



**OPCW**

**Scientific Advisory Board**

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**SUMMARY OF THE THIRD MEETING OF THE SCIENTIFIC ADVISORY BOARD  
TEMPORARY WORKING GROUP ON VERIFICATION**

1. The Report of the Third Meeting of the Scientific Advisory Board (SAB) Temporary Working Group on Verification is hereby circulated to States Parties. The meeting was held in The Hague from 7 to 9 April 2014.
2. The Chairman of the SAB and the Director-General have agreed that this report can be circulated to States Parties in advance of the Twenty-First Session of the SAB.
3. In accordance with the Rules of Procedure of the SAB, this report will be reviewed in detail by the SAB at its Twenty-First Session.

Annex:

Report of the Third Meeting of the SAB Temporary Working Group on Verification



**Annex**

**REPORT OF THE THIRD MEETING  
OF THE SAB TEMPORARY WORKING GROUP ON VERIFICATION**

**1. AGENDA ITEM ONE – Opening of the meeting and adoption of the agenda**

1.1 The Scientific Advisory Board Temporary Working Group (TWG) on Verification held its third meeting from 7 to 9 April 2014 at OPCW Headquarters in The Hague.

1.2 The meeting was chaired by Roberto Martinez-Alvarez on behalf of the SAB.

1.3 The meeting began with a brief opening statement by the Chair followed by a tour de table. The list of TWG members attending this meeting is given in the appendix to this annex.

1.4 The following agenda was adopted:

- (a) Introduction by the TWG chair and adoption of the agenda
- (b) Experiences of other international organisations
- (c) Routine verification
- (d) New technologies and methodologies
- (e) How can sampling and analysis most effectively be utilised for verification purposes?
- (f) Which methodologies might be helpful for the Secretariat to keep abreast of developments in science and technology of relevance to the Chemical Weapons Convention verification regime?
- (g) Any other business
- (h) Conclusions, recommendations, plan of action for intersessional period, elaboration of the TWG report and date of the next meeting
- (i) Closure of the meeting

**2. AGENDA ITEM TWO – Experiences of other international organisations**

2.1 Rob Visser briefed the TWG on a legally binding system of Mutual Acceptance of Data (MAD) for the purpose of safety assessments used by the Organisation for Economic Co-operation and Development (OECD). The system is based on the use of OECD Test Guidelines and the Good Laboratory Practice (GLP) quality control principles. GLP covers all aspects of the quality assurance for safety testing for all types of chemicals.

- 2.2 An elaborate system for compliance monitoring with GLP is set up within the OECD. This includes, for example:
- (a) The setting up of national GLP inspectorates.
  - (b) Agreed harmonised inspection processes and procedures; where inspections are conducted by national rather than international stakeholders. That is, lab inspections are done at a national level, while inspection processes are evaluated at an international level.
  - (c) A system for information exchange on national procedures and outcomes of inspections.
  - (d) A response obligation to questions from other countries.
  - (e) Regular meetings of national inspectors at OECD to address upcoming challenges.
  - (f) Agreed documents on inspection practices and policies.
  - (g) OECD training courses for inspectors.
  - (h) Organised Mutual Joint Visits of a national inspectorate by inspectors from other countries to evaluate the inspection procedures and processes.
- 2.3 GLP compliance monitoring is effectively a mutual recognition process. It avoids the legal complications of laboratory inspections in one country by inspectors of another country. It is based on agreed harmonised procedures, and is relying on an extensive technical support system and a strong network of national inspectors to ensure mutual confidence building among countries.
- 2.4 In the discussion, the following points were raised:
- (a) Two significant benefits realised from MAD is the avoidance of both duplication of testing and non-tariff trade barriers.
  - (b) MAD is more stringent than ISO accreditation (and ISO accreditation is not accepted by OECD countries for this purpose).
  - (c) Certain elements of the OECD GLP compliance monitoring model could be relevant in a verification context and help to improve efficiency and effectiveness of verification activities. Such a mechanism might be conceivable through facilitation by National Authorities.
- 2.5 Wilhelm Mandl (guest speaker) from the International Atomic Energy Agency (IAEA) provided an overview of the Agency's processing of State declared safeguards information. The IAEA receives and manages the information declared by States, as prescribed by the relevant safeguards agreements, and, together with all other safeguards-relevant information (e.g. inspection reports, publicly available information, State's voluntary reporting), evaluates it as part of the process supporting safeguards implementation. The Division of Information Management plays a key

