Africa) organization, which is challenging western hegemony. The hegemonic dynamic of nuclear power is also evolving as Russia (Geller, 2022) and China emerge as global leaders in nuclear energy development and exports. (Wang & Lee, 2022) To maintain global stability and security, compatible academic and policy tools must also be developed

Existing narratives born out of Cold War realism continue to frame the discourse in a profoundly different world order. Bin, for example, notes the alarmist view of nuclear weapons confrontation that frames much of the current discourse on U.S.-China nuclear relations. Ritchie notes a global nuclear “ordering anxiety” arising from the intersectionality of the mixed success of arms control initiatives and perceived renewed nuclear threats driven by the eroding “liberal international order”.

As long as realist Cold War and alarmist narratives continue to define the discourse on nuclear technology, leaders and academics, particularly in the west, will continue to look in the wrong direction by focusing on weapons when they should also be paying attention to Russia and China’s gains in nuclear energy. This has profound implications for foreign policy and the shaping of the emerging world order.

RESEARCH DESIGN AND METHODOLOGY

The over-arching phenomenon to be studied is the nuclear dimension of energy geopolitics. The hegemonic nature of nuclear power has changed over time with the simultaneous diminishing of Western dominance and the growing influence of the Global

South. Therefore, Grounded Theory, which, according to Merriam & Tisdell (2015), addresses “questions about process; that is, how something changes over time”, is the appropriate analytical framework for the study.

As Russia and China exercise hegemony through cooperation within the BRICS organization and in greater South-South relations, Cox’s Political-Economic Hegemony Theory is the most appropriate theoretical foundation upon which to base research for this paper. Since Russia and China’s emergence as nuclear energy hegemony within a governance context are relatively unstudied and overlooked, Critical Theory, which Bronner (2011) argues, “must respond to the new problems and the new possibilities for liberation that arise from changing historical circumstance”, is the appropriate framework under which to conduct research. At the same time, Grounded Theory, which Saldaña (2011) describes as “an analytic process of constantly comparing small data units” (in this case, case studies of Russian, Chinese, and American nuclear energy strategies), is the logical foundation for comparative analysis and is a practical approach to employ in building a definition of Nuclear Hegemony.

The primary methodology employed in this study consists of collecting and analyzing case studies under the Canonical Genre of qualitative research. (Marshall et al., 2021) Most contemporary literature about the philosophical and theoretical concepts of hegemony is oriented around Gramsci’s writings on power dynamics characterized by the transactions of socio-political groups as models to counter fascism, which modern scholars such as Hayes and Cox adapted and framed within geopolitical discourse. Considering that Gramsci was interested in alternate systems of governance (which is particularly relevant with the emergence of BRICS and other “counter-hegemonic” actors), his work and those of his modern counterparts are a logical foundation upon which to develop an appropriate concept of hegemony for the first phase of research for this paper.

The second phase consisted of case studies of Russian, Chinese, and American foreign policy and nuclear programs, encompassing analyses of government publications (where available) from all three states, as well as research and commentaries by western, Asian, and Eurasian academic institutions, think tanks, and media, who identified both the mechanisms by which these actors penetrated foreign nuclear markets, how their presence and capacity can and do affect how their client states behave, and to project how they may exercise their political, economic, and scientific advantages on the geopolitical stage.

During the third and final phase, the definition of Nuclear Hegemony is developed using Critical Genre approaches (Marshall et al.,) such as Critical Ethnography and Critical Discourse, based on Hayes' Political-Economic Hegemony Theory. The hegemonic tools identified in the case studies were incorporated into traditional perceptions of hegemony and framed within international relations theories of Realism, Liberalism, and Constructivism.

DISCUSSION

Hegemony Conceived

We will proceed with a working conceptual idea of hegemony based on Hegemonic Stability Theory (Gilpin, Keohane), which attempts to explain how more endowed states leverage their political and economic advantage to influence the behavior of less endowed states. In simple terms, according to Joseph (2003), hegemony concerns the relationship between a dominant group's leadership and a subordinate group's consent.

Cox's analysis of hegemony traces its modern origins to the work of Antonino Gramsci, former leader of the Italian Communist Party. While imprisoned in Italy, Gramsci wrote a series of papers that focused on defeating fascism and envisioned alternative models of the social fiber of the state based on Marxist concepts of an emergent working class that could exercise power in the state.

Contemporary scholars have struggled to define hegemony concretely. Ougaard (1988), for example, attempts to define hegemony first within the context of resource distribution in which hegemony represents “a preponderance of material power resources”, and second within the context of a state pursuing its own interests within an environment of conflict. Clingan (2013) attempts to define hegemony through economic indicators, suggesting, for example, that a state has achieved hegemony when its economy is larger than the next three combined. However, he notes that a definitive determination is a challenge because conventional measures such as GDP, GDP per capita, and output per worked hour, to name a few, yield different results. He also cites geography and distance as a limit on hegemony, noting that the ability to exert power diminishes proportionately with distance from power centers and resources.

Other scholars, such as Cox, focus on conditions conducive to achieving hegemonic capacity. He suggests that a prerequisite feature of a hegemon is the foundation and protection of a world order that originated with a social or economic revolution in the hegemonic state that then spilled over to other states. Consistent with Wallerstein’s World-systems theory, in which socially, politically, and economically advanced “core” states exert influence on less developed “semi-peripheral” and “peripheral” states, (Agnew, 2020) we can witness this phenomenon during the mid-nineteenth century British hegemonic expansion, the United States’ global position post World War II, and more recently during we are seeing the economic and political influence of the BRICS organization spreading to other states in the Global South. (Teslova, 2022)

Beyond these sources, there are few identifiable definitive factors that can be used to evaluate a state’s hegemonic status. Scholars of nuclear governance should not be discouraged by this but should instead see this as an opportunity to break new ground in this re-emerging field of study. Central to defining Nuclear Hegemony is the acknowledgment of

the hegemon's capacity to make the rules by which other players abide through "the elaboration of political projects, the articulation of interests, the construction of social alliances, the development of historical blocs, the deployment of state strategies and the initiating of passive revolutions." (Joseph)

International Relations Theory: Realism, Liberalism, and Constructivism

The three key international relations theories of Realism, Liberalism, and Constructivism seek to explain why and how sovereign states, who control all social, economic, and political activity within their borders, pursue their own interests and self-preservation absent accountability to a prevailing institution (Mearsheimer, 1994) in a "competitive, often ruthless, Hobbesian domain" known as anarchy. (Gilpin, 2012; Glaser, 2019) Thomson (1995) defines sovereignty as the "recognition by internal and external actors that the state has the exclusive authority to intervene coercively in activities within its territory".

Norwich University (n.d.) characterizes Realism as an environment in which a state acts to maximize its social, economic, and political power and influence in the interest of self-preservation. According to Donnelly (2014), "Realism emphasizes the constraints on politics imposed by human nature and the absence of international government. Together, they make international relations largely a realm of power and interests."

Because states will almost always act in their own self-interest, (Gilpin, 2007) the state's behavior is manifest through power. (Morgenthau & Thompson, 2018) Any action, including military action, is therefore justified in the interest of self-preservation (Schwarzenberger, 1964) as articulated by Schurmann's Political-Military Hegemony theory, which is based on "direct political and military rule by one state over many aspects of the internal and important aspects of the external policies of other states" and is inherently coercive.

As one state acquires power, it diminishes other states' relative power and influence. From a realist geopolitical perspective, hegemony can therefore be conceived as a global power system in which a state can exercise its economic and military dominance to "regularly get its way." (Clingan) The subsequent system of winners and losers creates a perpetual state of competition for power and influence (Waltz, 2010), which inevitably leads to conflict.

