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Germany and Proliferation:
The Nuclear Export Policy
ABSTRACT

The Federal Republic of Germany undertook certain international obligations with regard to nuclear trade, both in the context of the Non-Proliferation Treaty and in the framework of multilateral agreements among nuclear supplier states.

This paper reviews several nuclear export cases which demonstrated that the export legislation as well as its implementation by officials in the respective control authorities have not been able to prevent transfers that significantly contributed to the nuclear weapon capability of nuclear threshold states. The nuclear supply contract with Brazil in also reviewed. The shift to a policy which requires full-scope safeguards as a condition of supply is partly a consequence of know-how transfers to military programs in Brazil in the framework of this contract.

The amendments of the export legislation, enacted in November 1990, did not remove all loopholes. The improvements in the bodies charged with supervising the exports from the FRG were significant but not sufficient. A fundamental shift in the FRG nuclear export policy remains necessary.

ZUSAMMENFASSUNG

Die Bundesrepublik Deutschland hat internationale Verpflichtungen in bezug auf den Nuklearhandel übernommen. Als Unterzeichner des Nichtverbreitungsertrages und multilateraler Vereinbarungen zwischen nuklearen Lieferländern ist sie an Vorgaben für Nuklearexporte gebunden.

In diesem Papier werden einige Nuklearexportfälle untersucht, die zeigen, daß sowohl die Exportgesetzgebung als auch die Umsetzung seiten der Verantwortlichen in den jeweiligen Kontrollbehörden nicht geeignet waren, Transfers zu verhindern, die entscheidend zur Nuklearwaffenfähigkeit von nuklearen Schwellenländern beigetragen haben. Die Untersuchung erstreckt sich darüberhinaus auf den nuklearen Liefervertrag mit Brasilien. Der Wechsel zu einer Politik, die umfassende Sicherungsmaßnahmen zur Bedingung von Lieferungen macht, ist auch eine Konsequenz aus den Know-How-Transfers für militärische Programme in Brasilien im Rahmen dieses Abkommens.

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ABBREVIATIONS

AWG  Außenwirtschaftsgesetz / Foreign Trade Act
BARC  Bhabha Atomic Research Centre
BAW  Bundesamt für Wirtschaft / Federal Office of Economics
Be  beryllium
BGBl.  Bundesgesetzblatt / Federal Law Gazette
BT Drs.  Bundestags Drucksache / documents of the Bundestag
BMFT  Bundesministerium für Forschung und Technologie / Federal Ministry of Research and Technology
BMWi  Bundesministerium für Wirtschaft / Federal Ministry of Economics
BND  Bundesnachrichtendienst / Federal Intelligence Service
CDU  Christlich Demokratische Union / Christian Democratic Union
COCOM  Co-ordinating Committee for East-West Trade Policy
CSU  Christlich Soziale Union / Christian Social Union
CWC  chemical weapons convention
EC  European Communities
EURATOM  European Atomic Energy Community
FDP  Freie Demokratische Partei / Free Democratic Party
FRG  Federal Republic of Germany
FSS  full-scope safeguards
GDR  German Democratic Republic
HEU  highly-enriched uranium
HWR  heavy water reactor(s)
IAEA  International Atomic Energy Agency
IC  International Import Certificate
INFCIRC/..  Information Circular (of the IAEA)
KWKG  Kriegswaffenkontrollgesetz / War Weapons Control Act
LEU  low-enriched uranium
LSG  London Suppliers' Guidelines
LWR  light water reactor(s)
MTCR  Missile Technology Control Regime
NWS  nuclear-weapon state(s)
NNWS  non-nuclear-weapon state(s)
NPT  Treaty on the Non-Proliferation of Nuclear Weapons (Non-Proliferation Treaty)
NPT/CONF.../...  documents of the NPT review conferences
NPT/CONF.../SR...  summary records of the NPT review conferences
NTG  Neue Technologien GmbH
NWFZ  nuclear-weapon-free zone(s)
PAEC  Pakistan Atomic Energy Commission
PPNN  Programme on the Promotion of Nuclear Non-Proliferation
PTB  Physikalisch Technische Beratung
Pu  plutonium
SPD  Sozialdemokratische Partei Deutschlands / Social Democratic Party of Germany
UK  United Kingdom
US  United States
USSR  Union of Soviet Socialist Republics
WEU  Western European Union
ZKI  Customs Criminal Institute / Zollkriminalinstitut
INTRODUCTION

1. Relevance of the issue

The topic of nuclear non-proliferation is rarely at the focus of public attention. This applies as much to the FRG as to other states, though the public awareness of issues related to nuclear energy and nuclear weapons in the Federal Republic of Germany (FRG) is usually higher than in other states with a comparable industrial capacity. Both international and domestic developments indicate a growing significance of the issue and seem to attract more attention to questions of nuclear non-proliferation.

The parties to the Treaty on the Non-Proliferation of Nuclear Weapons\(^1\) (NPT) which forms the core of the so-called non-proliferation régime\(^2\) must decide on the future of the treaty in 1995. The last conference of states party to the NPT charged with reviewing the treaty before the agreement is up for extension was held in 1990. Developments during the next five years are therefore crucial for the further existence of the treaty;\(^3\) its uncertain future might be an incentive to debate the issue of nuclear non-proliferation more extensively.

The "Transnuklear/Nukem affair" in 1988 and subsequent investigations by a special Bundestag committee drew domestic and international attention to FRG's nuclear policy.\(^4\) In the course of its investigations, the parliamentary committee discovered that materials which can be used for the production of nuclear weapons had been exported to states with nuclear-weapon programs. The inadequacy of export legislation and the unreliability of the export control authorities became apparent. But the problem seems to reach beyond solely technical shortcomings in the control machinery. The sheer quantity of the sensitive exports leads to the assumption that a generally lax attitude towards the issue was instrumental for the exports of sensitive materials and equipments. It can therefore be questioned whether the terms "affairs" or "scandals" are applicable because they usually imply the notion of exceptions from a general rule.

Revelations of exports of materials relevant for the production of other weapons of mass destruction also play a role in this context. The Rabta case was the most extensively covered but not the only case of FRG assistance in the field of chemical weapons production. In addition, there are indications of involvement of West German firms in the development of biological

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weapons in the third world.\(^4\) Thus, the debate on nuclear proliferation in the FRG has also to be seen in the context of assistance for chemical and biological weapons production. The scope of this study, however, is limited to the spread of nuclear weapons.

2. Questions and objectives

The strongest commitment a state can make is accession to an international treaty. By ratifying the NPT, the FRG declared that it supports the notion that a world of more nuclear-weapon states would be less peaceful.\(^6\) The study therefore focuses on the relationship between the FRG's declared objective of non-proliferation and the policy she actually implements in that field.

Obligations for the nuclear export policy arising from NPT accession as well as from further multilateral agreements are presented in the first part of this paper. In the second part, the implementation of the FRG's nuclear export policy is analysed by reviewing case studies, each chosen to demonstrate a specific aspect of nuclear exports. Particular attention is devoted to the involvement of governmental institutions.

The war in the Gulf has again pointed to the fact that dealing with the topic of non-proliferation is most timely now. But focusing on nuclear exports to Iraq, as an issue of current interest, would distract attention from the need for a long-term nuclear non-proliferation policy. In other words, today every decision maker would probably agree that sensitive exports to Iraq are to be prevented, while it can be questioned whether the same political actors would come out against exports to those regions of the world where conflicts have not yet resulted in wars.

To assess whether the Bundestag investigations on nuclear exports have induced the executive and the legislature to reconsider their attitudes towards nuclear non-proliferation, the changes in export legislation are discussed. Improvements in the staffing of control authorities are equally important for such an assessment.

The question why the assumed difference between the declared policy of non-proliferation and the implemented policy in the field of nuclear exports did not lead to improvements in export controls before public attention was devoted to the issue is a major point of this study. It seems that the executive and the legislature only took action on export controls when it became an issue


\(6\) NPT preamble, paragraph two: "Believing that the proliferation of nuclear weapons would seriously enhance the danger of nuclear war."
of "widespread interest". The application of the non-decision theory seems therefore to be useful in analysing FRG policy in the field of nuclear non-proliferation. That is to say that until the public emergence of the issue, there was apparently no perceived need for a decision though the government was well informed about leaks in the export control machinery.

3. Sources

The study relies in large parts on empirical data. Some of this information has not yet appeared in the open literature. The study is mainly based upon information obtained from the final report of the Bundestag investigative committee, from articles in trade journals of the nuclear industry, from publications of observers of the Bundestag committee meetings, and from reports in the daily press. During a stay in Bonn, the author had the opportunity to contact the staff of members of the Bundestag investigative committee who pointed him to further details of the export cases.

The study is also based on documents of the NPT review conferences; full sets of documents of the second, third and fourth review conferences were available to the author. The observer status at the fourth review conference allowed the author to attend meetings of the conference plenary and its committees and thus make gathering of much useful information possible. Further

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8 According to Barach and Baratz who coined the term, "[a non-decision-making situation exist] when the dominant values, the accepted rules of the game, the existing power relations among groups, and the instruments of force, singly or in combination, effectively prevent grievances from developing into full-fledged issues which call for decisions." BACHRACH, Peter / BARATZ, Morton S., 'Decisions and Nondecisions: An Analytical Framework', The American Political Science Review, Vol. 57, No. 3 (September 1963), p. 641. See also "Non-decisions", in: Nohlen, Dieter / Schulze, Rainer-Olaf (eds.), Pipers Wörterbuch zur Politik I, Munich, Zürich (Piper) 1989, pp. 695-697.

9 Applying the non-decision theory, it can for example be suggested that the priority of free trade is a "dominant value" in the FRG. The fact that foreign policy objectives, such as non-proliferation, are usually discussed without major public involvement could be one "rule of the game". The nondecision-makers, those who want an issue not to become "important" are not necessarily formal decision-makers, i.e. they can hold other influential posts apart from governmental functions.

10 Bundesdrucksache (BT Drs.) 11/7800 of October 15, 1990. The document contains the official report as approved by the CDU/CSU-PDP majority in the committee and the dissenting report of the SPD and DIE GRÜNEN. Parts of the latter report were only supported by one of the two parliamentary parties. When referring to substantive parts of the document, the respective part will be indicated by adding "majority" or "minority".

11 These are the US journals Nucleonics Week and Nuclear Fuel. They contain information which cannot be obtained from the public media since they are internal information bulletins for people directly involved in the nuclear industry. Though these journals are publicly available, the limited access is guaranteed by an annual subscription rate of $1,280 and $1,325, respectively. They cannot be found in public libraries. In the FRG, they can only be consulted in the reference libraries of the Julich and Karlsruhe nuclear research centres.

12 MÜLLER, Harald, *After the Scandals: West German Nonproliferation Policy*, PRIF Reports No. 9, Frankfurt/M (Peace Research Institute Frankfurt) 1990; KOPPE, Holger / KOCH, Egmont R., *Bomben-Geschichte: tödliche Waffen für die Dritte Welt*, Munich (Koscheek & Schuler) 1990. One of the co-authors of the latter publication was directly involved in the Bundestag investigations; it can therefore be assumed that the book is based upon authentic information. List of the staff of the members of the investigative committee: BT Drs. 11/7800, p. 11, para. 1.6.1.

13 The publications of the head of the Nuclear Non-Proliferation Project of the Carnegie Endowment for International Peace, Leonard S. Spector, are the most reliable and comprehensive sources on the capabilities of nuclear threshold states. The most recent books and studies are also used as sources.
background information was obtained from many personal contacts to delegations, observers from other research institutes and journalists concerned with the topic. These contacts and the background information obtained from informal interviews in Bonn and Geneva as well as from "talks in the corridors" during the fourth review conference were most helpful in providing a better insight into the issue.
PART I
INTERNATIONAL OBLIGATIONS RELATED TO NUCLEAR NON-PROLIFERATION

1. Approaches to the prevention of nuclear proliferation: co-operation vs. denial

Approaches to the prevention of the spread of weapons of mass destruction are generally based on two different, partly conflicting principles. On the one hand, states having capabilities in relevant technologies can, together or individually, prevent or hinder the supply of assembled weapons or parts of them, of materials specifically designed to produce parts of such weapons, or of materials that could be useful in the production of those weapons. They can furthermore hamper the exchange of scientific knowledge or skills needed or useful for the construction of such weapons.\(^{14}\) On the other hand, states which have capabilities of producing such weapons can come to an agreement with those states which do not have the capability of producing them. In such an agreement all states would undertake not to acquire such weapons.\(^{15}\)

The first approach is apparently much easier to achieve. The group of parties involved is smaller and usually more homogeneous: no party forgoes the right to acquire a certain category of weapons. The second approach usually requires agreement among a larger, probably more heterogeneous, group of parties. The parties to such an agreement are likely to expect advantages in other fields.\(^{16}\) In the case of the NPT both possessors and non-possessors are parties to the same treaty though, contrary to the projected chemical weapons convention (CWC), they undertook different commitments.\(^{17}\) The renunciation of certain kinds of weapons by the non-possessors is thus part of a bargain between those having the capabilities and those not having them. It is also conceivable, however, that renunciation is seen as a security arrangement among those states that do not posses these weapons.\(^{18}\)

\(^{14}\) Hampering the transfer of know-how seems to become increasingly difficult since most design plans are no longer transferred by physically transporting blueprints or microfiches but via on-line communication between computer terminals. ALBRECHT, Ulrich, "Techniktransfer als Problem analytischer Sozialwissenschaft - Einleitung des Herausgebers", in: Albrecht, Ulrich (ed.), Technikkontrolle und Internationale Politik: Die Internationalisierung von Technologiefernveranstaltungen und ihre Folgen. Opladen (Westdeutscher Verlag) 1989, p. 15.

