

Inter-Continental Rebellion:
Europe-Asia Nuclear Transfers in the 1970s

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Abstract. This paper investigates why Western states transferred sensitive nuclear technology to Asian recipients throughout the 1970s despite growing proliferation risks. It introduces "nuclear consciousness," a qualitative measure of how supplier states understood their own permissible behavior in the international nuclear market given their nuclear history and capabilities. Using comparative process-tracing, it examines the export behavior of France, Canada, and West Germany between the beginning of the NPT in 1968 and the U.S. Nuclear Non-Proliferation Act of 1978, framed by a triangular dynamic of U.S. interdiction, supplier commercial and prestige interests, and recipient demand for nuclear independence. France's nuclear consciousness proved resilient despite pressure, Canada's shifted decisively toward restraint after India's 1974 test, and West Germany's remained comparatively fragile. This study finds that these divergent postures show the global nuclear market was less asymmetric than assumed, offering lessons for the modern resurgence of the nuclear industry and commercial proliferation.

The world at the close of the 1960s seemed to be on the precipice of a revolution in energy generation, with nuclear power at center stage. While the spread of peaceful nuclear technology was a boon for many governments for many reasons, the dual-use potential of the technology itself inherently contributes to a destabilized security environment. It is only in application that such technology can be characterized as peaceful, and even then, peaceful it must remain in an ever-shifting global landscape. For some highly industrialized Western nations, this created enormous commercial potential. For American policymakers, this posed a subtle dilemma in the maintenance of international security. The geopolitical conditions of the late 1960s into the 1970s were such that states expressing a need for nuclear energy could make credible claims as to their genuine need and peaceful intentions. Greater diffusion made the nearly indistinguishable distinction between peaceful and military applications of nuclear energy, recognized as problematic as early as the Acheson-Lilienthal Plan, both a greater security concern and a harder policy concept to apply against non-proliferation concerns. Recognizing the problem, yet lacking efficacious policy options, made controlling the spread of nuclear technology in the face of high demand and strong commercial interests a difficult task. While the nuclear boom of the 1970s provided strong impetus for the coalescence of emerging non-proliferation norms, reaching its apotheosis with the 1978 Nuclear Non-Proliferation Act, the matter of supplier behavior faded away. Largely reduced to strategic irrelevance by the free-market forces of reduced demand, the problem dissipated without a full resolution. Yet, a similar dilemma has resurfaced in the current context of renewed growth in the nuclear industry, with similar problems and strategic considerations at the nexus of civilian nuclear power generation and proliferation concerns now re-emerging. An examination of the 1970s with these developments in mind – while unable to offer solutions to this tension, for none were effectively employed to the point of achieving a successful resolution – constitutes a strong starting point to develop efficacious policy prescriptions for the modern non-proliferation environment.

In a historical context, understanding why nuclear technology transfers occurred in spite of the proliferation risk offers significant insights into the behavior of nuclear states and how they viewed their

position in the world given their nuclear capabilities. This can be summed up in the term “nuclear consciousness,” a measure of nuclear states’ own understanding of permissible behavior in the international arena given their particular nuclear history and capability. It is a novel qualitative tool designed to aggregate the many intricacies of this research into an easily comparable element. The span between the signing of the Nuclear Non-Proliferation Treaty in 1968 and the passage of the American Nuclear Non-Proliferation Act of 1978, offers a suitable testing period for the concept as a time when peaceful nuclear transfers from Western states to Asian states were at their high tide. Utilizing this timeframe and a supply-side focus, this study traces and compares transfers from France, Canada, and West Germany to various Asian countries. Recounting these actions will elucidate insights as to the root intra-state tension between security and commercial viability in the global nuclear market, along with the inter-state politics of transfer denial and non-proliferation. In essence, these two elements constitute the formation of a state’s nuclear consciousness and the international reactions to it, respectively.

The opaque realm of nuclear technology transfers necessitates the use of multiple vectors of analysis. Using the three exporter cases of France, Canada, and West Germany, this comparative process-tracing study will elucidate the forces that drove the transfer of nuclear technology in the 1970s, and how they inadvertently built the basis of the modern non-proliferation regime. These forces can be thought of as a triangle, consisting of (i) the United States’ interdictory efforts and non-proliferation interests, (ii) the Europeans’ and Canadians’ commercial and industrial interests, as well as national prestige, and (iii) the Asian recipients’ desire for nuclear energy independence. Each exporter case will be examined in light of the most illuminating Asian export deals it made during that period, extrapolating the nuclear consciousness of each along the way. Lessons from each case will then be aggregated together within the broader context of American non-proliferation efforts and general insights will be derived apropos of the current context of spreading civilian nuclear technology.

