Information Analysis is the heart of Strengthened Safeguards. Certainly as director of the Division of Information Technology I should be expected to believe this and YES I DO. But let me explain why you should believe it, too.

I will now describe the progress the Department has made in developing the various components of enhanced information analysis and the challenges, which remain.

**STRENGTHENED SAFEGUARDS**

As you know, the goal of the strengthened safeguards system is to detect the diversion of declared nuclear material and the presence of undeclared nuclear material and activities in a State with Comprehensive Safeguards agreements in force. In other words, under Strengthened Safeguards the Department of Safeguards must verify both the correctness and the completeness of State declarations concerning their nuclear inventories, facilities and activities.

Why did we have to strengthen Safeguards? Traditional Safeguards were designed to provide assurance regarding the correctness of the State’s declarations. It was assumed that a State had declared all nuclear material, facilities and activities. There was no way to prevent a State from under-declaring its initial inventory nor from building secret nuclear facilities. The Agency had no means to verify the completeness of the initial inventory nor to verify that undeclared facilities were not in operation.

The changing political framework of the early 1990’s, including such watershed events as the dissolution of the former Soviet Union, the information unearthed about the Iraqi weapon program, the declaration by South Africa of its past program, the resistance of the DPRK to verifying the completeness of its declarations, and the indefinite extension of the NPT, caused the IAEA Member States to demand stronger Safeguards from the Agency and to accept the correspondingly more intrusive inspections and more complete declarations requirements.

Two tracks were followed to strengthen safeguards under the 93 +2 Programme: additional measures were proposed under the existing authority of comprehensive safeguards agreements and still other measures were proposed which required the additional authority captured in a model Additional protocol (INFCIRC/540). Both types of additional measures required the Department to collect and process more information. Both types required new methods for integrating and evaluating this information.

The new measures adopted under existing Comprehensive Safeguards Agreements included:

- Voluntary reporting by States of the export of specified nuclear-related equipment and non-nuclear materials
- Collection and processing of environmental samples collected during inspections
- Remote monitoring of facilities and the use of unannounced inspections
- Acquisition of information from other Agency Departments
- Collection of publicly available, nuclear-related textual information from external sources
- Acquisition of commercial satellite imagery, and
- Enhanced information analysis; that is, the development of a process for collecting, processing, retrieving, evaluating, and integrating all this information at the STATE level.

Beyond all this, the Additional Protocol provided for even more information and information analysis. This expanded declaration at the State level requires reporting such new information as

- The status and capacity of uranium and thorium mines,
- Nuclear related research that doesn’t involve nuclear material
- Exports of specified nuclear equipment and non-nuclear material
- The capacity to manufacture specified nuclear equipment, and
- Each State’s long-range plans for nuclear fuel cycle development.

Given these facts, I’m sure you agree that information analysis forms the core of Strengthened Safeguards. All of this new information has to be collected, processed, evaluated, and used by the Agency to draw the conclusion that there is no evidence of undeclared nuclear material or activities in that state, for each state with a Comprehensive Safeguards Agreement and Additional Protocol in force. This was, and remains, a challenging enterprise.

**Enhanced Information Analysis**

**Safeguards Conclusions under Strengthened Safeguards**

The criteria for drawing the more-narrowly-defined conclusion that there is no evidence of diversion under Traditional Safeguards had been developed many years ago. Agreements had been reached between the Agency and the Safeguarded States on the type and format of information to be provided by the States, the type and format of information to be collected by Inspectors, a method for identifying discrepancies and inconsistencies between State and Agency data and a method for both resolving these discrepancies and evaluating the significance of those remaining unresolved. Information Systems were developed to process and store this information and to expedite the retrieval of the information required to identify discrepancies and inconsistencies, and to draw the conclusion regarding diversion of nuclear material.

However, the much broader conclusion that there is no evidence of undeclared nuclear material or activities in a state requires information analysis of a different kind than that performed under Traditional Safeguards.

First, the conclusion is to be drawn at the State level, rather than at the facility level. Further, it is necessary to use all available information, not just information provided by States under their Safeguards agreements or collected by Inspectors during verification activities.

These characteristics required that the Department developed several new information analysis components.

First we had to define a process for evaluating all this anticipated information. Then it was necessary to identify relevant sources of information and to obtain access to these sources. And finally, once the new sources had been identified and obtained, information systems had to be acquired or developed to process, store, and efficiently retrieve this information.

Let us look at each of these components in more detail, reviewing the progress we have made and the challenges that remain.
Information Analysis Components

State Evaluation Process
In addition to the conclusion on declared nuclear material the Department has developed a process for arriving at the conclusion of no evidence of undeclared nuclear material or activity for a given State. We call this the State Evaluation Process. It is based on consistency checks performed by state evaluation working groups. These working groups, under the direction of the responsible Operations Division, organize all available relevant information into State Files for each country. They then use the State Files to draft sensitive, restricted distribution State Evaluation Reports, which provide a snapshot of what the Department knows about each State’s nuclear capabilities and activities and which identify inconsistencies between the information declared by the States and all other information available to the Department.

