The IAEA System and Experience as a Model for Information Management under the Chemical Weapons Convention*

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ABSTRACT

Similarities in the verification aims of the monitoring regimes of the future Organization for the Prohibition of Chemical Weapons (OPCW) and of the International Atomic Energy Agency (IAEA), make their general data requirements similar: data are needed for planning inspections, for evaluating inspections, and for preparation of reports on compliance with the relevant treaty. In this paper we discuss the legal, procedural and administrative structure behind the data system associated with IAEA safeguards, and, after comparing this to the CWC regime, suggest possible improvements for consideration during the development of national implementation programs and of the declaration and inspection data management system for the OPCW.

INTRODUCTION

The negotiations on an international Chemical Weapons Convention (CWC)[1,2] are nearing completion at the 39-member state Conference on Disarmament in Geneva, Switzerland. The treaty is both a destruction agreement (all chemical weapons stocks and chemical weapons production facilities belonging to Signatories will be destroyed) and a prohibition on production, stockpiling, or use of chemical weapons. It provides for the continued "permitted production" of chemicals which **could** be used to produce chemical weapons, but which have other, legitimate purposes, another example of the troublesome "dual-use" concept.

Under the treaty, the Technical Secretariat of the international Organization for the Prohibition of Chemical Weapons (OPCW) will be responsible for monitoring chemical production facilities which make, process, or consume any of a listed group of "dual-use" chemicals. In other words, the OPCW will be verifying the "peaceful uses" of these chemicals. The monitoring of **on-going, allowed processes** which may involve specific **materials of concern** under the CWC may be considered analogous to safeguards of the International Atomic Energy Agency (IAEA), charged with monitoring the "peaceful uses of nuclear energy", i.e., inspection of **on-going, allowed processes** which involve specific **materials of concern.**

Implementation of the CWC will be **based on information** supplied to the OPCW by CWC-Signatory States in declarations about chemical weapons, about chemical weapons production facilities, and about industrial chemical production, processing, or consumption of the "dual-use" chemicals. Inspections to verify compliance with the CWC will include verification of the accuracy and completeness of these declarations. Data associated with the first two, chemical weapons and their associated production facilities (both of which are to be destroyed under the treaty), will be voluminous but finite. The data volume associated with the latter, i.e., industrial chemical production, will likely be overwhelming.

In the case of IAEA safeguards, which are also based on information, the number of facilities to be monitored (and, correspondingly the associated data for monitoring) has been dependent on the carefully controlled expansion of the use of nuclear energy (controlled precisely because of the potentially devastating consequences of the non-peaceful uses of special nuclear materials). For 1990, the IAEA had 515 nuclear installations under safeguards.[3] In contrast, the chemical industry was long-established, widespread, and flourishing, including the use of many of the "dual-use" chemicals, before chemical weapons were ever developed.[4] The CWC-related number of facilities has been estimated to range from

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thousands to tens of thousands. The number of declarations will track the number of facilities for the CWC as it does for IAEA safeguards.

During the negotiations on the CWC in Geneva, proposals surfaced to curtail the scope of verification under the treaty in anticipation of resource constraints on the Technical Secretariat of the OPCW; the OPCW budget will be dependent on Member State contributions, just as the United Nations and the IAEA budgets are. It would be difficult to justify a budget for verification of the CWC in excess of the budget for safeguards on nuclear materials, given the vast difference in potential threat posed by chemical weapons compared to nuclear weapons.

