
Illicit Nuclear Trafficking in the NIS: What's New? What's True?

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Until very recently, conventional wisdom among the Western nonproliferation community held that nuclear theft and cross-border smuggling involving proliferation significant nuclear material had declined markedly since 1994. This alleged lull in nuclear trafficking activity was attributed to a variety of factors including the positive impact of nonproliferation assistance programs in the Newly Independent States (NIS) of the former Soviet Union, enhanced law enforcement and customs and border controls, and an increase in information and intelligence sharing among different national governments. More pessimistic interpretations for the apparent lull also have been proffered, including the rise of more sophisticated smugglers able to avoid detection and capture.

Following the events of September 11, 2001, there has been a spate of news reports which suggest a far more active nuclear black market. Many, but not all of these reports, relate to alleged efforts by the Al-Qaida terrorist network to procure nuclear weapons. Although few of these accounts provide much concrete or corroborated information, they are cited widely and create the impression of a resurgence in nuclear trafficking. Moreover, some illicit trafficking cases, which have been known for a number of years, have received new interpretations by the

media, which speculate that potential buyers may have been representatives of terrorist organizations.

This article reviews the body of proliferation significant cases of illicit nuclear trafficking involving the former Soviet Union in the past ten years. It focuses on those cases that have been corroborated by multiple independent sources and/or were officially reported to the International Atomic Energy Agency (IAEA) by national governments. As discussed below, meeting this test significantly increases the probability that the case in question actually occurred as reported, but does not ensure it. For the purposes of this article, cases are designated as "proliferation significant" if they involve more than minuscule quantities of highly enriched uranium (HEU) or plutonium, or raise unusual concerns owing to the characteristics of the material involved or the circumstances surrounding the case.² This article pays particular attention to those cases in the 1998-2001 period, which have not received adequate analysis to date. A comparison of these cases with those in the 1992-1997 period provides a basis for discerning possible trends in illicit nuclear trafficking. The article concludes by examining the problem of data reliability and suggests steps that should be taken to improve our knowledge of illicit trafficking incidents.

NUCLEAR TRAFFICKING PATTERNS

1992-1995

The first case of proliferation significant nuclear trafficking in the former Soviet Union involved the theft of approximately 1.5 kilograms (kg) of HEU (90 percent U-235) from the Luch Scientific Production Association in Podolsk. The material was stolen over a five month period in 1992 by an employee of the facility. In the next three years, nine additional trafficking incidents involving HEU or plutonium occurred. (For a summary of these and other cases examined in this article, please refer to Table 1.)³ The last case during this period took place in June 1995 when Russian Federal Security Service agents arrested three suspects in Moscow for trying to sell 1.7 kg of HEU (21 percent U-235) diverted in May 1994 from the nuclear fuel fabrication facility in Elektrostal, Russia.

Sources of material for the ten cases in 1992-1995 varied from nuclear submarine fuel storage sites to research institutes to fuel fabrication facilities. In the majority of cases, the material was stolen by an employee of the facility acting alone and motivated by dire economic circumstances. These thieves were generally amateurish in their attempts to market the stolen nuclear material. They either attempted to find a purchaser themselves or else used personal contacts to connect with middlemen or brokers, who were often no better at finding a buyer. Even when these thieves succeeded in removing HEU or plutonium from the former Soviet Union to Western or Central Europe, the contraband was quickly intercepted. In the majority of cases, the purchasers were undercover police or intelligence agents.

1995-1998

The period between mid-1995 and 1998 saw *no* proliferation significant incidents involving illicit trafficking in HEU and plutonium from the NIS that can be confirmed based on open sources. The only possible exception to this finding is the disappearance of up to 2 kilograms of HEU (90 percent U-235) from the I.N. Vekua Physics and Technology Institute in Sukhumi, Georgia sometime between 1992 and the end of 1997. Civil conflict in Abkhazia, the breakaway region of Georgia in which the institute is located, prevented any attempts to determine the whereabouts of this material during this time. Russian Ministry of Atomic Energy (Minatom) inspectors regained access to the institute in 1997 and could not locate the

HEU that was recorded in a prior inventory from 1992. In May 2001, an IAEA mission was allowed to visit the I.N. Vekua Institute and also found no HEU there.⁴ The whereabouts of this material remain unknown.