Liberalism is defined by "an emphasis on international cooperation as a means of furthering each nation's respective interests." (Norwich University) The common market function of the European Union is an excellent articulation of liberal thought in which a capitalist, liberalized, integrated open market functions as the optimal mechanism to produce goods and services and ensure happiness and prosperity (Fukuyama, 1989) for its member states. It also creates a system of interdependence, in which states' collective wellbeing depends on their ability to cooperate. (Paul, 2012) Interdependency, in theory, minimizes the likelihood of armed conflict, but it also requires states to relinquish their sovereignty, in certain policy areas, to a supranational authority. Liberal theory, therefore, aligns with Cox, Fenton's (2018), and Mollakkattu's (2009) concept of hegemonic power as based on the compatibility of interests between the hegemon and consenting states who willingly accept and (sometimes) actively participate in the supranational authority of the hegemon.

Constructivism "rests on the notion that rather than the outright pursuit of material interests, it is a nation's belief systems—historical, cultural and social—that explain its foreign policy efforts and behavior". (Norwich University) States are not the most important actors in international relations because international institutions and other non-state actors are valuable in influencing behavior through lobbying and acts of persuasion. (Norwich University) It could be argued that the emergence of the BRICS organization to challenge western hegemony and reshape western-dominated global institutions represents a nascent constructivist hegemonic order.

While a firm understanding of these IR theories is crucial to building a definition of Nuclear Hegemony, it is critically important to recognize that hegemony within a nuclear context is evolving and therefore contains elements of some or all three theories, which are often contradictory. Saull (2017), for example, balances liberal and realist approaches, describing hegemony as “international leadership by one political subject, be it the state or a “historical bloc” of particular social groupings(...)of other, weaker, less powerful parties.”

Alternately, while Hayes notes that nuclear geopolitics are “nuclear bloc” politics versus “balance-of-power” politics, suggesting that he views nuclear politics through a liberal lens versus a strict realist approach, Cox notes the applicability of Gramsci’s concept of hegemony to global governance because of the interplay of power groups and “alternate states” which is particularly relevant with the emergence of BRICS and other constructivist organizations.

Before we add the layer of nuclear technology to our analysis, two final points need to be made about hegemony and international relations: 1. While Realism and liberalism appear to be the dominant IR theories that arise when analyzing hegemony, it is important to remember that while these conventional concepts have shaped academic thought on the subject, we are venturing into a new political arena with newly emergent players and new concepts of world orders that are challenging these concepts. Therefore, we must be vigilantly mindful of the role that Constructivism and constructivist institutions can play in shaping contemporary concepts of hegemony; 2. That notwithstanding, it is equally important to be mindful that despite the cooperative and consensual verbiage of nuclear agreements, Cox warns us that when analyzing hegemony, coercion is always implied.

[Perspectives on Nuclear Energy](#)

Nuclear technology remains controversial in many parts of the world, particularly in the west. Many western countries have voiced strong opposition to nuclear energy, ranging from safety and security concerns to costs. Critics of nuclear energy, for example, warn of the

potentially disastrous effects of reactor failure. The Union of Concerned Scientists (2013) list seven accidents associated with nuclear energy, including the melting of the Windscale 1 core in Cumbria, UK, in 1957 and the accidents at Three Mile Island in the United States, Chernobyl, Ukraine (former Soviet Union) in 1986, and most recently the Fukushima Daiichi reactor in Japan in 2011. The human casualties and environmental, structural, and capital damage that render affected areas indefinitely uninhabitable are sufficient reasons for many to oppose nuclear energy. Some critics, such as Muellner et al., (2021) also argue that nuclear power's contribution to mitigating climate change will be minimal (although their argument comes from a "main source of future electricity generation" rather than its efficacy as part of a greater diversified production strategy).

In addition to the environmental, structural, and capital damage caused by reactor failures, the safe transportation and storage of radioactive nuclear waste, (Gardoni & Murphy, 2015; Jacoby, 2020; Saraç-Lesavre et al., 2021; Siegel, 2020) the weaponization of uranium, which is the main fuel that is enriched and used to power nuclear reactors, (World Nuclear Association, n. d.) and concerns of nuclear war between both major nuclear states and actors outside the nuclear regime such as North Korea, (Grove, 2022; Pazzanese, 2022) make nuclear technology unacceptable for many.

Finally, opponents argue that the upfront capital cost and build time of nuclear reactors make them economically unsound, particularly as the cost of renewable production continues to fall and with the (until recently) relatively low cost of natural gas. (Dunai & Clercq, 2019; Ferguson, 2011; Lovins, 2021)

Proponents of nuclear energy argue that it plays a unique role in energy security by providing carbon-free, reliable, cost-effective energy. Meserve (2009) argues that nuclear power is an attractive energy source, not only in combatting climate change but in providing energy reliably and relatively cheap. Hassan et al. (2020) point out that nuclear energy can

contribute significantly to “ensuring energy security” while also reducing carbon pollution in developing nations and economies, such as the BRICS countries, where reliable, carbon-free energy is crucial.

In terms of safety, proponents argue that enhanced safety standards implemented since the Fukushima accident will ensure the continued safe operations of nuclear reactors. According to the World Nuclear Association (2022b), these standards have been effective since there have been no further accidents since their implementation. They also argue that current facilities for the transportation and storage of nuclear waste are sufficient. (Nuclear Regulatory Commission, 2021) Finally, proponents argue that the weaponization of uranium is unlikely because few non-nuclear states or non-state actors have the facilities to enrich uranium, which is usually enriched to between 3 and 5% for power production, (Center for Arms Control and Non-Proliferation, n.d.) to weapons-grade at 90%. (World Nuclear Association, 2017)

Despite the substantial capital costs of conventional Nuclear Power Plants (NPPs), which critics argue are unwarranted compared to the lower costs of renewable energy and natural gas, institutions such as the World Nuclear Association (2021b), the Nuclear Energy Association (2021), and scholars such as Rhodes (2018), Swanek (2018), and Ulmer-Scholle (2022) argue that nuclear energy has an overall lower cost long-term.

With new technology on the horizon in the form of, among other promising technological developments, Small Modular Reactors (SMRs), nuclear energy has the potential flexibility and adaptability to be a significant “resource in humanity’s arsenal in the fight against climate change” (Siegel) reliably and more cost-effectively. SMRs, according to Budinger & Bauman, will mitigate many safety concerns raised by nuclear opponents because they do not need water or giant cooling towers. They can operate with minimal manpower, thus mitigating the lack of technical capacity in many developing countries. The

design is inherently safe and includes automatic shutdown mechanisms in the event of an overheat (Cho, 2019; Parshley, 2021). Because of their small design, SMRs can also be constructed onsite, reproduced, transported, and deployed more quickly, efficiently, and at a lower cost than conventional large-scale reactors. (Fitzpatrick, 2017; Iurshina et al., 2019)

The International Atomic Energy Agency: A Nuclear Hegemon?

As Cox notes, international organizations, such as the United Nations, and the Bretton Woods institutions, such as the World Bank and International Monetary Fund (IMF), are mechanisms “through which the universal norms of a world hegemony are expressed.” He notes five attributes of international organizations that “express their hegemonic role:

- (1) They embody the rules which facilitate the expansion of hegemonic world order;
- (2) they are themselves the product of the hegemonic world order; (3) they ideologically legitimate the norms of the world order; (4) they co-opt the elites from peripheral countries and (5) they absorb counter-hegemonic ideas.”