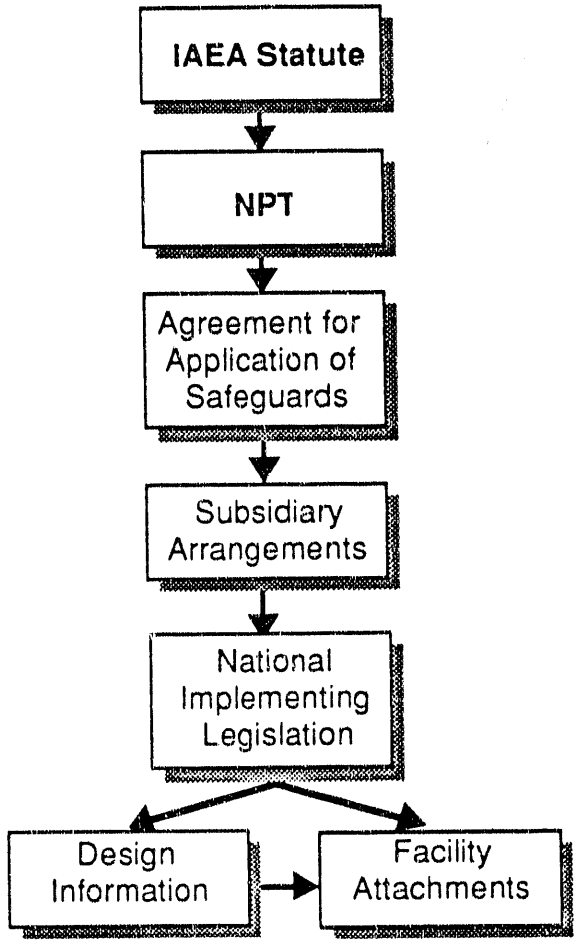
It might be expected then that the OPCW Technical Secretariat budget for verification would be on the order of $50 to $60 million (the IAEA safeguards budget for 1992 is approximately $65 million[1]). Given the much larger number of facilities subject to inspection under the CWC and the correspondingly greater restrictions on the budget, the OPCW will have to optimize its declarations collection, processing, analysis, and evaluation. Maximizing the useful information gained through verification activities by efficient data management prior to, during, and subsequent to inspections would seem to be more cost-effective than intensifying inspector activities.

Thus, it would be both logical and financially prudent for the OPCW to design and develop its data management system judiciously. Given the extensive experience base represented in the IAEA system, it seems reasonable to adopt, adapt or extend as much of the IAEA data collection, processing, and management systems where possible. In this paper we will discuss the legal, procedural and administrative structure behind the data regime associated with IAEA safeguards and, after comparing this to the CWC regime, suggest ways to improve the process for the OPCW and its Member States. We will also describe the data requirements, collection, management, and use under IAEA safeguards and, through extrapolation, under OPCW verification.

LEGAL, PROCEDURAL AND ADMINISTRATIVE STRUCTURE

The IAEA implements its data collection obligations under the NPT on the basis of a well-defined hierarchical structure of agreements (see figure). From the most general to the most specific, these are[5]:

- the **Statute of the IAEA**, which defines the basic mission, authorities, and responsibilities of the IAEA;



- the **Nuclear Non-Proliferation Treaty (NPT)**, which defines in general terms the respectitive rights and obligations of the IAEA and Signatories;
- **Agreements for the Application of Safeguards**, which define on a country-specific basis the general rights and obligations of Member States and of the IAEA with regard to safeguards implementation;
- **Subsidiary Arrangements**, which define on a country-wide basis the specific details of how the IAEA will carry out its inspection and data collection activities within that country; and
- **Facility Attachments**, which define facility-specific details of inspection and data collection procedures and responsibilities. These are based on information provided in **Design Information Questionnaires.**

The Chemical Weapons Convention might be considered analogous to the NPT. In addition, a State Party is required, under Article VII, "National Implementation Measures", to "adopt the necessary

measures to implement its obligations under this Convention", and ". . . appoint a National Authority . . . as the national focal point for effective liaison with the Organization and other States Parties". This National Authority will be involved in the negotiation of Agreements between the State and the OPCW. Negotiation of Agreements for verification of declarations and for inspection procedures is provided for in Annexes to Article VI, "Activities not Prohibited under the Convention" (i.e., the permitted production of chemicals, including dual-use chemicals). The annexes on permitted production and the annexes to Article IV "Chemical Weapons", which deal with the verification of storage facilities and destruction facilities, also mention Subsidiary Arrangements but no specifics are given.

