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Implementing nuclear non-proliferation in Finland

Regulatory control, international cooperation and the Comprehensive Nuclear-Test-Ban Treaty

Annual report 2007

Marko Hämäläinen, Paula Karhu (eds)

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Summary

Regulatory control of nuclear materials (nuclear safeguards) is a prerequisite for the peaceful use of nuclear energy in Finland. In order to uphold our part of the international agreements on nuclear non-proliferation – mainly the Non-Proliferation Treaty (NPT) – this regulatory control is exercised by the Nuclear Materials Section of the Finnish Radiation and Nuclear Safety Authority (STUK).

Nuclear safeguards are applied to all materials and activities that can lead to the proliferation of nuclear weapons or sensitive nuclear technology. These safeguards include nuclear materials accountancy, control, security and reporting. The main parties involved in a state nuclear safeguards system are the facilities that use nuclear materials – often referred to as “license holders” or “operators” – and the state authority. A license holder shall take good care of its nuclear materials and the state authority shall provide the regulatory control to ensure that the license holder does. Additionally, the International Atomic Energy Agency (IAEA) evaluates the success of the state safeguards system and the European Commission participates in safeguarding the materials under its jurisdiction.

To guarantee that Finland can assure itself and the international community of the absence of undeclared nuclear activities and materials, STUK is obliged to maintain a central nuclear materials accountancy system and to verify that nuclear activities in Finland are carried out according to the Finnish Nuclear Energy Act and Decree, the European Union's (EU) legislation and international agreements.

Finland has a significant nuclear power industry. About 99.8 % of the nuclear materials (uranium, plutonium) in Finland reside at the nuclear power plants in Olkiluoto and Loviisa. Most of the remaining 0.2 % is at the VTT research reactor in Otaniemi, Espoo. Additionally, there are a dozen minor nuclear material holders in Finland. The construction project for the final disposal facility for spent nuclear fuel does not involve any actual nuclear material yet, but nuclear safeguards are applied to the facility site on the national level already, to prepare for effective future safeguards. Proliferation-sensitive nuclear technology and nuclear dual use items are less easily mapped and tracked. They must, nevertheless, be kept under adequate safeguards.

The results of STUK's nuclear safeguards inspection activities in 2007 continued to demonstrate that Finnish licence holders take good care of their nuclear materials. There were no indications of undeclared nuclear materials or activities and the inspected materials and activities were in accordance with the licence holders' declarations. STUK

remarked on the nuclear safeguards systems of two licence holders in 2007, setting required actions for them to correct their reporting and to update the descriptions of their procedures. Neither the IAEA nor the European Commission made any remarks nor did they present any required actions based on their inspections. By their nuclear materials accountancy and control systems, all licence holders enabled STUK to fulfil its own obligations under the international agreements relevant to nuclear safeguards.

Finland, as any state, has the responsibility to take measures to prevent illicit trafficking of nuclear and other radioactive materials and sensitive technology, to protect its citizens and to fulfil its obligations under international agreements. STUK Nuclear Materials Section cooperates closely with the Finnish Customs to offer expert advice in development of radiation monitoring at borders, including training for Customs officers. One characteristic of the local conditions – our sharing the EU's north-eastern border with the Russian Federation – has motivated also successful cross-border cooperation between Finnish and Russian authorities. STUK cooperation programmes in the area of non-proliferation emphasise the importance of the regional nuclear security environment and of peer-to-peer exchanges between the regulatory authorities. Most of the methods of implementing non-proliferation contribute directly also to nuclear security.

STUK has set up an interdivisional Nuclear Security Task Group in order to improve internal coordination on this topic and to act as the focal point at STUK for issues dealing with nuclear security, counter-terrorism and radiological risk reduction. During 2007 the leadership of this task group was assigned to the Nuclear Materials Section.

The Comprehensive Nuclear-Test-Ban Treaty (CTBT) is one of the elements of the global nuclear non-proliferation effort. STUK has two roles in relation to the CTBT: STUK operates the Finnish National Data Centre (FiNDC) and one of the radionuclide laboratories (RL07) designated in the CTBT. The main task of the FiNDC is to inspect data received from the International Monitoring System (IMS) and to inform the national authority, the Ministry for Foreign Affairs, about any indications of a nuclear weapons test. The FiNDC falls under the non-proliferation process in STUK's organisation, together with the regulatory control of nuclear materials.

A major goal of all current CTBT related activities is the entry into force of the CTBT itself. An important prerequisite for such positive political action is that the verification system of the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) is functioning and able to provide assurance to all parties that it is impossible to make a clandestine nuclear test without getting detected. The FiNDC is committed to its own role in the common endeavour so that the verification system of the CTBTO can accomplish its detection task. While still incomplete, the CTBTO verification system has already demonstrated its potential for detecting nuclear tests, especially in connection with the nuclear test by North Korea (DPRK) in 2006. This event underlined the importance of noble gas (xenon) monitoring for the verification system.