The International Atomic Energy Agency (IAEA) is an autonomous international organization within the United Nations (IAEA, 2016). Within the U.N. system, it works with over 12 U.N. agencies, including close coordination with the U.N. Security Council and the European Commission within the European Union. It officially came into being on 29 July, 1957 with President Dwight Eisenhower’s ratification of the U.S. Statute. (IAEA). According to the Statute (2014), its objectives are to “accelerate and enlarge” the capacity of nuclear energy to promote peace and prosperity worldwide, contribute to improvements in health and medicine, and ensure that it is not used for military purposes. It also aims to enable “countries that were not among the advanced nuclear powers to take advantage of the nuclear age for a variety of uses and ensuring that nuclear facilities were not diverted from civil to military uses.” (de Blasio & Nephew)

As an actor, The IAEA procures over one hundred million dollars annually in goods and services, most of which are delivered to member states worldwide. The list of services

includes construction services and upgrades for nuclear facilities, disposal of nuclear waste, supplies, and equipment related to nuclear technology, raw materials for production, and goods and services related to safety and security. It serves a crucial role as the international safeguards inspectorate, which verifies compliance by non-nuclear weapon states with international rules under the NPT. As a resource, the IAEA's initiatives and programs, as well as research and publications, are utilized by member states to pursue their interests, which range from energy production to medicine, health and food production, and ultimately to weapons policy.

Brown (2015) argues that the IAEA has established itself as an international nuclear authority and is "an autonomous agent of global governance", having managed to gain considerable compliance and cooperation from the international community on its rules and services implemented. It has also established legitimacy by utilizing a strong policy bias relative to other international organizations.

The IAEA wields authority through two sources of independent power in international governance which Barkin (2013) identifies as moral authority and political entrepreneurship. Moral authority, he maintains, can be manifest in two areas. The first area is the legitimacy of the IAEA to act as an "official voice" and to command the global community's attention on nuclear technology issues. Secondly, as Brown notes, favorable assets such as the ability to leverage economies of scale in its projects and its perceived apolitical nature both also give weight to its moral authority, which can compel states to comply or consent in certain policy areas.

Political entrepreneurship, according to Barkin, is a process by which specific political positions are advanced through governance mechanisms. Thus, the IAEA is able to wield power by focusing international attention on issues that they deem important, as Secretary-General Mohamed El Baradei did through his initiative to prevent the militarization

of nuclear energy and ensure safety in peaceful applications (United Nations, 2005) for which he and the IAEA were awarded the 2005 Nobel Peace Prize.

Considering that the IAEA is funded mainly by Member State contributions as well as some voluntary contributions, its activities logically reflect the interests of its biggest contributors. Findlay (2012) maintains that international organizations' budgets are "determined by a combination of politics, history, organizational inertia, competing priorities, and the health of member states' finances." Therefore, despite its moral authority, legitimized by its role in the NPT and Nobel prize, the IAEA is nonetheless asymmetrically dependent on funding from member states and represents the western global order that many non-aligned nations are now challenging.

Recalling Cox's five hegemonic attributes of international organizations, it can be argued that the IAEA does embody rules that facilitate the expansion of the hegemonic world order. However, its activities are limited mainly to safety and security and therefore do not play a significant role in influencing states' behavior in geopolitics. While it is a product of the hegemonic world order and legitimates its norms, those norms are still defined by western values that are informed in a decidedly unidirectional manner. By perpetuating what can be perceived as western values, it could be argued that the IAEA continues to promote western hegemonic ideas versus absorbing counter-hegemonic ideas. Based on Cox's criteria and the IAEA's limited capacity to influence and inform the geopolitical behavior of states beyond areas of nuclear safety and security, not to mention the internal challenges it faces to function properly in even this capacity, this work concludes that it is not a hegemon.

[Russia: The World's One-stop Nuclear Shop](#)

Over the last two decades, Russia has become the world's go-to supplier of nuclear technology, especially for countries new to the civilian nuclear market. She is deeply experienced in constructing and maintaining nuclear plants, has considerable industrial and scientific capacity, as well as market share of the global uranium supply, and has the capacity

to reclaim spent nuclear fuel from client states. By positioning itself as a one-stop-shop for reactors, fuel supply and reclamation, financing, and worker training, (Lovering & Halland, 2022) Russia embodies the Dependency dimension of Nuclear Hegemony.

Russia's rise as a nuclear energy player started in 2006 with the Kremlin's \$55-billion plan to become a "leading global supplier of nuclear power". (Conant, 2013) By 2014 Russia had built 37 percent of all new nuclear reactors, compared to the US's 7 percent. (Lecavalier, 2015) Of the 439 nuclear reactors currently operating globally, 38 generate electricity in Russia. Additionally, 42 Russian-designed VVER reactors operate in Armenia, Bulgaria, Czech Republic, Finland, Hungary, India, Slovakia, and Ukraine, and an additional fifteen were under construction in Bangladesh, Belarus, China, Finland, Hungary, India, Iran, Slovakia, and Turkey as of 2021. (Bowen & Dabbar, 2022a) She has signed bilateral nuclear cooperation agreements with a total of 47 countries and has nuclear energy footprints in Africa, Asia, the Middle East, and South America. (Lovering & Halland, 2022)

According to the IAEA, (2021) Russia enjoys competitive strength in nuclear energy through its technological capacity, which includes intellectual property, manufacturing infrastructure, and workforce. Through its state-owned atomic energy corporation, Rosatom, Russia is able to "oversee and work at all stages of the nuclear fuel cycle and production chain, from uranium mining to decommissioning of nuclear facilities or management of spent nuclear fuel", which enables it to construct and operate nuclear reactors safely and economically. This makes it an attractive partner for energy-hungry states, especially developing states with limited capacity and financial resources.

She is also able to exercise considerable power in the nuclear Supply Chain through the considerable market share capture (Sallee, 2021) of many of the components of energy production. Through Rosatom, Russia controls key facilities in the mining, milling, conversion, and enrichment of uranium, as well as fuel fabrication and the manufacture and

distribution of "equipment, parts, and services for nuclear reactors." (Bowen & Dabbar, 2022b) According to Lovering & Halland, (2022) Russia controls nearly half of the global uranium enrichment capacity. Together with Kazakhstan and Uzbekistan, they supply half of the U.S.'s nuclear power imports and nearly 40 percent of Europe's.

Currently, Rosatom is the only nuclear supplier that can reclaim spent nuclear fuel from foreign clients to temporarily store and reprocess. (Kim, 2021; Schepers, 2019) Considering that most developing states and emerging economies lack the capacity to safely manage nuclear waste (which can potentially be weaponized) and considering that proper storage and management continue to challenge even developed states, the reclamation of spent fuel makes Russia not only an attractive supplier for "nuclear newcomer states", (Kerr, n.d.) but also offers a strong counter-narrative against criticism of her lax safety standards (Stulberg et al., 2021) and provides safeguard mechanism nuclear waste.