\(^{15}\) The two different approaches can also be described as "exclusive (or external) regimes" and "inclusive (or internal) regimes", respectively. WOLF, Klaus Dieter / ZÜRN, Michael, "Regeln für und wider den Markt", in: Albrecht (ed.), Technikkontrolle..., op. cit., p. 54.

\(^{16}\) In the case of the NPT these expected advantages were: security assurances by NWS, unlimited access to nuclear energy, and disarmament obligations by NWS.

\(^{17}\) The NPT is thus only technically an "internal regime". Cf. WOLF / ZORN, "Regeln für und wider...", op. cit., p. 51.

\(^{18}\) The latter function applies to agreements in which all states parties forgo the acquisition of certain weapons, e.g. the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) Weapons and on their Destruction of 1972, or the projected chemical weapons convention (CWC). It applies to a certain extent to the agreements on nuclear-weapon-free zones (NPWFZ), i.e. the Treaty for the Prohibition of Nuclear Weapons in Latin America (Treaty of Tlatelolco) and the South Pacific Nuclear Free Zone Treaty (Treaty of Rarotonga). The texts of all three treaties are reproduced in: UNITED NATIONS, Status of Multilateral Arms Regulation..., op. cit. In these cases, however, states parties also expect assurances of from NWS (which are not in the zone) not to use nuclear weapons against the zone. Therefore the NPWFZ treaties do not only rely upon agreements among non-possessors. The NPT which explicitly distinguishes between possessors and non-possessors, was widely seen as a bargain between NWS and NNWS. In recent years, however, some analysis have observed a growing interest in the NPT by NNWS apart from the initial bargain. Expectations in the treaty with respect to economic benefits and global disarmament are diminishing. According to these voices, the treaty is therefore
Historically, the denial approaches preceded the co-operative approaches in three areas of weapons of mass destruction. In the field of nuclear weapons, the US, as the first possessor of nuclear technology, attempted to prevent the spread of nuclear weapons through a strict policy of denial and secrecy in the early days of the atomic bomb. The approach relied solely on unilateral decisions by potential suppliers. Attempts to come to co-operative arrangements were developed much later. In the field of chemical weapons, the export restrictions agreed upon by the "Australia Group" represents the first multilateral measure designed to prevent further states from acquiring parts of those weapons. This informal agreement has been in force since 1985 while negotiation of a CWC has yet to be concluded. In the field of missile technology, the prevention of the spread of the means of delivery most apt for weapons of mass destruction has also been by means of the denial approach, i.e. an agreement among a limited group of states having the capability to manufacture important elements of the technology. The Missile Technology Control Regime (MTCR) has not been paralleled by a co-operative approach.

In the nuclear field, the two approaches overlap. There are multilateral agreements on export restrictions and further restrictions imposed by single states which are sometimes more far-reaching. The London Suppliers' Guidelines (LSG) rely exclusively on a policy of denial, i.e. they apply to all non-nuclear weapon states (NNWS) without respect to their commitments not to acquire nuclear weapons, while the unilateral guidelines of some supplier states distinguish between different categories of states. Thus the co-operative approach has had some influence on unilateral guidelines prohibiting the supply (or the unsafeguarded supply) of certain commodities. The co-operative approach in the nuclear field, the NPT, also provides for export

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20 The "Australia Group" is composed of Australia, Austria, Canada, Japan, New Zealand, Norway, Switzerland, the United States, all member states of the EC, and the EC Commission. The name stems from the fact that the group usually meets at the Australian Embassy in Paris. A similar informal agreement among Eastern European states existed in the form of the so-called "Leipzig Group". BERNAUER, Thomas, The Projected Chemical Weapons Convention: A Guide to the Negotiations in the Conference on Disarmament. Geneva (UNIDIR) 1990, p. 46.


22 Proposals for multilateral treaties eliminating a specific category of missiles were made (in the context of the US/USSR INF agreement) by USSR Foreign Minister Shevardnadze in 1988 and, more recently, by academis: Arms Control Reporter, Intermediate-range Nuclear Forces Treaty, Chronology 1988, p. 403.B.699; SIMPSON, John, Non-Proliferation in a Disarming World. Practical Steps for the 1990s, p. 6; NOLAN, Janine E., Raising the Barriers to Creation of New Arsenals: Ballistic Missiles and Chemical Weapons, p. 32, duplicated manuscripts prepared for the colloquium on "Non-Proliferation in a Disarming World: Prospects for the 1990s", Groupe de Bellerive, Geneva, June 20-21, 1990.

23 INFIRC/254. See also chapter 3.2, part 1 of this study.

24 Australia only supplies those NNWS which are parties to the NPT (and NWS which accept safeguards on the supplied materials). FISHER, David / SZASZ, Paul, Safeguarding the Atom: A Critical Appraisal, London and Philadelphia (Taylor & Francis, for SIPRI) 1985, p. 122.
restrictions. The Zangger Committee (a denial element) which interprets article III.2 of the NPT agrees on a list containing certain goods and materials which "trigger" IAEA safeguards.25 Thus, there are also elements of denial in the co-operative NPT approach.

Although it appears that, in the long term, the wider spread of nuclear weapons (as well as of other weapons of mass destruction) can only be prevented by co-operative (and comprehensive) measures,26 policies of denial have nevertheless a significant role to play. A policy of non-co-operation can significantly delay the nuclear-weapon capability of a given state.27 Export restrictions can thus ease the conclusion of or the accession to agreements. A policy of denial can also increase the financial and political costs of a nuclear weapon program. The political elite of a given state intending to acquire nuclear weapons can therefore be forced to reconsider its decision to acquire nuclear weapons. Thus, a restrictive export policy can have an impact on the wider dissemination of nuclear weapons. It appears that such a policy is all the more successful if combined with efforts in related areas.

2. Obligations under the Non-Proliferation Treaty

The FRG committed herself to the objective of preventing the spread of nuclear weapons when acceding to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) but has not always been a strong supporter of this contractual approach. The FRG signed the NPT on November 28, 1969 and deposited the instruments of ratification on May 2, 1975. When the Bundestag voted on the ratification act on February 20, 1974, members of the CDU/CSU parliamentary party pointed to the discriminatory character of the NPT,28 an argument which today is be used by threshold states for remaining outside the NPT. They mainly opposed the treaty because of its possible consequences on the control over nuclear weapons by the FRG.29

Neither did the SPD statement in the plenary represent unequivocal support for the aims of the NPT. The then governing party merely defended the ratification of the treaty as necessary to ensure the supply of nuclear fuel on the one hand and to preserve the policy of detente on the other hand.30 The ratification act was adopted with a majority of 355 votes in favour and 90

25 INFCIRC/209. See also chapter 3.1, part I of this study.
26 The shift in the policy of that state which first had a monopoly and later a dominant role in nuclear energy technology, the United States, from a strict policy of denial (MacMahon Act) to a policy of co-operation (Atoms for Peace, NPT) may have been the result of the recognition that the expertise to use nuclear energy and to build the nuclear bomb can sooner or later be acquired by other states, even without information obtained by espionage.
29 Ibid., p. 5256. That is underscored by the voting records. While some CDU/CSU representatives voted against the NPT, almost all of them voted in favour of the IAEA-EURATOM safeguards agreement. Ibid., pp. 5290-5293.
30 Ibid., p. 5273.
against (no abstentions). Some of the opponents in the Bundestag later became members of the Kohl government or held other influential posts.

Without ratification by the FRG the NPT would not have fulfilled its main objective. This is not to say that the NPT was drafted to "suppress" the FRG, as alleged by some NPT opponents in the 1960s. The USSR was clearly very concerned that the FRG should ratify, but did not make this a prerequisite of her own ratification of the treaty. The focus on the FRG was reasonable at that time. First of all, the FRG was likely to be the next state having the capability to produce nuclear weapons; she was the threshold state of the time. The FRG was not only one of the few states having the capability to manufacture nuclear weapons. In the 1950s and 1960s, members of the Federal Government, namely Chancellor Adenauer and Strauss, who had been the first Minister of Atomic Affairs and who later held the post of Minister of Defense, repeatedly stated that the acquisition of nuclear weapons by the FRG would be desirable. The declaration made in the context of the Western European Union (WEU) Treaty of 1954, frequently referred to by government officials as an early example for the renunciation of nuclear weapons, only prohibits their production on the territory of the FRG. The possibility of acquiring nuclear weapons by other means or of producing them on the territory of other states is not covered by the statement.

Furthermore, non-accession by the FRG would have induced the majority of industrial states not to join the NPT. Other EC NNWS were not prepared to ratify the treaty before the FRG has taken this step. Ratification by all EC member NNWS was the prerequisite for Japan to sign the

31 Ibid., pp. 5290-5293.
32 Negative votes were cast inter alia by Dollinger, Kiechle, Waigel, Wallmann, Warnke, and Zimmermann. Walter Wallmann was in charge of the nuclear industry when he held the post of the Federal Minister for the Environment and Reactor Security. As Prime Minister of Hesse state he was later responsible for the Pu storage and other significant nuclear facilities in Hanau. In 1988, Wallmann reiterated his criticism of the NPT in his testimony before the Bundestag investigative committee. "Wallmann kritisiert den Atomwaffensvertrag", Süddeutsche Zeitung, May 29, 1988. A further negative vote was cast by Mr. Riedl who held the post of junior minister (Staatssekretär) in the Federal Ministry of Economics and is thus involved in export controls. Manfred Wörner, former Minister of Defense, now Secretary-General of NATO, also voted against the ratification act.
35 The USSR ratified the NPT on March 5, 1970.
36 RADKAI, Aufstieg und Krise ..., op. cit., p. 324. Further states which were considered to be on the "nuclear threshold" at that time were Australia, Canada, Italy, Japan, and Sweden. SIMPSON, John, "Nonproliferation's divided agenda", Bulletin of the Atomic Scientists, July/August 1990, p. 17.
38 See e.g. the statement by the head of the FRG delegation to the plenary of the third NPT review conference: "In 1954, within the framework of the Treaty establishing the Western European Union, the Federal Republic of Germany had become the first country in the world to incur an internationally binding commitment not to produce nuclear weapons." NPT/CONF.3/5, SR.4, para. 26.
39 BGBI. 1955 II, p. 266.
40 At that time: Belgium, the FRG, Italy, Luxembourg, and the Netherlands.
treaty. An FRG decision against the NPT would therefore have induced a chain reaction significantly diminishing the universality of the treaty.

In the course of the two-plus-four talks on the foreign aspects of German unification in 1990, the foreign ministers of France and the USSR pointed to the question whether a future German state would also feel bound by its commitments not to acquire nuclear weapons. Though, from a legal point of view, it was clear that adherence to the NPT was guaranteed because no new state was to be founded, it appeared to be of high symbolic value to re-iterate the future commitment to the Treaty.

A statement containing such a commitment was delivered to the fourth review NPT conference in 1990 by the FRG Foreign Minister and the State Secretary in the GDR Foreign Ministry. It was also circulated as an official document of the conference. If the conference had agreed on a final document, a statement welcoming ('notes with satisfaction') the further German adherence would have been included.

2.1 Safeguards on Nuclear Exports

Besides an undertaking by non-nuclear-weapon states not to acquire nuclear weapons the Treaty also obliges states parties to export restrictions. Article III, paragraph 2 of the NPT requires safeguards of the International Atomic Energy Agency (IAEA) on exports to NNWS on "source or special fissionable material" and on "equipment or material especially designed or prepared for the processing, use or production of special fissionable material." The provision does not distinguish between exports to NNWS inside and to those outside the treaty. According to paragraph 2 of article III (which deals with exports), "all material shall be subject to safeguards." When signing the NPT, the FRG government stressed that it availed itself the right to define which equipment and material was covered by article III.2. When ratifying the treaty,

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41 FISHER, "Der Vertrag über ...", op. cit., p. 126.
42 Statements by the foreign ministers of France and the USSR at the first meeting of foreign ministers in the framework of the two-plus-four talks in Bonn on May 5, 1990, according to: Erstes Außenministerstreffen im Rahmen 2 + 4 in Bonn am 5. Mai 1990, Berlin, May 6, 1990, duplicated manuscript from the foreign ministry of the GDR.
43 The State Minister in the Foreign Office confirmed in September 1990 that the declaration issued at the fourth NPT review conference created no new commitment beyond existing WEU and NPT obligations. "Deutschland behält Atomwaffeneoption", die tageszeitung (Berlin), October 1, 1990, p. 6.
44 NPT/CONF.IV/34.
45 NPT/CONF.IV/28.
46 NPT/CONF.IV/MC.1, p.6, para. 6. The statement was later inserted into the "Treaty on the Final Settlement with respect to Germany" of September 12, 1990. BGBl. II of October 13, 1990, p. 1317. Given the fact that an united Germany is perceived as more powerful, further German adherence to the NPT underscores that a state can also play a significant role in world politics without possessing nuclear weapons. Cf. DHANAPALA, Jayantha, "Towards 1995", UNIDIR Newsletter, Vol. 3, No. 3 (September 1990), p. 4.
47 The commitment is undertaken by both NWS and NNWS parties.
48 Emphasis added. E.C.
the FRG reiterated that she would only accept those interpretations related to exports which she had explicitly approved.49

2.2 Nuclear export "philosophies": full-scope safeguards as a condition of supply vs. integration through co-operation

The NPT does not explicitly provide for safeguards on all present and future nuclear facilities of a non-party as a condition for supply by NPT nuclear supplier states. A stricter interpretation of the NPT export provisions was contentious at the review conferences.