Contents

1 Implementing non-proliferation in Finland: why and how does it work?

Nuclear non-proliferation is a prerequisite for the peaceful use of nuclear materials and nuclear energy, globally. In order for Finland to have a nuclear industry – most of which is constituted by nuclear energy production – we must ensure that nuclear materials, equipment and technology are used only for their declared, peaceful purposes. This is why we have nuclear safeguards: a national system for the regulatory control of nuclear materials. Nuclear safeguards are an integral part of nuclear safety and nuclear security and they are applied both to big and medium-size nuclear industry and to small-scale nuclear material activities. Along with the safeguards, the regulatory process for nuclear non-proliferation includes transport control, export control, border control, international cooperation and conventions, and monitoring compliance with the Comprehensive Nuclear-Test-Ban Treaty (CTBT). The following chapters describe how the Finnish nuclear non-proliferation implementation works.

1.1 Nuclear safeguards are based on international agreements and national law

Nuclear safeguards are based on international agreements, the most important and extensive of which is the Treaty on the Non-Proliferation of Nuclear Weapons (Non-Proliferation Treaty, NPT). The Treaty Establishing the European Atomic Energy Community (Euratom Treaty) is the basis for the nuclear safeguards system of the European Union (EU). Finland is bound by both of these treaties, and also has several bilateral agreements in the area of peaceful use of nuclear energy. Upon joining the EU, our bilateral agreements with Australia, Canada and the USA were partly substituted by the corresponding Euratom agreements.

Finland was the first state where an INFCIRC/153-type nuclear Safeguards Agreement with the IAEA entered into force (INFCIRC/155, 9 February 1972). When Finland joined the EU (1 January 1995), this agreement was suspended and subsequently the Safeguards Agreement between the non-nuclear weapon Member States of the EU, the Euratom and the IAEA (INFCIRC/193) entered into force in Finland, on 1 October 1995. Finland signed the Additional Protocol (AP) to the INFCIRC/193 in Vienna on 22 September 1998, with the other EU Member States, and ratified it on 8 August 2000. The Additional Protocol entered into force in April 30, 2004, when all the EU Member States had ratified it. The scope and mandate for Euratom nuclear safeguards are defined in the European Commission Regulation No. 302/2005.

After Finland joined EU as a Member State and therefore joined the Euratom nuclear safeguards, a comprehensive national safeguards system was still maintained. The basic motivation for this is the responsibility assumed by Finland for its nuclear safeguards and nuclear security under the obligations of the NPT.

The national nuclear safeguards derive their mandate and scope from the Finnish Nuclear Energy Act and Decree. As stipulated by the Act, STUK issues detailed regulations on safety and security (the YVL Guides) that apply to the use of nuclear energy. The YVL Guides most relevant to nuclear safeguards are:

- Control of nuclear fuel and other nuclear materials required in the operation of nuclear power plants (Guide YVL 6.1)
- The national system of accounting for and control of nuclear materials (Guide YVL 6.9)
- Reports to be submitted on nuclear materials (Guide YVL 6.10).

Nuclear materials control applies to:

- nuclear material (special fissionable material and source material)
- nuclear dual use items (non-nuclear materials, components, equipment and data suitable for producing nuclear energy or nuclear weapons as specified in INFCIRC/254 Part 1)
- licence holders' activities, expertise, preparedness and competence
- R&D activities related to the nuclear fuel cycle
- nuclear security, and
- safeguards for the final disposal of spent nuclear fuel.

1.2 Parties of the Finnish nuclear safeguards system: who makes it all happen?

The main parties involved in the Finnish nuclear safeguards system are the authorities and the licence holders. Undistributed responsibility for the safety, security and safeguarding of its nuclear materials is on the licence holder. It is the responsibility of STUK as the competent state authority to ensure that the licence holders comply with the requirements of the law and the nuclear safeguards agreements. To complement the national effort, international control is necessary to demonstrate credibility and the proper functioning of the national safeguards system.

1.2.1 Ministries

The Ministry for Foreign Affairs is responsible for national non-proliferation policy and international agreements. The Ministry of Employment and the Economy (MEEC, formerly the Ministry of Trade and Industry) is the highest state authority for management and control of nuclear energy. MEEC is responsible for legislation related to nuclear energy and it is also the competent safeguards authority mentioned in the Euratom Treaty. Also other ministries, such as the Ministry of the Interior and the Ministry of Defence contribute to the efficient functioning of the national nuclear safeguards system.