Since Rosatom is a state-owned enterprise (SOE), Russia can easily penetrate the nuclear export market by offering client states government subsidized loans with favorable terms that the U.S. cannot match. (Hayunga, 2020) Like China, this gives the Russian government direct and complete control over not only the construction of nuclear equipment and supply chains but also financing. This gives both countries a competitive advantage over the U.S., whose Export-Import Bank (EXIM) lending schemes are regulated by the Organization for Economic Cooperation and Development's (OECD) Arrangement on Officially Supported Export Credits which severely limited the financing of its nuclear exports until recently. (Nakano)

Ultimately, this means that Russia can establish a nuclear foothold in many client states efficiently and cheaply. In addition to financing 90% of the Rooppur Nuclear Power Plant in Bangladesh, and nearly 50% of the El Daaba reactor in Egypt (Schneider et al., 2018), Rosatom also offered to fund 100% of a nuclear project in Hungary, though Hungary

ultimately accepted a lesser amount. (Saha, 2017). Most Russian NPPs are built under EPC (Engineering, Procurement, and Construction) or "turnkey" contracts, (Lieu, 2020) where Rosatom designs and builds the reactors and then hands them over to the client state's utility company. (Schepers, 2019) However, the Akkuyu reactor in Turkey, which is currently under construction, was contracted under a "Build-Own-Operate" (BOO) agreement, where Rosatom will finance and retain ownership of the estimated \$22 billion project (Schneider et al.) and sell electricity back to Turkey (Sallee, 2021) While the financial efficacy of the BOO remains to be seen, Russia's energy strategy is proving to be a reliable source of income. As Schepers notes, from Rosatom's 2017 "Performance of State Atomic Energy Corporation" report, more than one-third of Rosatom's international revenue came from NPP construction.

By establishing itself as a one-stop shop for nuclear energy production that includes "flexible financing options, training opportunities, and support with developing nuclear infrastructures related to safety, security, non-proliferation and export control requirements", (Schepers, 2019) Russia has ensured that its clients will remain dependent for all aspects of production and for a long time, considering the length of nuclear projects. It also ensures a steady income stream with the potential for parallel long-term partnerships in other areas of cooperation with its client states. It is, therefore, positioned to leverage its control of the supply chain to exert influence over its clients in the greater geopolitical environment over a long period of time. Given current events, this is concerning. As Russia controls a substantial supply of the world's natural gas, which it has been accused of politicizing and weaponizing. (Eddy & Stevis-Gridneff, 2022; Sabadus, 2022) the implication that it could employ a similar strategy with nuclear power is obvious. By controlling 40% of the global uranium conversion market and 46% of global uranium enrichment capacity, (Bowen & Dabbar; 2022b) Russia could easily disrupt the energy supply of any country dependent on it. This potential threat is not limited to prospective client states, as evident by the fact that despite its activities in

Ukraine, Russia's uranium exports have yet to be sanctioned. (Arai & Hanawa, 2022; Freebairn, 2022; Hunnicutt & Scheyder, 2022; Wesolowsky, 2022)

Consequently, it can be concluded that Russia is exercising its Nuclear Hegemony by virtue of establishing a firm system of dependency through which it can exercise power over other states. While the cooperative nature of its bilateral agreements implies power by consent, the coercive, realist potential is nonetheless apparent.

China: Financing the Global Nuclear Belt

China's geopolitical nuclear power strategy is best conceived as a component of her Belt and Road Initiative (Ramana, 2022; Yi, 2018), which is branded as "a transcontinental long-term policy and investment program which aims at infrastructure development and acceleration of the economic integration of countries along the route of the historic Silk Road" (BRI, n.d.) that is intended to connect Asia, Europe, and Africa (Chatzky & McBride, 2020)

The BRI is a two-pronged initiative consisting of a land corridor, known as the Silk Road Economic Belt (SREB), and a sea corridor, known as the Maritime Silk Road (MRS), that will connect China with Europe and strategic sites in Africa through infrastructure projects related to energy, commerce, and transportation. (Kim, 2021) So far, 143 countries have agreed to participate in the BRI with about \$8 trillion of announced investments. (Sandalow, 2019) When completed, the BRI will span over 70 countries, representing 60% of the global population and nearly 30% of the global GDP. (Sarwar, 2018)

The SREB has three main routes through Eurasia: the northern route from China to Northern Europe via the Eurasia land bridge through Russia to Germany; the middle route consisting of oil and gas pipelines running from Beijing to Paris via Afghanistan and Kazakhstan; and the southern route consisting of transnational highways running from Beijing through Southern Xinjiang, Pakistan, Iran, Iraq, Turkey, Italy, through to Spain. (Sarwar) The MRS meanwhile aims to establish a seabound network by developing,

constructing, expanding, and operating ports, industrial parks, and special economic zones (SEZs) throughout the South China Sea and the Indian Ocean. (Ghiassy et al.,2018)

Sarwar argues that, unlike the original Silk Road, which facilitated trade and cultural exchanges between the east and west, the BRI is not only "an overt expression of China's power ambitions in the 21st century" but is also a geopolitical tool for China to counter the U.S.'s geopolitical pivot to Asia, and function as a foundation of a new global economy centered around China. Ayres, (2017) and Hillman & Sacks, (2021) and Zhang (2018) likewise caution about the political and economic threats that the BRI represents, not only to the west but also to BRI host countries.

Other scholars, such as Jin, (2017) suggest that China, BRI host countries, and even peripheral countries will benefit from the improved political and diplomatic relations that will be facilitated by the enhanced infrastructure connectivity, deepening economic cooperation, and person-to-person interactions facilitated by the BRI.

Kim (2021) conducted extensive research for the Wilson Center on the nuclear energy aspect of the BRI, which she notes is "important and understudied." China's global nuclear strategy, which aims at global dominance in high-tech sectors, was articulated in its 10-year "Made in China 2025" industrial policy in 2015. Through the BRI, she aims to build up to 30 overseas nuclear reactors by 2030, having (Reuters, 2019b) already built four nuclear reactors in Pakistan, with the goal to build 2 more. (Parameswaran, 2015; Tabeta, 2020) She is also in various stages of development of nuclear energy programs in Romania, Argentina, Brazil, the UK, Iran, Turkey, South Africa, Kenya, Egypt, Sudan, Armenia, The Philippines, Kazakhstan, and Saudi Arabia. (Rogers & Crow-Miller, 2017; WNA, 2022b)

China's domestic nuclear market has grown substantially over the last three decades. Driven by increasingly poor air quality from coal-fired power plants in the 1970s, Beijing

began to develop alternative energy sources. (Fairley, 2018; WNA) Therefore, Beijing began to invest heavily in domestic nuclear energy production.

Currently, China develops, constructs, and operates nuclear reactors through its three state-owned nuclear agencies: the Chinese National Nuclear Corporation (CNNC), the China General Nuclear Power Group (CGN), and the State Power Investment Corporation (SPIC) (WNA).

China's substantial investment in its nuclear industry (Baker et al., 2017) has enabled it to develop an array of domestically produced reactor models, such as the Hualong One (whose design is based on western technology) and is protected by intellectual property rights. (Reuters, 2019a) The first exported Hualong One reactor began construction in Pakistan in 2015 and commenced operation in May 2021. It is expected that China will ultimately construct a total of six nuclear reactors in that country. (ANS, 2021) According to Sallee, this homegrown reactor will give China access to new revenue streams and facilitate the building of stronger partnerships abroad. It is also representative of "China breaking the monopoly of foreign nuclear power technology and officially entering the technology's first batch of advanced countries."

Like Russia, China is able to penetrate the foreign nuclear market by offering generous and flexible financial terms, such as low-interest and concessionary loans with long grace periods (Chatzky & McBride; Mehta, 2020) to client states for whom nuclear reactors would otherwise be unaffordable. (American Security Project, 2019; Bastian, J.; 2021; Chatzky & McBride; Kim) Since these contracts often lack transparency, (Bastian, Gupta, and Hurley et al.) client states are likely not fully aware of what they are committing to.