The apparent three-year hiatus⁵ prompted some analysts to argue that the threat of illicit nuclear trafficking had receded owing to the more proactive policy of the NIS, which used international assistance to improve the security of nuclear materials. Others, however, maintained that the lack of confirmed cases connected with NIS nuclear facilities since 1995 did not necessarily indicate a decline in illicit trafficking, but might instead reflect more sophisticated smuggling techniques, the use of new routes, or the operation of well-organized groups of insiders at nuclear facilities. The pessimists argued that the amateurish “visible” nuclear black market that could be observed in the 1992-1995 period might be a poor and incomplete representation of a more sophisticated “invisible” nuclear black market.⁶

1998-2001

Since 1998, a handful of new cases suggest that the “pessimists” have a point. While clear evidence of a well-developed illicit market in weapons-usable nuclear material has not emerged, these cases demonstrate the possible presence of some of the key elements of such a market. For example, while the earlier cases often involved disgruntled individual employees, December 1998 Russian media reports of an attempted theft of 18.5 kg of HEU⁷ from an unspecified nuclear facility in Chelyabinsk Oblast, Russia, indicate the involvement of an organized group of facility employees. According to available information, this group was thwarted before it could remove any nuclear material.

The more recent cases also suggest that stolen material is now more likely to move southward toward potential end-users in the Middle East (as opposed to Western intelligence agents in Europe). Illustrative of this trend was the May 1999 seizure in Bulgaria of ten grams of HEU (76 percent U-235) reportedly intended for sale in Turkey, and the seizure in April 2000 of four suspects with 920 grams of HEU (30 percent U-235) in Batumi, Georgia. Two additional seizures involving very small amounts of fissile material also took place in Kara-Balta, Kyrgyzstan in June 1999 and in Tbilisi, Georgia in September 2000.⁸

In addition, there are indications that organized criminal groups may be more inclined today to accept the risks

Table 1. Proliferation Significant Incidents of Fissile Material Trafficking in the NIS, 1991-2001

CASE NAME & DATE OF DIVERSION	MATERIAL DIVERTED	ORIGIN OF MATERIAL	RECOVERY OF MATERIAL
Podolsk, Russia* 5/92-9/92	1.5 kg of 90 percent HEU	Luch Scientific Production Association, Podolsk, Russia	10/9/92: Russian police intercepted the smuggler in the Podolsk train station as part of an unrelated investigation.
Vilnius, Lithuania early 1992	About 150 g of 50 percent HEU	Institute of Physics and Power Engineering, Obninsk, Russia	5/93: Approximately 150 g HEU discovered in Vilnius bank vault embedded in portions of a transit shipment of four metric tons of beryllium.
Andreyeva Guba, Russia* 7/29/93	1.8 kg of 36 percent HEU	Naval base storage facility, Andreyeva Guba, Russia	7/29/93: Russian security forces discovered the missing fuel rods, arrested the thieves, and seized the material.
Tengen, Germany Unknown	6.15 g of plutonium-239	Unconfirmed; possibly Arzamas-16, Russia	5/10/94: Police stumbled upon the cache of plutonium while at the suspect's apartment for an unrelated matter.
Landshut, Germany Unknown	800 mg of 87.7 percent HEU	Unconfirmed; likely Obninsk, Russia	6/13/94: Undercover German police acted as potential customers in a sting operation.
Sevmorput, Russia* 11/27/93	4.5 kg of 20 percent HEU	Naval shipyard, Sevmorput, Russia	6/94: The brother of a suspect asked a co-worker for help finding a customer for the uranium stolen from fuel rods. The co-worker notified authorities.
Munich, Germany Unknown	560 g MOX fuel; 363 g of plutonium-239	Unconfirmed; likely Obninsk, Russia	8/10/94: Undercover German police acted as potential customers in a sting operation.
Prague, Czech Republic Unknown	2.7 kg of 87.7 percent HEU	Unconfirmed; likely Obninsk, Russia	12/14/94: Anonymous tip to police giving the material's location (a parked car). In two instances in June 1995, Czech authorities recovered small additional amounts of HEU believed to be from the same source.
St. Petersburg, Russia** Unknown	3.05 kg of 90 percent HEU	Unconfirmed; likely Machine Building Plant, Elektrostal, Russia	6/8/94: Russian news agencies report that in March 1994, Russian Federal Security Service agents arrested three suspects attempting to sell about three kg of HEU.
Moscow, Russia May 1994	1.7 kg of 21 percent HEU	Machine-Building Plant in Elektrostal, Russia	6/8/95: In a sting operation, Russian Federal Security Service agents arrested three suspects trying to sell HEU, one of whom was an employee of Elektrostal.

* This case is not included in the IAEA Illicit Trafficking Database.