Two developments make this study additional and guide its course and expected outcomes. First, the value of nuclear weapons has grown significantly in the eyes of many states. As acute security threats

multiply, the value of security rises, and thus the price to make states shrug off their self-interested behavior rises considerably more. As such, one goal of this research is to identify how non-proliferation efforts stand up to pressure, and if the norms they expound have proven resilient or not amid factious behavior in allied blocs and destabilizing trends in global events. To this end, the 1970s provide an apt source of parallels for contemporary times. Second, as the civilian nuclear energy industry enters into what some consider to be a global renaissance, the nexus between greater opportunities in civilian technology and strategic interests in non-proliferation will be the site of increasing opportunity and consternation alike. Novel technologies like SMRs and offshore reactor facilities open up new frontiers in the non-proliferation space that parallel the shifting technological landscape of the 1970s. This study does not presume an outsized influence of technological determinism in the non-proliferation space but does seek to understand how these two elements compete to influence the behavior of nuclear states.

International Context

High-level focus on the relationship between civilian nuclear power and potential proliferation was strong by the mid-1960s, yet new developments challenged the status quo. Starting in 1966, orders for nuclear reactors worldwide multiplied rapidly.¹ As the boom of the nuclear industry came to a head in the late 1960s, an expectation developed that plutonium would replace low-enriched uranium (LEU) as the chief nuclear power fuel by the end of the century.² This belief, persisting into the 1970s, drove proliferation concerns and fears surrounding the emergence of international terrorism. Packaged into a weaponized device, a comparative smaller amount of plutonium is needed to facilitate a fission reaction. The RAND researchers Gilinsky and Hoehn, however, argued as early as 1970 that enriched uranium would be a larger problem instead. They cited the comparative ease of taking LEU designated for fueling

¹ Samuel J. Walker, "Nuclear Power and Non-Proliferation: The Controversy over Nuclear Exports, 1974-1980," *Diplomatic History* 25, no. 2 (2001): 217-220.

² Robert Gillette, "Nuclear Technology: Essential Elements for Decisionmakers," in *Nuclear Policies: Fuel Without the Bomb*, ed. Albert Wohlstetter, Victor Gilinsky, Robert Gillette, and Roberta Wohlstetter (Cambridge: Ballinger Publishing Company, 1978): 11-13.

reactors and enriching it to sufficient levels for weapons-grade material.³ That the United States held a commercial monopoly on enrichment services during this period made attempts to bar the sale of enrichment technology on non-proliferation grounds particularly disingenuous in the eyes of the exporter.

Soon, the energy crisis incepted by OPEC further compounded the problems surrounding the diffusion of nuclear technology. Starting in October 1973, the OPEC oil embargo precipitated an energy shock that propelled further expansion in the global nuclear industry. To the commercial delight of nuclear exporters, it made countries increasingly aware of any type of foreign reliance tied to energy production, including the reprocessing of nuclear fuel. This popularized a new sector of the international nuclear market: sales of reprocessing technology, often packaged as complete facilities.

This conflux of factors connected energy politics and subsequent commercial entrepreneurship with proliferation concerns. An additional factor was the right of non-nuclear states to obtain civilian nuclear power capabilities, including (but not limited to) those in Asia. This right, enshrined in the Nuclear Non-Proliferation Treaty (NPT), was the small bit of leverage non-nuclear states had against the nuclear states, often framed within a development context. The case of India's peaceful nuclear explosion (PNE) in 1974 highlighted the difficulties for nuclear states in making good on this promise. The PNE weakened non-proliferation insofar as it gave pause to states, like Japan, who had not yet ratified the NPT. These states saw the PNE route as a path towards nuclear prestige without the consequences of overt weaponization.⁴ The effectiveness of the NPT was called into serious questions, along with the previously black-and-white nature of nuclear-capable states, due to the third path offered by the PNE route. The positive perception of nuclear exporter states among the non-nuclear recipients and the prestige that this

³ Victor Gilinsky and William Hoehn, *The Military Significance of Small Uranium Enrichment Facilities Fed with Low-Enrichment Uranium*, Report No. RM-6123-ARPA (RAND Corporation, 1970), 12-16, https://www.rand.org/content/dam/rand/pubs/research_memoranda/2021/RM6123.pdf.