According to Bing-Ming (2021), these financial arrangements, and the length of time of nuclear projects equate to a "marriage [that] is not easily dissolved." He goes on to explain that if a client state enters into a nuclear agreement with China and then decides to suspend

the project in the pre-construction phase, it is liable for sizeable damages to China for breach of contract. Once reactor construction has begun, Bing-Ming continues, "the marriage is truly ironclad." This is because China, like Russia, has developed a supply chain that includes partnerships for uranium imports with BRI partners Namibia and Kazakhstan (WNA, 2021a), as well as control of equipment, technology, workforce, and waste disposal supplies and facilities by her state-owned nuclear utilities, rendering the client state dependent over a long time.

Some critics claim that China's financial strategies harm client states, leaving them vulnerable and dependent on China. (Ayres, 2017; Brattberg & Soula, 2018; Chatzky & McBride, 2020; Hurley et al., 2021) Others, such as Gupta (2020) and Mehta, suggest that they are a deliberate tactic to lure states into "debt traps" through which China can secure a long-term foothold in other countries and acquire control of their resources and strategic locations.

In any case, the debt crises in many of China's client states are causing concern. The situation is particularly dire in Africa, where China is the top lender. (Chaudhury, 2021) Despite denial by the Kenyan government, concern remains that Kenya could lose its port in Mombasa to China over its struggles to repay its \$50 billion debt. (Chaudhury, 2019) Angola is likewise having to repay its debt in crude oil, (Pandey, 2018) leaving little for the country. Elsewhere, Tajikstan reportedly ceded 1,100 kilometers of disputed territory to China in exchange for debt forgiveness for an unspecified amount. (Gupta, 2020) China also assumed an 85% stake in the Hambantota Port in Sri Lanka under a 99-year concession for the \$1.1 billion package for the construction of the port.

From a hegemonic standpoint, we could consider China's nuclear strategy as a synthesis of the liberal and constructivist approaches. Its nuclear programs consist of bilateral agreements based on consent that have the dual potential to fulfill client states' energy needs

while affording China access to resources it needs to manage its domestic challenges. China is also incorporating new ideas and approaches by partnering with client states outside the traditional nuclear regime while embarking on one of the most ambitious infrastructure programs in history.

Throughout this analysis, we must heed our contemporaries' warning that in any hegemonic relationship, coercion is always implied. China is in various stages of nuclear cooperation with the Philippines, Thailand, Singapore, Cambodia, Sri Lanka, Sudan, Kenya, and Namibia, (WNA, 2022f) who are all participating in the BRI. (FSIF, 2021) Suppose we frame China's nuclear export strategy within the context of the BRI. In that case, it is easy to envision a coastal nuclear maritime route from China through the highly contested Malacca Strait (Greco, 2022) around the Indian Ocean and back.

Therefore, it could be argued that China is building hegemony in nuclear energy by establishing a supply chain that includes fuel, technological know-how, hardware, manpower, and disposal, similar to Russia. Driven by the aspirations of the BRI, it has been able to expand its hegemonic footprint by offering innovative and relatively affordable reactors with appealing financing terms that, while offering its client states cheap, reliable, and low-carbon energy could also render them not only dependent but also obligated for nearly a century if they default. Therefore, the latent coercive implications of hegemony are always there.

The United States: The Original Nuclear Hegemon

For decades, according to Poneman et al., (2017) the United States was the alpha and the omega of nuclear technologies. It established a new hegemonic world order post World War II, (Cox) leveraging its dominance of the global nuclear exports market to shape international nuclear governance through the Cold War. (Sallee) It could be argued that the U.S.'s entry into contemporary nuclear geopolitics was one of experimentation. Jurewitz (2002) notes that the first phase of nuclear development, which took place between 1955 and 1974, consisted of a series of "commitments to commercial development [that] were made

amidst massive technical uncertainties." Drogan, likewise, characterizes American nuclear exports as financial commitments to "learning by doing". This stands to reason because the post-World War II world order was still taking shape, and nuclear technology capabilities and utilization were still unclear. This analysis frames the American civilian nuclear program and its utilization as a foreign policy tool within a context of experimentation that we can consider a blueprint upon which other prospective nuclear hegemony built their programs.

The United States' nuclear foreign policy was initially marked by both a "legacy of assumptions, options, and fears" inherited post-World War II from the Roosevelt administration (Bernstein, 1975) and a policy approach based on "technology denial and secrecy". (Lavoy, 2003) The latter point is evident with the implementation of the Atomic Energy Act of 1946 during the Truman administration, which aimed to restrict access to nuclear technology and equipment and prevent the dissemination of scientific data. (de Blasio & Nephew, 2017; Hicks, 2014). The Soviet Union's first detonation of a thermonuclear device in 1953, (Medhurst) however, made it clear that nuclear technology could not be contained and thus began "the great contest between Western freedom and Soviet totalitarianism". (Gattie & Massey, 2020)

In the context of this great contest, the Eisenhower administration adopted a new approach to nuclear technology, which became known as the "Atoms for Peace" program, (Lavoy) which Rowberry (2013) describes as an exchange of American research reactors, fuel and scientific training for developing countries' commitment to use the technology only for "peaceful, civilian purposes." This approach, which Mateos & Suárez-Díaz (2016) argue was "an essential piece in the U.S. defense strategy and foreign policy at the beginning of the Cold War", led to the creation of the IAEA and included the 1954 amendment to the Atomic Energy Act. The amendment "liberalized the US nuclear enterprise by allowing private companies to develop and construct nuclear reactors domestically" (Gattie & Massey) and

allowed industry to engage with foreign partners in the sharing of scientific and technological knowledge for peaceful use (Lavoy) under federal government regulation.

Medhurst identifies four dimensions of the Atoms for Peace Program: 1. The Military and Security dimension, in which nuclear technology was reframed to focus public attention on its societal benefits and divert attention away from its destructive capabilities while the U.S. concurrently built up its nuclear arsenal to counter the Soviet Union; 2. The Economic dimension, which would create a domestic power industry and afford access to foreign markets by constructing NPPs; 3. The Diplomatic dimension, through which the U.S. would build trust with the Soviets through the IAEA and lead to eventual disarmament; 4. The Psychological dimension, which would build the U.S. brand as a benevolent and peace-loving nation that would help the world's impoverished nations develop (and simultaneously contain frame the USSR and Communist ideology as obstacles to peace and prosperity).

While he acknowledges the Economic, Diplomatic, and Psychological dimensions, Medhurst emphasizes the impact of the Military and Security dimension, the ultimate aim of which, he argues, was the "nuclearization" of the U.S.'s NATO allies to rebuff the Soviet Union. Several factors support this argument: 1. The U.S.'s first three nuclear cooperation agreements were with Belgium, Canada, and Great Britain (Colgan & Miller, 2019); 2. U.S. nuclear exports have not enjoyed much success in regions such as Latin America (Drogan, 2019) and other countries less connected to the Cold War; 3. As Gonzalez noted, while other countries began to consider alternative energy sources, including nuclear energy, during the 1970s oil crisis, the U.S., whose civilian nuclear efforts were already on the decline (Joskow & Parsons, 2009), chose not to reconsider nuclear power. If energy security was a vital element of the U.S. nuclear strategy, why was it not more rigorously pursued during the crisis? This paper, therefore, accepts NATO nuclearization, or more broadly, a classic realist,

coercive strategy as the driving force behind Atoms for Peace and the underlying goal of the U.S.'s nuclear foreign policy.