**This case is included in this table on the basis of reports to the IAEA by the Russian Federation. Additional corroborating evidence, however, is not readily available.

Table 1. Proliferation Significant Incidents of Fissile Material Trafficking in the NIS, 1991-2001

(continued from previous page)

CASE NAME & DATE OF DIVERSION	MATERIAL DIVERTED	ORIGIN OF MATERIAL	RECOVERY OF MATERIAL
Sukhumi, Georgia* Unknown, (sometime between 1992-1997)	Approximately 2 kg of 90 percent HEU	I.N. Vekua Physics and Technology Institute, Sukhumi, Georgia	12/97: Russian inspection team visited facility, which had been closed by 1992 Abkhazian-Georgian conflict, and found facility abandoned, and material included in 1992 inventory missing. <i>Material has not been recovered.</i>
Chelyabinsk Oblast, Russia* Unknown	18.5 kg of HEU (enrichment level unspecified)	Unknown, possibly Mayak Production Association, Chelyabinsk-70, or Zlatoust-36, Russia	12/17/98: Russian Federal Security service reports that it thwarted an attempt by workers at a nuclear facility in Chelyabinsk Oblast to steal 18.5 kg nuclear material. 10/00: Russian Ministry of Atomic Energy official confirms incident involved HEU.
Dunav Most, Bulgaria Unknown	10 g of 76 percent HEU	Unknown	5/29/99: Bulgarian customs officers discovered HEU hidden in the trunk of a car crossing into Bulgaria from Turkey. Driver said he had obtained material in Moldova.
Kara-Balta, Kyrgyzstan Unknown	1.5 g of plutonium metal	Unknown	10/2/1999: According to the IAEA list, Kyrgyzstani National Security Ministry officials arrested two persons in the act of selling a small metallic disk of plutonium (1.49 grams). The individuals were prosecuted and sentenced to prison.
Batumi, Georgia Unknown	920 g of 30 percent HEU	Unknown	4/19/00: Georgian police arrested four suspects and seized HEU.
Elektrostal, Russia*** Unknown	3.7 kg of 21 percent HEU	Unconfirmed, possibly Elektrostal Machine-Building Plant, Bochvar Institute (VNIINM), or Politekh enterprise, Russia	5/2000: A resident of Elektrostal was detained during an attempt to sell 3.7kg of uranium enriched to 21percent U-235. Incident was reported by Gosatomnadzor.
Tbilisi, Georgia Unknown	0.4 g of plutonium powder	Unknown	9/16/2000: An individual was arrested for illegal possession of a small quantity of mixed powder containing about 0.4 g of plutonium and 0.8 g of low-enriched uranium.
Paris, France Unknown	~5 g of 70-80 percent HEU	Unknown	7/16/2001: French police arrested three men and confiscated approximately 5 g of HEU.

*** This case was reported by Gosatomnadzor, but has not been officially confirmed by other Russian government agencies. It is not included in the IAEA Illicit Trafficking Database.

of nuclear trafficking because of the promise of financial gain. A March 1998 case in Italy, which involved U.S.-origin research reactor fuel enriched to 19.9 percent U-235 stolen from the Democratic Republic of the Congo (formerly Zaire), points in that direction. According to U.S. and Italian media reports, in this case an Italian organized criminal group sought to market the fuel (only a fraction below the internationally used but artificial definition of HEU as containing 20 percent or greater U-235) to either a Middle Eastern state or a terrorist organization.⁹ One also must be concerned about the propagation of news regarding the readiness of well-funded terrorist organizations such as Al-Qaida to purchase fissile material and its impact on the cost-benefit calculus of criminal organizations. Although there is no evidence to suggest an upsurge of Russian organized criminal activity in the nuclear sector, one should take note of the arrest near Moscow in December 2001 of six members of the Balashikha organized crime group who were attempting to sell over a kilogram of nuclear material which they marketed as weapons-grade HEU. The material turned out to be nuclear fuel pellets enriched to only 2.4 percent U-235.¹⁰

Several additional cases in the 1998-2001 period also merit attention. They suggest that the set of proliferation significant cases cited by most analysts probably overlooks a number of other actual trafficking incidents.

