PROCUREMENT DATA AND SAFEGUARDS: LOOKING HISTORICALLY AND TO THE FUTURE

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Abstract

Because nuclear programs depend on procurements, understanding such procurements has become an important aspect of safeguards today. This paper looks back at the development of this approach and draws out lessons for tomorrow. Past cases, recounted using open source data and Institute archives, are drawn from, among others, Iraq Action Team investigations, Iran inspections during 2003-2006, the Khan Network investigations, and the Joint Comprehensive Plan of Action. These cases illustrate important lessons about collecting and including procurement data more explicitly in state declarations and meeting inspection and monitoring goals. The cases also demonstrate the value of procurement data in facilitating the detection of irregularities in a nuclear declaration or verifying the correctness and completeness of a state's nuclear declaration. These experiences and historical cases yield additional insights and lessons into ways to increase the usefulness of procurement data in future safeguards practices and methodologies.

1. INTRODUCTION

The IAEA has received nuclear-relevant procurement data under a variety of mechanisms, including under safeguards agreements, from UN Security Council mandated missions, via open sources, industry, and third parties, and through voluntary reporting arrangements. The motivation has typically been to assess the correctness and completeness of state declarations of nuclear activities since understanding a state's key procurements can indicate inconsistencies in a declaration or undeclared activities. The IAEA has wide experience and deep expertise in obtaining and assessing procurement information and incorporating that information into safeguards activities, including analysis serving state evaluation purposes.

2. COMPONENTS OF A PROCUREMENT NETWORK

Nuclear programs often require a considerable number of imports of a wide variety of goods to build nuclear facilities. In the case of unsafeguarded, sanctioned, or covert nuclear facilities or activities, the acquisition of the imports are often disguised, involving false end-user statements and circuitous supply chains. Fig. 1 shows a network composed of an interacting collection of entities and individuals engaged in the process of procuring strategic commodities from industrialized countries, although it is worth recalling that less industrialized countries are also increasingly targeted. The figure includes the activities associated with organizing the acquisition of goods, including ordering goods, paying for them, and shipping them, while deceiving suppliers about their end-use. Globalization and the ease of international travel, communication, and trade has simplified the acquisition of goods for nuclear programs. For covert procurements, networks seek to mask their procurements as legitimate trade. Over time, that effort has become more elaborate and involved the use of various intermediaries to help hide the identity of the actual end-user from the supplier and authorities. A frequent tactic is the use of trading companies or universities located in the supplier or a transshipment state. A more complicated scheme involves the creation of an off-shore supply chain that both procures and produces needed dual-use goods and delivers them to the end-user. While covert procurements are often encountered, a distinguishing trait is that procurement networks must at some point abuse normal trade arrangements, such as at companies or financial institutions, to obtain these goods, increasing the chance of detection.