⁴ Robert S. Ingersoll, "U.S. Nuclear Non-Proliferation Policy and NSSM 202 Study Executive Summary" (official memorandum, Department of State, December 4, 1974), <https://nsarchive2.gwu.edu/nukevault/ebb268/doc03.pdf>.

brings is important to keep in mind, as is the fallout from American interdiction actions among non-nuclear states.

France

Among all Western nuclear states in the 1970s, France was the most forward with its export behavior. As the transfer agreements it signed came under pressure, commercial interests merged with national prestige to drive its fiercely independent export behavior, reaching its apotheosis under president Giscard d'Estaing.⁵ More broadly, as the European community strove to adopt non-proliferation protocols and safeguards, Paris was the primary disruptor within the bloc.⁶ This was indicative of a longer French tradition in its nuclear consciousness of asserting its right to nuclear sovereignty. It extended well beyond the following case studies, evidenced by its stubborn behavior regarding NPT adoption and towards the EPC working group on non-proliferation policy in the 1980s. However, France's engagements with Pakistan, South Korea, and Taiwan reveal how the French nuclear consciousness was applied across, and largely without regard for, different security environments.

The French reprocessing deal with Pakistan constituted an inflection point in the global nuclear trade. As early as February 1973, the French government was engaged in talks with Islamabad for the construction of a reprocessing facility, a breakthrough for Pakistani back-end fuel cycle capabilities.⁷ Already in possession of two reactors, a small U.S.-supplied research reactor and a Canadian CANDU reactor, attempts to obtain a reprocessing facility increased suspicions about weaponization. The small size of the nuclear energy sector in Pakistan meant that reprocessed fuel would not be useful in the civilian context for years to come. While talks with the French predated India's PNE in May 1974, the

⁵ William Walker and Mans Lonnroth, *Nuclear Power Struggles: Industrial Competition and Proliferation Control* (London: George Allen and Unwin, 1983), 61.

⁶ Harald Muller, "West European Cooperation on Nuclear Proliferation," in *Toward Political Union: Planning a Common Foreign and Security Policy in the European Community*, ed. Reinhardt Rummel (Boulder: Westview Press, 1992), 196.

⁷ Malcolm M. Craig, *America, Britain, and Pakistan's Nuclear Weapons Programme, 1974-1980: A Dream of Nightmare Proportions* (Cham: Palgrave Macmillan, 2017), 58-59.

French intent to go through with the deal in the wake of the test, and especially given the role played by imported materials in it, was a Rubicon for the supplier community.

The vitality of the Pakistan deal arose from domestic characteristics of the French nuclear industry and, crucially, recognition in Paris that these characteristics opened opportunities on the export side given the shifting nature of the global nuclear environment. The 1973 oil shock confirmed fears for many that nuclear power would dominate energy markets within a few decades, particularly through the expanded use of plutonium.⁸ Starting in the early 1970s, the question of export controls was taken up by the Zangger Committee, an informal predecessor to the Nuclear Suppliers' Group (NSG) that created a 'trigger list' of nuclear exports that required further IAEA prerequisites to be met. Given that the purpose of the Committee was to prevent exporting countries from gaining a competitive advantage by ignoring safeguard procedures, it is telling that France did not participate. Indeed, France's aggressive entrance on the global market was compelled by the development of domestic industrial capacity that French nuclear firms sought to keep engaged through export orders. These firms, namely Cogema (the parent of Saint Gobain), Framatome, and Creusot-Loire, possessed a high degree of specialization in the nuclear industry. Hence, a strong lobby developed around opening up new markets in order to keep them afloat.⁹ To many non-nuclear weapons states, the Zangger Committee and later export controls enacted by the NSG and the U.S. contradicted the spirit of Article IV of the NPT and the general right of states to pursue peaceful nuclear capabilities. In defying export protocols throughout the first half of the 1970s, France benefited from the sentiment in developing countries on the perceived discriminatory nature of non-proliferation. To a lesser degree, the exporter states reaped prestige from this phenomenon as well.

⁸ Malcolm M. Craig, *America, Britain, and Pakistan's Nuclear Weapons Programme, 1974-1980: A Dream of Nightmare Proportions* (Cham: Palgrave Macmillan, 2017), 50; Samuel J. Walker, "Nuclear Power and Non-Proliferation: The Controversy over Nuclear Exports, 1974-1980," *Diplomatic History* 25, no. 2 (2001): 218.

⁹ William Walker and Mans Lonnroth, *Nuclear Power Struggles: Industrial Competition and Proliferation Control* (London: George Allen and Unwin, 1983), 34-35, 59-61.

