

Unraveling the A. Q. Khan and Future Proliferation Networks

The most disturbing aspect of the international nuclear smuggling network headed by Abdul Qadeer Khan, widely viewed as the father of Pakistan's nuclear weapons, is how poorly the nuclear nonproliferation regime fared in exposing and stopping the network's operation. Khan, with the help of associates on four continents, managed to buy and sell key nuclear weapons capabilities for more than two decades while eluding the world's best intelligence agencies and nonproliferation institutions and organizations. Despite a wide range of hints and leads, the United States and its allies failed to thwart this network throughout the 1980s and 1990s as it sold the equipment and expertise needed to produce nuclear weapons to major U.S. enemies including Iran, Libya, and North Korea.

By 2000, U.S. intelligence had at least partially penetrated the network's operations, leading to many revelations and ultimately, in October 2003, the dramatic seizure of uranium-enrichment gas-centrifuge components bound for Libya's secret nuclear weapons program aboard the German-owned ship *BBC China*. Libya's subsequent renunciation of nuclear weapons led to further discoveries about the network's operations and the arrest of many of its key players, including Khan himself.

The Khan network has caused enormous damage to efforts aimed at stopping the spread of nuclear weapons, to U.S. national security, and to international peace and stability. Without assistance from the network, it is unlikely that Iran would have been able to develop the ability to enrich uranium using gas centrifuges—now that country's most advanced and threatening nuclear

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program. Suspicions also remain that members of the network may have helped Al Qaeda obtain nuclear secrets prior to the fall of the Taliban regime in Afghanistan. The damage caused by this network led former CIA director George Tenet to reportedly describe Khan as being “at least as dangerous as Osama bin Laden.”¹ The Khan network succeeded for many years by exploiting weaknesses in export control systems and recruiting suppliers, including some in states that were members of the Nuclear Suppliers Group (NSG). The network’s key customers were states contemptuous of NSG controls and committed to violating the Nuclear Non-Proliferation Treaty (NPT) in their quest for secret nuclear capabilities. In essence, the network adapted to and benefited from the discriminatory and voluntary export control regime that was embodied in the NSG and complementary national export control systems. There is little confidence that other networks do not or will not exist or that elements of the Khan network will not reconstitute themselves in the future.

Yet, the international response thus far has not been sufficiently effective. Although revelations about the Khan network have reenergized support for a range of reforms, more extensive improvements to the international non-proliferation regime are still needed to block the emergence of new networks and to detect them promptly if they do arise. The United States, with the help of its allies, needs to pursue a broad range of foreign policy, intelligence, nonproliferation, export control, and law enforcement initiatives, as well as policies designed to close down nuclear smugglers’ access to civilian industries in newly emerging industrial states.

The Khan Network

The Khan network is, first and foremost, an elaborate and highly successful illicit procurement network that Khan created in the 1970s to supply Pakistan’s gas-centrifuge program, which has been used to produce weapons-grade uranium for Pakistan’s nuclear weapons program. Khan and his associates slowly expanded their import operation, however, into a transnational illegal network that also exported gas centrifuges and production capabilities, as well as designs for nuclear weapons, to other, mostly Muslim countries to turn a profit and provide additional business for their international collaborators. In addition to money, Khan was also motivated by pan-Islamism and hostility to Western controls on nuclear technology.²

KHAN’S CUSTOMERS

Khan’s contempt for Western controls on nuclear technology was demonstrated early, in articles in technical journals in the late 1980s. They were

among the first hints that Khan was willing to disseminate sensitive nuclear information and may also have served to advertise what Khan was willing to offer to would-be customers. Indeed, Khan appears to have attracted his first major customer when Iran received centrifuge assistance in 1987, during a period in which relations between Iran and Pakistan were briefly warming.³ Even though Western intelligence agencies first suspected that Pakistan was providing aid to Iran's centrifuge program by the early 1990s, little was done to stop it.⁴ During the 1990s, the Khan network expanded and became more capable, evolving into an organization that could provide "one-stop shopping" both for the technology needed to produce weapons-grade uranium and nuclear weapons designs.

