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Multilateral Nuclear Fuel-Cycle Arrangements

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Multilateral Nuclear Fuel-Cycle Arrangements[1]

Harald Müller

Background

From the beginning of the nuclear age, the multilateralisation of the fuel cycle was seen as a way to harvest the fruits of the peaceful uses of nuclear energy without running the risk of the proliferation of nuclear weapons. Indeed, the first proposal ever to establish rules for „the atom“ at the international level, the Baruch Plan of 1946, was a far-reaching plan for multilateralisng all nuclear activities, from mining to final disposal. The plan failed, significantly, due to its asymmetrical distribution of obligations over time: The Soviet Union was not willing to condone a temporary US nuclear-weapons monopoly, while America could not agree to complete nuclear disarmament before an effective international verification and fuel cycle management system was installed.

Since, numerous studies, groups, and conferences have concerned themselves with this issue. While multilateralisation of the most proliferation-prone peaceful nuclear activities – enrichment, fuel production, reprocessing, interim spent fuel storage, and final disposal of spent fuel – is no panacea for all risks connected to the peaceful uses of nuclear energy, it is one instrument of nonproliferation policy deserving serious attention. All the efforts so far, however, did not result in actually establishing such multilateral arrangements. Many failed on the disagreement between the non-proliferation commitments required for participating in the multilateral arrangements, and the conditions on which assurance of supply would be given. Other reasons for failure were the reluctance of states to relinquish the option for national facilities; this reluctance was based in some cases on concerns about energy security (understood as autarchy), in other cases possibly on the desire to keep a „breakout“ option open in the least objectionable way.

Heightened concern about recent fuel-cycle activities in states where such activities had not yet been established, notably in Iran, have renewed the interest of the international community

[1] The following considerations are purely personal and do in no way reflect the work of the IAEA Expert Group on MNA of which I am a member. However, I have drawn on some language I have proposed for the Group's report.

to look into the possibility of multilateral fuel-cycle arrangements. IAEA Director General Mohammad El Baradei, who is highly interested in the matter, has appointed an international expert group to look into the details and assess the opportunities of multinational fuel-cycle arrangements. President Bush, in his non-proliferation initiative of February 2004, has called for a mandatory stop for new national fuel-cycle facility construction in new states, complemented by assurances of supply by existing suppliers.

Multinational Nuclear Arrangements as an Alternative to Fuel-Cycle Autarchy

Currently, the market in nuclear goods and services appears diversified enough to give comfort as far as assured supply for parties in good standing with their non-proliferation undertakings is concerned. There are two independent European fuel providers, EURODIF and URENCO, one American, and one Russian provider. China and Japan may enter the supply market, as may, in the distant future, Brazil. Capacity planning is more than enough to meet foreseeable demand. And the supply policies of the respective countries that would have to license exports are sufficiently diverse to make improbable a collective wilful embargo against a party in full compliance with its non-proliferation commitments.

On mere economic grounds, hence, there is thus no reason for constructing new, nationally based facilities. However, some countries are concerned about political conditions attached to supply, and there is the experience of „upping the ante“ in terms of supply conditions, and then reneging on valid supply contracts. Much of this experience is related to US supply policies. The US had changed principles rather abruptly in the seventies, when all of a sudden renouncing reprocessing became a condition for new fuel supply, and countries holding nuclear co-operation agreements were forced to re-negotiate existing contracts (only the European Community, due to its collective bargaining power, was capable of resisting this onslaught). Another significant episode concerned the supply for an Indonesian research reactor in the nineties. A European supplier had contracted to provide the charge, but it could not obtain the necessary license from the European Commission. Normally EU licensing is a mere formality, but is legally needed because, nominally, EURATOM is the legal owner of all fuel within Community territory. In this particular case, the energy Commissioner was of Portuguese origin, with a keen interest in the situation in East Timor due to the particular Portuguese responsibility as past colonial power. He (ab)used his authority to put pressure on the Indonesian government to come to terms with the situation on the ground, something

completely unrelated to the nuclear field - after all, Indonesia, even though an authoritarian country at the time, was in good standing with its obligations under the NPT. This episode was repeatedly quoted by members of the non-aligned movement as an example of the abuse of supply policies towards developing countries.