Regarding French behavior, the salience of the Pakistan deal lies in France's decision to hold its line even past several major thresholds in Western nuclear relations, indicating a stubborn and resilient nuclear consciousness. While commercial interests drove the agreement initially, the pressure France felt to go through with the deal revealed the pre-eminence of prestige concerns. In a December 1976 meeting with Henry Kissinger, the French ambassador emphasized that while France would not have made the deal at present, credibility and "political necessities" were being put at stake.¹⁰ It can be gathered that prestige alone was sufficient to hold the vitality of the French nuclear consciousness together when commercial interests fell away. France finally backed out in 1979.

The collapse of the France-South Korea agreement showed that such prestige and political drivers of the supplier's nuclear consciousness could be undercut by the U.S. through interdiction pressure against the client instead. In June 1975, *The Washington Post* revealed that the Republic of Korea (ROK) and France were in the process of negotiating a deal to provide the former with a reprocessing facility.¹¹ This would allow for the extraction of plutonium from spent nuclear fuel, fuel from civilian power plants that, rather suspiciously, the Koreans had not yet brought online. These talks were a subtle addendum to broader, not-so-subtle ROK fears of U.S. abandonment stemming from the Nixon Administration's Guam Doctrine. South Korea had been in the process of planning out civilian applications of nuclear power, reflected in its long-term nuclear energy development plan of 1968.¹² In May 1972, a ROK delegation travel to Europe and signed a deal with France for a reprocessing facility; government talks began later that year. The U.S. successfully pressured both France (and Canada, which was selling a reactor) to

¹⁰ Memorandum of Conversation, Brussels, December 10, 1976, in *Foreign Relations of the United States, 1969-1976*, ed. Adam M. Howard, vol. E-15, Part 2, *Documents on Western Europe, 1973-1976*, ed. Kathleen B. Rasmussen (Washington, DC: Government Printing Office, 2014), doc. 342, <https://history.state.gov/historicaldocuments/frus1969-76ve15p2/d342>.

¹¹ Mitchell Reiss. *Without the Bomb: The Politics of Nuclear Non-Proliferation* (New York: Columbia University Press, 1988), 91.

¹² Jungmin Kang and H.A. Feiveson, "South Korea's Shifting and Controversial Interest in Spent Fuel Reprocessing," *The Nonproliferation Review* 8, no. 1 (2001): 71.

demand South Korea ratify the NPT prior to the transfer.¹³ The recalcitrancy of Park Chung Hee to agree to safeguards led the Nixon Administration to threaten withholding a pending loan from the U.S. Export-Import Bank, meant for the ROK's Kori 2 reactor. The use of financing as a coercive means was also floated as a possible U.S. response to the France-Pakistan deal.¹⁴ This was not followed through on, however. By late 1975, the U.S. finally issued an ominous threat to South Korea as to the broader political consequences that continued pursuit of the deal and of interest in weaponization generally would bring. This led to a cancellation of the French contract by Park.¹⁵ Regardless of how strong France's nuclear consciousness applied itself in this case, it could not circumvent retracted demand on the market.

France's role in Taiwan's nuclear ambitions represented the opposite scenario, one in which runaway commercial interests fell into contradiction with French government policy. Having secured two small research reactors, and with Westinghouse under contract to build two more, Taiwan was still dependent on the U.S. for nuclear fuel. In late 1973, the U.S. learned that ROC Atomic Energy Council officials had quietly contacted the major European nuclear firms about a reprocessing facility. Even before the bidding process started, Taiwan asked the French company Saint Gobain to be the primary contractor for the facility, a request it turned down likely as a result of French government pressure.¹⁶ In the case of Taiwan, a split occurred between the French government, which apparently recognized the diplomatic quagmire that nuclear transfer to Taipei would create, and the commercial interests of French industry. These interests may have driven Saint Gobain to act without prior approval from Paris; evidence

¹³ Sung Gol Hong, "The Search for Deterrence: Park's Nuclear Option," in *The Park Chung Hee Era: The Transformation of South Korea*, ed. Byung-Kook Kim and Ezra F. Vogel (Cambridge: Harvard University Press, 2011), 497.

¹⁴ David Elliot and Robert Oakley to Brent Scowcroft, memorandum, Washington, July 12, 1976, in *Foreign Relations of the United States, 1969-1976*, ed. Edward C. Keefer, vol. E-8, *Documents on South Asia, 1973-1976*, ed. Paul J. Hibbeln and Peter A. Kraemer (Washington, DC: Government Printing Office, 2007), doc. 232, <https://history.state.gov/historicaldocuments/frus1969-76ve08/d232>.