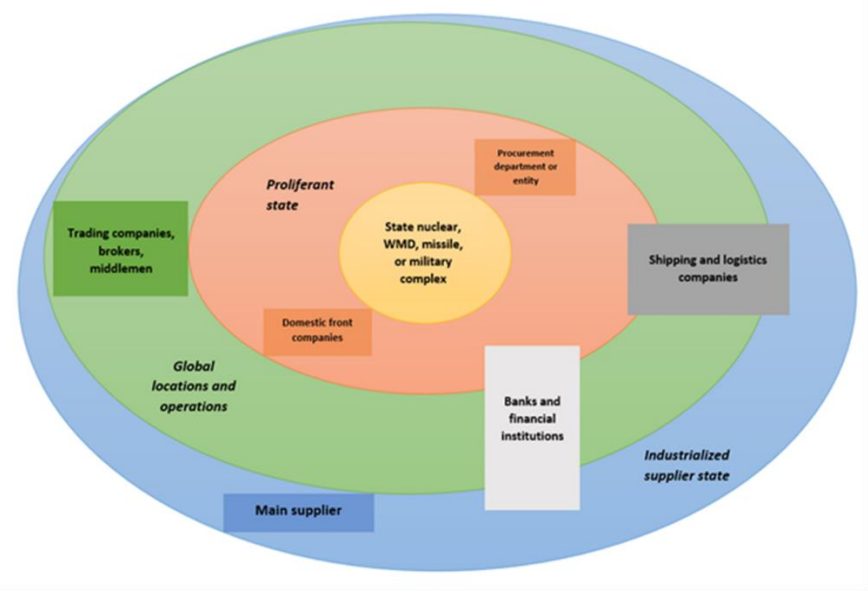


FIG. 1. Depiction of actors and entities in a procurement network composed of nodes or hubs [1]. (No connecting lines are included for the sake of clarity).

3. CASE STUDIES INVOLVING THE IAEA

Several case studies are considered to illustrate the IAEA's involvement in obtaining and using procurement data. They are drawn from open sources and Institute publications and archives, assembled over the last thirty years. They are examples of major events incorporating procurement data and highlight the value, even necessity, of inclusion of procurement data in determining the completeness of a declaration and finding indications of undeclared materials and activities

3.1 South Africa [2]

The IAEA's verification of South Africa's denuclearization stands as an important success, representing the deployment of a range of innovative verification methods made possible by South Africa's remarkable cooperation. These methods were justified following action by the IAEA General Conference, which on September 20, 1991, voted to request the Director General to verify the completeness of the inventory of South Africa's nuclear installations and materials. The subsequent verification activity included one important, early example of South Africa voluntarily providing the IAEA procurement data related to nuclear weapons production.

The voluntary cooperation involved Armscor, the entity responsible for the nuclear weaponization program. Although the provision of procurement information was not a key part of the completeness verification, and in fact South Africa's stated policy was not to reveal to the IAEA the names of the key suppliers of direct-use and dual-use equipment to its enrichment and nuclear weapons programs, Armscor officials broke with this policy and provided the agency with a list of goods it acquired for its nuclear weapons programs and informally provided some information about foreign suppliers. It was willing at the time to provide the IAEA more information, but it had only a small fraction of its original records. It had destroyed almost all of its nuclear weapons programs records, including foreign procurement data, under its dismantlement process by the time of the IAEA nuclear weaponization verification effort in 1993. Although by today's standards the list was not comprehensive and the names of the suppliers were sometimes omitted, it represented an important precedent of voluntary cooperation on procurement data with the IAEA during a time of transition for safeguards following the 1991 Persian Gulf War.

Armscor also provided information publicly, as can be seen in Fig. 2, which shows a photograph of an imported vacuum furnace in a post-nuclear weapons commercialization effort. Senior Armscor officials described the furnace as imported for the nuclear weapons program [2].

FIG. 2. Vacuum induction furnace used in the South African nuclear weapons program in the 1980s to sinter the tamper subcomponents of a gun-type nuclear device.[2] The furnace was not controlled when it was procured in the 1980s from a European manufacturer. In this image, the furnace was being used for civilian purposes as part of a program to commercialize aspects of the abandoned nuclear weapons program. Photo: Armscor