It is also possible that the many voices now heard to make the Additional Protocol a condition for new supply (a demand which, in itself, is quite reasonable) add to these fears and thus refuel thinking in terms of fuel cycle autarchy.

The secured availability of all types of energy, nuclear energy included, rests on assurances of supply of material, equipment and services. Domestic solutions, which are the priority of some states, are not available to others. And in an age of growing interdependence and globalisation, the striving for autarchy is diminishing as a guide to national economic policies. If we consider, for example, the Japanese situation - and Japan is one of the most autarchy-minded players on the nuclear scene - we discover quickly that energy independence is completely unachievable for Japan, as its transport sector will continue to depend on the import of oil. Even if its electricity would be supplied to 100% by nuclear energy, if all domestic heating were based on electrical heat, and if the whole power economy were based on the breeder (making, for an extended period of time, the import of uranium unnecessary), the country's economy would still hinge, as the ones of all other major industrialised countries, on the capacity of the world's most volatile region to supply a sufficient amount of crude oil.

While the dream of autarchy is thus elusive, it is still informing national policies to a degree that must not be underrated. MNAs that offer participation in decision-making, or a reliable arrangement to deal with supply interruptions caused by a regular supplier, may represent an effective alternative to national solutions. How effective this alternative would be in the eyes of those countries at the receiving end, would depend on conditions of the assurances of supply of fuel and/or services that are credible and seen by the potential clients as dependable, reliable and economical.

MNAs could come in two forms: As an international, multilateral fuel-assurance arrangement, or as the creation of private multinational consortia that give their members "drawing rights"

on the product of the company. These alternative models will be discussed in the following two chapters.

International multilateral fuel-assurance arrangements

In an international arrangement for fuel assurance, co-operation between fuel-service companies, governments, and the International Atomic Energy Agency is required. While it is conceivable that companies just agree among each other by contract to jump in when one of them falls out of a supply commitment - after the model of re-insurance of insurance companies - this would hardly be a reliable system without the consent of government to grant the necessary licenses in such emergency cases; in other words, the participating governments must have an agreement among themselves not to prevent emergency supply under such circumstances. For this purpose, however, they would have to rely on the impartial judgement of an actor not bound by national interests on whether the prospective recipient poses unacceptable risks - notably in terms of proliferation - or not. This brings in the IAEA as the arbiter of "good standing". The IAEA may even assume a more extensive role (see below), but its assessing the situation of the recipient is a minimum requirement for all viable fuel-assurance arrangements.

Such arrangements will function only if they create trust in their viability and reliability at both the recipient and the supplier side. Recipients must feel certain that the system will provide secure supply if the primary supplier, for whatever reasons, is not able or willing to transfer the contracted fuel. Suppliers must be confident that when they substitute for the primary supplier, their product will not be subject to abuse in the recipient countries. This trust on either side depends on whether a series of conditions are being met. These conditions will probably include:

- A diversity of suppliers participating in the MNA. It has already be stated that the supply side is diversified and will probably become more so as time goes by. If we compare this situation with, say, the one on the market for wide-body passenger and transport aircraft, another essential part of modern economies, the nuclear fuel sector is at least as competitive. It is essential, on this basis, that all supplying states (and their companies) become participants in the multinational fuel assurance system. But even then, confidence in the arrangement may not be sufficient to persuade reluctant

parties to renounce national fuel-cycle activities as long as present supply policies remain unchanged.