1.2.2 STUK

According to the Finnish nuclear legislation, STUK is responsible for maintaining the national nuclear safeguards system in order to prevent proliferation of nuclear weapons. STUK regulates the license holders' activities and ensures that the obligations of international agreements concerning peaceful use of nuclear materials are met. Regulatory control by STUK includes the possession, use, production, transfer (national and international), handling, storage, transport, export and import of nuclear material and nuclear dual use items. STUK is in charge of Finland's approval and consultation process for IAEA and European Commission in-

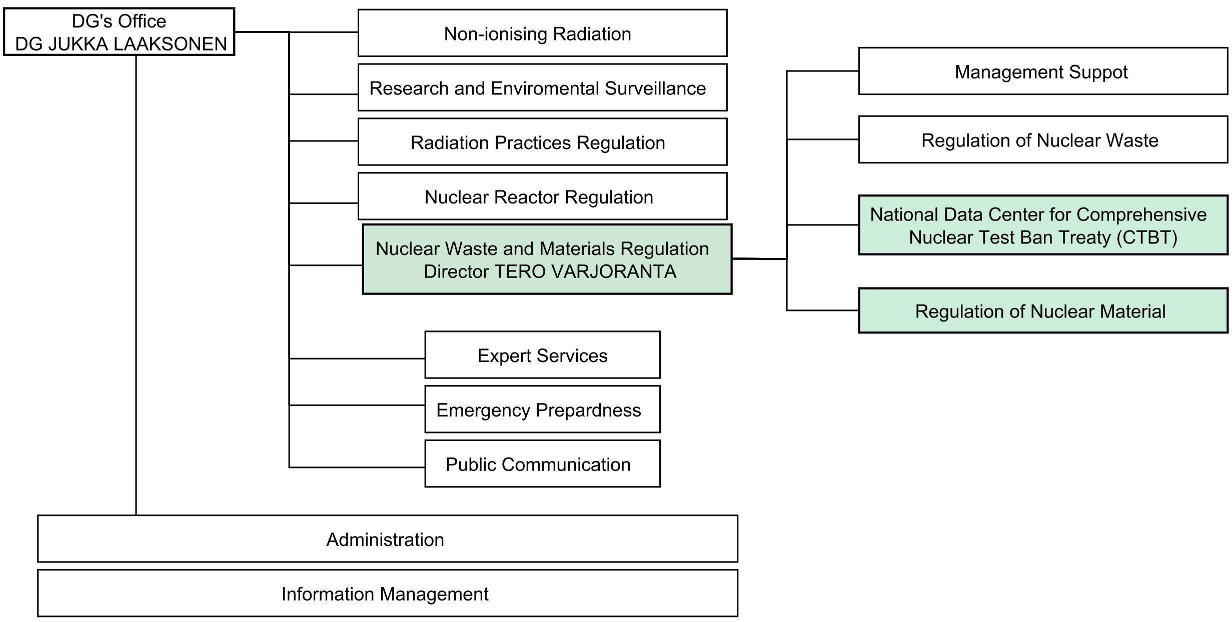

Figure 1. The Nuclear Materials Section and the Finnish National Data Centre for the CTBT within the STUK organisational structure. Section staff is presented in Appendix 3.

spectors. STUK approves an inspector as long as there are no such issues related to the person in question that might adversely affect nuclear safety or security at Finnish facilities or the non-proliferation of nuclear weapons. The new inspector requests are sent for comments to the operators that hold construction or operating licenses for nuclear facilities. If STUK cannot approve an inspector, it assigns the approval process to the Ministry of Employment and the Economy.

Nuclear safeguards by STUK cover all typical measures of a State System of Accounting for and Control of Nuclear Materials (SSAC) and much more. STUK reviews the license holders' reports (operational notifications, inventory reports), inspects their accountancy, facilities and transport arrangements on site and performs system audits. Office work constitutes 90 % of the inspection effort. STUK runs a verification programme for nuclear activities to assess the completeness and correctness of the declarations by the licence holders. Nuclear safeguards on the national level are closely linked with other functions of nuclear materials control and non-proliferation: licensing, export control, border control, transport control, combating illicit trafficking, the physical protection of nuclear materials, and monitoring compliance with the Comprehensive Nuclear-Test-Ban Treaty (CTBT) – all duties of the STUK Nuclear Materials Section. Nuclear safety and particularly nuclear security objectives are closely complemented by safeguards objectives.

1.2.3 License holders

An essential part of the national nuclear safeguards system are the licence holders (in nuclear industry often called the operators). They perform key functions of the national safeguards system: control of the authentic source data of their nuclear materials and nuclear material accountancy at the facility level for each of their material balance areas (MBA). Each license holders has to operate its safeguards system according to its own nuclear material handbook. The handbook is part of the facility's quality system and reviewed and approved by STUK.

Acting on the basis of the basic technical characteristics (BTC) submitted by license holder, the Commission shall adopt particular safeguards provisions (PSP). PSP is to be drawn taking account of operational and technical constraints, and in close consultation with the person or undertaking concerned and the relevant member state. Until particular safeguards provisions is adopted, the person or undertaking shall apply the general provisions of the Commission regulation No 302/2005.

99.8 % of all nuclear materials in Finland reside at the nuclear power plants (NPP). The nuclear material (uranium, plutonium) amounts in Finland in 1990–2007 are presented in Figures 2 and 3.