role in the processing of State declared information - from the transmission of information to the Agency to its ultimate use in the context of establishing State Evaluation Reports and the drawing of safeguards conclusions. The presentation highlighted the different types of information that are handled and described the information structure and transmission paths from the State authorities to the Agency. The Department of Safeguards is currently re-engineering its information technology (IT) capability. Remarks pertinent to the IT migration process, its impact on the relevant business processes, the historical context and the envisaged vectors of future development of this system were made.

2.6 In the discussion, the following points were raised:

- (a) Information granularity that matches the purpose for which the information is to be used is critical. Information structure must also match up with the tools that will be used to store and retrieve it.
- (b) Information is obtained in a variety of ways, including hand carry, electronically transmitted, sent by mail (which can be paper or electronic files), or by FAX. Information reported in hard copy is labour intensive and requires organised processes to extract into data handling systems.
- (c) Secure information transmission is a crucial aspect of willingness to use electronic data submissions by States Parties. However, requirements for encryption and confidentiality vary across States Parties. Encryption should also not hinder the ability to route information to its final destination. It was noted that solutions from the world of on-line banking are attractive for handling, storage and usage of confidential information.
- (d) The IAEA has faced the challenge of replacing an outdated IT system by a new system ensuring security of confidential information, while ensuring collaborative work. Part of that challenge was the migration of information from the obsolete system to a modern IT environment.
- (e) The issues raised on IT systems are highly relevant to the OPCW and how information can be effectively managed into the future.

2.7 Tamara Patton Schell (guest speaker) from the Vienna Center for Disarmament and Non-Proliferation (VCDNP) provided an overview of new technologies and approaches for non-proliferation and disarmament verification. The presentation described on moving from National Technical Means to International Technical Means for verification concepts; a shift that requires looking to commercially available methods of securing and transmitting information and harnessing R&D from other fields applicable to disarmament activities. Three core areas were described in detail: new satellite sensors, new types of publicly available information (geospatial) data, and new software capabilities.

2.8 In the discussion, the following points were raised:

- (a) Satellite images are now commercially available with high resolution, multispectral, hyperspectral, and thermal infrared capabilities. Temporal

information can be augmented to satellite images using publicly available geospatial data collected in real time from social media (e.g. volunteered geographic information from "tweeted" photographs), making these images more detailed and informative.

- (b) Applications discussed that could have relevance to Chemical Weapons Convention (hereinafter "the Convention") activities included satellite imagery for inspection planning, multispectral/hyperspectral satellite imagery for tracking chemical signatures, new (social) media analysis to support compliance monitoring, use of 3D modelling, and virtual reality to support inspection training.
- (c) As new technologies and capabilities arise there is an increasing magnitude of data that requires integration and processes for extracting value. The TWG noted the ability of informatics tools to integrate data from diverse sources and produce combined visual, temporal, analytical, and geospatial data summaries.

### **3. AGENDA ITEM THREE – Routine Verification**

- 3.1 Per Runn and Stefan Mogl provided the TWG with the results from a series of interviews they had conducted with staff of the Technical Secretariat regarding the challenges to the verification regime. They pointed to three main areas: continued support by States Parties for the verification regime; constraints of the Verification Annex; and the importance of verification methodologies to evolve with time to meet the new challenges.
- 3.2 The key challenge to the Convention verification regime is to maintain the continued support by States Parties and this requires that the costs and benefits of the regime for States Parties are balanced. The viability of the Convention will be assessed from its core objectives including the routine verification mechanisms and the Secretariat's capability to carry out Investigation of Alleged Use and Challenge Inspections to address concerns regarding compliance.
- 3.3 The detailed provisions of the Verification Annex provide a strong guidance, but can also be an obstacle to adapting the verification regime to changing circumstances. One example is the site selection mechanism for Schedule 3 and OCPF inspections. The procedures according to the Convention, as currently implemented, and, the number of inspections per year, will with time lead to a situation where States Parties with few declared facilities will have these repeatedly inspected while in States Parties with a large number of facilities many facilities will remain not inspected. Experiences from other international organisations should be considered, e.g. from inspections within the framework of the OECD.
- 3.4 For the verification regime to stay relevant it must be able to evolve with time. A number of areas have been identified to be addressed in the work of this TWG, including the adoption of a holistic approach to verification as well as exploring the benefits of using publicly available information. Acquiring modern and effective tools for data analysis and adopting technical innovations to make effective use of new methodologies will be critical. It is equally important to maintain the competence of staff and to ensure that the Technical Secretariat (hereinafter "the