According to the 1954 National Security Council Report by the State Department, initial nuclear exports were transacted through bilateral agreements where technology and knowledge, including the building of reactors, were provided in exchange for "a steady flow of radioactive ores" or other resources. In establishing these supply chains, Medhurst notes that some of the U.S.'s relationships, such as those with Belgium, Australia, and South Africa, were simple quid-pro-quo agreements that ensured a steady supply of uranium or thorium in exchange for technology, hardware, human resources, and fissionable material. He argues, however, that in less developed countries, the reactor programs "functioned as a form of Industrial imperialism" where the U.S. could gain a technological and economic foothold in countries that lacked nuclear capacity.

As with Russia and China's nuclear programs, these supply chains were crucial mechanisms through which the US established dominance in nuclear energy production. The architects of "Atoms for Peace" were aware that if the US industry could be the first to establish a global nuclear presence in strategic countries, those countries would almost inevitably be dependent for design, construction, initial operation, educational materials, and every other aspect of the infant industry." (Medhurst)

Ultimately, according to Piercy, (2020) rising costs, the proliferation of renewable energy and natural gas, not to mention the accident at Three Mile Island all contributed to the decline of American leadership in nuclear energy.

Nuclear Hegemony Defined

We have established that current concepts of hegemony concern the capacity of a dominant state to exercise influence and power over other, less powerful states. Analyses of Russia, China, and U.S. civilian nuclear programs revealed that they have been able to leverage their technological and financial capacities to penetrate foreign energy markets and

exert power and influence over less developed countries by establishing Dependency over a long period of time. Consequently, they have positioned themselves to assert influence in global nuclear energy governance and the greater geopolitical landscape.

We have also established that there are differing scholarly concepts of the coercive versus consensual exercise of the hegemonic relationship. One of the aims of this work is to conceptualize a definition outside the coercive, realist narrative that frames much of the discourse on nuclear technology. Russia and China have, at a superficial level at least, adopted liberal or even constructivist characteristics in their nuclear exports as articulated by cooperation and “win-win” scenarios where developing countries acquire low-carbon energy production capacity while Russia and China gain access to foreign resources and access to foreign markets for their surplus manufactured goods. They are also challenging current nuclear governance by working with a variety of states outside the conventional western-lead nuclear regime.

This paper, therefore, rejects the conventional terminology applied to states in hegemonic relationships, such as dominance (Clingan, Gilpin, Joseph) or subordinate and submissive (Cox, Fenton, Moolakkattu, 2009). This is because the traditional realist concept of hegemony is neither suitable nor accurate when describing the power balance in nuclear energy relationships, mainly because the fluctuating geopolitical landscape does not align with conventional concepts of hegemony. As research suggests, these new relationships are, at least on a surface level, displaying liberal and possibly constructivist features.

To more accurately articulate the role of actors in this new form of nuclear energy governance, we conceive as “preponderant” the hegemon who controls a greater share of resources and capacity (Ougaard) and leverages them to derive power from gaps (Craig, 2009) over the “acquiescent” client states who accept their expertise and leadership in their nuclear programs. Incorporating the aforementioned terms, this work defines Nuclear

Hegemony as “The leveraging of technological and financial nuclear capacities in energy generation by preponderant states over acquiescent states by establishing a system of dependency, encapsulating supply chain and financing mechanisms, over a multi-decadal time frame to exercise geopolitical power and influence.”

Dimensions of Nuclear Hegemony

Analyses of Russia, China, and the U.S.’s nuclear energy programs have revealed two dimensions of Nuclear Hegemony: Dependency and Time. Dependency refers to an established relationship in which the hegemon controls all the physical elements and materials of nuclear power generation to the extent that the client state cannot manage production absent complete reliance on the hegemon’s preponderant capacities.

There are three Dependency mechanisms through which the hegemon exercises its preponderance over an acquiescent state.

The first mechanism is technological capacity. The United States, Russia, and China established dominance in nuclear power because their technological prowess faced little competition. (Clifford, 2022; Graham Jr., 2022; Xie, 2022) The second mechanism is the Supply Chain. By capturing a significant market share of uranium production and commanding control of technology, intellectual property, hardware, workforce, and spent fuel reclamation, the hegemon ensures that their clients can transact with only them for their energy production. As a result, existing and future client states will continue to be Dependent on them for the foreseeable future. Bing-Ming points out that the U.S., France, Russia, and China all established robust supply chains for their nuclear industries. That these three countries are still among the top 5 global nuclear energy producers (Kumar, 2021) is not a coincidence.

The second Dependency mechanism is Financing. Both Russia and China offer favorable financing terms to client states through bi-lateral nuclear agreements that often

cover the majority of the costs of NPPs. Given the urgency of both energy demand and the need for low-carbon production in developing states, such conditions are hard to refuse.

Therefore, Financing is a mechanism by which the hegemon can easily penetrate new markets for their exports and assume control of assets in those markets in the event of a default. However, as some case studies of Chinese agreements reveal, defaults, which are likely outcomes in some developing countries, have sometimes resulted in those countries having to repay their debts through concessionary means, such as forfeiture of some control over their indigenous natural resources, or surrendering large stakes in commercial or industrial ventures.

The Time dimension of Nuclear Hegemony concerns not only the expediency with which NPPs can be built but also the lifespan of nuclear projects, which can last close to 100 years. Analyses of China and Russia's foreign nuclear projects show that their autocratic domestic political systems, government ownership of their nuclear industries, and financial resources create a conducive environment for rapid design, construction, and implementation of nuclear programs at home and for export. Consequently, they are in a better position to deliver potential energy solutions to client states more quickly and affordably than western states, which are impeded by democratic political systems, decentralized nuclear production, and lack of access to capital to construct NPPs. In such environments, the resultant delays in decision-making often cause nuclear projects to be delayed and go over budget, which subsequently drives up costs.

As analysis has also revealed, the life span of nuclear projects, from design and construction through to decommissioning, can last nearly 100 years. This ensures that client states, who are already dependent on the hegemon for fuel, technology, hardware, and manpower, will also be dependent and subject to its power and influence for nearly a century.

LIMITATIONS, APPLICATIONS, AND FUTURE AREAS FOR STUDY

Limitations

The aim of this paper is to interrogate the current usage of the term nuclear hegemony and to create a foundation upon which further work on the hegemonic nature of nuclear energy can be built. This work is a culmination of eleven months of diplomacy and international relations studies. As previously noted, most literature and research on hegemony is framed within a western perspective. Filtering the obvious biases against or favoring China and her nuclear programs that informed much of the research was a profound challenge. I am confident that my travels in Asia and China, my experience living in an Eastern European country that is somewhat within Russia's sphere of influence, and the insight and perspectives I gained from studying in Switzerland have enriched my perspective sufficiently to control for some of those biases.

Accessing some Russian government documents, presumably due to the current crisis in Ukraine, and translating those that were available, were also considerable obstacles. I substituted multiple alternate sources where appropriate to build a solid understanding of Russia's civilian nuclear strategies.

Finally, as I spent much of the last eleven months overseas, geographic distance, time differences, and the lingering effects of the pandemic often prevented me from holding in-person consultations with advisors and colleagues, which would have augmented my work. Fortunately, I was able to attend an in-person course in energy diplomacy in South Africa, and those interactions have proven integral in properly framing my research.

Despite these mitigation strategies, it must be emphasized that we are in uncharted waters and are barely getting our feet wet. With the limited time to conduct research and analysis, coupled with the challenges noted above, the points raised in this work are merely observational and far from conclusive. Much more research and analysis are required, and the concepts discussed will require much refinement and revision. Nevertheless, I hope this very

basic work will inspire others to wade deeper and chart a definitive course to understand Nuclear Hegemony.