According to a report by Gosatomnadzor, the Russian nuclear regulatory agency, prepared for its August 29, 2000 board meeting, a resident of Elektrostal was detained in May 2000 during an attempt to sell 3.7 kg of HEU enriched to 21 percent U-235. The name of the detained person and other details of the incident were not reported. Gosatomnadzor named the Machine-Building Plant in Elektrostal, the Bochvar All-Russia Research Institute of Inorganic Materials (VNIINM) in Moscow, and the Polytech State Enterprise in Elektrostal (shut down in 1995) as the facilities from which the material could have been stolen. An anonymous Minatom official interviewed by a Russian researcher about this case pointed out that the material might have been stolen in the mid-1990s, and the thief (or thieves) may have been searching for a potential buyer for several years. Some Russian journalists and environmental experts also cite this case, but no definitive confirmation is available.¹¹

There also are reliable reports that the 5 grams of HEU seized in Paris in July 2001 is probably of NIS origin. This

material apparently is of uneven assay but includes HEU slightly above the 70 percent enrichment level.¹²

Another incident of potential consequence was reported on October 31, 2001 by a senior Gosatomnadzor official. At an IAEA sponsored meeting in Vienna, he indicated that among the dozens of safeguards violations his agency had recorded during 2000-2001, one loss of nuclear material was of the "highest consequence."¹³ In subsequent interviews, the official indicated that the incident involved a discrepancy between the amount of material received at a nuclear facility and the amount recorded on the shipping document prepared by the sending facility. The discrepancy could have been caused by a theft in transit, a theft at the sending facility and forgery of the shipping document, or a bookkeeping error. His co-authored paper, however, clearly identifies the incident as a "loss of nuclear material" and on a ten interval scale, which the authors of the paper use to classify infringements on material control and accounting, it is assigned the highest importance.

DO WE KNOW WHAT WE THINK WE KNOW?

Attempts to discern patterns and trends in illicit nuclear trafficking are complicated by at least three data limitations. First, the number of confirmed cases is relatively small. Second, there is a high probability that the actual number of cases is much larger and that the sample we have discerned is unrepresentative of the larger universe of incidents. Third, the quality and scope of available information is very uneven and often is contradictory.

Underreporting

Most cases of fissile material theft, attempted theft, and seizure come to light through media reports and/or information releases provided by national governmental agencies and international organizations. An example of the latter is the Illicit Trafficking Database maintained by the International Atomic Energy Agency (IAEA).

Many cases which are first reported by media sources not surprisingly omit much relevant information. These initial omissions are due to the sensitive nature of the data, the reluctance of official sources to disclose information, and the decisions of journalists and their editors about the details which are newsworthy.

Publicly available national government databases and the IAEA database cannot be viewed as comprehensive

or up-to-date. Based on discussions with numerous officials, it is also clear that they face limitations of access to sensitive sources, including very marginal sharing of meaningful nuclear trafficking data even between U.S. and Russian intelligence sources. Data provided to the IAEA by national governments often is not provided in a timely manner and, as noted below, is neither comprehensive nor totally reliable.

Most surprising, however, is the apparent failure of national governments to invest significantly in detailed and systematic comparative analyses of illicit trafficking incidents or to expend much effort in interviewing the perpetrators of confirmed trafficking cases. Indeed, to the extent that relevant court documents have been unearthed and suspects and convicts interviewed, they typically have been the result of enterprising journalists.¹⁴

Overreporting

If problems of omission or underreporting distort our understanding of trafficking characteristics and trends, the inclination of the media to sensationalize smuggling incidents—often based on inaccurate information—confuse the public perception of the nature of the threat. The tendency to cry wolf and to confuse trafficking in any radiological substance with that involving fissile material was most pronounced in the 1992-1995 period, but remains frequent in recent years. Regrettably, false accounts of trafficking in HEU tend to be widely reported, while subsequent retractions which indicate that the material in question was low-enriched uranium (LEU) not useable in nuclear weapons rarely receive media coverage. Examples of this phenomenon in 2001 include initial front-page reports in July 2001 about 1.7 kg of “weapons grade U-235” seized in Batumi, Georgia¹⁵ and November 2001 reports of 1 kg of “weapons grade” uranium seized in Istanbul, Turkey.¹⁶ Many reports in scholarly journals and books also repeat uncritically such mistaken media accounts. These errors, on occasion, find their way into government reports. The February 2002 annual report of the U.S. National Intelligence Council on the Safety and Security of Russian Nuclear Facilities and Military Forces, for example, identifies the 1998 Chelyabinsk case as an alleged theft when, in fact, it appears at most to have been a failed theft attempt.¹⁷

Concealment and Intentional Distortion of Information

In addition to the data problems posed by slack underreporting and careless or inadvertent overreporting, public knowledge of illicit trafficking is impeded by conscious efforts by national governments to control, conceal, and/or distort information. Gosatomnadzor annual reports that include findings of nuclear material control and accounting anomalies and infringements, for example, not only have been withdrawn from public access, but appear to be inconsistent with the information provided by Russia to the IAEA for its trafficking database. The “loss of nuclear material” reported by Gosatomnadzor authors in their October 31, 2001 paper is only the most recent example of this discrepancy. Other NIS states also have been less than forthcoming in their trafficking reports to the IAEA. Georgia, for example, has not provided the IAEA with official information about the loss of HEU in Sukhumi.