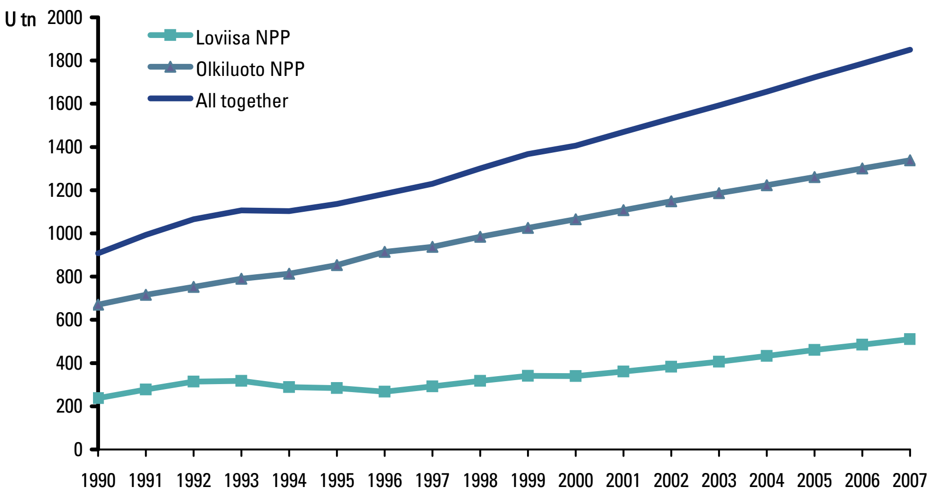

Figure 2. Uranium amount in Finland in 1990–2007.

Fortum (MBA WL0V)

Fortum is a partly state-owned energy company, one of the largest in the Nordic countries. Fortum operates power plants of several types, nuclear among others.

The nuclear power plant of Fortum Power and Heat is located in Loviisa on the south-east coast of Finland. This first NPP to have been built in Finland hosts two power reactor units: Loviisa 1 and Loviisa 2. Loviisa 1 started its electricity production in 1977 and Loviisa 2 in 1980. The two units share a common fresh and spent fuel storage and for nuclear safeguards accountancy purposes the whole NPP is counted as one material balance area (MBA code WL0V). The electricity generated by the Loviisa NPP constitutes ca. 10 % of the whole electricity production in Finland.

Most of the fuel for the Loviisa NPP has been imported from the Soviet Union / Russian Federation. Recently, also Fortum has purchased fuel from Spain, using a similar strategy as TVO (below), however, this is not expected to continue in the near future. The spent fuel of the Loviisa NPP was returned back to the Soviet Union / Russian Federation until 1996, and since then it has been stored in the interim storage due to a change in the Finnish nuclear legislation, which forbids, in general, import and export of nuclear waste.

Particular Safeguards Provisions for the Loviisa NPP that define the European Commission's nuclear safeguards procedures for the facility have been in force since 1998.

The Loviisa NPP site, as per the requirements of the Additional Protocol, comprises the entire Hästholmen island and extends to the main gate on the continent.

Teollisuuden Voima (MBAs W0L1, W0L2, W0LS and W0L3)

Teollisuuden Voima Oyj (TVO) owns and operates a nuclear power plant in Olkiluoto, in Eurajoki on the west coast of Finland. The Olkiluoto NPP consists of two nuclear power reactor units, Olkiluoto 1 and Olkiluoto 2, and an interim spent fuel storage. Olkiluoto 1 was connected to the electricity grid in 1978 and Olkiluoto 2 in 1980. The Olkiluoto NPP contributes ca. 16 % of the whole electricity production in Finland. At the Olkiluoto NPP there are three active material balance areas (MBA codes W0L1, W0L2, W0LS).

Presently, the uranium in the TVO's nuclear fuel is mainly of Australian, Canadian and Russian origin. Uranium is enriched in the Russian Federation or in the EU and the fuel assemblies are manufactured in Spain and Sweden.

The Finnish Government granted a licence for constructing a new nuclear reactor, Olkiluoto 3, on 17 February 2005. As a part of the licensing process, TVO's plan for arranging the necessary measures for preventing proliferation of nuclear weapons was approved by STUK. The construction and assembly work of the reactor unit is underway. The Ministry for Foreign Affairs of Finland has provided the Embassy of Japan with the Nuclear Suppliers' Group (NSG) assurances on the fuel channels to be shipped from Japan to Finland by 31 December 2010. The European Commission has assigned the MBA code W0L3 for Olkiluoto 3.

