



Major Programme 4: On-Site Inspection

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The primary objective of Major Programme 4 is to make the necessary preparations for the establishment of the on-site inspection (OSI) regime at entry into force (EIF) of the Treaty. The major elements of OSI are inspectors, equipment and the OSI Operational Manual, together with supporting infrastructures.

OSI STRATEGIC PLAN

In 2004, the PTS developed a strategic plan in order to establish the readiness of the OSI regime at EIF. The plan has two intermediate strategic goals and a final goal at the time of EIF. By achieving these goals in accordance with the time lines in the strategic plan, OSI readiness could be established by 2011.

The first intermediate goal is the large scale field exercise to be conducted in 2007 (FE07). The PTS began directing its efforts to plan, prepare and conduct FE07. In 2004, the PTS proposed the framework of FE07 to the States Signatories; this addresses the objectives and assumptions of the exercise as well as the procedures to be tested by FE07, the plan to conduct necessary training for the FE07 participants and the equipment procurement plan for FE07. In response to a note verbale concerning a host country for FE07, the PTS received proposals from three States Signatories and conducted site surveys to find a suitable site.

OSI OPERATIONAL MANUAL, METHODOLOGY EXPERIMENTS, INFRASTRUCTURE AND TRAINING

The elaboration of the draft OSI Operational Manual, which is to be presented to the initial session of the Conference of the States Parties upon EIF of the Treaty, remains a major task of the Commission. The PTS continued in 2004 to give priority to the support of the drafting process. Working on the agreed basis of the initial draft rolling text (IDRT), WGB is approaching the end of its first reading of the main body of the IDRT. For the purpose of making a smooth transition to a new stage of elaboration of the draft manual, States Signatories have started to explore practical ways of accelerating the process, with a new emphasis on the preparation of a set of inspection procedures, based on the results of the



Fourth tabletop exercise: control planning team.

elaboration process, to be included in field guides for FE07. The first-hand experience thus gained will help in assessing and rationalizing both the process and the product of elaboration.

At the request of WGB, and in particular the Task Leader for the draft OSI Operational Manual, the PTS submitted its view on the range of manual elements suitable for testing, as well as the scope of subsidiary documents needed, in the framework of the strategic plan and the preparations for FE07.

OSI Workshop-10 was held from 18 to 22 October 2004 in Vienna. The workshop concentrated on the Operational Manual and FE07 testing procedures, inspection techniques for the initial and later periods of an OSI, and radionuclide equipment development issues. Direct results of the workshop include: a common understanding on the scope of all manual related testing material for FE07, to be developed by the current elaboration group under WGB, and a set of subsidiary documents to be developed by the PTS; a request that the acquisition of OSI equipment be pursued aggressively by the PTS and Policy Making Organs (PMOs) to meet the needs of OSI activities; and identification of the scope of future work for radionuclide equipment development projects.

As a step in the implementation of suggested actions obtained by analysing the OSI information stored in the Lessons Learned Database, the 2004 OSI directed exercise (DE04) was designed to address these actions. One of the important lessons from the 2002 large scale field experiment in Kazakhstan (FE02) was that the field analysis of extremely low magnitude aftershocks resulting from a small underground explosion imposes specific requirements on the seismic equipment, processing computers and analytical software. To address this issue, the PTS, with the assistance of experts and equipment from supporting States Signatories, prepared and conducted DE04 during two weeks in October, focusing mainly on the acquisition and processing of seismic data. Following an offer from the Slovak Government to host DE04, activities in the first week, devoted to data acquisition in the field of simulated nano-aftershocks, took place near Bratislava. While they still require further analysis, the preliminary conclusions from the field activities are that the passive seismic detection may require a seismic network that is two to three times denser than originally anticipated, and that in order to improve the detection capability, the introduction in the passive seismic network of tripartite mini-arrays should be seriously considered. In parallel a training session was organized by the PTS at the VIC, in which experts nominated by States Signatories utilized different seismic software in order to identify the features required for the best applicable seismic analytical software for OSI. During the second week of DE04, the issue of seismic data processing was addressed and some key features for such software were identified.

Regarding OSI health and safety, the PTS set up an expert panel with the purpose of enumerating OSI-specific health and safety standards. At the initial meeting of the panel (nine experts from six States Signatories



2004 directed exercise, Slovakia: emplacement of a seismic station.

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Lecture during OSI introductory course.

together with PTS representatives) in Vienna on 22–24 March 2004, discussions were conducted on health and safety areas for which OSI-specific standards are needed, existing standards were reviewed for possible adoption for OSI purposes, and three subgroups were formed to focus on different areas. In addition to intersessional work, three more meetings were held in Vienna in October, November and December to produce the first comprehensive drafts of OSI health and safety standards and to agree on a schedule to finalize the standards by mid-2005.

