

MNA(核燃料サイクルへのマルチラテラル・アプローチ) 国際専門家グループ報告書

1. 背景

地域の軍拡競争、非核兵器国による保障措置協定の違反、輸出管理体制の不備、核拡散の地下ネットワークの顕在化、テロリストによる核物質等の取得への増大する危険性等、不拡散及び安全保障上の懸念に取り組む国際協力がますます重要性を増していることに対応して、エルバラダイ国際原子力機関(IAEA)事務局長は、2004年6月のIAEA理事会において、民生用核燃料サイクルに対して実現可能なマルチラテラル・アプローチ(以下、MNA¹)を検討するために、個人の資格で参加する国際専門家グループを指名した。同グループは、2004年8月から2005年2月まで4回にわたり会合を行い、2005年2月22日に報告書を公表した。(報告書の Executive Summary 及び参加者リストを別添²)

2. マンデート

同事務局長より国際専門家グループに与えられたマンデートは次の3点。

- (1) 核燃料サイクルのフロント・エンド及びバック・エンドに対するマルチラテラル・アプローチに関する問題及び選択肢の分析の特定及び提示。
- (2) 核燃料サイクルのフロント・エンド及びバック・エンドに対するマルチラテラルな取り決めにおける協力への政策、法、安全保障、経済、制度及び技術的なインセンティブ及びディスインセンティブについての概観の提示。
- (3) 本グループに関連して、核燃料サイクルに対するマルチラテラルな取り決めについて歴史的及び現在の経験に関する概観と分析の提示。

3. オプションの概観

拡散リスクの観点から最も機微性の高い核燃料サイクルの部分であるウラン濃縮、再処理、使用済み燃料の処分、及び使用済み燃料の貯蔵の4段階について、以下の各オプションの長所・短所を検討した。

¹ 報告書の正式タイトル:「核燃料サイクルへのマルチラテラル・アプローチ(Multilateral approaches to the nuclear fuel cycle)」。本報告書の本文では、右について、Multilateral Nuclear Approaches (MNA)との略称を用いている。なお、本報告書によれば、multinational(複数国の参加)、regional(近隣国からの参加)及びinternational(複数国及び/又はIAEAのような国際機関の参加)を包含する最も広く柔軟な概念を示す multilateral(単に複数の主体の参加を意味する)の用語を用いることとしている。

報告書全文は、IAEAホームページにて一般公開されている。

(<http://www.iaea.org/Publications/Documents/Infcircs/2005/infcirc640.pdf>)

² 同グループは、当初23名から構成されたが、第3回会合より、イラン、カザフスタン及びスウェーデンからの専門家が新たに参加し、26名となった。

タイプ1: 施設の所有権を伴わないサービスの保証

- a) 供給国による追加的な供給保証
- b) 政府間の国際的コンソーシアによる保証の拡大
- c) IAEA関連の取り決めによる拡大された保証の提供

タイプ2: 既存の国有施設の多国間施設への転換

タイプ3: 新規共同施設の建設

4. 主要な結論

国際専門家グループは、核燃料サイクル及び技術移転に対する全般的な管理を強化するための措置をとるよう勧告する。それらの措置には、追加議定書の普遍化や輸出管理のより厳格な実施及び普遍的参加も含まれる。

議論のモメンタムを維持するために、国際専門家グループは、IAEA加盟国、IAEA事務局、原子力産業及びその他の原子力関連組織が、MNA一般及び以下に提案する5つのアプローチに注目することを勧告する。