Secretariat”) remains an attractive workplace. Highly qualified staff members with initiative are required to ensure that verification can adapt to changing circumstances

- 3.5 Murat Gulay of the Secretariat updated the TWG on the Secretariat’s electronic verification tools. Mr Gulay informed the TWG on improvement initiatives of the Verification Information System (VIS), the release of Version 3.0 of EDNA (which included a new module for the declaration of Schedule 1 facilities), and the status and use of the SIX system since the recent security assessment and audit recommendations. Activities within the Secretariat to engage with States Parties and provide training and support for the electronic tools were also described. The briefing concluded with an overview of the efforts to implement a new Information Management System (IMS) for the verification division to manage all verification related information that is handled outside of the VIS, e.g. scanned images of documents. In other words, this is not a replacement of the VIS, but modernisation of all other legacy systems and practices that exist outside of the VIS, such as the Electronic Document Management System (EDMS). The main objective for the new project is to consolidate existing legacy systems, introduce contemporary document and records management capabilities, extended search capability, improve data quality, and provide flexible workflow management with little or no IT support.
- 3.6 Stephanie Dare-Doyen of the Secretariat briefed the TWG on the definition of Discrete Organic Chemical (DOCs) and declarability of Other Chemical Production facilities (OCPFs) in order to set the framework for discussions on both declaration of OCPFs producing mixtures containing DOCs and the verification aspects of the meaning of "produced by synthesis".
- 3.7 The TWG received an update by Mehran Rouzbahani on the progress made in identifying the key components of a consistent approach to declaring complex mixtures of discrete organic chemicals since the second meeting. The presentation highlighted the background and focused on technical and policy related questions provided in a paper which had been distributed earlier among the members of sub-group and responses received. Mike Walls presented his views, reflecting the chemical industry perspective. The TWG noted that the focus of the OCPF verification regime is on the capability or flexibility to produce scheduled chemicals.
- 3.8 In the discussion, the following points were raised:
- (a) The interpretation of “Discrete” in Discrete Organic Chemical needs further deliberation;
  - (b) The TWG also discussed possible options for such interpretations in relation to mixtures of DOCs and their impact on declarability of OCPFs.
- 3.9 The TWG will continue to discuss the elements of a response.
- 3.10 Stefan Mogl presented some of the findings of the Temporary Working Group on Convergence in Chemistry and Biology that may be relevant to the discussions of this TWG on verification. Mr Mogl reminded the TWG that the SAB in its report to The Third Review Conference (RC-3/DG.1, dated 29 October 2012) recommended that “any process designed for the formation of a chemical substance should be covered by

the term 'produced by synthesis'. Bulk and fine chemicals are being produced increasingly using biologically mediated processes. It is estimated that by 2020 approximately ten percent of chemical production volume will use such processes. Drivers for this trend are commercial and environmental factors and the competition for conventional feedstocks. Although this biotechnology could be applied to the production of toxic chemicals, bioregulators and toxins, the TWG on Convergence assessed the potential application to Schedule 1 and 2 chemicals production currently as limited. Furthermore, development and scale-up of new biological processes would require significant investment of capital, resources and time.