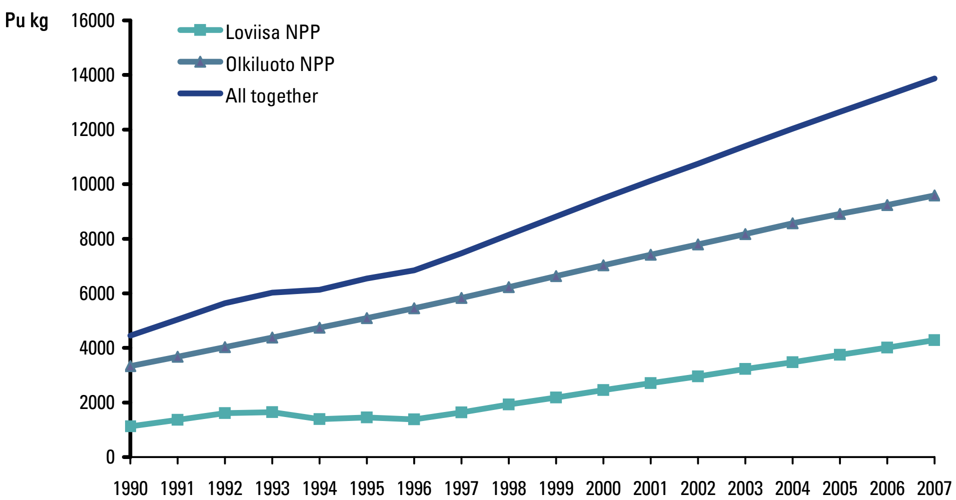

Figure 3. Plutonium amount in Finland in 1990–2007.

The TVO NPP site, as per the requirements of the Additional Protocol, comprises the fenced areas around the reactor units, the spent fuel storage and the storage for low and intermediate level waste as well as the Olkiluoto 3 construction site.

VTT FiR1 research reactor (MBA WRRF)

Small amounts of nuclear materials are located at other facilities than nuclear power plants. The most significant of those facilities is the VTT research reactor FiR1 (MBA code WRRF) in Otaniemi, Espoo. The research reactor was the first nuclear reactor built in Finland. It reached criticality on 27 March 1962.

Particular Safeguards Provisions that define the European Commission's nuclear safeguards procedures for the facility have been in force for VTT FiR1 from 1998.

The VTT FiR site, as per the requirements of the Additional Protocol, consists of the whole building around the research reactor.

STUK (MBA WFRS)

Small quantities of nuclear materials are stored in STUK, mainly material no longer in use and hence taken into STUK's custody. The Radiation and Nuclear Safety Authority was founded in 1958 and is located in its current premises in Roihupelto, Helsinki, since 1994. The STUK MBA (WFRS) consists of the STUK headquarters and the "central interim storage for small-user radioactive waste" at the Olkiluoto NPP site.

The STUK site, as per the requirements of the Additional Protocol, consists of STUK's headquarters (non-STUK premises in the building are excluded).

The University of Helsinki, Laboratory of Radiochemistry (MBA WHEL)

The Laboratory of Radiochemistry at the University of Helsinki (HYRL) uses small amounts of nuclear materials. HYRL is located in Kumpula, Helsinki.

The HYRL site, as per the requirements of the Additional Protocol, comprises the whole building that hosts the laboratory.

OMG Kokkola Chemicals (MBA WKK0)

The OMG Kokkola Chemicals facility is not using nuclear materials as such: the by-products of their cobalt purification process contain uranium, qualifying them as nuclear material. OMG Kokkola Chemicals has an operation license for storing and handling and shipping this nuclear material to Comurhex in France. OMG Kokkola Chemicals is located on the west coast of Finland.

Minor nuclear material holders

There are about 10 minor nuclear material holders in Finland. One of them is an actual material balance area: University of Jyväskylä, Department of Physics (JYFL, MBA code WDPJ), but in fact the nuclear material in JYFL has been derogated and exempted by the European Commission and the IAEA. Other minor nuclear material holders are members of a Catch-All-MBA (CAM), for purposes of international nuclear safeguards. CAM members are listed in Table 4 (Appendix 1).

Posiva

Posiva Oy is the company responsible for the final disposal of spent nuclear fuel in Finland. It is owned by TVO and Fortum. Posiva has been excavating an underground rock characterisation facility called "Onkalo", in Eurajoki, Finland, since 2004, and thus preparing for the construction of the final disposal facility. While not yet a nuclear material holder, Onkalo is highly relevant to the national safeguards system, as is explained in chapter 2.1.

1.3 IAEA and Euratom safeguards in Finland: enabled by the state, checking on the state

The IAEA and the European Commission nuclear safeguards both have their separate mandates to operate in Finland. These two international inspectorates have agreed on cooperation (New Partnership Approach, NPA), which aims to reduce undue duplication of effort. In Finland this has thus far not decreased the number of inspection days and there is overlap in the Commission's and the IAEA's safeguards activities. In 2007 the IAEA safeguards activities were carried out without significant changes to the previous years. Discussions in a constructive atmosphere are ongoing between the IAEA, the Commission and the EU Member States to enhance cooperation and find the synergies that would improve the efficiency of the three levels of nuclear safeguards in place in the EU. Finland endeavours to participate actively in this process.

Facility attachments (FA) according to the Safeguards Agreement (INFCIRC/193) were not in force in Finland in 2007. While not appreciated, this state of affairs is being tolerated, and it has not influenced negatively the implementation of international safeguards. The drafting of a "Safeguards Agreement for the Finnish geological repository" was initiated with the IAEA in 2004. Consequently, a meeting between the IAEA, Posiva and STUK was organised at the IAEA in September 2005 to establish formal safeguards between Finland and the IAEA already in the pre-nuclear phase of the repository. Unfortunately, such an arrangement is not yet in place.