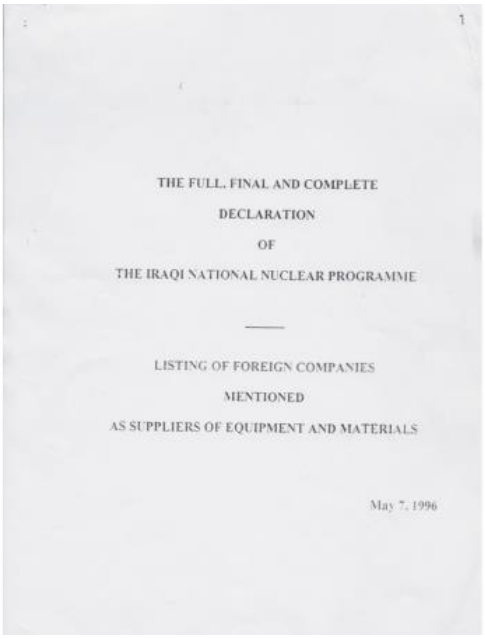
3.2. Iraq Action Team

After Iraq's defeat in the 1991 Persian Gulf War, the UN Security Council (UNSC) imposed a cease-fire agreement mandating Iraq's verified dismantlement of its nuclear weapons programs (along with ballistic missiles above a certain range, and chemical and biological weapons). The UNSC authorized the IAEA to establish the Action Team and charged it with the task of uncovering and verifying Iraq's nuclear disarmament. Within weeks, inspectors discovered hints of a vast, secret nuclear weapons effort that would take years to fully comprehend and dismantle. In general, from 1991 until 1998 when conflicts developed and on-the-ground Action Team inspections ended, Iraq's cooperation improved with time, particularly after 1995 and the defection of Saddam Hussein's son-in-law, Hussein Kamal who headed Iraq's WMD programs. Nevertheless, Iraq's cooperation should not be categorized as voluntary, given the unprecedented authorities granted to the Action Team under the cease fire arrangement.

Action Team inspectors uncovered a large overseas procurement effort, which had succeeded in obtaining large quantities of technology, equipment, and materials for Iraq's secret nuclear programs from many countries including Britain, Germany, Switzerland, Austria, Finland, Japan, Brazil, and the United States. The Action Team used the extraordinary powers granted by the Security Council to undertake an intensive multi-year investigation to detail Iraq's procurements, the suppliers, and the key facilitators of those efforts. The Action Team's authorities allowed for obtaining far-reaching state cooperation in tracking suppliers and seeking information from them.

The Action Team, with Iraqi and state support, compiled extensive lists of payments and major suppliers to the Iraqi nuclear program (see Fig. 2). It also discovered classified centrifuge design drawings and 164 URENCO documents in Iraq, earlier provided by German centrifuge experts secretly recruited by Iraq to aid its centrifuge program [3]. The documents collectively represented a significant body of secret centrifuge technology. Besides providing sensitive documents, the foreign centrifuge experts provided expertise on a range of Iraqi centrifuge challenges, both outside and inside Iraq. Without their expertise, the Iraqi program would likely have failed.

The Action Team used the information as part of its assessment on the scope and depth of Iraq's centrifuge and other nuclear projects. It also used the acquired information to create a control list, called Annex 3, of nuclear direct-use and dual-use items derived from Iraq's clandestine nuclear programs that was more comprehensive and restrictive than the Nuclear Supplier Group (NSG) Part 1 and 2 lists. Any item on this list would need IAEA approval for its export to Iraq. Annex 3 was approved by the UN Security Council as part of the IAEA's on-going monitoring program in Iraq.



THE FULL, FINAL AND COMPLETE

DECLARATION

OF

THE IRAQI NATIONAL NUCLEAR PROGRAMME

LISTING OF FOREIGN COMPANIES

MENTIONED

AS SUPPLIERS OF EQUIPMENT AND MATERIALS

May 7, 1996

FIG 3. The cover of a multi-page document prepared by the Action Team listing Iran's procurements for its secret nuclear weapons program. Source: Institute archives

A surprise was the discovery of an English-language document labelled as "Project A.B." in a large cache of documents hastily assembled and handed over by the Iraqis in 1995 after Kamal's defection [4]. It showed an offer via an intermediary from A.Q. Khan of Project A.B. It was quickly recognized that A.B. stood for "atomic bomb." The offer was made in October 1990, as intense international pressure built on Iraq following its invasion of Kuwait. It stated: "Pakistan had to spend a period of ten years and an amount of 300 million U.S. dollars to get it. Now with the practical experience and the world-wide contacts Pakistan has already developed, you could have A.B. in about three years' time and by spending about 150 million U.S. dollars." The document continued, "We will provide the detailed design and actual blueprint of A.B." at a cost of 5 million U.S dollars. Khan and his associates were offering aid to Iraq to establish a program to enrich uranium to weapons grade and manufacture nuclear weapons. They also pledged to undertake the procurement of all the vital components and materials from European suppliers via "our Dubai office." The proposal held out the possibility of two or three scientists resigning their positions and joining this new Iraqi effort.