Among the proponents of FSS on all nuclear facilities of a recipient state are the governments of Australia, Canada and the United States.50 The Australian government holds the view that full-scope safeguards (FSS) "emphasize(d) the importance of [NPT] membership for the non-proliferation objective."51 and furthermore that FSS on all nuclear exports

"would remove the current discrimination in the safeguards conditions concerning nuclear supply to non-nuclear-weapon States Parties and countries not parties to the Treaty, and would also help to rationalize the range of safeguards conditions now applying to nuclear trade."52

The FRG, together with some other supplier states repeatedly argued against FSS as a condition of supply. At the first three review conferences, the FRG prevented the inclusion of paragraphs urging NPT supplier states to require FSS as a condition of supply. A position that was finally given up at the fourth review conference in 1990. Belgium, the FRG, Switzerland, and Italy (they were backed by the UK and the USSR) held the view that NPT holdouts can be integrated into the non-proliferation system. According to the official rationale for their position, a strict policy of denial would induce states outside the NPT to build up an independently developed nuclear program. The policy of only requiring safeguards on the facilities actually delivered would make at least a part of the respective states' installations subject to IAEA safeguards.53 In addition, when co-operating with the respective non-NPT states, efforts could be made to bring those states closer to the NPT. 54

49 Paragraph IV, (15).
50 FISHER / SZASZ, op. cit., p. 122.
52 NPT/CONF.III/C.II/SR.3, para. 18.
53 Cf. the statements of (former) senior officials from the Federal Ministry of Research and Technology (BMFT) before the Bundestag investigative committee, cited in BT Drs. 11/760 (majority), p. 209-210.
54 The governmental FRG position, as presented to other NPT parties at the 1985 review conference reads as follows:

"The commitment of States to respecting the international safeguards system through co-operation in the peaceful nuclear field was by far the best means of enlarging the IAEA safeguards regime. The method of making the acceptance of full-scope safeguards a precondition for nuclear exports had already proved to foster the creation of independent, unsafeguarded second fuel cycles in countries which, for political reasons, had decided not to accept full-scope safeguards. NPT/CONF.III/C.II/SR.4, para. 7 and 8. A similar position is held by the Swiss government: Any non-proliferation policy should take account of the principle of the sovereignty of all States regarding the use of nuclear energy. Non-proliferation was a political, not a technical, matter. A non-proliferation system could be effective only if it was based on the conviction of States that their interests were better safeguarded within the
2.3 Agreement on FSS by NPT parties

The last conference of states parties to the NPT charged with reviewing the treaty was held in 1990. The conference failed to agree on a consensus final document but made progress in reaching an agreement in the area related to nuclear exports. The agreed formulations are contained in the reports of the drafting committee to the plenary of the conference. Though they are not as legally binding as they would have been if included in the final document, they nevertheless manifest the scope of agreement of the NPT states parties on certain issues. For the first time the states parties to the NPT agreed on FSS as a condition of supply. The wording contained in the committee report reads as follows:

"The Conference urges all non-nuclear-weapon States which have not already done so to make an international legally-binding commitment not to acquire nuclear weapons or other nuclear explosive devices and to accept IAEA safeguards on all their peaceful nuclear activities, both current and future, to verify that commitment. The Conference further urges the nuclear supplier states to require as a necessary condition for the transfer of relevant nuclear supplies to non-nuclear-weapon States under new supply arrangements, such a commitment and acceptance of such safeguards."

The path to the agreement on FSS was apparently made possible after the FRG decided to require FSS. The decision was taken by the Federal Government on August 9, 1990, thus shortly before the NPT parties met in Geneva. The decision of a major supplier state party to the NPT is likely to have induced the other NPT supplier states to also change their policies. It can be assumed that the shift in FRG policy on FSS was a direct result of the export cases disclosed during the Bundestag investigations. Though the FSS commitment is not formally binding to NPT parties since it was not included in a final document, the FRG is bound by her unilateral commitment.

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56 NPT/CONF.IV/DC1/1/Add.3(B).
57 PPNN Newsletter, No. 11 (Autumn 1990), p. 3.
58 HIBBS, Mark, "German Move to Full-Scope Safeguards Putting Heat on Other Supplier Countries", Nuclear Fuel, September 3, 1990, pp. 1 and 13. France (which is not party to the NPT) is not expected to adopt an FSS policy.
60 The delegation of Belgium announced after the failure of the NPT review conference that it does not feel bound by the agreed language on FSS. NPT/CONF.IV/SR.4. The USSR delegation reportedly said that it would only require FSS if France adheres to such a policy. Information obtained by the author at the fourth review conference. E.C.
3. Multilateral guidelines for nuclear trade

3.1 NPT: the Zangger Committee guidelines

In cases of exports of entire nuclear facilities, the provision of NPT article III.2 clearly requires safeguards on the exported facility though it is under contention whether all current and future facilities of the recipient state must be subject to safeguards (see previous chapter). When only specific items are supplied, however, it must be defined whether they are indeed parts of "equipment or material especially designed or prepared for the processing, use or production of special fissionable material."  

The leading suppliers states parties to the NPT have agreed on guidelines which define those items that "trigger" IAEA safeguards. The so-called Zangger Committee (named after its long-time chairman Professor Claude Zangger of Switzerland) periodically reviews and updates the "trigger" list. Though the Zangger Committee is not a formal body established by the NPT, it is closely linked to the treaty since its members explicitly declare that they act "in the light of [their] commitment[s] under Article III paragraph 2 of the Treaty on the Non-Proliferation of Nuclear Weapons."  

Beside entire facilities, the Zangger list includes, inter alia, special fissionable materials, natural uranium, depleted uranium, and thorium. Heavy water is also on the list while tritium and beryllium do not trigger IAEA safeguards.

A wording in the drafting committee report of the fourth NPT review conference (which is probably a consequence of the revelations in the FRG) has consequences for the Zangger Committee list. It had been agreed that tritium, which is not a special fissionable material but is nevertheless used in nuclear weapons, is to be included in the list. Apart from tritium which is named explicitly, the NPT exporters committee could thus also agree to make other materials

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61 Nevertheless entire facilities are also defined on the Zangger list. See INFCIRC/209, pp. 4, 6, pars. 2.1.1, 2.3.1, 2.4.1.
63 A definition of the NPT term "source and special fissionable material" is contained in article XIX of the IAEA statute.
64 The trigger list is not a formal agreement but only a set of identical letters simultaneously submitted to the Director General of the IAEA.
65 Switzerland took the initiative to establish the committee in order to prevent different interpretations by the major nuclear supplier states. It met for the first time on July 22, 1970. WINKLER, op. cit., p. 233.
67 "Deuterium and any deuterium compound in which the ratio of deuterium to hydrogen exceeds 1:5000 for use in a nuclear reactor (...) in quantities exceeding 200 kg of deuterium atoms for any one recipient country in any period of 12 months." INFCIRC/209, pars. 2.2.1. The annual limit for heavy water is therefore 1000 kg since deuterium accounts for one fifth of the mass of heavy water.
68 The latter materials play a role in the export cases discussed in this study.
69 See chapter 2.1.1, part II of this study.
70 NPT/CONF.V/WG/DC/1/Add.3(A), p. 3. On the possible application of safeguards to tritium see: KALINOWSKI, Martin, Technical Problems with Safeguarding Tritium, Working paper No. 10/1990, Darmstadt; Interdisciplinary
(which are neither "source or special fissionable material" nor "equipment or material especially designed or prepared for the processing, use or production of special fissionable material") subject to safeguards. That would help to close an existing loophole in the NPT, which does not prohibit the unsafeguarded transfer of bomb materials other than those named above.

3.2 Non-NPT: the London Suppliers' Guidelines

The London Suppliers' Guidelines (LSG) are also not a formal treaty but an agreement which does not legally bind the participants. Two main features distinguish the LSG from the Zangger list. The differences stem from the fact that the former stands in no direct relationship to the NPT. First of all, such an agreement could provide for general supply restrictions and could thus go beyond the Zangger guidelines which only define items that trigger IAEA safeguards. Due to article IV of the NPT and the explicit reference to article IV (which calls for assistance in other states parties civilian nuclear programs) in article III.3, it would be problematic, if not impossible, to agree on general supply restrictions in the framework of the NPT. The possible inclusion of non-NPT parties, such as France, is a further feature which is different from the Zangger list.

The initiative for the LSG was partly a consequence of the FRG/Brazil supply contract in 1975 which for the first time provided for the supply of the technology for a complete fuel cycle. The Indian nuclear test of 1974 was a further incentive for nuclear suppliers to come to an agreement on export restrictions. Some participating governments wanted the group to agree on FSS as a condition of supply. The FRG and France rejected the proposal. After the end of the London negotiations, then-chancellor Helmut Schmidt reiterated that the FRG is ready to supply nuclear reactors to every country upon request.

The content of the LSG is broadly similar to that of the Zangger list. Among the additional commodities, materials and technologies which trigger safeguards are heavy water production plants "especially designed or prepared therefor."

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73 Beryllium could thus also be covered by the Zangger list in the future. A Beryllium transfer by a FRG firm is described in chapter 2.3, part II of this study.
74 See chapter 1, part II of this study.
76 "Bonn will weiter Reaktoren liefern", Süddeutsche Zeitung (Munich), May 2, 1977, p. 2.
77 INFCIRC/254, p. 13, para. 2.6.1.
As mentioned above, one of the initial purposes of the consultations, namely an agreement on FSS was not reached. A further objective was an agreement on the non-export of sensitive technology, i.e. enrichment and reprocessing technology. The London Club also failed to meet that goal. The LSG only contain a call on suppliers to "exercise restraint" in the transfer of such technologies but no unequivocal commitment by all participating governments. It should be noted, however, that shortly after the London consultations the governments of France and the FRG declared that they would not export sensitive technology "for the time being". There is thus a de facto moratorium on the supply of sensitive technologies.

The fact that the LSG is not directly linked to the NPT has further implications. The non-NPT state France is not bound by any commitment under the treaty and thus French export policy is not subject to the Zangger Committee guidelines. The LSG's main purpose might have been the application of guidelines to French transfers similar to those adhered to by NPT suppliers. The scope of the provisions contained therein, however, does not go significantly beyond those of the Zangger Committee list.

One major omission of both the Zangger and the London Club list is the clause that all restrictions only apply to the export of material when exceeding a specific quantity to one state within a period of twelve months. The limits can therefore easily be by-passed by sending several small quantities via transit states, or by simply accumulating the received materials over a period of several years.

79 INFCIRC/254, p. 10, para. 7: "Suppliers should exercise restraint in the transfer of sensitive facilities, equipment or technology and weapons-usable materials."
82 See chapter 2.2, part II of this study for an example.
PART II
EXPORTS OF NUCLEAR EQUIPMENT AND MATERIALS

1. The nuclear supply contract with Brazil

The 1975 FRG-Brazil nuclear transfer agreement\(^{83}\) deserves special attention in a review of FRG nuclear export policy for several reasons. First of all, it was a contract of extraordinary dimensions: the agreement provided for the transfer of eight 1,300 Megawatt reactors, a pilot-scale reprocessing plant and a commercial-scale uranium enrichment facility.\(^{84}\) The contract thus included, for the first time, the supply of all facilities needed for a complete fuel cycle.\(^{85}\) The agreement also provided for the training of Brazilian personnel by FRG experts.\(^{86}\) The supply of "sensitive technology", i.e. a reprocessing plant which extracts plutonium and a uranium enrichment plant attracted much criticism when the agreement was concluded.

Furthermore, co-operation with Brazil in the nuclear field had political implications for the entire nuclear export policy of the FRG. First of all, the international debate on the contract was one incentive for the LSG negotiations in 1975. In addition, the revelations of the development of an unsafeguarded autonomous program by Brazil apparently influenced the review of FRG policy on FSS in 1990.\(^{87}\) The agreement also had high symbolic value, being seen to represent the economic success of the FRG.\(^{88}\)

According to a trilateral (Brazil-FRG-IAEA) agreement,\(^{89}\) the supplied facilities are subject to IAEA safeguards. The FRG thus met its formal obligations under the NPT. The FRG, however, did not require FSS, i.e. safeguards on all present and future nuclear facilities in Brazil whether or not supplied by the FRG. The agreement was a matter of contention between the US administration and the FRG government in the 1970s. The decision to extend the contract in 1989 was controversial both in Brazil and in the FRG.\(^{90}\)


85 See e.g. MOLTMANN, Bernhard, "Vergessene Vergangenheit - Brisante Gegenwart - Ungewisse Zukunft: Der deutsch-brasilianische Atomvertrag", in: Lienemann, Wolfgang et al., Alternative Möglichkeiten für die Energiepolitik, Band 2, Heidelberg (Forschungsstätte der Evangelischen Studiengemeinschaft) 1977, p. 270.

86 Some 450 Brazilian experts have been trained in the FRG. "Bis zur Grenze ist alles unverfänglich", Der Spiegel, No. 4/1989, January 23, 1989, p. 24.

87 See also chapter 2.4, part 1 of this study.

88 Cf. SCHRÖDER, Dieter, "Das Risiko der Atomgeschäfte", Süddeutsche Zeitung (Munich), February 8, 1977.

89 INF/CIRC/237.

1.1 Concerns about exports of sensitive technology to Brazil

The critics of the Brazil-FRG nuclear agreement mainly focused on the supply of a uranium enrichment plant and of a plutonium extraction (reprocessing) plant. The export of all facilities agreed upon by the FRG and Brazil would have equipped the latter with technology for the entire nuclear fuel cycle. The supplied enrichment technology, using the jet-nozzle technique is only capable of producing low enriched uranium (LEU) of .85 percent U-235, the weapon-grade material highly-enriched uranium (HEU), cannot be produced with the facility. The Brazilian government initially insisted on the supply of a centrifuge enrichment plant which would have been able to produce HEU. The FRG negotiators made it clear that the centrifuge technology would not be supplied, not because of non-proliferation concerns on the part of the FRG, but because the government of the Netherlands would not have given approval. Dutch endorsement was needed because the centrifuge technology stemmed from the URENCO facility jointly operated by the FRG, the Netherlands and the UK.