5つのアプローチの提案

国際的な供給保証を確保しつつ、民生用核燃料サイクルに関する不拡散上の保証を増加させる目的は、MNAを徐々に導入することによって達成することができるかも知れない。

- (1) **既存の商業的市場メカニズムの強化**。これは、ケースバイケースで、長期契約や政府の支持を背景とした透明性のある供給国の取り決めを通じてなされる。例としては、商業的燃料銀行、燃料のリース、(使用済み)燃料の引き取り、及び使用済み燃料の貯蔵・処分に関する商業的オファー。
- (2) **IAEAの参加による国際的な供給保証の発展及び実施**。例えば、IAEAが燃料銀行を運営する等、**IAEAがサービス供給の保証者**として役割を果たすといった様々なモデルを検討すべき。
- (3) **既存の施設のMNAへの任意の転換の促進**。NPT非核兵器国、核兵器国、及びNPT非締約国の参加を得て、同措置を信頼醸成措置として追求する。
- (4) 任意の合意及び契約を通じて、フロント・エンド及びバック・エンドの原子力施設の共同所有、引き出し権、又は共同管理を基礎とする**新規施設への多国間及び地域的なMNAの創設**。統合された原子力発電パークもこの目的に資するであろう。
- (5) 原子力エネルギーが世界中に更に拡大するシナリオにおいては、**より強力な多国間取り決め(地域又は大陸毎に)、並びに、IAEA及び国際社会を関与させるより幅広い協力を伴った核燃料サイクルの開発**が必要となるかも知れない。

以上

Multilateral Nuclear Approaches (MNAs)



Executive Summary

22 February 2005

1. The global nuclear non-proliferation regime has been successful in limiting, albeit not entirely preventing, the further spread of nuclear weapons. The vast majority of States have legally pledged to forego the manufacture and acquisition of nuclear weapons and have abided by that commitment. Nonetheless, the past few years have been a tumultuous and difficult period.
2. The decades long nuclear non-proliferation effort is under threat: from regional arms races; from actions by non-nuclear weapon States (NNWS) that have been found to be in fundamental breach of, or in non-compliance with their safeguards agreement, and which have not taken full corrective measures; from the incomplete manner in which export controls required by the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) have been applied; from burgeoning and alarmingly well-organised nuclear supply networks; and from the increasing risk of acquisition of nuclear or other radioactive materials by terrorist and other non-State entities.
3. A different significant factor is that the civilian nuclear industry appears to be poised for worldwide expansion. Rapidly growing global demand for electricity, the uncertainty of supply and price of natural gas, soaring prices for oil, concerns about air pollution and the immense challenge of lowering greenhouse gas emissions, are all forcing a fresh look at nuclear power. As the technical and organisational foundations of nuclear safety improve, there is increasing confidence in the safety of nuclear power plants. In light of existing, new and reawakened interest in many regions of the world, the prospect of new nuclear power stations on a large scale is therefore real. A greater number of States will consider developing their own fuel cycle facilities and nuclear know-how, and will seek assurances of supply in materials, services and technologies.
4. In response to the growing emphasis being placed on international cooperation to cope with non-proliferation and security concerns, the Director General of the International Atomic Energy Agency (IAEA), Mohamed ElBaradei, appointed in June 2004

an international group of experts (participating in their personal capacity) to consider possible multilateral approaches to the civilian nuclear fuel cycle.

5. The mandate of the Expert Group was three-fold:

- To identify and provide an analysis of issues and options relevant to multilateral approaches to the front and back ends of the nuclear fuel cycle;
- To provide an overview of the policy, legal, security, economic, institutional and technological incentives and disincentives for cooperation in multilateral arrangements for the front and back ends of the nuclear fuel cycle; and
- To provide a brief review of the historical and current experiences and analyses relating to multilateral fuel cycle arrangements relevant to the work of the expert group.

6. Two primary deciding factors dominate all assessments of multilateral nuclear approaches, namely "**Assurance of non-proliferation**" and "**Assurance of supply and services**". Both are recognised overall objectives for governments and for the NPT community. In practice, each of these two objectives can seldom be achieved fully on its own. History has shown that it is even more difficult to find an optimum arrangement that will satisfy both objectives at the same time. As a matter of fact, multilateral approaches could be a way to satisfy both objectives.

7. The non-proliferation value of a multilateral arrangement is measured by the various proliferation risks associated with a nuclear facility, whether national or multilateral. These risks include the diversion of materials from an MNA (reduced through the presence of a multinational team), the theft of fissile materials, the diffusion of proscribed or sensitive technologies from MNAs to unauthorised entities, the development of clandestine parallel programmes and the breakout scenario. The latter refers to the case of the host country "breaking out", for example, by expelling multinational staff, withdrawing from the NPT (and thereby terminating its safeguards agreement), and operating the multilateral facility without international control.