The annual OSI introductory course is already an established element of the training and exercise programme (TEP). The introductory course was endorsed by the 2003 OSI external evaluation team and by the participants of the 2004 OSI workshop as an important and well balanced outreach activity which also helps in preparing a roster of trained OSI inspectors. The eighth OSI Introductory Course was conducted in April 2004 in Vienna. Its aim was to familiarize experts from States Signatories with the OSI regime and its development. The course focused mainly on the OSI process and its context, the phenomenology of nuclear explosions, OSI technologies, and the rights and obligations of the inspection team (IT) and the inspected State Party (ISP). A total of 44 trainees from 33 States Signatories, representing all the geographical regions of the Treaty, participated in the course. The recommendations of the participants in these activities will contribute to improvement of the curriculum of the training programme as well as to the elaboration of the OSI Operational Manual.

The fourth tabletop exercise (TTE-4) was conducted from 22 to 26 November in Vienna. Like previous tabletop exercises, TTE-4 was a methodological exercise as well as a curriculum building activity. Thus its main objectives were to develop and test the curriculum for a tabletop exercise as an element of the TEP and to contribute to the elaboration of the OSI Operational Manual through lessons learned and a list of issues to be studied. The subject of TTE-4 was the transition from the initial to the continuation period of an inspection. This phase in the inspection has both technical and political aspects and needs special attention by the IT while it is still continuing its routine work of data collection, and is therefore an important subject in inspector training. TTE-4 was planned, designed and controlled with the help of an international control and planning team, which included four experts from four States Signatories. The exercise was based on a general scenario describing a hypothetical ISP and an IT during the conduct of an inspection on the 16th and 25th days. A total of 21 experts from 21 States Signatories participated in the event as the IT, while the control team participated as the ISP. In addition, there were two expert evaluators selected by the PTS and observers nominated by States Signatories.

From 26 July to 6 August 2004, a combined activity of equipment testing and curriculum development, which focused on equipment and techniques for the continuation period of an OSI, was conducted at the University of Leicester, United Kingdom. Eighteen technical experts from 16 States Signatories, 17 lecturers, including equipment suppliers, and 2 observers from States Signatories participated in the activity.



OSI equipment demonstration, United Kingdom: assembly of a ground penetrating radar system prior to use in the field.

The fifth OSI Experimental Advanced Course had the aim of developing a curriculum for the advanced course for the continuation period geophysical sub-team. Participants attended lectures pertaining to equipment utilization issues as well as nuclear explosion signatures and logistics of deployment of geophysical techniques during an inspection. During the course, participants concentrated on the actual deployment of the equipment in the field, data collection, data analysis and presentation of results. Special emphasis was given to the synergetic presentation of data gathered by the different geophysical techniques. The University of Leicester provided a unique and excellent site for testing the equipment and its deployment, and good administrative arrangements for the conduct of the overall activity. The equipment testing at Leicester was a follow-up of the demonstration in Italy in 2003. Selected equipment (for shallow measurements) was tested and recommendations on its applicability for OSI were considered. The activity was successful and achieved its objectives in both aspects.

OSI EQUIPMENT

A list of equipment for use during OSIs must be considered and approved at the initial session of the Conference of the States Parties. The current status of the Commission's work on a list of equipment for various categories and approval of the initial specifications thereof is summarized in Table 3. The Commission's mandate also requires it to acquire or otherwise make provisions for the availability of relevant inspection equipment, including communication equipment, and conduct technical tests of such equipment as necessary. Partial quantities of the types of equipment, for testing and training purposes only, that are currently in the custody of the PTS are also indicated in the table. In 2004, efforts continued towards the acquisition and technical testing of additional categories of specialized core OSI equipment, especially unique items for measurement of levels of radioactivity and equipment for use in geophysical methods during the continuation period of an OSI. No additional items were included in the PTS custody or inventory in 2004, but nonetheless significant advances were made towards achieving the Commission's objectives.

The focus in 2004 was on advancing projects for development, technical testing and acquisition of the various categories of unique radionuclide tools. Measurement of the radioactive noble gases xenon and argon-37 is important for OSIs conducted under the Treaty. Equipment for undertaking such measurement is, however, unique and needs to be specially designed and developed. The PTS initiated two separate projects for developing and obtaining, initially for testing and training purposes, the related equipment.

Following a competitive procurement action undertaken by the PTS, the two selected suppliers have embarked on the development of the prototype equipment for xenon sampling, separation and measurement. Development is on schedule and equipment from both suppliers is currently expected to be available to the PTS during the second half of 2005 for use in further demonstration, testing and training.



OSI equipment demonstration, United Kingdom: demonstration and testing of two alternative ground penetrating radar systems.



OSI equipment demonstration, United Kingdom: magnetic field mapping survey with a caesium vapour magnetometer.

