



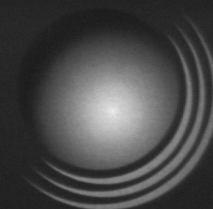
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# Built to Last: Conditionality and What It Can Do for the Disposition of Russian Weapon-Grade Plutonium

**FRANKLYN GRIFFITHS**

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DANS LE DOMAINE  
DE LA SÉCURITÉ  
INTERNATIONALE



CAI EA365 2002B74  
.b4016336 (E)

# **BUILT TO LAST: CONDITIONALITY AND WHAT IT CAN DO FOR THE DISPOSITION OF RUSSIAN WEAPON-GRADE PLUTONIUM**

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Prepared for the International Security Research and Outreach Programme  
International Security Bureau

December 2002

Dept. of Foreign Affairs  
Min. des Affaires étrangères

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## **PREFACE**

The views expressed in this paper are those of the author, and do not necessarily reflect the views or position of the Department of Foreign Affairs and International Trade or of the Government of Canada.

The Department of Foreign Affairs and International Trade wishes to acknowledge the work performed under contract in the preparation of this report by the author: Franklyn Griffiths.

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December 2002

## EXECUTIVE SUMMARY

In September 2000 the Russian Federation and the United States each agreed to make 34 tonnes of excess weapon-grade plutonium permanently inaccessible and unsuited to military use. Disposition is the word for this task. In June 2002 the G-8 instructed negotiators for the donors and the Federation to conclude a framework Multilateral Agreement in 2003 for disposition of the Russian amount. This is a programme that's likely to rely on Russian civil nuclear reactors and could take decades from initial authorization to the processing of the last kilo. Previously there has been some discussion of conditionality. This means performance requirements which need to be met by the programme in support of Russian disposition, and which therefore need to be addressed in the Multilateral Agreement. Irreversibility, nuclear safety, and environmental protection are key areas of concern. The better they are dealt with in the Multilateral Agreement, it's argued here, the more likely we'll have a disposition programme that's built to last in the face of foreseeable difficulty.

This study therefore seeks to show what might be done with the notion of conditionality to make disposition sustainable over the long haul. Opinions are offered and some recommendations. The idea at this point is to prompt discussion among negotiators and disposition planners, not to state firm conclusions. The perspective is that of the donor country interested in arrangements which are reliable in the long term and acceptable to the Russian Federation now.

Where irreversibility is concerned, major challenges to sustained disposition are identified in the nuclear hedging practices of both principals, and in the determination of the Russian side to prepare for the accumulation of plutonium for civil use as it reduces a portion of its military plutonium. The term given to these challenges, of which Russian plans for reliance on civil plutonium is the greater, is contravention.

Contravention challenges the credibility and hence the sustainability of disposition. The questions it raises are these: Why go to all the effort and expense to process 34 tonnes each when all along great amounts of metal are being held in reserve for the resurrection of cold-war strategic forces? Or when it would be far simpler to assist Russia in converting plutonium metal into oxide and then storing the material until its nuclear industry got to the point of being able to make commercial use of it? If questions like these are not properly resolved at the outset, the disposition programme could find itself open to attack the moment something went wrong in Russia. The very capacity to disposition could be threatened.

This study therefore recommends that the two principals be asked to show good faith with the principle of irreversibility by undertaking to negotiate hedge cuts. More emphatically it urges that the bias of the September 2000 Agreement against reliance on civil plutonium be maintained and, better, strengthened in a Multilateral Agreement. Specifically, export of Russia's excess for irradiation in non-Russian reactors should be avoided as providing Minatom with an income stream for use in making the transition to closed fuel-cycle technology.

As to nuclear safety and environmental protection, it's the view here that neither is to be counted upon in Russia today or for years to come. Relatively minor misadventure or major accident in either domain have the potential to nullify international arrangements to accelerate

disposition beyond two tonnes per year, or to kill the programme altogether. A Chernobyl-strength disaster in a Russian MOX fuel fabrication facility built with international assistance? We need more assurance than we now have that disposition will not be derailed.

What's required is new agency for nuclear safety and environmental protection in Russia.

A multinational management corporation (MMC), patterned initially on an early draft by Lacy and others at the U.S. DOE, is therefore proposed as a principal means of obtaining agency for sustained disposition. Guided by the terms of the Multilateral Agreement and by an intergovernmental council, the Corporation would be a nonprofit management entity having substantial autonomy in directing the work of disposition according to highest standards. It would also have certain unconventional features designed to address particular problems of sustained disposition in Russia.

First, the Multilateral Agreement would mandate the MMC not only to get the physical job of disposition done right, but to create preconditions for the handover of everything but financial functions to the Russian Federation. Transfer of operational control over the programme could be progressive and might be completed around the time disposition itself began, which could be about ten years after a Multilateral Agreement had been struck. The prospect of handover should ease Russian acceptance of an international management entity whose mandate went well beyond the job of disposition per se.

As executive agent for the Multilateral Agreement, the MMC would have the crucial task of creating regulatory, civil-society, and political-cultural preconditions for best practice in matters of nuclear safety and environmental protection as they relate to disposition activities within Russia. The Corporation, for example, would actively support the nuclear regulator, GAN, as part of its mission to create agency for utmost care in matters of nuclear safety and environmental protection.

A paradox becomes apparent: for donors to encourage best practice in Russian conditions is for them to depart significantly from standard practice elsewhere. Specifically, it is for them to build up in Russia what is usually regarded as the nuclear industry's opposition in their own countries.

In generating agency for sustained disposition in Russia, the Multilateral Agreement should break the mold for international security institutions. It should emulate the practice of the intergovernmental Arctic Council, on which the Russian Federation and the United States sit, and include NGOs as permanent nonvoting participants in the MMC's Council. Several purposes would be served including generation of information and counsel from those likely to be attuned to the on-the-ground effects of disposition, and providing assurance to the Russian people who, it's argued, could have something of a veto over disposition. As well, one Russian and one U.S. nuclear-watchdog or environmental NGO should be included in any international nuclear-safety and environmental-impact assessment panels set up to vet the programme once the Multilateral Agreement is in hand.

The following are additional recommendations: (1) give very strong support to the U.S. proposal for the G-8 to make a down payment on a conversion facility in Russia; (2) urge the R.F. and U.S. to resume bilateral conversations for a moratorium on the reprocessing of spent fuel; (3)

provide for cessation of civil plutonium production at Mayak, if only because by the time 34 tonnes of WGPu had been dispositioned 60-plus tonnes of RGPu could have been accumulated; (4) urge the R.F. to act vigorously now to decouple disposition from plans to import spent nuclear fuel; and (5) seek R.F. assent to an internationally monitored referendum in the Chelyabinsk area, if that's what it takes to sustain the programme in the donor countries as well as Russia over the long haul.

## RÉSUMÉ

### Un programme conçu pour durer : la conditionnalité et son influence potentielle sur l'élimination du plutonium militaire en Russie

En septembre 2000, la Fédération de Russie et les États-Unis ont convenu de traiter chacun 34 tonnes de plutonium militaire excédentaire afin d'en empêcher définitivement l'accès et l'utilisation aux fins militaires. C'est ce que l'on entend par « élimination ». En juin 2002, le G8 a chargé les négociateurs des pays donateurs et de la Fédération de conclure, en 2003, un accord-cadre multilatéral sur l'élimination des 34 tonnes de plutonium russe. Il est probable que cet accord prévoit l'utilisation des réacteurs nucléaires civils de la Russie, et il pourrait prendre des dizaines d'années à mettre en œuvre, depuis l'autorisation initiale jusqu'au traitement du dernier kilo de matière fissile. La conditionnalité a déjà fait l'objet de discussions. Cela signifie que les résultats du programme doivent respecter certains critères en ce qui concerne l'élimination du plutonium russe et, par conséquent, que les critères en question doivent figurer dans l'accord multilatéral. L'irréversibilité, la sûreté nucléaire et la protection de l'environnement font partie des principaux sujets de préoccupation. Le document soutient que la meilleure façon de s'assurer de la durabilité du programme d'élimination, en tenant compte des difficultés prévisibles, consiste à traiter de ces trois sujets de préoccupation le plus précisément possible dans l'accord-cadre multilatéral.

Le document cherche donc à montrer comment aborder la notion de conditionnalité de façon à garantir un processus d'élimination durable, notamment par la présentation d'opinions et de quelques recommandations. Pour le moment, l'objectif est de stimuler la discussion entre les négociateurs et les planificateurs du processus, et non de tirer des conclusions fermes. La perspective retenue est celle d'un pays donateur souhaitant l'établissement d'un mécanisme que la Fédération de Russie est en mesure d'accepter dès maintenant et dont la fiabilité à long terme est prouvée.

En fait d'irréversibilité, force est d'admettre que les mesures de stockage de garantie des deux parties constituent un obstacle important à l'élimination durable, tout comme la détermination de la Russie à accumuler du plutonium destiné à l'usage civil afin de réduire sa quantité de plutonium militaire. On appelle « contravention » ces difficultés, dont la principale est l'intention de la Russie de recourir au plutonium civil.

La contravention met en jeu la crédibilité et, par conséquent, la durabilité du programme d'élimination. Elle soulève les questions suivantes : Pourquoi investir tant d'efforts et d'argent dans chacun des deux pays pour traiter 34 tonnes de plutonium alors que de grandes quantités de ce métal sont gardées en réserve en prévision d'une éventuelle résurrection des forces stratégiques de la guerre froide? Pourquoi, en effet, puisqu'il serait tellement plus simple d'aider la Russie à transformer son plutonium en oxyde de plutonium, puis à l'entreposer jusqu'à ce que son industrie nucléaire soit en mesure d'en faire un usage commercial? Si, d'entrée de jeu, les questions de ce genre demeurent sans réponse, le programme d'élimination risque d'être attaqué de toutes parts si un incident se produit en Russie. La capacité même d'éliminer le plutonium militaire pourrait alors s'en trouver menacée.

La présente étude recommande de demander aux deux parties de faire preuve de bonne foi à l'égard de l'irréversibilité en entamant des négociations sur la réduction des stocks de



garantie. De plus, elle insiste pour que la tendance de l'entente de septembre 2000 à s'opposer à l'utilisation du plutonium civil soit maintenue ou même renforcée dans le cadre d'un accord multilatéral. Plus particulièrement, l'utilisation du matériel radioactif excédentaire de la Russie dans des réacteurs à l'extérieur du pays devrait être évitée; il vaudrait mieux que Minatom trouve une autre façon de financer la transition vers une technologie de cycle fermé.

Pour ce qui est de la sûreté nucléaire et de la protection de l'environnement en Russie, selon le document, elles semblent aussi improbables aujourd'hui que dans les années à venir. L'éventualité d'un accident nucléaire mineur ou d'un grave accident écologique risque de faire échec aux dispositions internationales visant à augmenter à plus de deux tonnes par année, la quantité de plutonium militaire à éliminer ou même de conduire à l'abandon du programme. Il suffit d'imaginer les conséquences d'un désastre de l'ampleur de Tchernobyl dans une installation russe de production de combustible MOX qui aurait été construite avec le concours de la communauté internationale. Vraiment, nous devons nous assurer que l'élimination du plutonium militaire ne déraillera pas.

C'est pourquoi il faut créer un nouvel organisme de sûreté nucléaire et de protection de l'environnement en Russie.

On propose donc l'établissement d'une société de gestion multinationale (SGM), dont le modèle a été conçu à l'origine par Lacy et d'autres fonctionnaires du département de l'Énergie des États-Unis. Celle-ci faciliterait grandement la création d'un organisme chargé de l'élimination durable du plutonium militaire. Guidée par les dispositions de l'accord multilatéral et par un conseil intergouvernemental, cette société de gestion sans but lucratif disposerait de l'autorité nécessaire pour diriger le travail d'élimination selon les normes les plus strictes. Des mécanismes spéciaux permettraient en outre de s'attaquer aux problèmes propres à l'élimination durable en Russie.

Tout d'abord, l'accord multilatéral chargerait la SGM non seulement de faire en sorte que l'élimination du plutonium s'effectue correctement, mais aussi de créer les conditions permettant de transférer toutes les responsabilités, sauf financières, à la Fédération de Russie. Le transfert du contrôle opérationnel du programme pourrait être progressif et se terminer environ au moment où l'élimination commencerait, soit une dizaine d'années après l'entrée en vigueur de l'accord multilatéral. La perspective de transfert devrait aider la Russie à accepter l'établissement d'une entité de gestion internationale dont le mandat irait bien au-delà de l'élimination en soi.

En tant qu'organisme de direction de l'accord multilatéral, la SGM aurait à s'acquitter d'une tâche cruciale, à savoir créer les conditions nécessaires à l'établissement de meilleures pratiques en matière de sûreté nucléaire et de protection de l'environnement pour les activités d'élimination en Russie, qu'il s'agisse du cadre réglementaire, politique et culturel ou de la société civile. Par exemple, la SGM soutiendrait activement le GAN, organisme de réglementation nucléaire de la Russie, conformément à sa mission de créer une instance hautement qualifiée en ce qui concerne la sûreté nucléaire et la protection de l'environnement.

Cela met en évidence un certain paradoxe : pour encourager les meilleures pratiques en Russie, les pays donateurs devront renoncer dans une large mesure aux pratiques habituelles. Plus précisément, ils devront mettre en place, en Russie, ce qui est généralement considéré comme l'opposé de l'industrie nucléaire dans leur pays.

L'organisme d'élimination durable du plutonium militaire, qui serait créé dans le cadre de l'accord multilatéral, doit sortir du carcan des institutions de sécurité internationales. Il devrait suivre le modèle du Conseil de l'Arctique, auquel siègent la Fédération de Russie et les États-Unis, et prévoir la participation d'ONG sans droit de vote au conseil de la SGM. Ce modèle comporterait plusieurs avantages : il permettrait à la SGM d'obtenir de l'information et des conseils de la part des intervenants les plus susceptibles de connaître les effets sur le site de l'élimination du plutonium, en plus de donner de l'assurance au peuple russe, qui, plaide-t-on, pourrait disposer d'un droit de veto sur l'élimination. En outre, deux instances chargées de sûreté nucléaire ou deux ONG environnementales, l'une russe et l'autre américaine, devraient siéger sur tout comité international d'évaluation de la sûreté nucléaire et des incidences environnementales établi aux fins d'examen du programme, une fois que l'accord multilatéral aura été conclu.

Voici d'autres recommandations : 1) appuyer fermement la proposition des États-Unis selon laquelle le G8 devrait effectuer une mise de fonds pour la construction d'une usine de traitement en Russie; 2) insister pour que la Fédération de Russie et les États-Unis reprennent au plus vite les discussions bilatérales au sujet d'un moratoire sur le retraitement de combustible irradié; 3) prévoir l'arrêt de la production de plutonium civil à Mayak, car dans l'intervalle de temps nécessaire pour éliminer 34 tonnes de plutonium militaire, 60 tonnes et plus de plutonium civil auront eu le temps d'être entreposées; 4) demander instamment à la Fédération de Russie de dissocier l'élimination des projets d'importation de combustible nucléaire irradié; 5) chercher à faire approuver par la Fédération de Russie la tenue d'un référendum supervisé par la communauté internationale dans la région de Tcheliabinsk, si cela est nécessaire au soutien du programme à long terme dans les pays donateurs aussi bien qu'en Russie.

## **BUILT TO LAST: CONDITIONALITY AND WHAT IT CAN DO FOR THE DISPOSITION OF RUSSIAN WEAPON-GRADE PLUTONIUM**

Complicated beyond belief, disposition will have to be made simple when politicians and publics are asked to approve and finance international arrangements to "dispose" of a first batch of excess Russian weapon-grade plutonium. Anything final is however a ways off yet. There's still plenty to do. This study is therefore written for negotiators and planners, and assumes familiarity with the subject. The focus is on conditionality. By this is meant performance requirements which donors in the first instance, and also the Russian Federation, might want a final agreement to meet. Nuclear safety, environmental protection, and irreversibility are key areas of donor concern. Thus far they have been raised only in general terms by participants in the intergovernmental talks on disposition.