1.4 Declarations provide the basis for state evaluation by the IAEA

A state's declarations on its nuclear materials and activities are the basis for the state evaluation by the IAEA under the obligations of the Additional Protocol.

In Finland, the state has delegated its responsibility for these declarations to STUK. STUK collects, inspects and reviews the relevant information and then submits the compiled declarations to the IAEA. STUK has been nominated a site representative, as per European Commission regulation No 302/2005. STUK also reviews the declarations about Finland that are submitted by the Commission. All declarations submitted by STUK are copied to the IAEA and the Commission.

In Finland, there are five sites in the sense of the Additional Protocol: the two nuclear power plant (NPP) sites: the Olkiluoto NPP and the Loviisa NPP, and the three minor sites: VTT, STUK and the Laboratory of Radiochemistry at the University of Helsinki. STUK reviews and verifies the correctness and completeness of the information about the sites provided by the license holders. In order to confirm the comprehensiveness of the site maps they are, in some cases, compared with optical satellite imagery and recently also with radar imagery.

STUK reviews annually the information about research and development activities that might be eligible for declaration, as well as activities specified in Annex I of the Additional Protocol. STUK maintains the information on general plans related to the nuclear fuel cycle for the next 10 years and keeps account of the exports of specified equipment and non-nuclear materials listed in Annex II of the Additional Protocol.

Important events related to the Additional Protocol and Finland

- *IAEA Board of Governors approves a model protocol 1997*
- *EU Member States sign the Additional Protocol 22 September 1998*
- *Finland ratifies the Additional Protocol 8 August 2000*
- *Additional Protocol enters into force in the EU 30 April 2004*
- *Finland (STUK) submits initial declarations 8 July 2004*
- *European Commission submits initial declarations about Finland 22 September 2004*
- *First Complementary Access (24 h), at the Laboratory of Radiochemistry at the University of Helsinki site 21 December 2004*
- *Annual declaration updates 4 May 2005 (Finland) and 13 May 2005 (Commission)*
- *First set of 2c questions from IAEA 15 July 2005*
- *STUK's answers to the first 2c questions 8 September 2005 (Finland)*
- *Commission's answers to the first 2c questions 13 December 2005 (Commission) and 24 January 2006 (Commission + Finland)*
- *Complementary Access (2 h), at the Olkiluoto site 13 September 2005*
- *Complementary Access (24 h), at the STUK site 7 December 2005*
- *Annual declaration updates 10 May 2006 (Finland) and 12 May 2006 (Commission)*
- *Complementary Access (2 h), at the Loviisa site 17 November 2006*
- *2a(ix)(a) declarations submitted quarterly*

1.5 Non-destructive assay and environmental sampling complement nuclear accountancy

Technical analysis methods are one tool for a state nuclear safeguards system to ensure that nuclear materials and activities within the state are in accordance with the licence holders' declarations and that there are no undeclared activities. Such methods can provide information on the identity of the nuclear materials and confirm that licence holders' declarations are correct and complete with respect to e.g. the enrichment of uranium, the burnup, and the cooling time of nuclear fuel. The technical analysis methods in use at STUK are non-destructive assay (NDA) and environmental sampling (ES).

STUK employs three methods for NDA. All of them are suitable for verifying spent nuclear fuel. One method lends itself for rapid scanning, as the detector is mounted on the fuel transfer machine and the fuel elements can be measured from above the fuel pond without moving the elements. The other two methods, on the other hand, allow confirming with greater confidence the correctness of the declared burnup and the cooling time. With the most precise method, the absence of a fuel pin or pins from a fuel element can be discovered.

All nuclear materials leave traces of their identity, source of origin and treatment. Safeguards environmental samples are used to investigate these traces, which provide further clarity in establishing whether the nuclear activities are in accordance with the declarations. In the Finnish nuclear safeguards system environmental samples are collected as surface swipes.

1.6 Export/import control and licensing are also elements of nuclear materials control

According to the Finnish Nuclear Energy Act also other items than nuclear materials are under regulatory control. A license is required for possession, transfer, export and import of components, equipment, materials and technology suitable for producing nuclear energy or nuclear weapons (nuclear dual use items). The list of these other items is based on Nuclear Suppliers' Group (NSG) Guidelines (INFCIRC/254 Part 1). The license holder is required to provide STUK annually with a list of the above mentioned items. In addition, export, import and transfer of such items shall be reported to STUK.

Mining and enrichment operations that aim to produce uranium or thorium are also under nuclear safeguards and regulatory nuclear safety control. A company or a person carrying out these activities shall have a license and an accounting system to keep track of the amounts of uranium and thorium. A license is also required to export and import uranium or thorium ore or ore concentrates and these activities shall be reported to STUK and to the European Commission.