The Action Team, despite extensive investigations in Iraq and overseas, was unable to confirm the offer or interview the principals or intermediaries. Senior Iraqi officials downplayed the offer and Pakistan aggressively denied it. When the inspectors left Iraq in 1998, the offer remained one of the major unresolved issues about Iraq's pre-1991 nuclear weapons program, standing as one the earliest and strongest indications that Khan was selling dangerous nuclear assistance, a warning from the IAEA that deserved more attention from the international community at that time.

3.3. Khan Network [4]

The A.Q. Khan Network's nuclear proliferation activities were finally uncovered and stopped in the early 2000s. By then, it had managed to create a transnational network that could do what only states had done before—sell complete nuclear facilities and the designs and technology for making nuclear weapons. It often failed, as the example of the A.B. documents in Iraq indicate, but it obtained a major sale to Libya valued at over $100 million that was progressing steadily by the time it was halted in 2003 [5]. To make this sale, Khan mobilized his entire transnational network, stretching from Switzerland to South Africa, through Turkey and Dubai to Malaysia. The Khan network also sold North Korea key gas centrifuges and associated technology. It also provided Iran with essential centrifuge components, whole centrifuges, and extensive sensitive nuclear documentation.

Mobilized to verify Libya's decision to denuclearize, the IAEA conducted over the next few years one of the most detailed investigations of the Khan network, obtaining a remarkable amount of voluntary cooperation from key states caught up in the network's activities. One key thread started by asking for access to Libya's centrifuge manufacturing workshop, which contained a large amount of foreign supplied centrifuge manufacturing equipment

and imported finished components, many in the original packaging with shipping documentation. By carefully noting the suppliers' names, this thread could be pulled to uncover a worldwide web of suppliers, subsequently contacted, yielding further important information.

The IAEA safeguards investigation was an outstanding example of seizing the initiative and proactively seeking cooperation from states. It contributed significantly to the overall understanding of the Khan network's nuclear proliferation activities, which benefited concerned states and created new standards of voluntary cooperation and the provision of third party information.

This investigation depended on the IAEA's expertise in the fuel cycle and its ability to conduct investigations of nuclear weapons activities. The latter used experts from the nuclear weapons states and involved the creation of carefully protected areas within the institution. Intrinsic to that capability was understanding the role of the equipment, materials, and procurement methods but also harnessing centrifuge and weaponization experts and conducting highly sensitive diplomatic outreach to a wide variety of countries.

3.3.1 Special Request by Switzerland

One of the IAEA's more unusual procurement investigations started with a request from a non-nuclear-weapon state – Switzerland – to help determine the meaning and significance of sensitive nuclear documents and designs that it had obtained while executing search warrants at Khan network member residences in 2006 [6]. In those raids, Swiss federal police authorities seized computer hard drives and documentation containing complete sets of centrifuge drawings and manufacturing books of P1 and P2 centrifuges, details about contracts with companies to make centrifuge components, procurement and shipping information, and a variety of valuable correspondence among the members concerning their activities for the Khan network. The Swiss authorities also received hard drives from the members' residences in the United Arab Emirates (UAE). The set of information about the P1 and P2 centrifuges was almost identical to what Libya had in its possession, representing an import of sensitive technology into Switzerland.

Confronted with so much sensitive technical information, the Swiss government turned to the IAEA for assistance; understanding the contents of the files was beyond Switzerland's competence. Unexpectedly, in the early spring of 2006, IAEA inspectors found drawings of nuclear weapon components within the documentation. The nuclear weapons documentation appeared to be in initial stages of preparation for its sale. The network members were scanning these drawings onto hard discs in preparation for turning them into computer aided design (CAD) drawings and developing manufacturing instructions for each part. The original drawings, some quite large, were hard copies produced by draftsmen, likely in Pakistan. Some drawings had the draftsmen's initials on them. The process of producing CAD drawings was laborious and not likely to have been one without a specific profit-making purpose in mind.