- The most important change concerns a willingness of a sufficient number of suppliers to renounce case-by-case licensing and to grant instead to the MNA generic consent for the transfer of the respective goods and services provided the basic conditions - good standing with regard to the non-proliferation commitments, physical security, export controls and safety (see below) - are met by the recipient. Generic consent means that for recipients participating in the arrangement, the individual case will not be scrutinized by licensing agencies and/or their superiors; if the good standing is determined by an independent and impartial authority (see below), the transfer is being granted automatically on the basis of a generally given, advance license that authorises the transfer of fuel to all faithful members of the arrangement.
- In the case of fuel supply, the second change concerns the availability to such suppliers of significant amounts of fissile material free of "flags" and such of prior consent rights of other parties. “Flags” indicate the origin of the natural uranium. Some natural uranium suppliers insist that, once they transfer the material to a recipient, the recipient accepts some specific constraints beyond NPT-related obligations, such as not to highly enrich or reprocess fuel. It is also conceivable that additional conditions could be attached, such as respecting human rights, not to permit abortions, or to teach creationism rather than evolution theory, to name a few examples that range from the understandable to the absurd, but not to the impossible. Suppliers insisting on “flag” conditions demand that these conditions accompany the material if it is re-exported by the original recipient, in other words, the first order recipient is not in a position to re-transfer the material (e.g. in the form of fresh fuel rods) if the second-order recipient does not accept, and observe, the very same conditions attached to the natural uranium by the first-order supplier. In a multinational fuel assurance arrangement, such flag conditions would create a lot of uncertainty and insecurity, as they could easily change during the lifetime of a reactor (which may extend beyond thirty or even forty years). Flag conditions are thus not viable in a fuel-assurance system as long as they cover more than a tiny amount of the uranium available in this system. If this is granted, “flag swapping” could deal with any problem arising from the flags still existing; “flag swapping” means that fuel that stems physically from a certain supplier who insists on conditions is factually transferred, but the “flag” with its conditions is moved to another physical part of the

inventory with the equivalent amount of fissile material. The original supplier can satisfy himself that "his" material was not given to the despised recipient, but the satisfaction is more virtually than physically justified. This might sound cynical, arcane or alien, but it is habitual practice in the nuclear fuel market. A sufficient number of natural uranium suppliers, however, must thus be willing to give up the cherished right of flag conditions in the first place. Some suppliers may not be willing to waive case-by case licensing because they wish to reserve the right to deny supply for reasons other than non-proliferation, physical security, safety and export controls; such suppliers may participate in an MNA, but if all suppliers show this reticence the system is unlikely to create sufficient confidence among potential clients to renounce the option to construct their own sensitive fuel cycle facilities.

- A sufficient reserve capacity of the respective fuel and services to meet the additional demand in a supply emergency, equivalent to the mandatory national oil reserves held by OECD members under the auspices of the International Energy Program of the International Energy Agency must exist. What can be excluded is the holding of physical inventory reserves of enriched uranium or fuel rods or pellets. Since the design of fuel, including the precise degree of enrichment, is reactor- or reactor-type specific, fuel must be tailored to the facility in question and cannot be held in reserve for all sorts of nuclear reactors. A "fuel bank" thus must be virtual rather than physical, and should consist in service surplus capacity devoted to the assurance system. It is important to keep this condition in mind at a time of overcapacity in enrichment and fuel-production services. If the market becomes tighter, confidence in a fuel-assurance arrangement would decline if production capacity were fully absorbed by regular current contracts. This opens the tricky question of who pays for extra capacity under circumstances where incentives for industry to provide it by itself are lacking. Of course, taxpayers cannot be asked to pay for idle capacity in a slack market (one should not extend bad practices from EU agricultural policy to other sectors!); but on the other hand, industry can hardly be expected to build and maintain surplus capacity if it is deemed unjustified by market conditions. Some type of burden sharing has to be agreed to solve this problem.
- A procedure to determine prices for replacement fuel and services in case of an emergency that is deemed fair and that ensures that these prices not be significantly higher than those that would have been charged by the original supplier. This is a second very tricky issue (as all problems where money is involved). If a certain price