¹⁵ Sung Gol Hong, "The Search for Deterrence: Park's Nuclear Option," in *The Park Chung Hee Era: The Transformation of South Korea*, ed. Byung-Kook Kim and Ezra F. Vogel (Cambridge: Harvard University Press, 2011), 500-503.

¹⁶ David Albright and Andrea Stricker, *Taiwan's Former Nuclear Weapons Program: Nuclear Weapons On-Demand* (Washington, D.C.: Institute for Science and International Security, 2018), 35.

suggests that Saint Gobain may have tried to work around this by outfitting a small Norwegian-designed reprocessing facility in Taiwan through an employee ostensibly on a leave-of-absence from the company's ongoing reprocessing project in Japan.¹⁷ The French government's refusal to authorize bidding for a larger Taiwanese reprocessing facility on the grounds of political sensitivity indicates that Paris did not see the global nuclear market in a vacuum. This runs contrary to the application of French nuclear consciousness in the previous two cases. While Taiwan offered a golden egg to the French nuclear industry, France's recognition of the political exigencies created by U.S.-PRC rapprochement signaled the existence of nuance in its nuclear consciousness. Thus, the France-Taiwan case rebuffs the claim that commercial and prestige interests controlled the French nuclear consciousness in its entirety.

French behavior across these three cases reveals a Foreign Ministry in Paris beset by strong commercial interests and a public-private lobby intent on using exports to transform industrial capacity into international prestige. Once commercial links were established internationally, prestige concerns made it difficult to sever them. By distancing itself from export safeguard frameworks, France exploited the slighted attitudes of non-nuclear states and used nuclear transfers as a means to pave the way for future cooperation and benefits. Moreover, by the latter half of the 1970s, the U.S. and France had come to a *de facto* agreement by which France restrained its aggressive export behavior in exchange for greater domestic bandwidth on reprocessing and Fast Breeder Reactor (FBR) development.¹⁸ The strength of the French nuclear consciousness thus granted France a strong reputation within the nuclear market and gave it leverage with a superpower ally. Nevertheless, the French case exemplifies a powerful nuclear consciousness broad in scope and closely integrated with larger strategic objectives, thus attracting a great deal of American interdictory effort.

¹⁷ David Albright and Andrea Stricker, *Taiwan's Former Nuclear Weapons Program: Nuclear Weapons On-Demand* (Washington, D.C.: Institute for Science and International Security, 2018), 56-57.

¹⁸ William Walker and Mans Lonnroth, *Nuclear Power Struggles: Industrial Competition and Proliferation Control* (London: George Allen and Unwin, 1983), 43.

Canada

An outgrowth of its collaboration on the Manhattan Project, the Canadian nuclear industry at its start in the 1970s was rife with desires for greater credibility. The unique nature of the CANDU (Canadian deuterium uranium) reactor design, the only heavy water reactor on the global market and the industry's chief export, was both a cause and remedy of these credibility concerns in a competitive nuclear market. Cold War ideological calculations factored heavily into Canadian export behavior, as did Canada's status as a member of the British Commonwealth. After the Indian PNE in 1974, the Canadian nuclear consciousness underwent a dramatic change in making commercial goals subservient to non-commercial ideals. This paradoxically resulted in a nuclear consciousness that sought a greater share of the nuclear market while simultaneously attempting to self-restrain for non-proliferation purposes. This stands in stark contrast to France, where commercial and non-commercial interests interacted as equals to influence behavior. Additionally, France and Canada possessed different strategic priorities that dictated engagement nuclear market engagement, and made the eventual restraint of the latter's nuclear consciousness possible.

South Asia offered an environment in which existing political (Commonwealth) ties worked to the advantage of Canadian commercial interests. Among the oldest of its kind, the Canada-India nuclear relationship began in the mid-1950s with New Delhi's purchase of a CIRUS research reactor. This was followed by the two power reactors, RAPP I and II, in the mid-1960s. These agreements were concluded with minimal safeguards in place and in spite of India's refusal to sign the NPT, indicating that Ottawa's initial concern was commercial success for AECL, Canada's foremost nuclear firm.¹⁹ Indeed, efforts to use the RAPP talks as a means to renegotiate for increased safeguards on the CIRUS reactor were dropped, as Canadian officials feared supplier competition.²⁰

¹⁹ Duane Bratt, "Candu or candon't: Competing Values Behind Canada's Nuclear Sales," *The Nonproliferation Review* 5, no. 3 (1998): 6.

²⁰ Duane Bratt, "Is business booming? Canada's nuclear reactor export policy," *International Journal* 51, no. 3 (1996): 491-492.