In February 2009, the Swiss government decided to rely upon IAEA specialists to segregate the documents on nuclear weapons and gas centrifuges. The inspectors completed their survey over two days in late March 2009 and identified the nuclear weapons and centrifuge documents, where the nuclear weapons documents were slated for destruction. This case shows the benefits the IAEA can offer to states to help solve complicated nuclear proliferation and procurement schemes. It also raised important issues of what it means to be a non-nuclear-weapon state party to the NPT and identified an IAEA role in enhancing assurances that non-nuclear-weapon states are free of highly classified nuclear weapons data.

3.4. Industry cooperation

Procurement information from companies via states has proven an effective method to acquire important proliferation-related data related to safeguards issues. Industry in essence serves as a key lookout for secret procurement. It often has important information about dual-use goods sought by nuclear programs. This information may exist in the form of requests for price quotes, or enquiries, and other communications with a potential buyer, containing information on the goods' specifications, trading companies, transit points, financing, end-uses, or end-user information. It may include items the company had no intention to sell to the prospective buyer because of suspicions about the actual end-use or end-user.

Several companies have been willing to share their data with the IAEA on a confidential basis, since 2005 under a voluntary cooperation mechanism called the IAEA Procurement Outreach Program. In some cases, companies who had earlier been involved in sales to unsafeguarded or secret nuclear programs have provided historical files about their sales, of value in evaluating whether a state's nuclear declaration was complete.

To illustrate the value of such sharing, the Institute benefited from such cooperation, helping detail Iran's secret 1980s efforts to obtain centrifuge components and equipment in Europe [4]. In one notable case the company turned over documentation around the year 2000 about Iran's earlier purchase of 50 P1 centrifuge components, dramatic evidence of an undeclared Iranian gas centrifuge program. It would be another three years before Iran admitted to the program and allowed the IAEA to inspect a centrifuge site near the city of Natanz. This type of information played an important role in detecting an undeclared nuclear program and helping achieve a fuller declaration from Iran.

3.5. Monitoring the JCPOA, under UNSC Resolution 2231 (2015)

The IAEA's involvement in verification activities of the 2015 Joint Comprehensive Plan of Action (JCPOA) was requested by the UN Security Council through UNSC Resolution 2231 and approved by the Board of Governors. Part of these activities involved verification of certain items supplied, sold, or transferred to Iran via the JCPOA's Procurement Channel for use in activities consistent with the JCPOA or other civilian non-nuclear end-uses. The Procurement Channel's measures were instituted for ten years or until late 2025. During this period, if a state wants to supply an item subject to the JCPOA and UNSC Resolution 2231, it must submit documentation to the executive of the Procurement Channel, the Procurement Working Group (PWG), which regularly reviews supply proposals.

The IAEA was provided special access to information regarding nuclear items (although the information would be supplied in any case if the supplier country has an Additional Protocol in place). If a state submits a proposal to the PWG to export to Iran items, materials, goods, and technology that are set out in the NSG's Part 1 list, officially INFCIRC/254/Rev.12/Part 1, (where the most recent version of this documents is used), the IAEA receives a copy of the proposal. To carry out its responsibilities, it has sometimes attended the PWG as an observer. For Part 1 items approved for supply, Iran must provide the IAEA with access to locations of intended use of the items. In addition, the IAEA receives post-supply notifications of items on both Part 1 and Part 2 (dual-use) lists from supplying states.

Far fewer than expected proposals have been submitted. From the JCPOA's implementation in January 2016 to March 2018, there was an average of about one proposal per month. All but one of these proposals involved NSG Part 2 items. End-use verification on the approved items has been a priority of the PWG. The small number of proposals during this period raised concern that either states are not submitting proposals to the PWG, or Iran was obtaining items outside the procurement channel.

With the breakdown of the JCPOA, starting in May 2018 when the United States ended its participation in the arrangement, the exact status of Iran's requirements under the procurement channel are uncertain. Nonetheless, Iran is suspected of having acquired items outside the procurement channel since May 2018 [7].