In late 1990, shortly after Saddam Hussein seized Kuwait and the UN Security Council imposed an embargo on Iraq, Khan offered to help Baghdad produce gas centrifuges and design nuclear weapons. Iraqi nuclear officials, ironically suspecting that the offer was a sting operation because Pakistan was a U.S. ally, proceeded cautiously and requested a sample of what Khan could provide. In the mid-1990s, when Khan's offer was discovered by International Atomic Energy Agency (IAEA) weapons inspectors, the Iraqis told UN inspectors that they did not receive anything.⁵

Little information is available about Khan's assistance to North Korea in the 1990s and early 2000s. Pyongyang has denied that it has a gas-centrifuge program, and Pakistan seems reluctant to divulge details about its nuclear dealings with North Korea. Nonetheless, evidence strongly suggests that North Korea has at least received centrifuge designs, a few sample centrifuges, and lists of potential suppliers from the network.⁶

The network has also offered aid to Egypt and Syria. Egypt is believed to have turned down the assistance.⁷ Pakistani investigators reportedly found that Khan's middlemen offered help to Syria but never provided assistance in the end.⁸ This assertion is still subject to scrutiny. Other countries, notably Saudi Arabia, may also have received offers of assistance.⁹ Khan traveled extensively, and his visits to 18 countries between 1997 and 2003 have furthered speculation about potential clients.¹⁰ His visit to Afghanistan during this period has added to suspicions that Khan or his associates may have offered nuclear aid to Al Qaeda or other terrorist organizations that were based in Afghanistan at the time.

The network's most ambitious customer, however, was Libya, which ordered a gas-centrifuge plant sufficient to produce enough highly enriched uranium to turn out roughly 10 nuclear weapons annually. The network in-

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tended to provide Libya with a turnkey gas-centrifuge facility, something typically reserved for states or large corporations in industrialized nations with full government support and knowledge.¹¹ The network also offered ongoing technical assistance to help overcome any obstacles in assembling and operating the plant. If Libya had continued to pursue its nuclear ambitions and the network had not been exposed, it could have succeeded in assembling the centrifuge plant in about four or five years and produced significant amounts of highly enriched uranium.

In addition to the means to produce fissile material, the Khan network also gave Libya the information necessary to build a nuclear weapon, including detailed nuclear weapons component designs, component fabrication information, and nuclear weapons assembly instructions.¹² The documents appear to have been information that Pakistan had received in China in the early 1980s. They include detailed, dated, handwritten notes in English taken during lectures given by Chinese weapons experts who were named by the notetakers. These notetakers appear to have been working for Khan, based on their cryptic notations deriding a rival Pakistani nuclear weapons program led by Munir Khan, the chairman of the Pakistan Atomic Energy Organization.¹³ The design appears to be for a Chinese warhead that was tested on a missile, has a mass of about 500 kilograms, and measures less than a meter in diameter. Although this design would have been too large for Libyan Scud missiles, it could have been airdropped or intended for a more advanced missile system that Libya may have been seeking. Indeed, the design would fit on existing Iranian and North Korean missiles.

Iran and North Korea have both denied receiving any weapon designs. The Pakistani government has told the IAEA that Khan claimed that the network had not provided any such designs to Iran. Nonetheless, as a result of the assistance provided to Libya and Iraq, suspicions remain that the network routinely offered these designs to its customers.

INNER WORKINGS

By 2003, when the Khan network was exposed to the public, it had become a truly transnational organization. The key providers of the necessary technology and several of the network's leaders, including Khan, were located in Pakistan, but other leaders were spread throughout the world, including in Switzerland, the United Kingdom, the United Arab Emirates (UAE), Turkey, South Africa, and Malaysia. The network also depended on unwitting manufacturing companies and suppliers in many countries. It sold what the Pakistanis have called the P1 and P2 centrifuges—the first two centrifuges that Pakistan deployed in large numbers. The P1 centrifuge uses an aluminum rotor, and the P2 centrifuge uses a maraging steel rotor, which is stron-

ger, spins faster, and therefore enriches more uranium per machine than the P1 centrifuge's aluminum rotor. Initial exports of the P1 centrifuges to Iran in the mid-1990s included 500 machines retired from Pakistan's nuclear program or made under contract by the network. This quantity of P1 centrifuges would only be able to produce about one quarter of a bomb's worth of weapons-grade uranium in a year.