8. The "Assurance of supply" value of a multilateral arrangement is measured by the associated incentives, such as the guarantees provided by suppliers, governments and international organisations; the economic benefits that would be gained by countries participating in multilateral arrangements, and the better political and public acceptance for such nuclear projects. One of the most critical steps is to devise effective mechanisms for assurances of supply of material and services, which are commercially competitive, free of monopolies and free of political constraints. Effective assurances of supply would have to include back-up sources of supply in the event that an MNA supplier is unable to provide the required material or services.

Overview of options

9. Whether for uranium enrichment, spent fuel reprocessing, or spent fuel disposal and storage, **multilateral options** span the entire field between existing market

mechanisms and a complete co-ownership of fuel cycle facilities. The following pattern reflects this diversity:

Type I: Assurances of services not involving ownership of facilities.

- a) Suppliers provide additional assurances of supply;
- b) International consortia of governments broaden the assurances;
- c) IAEA-related arrangements provide even broader assurances.

Type II: Conversion of existing national facilities to multinational facilities.

Type III: Construction of new joint facilities.

10. On the basis of this pattern, the Group has reviewed the pros and cons associated with each type and option. Pros and cons were defined relative to a "non-MNA choice", namely that of a national facility under current safeguards.

Uranium enrichment

11. A healthy market exists at the front end of the fuel cycle. In the course of only two years, a nuclear power plant operating in Finland has bought uranium originating from mines in seven different countries. For example, conversion has been done in three different countries. Enrichment services have been bought from three different companies. Therefore, the legitimate objective of assurances of supply can be fulfilled to a large extent by the market. Nevertheless, this assessment may not be valid for all countries that have concerns about assurances of supply. Mechanisms or measures, under which existing suppliers or international consortia of governments or IAEA-related arrangements may be appropriate in such cases.

12. At first, *suppliers* could provide additional assurances of supply. This would correspond to enrichment plant operators, individually or collectively, guaranteeing to provide enrichment capacity to a State whose government had in turn agreed to forego building its own capacity, but which then found itself denied service by its intended enrichment provider for unspecified reasons. The pros include the avoidance of know-how dissemination, the reliance on a well-functioning market and the ease of implementation. The cons refer for example to the cost of maintaining idle capacity on reserve, and the lack of perceived diversity on the supplier side.

13. At a second level, international *consortia of governments* could step in, that is they would guarantee access to enrichment services, the suppliers being simply executive agents. The arrangement would be a kind of "intergovernmental fuel bank", e.g. a contract under which a government would buy guaranteed capacity under specified circumstances. Different States might use different mechanisms. Most pros and cons are shared with the preceding case.

14. Then, there are *IAEA-related arrangements*, a variation of the preceding option, with the IAEA acting as the anchor of the arrangement. Essentially, the Agency would function as a kind of "guarantor" of supply to States in good standing and that were willing to accept the requisite conditionality (which would need to be defined, but would likely need to include forswearing a parallel path to enrichment/reprocessing plus acceptance of the Additional Protocol for NNWS). The IAEA might either hold title to the material to be supplied or, more likely, act as facilitator, with back-up agreements between the IAEA and supplier countries to fulfil commitments made by the IAEA effectively on their behalf. In effect, the IAEA would be establishing a default mechanism, only to be activated in instances where a normal supply contract had broken down for reasons other than commercial reasons. The suggested pros and cons are therefore similar, with the added value of broad international assurances. Several questions can be raised with respect to the IAEA and its special status as an international organisation subject to the control of its Member-States. Any guarantee provided by the IAEA would in fact require approval by its Board of Governors.