- 3.11 The presentation concluded with a survey of current bio-based industrial chemicals by Jonathan Forman of the Secretariat. Mr Forman provided the TWG with an overview of types and volumes of chemicals, motivations driving adoption of bio-based processes and trends in the products currently in development. The TWG was asked to consider from a technical viewpoint: which types of OCPFs not commonly declared today would be considered declarable?; which types of OCPFs (whether commonly declared today or among those identified by answering the previous question) represent a particularly low relevance to the object and purpose of the Convention and should therefore be exempted from declaration?; and which grounds, if any, exist for considering a revision of the threshold(s) for declaration and inspection of OCPFs? These questions will be addressed at the upcoming fourth meeting.
- 3.12 Piers Millet (guest speaker) from the Biological Weapons Convention Implementation Support Unit (BWC ISU) noted that there is no perspective from the BWC on the meaning of "production by synthesis". States Parties have never considered the implications of this term and it has no comparable usage under the BWC. The BWC does not have a list of agents comparable to the schedules of the Convention; it does not have specific details of agents of concern, and, therefore, cannot examine different ways in which they could be produced. Through subsequent review conferences, States Parties have reached agreements that do relate to the scope of the treaty with regards to methods of production. For example, the Sixth and Seventh Review Conferences reaffirmed that "the Convention is comprehensive in its scope and that all naturally or artificially created or altered microbial and other biological agents and toxins, as well as their components, regardless of their origin and method of production and whether they affect humans, animals or plants, of types and in quantities that have no justification for prophylactic, protective or other peaceful purposes, are unequivocally covered by Article I."
- 3.13 The BWC itself contains no provisions to verify the presence or absence of specific activities at relevant facilities. Dr Millet noted that most of the 1990s was spent attempting to negotiate a mechanism to strengthen the BWC, including through verification. However, efforts to develop a multilaterally negotiated, legally binding instrument were fruitless and States Parties were unable to reach agreement on what was relevant and how their activities might be verified. A summary of this process was provided, including an overview of: the 1992-1994 Ad Hoc Group of Governmental Experts to identify and examine potential verification measures from a scientific and technical standpoint (VEREX); the 1994 Special Conference; the 1995-2001 Ad Hoc Group; and the 2001-2002 Fifth Review Conference.

3.14 The last time BWC States Parties collectively considered the scientific technical aspects of verification was two decades ago, Dr Millet noted. The last version of a draft protocol for the BWC was tabled in 2001. At that time, there were discussions related to vaccine production facilities, facilities producing microorganisms and diagnostic reagents; biocontrol agent facilities, and lists of facilities involved in the production of microbially-produced substances. Dr Millet noted that such facilities were not categorised according to biosafety or biocontainment arrangements or according to the biological systems they were using. Specific exemptions for declarations were foreseen for facilities producing food or beverages for humans, or as waste, or as by-products. Exceptions for animal food and fuels had also been considered.

3.15 In discussion the following points were raised:

- (a) Questions were raised on what determines a process as biological. Some States Parties declare facilities employing bio-based processes, while others do not.
- (b) Some large scale bio-based production processes use fermentation to produce commodity chemicals (such as ethanol and glycerol) which are next converted into final products using a chemical process. In such cases, if the final product were a DOC, the facility should be declared.
- (c) There is a need to have an understanding of the feasibility of converting a bio-based production facility to produce chemicals of concern to the Convention, in order to develop guidelines for declarations regarding bio-based chemical production.

#### **4. AGENDA ITEM FOUR – New technologies and methodologies.**

4.1 During the second meeting of the TWG it was decided that a gap analysis should be undertaken to support the work on agenda items 4(a), 4(b), and 4(e); this was commenced before the third meeting. The initial phase was focused on Article VI. The following areas where new technology and methods might benefit verification were identified:

- (a) Timeliness, accuracy, and completeness of Article VI declarations.
- (b) Schedule 3 and OCPF site selection.
- (c) Planning and conduct of Article VI verification and reporting.
- (d) A need to enhance data analysis tools.
- (e) Ensuring sampling and analysis capabilities remain current.