The projected reprocessing plant, which was covered by the supply contract, was to extract plutonium, the other special fissionable material used in nuclear explosive devices. This part of the deal was subject to particular criticism from the US administration. The debate, which must be seen in the light of the nuclear test conducted by India only a year before, continued after the signing of the FRG-Brazil agreement. Especially the Carter administration (which came to office in January 1977) pursued the objective of halting all sensitive technology exports.

Non-proliferation concerns did not induce a review of the FRG decision to supply the technologies. The Federal Government repeatedly pointed to the fact that sensitive facilities would be subject to IAEA safeguards for the first time. It was furthermore stressed that safeguards on the supplied commodities adequately met the obligations incurred under the

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91 See e.g. "Bonn verteidigt seine Nuklear-Politik", Frankfurter Allgemeine Zeitung, November 18, 1976.
92 TURNER, Rik / HIBBS, Mark, "Brazil's Nuclear Reorganization Limits Dual Program Development", Nucleonics Week, September 8, 1988, p. 1.
93 BT Drs. 11/7800 (majority), p. 207.
94 Ibid.
95 On the URENCO project see e.g. RADKAU, Aufstieg und Krise ..., op. cit., p. 337-339.
97 The decision to sign the agreement was taken on April 30, 1975, two days before the instruments of ratification of the NPT were deposited in London and Washington. Cf. ibid., p. 191.
98 "Beschränkungen im Nuklear-Export?", op. cit. In January 1977, President Carter sent Vice-President Mondale to Bonn to demonstrate his determination to halt the sensitive exports to Brazil. REDICK, John R., Argentina and Brazil: An Evolving Nuclear Relationship, Occasional paper No. 7, Southampton (Programme for Promoting Nuclear Non-Proliferation) July 1990, p. 7.
99 See e.g. 'Bonn will weiter ...', op. cit.; 'Kein Exportstop für Kernkraftwerke', Handelsblatt, October 20, 1976.
100 "Beschränkungen im Nuklear-Export?", op. cit.
NPT. The criticism from the US was almost exclusively seen as an attempt to hinder the economic success of the FRG nuclear industry.

Following Carter's victory in the US presidential elections in November 1976, the Federal Ministry of Research and Technology (BMFT) and the Federal Ministry of Economics (BMWi) of the FRG called for an early decision on the export licenses anticipating a new US initiative aimed at preventing the export of sensitive technologies. The first export licenses were therefore granted on April 5, 1977.

In an official declaration issued by the Federal Government in June 1977, it was stated that no further exports of sensitive technology would be allowed. Facilities to be supplied under already-existing agreements, however, were explicitly excluded from that decision.

The exports of reprocessing and enrichment facilities received less attention after 1985 when the FRG-Brazil project was significantly curtailed due to cost overruns. It was decided only to complete the two reactors already under construction and the first stage of the jet-nozzle enrichment plant.

1.2 The Brazilian "parallel" program

In 1979, Brazil started a so-called "parallel" or "autonomous" program. As part of that project, a uranium enrichment facility was officially inaugurated on April 8, 1985. In contrast to the technology used by the FRG-supplied plant, the facility constructed within the unsafeguarded program uses the centrifuge process. The facility initially reached an enrichment level of 5 percent, but the level can be enhanced to 20 percent U-235. The material produced is reportedly to be used in a submarine reactor which requires a level of enrichment of that percentage. A

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101 Senior Bonn official quoted in MICHAELS, Heinz, "Querenschüsse aus den USA, Wie die americaniache Konkurrenz den deutschen Reaktorexport zu behindern versucht", Die Zeit, No. 26, June 20, 1975, p. 23.
102 Ibid.
105 "Erklärung der Bundesregierung zur Nuklearexportpolitik", op. cit., p. 613.
106 According to a statement by the main contractor Siemens-KWU of January 1989, Angra II and Angra III were 50 percent and 40 percent complete, respectively. Cited in: BT Drs. 11/7800 (majority), p. 211. Completion would reportedly require another $2.7 billion. They were still five and nine years from coming online. HIBBS, Mark / TURNER, Rik / BAKER, Gary, "World Bank Centre of Debate on Brazil's Angra Project", Nucleonics Week, January 26, 1989, p. 6; TURNER / HIBBS, op. cit., p. 1.
109 TURNER, Rik, "Saner and Alfonsin Inaugurate Brazilian Enrichment Facility", Nucleonics Week, April 14, 1988, p. 6.
110 PNIN Newsletter, No. 6 (July 1989), p. 8. It should be noted that the diversion of fissionable material for non-explosive military purposes is even possible under the NPT safeguards agreement (INFCIRC/153). The FRG/Brazil contract, however, prohibits the use of supplied facilities for "other military purposes". BT Dres. 11/7800 (minority), p. 723.
paper prepared by the Federal Intelligence Service (BND) in 1987 came to the conclusion that enrichment to 70 percent is also technically feasible. According to the same FRG intelligence sources cited by Nucleonics Week, the parallel program also includes the construction of two heavy water reactors and, according to other sources, also a heavy water production plant. The program furthermore includes a small-scale reprocessing plant. The parallel program is thus aimed at acquiring all facilities needed for an entire (unsafeguarded) nuclear fuel cycle.

1.3 The extension of the FRG-Brazil nuclear supply contract

The debate on the extension of the agreement with Brazil, which was at stake in 1989, focused on allegations of the diversion of personnel from the safeguarded program. According to these allegations, some 20 percent of the Brazilian staff trained in the FRG under the agreement were shifted from the civilian to the parallel program. Though the unsafeguarded program uses a different enrichment technology from that of the facility subject to IAEA safeguards, according to sources cited by Nucleonics Week, some knowledge obtained from the jet-nozzle program can also be applied to the centrifuge process. The Federal Government was informed about such know-how transfers by a report prepared by the FRG Foreign Office on October 26, 1987. In first official reactions, the executive assessed the transfer of personnel as "unproblematic" and called respective press reports an "insult" to an FRG trading partner. Later the Federal Government took the allegations more seriously and a joint Brazil-FRG commission was set up to investigate the charges.

Further allegations involved obligations undertaken by both states in the trilateral safeguards agreement with the IAEA. The respective paragraph provides for notification of all transfers to the IAEA. In January 1987, the IAEA informed the Foreign Office that the agency had not been notified on all equipment delivered to the FRG supplied enrichment plant and that no single notification had been received from Brazil. In addition, it had been disclosed that export

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112 PPNN Newsletter, No. 6 (July 1989), p. 8.
113 BT Drs. 11/7800 (majority), p. 221.
114 BT Drs. 11/7800 (minority), p. 726.
117 HIBBS, *Kohl Pressed By ...*, op. cit., p. 5.
118 Ibid.
119 Ibid.
120 INF CIRC/237.
121 HIBBS, Mark, "Kohl Pressed By ...", op. cit., p. 5.
authorities expected the respective firms to inform the IAEA while the firms involved left the notification to the government.\textsuperscript{122}

Despite the obvious transfers of trained personnel from the safeguarded FRG supplied program to the "parallel" program the agreement was eventually not cancelled by the FRG government and thus extended for five more years.\textsuperscript{123}

In October 1990, the Brazilian government officially acknowledged that its predecessors had conducted a program aimed at acquiring nuclear weapons.\textsuperscript{124} The Brazilian statement confirmed allegations put forward by the opposition in the Bundestag during the debate on the extension of the contract with Brazil.\textsuperscript{125} The Minister for Research and Technology was subsequently sent to Brasilia to re-negotiate the agreement.\textsuperscript{126}

When deciding not to cancel the contract in 1989, the Federal Government was reportedly informed about yet another problematic aspect of Brazilian nuclear policy. During the FRG-Brazil co-operation Brazil became an 'emergent supplier'.\textsuperscript{127} In September 1990, it was reported that a secret co-operation agreement on nuclear co-operation with Iraq was signed in 1979.\textsuperscript{128} The FRG government was informed about the nuclear co-operation between the two states by a 1984 BND report.\textsuperscript{129} The Federal Government first denied being informed of the sensitive supplies,\textsuperscript{130} but later admitted that a BND report had revealed this co-operation.\textsuperscript{131} The Federal Government stressed, however, that there was no relationship between the FRG assistance and the Brazil-Iraq co-operation.

1.4 The FRG-Brazil contract and its contribution to nuclear proliferation

Brazil is not party to the NPT. It signed and ratified the Treaty of Tlatelolco but did not waive the requirements for its entry into force. Brazil's growing capability to manufacture nuclear

\begin{itemize}
\item \textsuperscript{123} PPNN Newsletter, No. 9 (Spring 1990), p. 3.
\item \textsuperscript{124} SCHWARZ, Rolf-Dietrich, "Opposition: Bonn half bei Bombenbau", \textit{Frankfurter Rundschau}, October 12, 1990, p. 3; "Deutsche Atomhilfe bestätigt", \textit{Frankfurter Rundschau}, November 2, 1990, p. 5.
\item \textsuperscript{125} In the investigative committee report, (which was drafted before but issued after the Brazilian statement) the majority parties in the Bundestag came to the conclusion that the committee had no reason to believe that the uranium enrichment was used for nuclear weapons. The allegations made by the opposition, which since have been confirmed, were called "malevolent imputations". BT Drs. 11/7830 (majority), p. 227.
\item \textsuperscript{126} "Neuverhandlungen mit Brasilien", \textit{Frankfurter Rundschau}, October 17, 1990, p. 4; "Bonn's Atom-Hilfe bleibt weiter", \textit{Frankfurter Rundschau}, October 19, 1990, p. 4.
\item \textsuperscript{128} "Hilfe für Bagdad Atomtechnik", \textit{Frankfurter Rundschau}, September 4, 1990, p. 2.
\item \textsuperscript{129} LÖLHÖFFEL, Helmut, "Atom-Hilfe für Irak war bekannt", \textit{Frankfurter Rundschau}, September 5, 1990, p. 1.
\item \textsuperscript{130} "Atomhilfe in Bonn unbekannt?", \textit{Frankfurter Rundschau}, September 6, 1990, p. 4.
\item \textsuperscript{131} DEUTSCHER BUNDESTAG, 11. Wahlperiode ..., op. cit., p. 17385.
\end{itemize}
weapons is not in doubt.\textsuperscript{132} The existence of a nuclear weapon program has recently been admitted by the Brazilian government.

The FRG-Brazil co-operation agreement in the nuclear field apparently contributed to this nuclear-weapon capability.\textsuperscript{133} The training of Brazilian personnel in the FRG and in facilities operated under the agreement contributed to the program. In addition, the technology and know-how transfers may have contributed to the nuclear-weapon program of a further threshold state.\textsuperscript{134} Brazil became a supplier state which is bound neither by the Zangger list nor by the LSG. Given Brazil's urged need for convertible currency, nuclear exports by that state without requiring FSS are a growing danger.

The relationship between the former competitors in the race for nuclear weapons in Latin America, Argentina and Brazil, is currently rather stable. But, such a development was not foreseeable when the FRG supply agreement was concluded. The clause in the new Brazilian constitution prohibiting the acquisition of nuclear weapons\textsuperscript{135} does not cover "other nuclear explosive devices" (wording of article II, NPT) and thus permits so-called "peaceful nuclear explosions".\textsuperscript{136} Recent indications that Brazil and Argentina may become parties to the NPT\textsuperscript{137} have to be questioned. More likely is an accession to the Treaty of Tlatelolco.\textsuperscript{138} Problems may rise when an IAEA safeguards agreement is to be negotiated since the Tlatelolco Treaty provides for "peaceful explosions" and the IAEA model safeguards agreements do not. It seems increasingly likely that Argentina and Brazil will set up a regional safeguards agency.\textsuperscript{139}

If Brazil does indeed renounce the nuclear-weapon option through an international legally-binding instrument, the step will not have been induced by FRG policy but by a shift in domestic policies mainly because the military lost power in Brazil.\textsuperscript{140} The FRG policy of "entanglement" had clearly not succeeded.\textsuperscript{141}

\textsuperscript{132} ALBRIGHT, David, "Bomb potential for South America", \textit{Bulletin of the Atomic Scientists}, May 1989, p. 20.

\textsuperscript{133} Cf. ALBRIGHT, "How did Brazil...", op. cit., p. 20.

\textsuperscript{134} For a recent study on the state of the nuclear weapon capability of Iraq see: KALINOWSKI, Martin / LIEBERT, Wolfgang / NEUNRECK, Götz, "Ist der Irak nuclearwaffenfähig?, \textit{Sicherheit und Frieden}, Vol. 8, No. 3/90, pp. 176-183.

\textsuperscript{135} \textit{PPNR Newsbrief}, No. 3 (November 1988), p. 2.

\textsuperscript{136} SPECTOR, Leonard S., \textit{Nuclear Ambitions: The Spread of Nuclear Weapons} 1989-1990, Boulder, San Francisco and Oxford (Westview Press) 1990, p. 250. India's 1974 nuclear explosion was also alleged to serve "peaceful" purposes. The right to conduct nuclear tests for non-military purposes was claimed by Brazil when refusing to accede to the NPT in 1968. MOLTMANN, op. cit., p. 278.