In the Libyan case, the network focused on producing P2 components outside of Pakistan. The Libyans have stated to the IAEA that they placed an order for 10,000 P2 machines.¹⁴ Because each centrifuge has roughly one hundred different components, this order translates into a total of about one million components—a staggering number of parts given the sophistication of gas-centrifuge components. Thus, it is clear that Khan's network was assembling an impressive cast of technical experts, companies, suppliers, and workshops.

The workshops contracted to manufacture components for the network typically imported the necessary items, such as metals, equipment, or sub-components. After the facilities produced the item, they would send it to Dubai under a false end-user certificate, where it would be repackaged and sent to Libya. According to Mohamed ElBaradei, director general of the IAEA, "Nuclear components designed in one country could be manufactured in another, shipped through a third (which may have appeared to be a legitimate user), assembled in a fourth, and designated for eventual turnkey use in a fifth."¹⁵

Initial information found in Libya identified roughly a half-dozen key workshops spread across at least Africa, Asia, and the Middle East that were making the centrifuge components. The network selected a workshop based on the type of centrifuge component needed and the materials and equipment involved in making those particular components. The most publicly known facility—Scomi Precision Engineering (SCOPE) in Malaysia—made stationary aluminum components and was the source of 15 percent of the total number of components destined for Libya, including the centrifuge components seized on the *BBC China*.

Workshops in Turkey importing subcomponents from Europe and elsewhere assembled other key parts of the centrifuges, including centrifuge motors, power supplies, and ring magnets. Tradefin Engineering, a company in South Africa, produced the elaborate equipment needed to insert and withdraw the uranium hexafluoride gas that is enriched in centrifuges. Tradefin also attempted unsuccessfully to make the sensitive maraging steel rotors for the P2 centrifuges.¹⁶

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At some point after the initial order, Libya may have changed its initial plan to buy all the centrifuge components overseas and instead planned to build the components itself. Libya could have accomplished this objective because it also ordered from the network a sophisticated manufacturing center, code-named Workshop 1001, to produce centrifuge components. The original plan called for this center to make additional centrifuges either to replace broken ones or add to the total number after the network delivered the first 10,000 machines, but if the network encountered problems in making a component for the original 10,000 machines, Libya's manufacturing center may have had to accomplish that task as well. Most of the equipment for the center came from Europe, particularly from or through Spain and Italy, and was sent to Libya via Dubai. The network had also supplied detailed manufacturing information for many of the parts.

PAKISTAN GETS CORNERED

After the seizure of the *BBC China* and Libya's subsequent cooperation after its decision to renounce its efforts to produce nuclear weapons, the Khan network was exposed, and Pakistan came under intense pressure to deal with Khan and his associates. Pressure had already been building on Pakistan to rein in Khan. In September 2003, the IAEA Board of Governors passed a resolution requesting all countries (diplomatic code for Pakistan) to help the IAEA resolve questions about procurements for Iran's secret centrifuge program tied to Pakistan that had risen independently of the *BBC China* and Libyan cases.

The Pakistani government nonetheless initially resisted arresting Khan, whom most Pakistanis considered a national hero. U.S. secretary of state Colin Powell recalled in December 2004 that he had called President Gen. Pervez Musharraf in early 2004, telling him, "We know so much about this that we're going to go public with it, and within a few weeks, okay? And you needed to deal with this before you have to deal with it publicly." According to Powell, "[T]he next thing we knew, A. Q. Khan had been put in custody."¹⁷ After his arrest in February 2004, Khan confessed to selling sensitive technology and equipment to Libya, Iran, and North Korea. He received a conditional pardon and today remains under house arrest with very little access to outsiders. Khan also maintained that he alone was responsible and had acted independently of current and previous Pakistani governments—a statement that many experts view with skepticism as apparently intended to prevent Islamabad's further embarrassment.¹⁸

Although many Pakistanis have been detained since the scandal broke, none have been prosecuted. The Pakistani government has provided the IAEA and foreign governments with information about Khan's activities but

has not allowed anyone outside the Pakistani government to interview Khan or the others that were detained. Although the IAEA has been allowed to submit written questions that Khan will answer, this type of exchange is not a substitute for direct access to Khan and his associates.