Each State Party will direct its National Authority, on the basis of the extent of its chemical industry, to work out the administrative, procedural, and technical details of its interactions with the OPCW in relation to the performance of verification activities and in fulfillment of other obligations under the CWC. Documents similar to Subsidiary Arrangements could codify these arrangements. Since most, if not all, Signatories to the CWC will be IAEA Member States, they will probably have already established a safeguards-associated Authority. It is reasonable that states would draw on the experience of their own national safeguards-related resources to aid in information management and compliance with declaration requirements under the CWC.

There has been some discussion in Geneva about performing CWC verification inspections in the absence of Facility Attachments or their equivalent. We believe that inspections without facility specific guidance would become either superficial or very inspector- and time-intensive. Documents analogous to IAEA Facility Attachments, which would address not only facility-specific verification activities and procedures but also declaration content, should be considered for use in implementation of the CWC, particularly for those facilities which would be subject to routine inspection and/or for those which are huge, complicated physical complexes.

DATA REQUIREMENTS, COLLECTION, PROCESSING AND USE

Because of the similarities in the verification aims of the monitoring regimes of the OPCW and the IAEA, the general data requirements are similar: data are needed for planning inspections; for evaluating inspections and declarations or reports associated with activities under the purview of the relevant Organization; and for preparation of reports on treaty compliance of Member States. Requirements for data not needed for conduct of the verification activities provided for in the treaties (or for fulfillment of other treaty obligations) are not justified. It follows that the intended conduct of inspections must be well understood by those formulating details of inspection procedures and of State - Inspectorate (OPCW or IAEA) interactions.

Strictly speaking, the scope of an inspector's verification activities during a declared facility inspection is circumscribed by the declarations relative to that facility. A State or facility may voluntarily allow intrusion beyond that needed for verification of declarations, but is not compelled to do so. This points out the need for careful design of data requirements for declarations. In addition, careful definition of the samples, materials, equipment, activities, etc. to be inspected will help to avoid false positives.

Facility and Materials Information

IAEA experience has shown that in order to conduct inspections efficiently and effectively and to aid in evaluating the results of inspections, detailed descriptions of facilities to be inspected and of the materials to be verified are necessary. This information, which covers material flows, process descriptions, and facility measurement and materials accounting systems, is supplied to the IAEA by NPT Signatory States in the form of completed Design Information Questionnaires (DIQs)[6]. There several different types of DIQs for collecting information appropriate for the differing types of nuclear facilities the IAEA inspects. The format of the DIQs is designed to prompt the responding State to supply all necessary information in a form which is easily usable by the IAEA. Model DIQs have been prepared for a number of different types of nuclear facilities, in order to assist those preparing DIQs by illustrating the correct level of detail and most usable format for responses to the questions in the DIQs.

In the CWC, the Annexes relative to Articles IV and VI require states to submit information on their inspectable facilities to the OPCW. The content of the facility information required under the proposed CWC is specified but the details of the format, data submission procedures and facility-specific features are not addressed. Collection of this facility data could be made more efficient by use of forms similar to DIQs and by preparation and distribution of model DIQs illustrating the nature of the required data.

Periodic reports on inventories and flows or transfers of nuclear materials at facilities must be submitted for facilities under IAEA safeguards. The details of the format and content of these reports are specified in Code 10 of Subsidiary Arrangements between states and the IAEA. Code 10 defines a number of reporting forms (e.g., the Inventory Change Report, Physical Inventory Listing, and

Material Balance Report) which all NPT Signatories must use. Details of preparation of these reports, including all units, codes, and data formats, are also specified in Code 10. In addition, the IAEA conducts periodic training sessions to which States may send personnel for intensive training in the preparation of reporting forms.

Articles III, IV, and VI of the proposed CWC would require states to submit initial and periodic declarations of inventories of various materials and of activities to the OPCW. Some details of the contents of these declarations are specified in the Annexes for these articles, but the details of the format and procedures for preparation and submission of the data are not addressed. The Preparatory Commission, which will formulate the organizational, administrative and procedural detail needed for the OPCW to implement the CWC, might consider developing a form analogous to Code 10 to give to National Authorities of CWC States Parties to assist them in preparing their national declaration procedures. Training should also be provided to Member States personnel responsible for preparation and submission of data to the OPCW.