15. Where an MNA would take the form of a joint facility, there are two ready-made precedents, the Anglo-Dutch-German company Urenco and the French EURODIF. The experience of Urenco, with its commercial/industrial management on the one hand and the governmental Joint Committee on the other hand, has shown that the multinational concept can be made to work successfully. Under this model, strong oversight of technology and staffing, as well as effective safeguards and proper international division of expertise can reduce the risk of proliferation and even make a unilateral breakout extremely difficult. EURODIF on the other hand has a successful multinational record as well, by enriching uranium only in one country, while providing enriched uranium to its co-financing international partners, hence restricting all proliferation risks, diversion, clandestine parallel programme, breakout and the spread of technology.

Reprocessing of nuclear spent fuel

16. Taking into account present capacities to reprocess spent fuel for light water reactors and those under construction, there will be sufficient reprocessing capacity globally for all expected demands in plutonium-recycled fuel during some two decades. Therefore, objectives of assurances of supply can be fulfilled to a large extent without new reprocessing facilities involving ownerships (Types II and III).

17. Currently all reprocessing plants are essentially State-owned. By the very nature of the nuclear business worldwide, any guarantee from a supplier would have the implicit or explicit agreement of the corresponding government. As to *IAEA-brokered arrangements*, these could mean an IAEA participation in the supervision of an international consortium for reprocessing services.

18. *Converting a national facility* to international ownership and management would involve the creation of a new international entity that would operate as a new competitor in the reprocessing market. The pros reflect the advantages of bringing together international expertise, while the cons include non-proliferation disadvantages related to know-how dissemination and to the return of the separated plutonium.

Other cons deal with the fact that, of the existing facilities, all except two Japanese facilities are in NWS or in non-NPT States. In many of those cases, appropriate safeguards will have to be introduced if they had not been applied before.

19. As noted above, the *construction of new joint facilities* will not be needed for a long time. Therefore, a prerequisite for the construction of new facilities is the demand for additional reprocessing and for recycled-plutonium fabrication. In the future such reprocessing and fabrication would be done on the same location.

Spent fuel disposal

20. At present there is no international market for spent fuel disposal services, as all undertakings are strictly national. The final disposal of spent fuel is thus a candidate for multilateral approaches. It offers major economic benefits and substantial non-proliferation benefits, although it presents legal, political and public acceptance challenges in many countries. The Agency should continue its efforts in that direction by working on all the underlying factors, and by assuming political leadership to encourage such undertakings.

21. The final disposal of spent fuel (and radioactive waste as well) in shared repositories must be looked at as only one element of a broader strategy of parallel options. National solutions will remain a first priority in many countries. This is the only approach for States with many nuclear power plants in operation or in past operation. For others with smaller civilian nuclear programmes, a dual-track approach is needed in which both national and international solutions are pursued. Small countries should keep options open (national, regional or international), be it only to maintain a minimum national technical competence necessary to act in an international context.

Spent fuel storage

22. Storage facilities for spent fuel are in operation and are being built in several countries. There is no international market for services in this area, except for the readiness of the Russian Federation to receive Russian-supplied fuel, and with a possible offer to do so for other spent fuel. The storage of spent fuel is also a candidate for multilateral approaches, primarily at the regional level. Storage of special nuclear materials in a few safe and secure facilities would enhance safeguards and physical protection. The IAEA should continue investigations in that field and encourage such undertakings. Various countries with state-of-the-art storage facilities in operation should step forward and accept spent fuel from others for interim storage.

Combined option: fuel-leasing/fuel take-back

23. In this model, the leasing State provides the fuel through an arrangement with its own nuclear fuel "vendors". At the time the government of the leasing State issues an export license to its fuel "vendor" corporation to send fresh fuel to a client reactor, that government would also announce its plan for the management of that fuel once discharged. Without a specific spent fuel management scheme by the leasing State,

the lease deal will of course not take place. The leased fuel once removed from the reactor and cooled down, could either be returned to its country of origin which owns title to it, or, through an IAEA-brokered deal could be sent to a third party State or to a multinational or a regional fuel cycle centre located elsewhere for storage and ultimate disposal.