THE INVESTIGATION WIDENS

Absent major breakthroughs in Pakistan, attention has been focused on investigations conducted by national authorities and the IAEA in an effort to fully understand the network, its key suppliers, and its operations, as well as the history and procurement activities of the network's customers.

Prosecutions, which may provide the only way to fill in the remaining knowledge gaps, are in fact taking place in many countries, particularly in France, Germany, Japan, Malaysia, the Netherlands, South Africa, Spain, Switzerland, Turkey, and the United Kingdom. Many of these prosecutions have been slow to start, however, and some face tough challenges in proving the charges against the accused individuals and companies. In some cases, prosecutors or government investigators have been unaware of information that has been uncovered about their citizens through investigations in other countries. Because the network operated transnationally, information sharing among the key states remains critical.

Nonetheless, investigations in Malaysia, South Africa, Germany, Switzerland, and the UAE have already revealed a great deal about the Khan network. For instance, a Malaysian police investigation of SCOPE, the source of the centrifuge components seized on the *BBC China*, showed how the network exploited Malaysia's weak national export control system as well as SCOPE's owners, who seemed unaware of the network's activities.¹⁹ The Malaysian government detained B. S. A. Tahir, a Sri Lankan living in Dubai, for his role in coordinating the manufacturing operation, but no charges have been made public. Tahir has been identified as the chief organizer and "money man" for the Khan network's sales to Iran, Libya, and perhaps other countries. As of early 2005, however, the Malaysian government had not allowed the IAEA access to him.

In September 2004, South Africa arrested Johan Meyer of Tradefin on suspicion of manufacturing centrifuge parts and equipment for Libya. Meyer admitted to prosecutors that he knew that the items were for a uranium-enrichment plant.²⁰ Based on his testimony, other individuals were arrested, including Gerhard Wisser, a German citizen and owner of Krisch Engineer-

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ing in South Africa, who had a long history of involvement with other members of the network. Wisser had been arrested a month earlier in Germany for his alleged role in producing centrifuge parts in South Africa for delivery to Libya but had been released on bail.

In early October 2004, German prosecutors also nabbed Urs Tinner, a 39-year-old Swiss citizen who was mentioned in the Malaysian police report as being allegedly responsible for overseeing the production of centrifuge parts

at SCOPE for shipment to Libya. Urs Tinner is the son of Friedrich Tinner, who had previously been suspected of supplying Pakistan and Iraq with centrifuge-related items and is reportedly suspected by authorities of having played a key role in the Khan network's activities over the years. Friedrich Tinner remains free, although investigations into his activities continue.

Many questions about the extent of the network still remain unanswered.

In November 2004, the Swiss government arrested Gotthard Lerch, a German citizen. In the 1970s and early 1980s, Lerch was employed by Leybold Heraeus, a German company that developed and produced vacuum products and technology. Before undergoing significant internal reform in the early 1990s, Leybold Heraeus and its sister companies had been major suppliers to many secret nuclear weapons programs, including those in Iraq, Iran, South Africa, and Pakistan. Mentioned in the same Malaysian police report that cited Tinner, Lerch was allegedly involved in trying to obtain centrifuge parts for Libya from South Africa. There are indications that Germany asked Switzerland to arrest Lerch so that he would not be free when Wisser was released on bail by South African authorities who had sought to hold Wisser but lost on appeal. Investigators in the United Kingdom and the UAE, the principal transshipment point for much of the equipment bound for Libya, are investigating Peter and Paul Griffin, a British father and son team also named in the Malaysian police report, both of whom have allegedly had a long history of involvement with Khan.

At this point, many questions about the extent of the network still remain unanswered. Investigators worldwide believe that other key participants may not yet have been identified. Questions also remain about the full extent of these individuals' activities in manufacturing and supplying centrifuges and associated equipment. Whether or not all the key workshops and companies have been identified also remains unknown. Moreover, it is possible that components for uranium-enrichment plants have been produced but were not delivered to Libya. Perhaps they have been sent to other unknown customers.

