

# Improving technical support to IAEA safeguards

*Programmes supported by Member States are providing valuable resources*

by David Rundquist

The nuclear industry is entering a phase where more and more emphasis is being placed on cutting fuel fabrication and reprocessing costs. This emphasis, and increasing radiation levels of high burnup plutonium, are leading to increased automation of the associated production processes and facilities, and consequently reduced opportunity for personnel access to key areas of a plant. Fuel assemblies that can be disassembled and reconstructed also are coming into use, and large away-from-reactor spent-fuel storage areas are nearing fruition. In addition, new reactors and bulk-handling facilities with large inventories are being added each year to those already inspected by the IAEA.

These changes present new safeguards challenges and require that the entire safeguards process become more efficient, if the Agency is to meet its obligations in a zero growth budget environment.

One of the chief development difficulties faced is to anticipate these changes in advance of their actual implementation, and to develop the appropriate equipment and procedures in a timely manner.

We are effectively in the same position as the biblical Noah who began building the Ark before it started to rain. Unlike Noah, however, we do not have the benefit of Divine Guidance.

We can, of course, make use of the considerable experience built up within the Inspectorate, but experience is not always the best teacher in a rapidly changing technological environment. One is reminded of the Belgian proverb: "Experience is a comb that life gives you after you lose your hair".

Consequently, we attempt to combine in our development work an appropriate mix of experience (proven design) and innovation.

Fortunately, a development process has evolved at the Agency that aids in matching appropriate technology to our needs, primarily through the mechanism of voluntary Member State Support Programmes. Through these programmes, we have access to the resources and talent of many of the world's finest nuclear laboratories.

Because of the importance of these programmes in improving technical support, we will discuss how they

function at some length, with particular emphasis on the Agency's co-ordination role. Other development, carried on outside the Support Programmes, also will be briefly described.

## Member State Support Programme

Since 1976, ten Member State Support Programmes and one Co-operative Agreement with Euratom have been formalized (see accompanying table). Some appreciation of the scope of these combined programmes can be derived from the fact that approximately US \$14 million was spent in 1985.\* The formalization process typically consists of an exchange of letters between the relevant authorities in the Member State and the Director General. The offer letter contains the scope, extent, and any special considerations or attributes of the programme to be implemented.

### Member State Support Programmes

Country	Initiation date	No. of active tasks in 1984-85
Australia	1980	10
Belgium	1982	12
Canada	1977	46
Euratom	1981	15
France	1983	10
Germany, Federal Republic of	1978	34
Italy	1985	12
Japan	1981	26
United Kingdom	1980	30
USA	1976	105
USSR	1982	20

Note: Tasks indicate the number of identifiable projects and not the magnitude of effort or resources expended.

The IAEA's Director of Development and Technical Support in the Department of Safeguards has been designated by the Director General as the contact person and the channel for communications with the programme co-ordinators of Member States.

Bilateral review meetings between the Agency and the Member State are held periodically, generally at

Mr Rundquist is a Section Head in the Agency's Division of Development and Technical Support, Department of Safeguards. Also contributing was Mr Leonard Watkins, a staff member of the Department.

\* A precise quantification of the Support Programme effort in terms of a single currency is not possible due to variations in the operational and financial mode of the various programmes. The figure quoted is only a rough indicator.

least once per year, to review the status of individual tasks, discuss problems, and propose the inclusion of new tasks. Since acceptance of an Agency-defined task is voluntary, each task receives a critical review prior to initiation, sometimes by more than one Member State. During this review, much valuable advice is obtained about available and appropriate technology. In addition, every 2 years a meeting is held with all the Support Programme co-ordinators to discuss possibilities for improved multilateral co-operation, and also to inform them of progress in the other programmes. This joint meeting is particularly useful in initiating effort on tasks requiring the resources of more than one Member State for solution.

It is, of course, the job of the Department of Safeguards to define its development needs. These needs are formally co-ordinated through a working group with representatives from each division in the department. Terms of reference for the group are to survey the department for currently unsolved problems, translate the perceived needs into a standard format (including statements of the problem, possible solutions, expected impact on Agency safeguards, priority, estimated resources needed to do the job) and produce a continually updated list. This list is distributed to co-ordinators of Member State Support Programmes once a year to serve as a guide for new tasks that can be usefully incorporated into the various Programmes.

Monthly seminars on containment and surveillance and non-destructive assay also are used to inform departmental staff of progress and to receive their latest comments on needs, problems, and priorities.

On the working level for specific Support Programme tasks, an IAEA project officer is appointed to maintain contact with the developer and to provide liaison with the inspection divisions. A key aspect is the grouping of similar tasks in different support programmes under the same project officer. This enables efficient monitoring and guidance of the work. Consequently, the IAEA project officer is expected to be the most technically informed individual in the IAEA on a particular development. The officer attempts to promote more efficient task progress, as well as ensuring that there is no unnecessary duplication of effort. When the situation warrants, he may call a topical meeting to provide direct technical contacts and summarization of the overall progress.

Good co-ordination and communication are essential to success via the Support Programmes at all stages of the development process, for both external (developer-Agency) and internal (inspector-technical support) interactions.

### Development programme difficulties

Using voluntary Member State Support Programmes as the prime means to develop improvements for implementing safeguards is, of course, not without problems. Most of them involve the co-ordination and

communication aspects just touched upon, and would exist under any circumstances involving such a widespread international effort.