Some information that has been reported by Russia to the IAEA database must be questioned. An important example is the alleged 1994 seizure of 3.05 kg of HEU enriched to 90 percent U-235 and the arrest of three suspects in St. Petersburg. This case is included in most lists of “confirmed cases” due to the official nature of the source. It has not been corroborated, however, by other sources and is peculiar due to the absence of any reports of prosecutions related to the arrests. Some Russian analysts based at non-governmental organizations (NGOs) and journalists are also skeptical about the official version of the case. They suspect that it may have been invented or altered to allow the Russian government to provide information to the IAEA about illicit trafficking.¹⁸

Russian government officials have, at best, been inconsistent in their public reporting on cases of fissile material diversions. Over the years their reports have ranged from a total denial of any cases of thefts of weapons usable material to acknowledgment of thefts numbering over four dozen. For example, in 2000 Russian Deputy Minister of Atomic Energy V. Ivanov is quoted as saying that there were at least 23 attempted thefts of nuclear materials in Russia in the preceding ten years, one of which involved 3 kg of HEU.¹⁹ One year earlier, the head of Minatom’s Nuclear Materials Accounting and Control Department, Victor Yerastov, referred to 52 cases of nuclear material theft.²⁰

Conflicting Information

Even absent government distortions of information, the task of sorting out fact from fiction is exceedingly difficult due to often inconsistent or conflicting sources of information. For example, the IAEA list of confirmed cases reports the arrest of two people in Kara Balta, Kyrgyzstan in October 1999 for selling a small metallic disk of plutonium (1.49 grams). According to the IAEA illicit nuclear trafficking list, the suspects were prosecuted and sentenced to prison,²¹ although surprisingly this outcome (and the case itself) do not appear to have been reported in the NIS or Western media. Instead, one finds published reports of the seizure in May 1999 of a container, which was suspected to contain plutonium, in another Kyrgyz city—Bishkek.²² This incident involved the arrest of a single individual, but is not recorded in the IAEA database. Should we accept the IAEA version? Are the two reports different versions of the same case, two separate but related cases, or a garbled mix of facts and fiction?

A similar problem relates to the now widely cited loss of a 2 kg of HEU in Sukhumi, Georgia, which was first reported in 1998 by one of the co-authors of this article.²³ That report was based on numerous interviews with Georgian and Russian nuclear and foreign ministry officials and with IAEA experts. Last year, however, a senior official of the Sukhumi facility, Valter Kashiya, disclosed in an interview that the case involved only 655 grams of HEU and that the material allegedly was recovered in Poland.²⁴ In June 2002, NIS and western media published excerpts from a new interview with Kashiya and cited him as saying that the 655 grams of HEU was the amount his particular laboratory had before the Georgian-Abkhazian conflict, but that the actual amount of HEU at the entire institute may have totaled 2 kg or more. A 29 June 2002 Interfax report about the interview with Kashiya does not mention him saying that the material was recovered in Poland. Instead, Interfax quoted him warning that the HEU and other radioactive materials stored in the Sukhumi facility may have been sold to terrorist organizations or to Iraq.²⁵ Georgia, however, never reported the loss of the material, which is not included as a case in the IAEA database, and neither Georgia nor Poland has acknowledged the recovery of material corresponding to that missing from Sukhumi.

Finally, for purposes of illustration, one must look very carefully at the 1998 Chelyabinsk case, an incident that is noteworthy because of the large amount of material in-

involved (18.5 kg) and the reported involvement of a group of insiders at a closed nuclear city. This case, which does not appear in most trafficking databases because it involves an unsuccessful attempted theft, was publicly revealed in a December 1998 press conference by Major General Valeriy Tretyakov, head of the Chelyabinsk Oblast directorate of the Russian Federal Security Service (FSB).²⁶ It also was reported by Viktor Yerastov of Minatom in a 1999 interview with *Yaderny Kontrol*.²⁷ Before the Yerastov statement, Minatom officials privately had denied the incident. Some Russian researchers also believe the case may have been fabricated by the Chelyabinsk directorate of the FSB to impress FSB headquarters in Moscow, especially given the fact that Tretyakov's interview took place two days prior to the Day of the Secret Services in Russia ("Den' Chekista").²⁸ As with the St. Petersburg case and despite the much-publicized discovery of the plot, there have been no subsequent reports about the investigation, trial of the suspects, or convictions. Nevertheless, some key U.S. government analysts remain persuaded of its significance.