The key to the success of Khan's network was its virtual library of centrifuge designs and detailed manufacturing manuals. An important task for investigators is to retrieve as much of this information as possible. That effort requires, in turn, tracking down and prosecuting the members of the network with this kind of sensitive centrifuge information. Given the ease of copying and hiding documents and digital files, this centrifuge information may form the core of a future network aimed at secretly producing or selling gas centrifuges.

ROLLING UP THE KHAN NETWORK

The Khan network could not have evolved into such a dangerous supplier without the utter corruption and dishonesty of successive Pakistani governments which, for almost two decades, were quick to deny any involvement by its scientists in illicit procurement. They blocked internal investigations and hindered outside investigations of known cases. Pakistani leaders routinely denied that Khan was involved in any transfers of gas centrifuges, despite frequent reports to the contrary, including many that mentioned him by name.

Despite the pressure Washington applied to stop Khan, the United States must also share part of the blame for the network's successful operation over so many years. The United States and its allies failed to act on many hints about the network's activities, such as evidence of Pakistan's help to Iran and Khan's offer to Iraq. Too often in the 1980s and 1990s, the United States put other priorities ahead of exposing Khan and putting him out of business. Even today, the United States has not demonstrated that it places an equal priority on unraveling the activities of the Pakistani members of the Khan network as it does on maintaining Islamabad's support for hunting down Al Qaeda terrorists in Pakistan. Unraveling the activities of the network and ensuring that it is shut down require the Pakistani government to provide more assistance to investigators, including giving the IAEA direct access to question Khan and his associates verbally. Greater cooperation from Pakistan would allow the IAEA, the United States, and other affected governments to conduct more thorough investigations, to pursue criminal prosecutions of individuals involved in the network, and to recover physical remnants of the illicit procurement network that have not yet been found and that could provide the seeds for future, secret nuclear weapons programs.

Although Pakistan has taken steps to create a national export control system and to place additional controls over its nuclear scientists, Islamabad has not faced up to the difficult task of actually implementing an effective control system. One necessary step is to prosecute Pakistani members of the network to send a clear signal that Pakistan will punish illegal exporters severely and thereby reduce the likelihood that someone will step into Khan's shoes.

The successes of the Khan network should shatter any complacency about how effective national and international export controls have been in stopping illegal nuclear or nuclear-related materials. Some countries, such as South Africa and Turkey, were NSG members. Investigations have shown that these countries did not adequately implement their national export control and nuclear nonproliferation laws, despite their commitments as NSG members. Indeed, because of their countries' NSG membership, companies assisting the network could receive items from other NSG members

The key is to retrieve centrifuge information that may form the core of a future network.

essentially without checks on their potential end use. The failure of these NSG countries to stop the illicit manufacture of centrifuge components is one of the most embarrassing aspects of this scandal.

The network was also masterful in identifying countries that had sufficient industrial capability and were eager to make direct-use nuclear items, yet had little knowledge of nuclear technology or inadequate national export laws, making them oblivious or indif-

ferent to the actual nature of items. Revelations about the network have in fact highlighted the risk posed by states such as Malaysia that are outside the NSG. Because these states are not members, their governments and companies were poorly prepared to resist the Khan network's lucrative offers. Although many of the network's suppliers were not aware of the actual purpose of the materials they provided or the parts they were contracted to make, they were often located in countries whose authorities were unlikely to scrutinize exports carefully or to encourage curiosity about the actual end use of an item. In many cases, the companies themselves had little motivation arising from either conscience or threat of punishment to confirm the cover stories they were given by members of the network.

Members of the network even knew how to exploit loopholes in much more stringent European export control systems to obtain necessary sub-components, materials, machine tools, and other manufacturing equipment. For instance, the network depended on complicated transportation arrangements, mainly to confuse suppliers about the true end use of the item and to evade prying intelligence agencies or deceive them about the final destination for its products. The international free zone in Dubai, through which shipments are still subject to few meaningful controls, was particularly critical to the network. Indeed, most items found in Libya were transported through Dubai, in some cases more than once.

Efforts to Prevent Future Networks

Public revelations about the Khan network intensified support in 2003 and 2004 to improve the regimes already in place to address nuclear proliferation. In particular, the network's exposure reenergized efforts to strengthen inspections and national and international export controls. These efforts had gained international support in 2002 as a result of an IAEA investigation proving that Pakistan had provided substantial assistance to Iran's nuclear program. Nonetheless, significant progress had to await revelations about the extent of Khan's activities.