Two main purposes drive this study. They are interrelated. The first is to persuade the reader of the need for a conversation about conditionality. The implication, to be considered shortly, is that not all will be well disposed to the idea. The view here is that a proactive conditionality can do a power of good for disposition by helping the parties to anticipate and ward off danger to the programme and to the people of Russia.

This study also hopes to provide an independent audit of the multilateral venture that's taking shape for the disposition of excess Russian weapon-grade plutonium (WG Pu). My plain question is whether in threading their way through the trees, the negotiators may be in danger of losing sight of the forest. By forest I mean the sustainability of disposition over a duration that could include seven and maybe even more U.S. administrations, the ever-present potential for political surprise in the Russian Federation, the possibility of nuclear accident, the diversion of funds to unauthorized purposes, and who knows what else. Obviously there's no way of being fully assured about what will happen to such a project, indeed to any project, once the deal is done. Nevertheless, we stand to gain from a vigorous effort to look beyond what might soon be agreed, to how it might perform over the long haul.

This report therefore begins with a discussion of conditionality as such. The question is whether it offers a means of enhancing the long-term sustainability of disposition. Then we go to the evolving U.S. approach to disposition, and to the utility of conditionality as a means of evaluating the variants being put forward for discussion by Washington. The prime concern at this point is to anticipate and protect disposition against foreseeable adversity. Next comes the thorny question of what room Russian realities might allow for our troika of conditionalities. The emphasis changes to how best to protect Russians and their environment against disposition. The options are then reduced to their essentials, and priorities for a long-term strategy of disposition are considered in conclusion.

Throughout, the discussion relies heavily on interviews with experienced and thoughtful individuals who were generous with their insights and information. Those interviewed are not quoted or cited in the text, but they are listed in an appendix. It should also be said that not a lot of time was spent in reading. I chose, for example, not to conduct research into Russian legislation on environmental impact assessment as it relates to the introduction of new-generation reactors at sites already licensed for nuclear use. The governing intent has been to bring the big picture into focus, to see what can be accomplished with the notion of conditionality, and to avoid

getting caught up in particular requirements which may not be of interest to the parties to a Multilateral Agreement on disposition of the Russian excess.

### 1. The Case for Conditionality

To be clear about some basics, in September 2000 the Russian Federation and United States signed an agreement on mutual disposition of weapon-grade plutonium, this after about four years of negotiation. Further to the September accord, they and other parties (donors and potential donors) have been engaged in various working groups and bilateral conversations on technical and financial arrangements which are to be integrated in a multilateral framework agreement on disposition of the Russian excess. The G-8 Foreign Ministers, meeting in Whistler (British Columbia) in June 2002, instructed negotiators to complete this agreement in 2003. It may depart significantly from the provisions of the September 2000 accord, which therefore would have to be revisited. A multilateral agreement will also depend on the outcome of diverse talks in diverse places which address the troublesome question of liability, an international monitoring and inspection regime for both Russian and U.S. disposition which includes the IAEA, and the establishment of an entity to manage the disposition programme. At some point, all of this will come together in a final package of measures which, given the necessary approvals and appropriations, will open the way to licensing and the start of years of construction in Russia, after which the first amounts of WGPu will be processed.

So the array of concerns, talks, and accords includes: (1) the Russian-U.S. Agreement of 2000; (2) an impending agreement on liability; (3) the trilateral monitoring and inspection agreement, (4) an agreement on management of the programme; (5) a multilateral agreement between donors and the Russian Federation on technical and financial arrangements for disposition; and (6) everything taken together and closely integrated in a fully funded and ratified deal.

To avoid confusion in what follows, let us refer to the September 2000 treaty as the Agreement, to the integrated technical and financial arrangement for Russian disposition as the Multilateral Agreement, to the varied other instruments as agreements, and to the final ensemble of authorized and financed instruments as the Deal.

If conditionality is to be part of the overall endeavour, where in the sequence (1)-(6) is it best addressed? The answer offered in this study is principally at points (5) and (4), in working out the Multilateral Agreement and the management entity.

A condition is a requirement that's attached to an understanding or to a material contribution to a joint venture. A condition may be set for many reasons. Normally it is to provide a greater degree of confidence than would otherwise be had in the performance of others and their compliance with our expectations and needs. This basically has been the approach of those who raise the issue of conditionality in the context of international support for Russian disposition. The aim is to gain and then act on the agreement of all concerned to make their cooperation dependent on certain requirements which protect the interests of each and ensure the success of collective action. Conditionality is therefore not to be confused with earmarking. Under the latter regime, individual parties are free to tie their contributions to a basic option (for example, to work only on immobilization), to a particular activity in the recipient country (as in

limiting support to MOX fuel fabrication), to the participation of a particular industry in a donor country, or for that matter to the expenditure of the donor's contribution in the donor country only.

Although a practice of conditionality could yield a lengthy list of performance criteria, the expectation here is that the parties will insist on essential matters only. They will refuse to jeopardize the negotiation of a Multilateral Agreement by entertaining any discussion of peripheral performance requirements. That said, prudence demands an effort by all to ensure that disposition activity in Russia conforms to appropriate nuclear-safety standards. The need for standards to be met also applies to environmental protection. In the Canadian case, for example, the law requires that projects to which the Federal Government is party within and outside Canada be subject to a strategic environmental assessment (CEAA, 2000). As well, basic international security policy, to say nothing of the September 2000 Agreement, dictates that disposition of excess Russian WGPu be done in a manner that is assuredly irreversible. A trio of conditionalities should meet the needs of donors who would not only achieve a Multilateral Agreement but see that it performs as intended well into the future. But there is a problem in leaving it at this.

As currently understood, conditionality risks being treated as an add-on or afterthought to the main business, which is the business of getting to yes. To the degree that the imperative is to deliver the Multilateral Agreement, the parties are not going to have a lot of patience for add-ons which, by definition, have had to wait until most everything is worked out. And when closure is in sight, willingness to open up new lines of discussion will be even harder to find. What's likely to suffer in all of this is long-term sustainability. The problem here is shared by all parties.

### ***Sustainable over the Long Haul***

Disposition is an endeavour of such magnitude, complexity, and duration that the commitment of the parties at the moment of achieving the Multilateral Agreement, or later the Deal, is highly unlikely to drive implementation forward as desired over a period of decades. After all, we are considering disposition in a country which presided over the Chernobyl disaster not so long ago, and whose nuclear industry is unreconstructed. This is also a country which recently witnessed an attempt by its nuclear industry (Minatom, or the Ministry of Atomic Energy) to put the nuclear regulator (GAN, or Gosatomnadzor) out of business, and which saw its State Committee for Environmental Protection abolished and incorporated into the Ministry of Natural Resources in 2000. In circumstances such as these it is reasonable to expect controversy in the donor countries as well as the Russian Federation, even disabling controversy, about a plutonium disposition programme in Russia. It is more than reasonable to ensure from the outset that the endeavour is maximally resistant to political attack as well as physical mishap.

Disposition faces us with a situation which is not well addressed with the use of add-ons to a Multilateral Agreement. The dangers it presents could, if they came fully to life, do severe damage to persons, property, and the natural environment in Russia and elsewhere. Short of disaster, an accumulation of minor mishaps could drain international support from the disposition process. After all, donors would pay in annually over a period of decades, rather than up front all at once. Contributions could become a political issue. As well, it's all but certain that the Multilateral Agreement will include a withdrawal clause. Meanwhile, things going wrong at one

point or another are capable of sapping the credibility and sense of worth of those who are operationally responsible for the enterprise many years down the road. It is a paradox that we are talking here about new civil dangers to which disposition itself gives rise in reducing old military threats over what promises to be an unusually long period of time.

Beyond all this there is the potential for a failure of disposition in Russia to deal a blow to nuclear disarmament as such. The two principals currently hold very large amounts of WGPu, some 100 tonnes in the United States and, depending on whose numbers one uses, up to twice that amount in the Russian Federation. For each to disposition 34 tonnes is surely good, but not good enough. The costs, risks, and generally the time and trouble entailed in dispositioning 34 tonnes each would not be worth it if that's all they were to do. But 34 tonnes could be the limit for Russia if things went badly for an international programme in support of disposition there. There is no substitute for doing everything we can now to ensure the Russian programme against adversity in the future.

To address and preempt the long-term vulnerabilities of disposition, a discussion of conditionality should be joined to the negotiation for a Multilateral Agreement.

Conditionality should also be built into talks on the entity that is to manage the programme in Russia. Let's call this the Multinational Management Corporation or MMC. The aim, to be discussed later in this study, should be to institutionalize conditionality in the MMC as the body which directs the work of disposition out to the very end of the job.

As well, we might now identify an alternative, or at the very least a supplement, to the add-on approach. Let us call it proactive conditionality.

### *Thinking Proactively*

Add-on thinking and practice are concerned primarily with achieving an agreement that safeguards one's interests and reputation against future eventualities. The agreement is intended to order the future to the extent possible. Once it's in hand, the parties move on to other matters. If things go wrong in the implementation, everyone is protected, for example by provisions governing liability, taxation, intellectual property rights, or nuclear safety.

This is by no means to suggest that a practice of add-on conditionality is purely self-regarding, or simply a means of minimizing responsibility and the need to remain engaged. Irreversibility, for instance, is and will continue to be viewed as vitally important by all concerned. They can be expected to monitor performance out to the last kilo in seeing to it that dispositioned WGPu is not returned to military use.

Nevertheless, under an add-on approach to conditionality the parties do not start with an agreed set of criteria and then evaluate the technical and financial options accordingly. Instead, hardware and money matters tend to drive a discussion that is only secondarily modulated by safety, environmental, or irreversibility criteria. The parties proceed pragmatically. They ensure that the work of disposition meets various conditions which are alluded to as the need arises, but without formal consideration of each separately or of interconnections and priorities amongst them. Indeed, this is pretty well the way things are normally done in multilateral negotiation. But international support for disposition of excess Russian WGPu is not a normal undertaking.

Rather than attempt to make add-on conditionality into something more systematic, we are better advised to see what might be done with an alternative approach.

Proactive conditionality is performance-oriented. It is keyed not so much to the elaboration of agreement, but to envisioning and addressing the conditions in which agreed measures are likely to be implemented. It's heavily contextual. It directs attention to the circumstances in which disposition is to be done, as distinct from the work of disposition itself. It aims not so much to protect the parties as to see to it that collective action is a success. Proactive conditionality is thus more strongly future-oriented than add-on thinking and practice. It urges that downstream considerations which bear on the potential for performance failure be fully incorporated into the bargaining process here and now.

Basically, therefore, we are talking about evaluating alternative approaches to reactor-based disposition in the light of long-term sustainability criteria. This indeed is something the present paper will try to do. That said, let us cut short any further conceptual discussion and instead turn to what a proactive approach might do for us where nuclear safety and environmental protection are concerned.

Two main benefits stand out. They are interrelated. The first is to alert us to hitherto unexamined sources of surprise and accident in the work of disposition. The second is to assist Russia in becoming an equal partner in a programme which must seem intrusive and discriminatory.

A concern for proactive conditionality moves us to ask why a long-term perspective on nuclear safety and environmental protection does not feature more prominently in the discourse on disposition of the Russian excess. The answer is that there's a bias in the prevailing intergovernmental approach. It is to a nuclear-industry view of things. The bias arises when reactor processing of WGPu is selected as the prime means of disposition. Convergent economic interests underpin the bias.<sup>1</sup> It makes for overconfidence in the industry's problem-solving capacity. The tendency is to think that safety and environmental standards will be met in Russia, as they are elsewhere, with standard operating procedures.

But Russia rarely presents the standard case. To assume otherwise is to invite misadventure and worse, neither of which do we want in the course of disposition. Both are what a proactive conditionality seeks to avoid by looking hard at the circumstances in which disposition is to be done.

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<sup>1</sup> On the one hand, the global nuclear industry, relevant government departments in the donor countries, and intergovernmental organizations all have an interest in seeing that there's no nuclear disaster in Russia. A positive attitude follows when it comes to helping modernize Russian nuclear technology and practices. Meanwhile, Russia's industry is interested in service-life extensions and new reactors, as opposed to non-nuclear sources of energy or doing what may be most responsible in some cases, which is to shut NPPs down. The combined effect of interests such as these is to move intergovernmental deliberation toward solutions that maintain and upgrade Russia's nuclear industry, which is where disposition is headed. Robert Darst (Darst, 2001) is especially good on the convergence of Russian and donor incentives in environmental cooperation.

What's needed is discrimination. Negotiations for a Multilateral Agreement are biased to a nuclear-industry view, but the industry does not have a single view. On the one hand, there is the can-do, no-problem tendency to minimize difficulty in matters of safety and environmental protection, to fend off views to the contrary, and indeed to stonewall in the face of criticism. But there is another approach. It is concerned more with the marketing than with the production of nuclear energy. It reflects, and acts on, obvious industry interests in an outstanding safety and environmental record. A proactive conditionality will endeavour to work with and enlarge this latter tendency at the expense of the former. It will do so in an effort to proof disposition activity in the Russian Federation against disability and disaster over a period that could be measured in decades. A practice of proactive conditionality, while it runs against the grain of can-do thinking on the use of civil nuclear reactors, is compatible with substantial and indeed heavy reliance on the know-how of the industry in executing a Multilateral Agreement that's fully adapted to Russian conditions.

But what's to be the proportion between donor and recipient know-how and technology when it comes to the avoidance of trouble and disaster in matters of nuclear safety and environmental protection? The question here is about equality in a collaborative venture which cannot but commence in unequal fashion. Might a discourse and a practice of conditionality help the parties to square the circle on a crucial issue such as this?

The donor-recipient relationship starts out as one of inequality for many reasons but in this case it is because the Russian Federation is not up to speed in safety and environmental affairs. That said, let us blow the whistle, take time out, and do a reality check.

Where is the basis for such a judgment? Furthermore, how can anyone speak to, or about, Russia in such a fashion and expect to get anywhere with Russian representatives? If this is where proactive conditionality takes us, isn't it likely to bring on a negotiating disaster all by itself?

A negative assessment of Russia's capacity in matters of nuclear safety and environmental protection is based more on cultural and political than on economic and technical variables. Minatom is certainly capable of self-correction. Its formidable human resources, designers at the forefront, could readily be marshalled in support of safety and environmental-protection priorities. The latest licensing and other regulations that Minatom must follow are evolving and promise to be excellent by world standards. But even if the money were there to make the most of it all, the cultural and institutional preconditions for thoroughgoing nuclear responsibility are lacking and unlikely to appear any time soon if the Federation Government does what comes naturally.

A culture of nuclear responsibility has to be rooted in society if it is to be effective. It's fair to suggest that the roots are not well established in a population which went along with Soviet ways for generations and is now very largely consumed by the need to put a subsistence together. And if the social base for nuclear safety and environmental protection is neither broad nor deep, what can be expected from an industry that survives as a Soviet-style production monopoly? That offers the resistance it does to regulation? That's ready to extend the service lives of even first-generation nuclear power plants? That presides over the environmental catastrophe, to cite but one example, at Lake Karachai (MacKinnon, 2002) near Mayak, where a substantial part of the disposition programme is to be carried out? The short answer to these questions is, first, that



agency for nuclear safety and environmental protection is not what it should be in the Russian Federation, and second that it's up to the donors to satisfy themselves on this matter if disposition is to be sustained. But the Russian side can hardly be expected to welcome such a discussion.

On the contrary, it is very much in the Russian interest to take umbrage when anything disparaging is said about nuclear safety and environmental protection there. Officials need to be offended if they want to minimize foreign intrusion and to maximize national control over a perennial international endeavour that touches directly on highly sensitive issues and promises to run deep into the interior of their country. To the extent that they fail in this and must, as it were, kow-tow to foreigners, Minatom in particular will be taken down a few pegs in the scheme of things Russian. And beyond all this there is national pride, normal concern for sovereignty, deep-seated resentment at the West, and all the rest which may move Russian officialdom to powerful reactions when presented with views that can be interpreted as prejudicial and unjustified. But there's still more to it.

One of those I interviewed at the Kurchatov Institute insisted that the more stable Russia became, the less the United States was willing to pay for disposition of Russian WGPu, and the more it sought to spread the cost of the Russian programme among allies and others. There is surely some truth to this as a reading of the record. As well, there's a hint of the perversity that underlies donor-recipient bargaining over disposition.