RECOMMENDATIONS

It is now nearly ten years since the discovery of the first proliferation significant case of fissile material diversion in Russia. During this period, several dozen different organizations, including NGOs, national governments, and international organizations established databases on illicit nuclear trafficking incidents, and they continue to proliferate. They record in varying degrees of detail and with differing standards for inclusion new trafficking incidents. It is our impression, however, based on access to many of these data collections and interviews with their managers/analysts, that relatively little new information has been added over the years regarding old cases. Nor has much effort been expended to obtain such information. Moreover, remarkably little coordination or information sharing takes place among the data collection bodies. These observations lead us to the following recommendations.

Increase Transparency and Information Sharing

There is a vital need for greater sharing and coordination of trafficking information among government agencies, international organizations, and academic/NGO research centers. Historically, U.S. and Russian NGOs have been the first to break stories regarding significant trafficking incidents and continue to have superior access

to some relevant Russian/NIS sources. For the most part, however, mechanisms are not in place for them to interact routinely with national and international agencies following theft and smuggling cases. It is not apparent that much better routine coordination or information sharing exists among different U.S. and Russian-government agencies or between them and relevant international organizations. At a minimum, it would be valuable to share the basic characteristics of each party's trafficking lists and the criteria used for the inclusion and exclusion of incidents. Although some information on illicit trafficking cases may well need to remain classified, there is a considerable room for greater transparency on the part of national governments and international organizations. These bodies also must make better use of information available in open source and NGO data collections in order to construct a comprehensive and reliable picture of illicit nuclear trafficking.

Begin Meaningful Intelligence Sharing on Trafficking Incidents

In addition to transparency and information sharing among a broad number of actors, meaningful intelligence sharing on trafficking incidents, especially between the United States and Russia, is crucial in filling in gaps in data regarding past nuclear trafficking cases. Despite repeated pledges to cooperate in the realm of fissile material trafficking since the 1996 U.S.-Russia Moscow summit, such cooperation has been minimal as of the end of 2001.

Intelligence information sharing is particularly vital in the context of the ongoing war against international terrorism. In light of the new spirit of U.S.-Russian cooperation for nonproliferation and anti-terrorism reflected at the May 2002 Bush-Putin summit, it is imperative that the U.S. and Russian governments extend their cooperation to the sphere of nuclear trafficking. They should lead the effort in filling in existing information gaps. Cooperation of other states who are members of the anti-terrorist coalition is also important, especially those states where numerous incidents of seizure or theft of nuclear and other radioactive materials have taken place.

Reassess and Revise Prior Data on Cases

Significant discrepancies exist among major databases regarding the number and nature of fissile material trafficking incidents. For example, according to the IAEA database, the aggregate amount of HEU and Plutonium

stolen and recovered between 1993 and 2001 is 8.73 kg, while the amount indicated by the Stanford database is over 40 kg, including the missing 2 kg of HEU from Sukhumi.²⁹ Similarly, a recent report by an IAEA analyst identifies the Podolsk HEU as enriched to 45 percent U-235, while most databases have long identified the material as 90 percent enriched uranium.³⁰ Such discrepancies indicate the need to review and reassess carefully known cases for faulty information, to search more diligently for new information about old cases, and to probe the discrepancies across databases in pursuit of clues that will enhance our confidence in the reliability of competing sources of information. Regrettably, important gaps of knowledge remain for every confirmed trafficking case.

Be More Attentive to Cases Involving Material Discrepancies and Non-Fissile Nuclear Material

It is important to supplement our analysis of HEU and plutonium trafficking with the study of cases involving inventory discrepancies—both material losses and surpluses. Although some information on this topic can be researched by NGOs, the subject should be the focus of much more attention by U.S. and Western government agencies in cooperation with their NIS counterparts. More attention also should be given to patterns of diversion and export of LEU and radiological materials, as they may be indicative of vulnerabilities, procurement modes, and supplier-middlemen-end-user chains in the fissile material area.

CONCLUSION

A great deal of progress has been made in the past ten years regarding open-source data collection techniques. The volume of data related to the post-Soviet states and to nuclear issues also has increased dramatically. These advances have the potential to yield major breakthroughs in the analysis of illicit nuclear trafficking, but are unlikely to do so until the shortcomings of existing data collections are subject to more critical scrutiny and steps are taken to enhance their transparency, reliability, and comparability.