In direct response to the activities of the Khan network, President George W. Bush called for a wide set of reforms in a February 2004 speech at the National Defense University in Washington, D.C., proposing a broad strategy to strengthen and improve both domestic and international nonproliferation efforts as well as new measures designed to enable the United States and the international community to increase the likelihood of detecting illicit trade in nuclear-related materials.²¹ Among these steps were expanding the Proliferation Security Initiative (PSI); strengthening the legal framework governing proliferation, in particular through a UN Security Council resolution requiring states to criminalize proliferation, enact strict export controls, and secure sensitive materials; expanding efforts to secure nuclear material in the former Soviet Union and other states; denying enrichment and reprocessing technology to any states that do not already possess them; requiring countries to implement the IAEA's advanced safeguards Additional Protocol as a necessary condition for supplying equipment and materials for civilian nuclear programs; and reforming the IAEA to improve its capability to enforce states' obligations. The international community also responded with the adoption of various measures by separate bodies including the passage of UN Security Council Resolution 1540, reforms considered by the NSG, expansion of the PSI, the G-8 Global Partnership's Action Plan on Nonproliferation, and proposed steps to strengthen IAEA investigations.

UN SECURITY COUNCIL RESOLUTION 1540

In April 2004, the UN Security Council passed Resolution 1540, which requires all states to criminalize proliferation to nonstate actors and to establish, review, and maintain appropriate and effective export control systems. This resolution, which the United States had first proposed in September 2003, fills an important gap in existing nonproliferation regimes by including an export control law requirement for all 191 UN member states and targeting nonstate actors. Because its requirements apply to all states, this

resolution offers a remedy for some of the problems resulting from the NSG's voluntary, limited membership.

The UN resolution has several problems, however, in terms of its implementation. Some states, particularly in the developing world, may resist its main provisions, believing that the obligations should have been established through treaty negotiations. It will also likely be applied unevenly among even the most well-intentioned states because many, without extensive assistance, will experience difficulties in enacting, implementing, and enforcing effective export control legislation.

NUCLEAR SUPPLIERS GROUP

The NSG has considered steps designed to address weaknesses in its system that contributed to the Khan network's success, including implementing a so-called catch-all provision to give member states additional discretion to deny suspicious but not clearly controlled exports, making the IAEA Additional Protocol a condition for supplying nuclear technology for civilian use, expanding NSG membership, and increasing communication and information sharing among NSG countries as well as with the IAEA. The status of these initiatives, however, varies.

At the May 2004 NSG plenary meeting in Göteborg, Sweden, the NSG decided to establish the first measure—that, as part of their national export control laws, all member states should adopt a catch-all mechanism. This would directly target a tactic used by the Khan network to obtain dual-use items for its customers from several NSG countries. This useful tool, which is already in place in many countries including the United States, gives NSG members the legal authority to refuse to allow an item to be exported, even if it is not included on a control list, if that item might be intended for use in a nuclear weapons program. It also commits states to consider additional factors such as specifications of the requested item that may fall just below those requiring controls and known information about the imports and proliferation credentials of the recipient country. In addition, NSG members debated adopting the second measure, requiring states to implement the IAEA Additional Protocol as a condition for supplying nuclear items for civilian use. Agreement on this issue is likely to be reached at the NSG plenary meeting in 2005.

The NSG has also considered the third measure—expanding its membership—but remains hesitant to do so. The Khan network has shown that some states, such as Malaysia, that are not generally considered actual or potential suppliers of nuclear items have advanced industrial infrastructures that can be exploited to produce direct-use nuclear items such as centrifuge components. Expanding membership in the NSG would enable additional countries to im-

prove their export control systems and receive help from more experienced members. The NSG has already expanded significantly over the last decade, however, and as the cases of South Africa and Turkey highlight, many current NSG members cannot implement the controls they accepted when they joined the organization. Thus, leading members of the NSG, including the United States, are reluctant to expand the group until controls among all existing members are improved. At a minimum, the United States should dramatically step up its efforts to bring NSG members up to acceptable standards so that the group can increase membership in an effective manner.