To get the money it wants, the Russian side is implicitly encouraged by donors to be a problem, to remain needy and indeed incompetent in some but not to an excessive degree. Moscow, and Minatom in particular, must therefore tread a fine line: neither to be so dependent and unable as to undercut the likelihood of assistance, nor to be so self-reliant and capable as to offset donor readiness to make financial contributions. On balance, Moscow must project real but limited neediness if its WGPu holdings are to be converted into income. Accordingly and to the degree that the profit motive prevails, it is not on for Russian officials to acquiesce in donor comment on Russia's incapacity in matters of nuclear safety and environmental protection. For Moscow to let such things pass without a fight would be to risk enlarging donor perceptions of Russian inadequacy beyond the limits of what's required to produce the Multilateral Agreement and the income stream that is to come with it. The same surely applies to a discussion of conditionality per se.

A reality check therefore suggests that for the parties to bring nuclear-safety and environmental-protection issues to the fore may indeed be to increase the risk of things going wrong in the negotiation of a Multilateral Agreement. And yet, for the parties to mute a discussion of safety and environmental considerations is for them to risk sacrificing the long-term sustainability of disposition to the imperatives of achieving the Deal.

How then is a common interest in sustained disposition to be furthered without prompting Russian negotiators to go ballistic? Here we have a central problem of disposition, and of a conditionality that would support it. The problem is to ensure that everything proceeds as intended in Russia without making either unreasonable assumptions about Russian behaviour in future, or unreasonable demands for change in that behaviour now.

In part, the solution will be found in a dogged effort to negotiate arrangements that meet the legitimate performance requirements of the donor countries and the legitimate needs of the

Russian Federation not to be treated in discriminatory fashion. Part of the solution may also lie in building into the disposition process a progressive handover of control to Russian partners whose safety and environmental practices have become arguably as good as those anywhere. The prospect of near full Russian control over a multilateral support operation could provide an incentive for Moscow to accept less to begin with. The notion of disposition as an equalizing handover is one to which we'll return. But a practice of proactive conditionality should and can do more than encourage us to find means of anger management.

When the notion of conditionality is pressed for more benefit, unexpected understandings emerge which help us to see disposition in new and more productive ways than the standard perspective allows. Disposition ceases to be essentially a multinational collaboration in cost-effective materials processing. It also becomes an exercise in Russian affairs and the political and cultural considerations that matter mightily there. Pressing further, disposition is revealed as an exercise in mutual enculturation in which Russia has much to impart to donors as well as much to receive from them.

The understanding here, which is to be revisited later in this study, comes down to the observation that whereas donor countries may require Russia to change itself in the course of the programme, the donors themselves will also have to change the way they normally do business if disposition is to be sustained in the particular conditions that Russia presents. Specifically, a multinational management entity that's controlled primarily by donor countries to begin with will have to depart from standard international practice quite substantially if disposition is to succeed. Not only will it have to underwrite and build agency for a culture of nuclear safety and environmental care in Russia, but in so doing it will set new standards of best practice for industry and government in the donor countries and globally. Minatom will take small comfort from the prospect of change for the better elsewhere. But the Federation Government may react differently when it's clear that disposition is, and can be presented as, an exercise in which donors and recipient alike are obliged to seek out new and better ways.

### *Contravention*

What then of irreversibility? Not a lot has been said about it so far. This is mainly because it's centred on technical considerations which seem relatively cut and dried, and therefore tractable. There are, however, two problem areas. Both entail extra-negotiatory behaviour which runs counter to irreversibility but is not prohibited. The problem adds up to contravention. It's explicit in U.S. and Russian nuclear hedging, which will be considered in the following section. It is also implicit in the long-term civil energy strategy of Minatom, which aims at increasingly heavy reliance on closed fuel-cycle technology 30-50 years from now (Minatom, 2000). To consider what's at stake in contravention, let us outline the civil-military nuclear issues and then have a look at a view which says there is no real issue here.

If Minatom had its way, by the time that an arduous and expensive spent-fuel disposition programme was starting to make a real dent in 34 tonnes of WGpu, Russia would be getting ready to generate and reprocess tonnes of civil or reactor-grade plutonium (RGpu) for use in commercial breeder reactors. There is nothing illicit in this. But there is contravention. It is slight at present, but it's capable of undermining the disposition process later on. Later on must concern us now.

The contravention consists in proposed Russian behaviour which has the potential to undermine the entire disposition effort by making it look foolish. The foolishness, for its part, consists in the spectacle of donors going to great trouble and expense to assist Russia in reducing one pile of plutonium when all along Russia is preparing to amass another pile which is really not that different from the first.

There is a similarity between WGPu and RGPu. If there weren't an overlap in their properties there would be no talk either of converting WGPu to civil reactor use, or of the potential to generate WGPu in the blankets of civil breeder reactors (Albright et al., 1997, p. 21), or of the fact that all separated plutonium is usable in a nuclear explosive device (DOE, 1997, pp. 37-39; Allison et al., 1996, p. 217, who also cite Mark, 1993; Hinton et al., 1996, pp.4-1 to 4-7). What then could be going on in the mind of the donor country who assists Russia to burn down one amount of plutonium when, towards the end of 34 tonnes of WGPu, Minatom intends to start building a stock of RGPu?

Actually, the situation is even stranger. As matters stand, Russia not only has some 33 tonnes of separated civil plutonium on hand, but adds about one tonne annually to this amount (Rybachenkov, 2001, p. 8; Bunn, 2000, p. 53). If this rate of addition were to persist, then by the end of the 30 or so years from now that could be required to burn 34 tonnes of WGPu, Russia could have accumulated more than 60 tonnes of separated RGPu.<sup>2</sup>

The contravention problem is not that Russia might break out of nuclear disarmament by purifying its RGPu up to WGPu. This would not be necessary since even after disposition of 34 tonnes had been accomplished, 80 or more tonnes of weapon-usable plutonium would still be available for military use (Bunn, 2000). The problem is what the perception of concurrent reduction of WGPu and accumulation of RGPu might do to the credibility and therefore the long-term sustainability of an international programme of WGPu disposition in Russia.

If the Russians are going to build an RGPu stockpile, it has to be asked, why are G-8 and other donors working out a phenomenally intricate and expensive procedure for the disposition of a portion of Russia's WGPu? Where is the cost-effectiveness in this? Instead, why not see to it internationally that excess WGPu is securely stored in Russia for 40 years under IAEA inspection and then hand Minatom the key to the vault on the understanding that the stuff is to be blended down to reactor-grade and used commercially? It may be objected that secure storage is very expensive. But, as matters stand, spent-fuel disposition of 34 tonnes, and possibly of additional batches thereafter, requires secure storage right out to the end of the process even as amounts are reduced. Secure storage costs are not something over and above those that must be met in dispositioning 34 tonnes. They are built into the programme's estimates and, with conversion included, amount to \$600 million of roughly \$2 billion required to implement the Agreement (Joint U.S.-Russian Working Group, December 2001, p. x).

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<sup>2</sup> Furthermore, three RBMK reactors whose energy is needed for local electricity and heating (at Seversk and Zheleznogorsk) continue to produce about 1.5 tonnes annually of WGPu in oxide form (Bunn, 2000, p. 51). The United States has sought and is likely to succeed in assisting Russia to convert these reactors or to provide alternative energy sources. But if cooperation did not work out, and if reactor service lives were somehow extended, Russia could still be producing new WGPu around the time international disposition got under way.

The programme as it stands does not make sense. Russian contravention, and donor acquiescence in it, lends an element not merely of foolishness but of insanity to the Agreement and to an incipient Multilateral Agreement. Sooner or later the insanity will come to light. It will make disposition politically vulnerable and conceivably unsustainable in the donor countries. A disposition process that's disabled or stopped in its tracks, for whatever reason or combination of reasons, is part-way to being reversed. If 34 tonnes goes off the rails, the entire effort to make nuclear disarmament irreversible could be damaged. Contravention threatens irreversibility.

It could be objected that the argument being developed here is ignorant of what irreversibility is all about. When it comes to disposition of the Russian excess, an opposing view might go, irreversibility means ensuring that reactor-based processing of 34 tonnes renders it all but impossible to return to military use. Such a condition is achieved when WGPu is embedded in high-level nuclear waste and subjected to monitoring and inspection by the two principals and by the IAEA. Contrary to what's been said here, making disposition irreversible is nothing more and nothing less than doing what it takes to render a given quantity of WGPu permanently unavailable for renewed use in a weapon. In the Russian case, it could be added, we're talking about 34 tonnes to begin with, and we're doing something about it.

Accordingly, a critic could continue, references in this paper to Russia's recycling plans and to the accumulation of RGPu in that country are simply not relevant in a discussion of irreversibility. Furthermore, he could object to a blurring of the distinction between WGPu and RGPu: the former is vastly more valuable for military use, while large amounts of the latter circulate around the world in various forms and without incident.

My response is that irreversibility is a political as well as a physical outcome. Russia's 34 tonnes can indeed be processed successfully according to physical criteria only. To disposition that amount would be a beginning. We do need to begin somewhere. But, I suggest, the value of a proactive approach is to make us look well beyond the beginnings.

For the donor countries, the beginnings do not promise what they should when the recipient proposes not only irreversibly to disposition 34 tonnes of WGPu containing less than 7 per cent Pu 240, but, before the agreed amount is irradiated, to start generating large amounts of RGPu containing 18 per cent or more Pu 240. Disposition planners and people in the industry may find it easy to draw a sharp line between WGPu and RGPu. Publics and politicians will not. There's a downstream threat to disposition here. It could be multiplied by growing public awareness that all along the fraction of Russia's WGPu holdings that is slated for disposition could have been handled more cheaply and without detriment to international security by storing it under guard and international inspection until needed for commercial use. What then is to be done?

The Russian Federation and the United States could add countervailing provisions to the Multilateral Agreement and to a revised Agreement. Reviving a pre-negotiation which ended in 2000, they might work out a 40-year bilateral moratorium on the recycling of plutonium. Unlikely, it might be said, in view of the current U.S. Administration's energy policy. Or there could be an understanding to leave Minatom's future to market forces, and maybe also to a wager that Russian plans for heavy reliance on MOX will not pan out. This could readily be done. But

it would still leave international disposition vulnerable to political attack on cost-effectiveness grounds in the donor countries.

If all of this weren't enough, when we look beyond the physical dimension of irreversibility and into the political context in which it occurs, we uncover still further vulnerabilities that are better addressed now rather than later or not at all. The question here is whether and to what extent the Deal should be conditional on a supportive Russian public opinion. If sufficient public support cannot be had, donor-country governments and publics could find themselves in an awkward and even unethical position: having long made it their business to promote democracy in the Russian Federation, they could be asked to back the Russian Government against a majority of its own people in the name of international peace and security. If however the Deal were to be made conditional on the approval of the Russian people, the effort to get disposition going could conceivably be stopped in its tracks. Whether the trouble stems from events in Russia, controversy in the donor countries, or a mixture of both, no forward motion for disposition is part-way to a reversal of nuclear disarmament where weapon-grade plutonium is concerned.

The underlying theme of these introductory remarks is that a proactive conditionality is capable of anticipating and reducing safety, environmental, and irreversibility threats to a perennial disposition of excess Russian WGPu which has to move beyond 34 tonnes if it is to make sense. Precautions against foreseeable difficulty can and must be incorporated into a Multilateral Agreement. They should be woven proactively into the negotiation from the start. But even then, Russia is not a place where the provisions of an agreement can in themselves be counted upon to yield intended results. Nor can periodic assemblies in the form of review conferences, especially when the attention of donor governments has moved on to other things, as certainly it will after the Deal is done. What's needed in the years ahead is an enduring presence to guide the enterprise with the needs of conditionality fully in mind.

This study therefore argues that it's absolutely essential to get the MMC or management entity right if disposition is to be sustained. Although the Russian Federation has prime responsibility for disposition activity on Russian soil, donors cannot be expected to give Moscow great latitude in the expenditure of their contributions. Nor of course can they expect to micromanage the action in Russia themselves. As indicated, the parties will instead have to work out an arrangement which transfers to Russia, as rapidly as possible, control over the disposition management entity to a point where the authority of the Federation is fully acknowledged.

In the opinion of one of those interviewed in Moscow, what's important is not so much the specific arrangements that might be agreed and acted upon by donors and the Russian Federation, but the relationships that could come out of the interaction. Before we consider what, beyond the work of plutonium processing, might emerge from an interaction with Russia on our three conditionalities, let's look at the alternative approaches to disposition which are now being put forward for discussion by the United States.

## **2. Reacting to U.S. Positions**

The Bush Administration has reaffirmed U.S. support for the September 2000 Agreement. It has declared its intention to consult with the Russian Federation and concerned allies on more cost-

effective approaches to Russian disposition (White House, 2001). And now, the G-8 have ordered the negotiators to conclude a Multilateral Agreement in 2003. The effort to comply is certain to evoke divergent views. There is, for example, the question of whether on balance to hold to the framework specified in the Agreement, or to try and work out a way that's considerably faster and cheaper. Diverse parties are sure to have diverse opinions on this and other matters. Still, the United States has been and will continue to be the chief provider of direction and money for the programme. Though in the normal course of events a consideration of conditionality might be deferred until the parties were pretty well decided on what it was they wanted, this study is driven by a belief that challenges to the sustainability of the Russian programme are such that conditionality must be brought to the fore now. To begin, this means looking at U.S. positions in a new light.

The United States has invited discussion of several scenarios or alternative approaches in which rate of disposition, type of reactor, and location of particular disposition activity are the key variables. The alternative approaches are these:

- (1) disposition to be done in Russia with four VVER-1000 reactors (plus two in reserve), the BN-600, and BOR-60 all together irradiating two tonnes of WGPu per year (the base case scenario);
- (2) (2a) add three VVER-1000 and irradiate four tonnes per year in Russia; or (2b) obtain a rate of four tonnes per year by irradiating two tonnes in Russia and two tonnes abroad;
- (3) build and operate new reactors in Russia (BN-800 or VVER-1500) at some point in the process, for an annual rate of more than two tonnes;<sup>3</sup>
- (4) achieve an annual disposition of seven to nine tonnes by irradiating the whole lot abroad, including possible amounts beyond 34 tonnes; and
- (5) make a separate and early financial commitment to the construction and operation of a conversion facility in Russia, this to restore momentum to the G-8 disposition effort.

Alternatives (3) and (4) obviously hold the greatest potential to change the programme from what was agreed in September 2000. They are entirely consistent with Article V of the Agreement, which enjoins the parties to accelerate the work of disposition. They are also compatible with the December 2001 report of the Russian-U.S. Working Group on Cost Analysis and Economics in Plutonium Disposition (Joint U.S.-Russian Working Group on Cost, December 2001).

This latter report, it should be noted, cautions against viewing such alternative approaches as anything more than means of bringing out the cost implications of disposition. For our part, we will regard them not as opposed options but as variations on the general theme of disposition which may be packaged, repackaged, and supplemented with still others as the Multilateral Agreement takes shape. Let us see how the U.S. variants fare when we view them through the prism of conditionality and what makes for and takes away from long-term sustainability.

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<sup>3</sup> Construction of a BN-800 was withdrawn from further consideration following a report (July 2002) on the option from the Joint Russian-U.S. Working Group on Cost Analysis.

## *Irreversibility*

Plutonium is inherently restless. It cannot be sent to the heavens. Nor do we have the means to lay it to rest on earth. Any degree of finality is hard to come by in handling plutonium in the here and now. As we've seen, irreversibility is less exact than we might desire as a criterion for WGPu disposition, and for discrimination among varying approaches to the work of disposition. Still, let's see what can be done with it as the first of our three domains of conditionality.

Taking irreversibility as a physical process in which WGPu is dispositioned to the spent-fuel standard in reactors, alternative U.S. approaches (1)-(4) are virtually indistinguishable. They all serve to embed what was once WGPu in a nasty matrix akin to that ordinarily produced by light-water reactors. Approach (5), while useful as a first step, does not take us far on the road to spent-fuel disposition. On this reading, irreversibility would seem to be of little or no use in selecting for long-term sustainability.