Declaration and Report Data Collection and Processing

Given the quantity of data which will be required to be collected by the OPCW, it seems likely that some sort of computer database system will be necessary to store and process the data. The IAEA uses a large and complex computer system, the International Safeguards Information System (ISIS), to store and process the data it collects.

The IAEA allows states to submit data either on paper forms (which are designed to allow relatively easy manual entry of the data into the ISIS) or as machine-readable data in the form of magnetic tapes or disks. The machine-readable data are essentially images of the paper forms, and contain exactly the same data in the same basic format. The OPCW should consider similar provisions for data to be submitted either on paper forms or in machine-readable form, in order to accommodate the needs of both states which will submit very small amounts of data (these states might choose to use paper forms) and those which submit large quantities of data.

For submitted safeguards-relevant data to be efficiently entered and processed, it is necessary to define very precisely the exact format and content in which it is submitted to the ISIS. The IAEA provides States with extensive and detailed documentation on data submission procedures. The data submission formats, contents, and documentation are contained in Code 10 of the Subsidiary Arrangements under each Safeguards Agreement between a State and the IAEA. Additional facility-specific details of data to be submitted are contained in Facility Attachments. For example, facility-specific codes defined in Facility Attachments could be used to identify a particular facility, the different measurement points and accounting areas within it, specific materials expected to be found, and methods to be used to measure the quantities of those materials.

By following the established formats and procedures for data submission, IAEA Member States help minimize the costs of data entry and processing by the IAEA computer system. To facilitate the process, Safeguards Agreements, Subsidiary Arrangements, and Facility Attachments have been prepared which contain the appropriate details of data formats and submission procedures.

Effective and cost-efficient computer storage and processing of data submitted to the OPCW under the proposed CWC would also require carefully documented, uniform formats and procedures. The verification provisions of the Annex to Article IV of the CWC specify that the Subsidiary Arrangements for verification of storage facilities and destruction of chemical weapons be based on model agreements. The Annex relevant to Article VI similarly specifies that verification agreements be based on model agreements. These model agreements should, like the IAEA models, include specific details of the format and procedures to be used for data submission.

Inspection Data

IAEA inspectors collect a large amount of data in the course of their inspections of facilities under IAEA safeguards. A considerable amount of information is also necessary for planning of inspections and for evaluation of inspection results. In order to streamline planning inspections, gathering inspection data, and evaluating inspection results, the IAEA has developed a computer-based system for processing inspection data, the Inspection Field Support System (IFSS). This system allows inspectors to access data from the ISIS for planning and evaluating inspections. It also allows them to collect data (using portable IBM-compatible computers) in the field in a format suited for easy review and evaluation and to transfer inspection data and results directly to the ISIS at the end of an inspection.

The OPCW will most likely have analogous requirements for collection and processing of data in connection with planning, conduct, and evaluation of inspections. A system such as the IFSS could greatly reduce the time, effort and cost of inspection planning, conduct, and evaluation.

SUMMARY

The IAEA and the future OPCW have a number of analogous requirements regarding collection,

processing and use of information on facilities and materials and for planning, conduct, and evaluation of verification inspections. The experience base of the IAEA, in terms of the actual implementation of international verification of dual-use materials, should not be ignored. The Preparatory Commission for the implementation of the CWC should consider the development of specific Agreements with Member States for the verification activities of the OPCW, as well as of Subsidiary Arrangements or their equivalent to simplify interactions with Member States. These would include details of data content, format, and submission procedures and would be helpful particularly since many Member States will have large numbers of facilities subject to inspection. Signatories to the CWC will be required to "appoint a National Authority" and, presumably at the same time, to enact national treaty-implementing legislation. That legislation could be guided by documentation from the OPCW describing the types of information and access required; the IAEA's Model Facility Attachments and Design Information Questionnaires could be used in development of such documentation.

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