The NSG is committed to implementing the final measure, improving information sharing among its members, strengthening its relationship with the IAEA, and increasing the amount of information NSG members share with the agency. At the 2004 plenary meeting, NSG members made a commitment to improve information exchange, to reinforce contacts with states outside the NSG, and to strengthen the relationship between the NSG and the IAEA. Currently, members share information with each other on export denials but not approvals of key items. The IAEA does not routinely receive notice of denials. The NSG needs to start sharing key approvals among its members, and the IAEA should be notified of denials as well as approvals. This step would help members of the NSG and the IAEA develop a better picture of a potential proliferant state's overall nuclear capability, hopefully leading to earlier warnings of a state's undeclared nuclear activities.

The Khan network should shatter any complacency about export controls.

PROLIFERATION SECURITY INITIATIVE

Another policy area undergoing change as a result of the revelations about the Khan network is the PSI, which the U.S. Department of State defines as “a global effort that aims to stop shipments of weapons of mass destruction (WMD), their delivery systems, and related materials worldwide.”²² This initiative is pursued primarily through international coordination of efforts to interdict shipments of WMD-related items.

The successful seizure of the *BBC China* demonstrated the importance of the PSI as an enforcement tool that complements existing national and international export controls. The event also highlighted some of the PSI's weaknesses and controversies. Because it is a set of activities and not an organization, the PSI may be vulnerable to changes in administration. For example, the program is not directly funded but is supported through existing diplomatic resources.²³ In addition, the PSI can suffer from lack of

intelligence. Even though the PSI was responsible for the successful seizure of Malaysian-made centrifuge parts on the *BBC China*, the ship also contained many centrifuge parts made in Turkey that were not intercepted by the United States and its allies. Although no damage was done in this case—the parts eventually reached Libya, which turned them over to the IAEA and the United States—it revealed how critically the PSI depends on intelligence that, even in optimum cases, can be incomplete.

The international response thus far has not been sufficiently effective.

In fact, the premature release of information about the *BBC China* seizure may have damaged investigations into key members and suppliers of the Khan network. It is now suspected that members of the network realized that their activities had been discovered, leading some of them to destroy critical evidence. In apparent recognition of this risk, a State Department official noted that keeping PSI successes secret is important to pre-

serve the integrity of investigations.²⁴

As part of the PSI, Bush, in his February 2004 speech, called for using Interpol and other mechanisms to strengthen coordination among countries in their efforts to bring those who traffic in deadly weapons to justice—to shut down their labs, to seize their materials, and to freeze their assets. Toward this goal, the United States has undertaken a range of discussions with its allies aimed at building on existing international law enforcement cooperative efforts that have been successful in other areas. As of early 2004, however, few concrete results had been achieved.

G-8 GLOBAL PARTNERSHIP

Drawing from Bush's February 2004 speech, the G-8 Global Partnership reached agreement on an Action Plan on Nonproliferation at the Sea Island summit in July 2004.²⁵ The G-8 partners agreed that exporting "sensitive items with proliferation potential" should be allowed only in a manner consistent with nonproliferation norms and limited to states committed to these norms. In the action plan, the G-8 members made a commitment to pursue these goals by amending the NSG guidelines as appropriate and by working to gain wide support for these measures. While pursuing these efforts, the G-8 partners agreed not to initiate any new contracts to provide reprocessing or uranium-enrichment equipment and technologies to additional states for one year. This was a weaker commitment than the one that Bush had called for and that the U.S. delegation reportedly lobbied the G-8 to adopt. A complete, long-term ban on providing reprocessing and enrichment tech-

nology to new states will be difficult to achieve within either the framework of the G-8 or the NSG, although the United States is expected to continue to work toward achieving this important goal.

INTERNATIONAL ATOMIC ENERGY AGENCY

The Khan network confirmed the weaknesses of traditional IAEA inspections in detecting undeclared nuclear facilities and materials and the need for all states to implement the Additional Protocol in order to increase reporting of information by states and expand the rights of inspectors to verify that information. This case has also shown the need for the IAEA to receive more information from states about their exports and imports of key sensitive dual-use items. In the cases of Iran and Libya, the IAEA has retroactively received a wide variety of information about their imports of sensitive dual-use equipment, materials, and technology. The agency is now in a much stronger position to perform its responsibilities in those states, to make a determination about Iran's and Libya's compliance with the NPT, and to take the steps necessary to develop confidence that there are no undeclared nuclear activities or materials in these two countries.