Table 3. Current Status of List of OSI Equipment and Technical Specifications Approved by the Commission for Testing and Training Purposes

Activities and Techniques Specified in Part II of the Protocol to the Treaty	Equipment Approved (or to be Further Considered) by the Commission	Equipment Obtained by the PTS ^a	
		In PTS custody	In State Signatory custody
Position finding (para. 69(a))			
• From the air	Analogue altimeter	✓	
• At the surface	Satellite based positioning system	✓	
	Handheld range finding equipment	✓	
	Pocket transit compass	✓	
	Analogue altimeter	✓	
Visual observation (para. 69(b))	Field glasses/binoculars	✓	
	Binocular microscope	✓	
	Magnifying glass	✓	
Video and still photography (para. 69(b))	Handheld 35 mm camera	✓	
	Handheld instant camera	✓	
	Media for camera	✓	
	Processor for photographic film	✓	
	Handheld video camera (analogue)	✓	
	Video cassette recorder	✓	
Multispectral imaging (including infrared measurements) (para. 69(b))	Not yet approved		
Measurement of levels of radioactivity – gamma radiation monitoring and energy resolution analysis (from the air and at or under the surface) (para. 69(c))	Handheld search and limited gamma identification tools	✓	
	Vehicle-portable search and limited gamma identification tool		
Current list of radionuclides of OSI interest: 37Ar, 95Zr, 95Nb, 99Mo, 103Ru, 115mCd, 131I, 132I, 132Te, 131mXe, 133mXe, 133gXe, 135Xe, 140Ba, 140La, 141Ce, 144Ce, 144Pr, 147Nd, 99Tc, 106Rh	High resolution gamma spectrometer tool for field and laboratory use – ‘blinded’ or measurement restricted		Project ongoing
	Equipment for xenon sampling, separation and measurement		Project ongoing
	Argon-37 equipment for sampling, separation and measurement – not yet considered		Project ongoing
	Aerial gamma spectroscopy equipment		
Environmental sampling and analysis of solids, liquids and gases (para. 69(d))	To be elaborated		
Passive seismological monitoring for aftershocks (para. 69(e))	Passive seismic equipment	✓	
Resonance seismometry and active seismic surveys (para. 69(f))	Resonance seismometry equipment – not yet approved		
	Active seismometry equipment – not yet approved		
Magnetic and gravitational field mapping, ground penetrating radar, electrical conductivity measurements at the surface and from the air (para. 69(g))	Magnetic field mapping equipment		Project ongoing
	Gravitational field mapping equipment		Project ongoing
	Ground penetrating radar		Project ongoing
	Electrical conductivity measurement equipment		Project ongoing
Drilling (para. 69(h))	Not yet considered		
Communication equipment (para. 62)	Not yet considered		

^a Equipment ‘obtained by the PTS’ is categorized in accordance with paragraphs 39 and 40 of Part II of the Protocol and is obtained by the PTS through special procurement procedures in accordance with the decision of the Commission at its Eighth Session (CTBT/PC-8/1/Annex II).

As tasked by the Commission, the PTS supported and attended in March 2004 the initial demonstration of a Movable Argon-37 Rapid Detection System (MARDS) developed independently by the Institute of Nuclear Physics and Chemistry, China Academy of Engineering Physics, Mianyang, China. The technical descriptions and results of this initial demonstration of a field-deployable argon-37 measurement system were made available to States Signatories in the form of two reports prepared by the PTS and were also considered by experts attending OSI Workshop-10 in October. It is expected that this project will be expanded in 2005 to include work with a laboratory located at the University of Berne, Switzerland; this is the only alternative facility in the world currently having the capability and experience of measuring argon-37 at low levels in the atmosphere. The aim of this work is to enable improvements to be achieved in the measurement characteristics of MARDS and in the laboratory based analysis of samples.

PTS staff also continued to undertake market surveys and keep abreast of current developments in the commercial radionuclide measurement equipment market for unique radionuclide survey and analysis tools, specifically with a view to obtaining a high resolution gamma spectrometer tool. On the basis of previous technical work undertaken by the PTS, a detailed technical requirements document to be issued to possible suppliers was prepared, initially for review by States Signatories, and the PTS expects to undertake follow-up actions for obtaining this unique measurement tool during 2005.

During 2004, the partial set of equipment for the passive Seismic After-shock Monitoring System (SAMS) initially obtained by the PTS some five years ago was maintained and serviced by the vendor Refraction Technology (RefTek). In early October this equipment was deployed during DE04 in Slovakia. The recommendations from the vendor and by experts of States Signatories regarding the obsolescence of certain components of SAMS are a concern. The need to address the upgrading of the components will become pressing, especially if equipment owned by the PTS is to be available for use in FE07. Alternatives to purchasing components for upgrading, such as contributions in kind, could be explored by the PTS prior to FE07, but this approach will have to rely on equipment rental or on the willingness of States Signatories to assist the PTS.