With an understanding of irreversibility that's political as well as physical, we do gain some leverage in sorting the variants proposed by the United States. Item (5), early commitment to a conversion facility in Russia, acquires special significance in dealing with contravention in the form of hedging.

Nuclear hedging presents a powerful challenge to the irreversibility, and hence the sustainability, of disposition. As currently maintained by the United States, about whose activity more is known, the hedge consists of a reserve of warheads and pits sufficient for the rapid regeneration of a Cold War strategic force posture (Cochran, et al., 2002; Kristensen, 2001). Specifically, if the United States were to reduce to roughly 2500 deployed strategic warheads (the Strategic Offensive Reduction Treaty maximum of 2100 operationally deployed plus about 300 on SSBNs undergoing maintenance and the like at any given moment), it would also maintain an active responsive force of something like 2500 replacement warheads, an inactive reserve of a further 2500, and 5000 replacement pits for the active and inactive reserve combined. A total of up to 12,500 plutonium pits is therefore to be retained by the United States against a future need to reverse course and rebuild strategic offensive forces without delay.

Viewed from Moscow, Washington is seen to maintain the option of breakout from nuclear disarmament. Russia, or so goes the argument in Moscow, has no alternative but to maintain a hedge of its own, albeit one that's less imposing than the American.<sup>4</sup> Whether the Russian Federation is indeed set on maintaining a substantial option for breakout into the indefinite future cannot be said. At a minimum, Moscow will surely need the capacity to react to a Chinese response to a U.S. missile defence programme. In any case, there's no Russian denial of Russian hedging. Russia's reserves of military plutonium could be used to generate a force of 20,000 nuclear weapons (Bunn, 2000, p. 54). Improbable, certainly, but the potentiality is there.

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<sup>4</sup> Officials say that Russia's economic condition and industrial base make for a less than impressive capacity to go into reverse and rebuild strategic nuclear strength. One put Russia's operationally deployed strategic warheads at 1600 and declining because of a persistent inability to do the servicing required every seven or eight years. Mention is also made of the relative ease with which the United States could reload Trident and the B-1. See also the commentary in Bukharin, 2000.

Hedging is licensed reversibility. The two principals have declared it a key objective "to reduce irreversibly stockpiles of weapon-grade plutonium from each side's nuclear weapons programs" (Agreement, 2000). They are also maintaining an ability to resurrect very large strategic forces. As political goals, irreversibility and hedging cannot be reconciled.

Against this view it could be argued that the principals have committed themselves to the disposition of 34 tonnes each, and that there's no hedging of their legally binding obligations in this regard. One thing at a time, it may be said. We have an opportunity to begin disposition. Let's do it and not constrain ourselves with extraneous matters.

My response is to say that even this beginning could take decades to complete. All the while, the hedging behaviour of the two supplier countries would leave the programme open to derision and attack, especially if things went wrong in other domains of conditionality.

In the long haul, either disposition lives with reversibility and therefore with a threat to sustainability, or Russia and the United States cut the hedge. As for the short haul, why should anyone put much into a Multilateral Agreement that aims to make disposition and nuclear disarmament irreversible when the two suppliers of WGPu all along reserve the right to go full into reverse? Of course we all need to make the best of things. But the right to go into reverse makes a mockery of irreversibility. It is almost as though the two suppliers were seeking the help of others in the disposition of surplus WGPu and process waste while they held onto a generous sufficiency of pits for as long as they saw fit.

Left unattended, hedging poses a serious risk to the credibility of disposition today, and to the legitimacy of those who could be running an international management entity for Russian disposition in years ahead. Still, let us be realistic. Hedging will be with us for some time. Parties interested in a Multilateral Agreement are nevertheless in a position to enhance the long-term viability of disposition by encouraging the principals to get started on the process of cutting the hedge. The U.S. proposal to single out a conversion facility in Russia for support by the G-8 offers a point of departure. So also does the Russian-U.S. commitment at their May 2002 summit to set up an experts' group to consider ways of increasing the amounts of weapon-useable fissile material to be committed to disposition. Conversion should surely be part of the discussion here.

The most direct way to reduce hedging is to start moving reserve pits and subassemblies into a dismantlement facility and then to conversion. The same applies to inactive reserve warheads, and to elements of the active reserve, which would be moved to the inactive. A growing number of warheads and pits would thus be set in slow motion towards conversion, and thus to declassified forms and permanent IAEA inspection as added impediments to reversibility.

In considering the U.S. proposal to make a down payment now on a conversion facility in the Russian Federation, the G-8 have an opportunity to broach the issue of hedging and the risk it poses to sustained disposition. Given progress in the bilateral experts' group and an endorsement of the U.S. proposal on conversion, the G-8 could announce in 2003 or 2004 that Moscow and Washington had agreed to open talks on verified reductions of strategic nuclear reserve forces and, consequently, on the disposition of specified amounts of WGPu in addition to the 34 tonnes so far committed by each. Meanwhile, the G-8 could act for greater transparency by inviting and assisting the IAEA to establish a global registry of plutonium holdings in all forms.



However they do it, the G-8 have to address the issue of hedging if their sponsorship of irreversibility and, indeed, disposition is to be credible in the long haul.

In addition to hedging, the prospect of **burning down and breeding up** in Russia needs attention. Previously mentioned, let's now call this the B&B problem and consider what an attempt to do something about it might mean for the variants on disposition now being suggested by the United States.

Anything much on the subject of B&B and irreversibility is sure to read like an excursion into theology for those who want to get on with things. My reply is that the proactive disposition planner will try to get the theology right. This is absolutely essential for success in dealing with a Russia which has its own theology. To the degree we fail to get the theology right at the outset, the entire enterprise of disposition is less likely to hold under stress.

The concept of irreversible disposition, and of the spent-fuel standard as a measure of it, originated in a society with excess WGPu and no plans for the civil use of plutonium. Spent-fuel disposition was devised for purposes of national and international security, namely to take military plutonium out of circulation irrevocably. The Russians, for their part, were and are acutely aware of the interaction between military and civil plutonium, and of the potential to use WGPu disposition in creating financial and technological preconditions for greatly increased reliance on civil plutonium towards the middle of the twenty-first century (Minatom, 2000). For Moscow, the chief aim of disposition was and is to make the most of the linkages between civil and military plutonium over the long haul. Consistent with the U.S. aim to put excess military plutonium permanently out of reach, the September 2000 Agreement goes quite far in curtailing and postponing Russia's ability to reprocess spent fuel made from excess WGPu. It also places significant constraints on breeder-reactor use, and on the accumulation of civil plutonium holdings in Russia even after termination of the arrangement.<sup>5</sup> But none of this is conclusive.

Way out there, around 2040, Minatom or its successor could be moving vigorously into an electricity sector based on separated civil plutonium, on the closed fuel cycle, and at least in part on G-7 and other foreign support. If this is what the donors are to assist in, why not say so now and give a hand to Russia's long-term nuclear power strategy rather than curtail it? And if

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<sup>5</sup> It may be useful to make clear what the Agreement does to inhibit simultaneous WGPu disposition and accumulation of RGPu by the Russian Federation. Pu is not to be separated from spent military MOX until disposition of 34 tonnes of WGPu is complete (Article VI, para 2), and agreed international monitoring measures are in place (XIII: 7). Although Article XIII: 6, in raising the possibility of failure to agree on international monitoring, suggests that Pu could be separated from spent MOX by Russia on termination of the Agreement, it would be done with obligatory inspection by the United States. A less wrought-up scenario is suggested by provisions which allow Pu to be separated by mutual assent once the Agreement is terminated (XIII: 5c), although the Federation is to key separation to demand in the civil sector in order to avoid unnecessary accumulation of civil Pu holdings (Joint Statement). Further, if additional amounts beyond 34 tonnes are committed, termination of the Agreement will await disposition of the further amount (XIII: 4), thereby deferring separation of plutonium from spent military MOX. Meanwhile, the blanket in the BN-600 is to be removed in stages, but reprocessing of spent BN-600 fuel containing WGPu is allowed under agreed international monitoring (Joint Statement).

this is not what they want to do, why are the donors holding to the Agreement and its potential to help finance Russia's long-term transition to a plutonium economy? Some irresolution is to be expected in an exceedingly complex negotiation. But this is too much. It needs to be reduced. Otherwise, the core purposes of the Multilateral Agreement and the ensuing disposition programme will be opened to challenge the moment anything goes seriously wrong.

How then might irreversibility be bolstered, if not secured, against Russian contravention with civil plutonium? Three approaches warrant attention. In considering them we start to close in on a discussion of alternative strategies of disposition.

First comes burn-down. Under this approach all concerned would get off the spent fuel standard and part with the goal of "disposition." Instead, the aim would be to rid the world of plutonium through irreversible disposal. This would be accomplished through the development and use of an advanced reactor or reactors that not only burned plutonium down to nothing, but did the same for all spent fuel and nuclear waste. In effect, U.S. variation (3) listed previously would replace the base case scenario (1) and all other variants, but with the emphasis now entirely on burn-down. The whole programme would be focussed on and done in Russia by an international consortium. For as long as it took to do the job (i.e., for as long as uranium fuel was globally economic), large amounts of electricity would be produced. First disposals might aim to begin by 2050. Until then, Russia and the United States would disassemble, convert, and store progressively larger amounts of WGPu under IAEA inspection, as per item (5) on the U.S. list. All reprocessing would cease in Russia, the United States would not begin it, and the two countries which led the way into reliance on plutonium would lead the way out.

Second, we might hold to B&B and base case scenario (1) in the belief that disposition to the spent-fuel standard does indeed provide an adequate measure of physical irreversibility in taking WGPu out of circulation. Under the Agreement, Minatom's plans to increase the circulation of civil plutonium in Russia would be effectively deferred and made conditional on a commercial demand which itself may not materialize. Indeed, B&B could proceed on the donors' assumption that Minatom's strategy for the first half of the twenty-first century is simply unworkable. To speed things along, international cooperation in the development of a new reactor in Russia, as per variant (3), could be folded in at some point, but this would definitely be a thermal reactor and not a breeder. The export-all scenario (4), on the other hand, would definitely be excluded on the grounds of creating a significant new income stream which Minatom could use to accelerate the acquisition of breeders. All in all, the base case scenario would be deemed sufficient in meeting the needs of irreversibility as a physical outcome.

Finally, it is possible to imagine breed-up as a third strategy. In this case it could be argued that civil plutonium in Russia, as anywhere, presents no problem for international peace and security as long as it is properly safeguarded. Quite simply, there would be no contradiction or tension between the reduction of WGPu and the accumulation of RGPu. Nor would there be any Russian contravention or threat to the irreversibility of disposition as a process. The irreversibility mission for WGPu would be spent-fuel disposition and nothing more. In principle, thermal and breeder reactors could both do the job. In practice, breeders would be judged far superior in their ability to heighten the rate of disposition, the interest of the industry in Russia, and international investment and participation including lease or purchase of Russian utilities. Accordingly, breed-up points to the creation of an international consortium to build the BN-800 or an equivalent (and certainly not a thermal reactor), as suggested by alternative approach (3).

This, however, would take time. Rather than get going on disposition by starting with the Agreement as it stands and then building in a new breeder, the strategy could start with the export-only variant (4) in order to weld new international partnerships and provide Minatom with income for closed fuel-cycle development with foreign participation. The income here could be quite substantial if Moscow carried on past the 34<sup>th</sup> tonne. This it could do without negotiating an equivalent increase in U.S. disposition, since the Russian Federation holds greatly more WGPu than the United States to begin with.

In my view, all three of these approaches or quasi-strategies have problems in meeting the challenge of irreversibility. In their different ways they leave the fundamental rationale of disposition open to question and attack. They all therefore fall short in making disposition sustainable over the long haul. Burn-down is way ahead of the prevailing imagination and political will. Although it and disposal as distinct from disposition are the best way to go, an abolitionist approach will not be taken up any time soon. B&B strives manfully to resolve the dilemma of disposition. But it leaves Russia with a Mixed Oxide Fuel (MOX) fabrication facility, reactor life-extensions, and with an income stream for use in converting to breeder reactors and reprocessing as disposition proceeds. Breed-up, for its part, cannot surmount the cost-effectiveness deficit it shares with B&B. But the deficit in this case is larger. Whereas B&B endeavours to limit Russian contravention, breed-up sees no problem. It would have donor governments spend public money now on MOX export and a new Russia-based breeder to disposition one and possibly more batches of Russian WGPu, even though the stuff might more cheaply and easily be converted, stored, and then freed up when Russia was ready to make commercial use of it. Still, the effective choice is between B&B and breed-up. Both are orientations which leave disposition more or less vulnerable to criticism on cost-effectiveness, therefore more or less reversible, and hence not as sustainable as needs be over the decades.

Basically, what separates B&B from breed-up is attitude toward civil plutonium. B&B is hostile to it, principally on grounds that greater reliance on plutonium world-wide makes for a greater risk of nuclear proliferation.<sup>6</sup> Breed-up is plutonium-friendly and not greatly concerned with the risk of civil plutonium being turned to illicit military use. Whether reliance on civil plutonium is a problem or not is a matter of belief and, indeed, theology.

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<sup>6</sup> Thus far this study has said nothing about non-proliferation. It is the view here, definitely a minority view after 9/11, that the disposition of excess Russian WGPu figures directly in nuclear disarmament but does not offer any major means against nuclear proliferation. A disposition programme that takes decades to process even a portion of Russia's WGPu holdings is not greatly useful in stemming the leakage of Russian nuclear materials to potential nuclear-weapon states and terrorist networks any time soon. The prime non-proliferation need is to secure Russia's plutonium and other fissile materials in short order, not to seek major relief in a perennial WGPu disposition programme which could find itself without a mission if Russian control over its inventories should increase substantially, as we hope it will. The majority view of course sees it necessary to begin somewhere and to get some WGPu dispositioned irrevocably, irrespective of Russian intentions to accumulate RGPu. But today's most urgent need is MPC&A. If disposition can also be used to enhance Russia's commitment to MPC&A, for example under Article XIII: 5D of the Agreement, so much the better. Better, too, if disposition as a public works programme helps to keep Russia's nuclear know-how constructively engaged.

How then are we to proceed? Do we on balance hold to a prejudice against civil plutonium and Russian contravention? Or, in pursuit of faster and cheaper arrangements for physical irreversibility now, do we join Minatom in using the disposition process to ease Russia's way into the closed fuel cycle, thereby opening the programme to attack and reversal on cost-effectiveness grounds? In my view a significant but incomplete bias against breed-up is pretty well the best that can be achieved for irreversibility in a Multilateral Agreement. Far better this than underwriting breed-up by going all-out for items (3) and (4) on the U.S. list of alternative approaches.

Note however that we've uncovered something of a contradiction between irreversibility of disposition as a political process and cost-effectiveness of disposition as a physical process: getting the job done as fast and cheaply as possible may increase the vulnerability of the enterprise in the long haul. We'll return to this when we look at the situation within Russia. But now let's move on to nuclear safety and environmental protection as further expressions of a proactive conditionality that aims to ensure the long-term sustainability of disposition. Interestingly, an emphasis on safety and environmental consideration favours the breed-up tendency in the U.S. list.

### *Safety and the Environment*

Where irreversibility is ordinarily the preserve of politicians and attentive minorities until the media enter the picture, nuclear safety and environmental protection are issues-areas in which local and mass politics is more the rule. Considerations of safety and the environment may also be difficult to separate when civil nuclear activity is in question. Nevertheless, efforts on behalf of nuclear safety are likely to be keyed to technical reliability, process robustness and ability to withstand shock, and to standardized human performance. Action for environmental protection, on the other hand, will be based on considerations of ecosystem viability, design of human contrivance for minimum impact, and reliance on the precautionary principle which enjoins restraint when consequences cannot adequately be foreseen. Activity in both issue-areas, when fully developed, is not only well institutionalized but embedded in an enabling culture.