4.2 The TWG discussed a range of technologies, methodologies and approaches that might benefit the verification regime, including: how all relevant verification activities could be taken into account, sound use of publicly available information, augmented use of information technology tools (including the Verification



Information System, electronic inspection reports, extended use of electronic transmission of classified information, and data mining), and augmented sampling and analysis capabilities (including biomedical and trace analysis, portable analytical equipment, high resolution mass spectrometry, and attribution analysis). Recommendations would be made in the final report of the TWG.

- 4.3 The TWG would solicit views from other experts, including from the chemical industry, prior to its next meeting.

**5. AGENDA ITEM FIVE – How can sampling and analysis most effectively be utilised for verification purposes?**

- 5.1 Robin Black provided an introduction to attribution analysis which, in an investigation of alleged use context, is the attribution or linkage of a chemical warfare agent or precursor to its sources, precursor, or at least to a particular production route. This type of analysis has been developed for several non-Convention related applications (e.g. food/wine adulteration, counterfeit drugs, explosives), but has only relatively recently been investigated for attribution of chemical warfare agents. Attribution analysis relies primarily on impurity profiling, combined with statistical comparison of samples, and/or on comparison of elemental stable isotope ratios as determined by isotope ratio mass spectrometry. A number of OPCW-designated and other government funded laboratories are known to be investigating attribution analysis in a Convention context.

- 5.2 Daan Noort described a chemical attribution study performed in collaboration with the Netherlands Forensic Institute. The presentation highlighted the use of attribution analysis to assess chemical signatures of crude VX samples. The results show that chemical profiles of the VX samples are persistent and seem indicative for a particular synthesis method. However, it is envisaged that small changes in synthetic protocol might have a large impact on the chemical profile. Similar results were obtained with sulfur mustard and sarin.

- 5.3 Databases and/or an appropriate reference sample are critical for attribution, and suitable databases are currently limited. Inter-laboratory collaboration would therefore be essential for establishing a network of laboratories capable of undertaking such analyses. At present, because of the very limited experience of attribution analysis (at least available in the public domain), its reliability is uncertain. More research is necessary to evaluate the value of attribution analysis.

- 5.4 Hugh Gregg, Head of the OPCW Laboratory, gave a short presentation on “Sampling and Analysis in support of a United Nations fact-finding mission to Syria”. He described the differences between environmental and biomedical samples, and the OPCW's readiness to conduct sampling and analysis in support of investigation of alleged use. While two biomedical sample analysis confidence building exercises had been conducted prior to 2013, a significant amount of work was required to become ready to collect and analyse biomedical samples in support of an IAU. This work was accomplished, and the Secretariat was able to perform sampling and analysis in support of the United Nations fact-finding mission to the Syrian Arab Republic. Preliminary lessons learned were shared with the group.

5.5 In discussion the following points were raised:

- (a) When a large number of samples test positive for a given chemical agent, the question was raised on whether or not a second analytical method is necessary on each individual sample. The additional testing burden can prolong the time to report results. In the case of samples from the Syrian Arab Republic containing sarin, additional chemicals attributable to breakdown products of sarin were also definitively identified. Do these additional chemicals need to be identified to the standards normally required of the OPCW Designated Laboratories (for example by two analytical methods)?
- (b) Concerning samples from the Syrian Arab Republic investigation, chemicals relevant to, but not specific for sarin (e.g. chemical stabilisers) had also been identified. Identification and reporting of these types of chemicals have not been part of the scenarios for proficiency testing used thus far.
- (c) Procedures and protocols would benefit from review to ensure there is flexibility to handle unexpected sample numbers, sample types, and time frames while still ensuring robust and accurate analysis and reporting.
- (d) Biomedical samples require special equipment and handling procedures for health and safety concerns.
- (e) Many demands are being made on laboratories to participate in proficiency tests, adopt new analytical methods and reporting guidelines, and ensure preparedness for a broad range of analyte and sample types. The Secretariat is currently looking at resource implications.
- (f) As laboratories may have accreditation only for specific types of samples, it is important that if results are reported for analyses outside the quality system of the laboratory, this should be suitably noted and reported.