These reports are examined by the Information Review Committee, which endorses the conclusions and recommendations of the reports and may ask for additional information from the working groups, or that additional clarifications be requested from States or may propose additional actions be taken by the Department to resolve inconsistencies. The State Evaluation Reports are updated on a periodic basis, incorporating the new information acquired through follow-up activities. They are used by the working groups to evaluate declarations received under the Additional Protocol and to identify indicators of undeclared nuclear material or activities. The working groups then draft requests for clarification and requests for complementary access to resolve any inconsistencies or to substantiate potential indicators. The responses to these requests and results obtained through complementary access are folded into the next update of the State Evaluation Report.

As you can see, the process of information analysis is continuous, with information being collected and evaluated by the Department throughout the year.

Each protocol declaration evaluation or update to a State Evaluation Report merely captures the status of the evaluation at a moment in time.

Information Sources
Along with developing a State Evaluation Process, the Department has also identified new sources of information to be included in State Evaluations. Enhanced information analysis includes multiple types of information:

- State Declared: the information provided to the Agency by States pursuant to their Safeguards Agreements and Protocols additional to these agreements,
- information collected by Inspectors as part of their verification activities, and
- Open Source information.

Generally open source information can be grouped into two types:

- information collected by other Departments of the Agency (such as TC project reports, Travel Reports, and the Nuclear Fuel Cycle Information System) and
- outside information, that is, externally produced information which is available for the finding, asking, or buying (such as commercial satellite imagery, databases, Internet pages and other categories of textual information).

Identifying relevant information within other departments in the Agency has been fairly straightforward, and the Department now incorporates such non-Safeguards information in the State File for each country. However, the process of monitoring the activities of the other
Departments continues, since there may very well still be relevant non-Safeguards Agency information, which has not yet been included in the State Evaluation Process.

The real challenge, however, has been identifying collection mechanisms for relevant open source information.

**Collection Mechanisms**

The collection mechanisms for both State declared information and inspection information are well-defined by agreements between the Agency and the States. However, recently the Department has devoted considerable internal effort to developing collection mechanisms for open source information. These mechanisms include an internal collection effort, assistance from organizations doing similar work, and the development of regional collection centres.

**Internal Open Source Collection Effort**

As part of an internal open source collection effort, the Department has convened expert groups, developed contracts for consultation and for the supply of information, trained personnel, and hired staff with new skills and expertise to accomplish this task. However, the identification of new suppliers is a continuing responsibility. Information suppliers spring into being, change their focus and go out of business. Monitoring open source suppliers will remain a continuing responsibility for the Department.

An important part of identifying suppliers of relevant open source information has been the definition of criteria for information selection. These criteria are based on Department standards such as the indicators of nuclear processes captured in the Physical Model, the categories of the State File, the information specified by the Additional Protocol, and the structure of the State Evaluation Report. The content of the information specified by these standards includes such topics as a State’s political structure, economy, energy requirements, nuclear policy, fuel cycle-related activities and capabilities, and any potentially nuclear proliferation related activities in a given State. It is also a Departmental requirement that information covering these topics be collected from diverse sources so that geopolitical biases are counterbalanced.

**Commercial Satellite Imagery**

One type of open source information, commercial satellite imagery, requires even more specialised expertise for both collection and analysis. Today the Department obtains commercial satellite imagery such as SPOT, Landsat and IKONOS through an arrangement with Space Imaging. The Department uses in-house imagery analysts, augmented by Cost Free Experts, to identify and analyse commercial satellite imagery to support the State Evaluation Process.

**Organisations Doing Similar Work**

In addition to strengthening our in-house efforts to collect open source information, we have used the expertise of other organisations performing similar work to collect information for us. The Kurchotov and Monterey Institutes have located and collected significant databases of relevant information. We are currently proposing a similar arrangement with Kings College in England.
Regional Information Centres
Finally, we also are seeking to identify regional centres of information to increase our geographic coverage of open source information. Both the Japanese and South Korean Support Programs have established regional information centres to provide the Department with local information relevant to our mission. We are actively investigating possible additional centres in other regions in order to broaden the diversity of our information sources.

Existing Software Tools
One of the lessons learned during the collecting, disseminating, and analysing of information is that good software tools are essential to enhanced information analysis.

ISIS
The Department currently relies on the IAEA Safeguards Information System (ISIS) to process and retrieve State declared information and inspection data. The system includes both mainframe and LAN-based databases. A data warehouse is under development to improve the user interface to these databases. The mainframe system itself exists on an antiquated architecture with an obsolete user interface. It is supplemented by newer systems such as the Additional INFCIRC/153 Reporting Paragraphs System, and other small, special purpose databases.

Protocol Data Systems
The Department has developed two tools to assist with Additional Protocol Declaration processing: the Additional Protocol System, and the Protocol Reporter. The Reporter assists States in preparing an electronic submission of their Protocol Declarations. The other two tools convert hard copy submissions to electronic format and create a database of protocol declarations for efficient retrieval and analysis of protocol data by the Department.