Donors need to be open to persuasion, but as indicated it is an initial supposition of this study that a culture of nuclear responsibility is not well established in the Russian Federation. Donors concerned to ensure the long-term sustainability of disposition should therefore seek to satisfy themselves on such matters in a civil discussion with their Russian counterparts. Again, to urge this kind of conversation is in no way to detract from the achievements of Russian science, the ingenuity of Russian engineering, or the diligence of individual nuclear operators. It is instead to say that donors owe it to themselves, to the programme, and ultimately to Russia to scrutinize the conditions in which disposition is to be done. Fail-safe engineering and exacting regulations are certainly to be relied upon, but only so far in Russia, as anywhere. Ultimately Russia's need is not unlike that of a market or a democracy that works well: success depends heavily upon the diffusion of values, knowledge, and shared understandings which all incline the individual to act to best effect. The richness of Russia's human resources bodes well in this regard, and yet the broad outlook is unpromising for a country whose aging population could decline by 30 per cent to around 100 million by 2050 (Feschbach, 2001, p. 16).

As of now, donor governments need to ask the Russian Federation to excuse them for asking impolite questions about Russia's internal affairs, and then go on to ask questions in order

to be assured about the long-term prospects of the programme. As well and until persuaded otherwise by the Russian side, a skeptical attitude on matters of nuclear safety and environmental protection is appropriate in structuring donor choices among alternative approaches to disposition.

To keep things simple, we might think in terms of four criteria: fewer, faster, newer, and foreign. The fewer of the several steps of disposition that are taken in Russia, the better owing to the diminished likelihood of something going wrong. There is nothing discriminatory in this: a similar criterion would apply to any country faced with risk in hosting a major multilateral venture. Secondly, assuming that the work of disposition conforms to appropriate standards, the less time that's taken at it, the less the opportunity for accident and misadventure. Third, given the present state of Russian nuclear technology and regulatory practice, the newer the technology and the standards to which it must conform, the greater the assurance that disposition will not be met with major safety and environmental problems. Where "foreign" is concerned, the criterion has two aspects. On the one hand, the more of the disposition process that's done outside of Russia the better, since nuclear safety and environmental requirements may be looked after better in richer jurisdictions elsewhere. And by the same token, whatever the portion of the process that's done within Russia, the more vigorous the foreign participation, the better the outlook for safety and the environment.

Measured by these standards, export-only (4) is the best of the alternative approaches suggested by the United States and the base case scenario or existing Agreement (1) is the worst.

Export-only wins out on all criteria. Only two phases of the disposition process, conversion and MOX fuel fabrication, would be done in Russia (although spent fuel would no doubt have to be returned). Substantial foreign reactor capacity would be harnessed, thereby significantly shortening the mission of conversion and fuel manufacture in Russia, and narrowing the window for accident. The technology used in Russia, essentially for fuel fabrication, would be new and therefore more likely to be safe than when existing Russian capability was also adapted to new needs. Finally, substantial foreign participation in the processing of WGPu within as well as outside Russia would make for more sustainable practices and standards than could be had with approaches to disposition that relied primarily on autonomous Russian activity.

Comparatively speaking, the Agreement is poorly crafted when it comes to nuclear safety and the environment. All phases of the disposition process, and the vulnerabilities which accompany them, occur within Russia. Requiring a relatively lengthy period to complete, the process would also hold the window open longer for things to go wrong. As well, it would rely heavily on existing Russian reactors. This includes the BN-600, to which Minatom gives a clean bill of health (Minatom, 2000), and which others view as the site of numerous sodium fires (Yablokov, 2000). Foreign participation could however yield some safety and environmental benefits in fuel fabrication and reactor conversion. Moving to four tonnes per year, either in Russia or with half exported, does not alter the picture in a major way, particularly when 2+2 exported is not greatly cost-effective (Joint Working Group, December 2001). Four tonnes annually in Russia nevertheless seems more risky than 2+2.

Accordingly, the Agreement needs strengthening for greater nuclear safety and environmental protection and, thus, for greater long-term sustainability. Reliance on an international management entity to intensify foreign participation in all phases of the disposition

process in Russia could be part of the answer. Some of the answer could also be had in maximizing foreign participation in alternative approach (3), the construction and operation of a new reactor in Russia. In this case the Agreement would be altered to allow for the introduction of new LWRs at some point in the process.

What then of the safety and environmental effects of (3) as it concerns a new breeder reactor? Three variations stand out. The first would in effect put WGPu disposition on hold until a Russian reactor had been built. Done in Russia mainly by Russians, as with the BN-800, could be one route here. The BN-800, however, is the BN-600 writ large. As such, it could present substantial and avoidable risks to safety and the environment in Russia, which is to say nothing of the impression its business plan might create (Kuznetsov et al., 2001). Perhaps therefore the Agreement would better be put on hold to allow for an international consortium to develop, build, and later to operate a new breeder in conformance more with global than Russian standards. Or, in a third variant, and like a new LWR, a new Russian-designed breeder could be internationally built for introduction into the process envisaged under the Agreement. This would be done to make the Agreement more cost-effective, more appealing to more participants, and, owing to enhanced foreign participation, more benign in terms of safety and the environment than if Minatom were left to its own devices.

This said, variants of approach (3) are deficient in comparison with the export-only (4) alternative that's suggested for consideration by the United States. After all, if we focus tightly on nuclear safety and environmental protection, and if both fare better when less is done in Russia, why take a single step beyond fuel fabrication when foreign reactors are available to do the main part of the job in getting to the spent-fuel standard?

So as not to leave a false impression about the export-only alternative and, by extension, all the others, we should note that confining disposition to disassembly, conversion, and fuel fabrication in Russia still requires industrial activity on a very large scale.<sup>7</sup> Over and above MOX fuel fabrication, imposing volumes of nuclear-materials transportation and storage would have to be handled without mishap for all steps of the process within Russia's frontiers including storage of returned spent fuel until reprocessing could begin. The point here cuts two ways: not only is doing everything in Russia, as the Agreement requires, more problematic than it should be for safety and the environment, but even the alternative that's most elegant for these purposes still offers plenty of scope for things to go off the rails.

To begin to order our findings up to this point, nuclear safety and environmental protection correlate strongly and positively with approaches which aim to increase the cost-effectiveness of spent-fuel disposition beyond what can be done under the Agreement. When Russia's reactor deficit is countered by the export of its excess WGPu in MOX fuel or, to a lesser extent, by the introduction of new internationally sponsored reactors, nuclear safety and the environment within Russia naturally benefit. Whether new reactors ought to be burners or

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<sup>7</sup> If fresh military MOX is 5 percent WGPu plus up to 12 percent blend stock, disposition at a rate of four tonnes per year would require an average annual production of 80 tonnes of fuel. Add cladding and fuel assemblies, and annual production in Russia would be about 120 tonnes. Then increase the average yearly export rate to eight tonnes, and gross annual production rises to 240 tonnes.

breeders seems to be less immediately significant for safety and the environment than the breadth and penetration of foreign participation in the work of reactor-based disposition in Russia.

To ensure the long-term success of disposition against nuclear-safety and environmental vulnerabilities, it is therefore desirable to move as much military MOX as rapidly as possible out of the country, or to move substantial amounts of foreign technology and practice into Russia so as to improve on the indigenous capacity to get disposition right. All of this sounds rather like striving to protect disposition against environmental and other hazards. Still, if disposition is not to be disabled by catastrophe or cumulative harm, the parties will have to attend to environmental and safety needs in Russia very directly.

Even if other approaches have superior nuclear-safety and environmental-protection potential, might we nevertheless improve on the Agreement while continuing broadly to rely on existing Russian reactors for comparatively slow rates of disposition? Part of the answer is already before us. It's there as a counterpoint to what's been said about the export of Russian WGPu to another jurisdiction or jurisdictions which are better equipped to handle MOX. The answer is to address Russian safety and environmental problems at source. This the donors could do by treating disposition as an opportunity to export best international practices, and to transfer them to a Russia that's in need. Quite a lot will be said about this when we turn directly to the scene in Russia. Suffice it for the moment to suggest that significant gains for environmental and nuclear safety in Russia may be found in the design and operation of an international management entity that's to be part of the Multilateral Agreement.

But still, why attempt to do anything much with the Agreement as it stands when it's clear that significantly more cost-effective variants promise more for nuclear safety and environmental protection in Russia? The answer is that the Agreement is better than the alternatives when it comes to irreversibility, and irreversibility trumps nuclear safety and environmental protection. Though all three domains are complementary, if basic international security requirements are not well met there would be little reason to carry on with the design and operation of a disposition programme, whatever its safety and environmental promise.

### *Points Toward a Strategy of Disposition*

Certain of the U.S. approaches to disposition, such as export-only or reliance on new breeder reactors, are more cost-effective than the Agreement as it stands, but also promise to underwrite Minatom's nuclear fuel-cycle ambitions. If acted upon, they would accentuate the B&B problem. Before donors acted upon these alternatives, they would have to explain why they weren't instead helping Russia to convert and store its military plutonium under IAEA control for blend-down and commercial use many years in the future. No good explanation could be found, aside perhaps from the assertion that Russia would not accept the loss of income and political leverage entailed in going to powder and, in effect, to partial immobilization as distinct from reactor-based disposition. But then it would become clear to all that the donors were going along with an accentuated B&B approach owing to the insistence of a Russia that wanted to apply income from the disposition of military plutonium to the accumulation of civil plutonium. It might even seem that in going along with an accentuated rather than a lessened B&B approach, donors were yielding to extortion by a Russia that aimed to have things both ways: to join in

good works of nuclear disarmament that should be their own reward, and with the proceeds to build reliance on RGPu.<sup>8</sup>

The Agreement, in contrast, points in the right direction, which is to burn excess Russian and U.S. WGPu down rather than see Russia prepare to breed civil plutonium as it is helped to burn military plutonium. The Agreement rightly aims to defer and restrict Minatom's capacity to accumulate and rely upon civil plutonium derived in part from international support for the disposition of Russian military plutonium.

With this as our judgment, let us gather the main policy inferences which have surfaced thus far. Insofar as the parties have an interest in ensuring the long-term sustainability of disposition against foreseeable physical and political threats to its integrity, sense of worth, and credibility right out to the last tonne, they might in preparing a Multilateral Agreement:

- acknowledge that irreversibility trumps nuclear safety and environmental protection in securing the process of disposition over the long haul;
- affirm and strengthen the bias of the Agreement against closed fuel-cycle development, avoiding the export-all option in particular;
- as per U.S. alternative (5), give priority support to conversion under IAEA verification; make a financial commitment, possibly to cover IAEA verification costs in particular;
- avoid linking disposition excessively to related international security issues, for example to prompt action against nuclear hedging;
- strive to obtain R.F. and U.S. acceptance, even in principle only, of talks for verified disposition of strategic nuclear warheads held in or planned for the hedge, beginning with dismantlement and conversion as per U.S. alternative (5);
- see what can be done to get the R.F. and U.S. to resume bilateral talks to limit the reprocessing of spent fuel, aiming initially at a 40-year moratorium in both countries;
- relatedly and in a variation on U.S. alternative (3) concerning new reactors, explore the potential for long-term cooperation in the development of a new megaburner in Russia to dispose of all plutonium and spent fuel;
- provide for the cessation of civil plutonium separation at Mayak; do the same for continued separation of some 1.5 tonnes of WGPu annually at Seversk and Zheleznogorsk;
- as per U.S. alternative (3), consider adding to the Agreement purpose-built new international LWRs if the R.F. and U.S. agree to a moratorium on spent-fuel reprocessing;

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<sup>8</sup> Extortion is too strong a word. Nevertheless, the Russian nuclear-materials control and civil nuclear power situation is such that others are ready to pay the Russian Federation to make itself and thus everyone else safer. Russia therefore has an incentive not to take as full responsibility as it otherwise might for its own situation. To do so would lower the potential for future subsidy (Darst, 2001). All of this suggests a talent for converting weakness into strength. Horror-show stories about lax nuclear-materials security in Russia help to keep the money coming in. For a good example of the process at work, see Erlanger, 2001, which conveys Russian reports of serious lapses in materials control to readers of *The New York Times*.



- on behalf of greater transparency, invite and assist the IAEA to establish a global registry of plutonium holdings in all forms;
- for reasons of nuclear safety and environmental protection seek, whatever the thermal reactor chosen, maximal Russian assimilation of foreign standards, experience, and technology;
- recognize that when nuclear safety and environmental protection are the main concerns, which is when difficulties with irreversibility have somehow been resolved, export-only of Russian military MOX as per U.S. alternative (4) is the best option;
- regard an international management entity as a key means of ensuring irreversibility as well as nuclear safety and environmental protection throughout the course of the programme in the R.F.; and
- consider making entry of the Multilateral Agreement into force conditional upon a supportive Russian public opinion.

What we have here are indications of an integrated strategy of disposition as prompted by a preliminary discussion of conditionality. This is a strategy which allows long-term sustainability with cost-effectiveness and technical reliability. How a strategy that's inimical to the closed fuel cycle might fare in negotiations with the Russian Federation today, and in the Russian context over a good many years, is our next concern.

### **3. Dealing with the Russian Federation**

To this point we have been concerned with what it takes for disposition to be sustainable over the years. Now the focus shifts to what's needed to make the work of disposition safe for the Russian people and their environment. If things go wrong within Russia, not only will there be deprivation but, once again, disposition will suffer. To protect Russia from threats and losses that could arise from disposition is not unlike protecting Russia from Minatom. We therefore begin with an assessment of Minatom's current situation and prospects. Then we move on to discuss an international management organization as the main instrument of proactive conditionality in the support of donor countries to the Russian Federation.

#### **Minatom in Transition**

The Ministry of the Russian Federation for Atomic Energy is one of the few remaining state monopolies in Russia today. The beneficiary of many advantages acquired in the Soviet era, it is in urgent need of new income. Some in Russia say the industry is dying and will likely account for a substantially reduced share of electricity production, which currently stands at about 15 percent. If this were indeed the future, much of Minatom's talk about 50-year planning and the closed fuel cycle could be dismissed as bravado. Similarly, the B&B problem which so preoccupied us in the preceding section would be greatly reduced if not eliminated when prospects for breeder-reactor development in Russia are diminished or dashed. But the judgment in this study is more cautious.

Minatom is troubled now. It will do whatever it can to survive and prosper without much in the way of handouts from the Federation Government. If this means cutting corners on nuclear

safety and environmental protection, it will be up to Minatom's partners in disposition to insist on the need for care that otherwise is going to be hard to find within contemporary Russia. Nevertheless, the long-term outlook has to be good for a Ministry in which civil and military operations are housed together. Minatom will remain a prime source of international respect and leverage for the Russian Federation as a nuclear-weapons state. Until the economy creates new choices, its civil power operations will be secure against privatization. We are thus faced with a Ministry that's certain to be in some difficulty, and difficult to deal with, for years to come. But it is also a Ministry whose fortunes could eventually rebound.

When it comes to accountability and transparency, Minatom is actually quite untroubled in comparison with its counterparts in the established liberal democracies. After all, this is an old-line Soviet ministry whose closure to society was entirely normal for decades and is bolstered by the need for security and secrecy which still attaches to nuclear affairs. In fact, Minatom is so far removed from operative responsibility to the Russian people that the very mention of accountability and transparency is all but naïve. Why then raise these issues? Obviously because donors to a disposition programme will want to know what's going on. But also because long-term sustainability is involved. Nuclear safety and environmental protection are better cared for when there's a civil society to inform and pressure government about the doings of industry. To the extent that Russia's civil society is not what it might be, it could fall to a multinational management entity to do some of civil society's work in helping to secure Russia against disposition and, consequently, disposition against adversity in Russia.

But before we go any further with this line of inquiry, let us do a quick reality check. In the real world of disposition planning and multilateral negotiation who needs to consider civil society? Is this not an academic preoccupation that has no place in the work for a Multilateral Agreement?

The short answer is that the more information is withheld from civil society, the more difficult it will be for those in foreign jurisdictions to know what is going on. Derogation or denial of civil-society considerations is also indicative of an unexamined bias in favour of the nuclear industry's ability to get things right on its own. As already indicated, this is a bias that makes for surprise and accident. Disposition is done in a context. It cannot override its circumstances, society and customs included. To believe and act otherwise is to ask for trouble, and no more so than when disposition is to be done with international support in a country such as Russia.