Applications

Under the current definition of Nuclear Hegemony, the hegemon can exercise power in many ways. Through the Dependency dimension, a hegemon's capture of the Supply mechanism renders the client state dependent and vulnerable to hegemonic influence (Baker et al.) to maintain energy supplies. As Kim points out, "nuclear vendors can threaten to suspend fuel supplies", as we can see with Russian supplies of natural gas to Europe. Additionally, client states are dependent on the hegemon throughout the entire Supply Chain for technology, hardware, workforce, and waste management.

Through the Finance mechanism, client states are dependent on the hegemon's capital to produce energy. As Mehta and Gupta have pointed out, default on loans can result in the hegemon appropriating a client state's resources or facilities. Using data from the World Bank and IMF, Hurley et al. identified ten countries in Central, East, South, and Southeast Asia, seven in the Middle East and Africa, and six in Europe and Eurasia that are suffering high degrees of debt distress due to BRI-related financing. If previous examples inform China's behavior towards other indebted countries, we can see a potentially larger foothold all around the BRI roadmap.

The Time dimension facilitates rapid penetration of the hegemon into the client state's markets and, due to the lifespan of nuclear reactors, ensures a relationship that can last up to a century, during which the hegemon can grow its foothold in that state. (American Security Project, Nakano,)

This intersectionality of Dependence and Time presents a profound paradigm. If we accept British Prime Minister Harold Wilson's assertion that "a week is a long time in politics", (Stevenson, 2022) then a century in geopolitics might as well be a millennium. As Russia, China, and other non-aligned countries continue to gain power and influence in the

global system, 100 years is an enormous window for both countries to affect geopolitics as Nuclear Hegemons. (Hayunga, Liu, Nakano, Schepers,)

We can use history to attempt a prediction of how these countries will assert their hegemonic position. Geller characterizes Russia as “an aggressive, paranoid, power-seeking, and autocratic state, no matter its leader.” Its foreign policy, he maintains, can be summarized as a long history of aggression toward bordering countries, driven by an ongoing desire to protect its borders but often marked by defeat and humiliation.

Regardless of Russia’s motivations, its primary foreign policy objective can be conceived as an aim to secure its territorial and political sovereignty (Volker, 2022; Palaccio,2022) and legitimize its status as a world leader. Its activities in Ukraine can be seen as securing its territory in Europe and rebuffing further NATO expansion. On a global level, its diplomatic activities in South and Central America can be seen as further efforts to contain American spheres of influence. (Baker et al., Feldman & Lavi, 2022; Palaccio)

From a Nuclear Hegemonic perspective, it seeks to surpass the United States in nuclear technology and “solidify its status as a top nuclear power.” (Geller) Its control of a large share of uranium gives its nuclear supply chain leverage to which many countries, including the U.S., are vulnerable. Its hegemonic power over many non-aligned countries, defined by Dependency and Time, put it in a unique position to reshape global governance within the nuclear realm and the greater sphere of geopolitics. It could, for example, compel client states to support its measures and initiatives that increase its power in global institutions such as the United Nations. (Baker et al.) That it enjoys significant revenues from nuclear exports ensures that it has the financial means to further its activities in non-aligned countries

While Shambaugh maintains that China “is a single-dimension power-economic”, Bing-Ming argues that China’s economic ambitions as articulated through the BRI are

“superseded by political considerations” characterized as a “pushback” against the U.S.’s pivot to Asia. (Chatzky & McBride). China faces domestic challenges such as poverty, income inequality, and energy insecurity. (Goodman, 2021; Ling & Wang, 2020) Therefore, the BRI does serve an economic function by ensuring revenue and resource flows from its overseas projects. Cavanna (2018) elaborates, characterizing the BRI as China’s effort to stabilize “its western peripheries, rekindle its economy, propel non-Western international economic institutions, gain influence in other countries, and diversify trade suppliers/routes while circumventing the U.S. pivot to Asia.” Finally, according to Schuman (2021), China seeks to reshape the world order in closer alignment with its own concepts of governance and leadership, while Feldman & Lavi suggest that she is also eager to restore “the glory of its past in the Imperial period.”

As a Nuclear Hegemon, China is in a position to secure its MRS goals by deploying its nuclear exports in strategic coastal sites in the South China Sea and the Indian Ocean. It can gain acquiescence from client states in those sites by employing Finance mechanisms. Should those client states default, it can appropriate resources or facilities over a long-term period ensuring its power in those areas and securing its MRS foothold. As Kim points out, China’s growing nuclear dominance, particularly in non-aligned states, puts it in a position to leverage its power to not only ensure a steady supply of revenue and resource needs but also reshape its position in nuclear and global governance by compelling client states to support its positions in global institutions. (Brattberg & Soula, 2018; Chatzky & McBride)

With nuclear projects in various stages of development in Europe, including the potential construction of a Hualong One reactor in the United Kingdom, which would be the first Chinese-manufactured reactor to be constructed in Europe, (Baker et al., Hesketh et al., 2022; Kim) China’s Nuclear BRI seems well poised to realize its goal of connecting Asia and Europe and garner legitimacy for its nuclear prowess. Her nuclear overtures toward states in

Central and South America, on the other hand, seem to indicate an attempt to contain the U.S. (WNA, 2022f)

We can therefore view China exercising its Nuclear Hegemony to connect Asia to Europe, secure its position in the South China Sea and Indian Oceans through the BRI, and potentially leveraging it to change nuclear and global governance. Russia is utilizing Nuclear Hegemony to secure its borders and regain former Soviet territory, with nuclear revenues driving those efforts and potentially driving change in governance. Both are also attempting to contain U.S. influence in Asia and Central and South America. Meanwhile, the U.S. and its western allies are attempting to reestablish hegemony by reviving fuel supply chains, financing nuclear exports, and accelerating new nuclear technology.

For the foreseeable future, it appears that Russia will continue to be the dominant player (Kim), as it currently is the top nuclear exporter (Nakano), has considerable control over the uranium market, offers favorable financial conditions, and can reclaim spent nuclear fuel. (Bastian, Kim, Nakano) However, as Nakano argues, China has considerable capital that could enable it to surpass Russia, especially if sanctions over Ukraine (Hayunga, Ramana) impact its exports.

While Chatzky & McBride suggest that Russia and China could partner more closely in nuclear projects, Yellen (2020) argues that this is not likely because they are competitors in the market (something, he suggests, the U.S. should exploit). It is also worth noting that both countries face obstacles to their hegemonic aspirations. Despite China's nuclear ambitions, it has suffered several delays in reactor construction. (Dangwal and Ramana) Meanwhile, besides sanctions, Rosatom's nuclear contract in Finland was recently canceled, (Liu, 2022) and its contract with Hungary could see a similar fate. (Ramana) There has also been some backlash from participating countries to the BRI (Chatzky & McBride) that could impede its progress.

At the same time, recent developments in the United States indicate more concrete steps to reclaiming its Nuclear Hegemony. Earlier this year, the Biden administration announced a \$6 billion fund to keep some older domestic nuclear reactors operational and more cost-effective. An additional \$2.5 billion was invested in nuclear projects in Washington State and Wyoming (Penn, 2022) Internationally,

In April 2022, the United States Senate introduced the International Nuclear Energy Act, which aims to reestablish U.S. leadership in nuclear production by increasing international nuclear energy cooperation by creating enhanced financing and security mechanisms that facilitate civil nuclear exports. Additionally, Hayunga notes that EXIM can finance large-scale projects again, and the ban on funding nuclear projects by International Development Finance Corporation (DFC) was lifted in 2020.