¹ An earlier version of this article was presented at the 43rd Annual Meeting of the Institute of Nuclear Materials Management, Orlando, Florida, June 25, 2002.

² The authors' definition of "illicit nuclear trafficking" includes theft, smuggling, illegal possession and illegal trade of fissile material (HEU and plutonium). This article uses the IAEA definition of HEU, i.e. uranium with a U-235 isotopic content of 20% or more. However, in contrast to the IAEA, the authors do not consider cases involving gram quantities of plutonium in the form of fabricated sources (such as smoke detectors, static eliminators, or plutonium-beryllium neutron sources) to be proliferation-significant.

³ Additional details about the cases in the Table 1 "Proliferation Significant

Incidents of Fissile Material Trafficking in the Newly Independent States, 1991-2001" can be found in related entries in the NIS Nuclear Trafficking database, which is maintained by CNS, <<http://www.nti.org/db/nistraff/index.html>>.

⁴ Charles J. Hanley, "Bomb Material Missing From Tbilisi," Associated Press, June 26, 2002.

⁵ The absence of information about the time of the disappearance of the HEU from the Sukhumi institute precludes placement of this case confidently in either the 1992-1995 or the 1995-1998 time periods.

⁶ For a discussion of these alternative interpretations, see Emily S. Ewell, "NIS Nuclear Smuggling Since 1995: A Lull in Significant Cases?" *The Nonproliferation Review*. (Spring-Summer 1998), pp. 119-125.

⁷ The precise enrichment level is unknown. The Russian Federal Security Service official who revealed the case initially did not specify the type of radioactive materials involved, although he mentioned that it "might have been used for production of components for nuclear weapons," suggesting that either HEU or plutonium may have been involved. An unspecified Minatom official informed a U.S. researcher in 2000 that the material was HEU, but neither the enrichment level nor the name of the facility involved were disclosed.

⁸ For details concerning these cases, see the corresponding abstracts in the NIS Illicit Trafficking Database, <<http://www.nti.org/db/nistraff/index.html>>.

⁹ "Our Last Trace Was in District in Rome," *La Repubblica*, November 8, 2001; in "Italy: Finance Police Captain on Uranium Bar Probe", FBIS Document EUP2001110800021.

¹⁰ According to Russian Minister of Atomic Energy Aleksandr Rumyantsev the material seized in Balashikha had been stolen from the nuclear fuel fabrication plant in Elektrostal many years earlier. Its recovery was reported as the result of a long-term operation by Russian security services. For details about this case, see NIS Nuclear Profiles Database, "LEU Peddlers Arrested in Balashikha, Russia," December 7, 2001, <<http://www.nti.org/db/nistraff/2001/20010640.htm>>.

¹¹ See for example V.M. Kuznetsov, "Osnovnyye problemy i sovremennoye sostoyaniye bezopasnosti predpriyatii yadernogo toplivnogo tsikla Rossiyskoy Federatsii," AtomSafe, Moscow, Russia, 2001 <<http://www.atomsafe.ru>>; and Dmitriy Frolov, "Bitva v puti. Minatom d predchuvstviy 'relsovoy voyny,'" *Novyye Izvestiya*, November 24, 2001.

¹² Tanguy Berthemet and Michele Bietry, "Enriched Uranium Seized in Paris," *Le Figaro* (Paris), July 23, 2001; in FBIS Document EUP20010723000399; and "Uranium Seized in France Could have Made Low Grade Bomb," Agence France Presse, October 21, 2001.

¹³ See Alexander Dmitriev, Yuri Volodin, Boris Krupchatnikov, and Alexander Sanin, "Efforts in Strengthening Accounting for and Control of Nuclear Materials in Russia," paper presented at IAEA Symposium on International Safeguards: Verification and Nuclear Material Security, Vienna, Austria, October 29-November 2, 2001.

¹⁴ Examples are the cases of Podolsk, Vilnius, Andeeva Guba and, to a lesser extent, Prague, which are all listed in Table 1.

¹⁵ See for example, Amelia Gentleman and Ewen MacAskill, "Weapons-Grade Uranium Seized: 1.7kg of Nuclear Material Found in Georgia May Have Been Destined For a Rogue State or Terror Group," *The Guardian*, 25 July 2001; in Lexis-Nexis Academic Universe, <<http://web.lexis-nexis.com/universe>>; also Tbilisi Prime-News, 24 July 2001; in "Quantity of Weapons-Grade Uranium Seized in Georgia," FBIS Document CEP20010724000038. See also the NIS Illicit Trafficking Database entry 20010300; <<http://www.nti.org/db/nistraff/2001/20010300.htm>>.