4. WATCH LISTS

A key lesson derived from efforts to detect covert nuclear-related procurements and enforce national strategic trade control laws is that NSG Part 1 and Part 2 control lists are insufficient to understand covert procurement. The type and specification of sought-after items are more varied, with lower specifications than those found on Part 1 and 2 lists. Some key items are not on these lists. Control lists, which are developed through time-consuming negotiations among NSG members, have several loopholes and other limitations, meaning that items deserving listing are not always included. Nonetheless, these lists are critical for export controls, as is their regular updating, but a broader understanding is necessary to design safeguards relevant approaches. In the export control context "catch-all" clauses have been developed to incorporate this lesson. For safeguards purposes, a catch-all procedure is hard to operationalize.

The Institute has developed lists of goods involving specific technologies, such as gas centrifuges. They are called "watch lists." Others call them "chokepoint lists;" there are other names. But the point is that the lists serve as a guide to the most important goods, typically dual-use goods, to monitor for export with the goal of preventing sales, identifying covert procurement, and learning more about covert or sensitive nuclear programs.

An item on the watch list may not be on the NSG lists. The watch list was not developed as a control list. If an item on a watch list is not on a NSG control list, it is on the watch list typically because it was sought as part of secret procurement efforts for nuclear purposes.

The use of a watch list allows for a broader search for secret procurements and undeclared nuclear or nuclear-related activities. It is likely that the IAEA has its own lists of nuclear-related items relevant to covert procurement efforts, and additional sources would undoubtedly be appreciated.

5. COMMERCIAL TRADE DATA

Publicly available trade or shipping manifest data can provide indications of undeclared activities and support the verification of state declarations under the additional protocol. Individual listings in the data set typically contain information about a shipment, including its value, a description, weight, and shipper and recipient addresses. Many shipments have a Harmonized System (HS) code, which traders use to declare goods to customs. These HS codes are oftentimes too broad to associate with a particular proliferation- or safeguards-related item. However, practice has shown that sets of HS codes can be used as a starting point to identify relevant shipments, but the analysis of the screened results is labor intensive.

Because trade data sets can involve millions of records, and suspicious ones are few, data sets need to be incorporated into data science, or "Big Data," software technologies that can conduct searches of the entire data set in reasonable times. These programs are commercially available, helping to mitigate cost and software usability.

It should be noted that searches for individual HS codes are typically fraught with mistakes or are often non-productive because of the lack of specificity and inherent ambiguities in an HS code. However, creating families of codes tied to individual technologies, such as gas centrifuges, nuclear weaponization, or nuclear reactors, has proven more productive in identifying suspicious transactions. But it should be noted that the lists of items needed in a particular nuclear technology go beyond any control list, similar to watch lists. These search lists should be supplemented by other screening lists, such as sanctions lists.

These searches typically output a subset of individual shipments, ideally relatively small in number. The next step is demanding, analysis by subject matter experts looking for suspicious shipments, shippers, or end-users among results. While commercial trade data are readily available, software and search methods are needed to output manageable sets of relevant data quickly and thoroughly from large data sets, and subject matter experts are vital to analyze the results. When that is done, this is an effective tool to produce timely, actionable information about procurements. It has been possible to discover a wide variety and number of suspicious shipments and end-users. Some examples include detection of shipments of nuclear dual-use goods to suspicious or sanctioned entities, shipments to many false end-users, suspicious transshipments through a variety of countries, and trade flows of nuclear-related goods.

6. LOOKING TO THE FUTURE

The receipt and analysis of procurement has played an important role in the IAEA, aiding the accomplishment of its safeguarding and monitoring mandates. This experience should be built upon in the future.

6.1 Voluntary cooperation and third party information

The case studies highlight the importance of voluntary cooperation by states, regardless of the specific method. Typically, this works best if it builds upon an existing cooperation program or upon an immediate need of high interest to the international community. Seeking such cooperation related to procurements, including the provision of third party information, will continue to be important to the success of safeguards.

The voluntary state cooperation discussed in several of the case studies has sometimes been quite broad. That breadth was often necessary to understand the purpose of the covert procurement, a safeguards violation, or an incomplete declaration. The IAEA should continue being proactive in seeking safeguards-relevant procurement data from states and continuing to approach states for assistance in that effort, for example utilizing the IAEA Procurement Outreach Program.