had been agreed in the original contract, but market prices are significantly above this level at the time of the supply interruption, this interruption would work as a sanction against the recipient if there would not be some balancing of the price. On the other hand, the supplying company (and its home state) can hardly be expected to subsidize the recipient in order to compensate him for that loss. While it seems logical at first glance to claim the difference from the original supplier, whose decision not to make good on the contract had created the trouble in the first place, this is not likely to be politically feasible because the motivation not to supply fuel would also motivate this state not to pay money. For the same reason, it is probably unviable to write a compensation rule into the MNA contract, because those parties not willing to renounce prior consent and case-by-case licensing rights would be equally unwilling to promise compensation in the case of a supply interruption. Maybe the solution is a moderate trust fund in which all participating countries would invest some fee, and that would also receive money from the recipient if the market price at the time of emergency supply would be below the original contract, following the way of some of the buffer funds attached to traditional international commodity agreements. It has to be noted, however, that these agreements are not popular everywhere and have come somehow out of fashion in the period of neoliberalism in the international economy.

- A credible, timely, transparent and reliable decision-making mechanism for the release of replacement supply. The mechanism must be credible in that the prospective recipient must have confidence that the participating actors are capable of reaching a decision. It must be timely, as the decision must be taken in a way to ensure that the fuel will be at the plant when it is needed. It must be transparent in that the recipient must know who is involved in decision-making, and what the procedure and conditions for a decision are like. And it must be reliable in that the recipient must be certain that supply will be forthcoming if he has met the respective conditions. In several suggestions, the IAEA has been named the "guarantor" of a fuel assurance system which appears to imply that the IAEA, through its Board of Governors, could act as the decision-making body of a virtual fuel bank that could draw on fuel-fabrication capacity – pledged by existing suppliers to this fuel bank. It is questionable, however, whether those involved in a fuel assurance system would wish non-involved countries to participate in decision making involving their national assets. Probably, they would prefer a consortium that involves those participating actively as suppliers and recipients. Such a group should be large and broad enough to

ensure that the national idiosyncrasies that had persuaded the original supplier to withdraw from its contract would not prevail, but that a more comprehensive and impartial view would obtain. On the other hand, it would also suggest that supply would not go forward if grave concern about the recipient's intentions persists. The latter condition could be ensured by requiring a qualified majority (say, two thirds) of participating countries to assent to a supply decision.

- In order to reach such a decision, a neutral and fair process must be established for determining whether the aggrieved recipient who lost its original supplier is in good standing with its non-proliferation and other essential nuclear commitments. Non-proliferation is naturally the primary concern, as it is this objective that motivates the discussion on MNAs in the first place. The recipient must have a clean record of compliance, must be in full compliance with all its non-proliferation commitments, and should be subject to the verification mode that is recognized as standard. For the foreseeable future that will be comprehensive safeguards plus the Additional Protocol. There are, however, additional considerations that should be satisfied as conditions for a positive supply decision. The recipient should be party to the Convention on the Physical Protection and the respective amendment. It should have implemented UNSC Resolution 1540, and the reactor to be fuelled by the supplied fuel should have a good safety record. It is here where the role of the IAEA is decisive. The Agency is, of course, the authority to determine good standing with the non-proliferation commitments in terms of the safeguards record. As depositary of the Convention on the Physical Protection, it can judge the membership of the recipient state. The membership conditions in the fuel-assurance system may stipulate that participating states agree that the Agency, in case of an emergency supply request by member states, calls on the 1540 Committee to release data on the state's implementation; the Security Council might wish to amend the resolution in order to give general authorization for that purpose. Finally, the Agency might be in a position to quickly collect information on the safety record from its various information systems on the technical safety of nuclear facilities. In other words, while the utility of the IAEA as manager and decision-maker of the fuel-assurance system continues to be a matter of debate, there is no doubt that it is a uniquely well-placed arbiter on whether the recipient is in good standing. If an independent body is charged with running the assurance system, the IAEA would report to it, and the formal decision to supply would then be made by the independent body. The advantage of this latter

arrangement would be not to have the IAEA in the line of fire if an established supplier had decided not to deliver fuel to a certain recipient, but the emergency mechanism would factually neutralise this sanction. The disadvantage would be the need for a new standing bureaucracy. If, however, one would establish a formally independent body representing the consortium, but co-locate it with the Agency, this new body could make use of (and pay for) administrative services by the IAEA, making the whole arrangement more economical.