¹⁶ "Turkish Police Seize Weapons-Grade Uranium," Agence France Presse, November 7, 2001. This and the previous case are also cited by George Anzelon as examples of greatly overstated news reports in his paper "Incidents of Illicit

Trafficking in Nuclear and Radioactive Materials," paper delivered at the Regional Conference on Illicit Trafficking and Trade of Nuclear and Radioactive Materials, Almaty, Kazakhstan, March 2002.

¹⁷ See the National Intelligence Council, "Annual Report to Congress on the Safety and Security of Russian Nuclear Facilities and Military Forces," February 2002, <http://www.cia.gov/nic/pubs/other_products/icarussiansecurity.htm>. In this report, the National Intelligence Council cites the Chelyabinsk incident and three others as evidence that Russian institutes have lost fissile material in thefts. In two of the additional cases, however, the 1992 Podolsk theft of 1.5 kg of 90 percent enriched uranium and the 1994 theft of 3 kg of 90 percent enriched uranium in Moscow (probably referring to the seizure in St. Petersburg of 3.05 kg of HEU stolen from Elektrostal, Moscow Oblast), the material was recovered. In the third case, the 1999 seizure of weapons-usable material in Bulgaria, only four grams of HEU were involved. Taken together with the murky Chelyabinsk case, this list may provide evidence of "theft" but not of a pattern of successful smuggling, as its context in the report implies.

¹⁸ Russian NGO analysts (names withheld by request), interviews with authors, Moscow, Russia, and Monterey, CA, Winter and Spring 2001-2002.

¹⁹ Cited by Yuri Golotyuk, "Yadernyy uchët i kontrol," *Vremya Novostey*, September 29, 2000.

²⁰ Viktor Yerastov, "Yadernyye zloumyshlenniki v Chelyabinskoy oblasti mogli nanesti serezhnyy vred gosudarstvu," *Yadernyy Kontrol* (November-December 1999), p. 40.

²¹ International Atomic Energy Agency, "Confirmed Incidents with Plutonium or High-Enriched Uranium," IAEA Illicit Trafficking Database, November 9, 2001. This particular IAEA list of incidents was circulated to a variety of journalists.

²² Yu. Gruzov, "ChP v aeroportu," *Vecherniy Bishkek*, May 14, 1999, p. 1; "Uzbeki Held in Kirghizstan for Trying to Pass Plutonium to UAE," Agence France Presse, May 14, 1999.

²³ William C. Potter, "A U.S. NGO Perspective on US-Russian MPC&A Cooperation," Paper Presented at the 39th Annual Meeting of the Institute for Nuclear Materials Management, Naples, Florida, July 26, 1998. See also NIS Illicit Trafficking database, <<http://www.nti.org/db/nistraff/1998/19980500.htm>>.

²⁴ "Georgian Official Discusses Missing HEU from Sukhumi Institute," Prime News, May 21, 2001.

²⁵ "V Tbilisi ne isklyuchayut, chto obogashchennyy uran iz sukhumskego fiziko-tehnicheskogo instituta mog byt prodan teroristam," Interfax, June 29, 2002.

²⁶ Alevtina Nikitina, "Komu vygodno razrusheniye FSB?" *Chelyabinskiy rabochiy*, December 19, 1998, <<http://www.chelpress.ru>>; and Yevgeniy Tkachenko, "FSB Agents Prevent Theft of Nuclear Material," ITAR-TASS, December 18, 1998.

²⁷ Viktor Yerastov, "Yadernyye zloumyshlenniki," p. 40.

²⁸ Russian analysts (names withheld by request), correspondence with authors, February 1, 1999.

²⁹ The IAEA aggregate number is arrived at by adding the amounts from the document: International Atomic Energy Agency, "Confirmed Incidents with Plutonium or High-Enriched Uranium." The aggregate number from the Stanford database is cited by Lisa Trei, "Database Exposes Threat from 'Lost' Nuclear Material," *Stanford Report*, March 6, 2002, <<http://news-service.stanford.edu/news/march6/database-36.html>>. The total from illicit trafficking incidents involving fissile material identified in this article produces a similar total to that given in the Stanford database number—over 42 kg.

³⁰ See Anzelon, "Incidents of Illicit Trafficking in Nuclear and Radioactive Materials."