A combination of credibility- and strategy-justified incentivized boldness in export behavior, and thus became the foundation of the Canadian nuclear consciousness. The 1965 deal to provide Pakistan with its KANUPP reactor reflected the complexity of this stance. Coming between the two RAPP reactor purchases, the Pakistan deal stemmed from some of the same drivers as the India deals, namely Commonwealth ties and commercial interests. However, after the CIRUS transfer, Canada increasingly saw itself as a potential balancer between its two Commonwealth partners, a political view that served to justify aggressive export behavior. The commercial benefits of this balancing act, reflected in the desperation of Canadian officials to showcase CANDU demand to the rest of the market, overshadowed the ominous nature of a nuclear transfer to a military government without appropriate safeguards.

India's 1974 nuclear test shifted the Canadian export paradigm away from commercial and credibility interests and towards a focus on non-proliferation and safeguards. Following the test, which used reprocessed fuel from the CIRUS reactor, Canada immediately suspended nuclear cooperation with both India and Pakistan in spite of tremendous financial consequences.²¹ Crucially, the Canadian shift towards export restraint post-1974 was entirely self-imposed. The U.S. downplayed the Indian test despite having exported twenty-one tons of heavy water for the CIRUS reactor that likely had a role in facilitating the test. Canada saw this same lax U.S. approach to non-proliferation that France did. Yet, while this enabled France's aggressive exporting in the first half of the decade, Canada chose to self-restrain instead.²² Thus, the Indian test reveals the weight of traumatic consequences stemming from export behavior upon a state's nuclear consciousness. France, which never faced the same monumental consequences as Canada for its bold, commercially driven export behavior, remained unrestrained until the U.S. finally stepped in.

²¹ Duane Bratt, "Candu or candon't: Competing Values Behind Canada's Nuclear Sales," 7; Mitchell Reiss. *Without the Bomb: The Politics of Nuclear Non-Proliferation* (New York: Columbia University Press, 1988), 228.

²² Mitchell Reiss. *Without the Bomb: The Politics of Nuclear Non-Proliferation* (New York: Columbia University Press, 1988), 218-219.

The post-1974 shift in Canadian export policy created an opportunity for prestige unique among all the supplier nations. In December 1976, the Canadian secretary of state for external affairs announced that Canada's new stringent approach to nuclear transfers, along with the inevitable commercial consequences it would bring, was a price the country was willing to pay "to curb the threat to mankind of nuclear proliferation."²³ Already deriving technological prestige from the unique CANDU design, Canada used the Indian test fallout to portray itself as a more mature supplier. However, just as in the French case, the effect of prestige on importer behavior, insofar as they increased demand for a particular state's nuclear technology, remains unclear.

The Canada-ROK case may indicate some causation between the professed caution of a supplier and commercial success. After renegotiating with Seoul for more safeguards on a CANDU sale following the 1974 shift, South Korea went on to purchase three more reactors over the next decade (Wolsung I – IV). While a bribery scandal in the ROK case dilutes the prestige argument, the sales exemplify the follow-on effect that nuclear suppliers sought for the sake of steady orders. This effect was enhanced in the Canadian context due to the CANDU design, the one of only two commercial heavy water reactor designs on the market. This couched civilian nuclear export agreements with Ottawa in special terms, which established a belief in the exclusivity of its technology as a core element of the Canadian nuclear consciousness that outlasted commercial and strategic interests.²⁴ The Canadian case is differentiated further by the proliferation risks associated with heavy-water reactors like the CANDU design. Using natural uranium, these reactors produce about 30 percent more plutonium than light-water reactors of the

²³ Duane Bratt, "Is business booming? Canada's nuclear reactor export policy," *International Journal* 51, no. 3 (1996): 493.

²⁴ Robert Morrison, "Global Nuclear Markets in the Context of Climate Change and Sustainable Development," in *Canadian Nuclear Energy Policy: Changing Ideas, Institutions, and Interests*, ed. G. Bruce Doern, Arslan Dorman, and Robert W. Morrison (Toronto: University of Toronto Press, 2001), 37-38.

same size.²⁵ Indeed, the Canadian nuclear consciousness, traumatized by its culpability in the Indian PNE, adopted a powerful self-regulating element that precluded American interdiction.