Multilateral Companies

The alternative option would be the creation of multinational companies in which countries fulfilling certain conditions - equivalent to the emergency supply conditions discussed above - would be free to join. This would be a two-layer structure, with a private law contract setting up the legal and economic terms for the consortium, and an intergovernmental framework treaty setting up the political terms under which the consortium is permitted to operate. Presently, there exist two models how such consortia could be structured, both located in Europe.

In the enrichment company EURODIF, Italy, Belgium and Spain participate together with France, the host country of the enrichment plant. Iran has a share in a company with majority French ownership that also has shares in Eurodif. France is the only technology holder and controls completely the management of the company and its facilities. The non-French partners, by their investment, have acquired drawing rights on the output of the factory (that is, on enrichment services), without sharing in the technology; this does not apply to Iran because its share is only indirect (this was the way to solve the problem that after the expulsion of the Shah - who did indeed own drawing rights - the consortium partners would not grant the Revolutionary government in Iran the right to own even low enriched uranium).

EURODIF is a good model for integrating „new“ countries, which do not presently dispose of sensitive fuel cycle activities, but have an interest in supply, into multilateral arrangements without a serious proliferation risk. For such countries, the model offers a perfect opportunity to demonstrate their impeccable non-proliferation credentials while securing for their reactors a reliable and economical source of fuel supply; in addition, as shareholders in a profit-

making company they will also earn profits (or taxes from their shareholding national companies if the shares are held privately, not publicly).

However, there may be reasons for countries not to prefer this way of assuring fuel for themselves. First of all, the Iranian example may be deterring. The Shah had bought himself into EURODIF precisely to secure a long-term source for his extremely ambitious civilian nuclear program - when the German Siemens company contracted for the Bushir I and Bushir II nuclear power plants, the option of up to eight reactors was considered. The pressure on Iran to concede a change in contract terms after the revolution must be disquieting for people responsible for the nuclear power and electricity sector who, as professionals, may well survive a change in the governmental system. Their duty is to see to it that the country's electricity supply is running. If a shareholder position is not good enough to survive a change in government, this appears not to be a long-term option for a power plant whose life-time might run somewhere between thirty and fifty years. For that reason, the least suspect people - the a-political officials responsible for the civilian nuclear sector - might be averse to the more passive option contained in the EURODIF model, at least in countries where a change of the governmental system cannot be excluded (which includes quite a few Third World countries).

A second, politico-economical interest that would obviate the EURODIF option is the desire to harness the fruits of technological progress and skill. To be excluded from technology ownership and development, then, makes a mere shareholding position unattractive. The same applies if there is an interest in exporting fuel services later on as part of the national trade posture.

Closest to this particular motivations are considerations regarding status and prestige. Nuclear power is still enveloped in an aura of progressiveness, even though it has long ceased to be the "cutting edge" of industrial development. Nevertheless, it is observable in countries like Iran and Brazil that this aspect plays a considerable role.

There are, in other words, motivations apart from the interest in a nuclear explosive that can drive countries to dislike the EURODIF model (there is an additional military motivation that should be mentioned, the interest in nuclear power-driven naval vessels; it is unlikely that countries keen to pursue this option (one reportedly still endorsed by the Brazilian navy) would wish to be dependent on foreign suppliers for highly valued national security assets.)

For these countries, the alternative consortium model, URENCO, may provide more attractions. URENCO is a tripartite British/Dutch/German company in which all partners share equal rights. URENCO disposes of a joint management and a division of labour as far as the various activities connected to research, development and construction of centrifuge enrichment facilities are concerned, whereby Britain is responsible for plant design, the Dutch partner deals with for centrifuge production, and the Germans conduct centrifuge R&D. This arrangement is a consequence of considerations following the shocking experiences with Dr. A. Q. Khan, the "father of the Pakistani bomb", who as a young scientist worked at the Almelo centrifuge plant in the Netherlands, stole the blueprints and lists of suppliers and used this know-how to develop Pakistan's military nuclear program, the centre of which is a centrifuge enrichment facility. The idea was that by agreeing on a division of labour, it would be impossible for employees to grasp the full range of necessary technologies. As a side-effect, breaking out of the consortium will become more costly for each of its members. This mitigates, but does not eliminate, the fact that all participants are technology-holders.