Because Iran and Libya lied to the IAEA about their nuclear activities, they were under intense international pressure to be more transparent with the IAEA. Under normal circumstances, however, the IAEA receives limited information about countries' exports and imports. The IAEA's Additional Protocol does require states to report on exports of direct-use nuclear items. In practice, however, nuclear smuggling networks can be expected to export those items illegally—hiding their true purpose—as the Khan network frequently did. Thus, states would receive false information and could not report such items to the IAEA as being of direct use.

Reports of exports of nuclear dual-use items would be more useful. These items would be more likely to be exported with a license, albeit with a false end-use declaration, and thus reportable to the IAEA and subject to scrutiny aimed at revealing undeclared activities in a country of concern. Requiring states to report on a wider variety of exports and imports would be a logical extension of the current safeguards that place great emphasis on developing a broader picture of a state's nuclear and nuclear-capable infrastructure. These new reporting requirements should be seen as a necessary component of implementing credible safeguards.

Such a reform could be implemented on a case-by-case basis, as has been done with regard to Libya and Iran. Additionally, it could be achieved by amending the Additional Protocol to require states to report more exports and imports to the IAEA. In either case, the IAEA must allocate more resources to retrieving and analyzing import and export information.

A New System to Improve Export Controls

Beyond these existing reforms, ElBaradei has called for a formal international arrangement to control exports and imports. In January 2004, ElBaradei said that “export controls must be dramatically improved and, in contrast to the past, must be carried out within an international framework.”²⁶ A month later, he urged the establishment of universal, “binding, treaty-based controls.”²⁷ ElBaradei did not provide any details about a potential treaty, and he also apparently recognized the difficulty of achieving such a treaty in practice.

A universal, treaty-based system controlling nuclear export activities could help.

Nonetheless, his proposal warrants further study because it could solve many of the problems in the current system of export controls, making it significantly more difficult for nuclear smuggling to occur.

A universal treaty-based system controlling nuclear export activities would be binding on states and would include a means to verify compliance. Under such a treaty, countries would implement a set of nuclear and nuclear-related export control laws and criminalization procedures, similar in nature to those required by Resolution 1540. The agreement, however, would also require an organization to verify compliance, ensure the adequacy of a state’s laws, and investigate illicit procurement activities. Signatories to the agreement would inform this organization of sensitive nuclear or nuclear-related exports, and it would have the mandate and legal right to verify that the transactions are indeed legal. The organization would also verify the accuracy and completeness of a country’s declaration about its nuclear or nuclear-related exports or imports. In addition, a treaty-based system of export controls and verification would impose new requirements on all states, even those that have not implemented the Additional Protocol.

The IAEA is a logical choice to undertake this role because, as part of its safeguard responsibilities under the NPT, it is already pursuing investigations of illicit procurement activities by Iran and Libya. These investigations include taking inventories of all centrifuge equipment and components in Iran and Libya and verifying their accuracy and completeness, determining the network’s suppliers and manufacturing activities, cooperating with a range of governments on the network’s activities, receiving information about suppliers from member states, and meeting with Pakistani investigators. These investigations involve receiving more information from states than the IAEA’s Additional Protocol requires.

By more formally linking its safeguards system with export control verification and monitoring, the IAEA would be in far better position to assure the absence of undeclared nuclear activities and to detect cheating in a timely manner. A treaty-based export control system would allow the IAEA to perform a task that governments have been unable to do and thereby significantly increase the security of the United States and the international community.

As it is, the A. Q. Khan network exploited loopholes in the existing nationally based system and created a network of suppliers, manufacturers, and shippers that provided secret nuclear technology to Iran, Libya, North Korea, and perhaps others. Iran and Libya would have been severely hindered in their efforts to achieve nuclear weapons capability absent assistance from the Khan network. These transfers went largely undetected, and any hints of these dangerous activities were not pursued aggressively until relatively recently. With the international community increasingly aware of the damage done by the Khan network, it needs to take further steps to uncover all aspects of the network and prevent future nuclear smuggling.

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