**6. AGENDA ITEM SIX – Which methodologies might be helpful for the Secretariat to keep abreast of developments in science and technology of relevance to the Chemical Weapons Convention verification regime?**

6.1 Jonathan Forman briefed the TWG on the Secretariat's science and technology monitoring activities. Technology development with multidisciplinary approaches is common place and must be taken into account. Technologies that have been enabling advances in the chemical and biological sciences are coming from other disciplines and may not be immediately recognised if monitoring is limited to chemical specific information. The Secretariat will continue active engagement with scientific experts from a range of disciplines and use scientific social media. Information and communication technologies are key enablers for new scientific developments; examples of integration of these technologies with chemical, spatial, and temporal data were discussed. Examples of similar technologies that have made their way into consumer products were also highlighted, demonstrating the significant reduction in cost and improved robustness of many new technologies. The TWG was asked to consider impacts on verification that are being driven by integrated informatics capabilities and electronic communication advances.

6.2 The following points were raised:

- (a) Remote/automated monitoring and informatics technologies may have applications in challenge inspections and investigations of alleged use.
- (b) The ability to collect information has outpaced the ability to analyse information and there is an overwhelming amount of interesting and capable technology developments. In considering which technology developments are most relevant to the activities of the OPCW, appropriate formulation of questions to help guide the review of science and technology is necessary.
- (c) Technology foresight has been used by other International Organisations to effectively engage with scientific and technical experts in Member States. There may be benefits for the OPCW to explore similar approaches.
- (d) Social media is not a one way conversation and the feedback and dialogue it generates are as valuable as its ability to reach a broad audience.

**7. AGENDA ITEM SEVEN – Any other business**

There was no other business.

**8. AGENDA ITEM EIGHT – Conclusions, recommendations, plan of action for intersessional period, elaboration of the TWG report and date of the next meeting**

The fourth meeting of the TWG was tentatively scheduled for 29 September to 1 October 2014.

**9. AGENDA ITEM NINE – Closure of the meeting**

The Chairperson closed the meeting at 13:10 on 9 April 2014.

### Appendix

#### LIST OF PARTICIPANTS IN THE THIRD MEETING OF THE SAB TEMPORARY WORKING GROUP ON VERIFICATION THE HAGUE, THE NETHERLANDS 7 - 9 APRIL 2014<sup>1</sup>

PARTICIPANT	INSTITUTION
Professor Roberto Martinez-Alvarez* <sup>2</sup>	Universidad Complutense de Madrid
Dr Augustin Baulig*	Secrétariat général de la défense et de la sécurité nationale, Paris
Dr Robin Black	Defence Science and Technology Laboratory (DSTL), Porton Down
Mr Hermann (Alex) Lampalzer	Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO)
Dr Nicia Maria Fusaro Mourão*	ABIQUIM (Brazilian Chemical Industry Association), São Paulo
Mr Stefan Mogl	SPIEZ Laboratory, Spiez
Dr Daan Noort	Netherlands Organisation for Applied Scientific Research (TNO)
Mr Eric Pujol	International Atomic Energy Agency (IAEA)
Mr Mehran Rouzbahani	Consultant
Dr Per Runn	Consultant
Ms Mui Tiang Sng	DSO Laboratories, Singapore
Professor Alejandra Graciela Suárez*	Universidad Nacional de Rosario. Consejo Nacional de Investigaciones Científicas y Técnicas
Professor Paula Vanninen*	Finnish Institute for Verification of the Chemical Weapons Convention, University of Helsinki
Mr Francois Mauritz van Straten*	South African Nuclear Energy Corporation SOC Ltd, Pretoria
Dr Rob Visser	Consultant
Mr Michael Walls	American Chemistry Council
Mr Wilhelm Mandl (guest speaker)	International Atomic Energy Agency (IAEA)
Dr Piers Millet (guest speaker)	Biological Weapons Convention Implementation Support Unit (BWC ISU)
Dr Tamara Patton Schell (guest speaker)	Vienna Center for Disarmament and Non-Proliferation (VCDN)

\* Member of the Scientific Advisory Board

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<sup>1</sup> Bimal Mehta (Transpek Industry Ltd., Vadodora) could not attend the third meeting of the TWG.

<sup>2</sup> Chairperson of the TWG on Verification.