\textsuperscript{137} "Argentina and Brazil may back nuclear checks", \textit{Financial Times}, November 15, 1990, p. 6.

\textsuperscript{138} According to a BMFT statement issued after Riesenhuber's trip to Brazil. \textit{Brasilienreise von Bundesforschungsminister Dr. Heinz Riesenhuber, Pressemitteilung, Bonn (Der Bundesminister für Forschung und Technologie) October 22, 1990, p. 2}, press release.


\textsuperscript{140} Cf. SPECTOR, Leonard S., \textit{Nuclear Ambitions...}, op. cit., p. 243.

\textsuperscript{141} This assessment is shared by a BMWi paper of 1987. Reproduced in: BT Des. 11/7800 (majority), p. 222.
2. Case studies on nuclear exports

2.1 Equipment and tritium transfers to Pakistan

The case which received most of the attention in the context of the Bundestag investigations on nuclear transfers involved Neue Technologien GmbH (NTG)142 and its subsidiary Physikalisch Technische Beratung (PTB). Among other trade activities with nuclear commodities to a number of nuclear threshold states (India, Pakistan, South Africa),143 NTG particularly contributed to the Pakistani nuclear-weapon program. Among other materials and facilities, NTG delivered pure tritium and a plant for storage and purification of tritium to Pakistan.144

2.1.1 The use of tritium and tritium extraction technology for nuclear-weapon programs

NTG supplied at least 8 grams of pure tritium to the Pakistan Atomic Energy Commission (PAEC). Tritium is not a fissionable material like plutonium (Pu) or highly-enriched uranium (HEU), but, given an adequate design, tritium can significantly enhance the explosive power and thus reduce the amount of PU or HEU needed for the desired yield of a fission bomb.145

With the implantation of tritium into the core of the fissionable material smaller and lighter nuclear warheads can be constructed.146 Through the so-called boosting, the yield of a fission bomb can be upgraded by a factor of 2 to 10.147 Most sophisticated warheads contain some four grams of tritium.148 While advanced nuclear weapon states use tritium to manufacture smaller weapons for more limited and more "predictable" use, the intentions of threshold states are different. The implantation of tritium into a nuclear bomb or warhead helps a threshold state with a limited resource of special fissionable material to "save" Pu or HEU. In contrast to beryllium,149 however, tritium cannot reduce the minimum amount necessary for a nuclear explosive device.

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142 The original name was Nukleartechnik GmbH, it was later changed to avoid the term "nuclear" in the letterhead.
143 HIBBS, Mark, "German Investigators to Ask U.S. to Assist Probe of Firms' Exports", Nuclear Week, August 24, 1989, p. 8.
145 Tritium is also used in fusion bomb designs.
147 KALINOWSKI, Nuclear Weapons Uses ..., op. cit., p. 2.
149 See chapter 2.2, part II of this study.
The use of tritium has also a major disadvantage for nuclear-weapon programs. The half-life period of tritium is relatively short. Tritium decays at a rate of 5.5 per cent per year. After one year, the desired boosting effect, when used in nuclear weapons, is reduced by 50 percent. For this reason tritium is usually filled in easily renewable capsules. The tritium is injected into the core of the critical mass only shortly before the explosion.

The PAEC also acquired a plant to store and purify large amounts of tritium gas (also called "tritium handling system") from NTG. The facility is designed to purify tritium gas contaminated with helium-3. For the process employed in this plant, tritium gas is heated and passed through uranium filters that capture the impurities by forming metal hydrides. 98 percent pure gas results from this process. The plant has a reported hold up capacity of 100,000 to 200,000 curies (equal to 10 to 24 grams) of tritium and has the capacity to provide 5,000 to 10,000 curies (equal to .5 to 1.0 gram) per day. As outlined above, tritium cannot be stored over an extended period without being contaminated. The tritium plant delivered by NTG is therefore not only needed for the initial purification of tritium gas. The facility is also indispensable for maintaining tritium with a purity of 98 percent.

In contrast to the large quantities of Pu and HEU used in civilian facilities, the civilian use of tritium does not exceed microgram amounts. Any recipient intending to acquire amounts of tritium exceeding microgram amounts can therefore be suspected of obtaining the material for military purposes.

There are two technical processes for acquiring tritium. Heavy water (deuterium oxide) becomes contaminated with tritium when used as a moderator in natural uranium reactors (heavy water reactor, HWR). Subsequently, the tritium can be extracted from the heavy water with certain technologies. After the revelations on the acquisition of the tritium storage and purification plant from NTG, it was initially assumed that the Pakistani nuclear program used heavy water irradiation to obtain tritium. It seems to be more likely, however, that the Pakistani program uses another technology which is also applied by the advanced nuclear weapon states. In this process, Lithium-6 is bombarded with neutrons, the result of which is a product of tritium and large amounts of helium-3 and helium-4. The technology supplied by NTG cannot purify "dirty" tritium extracted from heavy water but the plant is designed to purify "dirty" tritium gas extracted through the lithium-tritium technology.

151 KOPPE / KOCH, op. cit., p. 122.
152 KALINOWSKI, Nuclear Weapons Uses ..., op. cit., p. 2.
153 HIBBS, Mark, "German Firms Exported Tritium Purification Plant to Pakistan", Nuclear Fuel, February 6, 1989, p. 6.
154 Ibid.
155 HIBBS, "German Firms Exported ", op. cit., p. 6.
2.1.2 The export of tritium technology by Neue Technologien GmbH / Physikalisch Technische Beratung

Co-operation between the executive director of NTG, Ortmayer, and the PAEC started in 1982. Most contracts were conducted by NTG's subsidiaries, Physikalisch-Technische Beratung, and Chemisch-Technische Beratung. All communication was apparently linked via Pakistani diplomatic missions. Chemisch-Technische Beratung was formally run by the wife of Heinrich Weichselgartner, a scientist who played a key role in the transfers. Weichselgartner, a physicist at the Max Planck Institut for Plasma Physics provided scientific advice to NTG and the PAEC prior to and during the installation of the tritium plant. Weichselgartner's contacts to the industry and his reputation as a scientist at a notable research institute were instrumental for a smooth handling of the exports.160

In 1984, PAEC showed an interest in acquiring a plant, capable of extracting tritium from heavy water. Two years later, the PAEC cancelled the order for the DM-30-Mio plant. This may have either been the result of purely financial considerations or stemmed from a more far reaching decision of the PAEC in favour of the lithium-tritium technology (see above). In 1986, NTG delivered the plant described above for storage and purification of tritium for approximately DM 2.5 Mio. Prior to this, NTG had also organized the sale of test quantities of tritium to Pakistan by the West German Gutekunst company. Gutekunst, a manufacturer of luminous paints and therefore a frequent recipient of small amounts of tritium, had acquired the material from the Swiss Radium Chemie AG.164

2.1.3 Involvement of FRG control authorities

When the PAEC indicated interest in acquiring a tritium recovery facility from NTG, Ortmayer informally contacted senior officials in both the Federal Ministry of Economics (BMWi) and the subordinated Federal Office of Economics (BAW), which is in charge of granting export licenses. Before making the formal request for an export license (more precisely: before inquiring whether an export license would be necessary), Ortmayer discussed with senior officials...

156 Ibid.
157 Ibid.
158 Ibid., p. 252; KOPPE / KOCH, op. cit., pp. 110-112; HIBBS, Mark, "Germany May Have Approved Exports Alleged by Prosecutor to be 'Illegal', Nuclear Fuel, January 9, 1989, p. 2.
159 Ibid.
161 Ibid., op. cit., p. 130.
162 Ibid., p. 7.
officials the best way to avoid complications. The NTG manager pointed out that his Pakistani partners would use the facility for environmental protection measures. The Canadian-supplied reactor at Karachi would lose heavy water contaminated with tritium. The heavy water must therefore be purified. The desired facility would thus insure the safety of employees and avoid contamination of the environment with tritium. The contacted senior official in the BMWi had no reservations concerning the export given the fact that, as he took it, the plant would not be used for sensitive programs. Ortmayr also contacted the personal adviser to the Minister of Research and Technology whose ministry (BMFT) is also involved in the licensing procedures. BMFT officials, also, had no reservations since the facility was not on the FRG export list at that time. Only officers in the third ministry involved, the Foreign Office, were alarmed when noting that a plant producing a material relevant for nuclear weapon production was to be exported to a nuclear threshold state. At the outset, the Foreign Office therefore did not endorse the granting of a "no-licence-needed certificate" (Negativbescheinigung). The US State Department repeatedly informed the Foreign Office that the PAEC was attempting to acquire tritium technology and indicated its non-proliferation concerns. On March 13, 1986, the US explicitly pointed to the danger of the potential export of the tritium plant by NTG.

Supporting NTG, the BAW notified the Foreign Office that the real purpose would not be the extraction of tritium but merely the purification of heavy water. Subsequently, the plant was officially designated "heavy water purification facility" (Schwerwasserreinigungsanlage) rather than "tritium recovery facility" (Tritiumextraktionsanlage). In addition, the BMFT stated that the amounts of tritium produced as well as the purity of the extracted tritium were of no strategic relevance. The Foreign Office finally gave up its opposition to the export. In September 1985, the BAW informed NTG that no special export license was needed. The official "no-license-needed certificate" was not issued because the NTG application contained some formal mistakes.

Notwithstanding the placet by the BAW for the export, the facility was not shipped to Pakistan. Instead, the PAEC decided to acquire a plant for the storage and the purification of tritium. The plant which can also produce tritium, but through a different technology and from

166 KOPPE/KOCH, op. cit., p. 121
167 BT Drs. 11/7800 (majority), p. 258-259.
168 In addition, the Foreign Office asked the BMWi to inquire about the extent of NTG co-operation with Pakistani firms. The BMWi, however, did not follow the request. KOPPE/KOCH, op. cit, p. 122.
170 HIBBS, "Germany May Have ...", op. cit., p. 2.
172 KOPPE/KOCH, op. cit., p. 129.
173 BT Drs. 11/7800 (majority), p. 257.
different precursors (see above), reached its destination in 1986 without the respective export license from the FRG authorities. The prosecutor in charge of the NTG case assumed in a testimony before the special Bundestag committee that NTG only applied for the certificate for the tritium extraction plant in order to distract attention from the export of the storage and purification facility.

In contrast, the export of \(0.8\) grams pure tritium (\(0.5\) grams in August 1985 and \(0.3\) grams in March 1986) to test-operate the plant was officially declared to the BAW. But the authorities were foiled about the real recipient of the material. Instead of indicating Pakistan as the recipient state, NTG's partner Gutekunst applied for an export license for a sale to a Hongkong-based company which uses small amounts of tritium to manufacture luminous clock-faces. The export documents were enclosed with empty containers which were shipped to Hongkong while the tritium was sent to Pakistan in containers declared to be empty.

### 2.1.4 Contribution to nuclear proliferation and the responsibility of FRG authorities

The export of a plant for the storage and purification of tritium as well as the export of a test quantity of tritium apparently contributed to the efforts of a non-NPT NNWS to become a *de facto* nuclear-weapon state. The fact that large amounts of tritium are of no use for civilian purposes is not seriously questioned. It can therefore be assumed that the NTG exports significantly enhanced the capability of Pakistan to acquire larger amounts of nuclear weapons or more sophisticated nuclear weapons. FRG authorities were well informed about the activities of the exporters. They intended to grant a "no-license-needed certificate" for a projected export of a facility similar in purpose to the plant actually delivered in secrecy.

### 2.2 Heavy water transfers to India

The Hempel group with several subsidiaries in the FRG and abroad, the most important of which are the Dusseldorf-based Rohstoff Einfuhr and Orda AG in Zug, Switzerland, was involved in various transfers of nuclear materials which apparently contributed to the nuclear weapon capability of several threshold states. Hempel supplied Argentina with uranium and shipped heavy water to Argentina, India, Israel, and Pakistan. Over a period of 15 years, the Hempel firms

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174 [HIBBS, MARK, "Prosecutor Link Tritium Plant to Pakistan Weapon Program", Nuclear Fuel, May 1, 1989, p. 13.](#)
175 [BT Des. 11/7800 (minority), p. 751.](#)
176 [BT Des. 11/800 (majority), p. 255-256. See also KOPPE / KOCH, op. cit., p. 133.](#)
177 Cf. SPECTOR, Nuclear Ambitions ..., op. cit., p. 35.
178 "A civilian use of the tritium gas produced by the plant is not plausible." A German prosecutor who investigated the NTG export quoted in MILHOLLIN, Gary, "German Nuclear Presents for South Asia", International Herald Tribune, June 15, 1990, p. 6.
179 Beside the knowledge about the intended export of a tritium extraction facility, in 1985 and 1987, the Foreign Office and the BMWI received information from the French government about the supply of the fuel element plant to Pakistan. BT Des. 11/7800 (majority), p. 252-253.
may have shipped more than 250 metric tons of heavy water to nuclear threshold states. The following two cases have been chosen for two reasons. First of all, reliable information on these exports is available. Furthermore, in both cases described below the lax attitude of export control authorities was decisive for the smooth handling of the exports.

2.2.1 The use of heavy water for nuclear-weapon programs

In contrast to ordinary water, heavy water contains deuterium, a heavier isotope of hydrogen. It is produced through a chemical exchange between ordinary water and hydrogen sulphide, a process which consumes much energy. Deuterium oxide (D₂O), as it is properly called, "moderates" neutrons passing through it. In nuclear reactors, the resulting lower speed of neutrons is essential to achieve the fission of uranium. As opposed to ordinary water, which can also be used as a moderator, heavy water does not absorb many neutrons. The lower percentage of absorption has the advantage that the reactor fuel, uranium, does not have to be enriched. While heavy water reactors (HWR) can operate with natural uranium, which consists of only 7 percent of U-235 (and 99.3 percent of U-238), light water reactor (LWR) fuel must be enriched to 3 percent of U-235 (LEU). Twenty metric tons of heavy water are enough to operate a HWR for a year.