Federal Republic of Germany

West German nuclear transfers to Asia in many ways parallel the commercial intensity shown by the French, yet Bonn faced unique hurdles that limited the magnitude of effect exports had on its nuclear conscious. For political and efficiency reasons, West Germany direct imported from and signed licensing agreements with U.S. firms all while accepting IAEA safeguards and signing the NPT in 1969.²⁶ By accepting these restraints early on, the state gained a legitimacy in the nuclear field that propelled its participation in the international nuclear market. It was not a coincidence that West Germany emulated a similarly aggressive style of export behavior as France, but the Germans attempted to justify their marketplace engagement with legitimizing measures instead of reputation or prestige.

The clearest indication as to the strength of commercial interests embedded in FRG nuclear export policy arose from the German role in Taiwan in 1973. The same ROC delegation that met with Saint Gobain also met with the German firm UHDE-Lurgi to explore a sale of reprocessing technology. Crucially, the ROC learned that Bonn was guaranteeing the transfer, placing UHDE-Lurgi in the top bidder spot.²⁷ The act of offering a guarantee prior to an official agreement signaled the primacy of commercial interests in West Germany, namely fears of industrial overcapacity in the nuclear sector while a recession loomed. This was also recognized by the U.S., which instructed the FRG ambassador to make an appeal “to counter pressure probably being put on FRG by that company [UHDE-Lurgi] for approval

²⁵ Robert Gillette, “Nuclear Technology: Essential Elements for Decisionmakers,” in *Nuclear Policies: Fuel Without the Bomb*, ed. Albert Wohlstetter, Victor Gilinsky, Robert Gillette, and Roberta Wohlstetter (Cambridge: Ballinger Publishing Company, 1978): 17.

²⁶ William Walker and Mans Lonnroth, *Nuclear Power Struggles: Industrial Competition and Proliferation Control* (London: George Allen and Unwin, 1983), 27-31.

²⁷ David Albright and Andrea Stricker, *Taiwan’s Former Nuclear Weapons Program: Nuclear Weapons On-Demand* (Washington, D.C.: Institute for Science and International Security, 2018), 34; U.S. Mission to the European Economic Community to State Department, Telegram 5045, “Proposed Reprocessing Plant for Republic of China,” December 21, 1972, <https://nsarchive.gwu.edu/document/17788-document-08-u-s-mission-european-economic>.

of sale.”²⁸ While the U.S. confronted Taiwan about its attempts to obtain a reprocessing plant, it quietly increased pressure on the West German government not to approve the sale.

This was not the first instance of interdiction against German exporting behavior. In 1966, the opportunity for Bonn’s first major nuclear export arose when Taiwan approached Siemens about a potential heavy water reactor sale. Excited by the commercial prospects, the West German government approved the sale on the condition that Taiwan entered into a safeguards agreement with the IAEA. Even with the agreement, however, this transfer was successfully broken apart by the U.S. as well. While the FRG Science Ministry supported the sale, the Foreign Office opposed it on political grounds. Recognizing this split, U.S. diplomats put American weight behind the Foreign Office, convincing the Science Ministry to reverse its position.²⁹ The subtlety of this effort is indicative of a crucial juxtaposition in U.S. interdiction efforts.

It was no coincidence that American efforts to interdict FRG-Taiwan nuclear transfers both in 1966 and 1973 were far more delicate on the supplier side. Since both transfers would have occurred under IAEA safeguards agreements, the U.S. recognized that blocking them would lead other states (most consequentially the other exporter state cases) to harbor doubts about the efficacy of the safeguards system.³⁰ That the Germans yielded quicker under American pressure than the French did indicates that Bonn possessed a comparatively weaker nuclear consciousness, represented by the lack of consensus between the Foreign Office and the Science Ministry. The less cohesive state of the West German nuclear consciousness gave the U.S. leverage to exploit openings, where possible, for non-proliferation goals.

²⁸ State Department to Embassies in Bonn, Brussels, and Taipei, Cable 12137, “Proposed Reprocessing Plant for the Republic of China,” January 20, 1973, <https://nsarchive2.gwu.edu/NSAEBB/NSAEBB20/docs/doc03.pdf>.

²⁹ U.S. Embassy Bonn to State Department, Cable 3000, “German Nuclear Reactor for Taiwan,” March 25, 1966, <https://nsarchive2.gwu.edu/NSAEBB/NSAEBB20/docs/doc27.pdf>.

³⁰ U.S. Mission to the European Communities to State Department, Cable ECBUS 898, “Possible German Reactor Export to Taiwan,” April 7, 1966, <https://nsarchive2.gwu.edu/NSAEBB/NSAEBB20/docs/doc31.pdf>.