In addition, each of them has a fully operational commercial enrichment plant on its territory. Configured to produce low-enriched uranium, they could be reconfigured to reach higher degrees of enrichment. However, this could not be done without the partners' immediately acquiring knowledge, with the possibility of them taking countermeasures. Cheating, breaking commitments or breaking out is thus costly, and the sunk investment is certainly an incentive to stay on the agreed course. It is also noteworthy that joint management means a shared responsibility for all exports. The German plant, for example, could not transfer its product to a foreign recipient without British and Dutch consent.

The consortium has a dual command system, with a company management committee deciding on commercial issues such as new investment, output or price, while a governmental committee decides on policy issues such as exports or technology transfers. Change in the terms of the inter-company relationship must also be agreed to by the governmental committee.

URENCO, by accepting the sharing of technology and admitting plants in all participating states, is rather a model for countries that are already technology-holders to get together for

confidence-building and mutual supervision, or for countries that for economic or status reasons are not ready to confine themselves to the more limited role of mere shareholder.

The front end of the fuel cycle has been intensely discussed here, because it is the more contested subject at the moment, and because enrichment and fuel services are the indispensable part of a light water civilian nuclear program. It should be noted, however, that MNAs are also conceivable at the back end, including interim storage, reprocessing, MOX fuel production, and long-term storage facilities. In fact, the Russian consideration to offer storage services is one of the most promising MNA options presently under discussion.

Reprocessing and MOX production are, of course, contested activities. Some observers see in the recycling of weapons-capable plutonium an additional and avoidable proliferation risk and hence opt for a once-through fuel cycle with long-term storage at the back end. Others contend that the proliferation risk of spent fuel rises over time as the protective value of highly radioactive fission products diminishes over time with their decay.

MNA Politics: A Look At the 2005 NPT Review Conference

The idea of MNA has not been greeted everywhere with unambiguous enthusiasm. States keen to preserve what they regard as autarchy, such as Japan, are not willing to compromise on their plans for a completely closed national fuel cycle. Others, such as Brazil want their construction projects to be “grandfathered” before the door is closed. President Bush’s February 2004 suggestion to deny access to all those not currently holding sensitive technology in exchange for a fuel-supply guarantee has contributed much to create distrust and opposition against the entire MNA conception.

This resistance was clearly tangible at the NPT Review Conference in 2005. It showed on two issues, a moratorium on new sensitive facilities, as proposed by the UN Secretary General’s Advisory Board on Disarmament Matters, the High Level Panel on Threats, Challenges, and Change, and IAEA Director General El Baradei; and on the report by the IAEA MNA expert group.

The moratorium was supported by no one with the exception of Norway. The reluctance to endorse the proposal was not only widespread among the non-aligned countries. It encompassed quite a few industrialised countries, and the background of this position is commercial interest. URENCO is in the course of transferring centrifuge technology to both the United States and to France. Neither URENCO's host countries nor the technology recipients are thus eager to endorse a moratorium on the construction of new facilities. Brazil and Japan have plants under construction, short of commissioning. A moratorium is thus running counter to their interests as well. As a consequence, the moratorium idea has little chance of being realised.

On MNAs, there were friendly voices from Western industrialised countries on the Expert Group report and en endorsement for further study of the issue. Some parties such as Argentina, however, emphasized that the priority should be for the use of existing instruments such as the Additional Protocol and the compliance mechanism embedded in the Treaty, the IAEA Statute, and the United Nations Security Council rather than inventing new ones while the old ones are not adequately used. Japan made it clear that, if the issue should be further studied at all (which implied that probably it should not), the non-proliferation value should be clearly proven (which implied MNAs probably had none). The non-aligned group asked for fuel assurances as an additional element in the whole system but without any reciprocal renunciation of national sensitive facilities by those who join such a fuel-assurance system. The non-aligned emphasized the unlimited application of Art. IV and were not ready to devote particular attention or concern to the risks which may emerge from a growing number of enrichment and/or reprocessing plants worldwide, particularly in instable region. The hardliner policy by the United States had engendered the effect that developing countries were so distrustful of northern intentions that they would not even check new proposals for their potential utility - clearly a counterproductive result that augurs badly for the political viability of the MNA concept.