24. The weak part in the arrangement outlined above is the willingness, indeed the political capability, of the leasing State to take-back the spent fuel it has provided under the lease contract. It could well be politically difficult for any State to accept spent fuel not coming from its own reactors (that is, reactors producing electricity for the direct benefit of its own citizens). Yet, to make any lease-take-back deal credible, an ironclad guarantee of spent fuel removal from the country where it was used must be provided, otherwise the entire arrangement is moot. In this respect, States with suitable disposal sites, and with grave concerns about proliferation risks, ought to be proactive in putting forward solutions. Of course, commitment of client States to forego enrichment and reprocessing would make such undertakings politically more tolerable.

25. As an alternative, the IAEA could broker the creation of multinational or regional spent fuel storage facilities, where spent fuel owned by leasing States and burned elsewhere could be sent. The IAEA could thus become an active participant in regional spent fuel storage facilities, or third party spent fuel disposal schemes, thereby making lease-take-back fuel supply arrangements more credible propositions.

Overarching issues

26. Apart from the cross-cutting factors related to the implementation of MNAs, such as the technical, legal and safeguards ones, there are a number of overarching issues, primarily of a broad political nature, which may have a bearing upon perceptions of the feasibility and desirability of MNAs. These issues may be decisive in any future endeavour to develop, assess and implement such approaches at the national and international level.

Relevant articles of the NPT

27. The NPT incorporates a political bargain with respect to peaceful uses and nuclear disarmament without which the Treaty would not have been adopted nor received the widespread adherence it obtained afterwards. The promise by all States parties to cooperate in the further development of nuclear energy and for the NNWS to work towards disarmament provided the basis for NNWS to abstain from acquiring nuclear weapons.

28. Cooperation in the peaceful uses of nuclear energy, which had earlier provided the basis for the foundation of the IAEA, is embodied in Article IV, which stipulates that nothing shall be interpreted as affecting the "*inalienable right of all Parties to develop research, production and use of nuclear energy for peaceful purposes without discrimination and in conformity with Articles I and II*" (that specify the non-

proliferation objectives of the Treaty). Furthermore, that same article specifies that all Parties to the NPT shall undertake to "*facilitate, and have the right to participate in, the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy*", and moreover to "*cooperate in contributing alone or together with other States or international organizations to the further development of the applications of nuclear energy for peaceful purposes...*" Article IV was specifically crafted to preclude any attempt to reinterpret the NPT so as to inhibit a country's right to nuclear technologies - so long as the technology is used for peaceful purposes.

29. NNWS have expressed dissatisfaction about what they increasingly view as a growing imbalance in the NPT: that, through the imposition of restrictions on the supply of materials and equipment of the nuclear fuel cycle by the NWS and the advanced industrial NNWS, those States have backed away from their original guarantee to facilitate the fullest possible exchange referred to in Article IV and to assist all NNWS in the development of the applications of nuclear energy. There are also concerns that additional constraints on Article IV might be imposed,

30. Article VI of the Treaty obliges NWS Parties "to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament." Many NNWS deem the implementation of Article VI of the NPT by NWS as unsatisfactory, as are the non-entry into force of the Comprehensive Nuclear-Test-Ban Treaty (CTBT) and the stalemate in the negotiations on a verifiable Fissile Material (Cut-off) Treaty (FM(C)T). Such concerns have fostered a conviction among many NNWS that the NPT bargain is being corroded.

Safeguards and export controls

31. Some States have argued that, if the objective of MNAs is merely to strengthen the nuclear non-proliferation regime then, rather than focussing on MNAs, it may be better to concentrate instead on the existing elements of the regime itself, for example, by seeking the universality of the Additional Protocol (AP) to IAEA safeguards agreements and by the universalisation of safeguards agreements and multilateral export controls.