Finland's export control system is based on Regulation No 1334/2000 of the Council of the European Union (EC). This regulation sets up a Community regime for the control of export of dual use items and technology. Export of Nuclear Suppliers' Group (NSG) Part 1 items are regulated by the Finnish Nuclear Energy Act and of Part 2 items by the Finnish Act on the Control of Exports of Dual Use Goods. The authority in the first case is STUK or the Ministry of Employment and the Economy (formerly the Ministry of Trade and Industry) and in the latter case the Ministry for Foreign Affairs. In both cases an authorization is required to export nuclear items outside the European Union. A license is also required for EU internal transfers of NSG Part 1 items excluding non-sensitive nuclear materials.

1.7 Regulatory control of transport covers nuclear and other radioactive materials

Requirements for the transport of radioactive material are set in the Finnish regulations on the transport of dangerous goods. The requirements are based on the IAEA safety standard Regulations for the Safe Transport of Radioactive Material, TS-R-1, and their purpose is to protect people, environment and property from the harmful effects of radiation during the transport of radioactive material. Based on these regulations on the transport of dangerous goods, STUK is the competent national authority for the regulatory control regarding the transport of radioactive material.

Transporting radioactive material is regarded as use of radiation but no separate licence for transport is required in Finland of the consignor or of the carrier. However, the consignor shall have a safety licence for the possession or handling of radioactive material. The consignments of radioactive material may be carried out either by transport companies that are specialised in dangerous goods or by the consignor themselves, in cases where the consignor is competent. Competence may be obtained by acquiring the driver's licence for transport of dangerous goods (the ADR licence).

The consignor has the main responsibility for

Some central international and Finnish regulations on the transport of dangerous goods by road

- *IAEA Safety Standard, Regulations for the Safe Transport of Radioactive Material, Safety Requirements No. TS-R-1*
- *European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR)*
- *Finnish Act on the Transport of Dangerous Goods (719/1994)*
- *Finnish Decree of the Council of State on the Transport of Dangerous Goods by Road (194/2002)*
- *Finnish Decree of the Ministry of Transport and Communications on the Transport of Dangerous Goods by Road (277/2002)*
- *Finnish Decree on the Safety Adviser for the Transport of Dangerous Goods by Road and Rail (274/2002)*
- *Finnish Decree on a Driving Certificate of Drivers of Vehicles carrying Dangerous goods (1112/1998).*

the safety of the transport, whereas other actors involved in the transport, such as the carrier and the consignee, are responsible for their specific parts of the transport. According to the Finnish Radiation Act, the safety licensee acting as the consignor shall assure that both the package and the mode of transport fulfil the safety requirements and that the carrier has all the information and instructions necessary for safe transport. STUK guidelines further obligate the safety licensee to manage the security of the materials. In some specific cases where the requirements cannot be completely met, STUK may grant an approval for a transport with special arrangements, based on an application. When granting such an approval STUK must, however, be able to confirm that the appropriate safety level is achieved.

In addition to the dangerous goods transport regulations, the Finnish Nuclear Energy Act sets specific requirements for the transport of nuclear material: a licence granted by STUK is needed for it. Usually the transport licences are granted for a fixed period, typically for a few years. A transport plan and a security plan approved by STUK are mandatory for each transport of nuclear material. A certificate of nuclear liability insurance shall also be delivered to STUK before the transport. Furthermore, a package may be used for the transport of fissile nuclear material only after the package design has been approved by STUK.

1.8 STUK contributes intensively to international safeguards development

Nuclear non-proliferation is, by nature, an international domain. This is seen in our daily work and, hopefully, throughout the chapters of this report. Here are some specific international nuclear safeguards related cooperation and development efforts that STUK participates in:

STUK is a member of the European Safeguards Research and Development Association (ESARDA), and has nominated Finnish experts to its committees and most of the working groups. STUK participates in the ESARDA Executive Board meetings and the Vice-Presidency of ESARDA is currently held by STUK's representative.

STUK's expert participates in the work of the Atomic Questions Group (AQG) of the Council of the European Union and contributes to the Safeguards Experts meetings.

The Standing Advisory Group on Safeguards Implementation (SAGSI) comprises a group of nuclear safeguards experts from the IAEA Member States, appointed by the IAEA Director General to advise on safeguards implementation issues. One of the experts in this group is a STUK staff member.

Upon request by the IAEA, STUK's experts have contributed to the IAEA's international evaluation missions, such as the International SSAC Advisory Service (ISSAS). The ISSAS mission reviews State Systems of Accounting for and Control of Nuclear Materials (SSAC) and provides suggestions for improving them.

1.9 The Comprehensive Nuclear-Test-Ban Treaty: a global technology-based non-proliferation tool

The Comprehensive Nuclear-Test-Ban Treaty (CTBT) is an important part of the international regime for the non-proliferation of nuclear weapons. The CTBT bans any nuclear weapon test explosions in any environment. This ban is aimed at constraining the development and qualitative

Comprehensive Nuclear-Test-Ban Treaty (CTBT) Status (31.12.2007)

- *CTBT Member States* 177
- *Total Ratifications* 141
- *Annex 2 Ratifications* 34

improvement of nuclear weapons, including also the development of advanced new types of nuclear weapons.