Companies should continue to be encouraged to provide procurement data to the IAEA, also through the IAEA Procurement Outreach Program. Many members of industry regularly provide such data to states, and these data are a valuable source of information about covert nuclear-related procurements. This outreach program should expand the number of companies visited, with relevant state officials, under the program's awareness-raising outreach effort.

6.1.1 Voluntary Reporting Scheme

The Voluntary Reporting Scheme (VRS), which was not discussed earlier, involves about 35 states and the European Commission reporting on nuclear material, specified equipment, and non-nuclear material. The list of the specified equipment and non-nuclear material used in the voluntary reporting scheme is from Annex II of the Model Additional Protocol (INFCIRC/540 (Corrected)), which is an older version of the NSG Part 1 list. The scheme was

established in 1993 for states to voluntarily report items not otherwise required to be reported by safeguards agreements (originally, prior to the Additional Protocol, INFCIRC/254/Part 1 "as periodically updated" was the basis). It has most value to states that have not ratified the Additional Protocol, which requires states to report exports set out in Annex II and, upon IAEA request, to report on imports of items in this annex. However, there does not appear to be anything in the VRS that would prevent states from reporting more broadly than only items relevant to Annex II, including and some VRS states continue to use the latest version of the NSG Part 1 list. All members should be encouraged to increase the provision of relevant procurement data to the IAEA.

6.1.2 State information on suspicious procurements

Many states devote extensive resources to detecting and prosecuting illicit procurements. Supplier states sometimes make this information available to the IAEA. Supplier states should consider disclosing more of this information to the IAEA. That could include evidence gathered in criminal prosecutions relevant to safeguards implementation. States should also share with the IAEA safeguards-relevant information from end-use verification, particularly unfavorable ones.

6.1.3 State export denials

State denials of exports, which involves a state decision to deny permission to export an item, are useful in understanding an applicant's intention, needs, and capabilities. As such, they can be useful in evaluating the declaration of the state requesting the item. The NSG shares denials among its members, and hopefully the IAEA receives many of these denials. It would be useful for NSG members to provide all of their denials of nuclear-related exports to the IAEA on a voluntary basis.

6.2 Updating Annex II (and Annex I) in the Model Additional Protocol

The Voluntary Reporting Scheme highlights one of the problems posed by Annex II and by implication Annex I – the need to update them. The model for Annex II, namely INFCIRC/254/Part 1 has been revised many times since its incorporation into the Additional Protocol over 25 years ago. However, Annex II has not been updated, despite all these modifications, in some cases the changes were quite extensive, as witnessed following the NSG's fundamental review of its lists undertaken in 2010-2013. Similarly, Annex I has not been updated, despite the changes in the underlying NSG lists and additional experience in implementing the Additional Protocol.

The revision process appears simple; under article 16 of the Additional Protocol, the list may be amended by the Board upon the advice of an open-ended working group of experts established by the Board. Despite the apparent simplicity, the lists have never been updated and the working group has not been established. The issue was raised by the IAEA Secretariat and Committee 25 in 2006, but no board action was taken [8].

Planning the future of safeguards provides an opportune time to consider updating Annexes I and II and creating an ongoing way to evaluate the adequacy of the items in the annexes. Absent an updating of Annex I and II, the IAEA should request states to include voluntarily information in their Additional Protocol declarations that goes beyond items in Annexes I and II.

6.3 Understanding covert procurements and the underlying technologies

Collectively, there is considerable information available about how covert procurement occurs and ways to detect and prevent it. It is important to understand the process and methods of covert procurement both currently and in the past. In such an endeavor, states can provide valuable experience and insights. This is related to the IAEA's acquisition pathway analysis (APA) and the State Level Approaches (SLA), although the extent that APA and SLA incorporate covert procurement pathways is unknown, especially their reliance on a separate, more general effort aimed at understanding covert procurement. Given the wide variety of goods that could be safeguards relevant, any such effort requires a network of scientific and engineering experts.