32. The risks involved in the spread of sensitive nuclear technologies should primarily be addressed by an efficient and cost-effective safeguards system. The IAEA and regional safeguards systems have done an outstanding job in these matters. Safeguards, rationally and well applied, have been the most efficient way to detect and deter further proliferation and to provide States Parties with an opportunity to assure others that they are in conformity with their safeguards commitments. Of course, advances in technologies require safeguards to be strengthened and updated, while protecting commercial, technological and industrial secrets. The adoption of the Additional Protocol, and its judicious implementation based on State-level analysis, are essential steps against further nuclear proliferation. The Additional Protocol has proven to provide additional, necessary and effective verification tools, while protecting legitimate national interests in security and confidentiality. Sustained application of the Additional Protocol in a State can provide credible assurance of the absence of undeclared materials and activities in that State. Together with a comprehensive

safeguards agreement, the Additional Protocol should become the de facto safeguards standard.

33. The above notwithstanding, the IAEA should endeavour to further strengthen the implementation of safeguards. For example, it should revisit three facets of its verification system:

- a. The technical annexes of the Additional Protocol, which should be regularly updated to reflect the continuing development of nuclear techniques and technologies.
- b. The implementation of the AP, which requires adequate resources and a firm commitment to apply it decisively. It should be recalled that the Model Additional Protocol commits the IAEA not to apply the AP in a mechanistic or systematic way. Therefore the IAEA should allocate its resources on problematic areas rather than on States using the largest amounts of nuclear material.
- c. The enforcement mechanisms in case of fundamental breach of, or in case of non-compliance with, the safeguards agreement. Are these mechanisms progressive enough to act as an effective deterrent? Further consideration should be given by the IAEA to appropriate measures to handle various degrees of violations.

34. Export guidelines and their implementation are an important line of defence for preventing proliferation. Recent events have shown that criminal networks can find ways around existing controls to supply clandestine activities. Yet, one should remember that all States party to the NPT are obliged, pursuant to Article III.2 thereof, to implement export controls. This obligation was reinforced by United Nations Security Council Resolution 1540 (2004) that requires all States to enact and implement export controls to prevent the spread of weapons of mass destruction and related materials to non-State actors. The participation in the development and implementation of export controls should be broadened, and multilaterally-agreed export controls should be developed in a transparent manner, engaging all States.

35. In fact, the primary technical barriers against proliferation remain the effective and universal implementation of IAEA safeguards under comprehensive safeguards agreements and additional protocols, and effective export controls. Both must be as strong as possible on their own merits. MNAs will be complementary mechanisms for strengthening the existing non-proliferation regime.

Voluntary participation in MNAs versus a binding norm

36. The present legal framework does not oblige countries to participate in MNAs, as the political environment makes it unlikely that such a norm can be established any time soon. Establishing MNAs resting on *voluntary* participation is thus the more promising way to proceed. In a voluntary arrangement covering assurances of supply, recipient countries would, at least for the duration of the respective supply contract, renounce the construction and operation of sensitive fuel cycle facilities and accept safeguards of the highest current standards including comprehensive safeguards and the Additional Protocol. Where the demarcation line between permitted

R&D activities and renounced development and construction activities has to be drawn is a matter for further consideration. In voluntary MNAs involving facilities, the participating countries would presumably commit to carry out the related activities solely under the common MNA framework.

37. In reality, countries will enter into such multilateral arrangements according to the economic and political incentives and disincentives offered by these arrangements. A political environment of mutual trust and consensus among the partners - based on full compliance with the agreed nuclear non-proliferation obligations of the partners - will be necessary to the successful negotiation, creation and operation of an MNA.

38. Beyond this, a new *binding* international norm stipulating that sensitive fuel cycle activities are to be conducted exclusively in the context of MNAs and no longer as a national undertaking would amount to a change in the scope of Article IV of the NPT. The wording and negotiation history of this article emphasise the right of each party in good standing to choose its national fuel cycle on the basis of its sovereign consideration. This right is not independent of the faithful abiding by the undertakings under Articles I and II. But if this condition is met, no legal barrier stands in the way of each State party to pursue all fuel cycle activities on a national basis. Waiving this right would thus change the "bargain" of the NPT.