Civil society is as an intermediate layer of players, institutions, and activities in the political space between society at large on the one hand, and the state and big business on the other. A civil society was emergent in Russia before the revolution. But that event ushered in a set of rulers determined to eliminate the middle strata and their capacity to resist the demands of socialism. For seventy years public accountability and transparency were nowhere to be seen, nor was anyone accustomed to such things. Now, more than a decade after the collapse of the Soviet Union, civil society and its institutions are rising again, as is the private sector. But civil society has a very long way to go. Consider, for example, the bane of the nuclear industry everywhere.

Environmental and nuclear-watchdog NGOs are something of a novelty in Russia. In recent years their principal issue has been Minatom's plan to make Russia a repository for nuclear waste from abroad. Despite the collection some two million signatures in opposition, the

legislation has been completed in 2002. The public attention gathered by the issue in Russia may also have been something of an anomaly since national interest in nuclear issues seems generally to be waning as the memory of Chernobyl recedes. Letters to the Duma expressing concern about the environment are said in 2002 to be less than one per cent of total mail, down substantially from a few years ago. That the NGOs have a narrow social base is indicated by the fact that national-level organizations tend to be heavily financed by foreign foundations who seek among other things to provide the Russian Government with alternative sources of information. Overall, mass support is lacking for nuclear and environmental groups as long as the makings of an issue are also lacking. Although some local concern does exist (Webster, 2001), disposition is pretty well a non-issue for the Russian public at large and an item of interest to experts at present.

Whatever one's attitude towards NGOs in Russia or elsewhere, a civil society will have procedures which allow citizens to challenge the actions of the state and business in ways other than those allowed by the electoral process. Short on mass support, Russia's environmental groups also face a shortage of enabling institutions in their effort to make Minatom accountable. Use of the Federation's courts to further the public interest in health, safety, and the environment is more promising than we might think, but it requires foreign financial support. As to the regulator, it will be some time before a Russian citizens' group applies, under rigorous pleading criteria set up by GAN, and obtains the right to a public evidentiary hearing at which it can litigate a variety of safety and environmental issues raised by a MOX-related license application from Minatom – for example, environmental-impact issues connected with the risk of a successful terrorist attack at the Balakovo NPP and along the transportation routes. Where things are at today is well represented by a politician who was interviewed in Moscow: the public should be present “as observer” at hearings which are well done when 100 people meet in a room for four to five hours, principally to observe the experts. For those who are aware of the situation elsewhere, freedom of information in Russia is something of a dream. For the vast majority, the thought that ministerial action ought to be transparent seems foreign. As to the media, the fall of the last independent television station to the Federation further constrains the capacity of NGOs to make national issues of things nuclear. The focus is instead on local controversies, for example those associated with rail transport of spent fuel.

All of this is a backhanded way of saying that where civil society and an established culture of civic participation are concerned, Minatom enjoys quite a free hand. But in relation to elements of the Russian state other than the Duma and the courts, Minatom's situation is at once trouble-free and somewhat uncertain: GAN is in no real position to discipline Minatom, but the President is if he thinks it's warranted by considerations of clubworthiness.

Where the regulator is concerned, the relationship adds up to regulatory capture by industry. Certainly this is was the case with the State Committee for Environmental Protection, which now faces Minatom and Russian industry generally as a unit of the natural-resources ministry. GAN, as indicated at the outset of this study, narrowly escaped a similar formalization of the underlying realities. This is in no way to deny the value of GAN's current work in preparing state-of-the-art nuclear regulatory documents with U.S. and European Union aid. Nor should we take away from the Commission's Chairman, who seems to be regarded with respect by concerned individuals outside of government.

The question for disposition is how well the Commission's regulations will be put into effect by Russian industry and its foreign partners. Today, GAN is not really able to insist.

Money is part of the problem, standing is another. Its base budget is such that U.S. aid provides a greater amount. Its inspectors in the field are paid one-third of what equivalent NPP employees receive. Minatom may see to it that consulting and other arrangements provide a supplement to the salary of those who are willing. The word is put out that GAN is corrupt, head office included. As well, while politically driven regulation was the essence of the Soviet order, the idea of an independent regulator has yet to take hold. Note also that as in other countries, senior personnel of the Commission are from the industry and share its culture and standards. For these and other reasons GAN lacks independent status, notwithstanding G-7 intervention on its behalf. Rather like Russia's NGOs, it is obliged to rely on foreign political as well as financial support to have a voice in the country's internal affairs. Some therefore say that Minatom didn't really need to shut GAN down a couple of years ago, and that it nevertheless tried was evidence mainly of ineptitude. Be this as it may, it's hard to avoid the conclusion that GAN as it stands is unable to do greatly more than set safety and environmental standards for a Minatom that retains very considerable freedom of action.

Minatom's problems come not from below or, as it were, from the side, but from want of money and therefore from the unwillingness of the President (to whom we'll come in a moment) to bail the Ministry out. As is well known, an entire archipelago of under- and unemployed personnel and their dependents is in the Minatom's hands. To its credit, it tries to look after its people as best it can. As well, it's determined to protect and if possible expand operations wherever it can. One result is the bizarre transportation activity which would occur under the base case scenario so that disposition can help finance continued activity within the archipelago.<sup>9</sup> More important and less well known is the projection that 19 of Russia's 30 reactors are approaching the end of their service lives and will require replacement, life extension, or shutdown by 2010. GAN notwithstanding, life extensions are part of the plan as Minatom endeavours not so much to prepare for an early transition to closed fuel-cycle technology, but to avoid a massive dieback of generating capacity and clout. Where then is the money to come from?

At present Minatom gains income from the sale of HEU to the United States, and from Nunn-Lugar and related U.S. assistance. It also benefits from the sale of nuclear technology to Iran, which Washington strongly opposes, and to Myanmar. As well, there are sales of uranium and a small federal budget. New income could be generated through WGPu disposition (estimated at \$1.7 billion minimum), the import of spent fuel over which the United States and Canada have substantial consent rights (up to \$20 billion revenue cited in Russian sources), and through increased export of electricity to Europe from the Kola NPP. There is also the potential for investment from Gazprom, which would increase future gas exports by subsidizing civil

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<sup>9</sup> To spell some of it out, metal from disassembly at Ekaterinburg-45, Penza-17, and Zlatoust-36 to Mayak near Ekaterinburg for conversion; plutonium dioxide from the conversion facility at Mayak to the MOX plants at Krasnoyarsk and Dimitrovgrad; depleted uranium from the uranium processing sites to Krasnoyarsk, Mayak, and Dimitrovgrad; fuel elements for lead test assemblies from Dimitrovgrad to Novosibirsk ; VVER-1000 LTAs from Novosibirsk to Balakovo NPP; fresh BN-600 MOX fuel from Mayak to Beloyarsk NPP and from Dimitrovgrad to the same; fresh BN-600 and VVER-1000 MOX fuel from Krasnoyarsk to Beloyarsk and Balakovo; spent BN-600 and VVER-1000 fuel for Beloyarsk and Balakovo to storage at Krasnoyarsk. Total kilometers to be travelled over the life of the programme are mind-boggling. So also is the vulnerability of the base case scenario to transportation accident.

nuclear power (Khripunov, 2001). New revenue could as well be derived from domestic energy sales if natural gas leads the way in being sold in Russia at world prices. Base-case disposition, it should also be noted, would provide six VVER-1000 reactors (four at the Balakovo NPP, and two in reserve at Kalinin NPP) with upgrades, adaptation for MOX use, and a service life of at least 15 years from start-up. Still, it's the spent-fuel import plan that is central to Minatom's survival without major downsizing over the next decade or two. So also is the United States. Indeed, the outlines of a deal could be there in a trade of consent rights for a Russian scale-down in Iran and other considerations including a Russian financial contribution to the Russian WGPu disposition programme. There's a question here that's worth thinking about.

If Minatom's nuclear-waste import scheme has any chance of success, why would G-7 members and others pay now into a WGPu disposition effort which the Russian Federation could itself fund? A donor's answer might be that the scheme is just that, whereas multilateral disposition is viable and should be acted upon now. By the same token, it could be in the Russian interest to close the Deal on WGPu disposition before coming across on Iran and taking in substantial additional income that could arise from the import and reprocessing of nuclear waste. Accordingly, the United States and Canada as G-8 countries with consent rights could at some point make it clear to Moscow that a portion of any income from nuclear-waste imports would have to be applied to the WGPu disposition programme.

While Minatom's bargaining position is not all that great at present, the outlook improves somewhat when we add a transnational dimension. From Senator Domenici in the West to the Japanese nuclear industry in the East, like-mindedness prevails on fast reactors and on reprocessing, if not on Russian MOX exports to Europe as well. The point here is that despite the problem of Iran, there's scope for improved commercial and intergovernmental relations with G-8 countries. Ultimately, however, Minatom will have to go along with what's offered by the United States and its associates. Nor will the offer go to Minatom. It will go instead to President Putin, who is steadily reestablishing the power of the centre in the Russian Federation.

As of early 2002, Minatom had entered a period of political uncertainty. The President, having brought the country's regions to heel, was moving to assert control over the federal ministries and key personnel, some of whom were Yeltsin-era holdovers. In December 2001, Minatom's Deputy Minister had been forced to resign. Whether or not he'd been involved, part of what happened stemmed from a scandal involving corrupt business practices over spent fuel from Bulgaria, information on which had been brought to the centre by an NGO. For a while the fate of the Minister, Aleksandr Rumyantsev, seemed also to be in question, but now he appears to be steadily consolidating his hold on the Ministry even as privatization of other state monopolies continues.

When it comes to nuclear safety and environmental protection we cannot expect anything soon from the Ministry. Rather it will come from Putin's endeavour to make Russia increasingly clubworthy. As seen in his continuing endeavour to improve the Federation's ties with the G-8 as distinct from 7+1, with the European Union, NATO, the WTO, and so on, the President seeks to have his country accepted. Irrespective of who the Russian leader is, and of what Russians think and might want to do about a war in Iraq or the U.S. missile defence programme, being a valued member of key clubs is and will continue to be viewed as essential to getting on in the world. In this regard, September 11 and the ensuing shift towards enhanced cooperation with the United States served to accentuate a preexisting tendency in Russian awareness and conduct.

To be clubworthy is to go by the standards of the club in question. These are largely but not wholly standards of proper procedure. To become a member in good standing is to take such standards to heart, so much so as to become or appear to become different in some significant way. Conversely, not to live by them is to face disapproval, shame, loss of opportunity, and exclusion. Where Russia is concerned, we are talking not only about incentives to behave like a member, but about processes that over time are capable of modifying Russia's identity by making it part of a community of judgment from which it previously stood aside. The word that sums up these processes is enculturation.

It is through enculturation, as well as material incentives, that Russia will come to take more care with nuclear safety and environmental protection (Griffiths, 1996, pp. 36-37). Disposition can be viewed as an instrument of enculturation, in addition to its being a tool of physical and political security. A strategy of sustained disposition will therefore be one of indirection as well as direct action for safety and the environment in Russia. It will recognize that nuclear responsibility is a by-product of larger forces and relationships which are capable of changing Russian procedures and aspects of the Russian identity without making Russians over into Westerners. The strategy will be aware that relationships which are created in the work of disposition may have as much or more to add to sustainability than getting the details of the programme right in the first place. All of this bears directly on what we should expect of the entity that will be required to execute a Multilateral Agreement.

### ***A Multinational Management Corporation***

Left to fend for themselves in today's Russia, nuclear safety and environmental protection as two of our troika of conditionalities would not fare well. Donors cannot therefore be as confident as they should that a disposition programme very largely in Russian hands will bring no harm to Russia. Irreversibility as a third dimension of conditionality could also be vulnerable to environmental or safety mishap or disaster which served to disable the programme as a whole. In no way can we examine even a fraction of all the contingencies in seeking to make the troika fare better. Instead, a broad understanding is required.

From what's been said thus far, three conditions are lacking: a political and also business culture that makes for appropriate care in matters affecting safety and the environment; a forceful as distinct from a hobbled regulator, this even more in the case of the environment than for nuclear safety; and a civil society that's able to make a difference in ensuring that government and business do what's in the public interest as distinct from the interests of a state monopoly. Agency for change is certainly there, but none of these deficiencies is going to be righted in Russia any time soon.

Unless again the Russian side is very persuasive, donors will have to impart needed agency themselves if Russia is adequately to be protected, and if the programme is to be sustained against adversity over the long haul. The best way to do this is with a multinational disposition management corporation, control over which would be transferred to a Russian counterpart entity as benchmarks were met.

Russians do not indicate that they have given much thought to the organization of disposition. When the question is raised, they tend to anticipate an arrangement that's brought into being by international agreement, provides funding for work to be done in Russia, and otherwise leaves implementation to Minatom. Those who've read the Agreement will add that Russia's jurisdiction over environmental and safety matters is explicitly recognized by the United States in Article VIII. In short, Russians are likely to expect and to seek maximal control over all disposition activity occurring within their country. They will not be receptive to proposals which entail intergovernmental intervention in their internal affairs. Nor should they. But, as indicated already, nor should the donors turn things over to Minatom.

How then to persuade the Russian Federation to accept international agency for change in their internal safety and environmental practices, agency required by foreign donors who are determined to act responsibly and with an eye to the long-term sustainability of disposition? The answer is first to redefine the problem. Second, it is to make the solution more appealing.

The achievement of sustained disposition in Russian conditions is best regarded as something more than an international security problem in which states have prime responsibility. As well, it can be seen as a problem of enculturation in which Russia instructs its partners as well as learns from them.

The solution to the problem of disposition understood in terms of enculturation is to be found not so much in intergovernmental activity and state-managed programmes within Russia. The lead goes instead to the best in the global industry acting in the public interest. Specifically, the solution is to be had in multinational commercial management activity which brings about targetted change in Russia's political and business practice. This change, in turn, triggers transfers of control over disposition to the Russian Federation. Use of the term multinational, as distinct from international, indicates that from the outset Russia is a central part of the entity and member of the club, not set aside or standing apart.

If the preceding propositions are accepted, the delivery of disposition should be multinational and commercial. It should serve the public purpose. It should be done by a multinational corporation with an intergovernmental board of directors. An entity something like this has been examined by James Lacy and colleagues at the U.S. Department of Energy (Lacy et al., 2000). Their treatment is an early version among others, but it provides a point of departure for our discussion here. Let's see where it might take us.

A key premise is that governments and officials are not the best source of the judgment and know-how required to manage a complex and extended programme of international support for WGPu disposition in the Russian Federation. A new intergovernmental organization, or one that's added onto an existing IO, wouldn't do proper justice to the design, licensing, contracting, construction, financial, and other requirements. Nor on the other hand would a purely commercial entity contracted to provide disposition management services under a Multilateral Agreement: the work of disposition must also mesh with the nuclear disarmament, nonproliferation, and other shared purposes of the participating governments including, it might be added, nuclear safety and environmental protection. What's suggested as a better course in the Lacy paper therefore is an international nonprofit corporation, which would act as executive agent for the Multilateral Agreement.

We have called this the Multinational Management Corporation (MMC). As we consider it here, the MCC would be responsible to an Intergovernmental Council made up of the donors and the Russian Federation. The Council would meet twice yearly to give direction. It would appoint senior staff including the Chairman of the Executive Board which itself would form the senior management of the Corporation. There would also be a technical and a regulatory committee to advise the Council on request, and to interact with corporate staff. The latter would consist of not more than 50 persons, most of whom would be based in Russia and organized into divisions for hands-on control over various functions from conversion to spent-fuel storage. The MMC would be reasonably independent in exercising its responsibility in all financial and technical aspects of the programme as mandated by the Multilateral and related agreements. Depending on the requirements, Russia's nuclear industry would have priority in the award of contracts by the Corporation.

As a nonprofit multinational management entity, an MMC would have greater all-round credibility and acceptance in Russia and internationally than an intergovernmental organization. Donors aware of the sustainability needs of disposition could find in the Corporation and its Council some of the agency required to see the programme through to success within Russia in the long haul. An MMC that acted as executor of a Multilateral Agreement which the Russian Federation had signed, and was governed by a Council on which the Federation was represented, could also be seen as an instrument of the Russian purpose. For its part, the Federation would presumably set up a counterpart corporation of its own, and/or arrange for Minatom, GAN, and other Russian players to deal directly with the MMC as need be. Taken together, the arrangements within and surrounding an MMC start to look complicated, but surely not overly so. A multinational corporation with a mandate to deliver a public service offers a straightforward means of seeing to it that the work of disposition is done right.