For a state conducting a nuclear weapon program, the use of heavy water reactors has further advantages. A heavy-water-moderated natural uranium reactor provides the easiest way to acquire fissile material. Plutonium is produced in the core of the uranium while the reactor is operating. The subsequent reprocessing is relatively easy to conduct compared to the technology needed to recover Pu from the spent fuel of a LWR. Another way to weapon-grade fissile material is the enrichment of uranium to a percentage of 90 per cent U-235. The enrichment of uranium to such a high degree, however, still requires a more sophisticated technology and is a more costly way to weapon-grade fissiable material than the acquisition of Pu through recovery from heavy water after its use as a moderator in a HWR. For this reason, all states which have openly demonstrated their nuclear-weapon capabilities by conducting a test explosion, with the

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181 The two following paragraphs are mainly based on MILHOLLIN, Gary, "Heavy Water Cheaters", Foreign Policy, No. 6 (Winter 1987-88), pp. 101.
185 Ibid, p. 5.
exception of China, used Pu for their first explosions. Some nuclear threshold states, including India, still rely exclusively on this technology.

2.2.2 Two of the heavy water transfers by the Hempel group

One of the diversions of heavy water into the black market was arranged in 1983. In May 1988, the Norwegian Foreign Ministry confirmed press reports stating that 15.18 metric tons of heavy water were missing. On 31 August 1983, the FRG firm Rohstoff Einfuhr ordered the material from the Norwegian Norsk Hydro company. The export was permitted by the Norwegian authorities after the Hempel firm provided an International Import Certificate (IC) issued by the BAW on September 8, 1983. The certificate stated that the importer intended to import the respective commodities to the Federal Republic of Germany. On December 1, 1983, the Hempel firm received the material at Oslo airport. A Liberian West African Airline aircraft carried the heavy water to Basel, Switzerland, and not, as originally indicated to Frankfurt/M. Only shortly before take-off, the pilot filed a new flight plan. Rohstoff Einfuhr later claimed that the West German customer, the Jülich Nuclear Research Centre (which actually never ordered the material and which only has a capacity for 11 metric tons of heavy water in its research reactor), cancelled the order, and that the Norwegian supplier was notified about the change of destination. A telex containing such information, however, never reached the Norsk Hydro company. The heavy water was subsequently sold to the Swiss Orda AG, Hempel's Switzerland-based subsidiary.

After the first revelations of the diversions of Norwegian heavy water, it was already assumed that India was the final destination of the material. The allegation was mainly based on a study by Professor Gary Milhollin of Wisconsin University, who revealed that India had either diverted heavy water from safeguarded facilities or had clandestinely imported heavy water from sources that did not require IAEA safeguards. India repeatedly denied these allegations. Indian officials stated that India had not imported any heavy water apart from the USSR supplied material which is subject to IAEA safeguards. According to that statement, further heavy water

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189 KOPPE/KOCH, op. cit., p. 195.
190 BT Dms. 11/7800 (minority), p. 748.
191 KOPPE/KOCH, op. cit., p. 194.
193 BT Dms. 11/7800 (majority), p. 245.
194 BT Dms. 11/7800 (majority), p. 245; KOPPE/KOCH, op. cit., p. 196.
195 BT Dms. 11/7800 (minority), p. 748; MÜLLER, Harald, After the Scandals ..., op. cit., p. 6.
196 SCHUEER, "Wie das Wasser...", op. cit., p. 15.
198 MILHOLLIN, Gary, "Dateline New Delhi: India’s Nuclear Cover-Up", Foreign Policy, No. 64 (Fall 1986), pp. 161-175.
stockpiles were produced domestically. But the first allegations that the heavy water was transported to Bombay via the United Arab Emirates have since been substantiated. The Directorate of Purchase and Storage, a branch of the India Atomic Energy Agency has been named as the recipient of the material.

At Basel airport the airplane loaded additional 6.6 metric tons of heavy water of Soviet origin, which reached its destination in Switzerland by land. The truck of the USSR firm Sowtransawto carrying the commodity crossed FRG territory on its way from Helmstedt (then an FRG/GDR boarder checkpoint) to Basel.

In July 1985, a similar shipment took place, this time involving only Soviet heavy water. The material reached Zurich, Switzerland on 10 July 1985. The shipment of 5,980 kg was split up into six amounts of 990 kilograms and one amount of 40 kilograms. The declared recipient states were Austria, Belgium, Denmark, the FRG, the Netherlands, and Switzerland, the 40 kilogram amount was allegedly to be exported to West Berlin. With such a split up, the exporter circumvented IAEA safeguards which, according to the London Suppliers' Guidelines, apply to any export "exceeding 200 kg of deuterium atoms [equal to 1,000 kilograms of deuterium oxide; E.C.] for any one recipient country in a period of 12 months". The inquired of all listed firms about the receipt of the heavy water. Only the West Berlin based firm Isotron, a further Hempel subsidiary, confirmed the receipt of 40 kilograms of heavy water. Soviet officials denied the involvement of the USSR in uncontrolled shipments of heavy water. According to testimony before the Bundestag investigative committee by a former Hempel employee, however, the Soviet suppliers were informed about the final destination of the material.

2.2.3 Involvement of FRG control authorities

FRG ministries had been informed about the trade activities of the Hempel firms since 1980. The US State Department repeatedly complained about the transfers of sensitive materials.

204 BT Dts. 11/7800 (majority), p. 245.
205 SCHEUER, "Wie das Wasser ...", op. cit., p. 15. The report of the Bundestag committee majority states, in contrast to its otherwise rather legalistic approach to the investigations, that the question whether the commodities reached FRG territory in this case is not worth clarifying. BT Dts. 11/7800 (majority), p. 245.
207 INFCIRC/254, para. 2.2.3. See also chapter 3.2, part I of this study.
208 BT Dts. 11/7800 (majority), p. 246.
issue had also been raised at official bilateral meetings. FRG officials, however, maintained that Hempel's practices were "perfectly legal" without seriously considering consequences for domestic changes in export control guidelines.

In the Norwegian heavy water case, the Federal Government was not only informed about the planned acquisition of sensitive materials, the control authorities were directly responsible for the deception of the Norwegian authorities. The BAW issued the required international import certificate (IC) essential for the heavy water to leave Norway legally. But FRG authorities did not seriously control whether the respective commodities were indeed imported to the FRG. The BAW only made random inquiries concerning the return of the import certificates after they were filed in by the custom police. Only three years later, in October 1986, did the BAW request Rohstoff Einfuhr to submit the custom document in order to prove that the material had indeed been imported. When the letter was returned to BAW with the note "change of address", the BAW did not take further action.

Due to the fact that the export control legislation only applied to activities on FRG territory at that time, most of Hempel's transfers were legal. In addition to lax controls of the correct use of the IC, the failure of the FRG control machinery also became apparent in the case of the second heavy water trade described above. There is evidence that Soviet trucks carrying heavy water repeatedly crossed FRG territory. Apparently, this could occur without the knowledge or at least without the interference of the custom police. FRG authorities frequently stated that interference with Hempel's trade in heavy water was not possible due to the fact that the activities were perfectly legal as long as the relevant commodities did not enter West German territory. In the case of the Soviet heavy water transport to Basel, however, it cannot be denied that unauthorized transfers could have been subject to FRG jurisdiction.

2.2.4 Contribution to nuclear proliferation and the responsibility of FRG authorities

The sale described above was a direct support of a nuclear-weapon program because heavy water can be used to produce weapon-grade fissionable material at relatively low costs. Also in the long-term the export contributed to India's efforts to further develop its nuclear weapon


212 This assessment by Professor Milhollin on the legal consequences of the import certificate is questioned by the FRG executive. The Federal Government holds the view the issuing of an International Import Certificate by the BAW only indicates that the FRG accepts responsibility for the commodities as soon as they are indeed imported. According to this view, responsibility for the export remained with the state of origin as long as the goods have not reached FRG territory. BT Drs. 11/7800 (minority), p. 749.


216 CI. SCHEUER, "Wie das Wasser ...", op. cit., p. 15.
capability. The Indian program urgently needed additional amounts of heavy water for its HWR at the time of the secret supply. If India had been dependent on imports pursuant to LSG guidelines, it might have accepted IAEA safeguards at least on further parts of its fuel cycle. Thus, the lax controls of FRG authorities, partly due to inadequate export control laws, contributed both in the short-term and in the long-term to the nuclear weapon capability of a non-NPT nuclear threshold state.

2.3 Beryllium transfer to India

The West German firm Degussa exported 95 kg Beryllium to India. This material, which can be used to enhance the yield of nuclear weapons, is neither on the Zangger nor on the London Suppliers’ list but is on the FRG nuclear energy list (Kernenergieliste). The export of items on this list requires the approval of the authorities but is not subject to a general prohibition. The specific feature of this case is the fact that Degussa received the material from the original supplier in the US with the proviso that any re-export would be subject to approval by the US government.

2.3.1 The use of Beryllium for nuclear-weapon programs

Beryllium (Be) is used in thermo-nuclear weapon designs, in rocket technology, and for missile guidance systems, and it also has some applications in non-military areas. In nuclear explosives, Be is used as a so-called reflector. It enhances the yield of nuclear explosive devices and can be used to reduce the minimum amount of fissionable material needed for a nuclear weapon. In the Degussa export case, the degree of purity played a significant role. While FRG authorities involved in the export maintained that Be with a purity below 99.5 percent cannot be used in nuclear explosive devices, US officials and further sources cited by Nuclear Fuel later contended this, alleging that material of 98 per cent purity can be of military value if the impurity is oxygen (as it was the case in the Degussa export).

219 Ibid., p. 232.
220 According to Nuclear Fuel, the special fissionable material needed can be reduced by 50 to 73 per cent. KNAPIK, Michael / HIBBS, Mark, “German Firms Beryllium Exports to India May Have Violated U.S. Law”, Nuclear Fuel, (Special Issue), January 30, 1989, p. 2; Arms Control Reporter, South Asia Nuclear-Weapon-Free Zone, Chronology 1985, p. 454.B.305.
221 BT Dts. 11/7800 (majority), p. 231.
2.3.2 The Beryllium export by Degussa

When the Directorate of Purchase and Stores of the India Department of Atomic Energy indicated interest in acquiring Beryllium from Degussa, the FRG firm officially applied for an export license to the BAW; no item was clandestinely exported.

When the activities of Degussa were revealed in early 1989, US officials stated that, had they been informed, no re-export permission would have been granted. The violation of US export regulations by Degussa resulted in an $800,000 fine by the US Department of Commerce. In addition, Degussa accepted on-site inspections on challenge by US officials. The FRG firm probably accepted the fine and the interference with its trade activities because it would otherwise have been excluded from any further supply of Be (and possibly also of other materials) from the US.

4.3.3 Involvement of FRG control authorities

In October 1983, Degussa applied for a license for the export of 50 kg of Beryllium with a purity of 99 per cent and, some weeks later, for the export of 45 kg Be with a purity between 98 and 98.5 per cent. The Government of India, Department of Atomic Energy was indicated as the end-user, the Bhabha Atomic Research Centre (BARC) was named as the location where the material would be used. The application stated that the material would be used for "research and development for vacuum induction smelting, sintering, and casting of metals," the same purpose was indicated on the end use statement provided by the Indian customers.

Upon request by the Foreign Office, the FRG general consulate in Bombay cabled to Bonn that it obtained "en passant" information that the material was intended to be used in the Indian space program. The declaration of the customer was taken as a further sign that the export was no matter of concern. The certificate stated that India neither had a nuclear weapon program nor would it use the ordered Be for any other military purpose. Such a statement is consistent with the declared Indian policy that the 1974 nuclear explosion served solely peaceful purposes.

The Foreign Office had no further reservations after it received the information from its Bombay envoy. The BMFT provided an expert statement to BMWi stating that Be with a purity

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223 "U.S. fines Germany's Degussa $800,000 For Illegal Exports to India, North Korea", Nuclear Fuel, April 2, 1990, pp. 1-4.
224 It should be noted that the US holds almost a monopoly on Be exports for the Western industrial states. KNAIP / HIBBS, "German Firms Beryllium...", op. cit., p. 1.
225 Ibid.
226 Ibid.; BT Drs. 11/7800 (majority), p. 231.
227 BT Drs. 11/7800 (majority), p. 231.
228 Ibid., p. 232.
229 For an elaboration on the Indian stance see e.g. Jain, Girilal, "India", in: Goldblat, Joseph (ed.), Nuclear Non-Proliferation: The Why and the Wherefore, London and Philadelphia (Taylor & Francis, for SIPRI) 1985, pp. 93-94.
below 99.5 percent was not pure enough to be applied in nuclear-weapon programs.\textsuperscript{230} In February 1984, all involved ministries agreed to grant an export license.\textsuperscript{231}

2.3.4 Contribution to nuclear proliferation and the responsibility of FRG authorities

The Degussa Beryllium export might either have contributed to efforts by a \textit{de facto} nuclear-weapon state to acquire the capability for more sophisticated nuclear weapons or the material could enable India to assemble more nuclear weapons with the same amount of special-fissionable material. It can of course hardly be proved that the delivered material was actually used for nuclear explosives.