Open Source Information System
With regard to open source textual information, we have learned that the efficient retrieval of information from full-text documents requires highly specialized software. We have selected Verity’s Search '97 software as the backbone of our Open Source Information System.

Search '97 provides the following special strengths:

- It allows the construction and use of complex, weighted queries called topic trees.
  - Technological topic trees based on the physical model have been developed by the Department.
  - In addition, we have constructed geographic topic trees for every country with a Comprehensive Safeguards Agreement.
- It can index information on remote servers so that our topic trees can be used to search these external information sources. And finally,
- Selected open source information can be organised into electronic state files through the Knowledge Organiser capability of the software.

These strengths enable the efficient retrieval of relevant information from full-text open source databases.
Software Tools for Commercial Satellite Imagery
The processing and analysis of commercial satellite imagery also requires highly specialized tools. The Department is adapting commercial software such as Carterra Analyst to our needs and we are working with an Institute of the Joint Research Council of the European Union in Ispra, Italy, to develop the Site Investigation Tool, which will link Additional Protocol data to site information.

Illicit Trafficking Database
The Department, with the assistance of some Member States, has also developed a database of reports concerning the illicit trafficking of nuclear material. The Illicit Trafficking Database captures both open source and state-provided information about incidents involving the illicit acquisition, transportation or disposal of nuclear material or radioactive sources. Reports from the databases are provided quarterly to participating States.

The Challenges which Remain

New Skills
Many challenges remain for the Department in implementing enhanced information analysis. This broad type of information analysis is a new requirement for the Department. Staff in both the Operations Divisions and the Support Divisions have to develop new skills and a new mindset in order to identify indicators of undeclared nuclear material or activities in States. The Department has developed several in-house courses to train personnel in these new skills: these include the Performing State Evaluations Workshop, the Nuclear Fuel Cycle and Proliferation Indicators course, Complementary Access Roles and Responsibilities course, Satellite Imagery Awareness Course, and Enhanced Observational Skills Training.

In addition, existing job titles require new recruiting profiles, which include such skills as well. New personnel will be expected to integrate State declared, inspection, and open source information into a credible assessment of a State’s capabilities. And finally, the Department has defined new jobs specifically tailored to enhanced information analysis, such as imagery analyst and senior inspector for state evaluations.

Integrated Systems
Another challenge is to integrate the various information systems used to analyse information within the Department. Members of the State Evaluation Working Groups require a secure, integrated interface in their offices to all information used to draft State Evaluation Reports and to evaluate and respond to Additional Protocol Declarations. The information which must be accessed to identify indicators of nuclear-related activities includes State Evaluation Reports, Information Review Committee minutes, other reports previously produced in the Department concerning their countries, including analysis of environmental samples, Additional Protocol Declarations, satellite imagery, Open source information, Computerized Inspection Reports, and accounting data declared by States under their Safeguards Agreements. In addition, the current system for storing and processing information declared under Safeguards Agreements (ISIS) must be modernized so that it is capable of providing the integrated information required in a timely manner, as required by the State Evaluation Process.

Beyond integration, Department staff participating in State Evaluations require collaborative software on an approved secure network which will allow them to record comments, control versions of drafts, and obtain electronic review and approval of drafts.
As the Department seeks to make integrated information more readily available to working group staff, the approaches selected must also meet the demands of Member States for robust information security. Accomplishing both goals, easy access for those with an approved need to know and secure protection against those who are not approved, is still another challenge.

**Expanding Access to Information**

Once our existing sources of information have been integrated into a single, secure interface, our work will not be finished. The Department must institutionalise the process of identifying new sources of information, both internal and external, which are relevant to State Evaluations. This continuous monitoring will be an essential part of the process over time and will result in even more information being fed into the process. This in turn will require constant adaptation of information systems.

For example, at this time most of our open source information is English. This is a severe limitation. We mitigate it by acquiring translated information from many sources originally published in other languages, but we must develop a true multilingual capability. This implies integrating translation tools with multilingual search and retrieval.

In addition, Department staff should be able to access electronically documents currently maintained only in hard copy archives in the Agency. This implies a major effort to identify relevant paper archives and convert them to electronic files.

**Credibility of Information**

Assessment of credibility is a challenge, which needs a continuous built up of the capability. The factors affecting credibility of information must be defined and a technique for credibility assessment developed comprehensively.

**Continuous Evolution and Adaptation**

Finally, in conclusion, the ultimate challenge for information analysis is that it is part of a dynamic environment, which requires us to continuously monitor change, adapt to it, and adjust our procedures to take advantage of new capabilities on four fronts:

- Information Technology, which is constantly upgrading and extending its capabilities.
- Sources of Information, which come into existence, cease publication, change formats, or change scope,
- The State Evaluation Process itself, which continues to evolve, and
- The new skills of staff, which are being trained in new areas and being hired with a different skill, mix than in the past.

It is only through constant adaptation in these areas that the Department will meet the challenges of enhanced information analysis. The Bottom Line is that we have to do all these activities under zero gross budgets.