Voluntary or mandatory? Conditions for establishing MNAs

The present legal status does not oblige countries to participate in MNAs. Art. IV permits the unrestricted use of nuclear energy, as long as it is confined to strictly civilian purposes, and the negotiation history of the Treaty establishes that this meant sensitive nuclear facilities if

the country in question had designed its civilian nuclear planning along the lines of a completely closed fuel cycle.

The political environment just described makes it unlikely that such a norm can be established any time soon: distrust and the ensuing opposition are too strong. If MNAs are to be established, hence, this will more probably rest on the voluntary decision by interested governments weighing the incentives and disincentives of joining such an endeavour.

A voluntary MNA on fuel assurances would probably require its members to renounce for the duration of the respective supply contract the construction of a national enrichment facility, including pilot plants. The difficult task would be to define the demarcation line between legitimate and permitted research, and prohibited activities concerning development and construction. Likewise, participating in a consortium of the EURODIF or URENCO model would require the renunciation of strictly nationally controlled plans. It would supposedly also exclude national replicas of the shared technology for an extended grace period after withdrawal from the consortium, say, 20 years, the time-span occasionally used in previous nuclear technology transfer contracts such as the German-Brazilian deal in the seventies.

MNAs would have to deal with the double breakout problem: national breakout from the MNA with the intent to establish national facilities, and breakout by a MNA member from the NPT while resting a member in the consortium. The first option has just been dealt with. The second option should be legally excluded. This would mean, however, that non-NPT countries could not legitimately become MNA members even though they hold the respective technologies in their military, and partially also in their civilian, fuel cycles. Other concepts, including that of Mohammed El Baradei, conceived of the three non-NPT nuclear powers as potential MNA members as a way to draw them closer to the non-proliferation regimes. This move, however, would require nuclear suppliers to drop the full-scope safeguards condition, which obliges them not to transfer new nuclear goods, materials or technology to countries where all nuclear activities are not covered by IAEA safeguards. This condition, however, appears on the retreat anyway after the US offer to India to co-operate in the peaceful uses of nuclear energy.

Even if economic incentives outweigh disincentives, it is not implausible that in the current, tense climate among NPT parties, the successful negotiation of a voluntary MNA would

depend on significant steps by the nuclear weapon states to implement article VI. The reason is the perception by non-nuclear weapon states that an MNA intrudes into their Art. IV rights, and this should not be permitted without a tangible quid pro quo.

This consideration applies all the more if one would attempt to create a new legally binding international norm that would prohibit sensitive fuel-cycle activities outside of MNA. This would indeed be a material change in Art. IV of the NPT and amount to an amendment; it could be brought into force, however, not by the cumbersome amendment procedure of the NPT, but by a new, superseding international treaty, such as the CTBT; if it would enter into force, it would supersede Art. V of the NPT that provides principally for "peaceful nuclear explosions".

Such a new norm will certainly not be realised as a discriminatory one: it will have to apply universally to nuclear-weapon states, non-nuclear-weapon states, and non-NPT countries. Since constraining the rights from Art. IV would fundamentally shift the "bargain" embedded in the Treaty, non-nuclear-weapon states would rightfully demand a tangible record of implementation of Art. VI. The most obvious step is the Fissile Material Cut-off. It prohibits all states enriching uranium or reprocessing plutonium for explosive purposes. Consequently, it puts nuclear-weapon states, non-nuclear-weapon states, and non-NPT states on the same level playing field as far as fuel-cycle activities are concerned - provided it is adequately and equally verified. It is also not unlikely that non-nuclear-weapon states would request additional disarmament steps, notably a revival of the "Thirteen Steps" agreed to in the year 2000.