Furthermore, and in contrast to an intergovernmental institution, an MMC should be the preferred instrument for donor countries and the Russian Federation in jointly managing a disposition process which also consists of a handover of control. Such a process could begin with the accent on donor control, produce change in the culture and practices of the recipient which reassures the donor, and ends with an all but complete transfer of control to the recipient.

Transfer of control could be effected in different ways. It might be done by change in the decision-making rules of the MMC's Intergovernmental Council so as to give Russia progressively greater voting weight.<sup>10</sup> Or different functions performed by the MCC, for example specification and application of uniform regulatory standards for all aspects of the programme, could be transferred in succession to a Russian counterpart corporation or to designated Russian agencies. Alternatively, the MMC could be ended and all its functions, less the financial, transferred at one go after the startup of disposition. Whatever the preference, the Multilateral

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<sup>10</sup> The Council would decide by voting weighted according to the donor's financial contribution, and by unspecified arrangements in the case of the Russian Federation. Still, it would be reasonable to expect that if Russia and the United States wanted something to happen, Council would act accordingly. Indeed, proceedings of the Council could be by consensus, which is to say without formal decision. Nevertheless, an increasing Russian vote would increase Russian confidence in things going right in Council. It would also be graphic proof of Russian belonging in this particular club.



Agreement or a separate accord on the management entity would lay out the procedures, benchmarks included, for a transfer of donor control that signified confidence in the long-term sustainability of disposition.

So the vision here is for a management entity which very largely self-liquidates around the time when disposition begins. There could therefore be some small savings in the cost of the Corporation over the life of the programme. Under the base case scenario, all the research and design, licensing and regulatory, and construction work would have been done seven or eight years into the endeavour.<sup>11</sup> Ten years in and thereafter to the end, financial support would still be required, but otherwise disposition would consist very largely of routine Russian processing, transportation, and storage operations.

We could therefore be thinking of benchmarks for full transfer of control over technical matters to the Russian Federation ten years from the start of the programme. To all but get out of business, the MMC would need not only to manage the crucial work of disposition in Russia. It would also have to support the Russian Federation in a decade's worth of cooperative enculturation. This it would do as part of its total effort to run the programme and strengthen it against disability in a setting quite different from that normally encountered by donor-country nuclear industries.

Enculturation, we've seen, results in the acquisition of beliefs and practices which serve to alter one's identity and sense of belonging. Our interest is very obviously not in the enculturation of Russia in general, but in those beliefs and practices which are capable of altering Russia's sense of self for the particular purpose of sustained WGPu disposition. Three broad areas in which disposition could benefit have already been identified: political and business culture and practice; regulation; and representation of civil society in the Russian policy process. There are opportunities for an MMC to make a difference for long-term sustainability in all three. The Corporation would take them up not in a spirit of social work, but in an aggressive effort to create preconditions for its own success.

In the course of a decade or more the MMC's managers should be able to make an impression on Russia's nuclear industry and its values and practices. After all, they would be contracting, monitoring, and consulting on quality and performance evaluations for every piece of disposition-related work. Indeed, the appearance of the MMC on the scene in Russia could mark the onset of a new and exemplary emphasis on international competitiveness in the performance of the nuclear industry there. It could be an aim of the MMC to support the emergence of a strong, commercially-minded Minatom whose success was understood to depend on demonstrated concern for the environment and safety.

Others will know far better than I what should be emphasized and how. Suppose, however, that quality assurance were the key. The message would be evident in the actions of the Corporation's staff. It would go to senior managers in Russian industry, and on down for all aspects of production and service including safety and environmental protection. To the degree

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<sup>11</sup> The mission and character of the MMC would of course vary with the approach taken to disposition: simpler but still fairly imposing if export-only were chosen; more complex and time-consuming if a new reactor were to be built in Russia. For simplicity's sake we hold here to the base case or Agreement scenario.

that the message took hold, new objectives, evaluative standards, and procedures could create in Russian industry a greater sense of affinity, if not community, with best practice elsewhere. Voluntary peer reviews of nuclear safety, for example, could become something of a standard Russian procedure in demonstrating reliability, competitiveness, and identification with global norms of excellence. Of course, one multinational programme and once management Corporation cannot be expected to transform the Russian identity, sense of quality, and understanding of worth in civil nuclear affairs. But to the degree that enculturation in something like quality assurance was successful, the work of disposition would surely go better, Russia's nuclear industry would become less accident-prone, the programme as a whole would more easily be sustained, and Russia would gain higher standing in the nuclear-safety club.

To provide further agency for donor countries on behalf of disposition, the Corporation's terms of reference could also require it to work closely with and to support GAN. An exemplary attitude on the MMC's part over a decade or more should go some way in promoting accountability and respect for an independent regulator within the industry and the country more widely. But there needs to be more of a GAN for the Corporation to work with in the first place. Donors could therefore consider making the Multilateral Agreement conditional on legislation to strengthen GAN's licensing authority, and on a Federation commitment both to increase the agency's base budget and to endow it with political backing for enforcement as well as standard-setting powers on a par with what's found in other G-8 countries. Similarly, donors wanting greater assurance of sustained disposition could well seek an undertaking from the Russian Federation to establish a Ministry, and not a State Committee, for environmental protection.

In addition to continuing efforts on behalf of better regulation, donors and the Corporation as their executive agent would face immediate and precedent-setting tasks which should be provided for in the Multilateral Agreement and related accords. Specifically, are nuclear-safety and environmental-impact assessments to be done for the disposition programme as a whole? Are they to be performed before the first concrete is poured? By whom? With what expenditure of time and money? And whose money? If the goal is simultaneously to protect Russia from adversity connected with disposition and to secure disposition against nuclear accident and political attack, licensing and impact-assessment work will have to be up to the highest standard. If they're not, avoidable difficulty would be sure to follow. But GAN alone isn't fully up to the task. Still less is the environmental-protection office of the resources ministry. Nor would the MMC itself be well suited to the task in view of its mandate to make a success of a given reactor-based disposition programme which others disputed, for example on the safety of the VVER-1000 or BN-800 (Kuznetsov and Slivyak, 2001; Kuznetsov et al., 2001). Evidently it would fall to the Corporation to establish independent international nuclear-safety and environmental-impact assessment panels in conjunction with the relevant Russian regulatory agencies. All of this would have to be sorted out by the negotiators of the Multilateral Agreement in a way that showed respect for civil society as well as government, industry, and the regulator in Russia.

Finally, there's action the Corporation could take to underwrite the capacity of civil society in Russia to voice the public interest in safety and environmental matters. The action in this case ought to be practical and exemplary. It could break the mold for international security institutions.

In the creation of the Arctic Council, an intergovernmental conference of the eight regional countries which includes the Russian Federation and the United States, Canada successfully championed the inclusion of international and national aboriginal organizations as permanent nonvoting participants. The original idea was that collective action is likely to be better adapted and more successful when those most highly sensitized and vulnerable to the consequences of decision are also at the table (Arctic Council Panel, 1991). Since the Arctic Council's establishment in 1996, the Inuit Circumpolar Conference, the Saami Council, the Russian Association of Indigenous Peoples, and U.S. native NGOs have been active and constructive participants. An equivalent practice could be instituted in the MMC for Russian weapons plutonium disposition.

Under this procedure, one Russian and one U.S. environmental/nuclear NGO would each have a seat on the Corporation's Intergovernmental Council, and on its technical and regulatory committees. The NGOs would be selected by their peers in each country. The Russian participant could well be locally based, for example at Ozersk (Mayak). A U.S. NGO would be included to offset the lack of media access for its Russian counterpart and the transnational linkages that operate between national nuclear industries. Private funding would meet all costs of NGO participation including staff, analytical work, travel, and the like. The two NGOs would have full access to the Corporation's information except for proprietary matters not shared among governmental representatives. Formal meetings would not be held without informing and admitting them. Endowed with speaking rights, they would have no voting rights. Perceiving co-optation, not all NGOs would be willing to participate on such terms. Indeed, given international agreement to move ahead with disposition, they would necessarily be present not to undo the Deal, but to reduce the dangers of disposition to Russia and its people. This would surely be a worthy cause. It is also what the Corporation should be doing as it executes the Multilateral Agreement. NGO and Corporation goals could overlap significantly.

Non-governmental participation in an MMC would be productive. Something like it has been done before. It's been done under Russian and U.S. government auspices. It works. The effect in an MMC could be something like having a review team permanently on hand to ask awkward questions about nuclear engineering designs. It wouldn't have to be abrasive. It would help to broaden the range of information available to the Corporation and improve its capacity to anticipate and self-correct. In short, NGO participation in an MMC should contribute significantly to sustained disposition. As well, there ought to be beneficial long-term effects for civil society in Russia. These could redound to the benefit of a disposition programme that carried on over an extended period.

But let's pause for another reality check.

Surely it is counterintuitive to believe that the staff of a disposition management Corporation drawn from industry would see any merit in bringing NGOs into the company, acting to strengthen the regulator, and extending support to civil society. Surely this is not the way things are done, and for good reason. Disposition is a job of materials management. There's engineering in it, but not social engineering. Accordingly, why not simplify the task and develop a management system that's less demanding and more easily negotiated?

Actually, why not forget about trying to change Russia? Why not instead seek substantive goals and concrete outcomes, telling the Russian side what's on offer and not how to

run their business? If this were the way to go, a Russian and not a multinational entity would have the lead from the outset in managing the programme as per the Multilateral Agreement and with active donor-country oversight. Everything from licensing to quality assurance in spent-fuel management would be done by Russian and, as necessary, foreign industry according to donor standards or to standards agreed by Russia and the donors, who either way would pay for continuous or intermittent reviews. Oversight could be vested in an advisory board that included the Russian Federation as a participant observer. Furthermore, a separate panel could be set up to advise the advisory board on the Russian performance in matters of nuclear safety and environmental protection. Or in what would amount to a still more pronounced expression of add-on conditionality, oversight on behalf of safety and environmental standards could be provided under an arrangement negotiated separately from the Multilateral Agreement. Whatever the particulars, donors geared to can-do expectations could find favour with a set-up that gave Russia the lead in programme management.

Almost exactly the opposite is being urged here. Can-do expectations are not warranted in the Russian case. To rely primarily on Minatom and the Federation Government to get things right over the long haul is to court avoidable risk. Not can risk be reduced significantly under a management system that has donors in an advisory position, much less under an arrangement that separates safety and environment from the guts of the programme. Reliance on processes of review is not the way to go in reducing the likelihood of the programme being derailed by events in Russia. Far better to integrate application of standards with hands-on management by means of an MMC that is progressively subject to Russian control. Far better, too, the continuous effort of an MMC to build counterweights to business as usual by developing affirmative relationships with civil society and NGOs as well as regulatory agencies in the Russian Federation.

So, to return to the argument, a Corporation with NGO participation could do a number of things for Russia's nascent civil society and thus for the disposition programme. First, it would constitute a new departure, a precedent-setting demonstration of novel possibilities for citizen action which could be taken up in the handling of other nuclear-safety and environmental-protection issues. Early opportunities for emulation could arise in the event that the Corporation set up international safety and environmental impact assessment panels, or in the establishment of a counterpart Russian Federation entity to interact with the Corporation. However slight the incremental effects, they would bolster values and practices of civil-society participation in what's still something of an authoritarian political culture.

Second, NGO participation could be expected to reveal and help legitimize new means of achieving accountability and transparency in the provision of public goods in Russia. The good in this case would be sustained disposition of excess WGPu. The entity that provided it to the public, the MMC, should be accountable and transparent to that same public in some degree. Secrecy is the enemy of civil society. Glasnost is its friend. The cause of transparency would gain in Russia, however slightly, from NGO access to and ability to disseminate information pertaining to disposition except as constrained by proprietary rights. As to accountability, it should be aided by the precedent of stakeholder representation that extended beyond Russian insiders whose interests and predispositions, if left unbalanced, would surely tilt the benefits and deprivations of the programme against nuclear-safety and environmental values. Again, there's no revolution in Russian culture and practices to be expected here. But NGO participation points in the right direction. It also has potential to provide disposition with a widened social base and greater adaptation to the physical environment.

Although the programme would be far and away the core of the job of those charged with disposition, donors should seize the opportunity for an active engagement with Russia's incipient civil society. But they should be clearly aware of a loose end here. It's the potential for a hostile public reaction to the programme in Russia.

For the G-8 (including the European Union as a non-voting member) to override a Russian majority clearly opposed to the programme would be politically very difficult, if not unthinkable. Dangers of a clear majority against, which are not evident today, arise first from Minatom's and the Federation Government's proposal to import high-level nuclear waste, and second from contamination of disposition with the waste issue. If disposition is to get anywhere, it is vital to decouple it from the waste-import proposal, and to begin doing so without delay.

What's needed is a strategy of reassurance which helps to set disposition apart from past practice and to make it relatively appealing. Everything said thus far about engaging civil society should stand in good stead here: a welcoming attitude to transparency, accountability, and above all NGO participation as proof the new attitude was authentic. Further, it could be well for the G-8, the Federation Government very much included, to acknowledge the potential for a veto of the programme by the Russian people, and to make clear in advance that a regional referendum, centred perhaps on the Chelyabinsk area, would be held if needed. To maximize donor-country and Russian public confidence in the outcome, the vote could be supervised by the G-8 if the Federation agreed. It might agree, since it has taken a position on the waste issue which could affect the decision. Furthermore, given international supervision of a referendum on disposition, the Federation Government itself could more readily campaign for a proposition which has yet to find either a champion or coherent opposition in the country.

#### *Additional Points Toward a Strategy*

Conditionality comes into play when we're leery, when an undertaking seems likely to go wrong or otherwise to fall short of expectation. If leerness is substantial, conditionality should be built into the enterprise from its foundations out to when the job is done. The discussion here suggests that in the areas of nuclear safety and environmental protection, today's Russia, on its own, is unlikely to perform according to standards required by donors. When we multiply this finding by a variable which sums up the extraordinary complexity and duration of disposition, a proactive conditionality seems fully justified. Furthermore, both the job and the situation in which it is to be done are sufficiently unusual, perhaps even unique, to warrant unusual measures in getting things right.

A strategy for sustained disposition might therefore be guided by three principles: indirection, agency, and reassurance. On the first, improved safety and environmental practices in Russia will to some extent be indirectly and informally derived, as well as being the direct outcome of formal prescriptions in a Multilateral Agreement and other instruments. The extent of informal influence is impossible to calculate. But indirection cannot be ignored in a high-content culture in which relationships provide context for calculations of interest. Indeed, as the theme of Russian clubworthiness suggests, a desire for certain kinds of relationships may drive behaviour in its particulars. For example, entry into the G-8 Nuclear Safety Working Group, which is something that Russia has sought as evidence of good standing after Chernobyl (and is now to be

worked out in time for the 2003 G-8 summit), should make for improved safety in the upgrading of the Federation's civil power reactors. More important for our purposes here, enhanced clubworthiness would be the meaning of joint action with G-8 and other participants in an international programme of disposition. Over time, an official desire to reinforce the symbolism of participation could do more for Russian receptivity to best practice than the prescriptions contained in a Multilateral Agreement. Similarly, over a period of years the staff of an MMC could make a significant difference as exemplars of quality assurance and enforcers of high standards of performance as well as process managers pure and simple. In sum, a strategy of sustained disposition will exploit opportunities for working relationships to serve as channels for the transfer of practices and values conducive to greater care in the civil nuclear power sector.

Second, a strategy will strive for long-term sustainability of disposition by imparting agency for nuclear safety and environmental protection to the programme. Aside from affirming that the instrument should be a nonprofit corporation operating in the public interest and staffed by individuals from the industry, only little needs to be added. In a sharp break with past practice in Russia and current practice elsewhere, the Corporation should have an open and friendly attitude to the regulator(s), to civil society, and to the NGO community in particular. Implicit in this statement is the transcultural theme that's already been discussed. Sustained disposition is not a matter of Russians being instructed by others or Russians doing it their own way. A Western-style nuclear management corporation that wants to succeed in unique Russian circumstances will have to do some learning itself. Western and Japanese nuclear industries and governments will need to be more responsive socially and environmentally than is ordinarily the case if a public service of disposition is to be rendered without serious mishap over a period of many years. They will have to do more than put up with the Russian equivalent of what's usually regarded as the opposition in their own countries. They will also have to collaborate actively with the opposition and moreover encourage Minatom to follow suit. Enculturation is therefore a two-way street. It enlarges agency for nuclear responsibility in donor and recipient alike.