As a general solution to the generic problems listed below, the right questions should be asked throughout the development process, and the answers checked against the inspectors "real-life" field situation. In this regard it is instructive to remember Bertrand Russell's comment on the nature of science: "Aristotle could have avoided the mistake of thinking that women have fewer teeth than men by asking Mrs Aristotle to open her mouth".

- *Development effort not under direct control of the IAEA.* The Agency can suggest a task including a possible method of proceeding. The acceptance of such a task is voluntary and it may be necessary to approach more than one Support Programme, or to issue an Agency-funded contract if the work is not accepted by the Support Programme(s) deemed most appropriate. Moreover, the State and developer organize and control the actual effort, although the Agency can influence this process. Of course, if the development product is deficient, the Agency is not obliged to implement it.

- *Developer not fully aware of implementation constraints.* When the IAEA and a State implement their safeguards agreement, there are a number of constraints that may be written into a specific agreement for a specific facility. The developer may not be aware of these. In addition, there are general constraints on the Agency's implementation of safeguards, such as particular inspector skills, time and facility resources required for implementation, and influence on facility processes. All of these constraints have to be considered and communicated if a development effort is to be ultimately successful.

- *Assimilation into routine use by the Agency may require more effort than development.* From experience it has become apparent that the integration of new equipment or techniques into the routine inspection repertoire is both difficult and time consuming. Often, it is more of a challenge than the original development effort. Appropriate efforts for documentation, maintenance, procedures, training, logistics, acceptance by other States, and facilities have to be considered if successful use of a new technique is to be made. Production of prototypes and evaluation of the capability of the devices does not guarantee successful implementation by the Agency, which can be frustrating for the developer. A joint evaluation by the Agency and developer of the needs for the entire project at the time of initialization of a task (or shortly thereafter) will usually result in a minimum time for completion, and optimum use of resources.

### Results of programmes

In the approximately 10 years of their existence, Member State Support Programmes to IAEA safeguards have had a profound effect on all aspects of Agency



safeguards. This includes development and introduction of instruments and techniques deployed directly for inspection, as well as support activities such as data processing, data evaluation, and system studies.

Categorization of this support can be made under the following headings (the number of active tasks during the 1984-85 period are in parentheses). These numbers are indicative only of the number of projects and not the resources expended. Usually training and test programmes require substantial expenditures.

- **Information and expertise** (118). This includes provision of cost-free experts, studies, and development of methods for inspection planning and execution, data treatment, and data evaluation.

- **Instrumentation, methods, and techniques** (163). Non-destructive assay, destructive assay, containment and surveillance instruments, and related methods and techniques have been developed for quantitative and qualitative assessment of the status of nuclear material subjected to IAEA safeguards. (The accompanying photos show some representative equipment.)

- **Training** (23). Equipment, expertise, and facilities have been provided to enable the Agency safeguards staff to cope with their safeguards responsibilities.

- **Test and calibration facilities** (10). Appropriate facilities are a fundamentally important ingredient for the development, testing, calibration, and improvement of instruments and safeguards approaches, and at various times have been provided by support programmes.

#### States also benefit

Advantages accrue to the States participating in the development efforts. For example, the co-operative nature of the development effort enables the States to become aware of the problems faced by the Agency safeguards inspectors, and to better prepare their own facilities to meet the safeguards obligations of the State and the IAEA.

In this development environment, the new instruments and techniques are also subjected to a high degree of international visibility. This provides a concurrent high degree of credibility to those instruments and methods that eventually pass through the development, test, and evaluation phases of the programme and proceed to routine implementation by the Agency safeguards inspectors.

#### Other means of technical support

The bulk of technical support to IAEA safeguards is primarily through the voluntary Member State Support Programmes. There have been other means of providing technical support which, even though they have amounted to only 10-to-20% of the total development expenditure during the past 10 years, have made significant contributions.



The improved Cerenkov viewing device, which is used for identification and accountability of irradiated fuel elements.

Some particularly important safeguards areas that have been investigated in recent years via *multi-national* co-operation programmes include the:

- International Working Group on Reprocessing Plant Safeguards
- Tokai Advanced Safeguards Technology Exercise (TASTEX)
- RECOVER project
- Hexapartite project for improvement of safeguards at ultracentrifuge U-235 enrichment plants.

The Reprocessing Input Tank Calibration Exercise (RITCEX) and the IDA-80 experiment could also be included in this connection.

The IAEA also enters into bilateral research agreements with individual research and development (R&D) institutions or States to investigate a single problem, or perhaps to provide training or training facilities. On occasion, the Agency provides a nominal fee via a research contract to facilitate the development effort by an institution. Finally, an alternative mode of development is by an in-house R&D effort. This is generally limited to short-term problems that require a quick response.

#### Formidable, continuing task

Providing credible and efficient safeguards techniques in view of the changing nuclear industry and advances in the technology on which safeguards is based is a formidable and continuing task for the IAEA and its Member States. Fortunately, a number of development mechanisms exist which to a large measure are equal to the task. Most important of these mechanisms is the voluntary Member State Support Programme. The 11 Support Programmes now in operation provide a variety of resources that can be called upon to investigate a wide range of problems. Laboratories and individual experts from around the world have co-operated in successfully meeting many of the challenges faced by the IAEA in the past. This effort must continue to maintain acceptable credibility and to improve efficiency in the future.