An example of the purpose of such an effort is to understand the evolution of the acquisition needed for a particular nuclear activity, in particular, as a state moves from acquiring a controlled good, or one on a watch list, to subcomponents of the good, for manufacturing and assembly in the state, thereby bypassing detection or control. There are several examples of this progression.

6.4 Open Source Publications

Using open source publications, the IAEA has demonstrated a remarkable ability to collect information relevant to covert procurements and the broader issue of state acquisition of goods that is safeguards relevant. Open source analysis at the IAEA is viewed as including evaluations of goods not listed on control lists.

Much information can be collected remotely, and the IAEA is constantly improving its ability to do so. This effort deserves increased support in the future. This effort can be aided by directly reaching out to open source information originators to acquire additional information that may not be in the electronic or printed record.

6.5 Trada data assessments

Assessing large sets of trade data appears useful for safeguards purposes. However, to do so effectively is expensive. It involves collecting trade data (via purchase for high quality data), developing a Big Data software system to assess the data, developing search protocols relevant to safeguards, and assembling subject matter experts. The result of the search will usually constitute tips that will require follow up by safeguards personnel. If the IAEA has not instituted a large trade data system, establishing a pilot project makes sense. In addition, states should proactively and voluntarily share safeguards relevant information from their own trade analysis systems.

6.6 Lists

Because lists of sensitive goods, whether NSG or watch lists, are so important, the IAEA needs an in-house method to evaluate the lists and their relevance to safeguards. This institutional capability needs to be broader than a working group related to Annexes I and II revision. The NSG and national authorities regularly seek to update their lists, and the IAEA needs a better way to understand lists from its safeguards perspective and incorporate these changes into its safeguards work.

7.0 FINAL WORD

Nuclear proliferation and the need for robust IAEA verification is not going to disappear anytime soon; in fact, nuclear proliferation may worsen over the coming years, making the IAEA even more important. Outfitting and maintaining nuclear programs will continue to depend on procuring key goods abroad, many done covertly. Detecting these procurements will remain a priority for authorities and experts. It is vital that the IAEA continue and grow in its own ability to analyze procurements relevant for safeguards missions to help reduce the dangers posed by nuclear weapons and ensure the peaceful use of nuclear energy.

REFERENCES

[1] ALBRIGHT, D., BURKHARD, S., FARAGASSO, S., KEENAN, L., STRICKER, A. Characterizing and Drawing Lessons from Tactics and Methods of Illicit Procurement to Improve Counterproliferation: Volume 1: Case Studies and Findings, Institute for Science and International Security Press, Washington, D.C. (2020).

[2] ALBRIGHT, D., Revisiting South Africa's Nuclear Weapons Program, Institute for Science and International Security Press, Washington, DC (2016).

[3] ALBRIGHT, D., Iraq's Acquisition of Gas Centrifuge Technology, Parts I, II, and III, http://exportcontrols.info/case_studies.htm

[4] ALBRIGHT, D., Peddling Peril, Free Press, New York (2010).

[5] ALBRIGHT, D., Libya: A Major Sale at Last (2010), https://isis-online.org/uploads/isis-reports/documents/Libya_and_the_Khan_Network_1Dec2010.pdf

[6] ALBRIGHT, D., BRANNAN, P., The Tinner Case (2010), https://isis-online.org/uploads/isis-reports/documents/tinner_case_evaluation_21Dec2010.pdf

[7] FARAGASSO, S., BURKHARD, S., Iranian Illicit Procurement Scheme to Acquire Controlled Spectrometry Systems Busted (2021), https://isis-online.org/isis-reports/detail/iranian-illicit-procurement-scheme-to-acquire-controlled-spectrometers/8

[8] ROCKWOOD, L. MAYHEW, N., LAAREV, A., PHNEISL, M., IAEA Safeguards: Staying Ahead of the Game, (2019), https://vcdnp.org/wp-content/uploads/2019/09/201914-iaea-safeguards-staying-ahead-of the-game.pdf