As to reassurance, it's vital to a strategy which not only meets donor needs but assists the recipient in complying without being lessened. For the Federation this could be done principally by arranging for a handover of the technical functions of an international management entity as benchmarks were met in the performance of Russia's industry and the regulators. Whether done incrementally or at one go, a future handover of everything but financial responsibility for the programme should provide Moscow with the prospect of renewed control over its civil nuclear affairs, especially when the event could also be read as symbolizing increased Russian standing in a multinational club of nuclear responsibility. For the nuclear industry in Russian, reassurance should consist in having an international corporate and not an intergovernmental management agency to deal with in executing the Multilateral Agreement. But beyond what might be provided to government and industry, the real job of reassurance would be to convey a sense of widened prospects to civil society. In adopting an innovative attitude to NGO participation and the like, a strategy of reassurance would convey a determination to break with past practice. It would break with the perennial denial of civil society by government, with decades of grievous pollution by Russian's nuclear industry, and with anything similar in the plans of government and industry to import spent nuclear fuel. In short, if disposition is to succeed a strategy will be needed that addresses the apprehensions of a Russian public which could block the entire venture.

If we break some of the above into point form, donors and the Russian Federation might consider working together for long-term sustained disposition by drafting a Multilateral Agreement and related accords which:

- create new agency for nuclear safety and environmental protection in Russia through the use of a nonprofit multinational management corporation (MMC) along lines initially suggested for discussion by the U.S. Department of Energy;
- design the MMC to allow transfer to the Russian Federation of all operations other than finance upon the achievement of agreed benchmarks;
- see to it that the MMC is firmly guided by a set of public policy objectives, but is otherwise relatively autonomous in managing the nuts and bolts of disposition;
- state the Corporation's terms of reference to include a mission of enculturation through the transfer and entrenchment of best practices, especially in nuclear safety and environmental protection;
- transfer the successful experience of the intergovernmental Arctic Council by including one Russian and one U.S. nuclear-watchdog or environmental NGO as permanent non-voting participants in the MMC's Intergovernmental Council and advisory committees;
- allow for similar NGO participation on international nuclear-safety and environmental-impact assessment panels convened by the MMC, and therefore with Russian Federation assent, to evaluate the disposition programme as a whole;
- enhance, either through unilateral Russian action or jointly, the authority, budget, and enforcement powers of GAN and a new Ministry of the Environment which the Federation would undertake to establish;
- make clear that a regional referendum, possibly with international monitoring, would be held in Russia if necessary; and
- act vigorously to decouple disposition from Russian plans to import spent fuel.

This is some of what it could take to protect Russians and their environment against hazards peculiar to disposition, and disposition against hazards peculiar to Russia.

#### **4. Findings and Recommendations**

Proactive conditionality can do plenty for disposition. In its drive for sustainability it makes for joint action that's more likely to succeed in the long haul than when the parties' initial concerns concentrate on negotiability, technical robustness, and cost-effectiveness. In the particular case of disposition in Russian conditions, the potential for misadventure and the need to ensure against it demand unusual efforts to anticipate and address contingency. A proactive conditionality assists in moving the parties to question and when necessary to traverse normal assumptions, standard procedures, and even theologies. It opens the way to new departures when they are needed. Beyond this, conditionality is a tool for the design of collective measures, in this instance international support for Russian disposition. It has guidance value in helping us to recognize patterns amidst complexity, to formulate a strategic choice, to select an optimal

strategy, and to structure action to suit. Needless to say, a discourse of conditionality is not conducted in isolation from other instrumental values. Nor does it take precedence over them. But it should be a familiar topic of conversation if we are to avoid trouble down the road and maybe sooner.

### *Key Findings*

Given its complexity, its openness to contingency, cost, unwieldiness, and other features we have come across, the disposition of excess Russian WGPu cannot be called a certainty. This study nevertheless proceeds on the assumption that until we are presented with a better alternative that is or could soon be actionable, we are best advised to hold to the present international effort to support the Russian Federation in a reactor-based disposition of 34 tonnes.

Disposition is a political as well as a physical process. It consists not only in the capacity to make WGPu conform to the spent-fuel standard, but also in the capacity to commit WGPu to treatment in the first place. The capacity to commit, which is political, has primacy. Without it there is nothing to disposition physically.

Of our trio of conditionalities, irreversibility trumps nuclear safety and environmental protection. Disposition is done for international security purposes. Safety and environmental protection are derivative concerns which arise from disposition as a physical act. They do however have the potential to work out very badly for Russians and their environment, and therefore to threaten irreversibility as a political process.

Russian and U.S. hedging contravenes the spirit of irreversibility. It does harm to the integrity of disposition and of those who would contribute to it. Committed and potential donors should consider ways of bringing the two principals to acknowledge the contravention and to start cutting the hedge.

Irreversibility as a political process is also threatened by loss of credibility which stems from contravening Russian intentions to start breeding large amounts of RGPu once 34 tonnes of WGPu are dispositioned and possibly before the job is done. Readiness of the part of donors to accede to breed-up, which is accentuated in certain of the current U.S. negotiating approaches, could yield the widespread perception of G-8 members helping to finance the substitution of one amount of Russian plutonium for another. Breeding civil plutonium later in Russia flies in the face of donor efforts to make the disposition of Russian WGPu irreversible now. Rather than allow disposition to be used in support of breed-up, it's more cost-effective for donors to assist Russia in converting and storing the WGPu until needed for commercial purposes.

If disposition is to be sustained in the long haul, and if the managers of the programme are to have a mission that's widely respected and therefore draws top performers, the Multilateral Agreement will be structured in a way that minimizes subsidy for Russian reliance on breeder reactors and closed fuel-cycle technology.

If a way could be found to reconcile export-only or breeder-reactor approaches with the needs of irreversibility as a political process, sustained disposition would become very largely a problem of nuclear safety and environmental protection. Of the various approaches suggested by



the United States, export-all would be most effective in minimizing safety and environmental threats both to Russia and to sustained disposition.

Approaches to reactor-based disposition that are friendly towards closed fuel-cycle development in Russia cannot however be reconciled with irreversibility without reducing the latter to a physical procedure aimed at making WGPu conform to the spent-fuel standard. If we're determined to safeguard the collective capacity to commit excess WGPu to reactor-based disposition, there is no choice but to avoid procedures which pose safety and environmental dangers to Russians, to their surround, and to the programme of disposition itself.

Agency for nuclear safety and environmental protection is lacking in Russia.

Donors will therefore need to work with the Russian Federation to create new agency if disposition is to be sustained.

Of the alternatives that might be considered, this study finds in favour of a nonprofit corporation which would be handed over to the Russian Federation once agreed milestones had been passed. Subject to the guidance of an intergovernmental council, the corporation would have a number of novel features corresponding to the novel situation in which it would have to work. It would strive to create nuclear-safety, environmental, and social conditions conducive to its own success. It would carry a proactive conditionality forward on behalf of sustained disposition.

Finally, this study finds it necessary to take Russian public opinion into account now if a Multilateral Agreement on disposition is to get off the ground. Specifically, disposition must be separated from the issue of nuclear-waste imports. The circumstances in which the Russian people might in effect acquire and exercise a veto over a Multilateral Agreement, or over the continuation of disposition following an accident, cannot of course be predicted. But the potentiality is there, as is the political and ethical responsibility of donors to defer under certain conditions. Such a responsibility should be publicly acknowledged.

### *Strategy for Sustained Disposition*

Strategies for disposition have not been the subject of international debate. Contrasting views are still to be found on reactor-based and immobilization routes to disposition. But little or no systematic attention has been given to what it takes to succeed in providing international support for disposition in Russia over a period of many years.

A proactive approach to disposition which originates in our trio of conditionalities does help us start grappling with the long view in a substantial part of its complexity. A focus on conditionality generates two strategic priorities and a unifying perspective. By no means do considerations such as these add up to a strategy. But they do impart structure to the situation in ways that open new possibilities to control outcomes.

The first of the priorities is to secure disposition against contravention. Hedging by both principals and closed fuel-cycle development in Russia offer powerful challenges to irreversibility. Future Russian reliance on civil plutonium poses the larger threat. It requires the

parties to draft the Multilateral Agreement so as to confirm and strengthen the bias of the September 2000 accord.

The second priority is to create agency for nuclear safety and environmental protection in the Russian Federation. Conditionality aims to colonize the future to the degree possible. For disposition this means seeing to it now that it's guarded against adversity and moreover is made a success in a period that could be measured in decades. The principal colonial agent of the donor countries and the Russian Federation together should be an MMC. For the Corporation first to be established and then to succeed in the ensuing years, a Multilateral Agreement would have to provide substantial reassurance to the Russian people as well as the Russian Government.

There is no need to add to what's been said about contravention and agency. More interesting is the larger perspective which emerges from an analysis of disposition that's keyed to conditionality. As the puzzle comes together, the underlying theme turns out not to be international security as conventionally understood, for example irreversible nuclear disarmament. This is the distant goal, but the real business of achieving it lies in cooperation and conflict among cultures which treat civil nuclear affairs differently. In its fundamentals, the strategic interaction which makes for disposition of excess Russian WGPu is one of mutual enculturation.

Although there have been indications otherwise, this study has thus far stressed the enculturation of Russia according to the standards of a nuclear-safety club from which it stands apart. The need for agency to transfer standards, practices, and shared meaning to Russia from elsewhere has been a main theme. So also has the Russian desire for clubworthiness. And yet it's also become evident that if best nuclear safety and environmental practices are to be applied in Russian circumstances, these practices will themselves have to be amended. Not only do Russians have something to learn about nuclear responsibility from G-8 and other countries, but the latter have something to learn from an encounter with Russian realities in constructing an approach to disposition that works in the long haul. Together, the participants in disposition can do more than live according to the by-laws of the club. They can improve the club's standards and practices.

The disposition of Russian weapon-grade plutonium offers an opportunity to bring forward new and improved means of international security. We should not settle for less in a Multilateral Agreement. We need a disposition programme that's built to last.

## Bibliography

Agreement, September 2000. Agreement Between the Government of the United States of America and the Government of the Russian Federation Concerning the Management and Disposition of Plutonium Designated As No Longer Required for Defense Purposes and Related Cooperation.

Albright, David, Frans Berkhout, and William Walker, 1997. *Plutonium and Highly Enriched Uranium 1996: World Inventories, Capabilities and Policies*. New York, SIPRI/Oxford University Press.

Allison, Graham T., Owen R. Cote, Jr, Richard A. Falkenrath, and Steven E. Miller, 1996. *Avoiding Nuclear Anarchy: Containing the Threat of Loose Russian Nuclear Weapons and Fissile Material*. Cambridge, Mass., The MIT Press.

Arctic Council Panel, May 1991. "To Establish an International Arctic Council. A Framework Report. Prepared by the Arctic Council Panel." Ottawa, Canadian Arctic Resources Committee.

Bukharin, Oleg, 2002. "A Breakdown of Breakout: U.S. and Russian Warhead Capabilities," *Arms Control Today*, 32:8 (October), 8-12.

Bunn, Matthew, 2000. *The Next Wave: Urgently Needed New Steps to Control Warheads and Fissile Material*. Washington, D.C. and Cambridge, Mass, Carnegie Endowment for International Peace and Harvard University Belfer Center for Science and International Affairs.

CEAA (Canadian Environmental Assessment Agency), 2000. Strategic Environmental Assessment. *The 1999 Cabinet Directive on the Environmental Assessment of Policy, Plan, and Program Proposals. Guidelines for Implementing the Cabinet Directive*. Ottawa, CEAA.

Cochran, Thomas B., et al., 2002. "Faking Nuclear Restraint: The Bush Administration's Secret Plan for Strengthening U.S. Nuclear Forces," *NRDC Report*, February 13, 2002. Washington, D.C., Natural Resources Defence Council.

Darst, Robert G., 2001. *Smokestack Diplomacy: Cooperation and Conflict in East-West Environmental Politics*. Cambridge, Mass., The MIT Press.

Erlanger, Steven, 2001. "Lax Nuclear Security in Russia Cited as Way for bin Laden to Get Arms." *The New York Times*, November 12, 2001.

Feschbach, Murray, "Russia's Population Meltdown," *The Wilson Quarterly*, XXV: 1 (2001), pp. 12-21.

Griffiths, Franklyn, 1997. "MOX Experience: The Disposition of Excess Russian and U.S. Weapons Plutonium in Canada." Toronto, Ignatieff Chair of Peace and Conflict Studies, University of Toronto.

Hinton, J.P., et al., 1996. Proliferation Vulnerability Red Team Report. SAND97-8203. Sandia National Laboratories.

Joint U.S.-Russian Working Group on Cost Analysis and Economics in Plutonium Disposition, March 2001. "Cost Estimates for the Disposition of Weapon-Grade Plutonium Withdrawn from Russia's Nuclear Military Program."

-----, December 2001. "Doubling the Annual Disposition Rate for Weapon-Grade Plutonium Withdrawn from Russia's Nuclear Military Programs: Cost Implications of Specific Approaches."

-----, July 2002. "Cost Implications of Fast Reactor Options in the Disposition of Russian Weapon-Grade Plutonium Withdrawn from Nuclear Military Programmes."

Khripunov, Igor, 2001. "MINATOM: Time for Crucial Decisions." *Problems of Post-Communism*, 49:4 (July-August 2001), 49-58.

Kristensen, Hans M., 2001. "The Unruly Hedge: Cold War Thinking at the Crawford Summit." *Arms Control Today*, 31:10 (December), 8-12.

Kuznetsov, Vladimir, and Aleksandr Polyakov with Vladimir Sliviyak, 2001. "Nastoyashchee i budushchee bystrykh reaktorov. Nekotorye voprosy ekonomiki BN-800" [The Present and Future of Fast Reactors. Some Questions about the Economics of the BN-800]. Moscow, Ecodefense!, available at [ecodefense@online.ru](mailto:ecodefense@online.ru)

Kuznetsov, Vladimir, and Vladimir Sliviyak, 2001. "The Consequences of Using Mixed Oxide Uranium-Plutonium Fuel in Russian VVER-1000 Power Reactors." Moscow, Ecodefense!, available at [ecodefense@online.ru](mailto:ecodefense@online.ru)

Lacy, James L., Nigel Mote, and Art Atkins, February 2000. "Toward a Management Framework for International Support of Russia's Weapon-Grade Plutonium Disposition. Background and Discussion Paper." Washington, D.C., U.S. Department of Energy.

MacKinnon, Mark, 2002. "In the Shadow of Nuclear Catastrophe," *The Globe and Mail* (Toronto), August 12.

Mark, J. Carson, 1993. "Explosive Properties of Reactor Grade Plutonium." *Science and Global Security*, 4: 1, 111-124.

Minatom (Ministry of the Russian Federation for Atomic Energy), 2000. *Strategiya razvitiya atomnoi energii Rossii v pervoi polovine XXI veka* [Strategy for the Development of Russia's Nuclear Energy in the First Half of the Twenty-first Century]. Moscow, Minatom.

Rybachenkov, V., 2001. "Managing Excess Plutonium – A View from Russia." Paper presented December 10, 2001 at the conference on "Addressing Excess Stocks of Civil and Military Plutonium." Washington, D.C., Institute for Science and International Security.

Webster, Paul, 2001. "Russian Critics Fear Plutonium Conversion." *The Toronto Star*, July 19.

White House, 2001. "Fact Sheet: Administration Review of Non-Proliferation and Threat Reduction Assistance to the Russian Federation." Crawford, Texas, Office of the Press Secretary, December 27, 2001.

Yablokov, A.V., 2000. *Mif o bezopasnosti atomnykh ustanovok* [The Myth of the Security of Nuclear Power Installations]. Moscow, Tsentr Ekologicheskoi Politiki Rossii.

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Three of the above were consulted by telephone. Two were kind enough to comment in detail on a draft of this paper.

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