Conclusions: Reflections of Nuclear Consciousness in American Interdiction

American counter-transfer action in the 1970s, even under the laxity of the Nixon administration, thus relied on a two-pronged approach. First, the public promotion of the IAEA and the safeguards system defended the credibility of the non-proliferation regime as independent and legitimate. This effort was made necessary not only to constrain Western nuclear commercial interests, but also to counter narratives of nuclear discrimination against developing countries and of the American desire to defend their market hegemony. Secondly, quiet diplomatic pressure campaigns attempted to pry supplier governments away from their overriding commercial interests. These leveraged American superpower status against European resentment of American nuclear market dominance. Indeed, efforts by the Europeans to compete with this U.S. dominance in civil nuclear production translated into increased nuclear transfers starting in the late 1960s. As nuclear power became more attractive across the world even before the oil embargo, European and Canadian exporters made good on their resentment by enacting “vigorous policies of industrial and technological development.”³¹ This growth of industrial production capacity in the nuclear sectors of the exporter case states outpaced the needs of their domestic power utilities. Thus, a cycle was born in which politics drove industry which in turn drove commercial interest in the global market; the “revolutions” of this cycle are the basis of nuclear consciousness in each state. By the eve of the Indian PNE, American interdiction and defense of the non-proliferation regime came to be seen as an implicit act of support for U.S. suppliers as intense commercial competition turned it into a buyer’s market.

American interdiction efforts grew more determined as the decade went on. Initial willingness to attempt interdiction was tied to broader strategic considerations in the respective theater before shifting towards general proliferation concerns in the latter half of the decade. The U.S. resumption of arms sales to Pakistan without commitments to non-weaponization was linked to Pakistan’s role in facilitating U.S.-

³¹ William Walker and Mans Lonnroth. *Nuclear Power Struggles: Industrial Competition and Proliferation Control* (London: Goerge Allen and Unwin, 1983), 18.

PRC rapprochement, a higher objective than non-proliferation for the Nixon administration. Conversely, the China dialogue impelled the effort to stop nuclear technology sales to Taiwan. Indeed, Kissinger was notably apathetic about his role in inaugurating the London Supplier's Club, the initial iteration of the NSG. By the twilight of the Ford administration, non-proliferation had found traction again, represented by the U.S.'s forceful tactics with South Korea. As the United States' own nuclear export policies came under scrutiny in the wake of the Indian PNE, domestic pressure came to support strategic concerns about the spread of nuclear technology. The convergence of forces can be seen in multiple studies undertaken across the Ford and Carter administrations and peaked with the passage of the Nuclear Non-Proliferation Act of 1978.

The record reveals that interdiction efforts clearly differed between client states, such as Taiwan and South Korea, and non-client states of the U.S., such as Pakistan. The former cases showed US confidence to attempt interdiction through both the supplier and the client equally, whereas the latter cases saw the U.S. weigh its efforts more heavily on the supplier side. This bifurcation of interdiction policy reveals insights into alliance politics that warrant further study.

The behavior of Western nuclear suppliers in the 1970s was largely tangential to the security paradigm of the era. Ultimately, it helped eliminate the compartmentalization that had previously existed between weaponization and nuclear technology transfers under the logic of the Atoms for Peace era. The vacuum of U.S. non-proliferation leadership in the first few years of the decade allowed for a highly active nuclear market. The gap between mid-1975, when American interest in non-proliferation resumed in force, and 1977, when the nuclear market finally came to heel under U.S. influence, indicates that the earlier pause allowed the nuclear consciousnesses of others supplier states to develop independently. This diluted Washington's leverage and meant that the resumption of successful counter-transfer influence on the supplier side took time to become efficacious. More than others, the 1970s revealed the existence of a zero-sum relationship between the confidence of Western nuclear states' behavior in the global nuclear market and the effectiveness of the U.S.-led non-proliferation regime. It is questionable how much more

difficult the nuclear consciousnesses' of the exporter case states would have been to overcome had the Indian PNE occurred later. The PNE was the limiting factor in that of at least one of the cases (Canada) and was, most saliently, the catalyst for stronger non-proliferation objectives in U.S. policy, without which its interdiction efforts would have been notably weaker. Bringing together the aggregate actions of each exporter state into the single nuclear consciousness variable reveals that the power distribution within the Western alliance structure was not nearly as asymmetric on nuclear technology issues as is sometimes thought. Indeed, American grand strategy, underwritten by non-proliferation protocols, was best served when the nuclear consciousnesses of Western allies was diminished and brought to heel. It would be surprising if these same asymmetric dynamics were not even more pronounced in present times, boding a renewed challenge for U.S. alliance management and non-proliferation objectives.

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