39. Such a fundamental change is not impossible if the parties were to agree on it in a broader negotiating frame. For NNWS, such a new bargain can probably only be realised through universal principles applying to all States and after additional steps by the NWS regarding nuclear disarmament. In addition, a verifiable FM(C)T might also be one of the preconditions for binding multilateral obligations; such a treaty would terminate the right of any participating nuclear weapon States and non-NPT parties to run reprocessing and enrichment facilities for nuclear explosive purposes and it would bring them to the same level - with regard to such activities - as non-nuclear weapon States. The new restrictions would apply to all States and facilities related to the technologies involved, without exception. At that time, multilateral arrangements could become a universal, binding principle. The question may also be raised as to what might be the conditions required by NWS and non-NPT States to commit to binding MNAs involving them.

Nuclear-weapon States and non-NPT States

40. Weapon-usable material (stocks and flows) and sensitive facilities that are capable of producing such material are located predominantly in the NWS and non-NPT States. The concerns raised previously for MNAs in NNWS do not all apply when an MNA would involve NWS or non-NPT States. Yet, one of the questions here relates to the possibility that the nuclear material produced in an MNA could contribute to such a State's nuclear non-peaceful programme. This shows again the relevance of a FM(C)T.

41. The feasibility of bringing NWS and non-NPT States into MNAs should indeed be considered at an early stage. As long as MNAs remain voluntary, nothing would preclude such States from participating in an MNA. In fact, France (in connection with the EURODIF arrangement) and the United Kingdom (in connection with Urenco) are examples of such participation. In transforming existing civilian facilities into MNAs

subject to safeguards and security requirements, such States would demonstrate their support for non-proliferation and for peaceful international nuclear collaboration.

Enforcement

42. Eventually, the success of all efforts to improve the nuclear non-proliferation regime depends upon the effectiveness of compliance and enforcement mechanisms. Enforcement measures in case of non-compliance can be partially improved by MNAs' legal provisions, which will carefully specify a definition of what constitutes a violation, by whom such violations will be ruled on, and enforcement measures that could be directly applied by the partners in addition to broader political tools.

43. Nevertheless, enhanced safeguards, MNAs, or new undertakings by States will not serve their full purpose if the international community does not respond with determination to serious cases of non-compliance, be it diversion, clandestine activities or breakout. Responses are needed at four levels, depending upon the specific case: the MNA partners of the non-compliant State; the IAEA; the States Parties to the NPT; and the UN Security Council. Where these do not currently exist, appropriate procedures and measures must be available and must be made use of at all four levels to cope with breaches and non-compliance instances, in order to unequivocally make clear that States violating treaties and arrangements should not be permitted to do so unimpeded.

Multilateral nuclear approaches: the future

44. Past initiatives for multilateral nuclear cooperation did not result in any tangible results. Proliferation concerns were perceived as not serious enough. Economic incentives were seldom strong enough. Concerns about assurances of supply were paramount. National pride also played a role, alongside expectations about the technological and economic spin-offs to be derived from nuclear activities. Many of those considerations may still be pertinent. However, the result of balancing those considerations today, in the face of a latent multiplication of nuclear facilities over the next decades and the possible increase in proliferation dangers may well produce a political environment more conducive to MNAs in the 21st century.

45. The potential benefits of MNAs for the non-proliferation regime are both symbolic and practical. As a confidence-building measure, multilateral approaches can provide enhanced assurance to the partners and to the international community that the most sensitive parts of the civilian nuclear fuel cycle are less vulnerable to misuse for weapon purposes. Joint facilities with multinational staff put all MNA participants under a greater degree of scrutiny from peers and partners and may also constitute an obstacle against a breakout by the host partner. They also reduce the number of sites where sensitive facilities are operated, thereby curbing proliferation risks, and diminishing the number of locations subject to potential thefts of sensitive material. Moreover, these approaches can even help in creating a better acceptance for the continued use of nuclear power and for nuclear applications, and enhance the pros-

pects for the safe and environmentally sound storage and disposal of spent nuclear fuel and radioactive waste.