The Be export was officially licensed since FRG export control authorities did not correctly assess the significance of the material for nuclear-weapon programs.\textsuperscript{232} In the Degussa case, the Foreign Office was not in opposition to the BMWi and the BMFT. The Foreign Office approval of the export solely relied on information received from its Bombay general consulate. In addition, the export reservations by the original supplier should have been known to the ministries granting the export license. But the concerns of the original supplier did not provoke the attention of FRG control authorities.

3. Consequences following the Bundestag investigations on nuclear exports

3.1 Export legislation

The basis for the legal regulation of export restrictions from the FRG can be found in the federal constitution.\textsuperscript{233} Article 26, of the Basic Law (Grundgesetz) reads as follows:

(1) Acts tending to and undertaken with intent to disturb the peaceful relations between nations, especially to prepare for war of aggression, shall be unconstitutional. They shall be made a criminal offence.

(2) Weapons designed for warfare may not be manufactured, transported or marketed except with the permission of the Federal Government. Details shall be regulated by a federal statute.\textsuperscript{234}

The War Weapons Control Act (Kriegswaffenkontrollgesetz, KWKG) of 1961 is the implementing law of this constitutional principle, while the Foreign Trade Act

\textsuperscript{230} Hibbs, Mark, "Some German Officials Puzzled by Okay For Beryllium Export to India", \textit{Nuclear Fuel}, February 20, 1989, p. 10.

\textsuperscript{231} BT Drs. 11/7800 (majority), p. 232.

\textsuperscript{232} Citing an expert statement by the Jülich Nuclear Research Centre, the majority in the Bundestag committee of investigation maintained that it is not confirmed that Be of the delivered purity finds application in nuclear weapons. BT Drs. 11/7800 (majority), p. 232. In addition, the report states that the committee is not aware of India's possession of "nuclear explosive devices or even nuclear weapons". BT Drs. 11/7800 (majority), p. 232-233. Beside the official Indian statements and the wide array of publicly available information on India's nuclear weapon capability, it is all the more surprising that the committee distinguishes between nuclear explosive devices and nuclear weapons.

(Außenwirtschaftsgesetz, AWG) of 1961 was enacted to implement the multilateral COCOM\textsuperscript{235} accord limiting exports of military relevant goods to the USSR and her allies.\textsuperscript{236} After the public debate on the export cases, several federal statutes were amended.

The amended version of the Foreign Trade Act (AWG) entered into force in August 1990.\textsuperscript{237} The amendments of the Atomic Act (Atomgesetz), the Financial Administration Act (Finanzverwaltungsgesetz) and the War Weapons Control Act (KWKG) were enacted in November 1990.\textsuperscript{238} The new legislation mainly provides for an improved exchange of data on firms handling nuclear materials.\textsuperscript{239} The amendment of the AWG and of the KWKG also raised the sentences for violations of the acts. The newly enacted provisions of the KWKG were highly controversial. The AWG and the KWKG are discussed in their former and in their amended versions, followed by an analysis of the debates that preceded the adoption of the new legislation.

3.1.1 War Weapons Control Act

The KWKG, in its original form, only applied to weapons but not to production facilities and only to some extent to components of weapons. Nor did it prohibit indirect assistance in arms production. The prohibition explicitly applied only to those weapons and components that were listed in an annex (Kriegswaffennliste) to the KWKG. Items included on the list are not automatically excluded from export. They are, however, subject to explicit licensing. In cases in which the exporting firm is not sure whether items are covered by the list, a "no-license-needed certificate" (Negativbescheinigung) can be requested from the BAW.\textsuperscript{240} Prior to the changes, nuclear weapons were not mentioned in the main body of the KWKG but only in the annex. The KWKG then only provided for a minimum penalty of one year in prison.

Components of nuclear weapons were only covered by the law as far as they were especially designed or essential for nuclear weapons. The law, in its unamended version, only covered actions on the territory of the FRG. The KWKG could not be applied to most nuclear exports.
that were relevant for nuclear weapon programs\textsuperscript{241} because it neither covered know-how transfers nor exports of components relevant for nuclear weapon programs.\textsuperscript{242}

Some crucial changes were enacted in November 1990 (together with the above-mentioned changes of other acts).\textsuperscript{243} The paragraphs 19 to 21 of the KWKG were amended. In the revised version, the legislation also applies to violations by German citizens acting outside the FRG. Nuclear weapons (as well as chemical and biological weapons) are explicitly named. The maximum sentences for trading with weapons of mass destruction exceed those envisaged for unauthorized trade with other weapons. The new version of the KWKG as enacted in November 1990 provides for a minimum sentence of two years imprisonment for the development and production of, or the trade with nuclear weapons.

It is worth mentioning that nuclear weapons on the one hand and chemical and biological weapons on the other hand are not given equal treatment in the amended version of the KWKG. While the assistance in the development and production of, or the trade with the latter are subject to a general prohibition, this is not the case for nuclear weapons. According to the amended law, assistance is only criminal if one of the following conditions is met:

a) the security of the Federal Republic of Germany is affected,

b) the peaceful relations between nations are disturbed,

c) the foreign relations of the Federal Republic of Germany are significantly threatened.\textsuperscript{244}

The significance of this unequal treatment is underscored by the governments commentary on the draft text. It is stated that such a qualification is needed because chemical and biological weapons are banned (or will soon be banned) by international law. According to the Federal Government, nuclear weapons are not banned by international law and are the "legitimate basis" of the defense strategy of NATO.\textsuperscript{245} This points to a direct link between the FRG's indirect participation in nuclear-weapon control and efforts intended to prevent the further spread of nuclear weapons.\textsuperscript{246}

3.1.2 Foreign Trade Act

The law covers foreign trade activities in general (imports and exports) and does not deal with sensitive goods in particular. The first article defines the principle governing FRG export

\textsuperscript{241} The exception is the NTG/PTB case. Ortmar was also sentenced on the basis of the KWKG. SALZMANN, Bernd, "Ortmayer und Finke müssen hinter Gitter", Frankfurter Rundschau, October 30, 1990, p. 18.

\textsuperscript{242} A similar assessment with a view to chemical weapons can be found in: ZANDERS, Jean Pascal, Chemical Weapons Proliferation, Mechanisms Behind the Inhaussen/Rabia Affair, Vredeseconzak No. 4, Brussels (Free University of Brussels, Centre for Polemology) March 1990, p. 38.

\textsuperscript{243} BGBI. 1990 I, p. 2428.

\textsuperscript{244} Ibid., p. 2430. Translation by E. C.

\textsuperscript{245} "Diese erfolgsqualifizierenden Merkmale (...) rechtfertigen sich aus der besonderen Problematik einer Strafverschrift gegen Atomwaffen, die andern als die bereits gelisteten biologischen Waffen und die vor ihrer Achtung stehenden chemischen Waffen völkerrechtlich nicht verboten sind die legitime Grundlage der Verteidigungsausgabe des Nordatlantischen Bündnisses sind." BT Drs. 11/4609 of May 30, 1989, p. 9.
policy. It declares that foreign trade is "free on principle". Consequenly, prohibitions or restrictions only apply to explicitly-named exceptions to this general rule. This still reflects an attitude which pretends "to avoid a coupling of politics and trade" - an approach that neglects the political impact of the exports of materials that can be used for the production of nuclear weapons.

The basis for export regulations in connection with COCOM or the NPT is article five which states that governmental interference with foreign trade is possible in order to fulfill obligations under international agreements. Article seven enunciates the possibility of enacting restrictions on foreign trade but not the obligation of the executive to do so. Foreign trade can be restricted in certain cases. The requirements for such restrictions are those formulated in the KWKG as amended (see above).

Violations of the AWG provisions were only punished by a maximum of three years, violation by neglect up to one year in prison. A more serious problem is the qualification (which does also apply to the KWKG) that exports of nuclear material are only illegal under certain conditions. It is, for example, very difficult to prove that the foreign interests of the FRG have indeed been significantly damaged. In fact the Federal Government must confirm that this was the case. The executive can thus influence every court decision dealing with nuclear exports, a possibility which runs contrary to the notion of the division of powers.

The amended version provides for sentences between three months and ten years. In addition, it is no longer necessary to prove that the foreign interests of the FRG or the other above-mentioned objectives were "endangered", actions that "are able to endanger" them are also to be penalized.

3.1.3 The controversy over the export legislation amendments

Eighteen days after the New York Times released information on the involvement of German firms in the construction of a chemical weapons plant in Lybia, the Federal Government finally

246 See also chapter 2, Part I of this study.
247 "Der [Außenwirtschaftsverkehr] ist grundsätzlich frei."
249 The fundamental shift which is needed becomes most apparent when comparing FRG trade policy with that of other industrial states. As Broska put it: "In the case of the FRG, the basic principle is that of freedom of economic activity, in the case of the USA it is that of control over events in the world. These are two distinctly different world views." BRZOSKA, Michael, Zur Verbreitung von Massenschreckenwaffen Working papers No. 31, Hamburg (University of Hamburg, Centre for the Study of Wars, Armaments and Development) e.d., p. 20.
250 BGBl. 1990 I, p. 1458.
251 Cf. LOCK, op. cit., p. 75.
252 BGBl. 1990 I, p. 1458.
confirmed the export in a statement to the Bundestag.\textsuperscript{254} The executive promised to act promptly in order to prevent such cases in the future. Among other measures, the Federal Government announced that punishment for assisting biological and chemical weapons construction will be significantly tightened.\textsuperscript{255} The Federal Government did not mention nuclear weapons in the above-cited statement before the Bundestag. Though the NTG case had been disclosed a month before this statement,\textsuperscript{256} the nuclear exports had apparently not yet attracted so much public attention as to induce the Federal Government to mention shortcomings with the control of nuclear exports.

The announced improvements in the legislation relevant to sensitive exports were not as promptly implemented as the statement first made belief. The revision of the War Weapons Control Act (KWKG) had been subject to controversy for a long time, not only between the CDU/CSU-FDP government and the opposition, but also between the executive and its supporting parliamentary parties. The debate mainly focused on two questions: first of all, the penalty for assistance in the construction of nuclear, biological and chemical weapons, and secondly, the punishment for scientific co-operation indirectly useful for the construction of weapons of mass destruction. Only the provision which extends the application of the KWKG to actions of German citizens abroad was not contentious.

After the executive introduced the draft legislation, it was criticised by members of the Bundestag belonging both to (Kohl's) Christian Democratic Union (CDU) and to the Free Democratic Party (FDP) of Foreign Minister Genscher.\textsuperscript{257} The conflict was thus not along party lines but between the executive and members of the coalition caucuses. This is a rather unusual constellation in the FRG and may stem from the fact that the executive was under pressure from the US,\textsuperscript{258} while the members of the Bundestag who criticised the draft legislation were being successfully lobbied by industry officials.\textsuperscript{259} The delay in passing the legislation by the Bundestag majority induced US Senators to appeal directly to the legislators in May 1990.\textsuperscript{260}


\textsuperscript{256} See chapter 2.1, part II of this study.

\textsuperscript{257} HIBBS, Mark, "U.S. Keeping Tabs on German Nuclear Export Control Matters", Nuclear Fuel, February 5, 1990, pp. 9-10.

\textsuperscript{258} Regular meetings between US and FRG officials took place during the controversy. Ibid., p. 9; "U.S.-West German export officials meet", Nuclear Fuel, May 15, 1989.

\textsuperscript{259} HIBBS, Mark, "Bonn Holding Up ...", p. 5

\textsuperscript{260} "US-Senatoren mahnen Bonner Außenwirtschaftsgesetz an", Der Tagesspiegel (Berlin), May 23, 1990, p. 6.
The opponents of the legislation argued that the amendments are unconstitutional and a threat to the competitiveness of the FRG industry.\textsuperscript{261} As stated above, the FRG constitution includes an article prohibiting actions that disturb international peace.\textsuperscript{262} There is, however, no constitutional principle which declares free trade a priority. The legislation was finally approved by the first chamber of the FRG parliament in the version of the opponents of tighter controls in June 1990.\textsuperscript{263}

The Bundestag had introduced two significant changes to the executive’s draft.\textsuperscript{264} First of all, the minimum penalty was again reduced to a prison sentence of one year. This change is significant because sentences up to one year are usually suspended in the FRG.\textsuperscript{265} Thus the change is in fact not a question of the length of the prison term but a question of introducing a prison sentence at all. The proposed change would thus have the effect that violations would only be fined. The draft, as amended by the Bundestag, furthermore provided for a life sentence if a nuclear weapon is used against human beings and if the perpetrator was aware of the intended use when he committed the crime. It can be assumed that such a case can never be proved. While it would be difficult to prove that the provided assistance clearly contributed to the production of the nuclear weapon used, it would be impossible to prove that the perpetrator was aware of the future use of the nuclear weapon. The paragraph, which would not have any implications for cases similar to those disclosed in the past, may have been introduced simply to distract attention from the reduction of the sentence for cases that are much more likely.

A further substantial amendment endorsed by the first chamber of the legislature was the so-called "scientists clause". The Bundestag version defined actions taken in the form of scientific cooperation as negligent.\textsuperscript{266} (For violations by neglect the sentences are much shorter.) Such a provision is problematic since it ignores the significance of the know-how transfers without actually "exporting" blueprints, a practice that becomes increasingly important.\textsuperscript{267}

When the draft, as approved by the Bundestag was submitted to the Bundesrat, the social-democratic-governed Länder held a majority in the second chamber. The Bundesrat draft amendments were basically intended to revise the changes made by the Bundestag and to come

\textsuperscript{261} HIBBS, Mark, "Bonn Holding up Tighter Controls on West German Nuclear Exports, Nuclieonics Week, December 7, 1989, p.5.