Ultimately, although Russia and China seem to be on a firm trajectory toward achieving Nuclear Hegemony, the complex nature of nuclear energy, combined with the geopolitical challenges they face, could severely impede their ability to realize their aspirations' full potential. By the same token, although the U.S. and the west face formidable obstacles to reestablishing Nuclear Hegemony, recent promising developments could enable them to reclaim their preponderance in global nuclear governance.

Areas for Future Study

An analysis of current geopolitical trends concerning nuclear governance has revealed several areas where this definition of Nuclear Hegemony can be applied and refined in academia. There are three unstable regions where China and Russia are competing in the nuclear energy market: Pakistan, Kazakhstan, and Iran.

As Parameswaran notes, Pakistan is China's first nuclear importer. Meanwhile, Russia has been exporting its own technology to India. (Sengupta & Ponangi, 2022) In a region marked by "rivalries and deteriorating relationships" between India and Pakistan (Rupert, 2022) and border disputes between China and India, (Singh, 2022) instability in the

region threatens not only nuclear facilities but other infrastructure projects. Of particular interest is how the India-Pakistan rivalry could have a ripple effect on its hegemons, particularly if the nuclear projects of one hegemon are threatened by the activities of the other's client state. How Nuclear Hegemony functions in the interplay cooperative/competitive dynamic of three BRICS members is also a topic that invites more research.

Kazakhstan is a critical source of uranium in Russia's Supply Chain and a participant in the BRI. Given its geographical position and its endowment of resources, it could serve as a uniting force between Russia and China, or it could drive a wedge between the two. (Burke-White, 2022) An interesting angle to explore would be the potential bidirectionality of Nuclear Hegemony, where a perceived client state could leverage its advantages over a hegemon.

Iran is another area for further study of Nuclear Hegemony. According to Feldman & Lavi, Iran is an important geopolitical partner not only for Russia, which built a nuclear reactor in Bushehr, but also for China, which has aspirations to penetrate more Middle Eastern markets. Although Mahmoud Abbaszadeh-Meshkin, spokesman for the Iranian parliament's National Security and Foreign Policy Committee, was quoted in January of 2022 as saying that "a triangle consisting of three powers – Iran, Russia, and China" had formed in Asia, (Sinaee, 2022) the RANE network (2015), predicts that Iran could, in fact, become "the first battleground between China and Russia in terms of nuclear exports." Tanchum (2015) notes that Rosatom's nuclear monopoly in Iran, which is now being threatened by China's entry into the market, is in various stages of agreement with other countries in the Middle East, including signing a bilateral agreement with Iran's enemy, Saudi Arabia. These three areas represent a different geopolitical context to apply our definition of Nuclear Hegemony.

How the hegemons interact with each other in unstable areas in the face of more direct competition can add deeper dimensions to our definition.

The Financing dimension of Nuclear Hegemony is clearly under Russian and Chinese capture, and the U.S. and western states do not currently have the competitive capacity to leverage influence unilaterally. One solution postulated by Baker, Fitzpatrick, and Goldberg is co-financing nuclear projects by OECD states such as the U.S., Canada, the UK, France, Japan, and Korea. Collectively, these states could competitively fund nuclear projects. Many have noted that the west is far behind Russia and China in nuclear capacity. Under a new form of nuclear cooperation, a supply chain could be developed leveraging Canada and Japan's uranium capacities (WNA, 2021; 2022g) for fuel, accelerating American, French, and Japanese cooperation in the deployment of advanced reactors, such as the Economic Simplified Boiling Water Reactor (ESBWR), and the Advanced Pressurized-Water Reactor, and accelerating development and deployment of SMRs such as the American-designed NuScale reactor. (ANS, 2013) Such a strategy reduces financial liability, is more transparent, and assuages safety concerns.

From a Nuclear Hegemonic perspective, this raises three future research questions to be answered: 1. Will western Nuclear Hegemony re-emerge in a classic model vis-à-vis one state dominating supply chains? Or will they adopt a more liberal or constructivist approach? 2. How will partnering states interact with each other? 3. How would a re-emergent hegemonic west shape energy geopolitics vis-à-vis Russia and China?

Finally, there are many opportunities to challenge, amend and expand our definition of Nuclear Hegemony. This study deliberately avoided considerations of nuclear weapons because much time and effort have already been put toward the hegemonic aspect of nuclear weapons. However, scholars should conduct a comparative analysis of the energy and weapons aspects of Nuclear Hegemony. Our analysis thus far has already established that

coercion is a latent aspect of any hegemonic relationship, including Nuclear Hegemony as defined in this work. Medhurst has suggested that American civilian nuclear exports under the Atoms for Peace program were nothing more than an attempt to obscure the U.S.'s goal to nuclearize allies against the Soviets. Contemporary analysis of modern nuclear technology has raised concerns that advanced nuclear technologies are capable of being weaponized. For example, the China Experimental Fast Reactor (CEFR) is reportedly capable of generating enough weapons-grade plutonium to produce 1,270 nuclear warheads by 2030. (Sokoloski, 2021) In 2018 Nguyen reported China's intention to build and deploy up to 20 floating NPPs throughout the South China Sea to "support China's offshore oil and gas exploration, as well as to sustain the Chinese civilian presence." Given the sparse population of the islands in the region, he states that 20 NPPs are "unjustifiable if only for civil facilities." Instead, he suggests, the NPPs will be used to "solidify China's military foothold in this contested area" by powering her regional infrastructure" to guard against attack. If, therefore, nuclear weapons and energy go hand in hand, as it were, a logical next step in developing our definition of Nuclear Hegemony may be to synthesize its weapons and energy aspects,

CONCLUSION

This paper sought to develop a more refined definition of Nuclear Hegemony as it pertains to energy geopolitics. From the perspective of a looming potential global energy security crisis exacerbated by the geopolitical instability in Ukraine, coupled with the critical need to reduce carbon emissions, many western states who had previously retreated from the nuclear energy sector are now reconsidering revisiting the technology to meet increasing energy demand.

Most scholarly work on the hegemonic dimensions of nuclear energy frames them within a realist coercive context reflective of Cold War politics. However, the geopolitical landscape is dramatically changing as the rising influences of Russia, China, and other non-

aligned countries coincide with declining western dominance. These actors have the political and economic capacity to pursue their interests on their terms outside the Western governance established at the end of World War II. Russia and China have developed robust nuclear power industries, which they are eager to export to developing countries that need reliable, low-carbon energy solutions. This gives Russia and China an opportunity to establish a foothold in these countries and leverage their nuclear capacity to exert influence to alter the trajectory of the current world order.

This warrants a new definition of Nuclear Hegemony that focuses on energy geopolitics. By establishing an overall concept of hegemony that seeks to explain how more endowed states leverage their political and economic advantage to influence the behavior of less endowed states, case studies of the IAEA and Russian, Chinese, and American nuclear programs enabled us to conceive our definition of Nuclear Hegemony as “The leveraging of technological and financial nuclear capacities in energy generation by preponderant states over acquiescent states by establishing a system of dependency, encapsulating supply chain, and financing mechanisms, over a multi-decadal time frame to exercise geopolitical power and influence.”

The intersectionality of Dependency and Time in Nuclear Hegemony represents a profound dynamic in the current geopolitical environment marked by Chinese and Russian nuclear export competition and Western attempts to reclaim leadership in nuclear governance.

For the foreseeable future, nuclear energy will play a part in energy geopolitics. How it will shape the future of geopolitics and who will emerge as the hegemon (or hegemons) remains to be seen. While the implications of a realist, coercive relationship are implied, it is essential to consider the liberal and constructivist aspects of Nuclear Hegemony for academic

purposes. It is hoped that this definition will be helpful to scholars in further analysis of geopolitical nuclear relationships.

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