46. As far as assurances of supply are concerned, multilateral approaches could also provide the benefits of cost-effectiveness and economies of scale for whole regions, for smaller countries or for those with limited resources. Similar benefits have been derived in the context of other technology sectors, such as aviation and aerospace. However, the case to be made in favour of MNAs is not entirely straightforward. States with differing levels of technology, different degrees of institutionalisation, economic development and resources and competing political considerations may not all reach the same conclusions as to the benefits, convenience and desirability of MNAs. Some might argue that multilateral approaches point to the loss or limitation of State sovereignty and independent ownership and control of a key technology sector, leaving unfairly the commercial benefits of these technologies to just a few countries. Others might argue that multilateral approaches could lead to further dissemination of, or loss of control over, sensitive nuclear technologies, and result in higher proliferation risks.

47. In summary, the Expert Group on Multilateral Approaches for the Nuclear Fuel Cycle has reviewed the various aspects of the fuel cycle, identified a number of options for MNAs deserving further consideration, and noted a number of pros and cons for each of the options. It is hoped that the report of the Expert Group will serve as a building block, or as a milestone. It is not intended to mark the end of the road. MNAs offer a potentially useful contribution to meeting prevailing concerns about assurances of supply and non-proliferation.

48. The Group recommends that steps be taken to strengthen overall controls on the nuclear fuel cycle and the transfer of technology, including safeguards and export controls: the former by promoting universal adherence to Additional Protocols, the latter through a more stringent implementation of guidelines and a universal participation in their development.

49. In order to maintain momentum, the Group recommends that attention be given - by the IAEA Member States, by the IAEA itself, by the nuclear industry and by other nuclear organisations - to multilateral nuclear approaches in general and to the **five approaches** suggested below.

Five suggested approaches

The objective of increasing non-proliferation assurances associated with the civilian nuclear fuel cycle, while preserving assurances of supply and services around the world could be achieved through a set of gradually introduced multilateral nuclear approaches (MNA):

1. Reinforcing **existing commercial market mechanisms** on a case-by-case basis through long-term contracts and transparent suppliers' arrangements with government backing. Examples would be: fuel leasing and fuel take-back offers, commercial offers to store and dispose of spent fuel, as well as commercial fuel banks.
2. Developing and implementing **international supply guarantees** with IAEA participation. Different models should be investigated, notably with the **IAEA as guarantor** of service supplies, e.g. as administrator of a fuel bank.
3. Promoting voluntary conversion of **existing facilities to MNAs**, and pursuing them as **confidence-building measures**, with the participation of NPT non-nuclear-weapon States and nuclear-weapon States, and non-NPT States.
4. Creating, through voluntary agreements and contracts, **multinational, and in particular regional, MNAs for new facilities** based on joint ownership, drawing rights or co-management for front-end and back-end nuclear facilities, such as uranium enrichment; fuel reprocessing; disposal and storage of spent fuel (and combinations thereof). Integrated nuclear power parks would also serve this objective.
5. The scenario of a further expansion of nuclear energy around the world might call for the development of a **nuclear fuel cycle with stronger multilateral arrangements** – by region or by continent - **and for broader cooperation**, involving the IAEA and the international community.



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IAEA support

The following IAEA staff members made contributions to the Group's work: Ms. Fiona Simpson ("Keeper of the text") and Mr. Tariq Rauf (Scientific Secretary); Messrs. Alan McDonald, Vladimir Kagramanian (former staff) and Jan-Marie Potier; Mr. John Rames (former staff) and Ms. Laura Rockwood; Ms. Jill Cooley, Messrs. Mazhar Saied, Eckhard Haas and Matthias Gohl (Intern) and Ms. Elena Bergo for administrative support.

External support

The Group drew on the expertise and presentations of external persons: Mr. Pat Upson (Urenco), Messrs. Philip Sewell and Charles Yulish (US Enrichment Corporation), Mr. Jean-Louis Lemarchand and Ms. Caroline Jorant (AREVA), Mr. Charles McCombie (Arius Association) and Messrs. Alexy Grigoriev (TVEL) and Sergey Ruchkin (TENEX).