\textsuperscript{262} Besides the above-mentioned article 26, the second preamblular paragraph of the basic law is also relevant in this respect: "Animated by the resolve to preserve their national and political unity and to serve the peace of the world as an equal partner in a united Europe". The "Treaty on the Final Settlement with respect to Germany" of September 12, 1990 added a contractual obligation: "The Governments of the Federal Republic of Germany and the German Democratic Republic reaffirm their declarations that only peace will emanate from German soil." (Article 2, first sentence). BGBl. 1990 II, p.1320.

\textsuperscript{263} See also: "Der Bundesrat verabschiedet neue Exportkontrollgesetze gegen Waffenhandel", Frankfurter Allgemeine Zeitung, June 2, 1990; "Bundestag stellt Mitarbeit von ABC-Waffen unter Strafe", Der Tagesspiegel (Berlin) June 2, 1990; SCHUEFER, Thomas, "Lex Rabita' vor dem Bundestag", die tageszeitung (Berlin), June 1, 1990.

\textsuperscript{264} BT Drs. 11/7221 of May 25, 1990.

\textsuperscript{265} HOFFMANN, Wolfgang, "Hehre Adolesc - peinlicher Rückzug", Die Zeit, No. 9, February 23, 1990, p. 22.

\textsuperscript{266} Ibid.
back to the executive's draft, i.e. to drop the "scientists clause" and to increase the sentence for assistance in nuclear weapons production to two years imprisonment. 268

3.2 Staffing and re-organization of domestic control authorities

The authorities directly involved in the control of exports are the Federal Office of Economics (Bundesamt für Wirtschaft, BAW) and the Customs Criminal Institute (Zollkriminalinstitut, ZKI). The former is subordinated to the Ministry of Economics (BMWi), the latter to the Ministry of Finance. 269

3.2.1 Federal Office of Economics

The Federal Office of Economics (BAW) is not a specially-established licensing office. It has tasks in various fields, such as the promotion of trade, the supervision of imports, energy safety measures, etc. The department (Abteilung) which is in charge of sensitive exports (but deals also with other matters) is one out of six departments of the BAW. 270 For all these tasks the BAW has a total staff of 600 employees. 271

Before the revelations on various nuclear transfers, the BAW department dealing with nuclear materials, nuclear facilities and related items consisted of only one specialist and two further employees with no expertise in the field. 272 The average time available for considering applications was 20 to 30 seconds per nuclear exports. 273 The staffing of BAW has been increased up to some 230 employees following the Bundestag revelations. 274 But one fundamental problem remains. The BAW considers itself an institution dedicated to supporting the FRG industry. The control of sensitive exports is only one task among others. 275 It seems to be generally inappropriate to assign both the promotion and the control of exports to the same agency. 276 It

267 ALBRECHT, "Techniktransfer als Problem ...", op. cit., p. 15.
269 On the governmental level the Foreign Office, the Ministry of Research and Technology (BMFT) and the BMWi are involved. MÜLLER, After the Scandals ..., op. cit., p. 12.
270 BUNDESAMT FÜR WIRTSCHAFT, BAW, Ebachborn, 1990, public information brochure, passim.
271 Ibid., p. 23.
272 FRÖHDER, Christoph Maria, Tod für die Welt, Die deutschen Waffenschieber, documentary broadcast by First German Television (ARD) on September 27, 1990 at 8.15 p.m., duplicated transcript provided by Hessischer Rundfunk, p. 12.
273 Ibid., p. 10.
274 HIBBS, "Bonn Holding Up ...", op. cit., p. 5.
275 It is therefore misleading to translate "Bundesamt für Wirtschaft" as "Federal Export Licensing Office", as does MÜLLER, After the Scandals ..., op. cit., p. 35.
276 For an example outside the FRG which supports this assumption see e.g. SMITH, Jeffrey / WEISER, Benjamin, "U.S. Barely Halted Sensitive Iraq Sale", International Herald Tribune, September 14, 1990, p. 3. A similar problem arose from the dual-objectives of IAEA and EURATOM.
seems also that improvements can hardly be effective unless BAW employees adopt a more positive attitude towards co-operation with other authorities, such as the ZKI.\textsuperscript{277}

3.2.2 Customs Criminal Institute

The Customs Criminal Institute (ZKI) is the second most important institution in the control of nuclear exports. While the BAW is in charge of granting or denying licences, the ZKI, together with local custom authorities, is to enforce actual compliance with export regulations. While the BAW is a political agency issuing binding interpretations of the regulations, the ZKI is in charge of physically detecting violations of the export laws.

Prior to 1989, the ZKI had a staff of eleven officers; now it has a staff of fifty.\textsuperscript{278} The additional personnel will mainly co-ordinate a computerized data system which is to be in operation by 1991.\textsuperscript{279} The so-called "Kobra" system (for "Kontrolle bei der Ausfuhr" - control when exporting) is intended to connect data bases of the BAW, the ZKI, boarder checkpoints, the Federal Criminal Office (Bundeskriminalamt, BKA), and FRG intelligence services.\textsuperscript{280}

The success of the newly-installed data base of the ZKI will heavily rely on data from the BAW. But it will be several years before an on-line access to the BAW data base is possible. Until recently, BAW was administered without a computerized data base.\textsuperscript{281} The personnel has yet to be trained, export application forms must be standardized\textsuperscript{282} and the computers have to be fed with millions of data which are currently in a rather disorganized archive.\textsuperscript{283}

\textsuperscript{277} Prior to the parliamentary investigations, the BAW staff had order not to contact the ZKI or other custom agencies. FRÖHDER, op. cit., p. 13.

\textsuperscript{278} ZOLLKRIMINALINSTITUT, Stellungnahme zum Fragenkatalog des Ausschusses für Wirtschaft des Deutschen Bundestages für Öffentliche Anhörung am Montag, dem 23. Oktober 1989, Cologne, October 6, 1989, manuscript prepared for a Bundestag hearing.


\textsuperscript{280} Ibid.

\textsuperscript{281} FRÖHDER, op. cit., p. 10.


\textsuperscript{283} Ibid., p. 11.
CONCLUSIONS

First steps towards a new nuclear non-proliferation policy can be observed in the Federal Republic of Germany. The policy towards the Non-Proliferation Treaty and the policy towards export controls are undergoing first positive changes. These resulted in large parts from the changing international situation and the public awareness on the issue. A more fundamental shift will still be necessary.

1. The nuclear export policy of the Federal Republic of Germany and its implications

The case studies have demonstrated that FRG export legislation did not cover the most important parts of production facilities or materials for nuclear weapons and that the administrative bodies charged with granting export licenses and with physically controlling exports were not interested in or capable of preventing the exports.

Both the Federal Office of Economics (BAW) and the custom authorities were not adequately staffed and equipped to enforce even the lax legislation. In the case of the administration charged with granting export licenses, the BAW, one can assume that additional staffing and re-organization will not significantly alter the non-proliferation record. The BAW sees its main task in assisting the industry and is export oriented. It cannot be supposed that long-term foreign policy objectives such as the prevention or the delay of nuclear proliferation are seriously considered by this agency.

When comparing the export laws in the FRG with those in other states, one has to consider that, in practice, the effectiveness of control mechanisms depends on the quality and quantity of exports from a state. In addition, it seems that an adequate export control system cannot be achieved by solely technical means. The potential political power inherent in an export oriented economy must be acknowledged, i.e. nuclear exports must be under political control. The legalistic approach, maintaining that the executive can only interfere with the trade activities of FRG firms if there are proofs of links to weapon programs that 'can stand up in court' can hardly be an adequate political guideline for an exporting nation.

A fundamental shift in the attitude to foreign trade is required. It must be questioned whether the situation will change significantly as long as free trade has priority over a policy that would take the implications of certain technology exports into consideration.

2. The non-proliferation commitment and the nuclear export policy

The question whether a denial of technology supply can serve the goal of non-proliferation is hotly debated, as much in the nuclear field as in other areas of weapon usable advanced technologies. This investigation adopted the working hypothesis that export restrictions can
significantly delay the spread of nuclear weapons. This approach, as outlined in the first chapter of part one, is justified so long as other measures are also taken into consideration that have to be combined with policies aimed at restricting the access to advanced technologies.

The practice of nuclear exports from the FRG indicates that efforts to prevent the spread of nuclear weapons have not represented a foreign policy priority. The commitment undertaken under the NPT as well as the principle of governmental control over weapons of war as laid down in the basic law of the FRG received significantly less attention than the principle that everything can be exported except in the case of an explicit prohibition, as still stated in the amended version of the Foreign Trade Act. Governmental control and potential restrictions are merely seen as exceptions and not as tools to be used to implement foreign policy objectives.

The export legislation of the FRG has been inadequate, given the long-term risks that are posed by exports of sensitive items. The amendment process (of the Foreign Trade Act and the War Weapons Control Act) indicated that those members of the legislature willing to adopt a more stringent approach had a difficult stance. Even though the initial draft amendment proposed by the executive was finally enacted, loopholes still remain and the relationship between the potential sentences and the constitutional norm of contributing to peace seems not to be adequate.

The priority of exports over other foreign policy goals is also reflected in the FSS policy of the FRG. The Brazilian case study points to the failure of the declared policy of entanglement, and it must be questioned whether this policy has ever really been a significant consideration. It seems that only the obvious existence of a nuclear program in Brazil aimed at acquiring nuclear explosive devices induced the Federal Government to shift its stance on FSS.

It looks as if the international effects of the FRG's nuclear exports have been deliberately neglected, so as not to have to confront the need for improving export controls. It can be assumed that the fact that military power is still seen as the most important factor in international politics helped to distract attention from the long-term impact of sensitive exports on international developments. The FRG's attitude to exports stems from the illusion that interference with exports is political while at the same time neglecting the fact that certain exports have a higher impact on international developments than many other means of foreign policy. Uncontrolled and unrestricted exports are therefore a political factor as much as export restrictions.

The disclosures of the export cases did not provide relevant decision-makers with any additional information. Administration officials either explicitly approved sensitive technology transfers or were at least informed without taking adequate consequences. Only the public coverage of the issue made export controls a matter of concern and pointed to the close inherent link between the transfer of nuclear technology and the spread of nuclear weapons. Both the
criticism at NPT review conferences (concerning FSS) and non-papers by foreign intelligence services (concerning export controls) had alerted the Federal Government to the relationship between the NPT and an adequate export policy. It can therefore be assumed that a policy of non-decision was performed which had to be given up when the involvement of FRG firms in the development of nuclear weapons became an issue of widespread interest.

3. Outlook

This paper undertook to illuminate transfers of nuclear materials and equipment from the FRG to states which are suspected to use these items for nuclear-weapon programs. This trade pattern resulted from a policy which did not devote much attention to nuclear non-proliferation. Important parameters of this policy remain to be elaborated:

- Though research and development for nuclear energy has been heavily subsidised by both Länder and federal governments, the nuclear industry itself has never been as fully under governmental control as it was the case in other states with significant nuclear capabilities. The fact that the civilian nuclear program was never directly linked to a nuclear-weapon program had some negative impact on non-proliferation. Research on that aspect of the FRG nuclear policy may highlight a significant feature that facilitated the neglectful export policy.

- Requirements on the nuclear trade policy of the FRG were imposed by international actors, mainly the US, on the one hand and a domestic lobby pressing for exports on the other. When an attentive public became finally aware of the issue, the domestic public opinion concurred with the complaints of international actors with respect to FRG nuclear non-proliferation policy. The specific impact of international and domestic factors are worth to be analysed in detail.

- The issue of nuclear non-proliferation involves conflicts concerning the foreign policy priorities of the FRG. It had been concluded above that non-proliferation itself did not represent a foreign policy priority. It would, however, be helpful to evaluate the conflict between two significant priorities, i.e. the demand for a close security relationship with the US on the one hand and aggressive foreign trade policy on the other hand. In this context, the increasingly debated change in Germany's role in world politics could alter the FRG foreign policy, including nuclear non-proliferation, though it is too early to predict the direction of the change, i.e. increased autonomy or imposition of sharing responsibility.

But also the questions elaborated in this paper call for further attention. The coming years will show whether the measures taken to implement the announced shift in the nuclear non-proliferation policy of the FRG are adequate. The implementation of the commitment to FSS is
to be observed in the future. What might become of particular concern are potential supplies of items which are not directly used for the nuclear parts of nuclear power plants such as components of generator technology. Such supply would be conceivable in co-operation with a nuclear supplier state not requiring FSS.

The effectiveness of the new export legislation is also to be reviewed in the next years. As outlined in the case studies presented in this paper, the transfers were not only facilitated by lax export legislation but also by the export-oriented attitude of the authorities charged with the control of technology transfers. Given the undiminished priority of unrestricted exports, it can be questioned whether the export policy will indeed be distinct from that of the past. A commitment to tough controls is all the more important in view of the impending creation of a single European market. Efforts will be needed to apply effective controls to all nuclear exports from all member states of the European Communities. Even the modest improvements in FRG exports controls could otherwise easily be circumvented by taking advantage of the lower standards in those member states of the EC without a significant nuclear industry.

The unprecedented attention devoted to the NPT review conference by the Federal Government, the reference to the NPT in the two-plus-four treaty, the adoption of a FSS policy, and the amendments of the legislation relevant for sensitive exports indicate a new attitude to nuclear non-proliferation. Given the fact that the new policy was mainly prompted by public awareness and pressure from abroad, it can be questioned whether it will prevail. It can only be hoped that at a time when the immediate threat of a nuclear war in Central Europe, and thus also in Germany, is increasingly diminishing, an attentive public will not neglect the potential role of an exporting state in preventing - or contributing to - nuclear arms build-ups in other regions of the world.