Summary: MNAs - Pros and Cons

Notwithstanding the fact that the present political climate and constellation is not overly conducive to realising the MNA concept, it continues to be worth exploring and studying. The pros and cons of MNAs in a non-proliferation perspective can be listed as follows:

- Non-proliferation advantages:
    - MNA, by sharing management and control, adds a layer to transparency on the nuclear activities of participating countries in the most sensitive parts of fuel cycle technology. It goes without saying that this is only of additional value if

the participating countries are covered by the Additional Protocol that would make it very difficult for them to engage in a clandestine parallel program.

- The mutual insight in these activities is likely to create more trust among the participants. This could be particularly welcome in those regions where distrust is high and instability roams, such as East Asia and the Middle East. However, it remains questionable whether the political conditions for such far-reaching co-operation can met in these hot spots. It is not by incident that the two successful MNA models are in Europe, a region where integration has progressed far and the notion of a war against each other has completely dropped from the agenda of the regional powers.
- Where MNAs lead to a limit on the spread of national facilities, not only state proliferation dangers are curbed, but non-state actors gain less points of access to sensitive material; there is a value added in terms of sub-state proliferation.
- When the EURODIF model is chosen, or there is an MNA fuel-assurance arrangement in exchange for renouncing national facilities, the spread of technology is also halted.

- Non-proliferation shortcomings
  - When technology is shared, it may spread more quickly and farther due to MNAs than would otherwise be the case. This applies, in particular, for the URENCO model if countries not presently technology holders are admitted by their partners to share in the technology.
  - A plutonium-recycling MNA may lead to a civilian utilisation of plutonium, and thus to the opportunity of access to weapons-capable (if not weapons-grade) fissile material to a wider range of states, and to more points of access of non-state actors, than would otherwise be the case.
  - Technology sharing models are a non-proliferation gain only if precautions are taken to prevent, and quickly discover and sanction, clandestine national breakouts, and have appropriate procedures in place for open breakout.
  - The participation of non-NPT parties might be welcome to some, but bears the risk that basic principles of the Treaty might be compromised, or that faithful non-nuclear parties to the NPT develop an even stronger feeling of alienation.

In summary, one should realise that an MNA might be a reasonably useful complement to the present regime, but neither a panacea nor a substitute. Precaution must be taken not to use it as a placebo for papering over regime shortcomings, notably in terms of compliance and enforcement policy. For one thing is sure, and this point has been driven home aptly by Argentina: Without the proper use of existing compliance and enforcement procedures, the regime is compromised anyway, with or without MNA.

List of published studies and papers

All papers and studies are available as pdf-files at the Commission's website: www.wmdcommission.org

No 1 "Review of Recent Literature on WMD Arms Control, Disarmament and Non-Proliferation" by Stockholm International Peace Research Institute, May 2004

No 2 "Improvised Nuclear Devices and Nuclear Terrorism" by Charles D. Ferguson and William C. Potter, June 2004

No 3 "The Nuclear Landscape in 2004: Past Present and Future" by John Simpson, June 2004

No 4 "Reviving the Non-Proliferation Regime" by Jonathan Dean, June 2004

No 5 "Article IV of the NPT: Background, Problems, Some Prospects" by Lawrence Scheinman, June 2004

No 6 "Nuclear-Weapon-Free Zones: Still a Useful Disarmament and Non-Proliferation Tool?" by Scott Parrish and Jean du Preez, June 2004

No 7 "Making the Non-Proliferation Regime Universal" by Sverre Lodgaard, June 2004

No 8 "Practical Measures to Reduce the Risks Presented by Non-Strategic Nuclear Weapons" by William C. Potter and Nikolai Sokov, June 2004

No 9 "The Future of a Treaty Banning Fissile Material for Weapons Purposes: Is It Still Relevant?" by Jean du Preez, June 2004

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No 20 "WMD Verification and Compliance: Challenges and Responses" submitted by Foreign Affairs Canada, October 2004

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