The CTBT was adopted by the United Nations General Assembly, and was opened for signature in New York on 24 September 1996. The CTBT will enter into force after it has been ratified by the 44 states listed in its Annex 2. These 44 states participated in the 1996 session of the Conference on Disarmament and possess nuclear power or research reactors.

A global verification regime is being established in order to monitor compliance with the CTBT. The verification regime consists of the following elements: the International Monitoring System (IMS), a consultation and clarification process, on-site inspections and confidence-building measures.

Finland has signed and ratified the CTBT. In addition to complying with the basic requirement of the CTBT of not to carry out any nuclear weapons tests, Finland takes part in the development of the verification regime.

In the CTBT framework, the national authority is the Ministry for Foreign Affairs. STUK has two roles: STUK operates the Finnish National Data Centre (FiNDC) and one of the radionuclide laboratories (RL07) designated in the CTBT. The main task of the FiNDC is to inspect data received from the IMS and inform the national authority about any indications of a nuclear weapons test. The radionuclide laboratory contributes to the IMS by providing support in the radionuclide analyses and in the quality control of the radionuclide station network. The third major national collaborator is the Institute of Seismology at the University of Helsinki, which runs a seismology station (PS17 in Lahti), which is included in the IMS, and provides analysis of waveform IMS data.

1.10 Nuclear security shares many of its objectives and methods with nuclear safeguards

STUK is the national authority for the regulatory control of nuclear and radiological safety, security and safeguards. Within STUK's organisation, a few of its nuclear security related tasks fall – solely or partly – under the duties of the nuclear non-proliferation process and the Nuclear Materials Section. In other words, the majority of the activities that aim at non-proliferation of nuclear weapons, nuclear materials and sensitive nuclear technology contribute also to nuclear security (see the definition of nuclear security in the infobox). In the list below these nuclear security related activities are grouped into categories according to the defence in depth concept commonly used in the nuclear security terminology:

Prevention

- nuclear non-proliferation: a national system for the control of nuclear materials and nuclear dual use items
- facilitating international nuclear safeguards activities in Finland
- regulatory control of the transport of nuclear and other radioactive materials

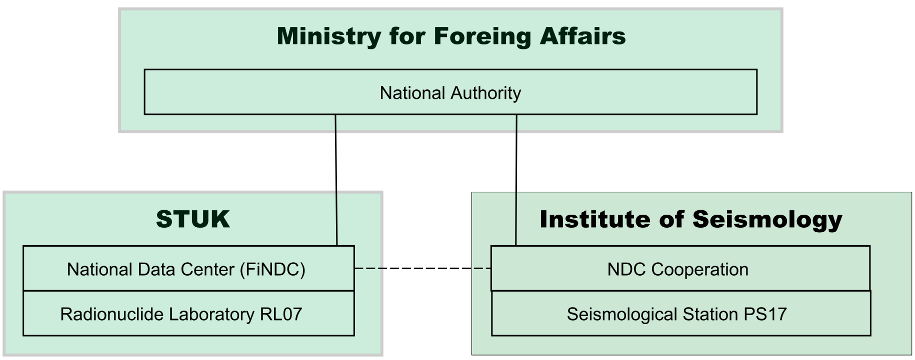

Figure 4. The Finnish CTBT organisation.

Definition of nuclear security: *The prevention and detection of and response to theft, sabotage, unauthorized access, illegal transfer or other malicious acts involving nuclear material, other radioactive substances or their associated facilities (working definition established by the fifth meeting of the Advisory Group on Nuclear Security 1–5 December 2005) [IAEA Nuclear Security Plan 2006–2009].*

- measures due to abnormal detections abroad of nuclear or other radioactive materials
- export control: expert support to the Ministry for Foreign Affairs
- cooperation with other national authorities in prevention of illegal activities related to nuclear or other radioactive materials: threat assessment, self-assessment, improvement, information sharing, training, exercises
- national expert contact point for international conventions, resolutions and agreements against proliferation of nuclear weapons and sensitive technology (UNSC Resolution 1540, Global Initiative for Combating Nuclear Terrorism (GICNT), etc.) in support of the competent ministry
- participation in the work of the international nuclear safeguards and nuclear security communities and working groups (IAEA, ESARDA, AQG, ITWG)
- operation of the Finnish National Data Centre for the Comprehensive Nuclear-Test-Ban Treaty
- expert advice to the Finnish Customs on radiation monitoring at borders, for concept development and technical specifications of monitoring equipment and data transfer; training for Customs officers.

Detection

- national system for control of nuclear materials and nuclear dual use items: non-destructive assay and environmental sampling, other inspections.

Response

- participation in STUK's response in cases of radiological or nuclear incidents, e.g:
- expert advice to the Finnish Customs on interpretation of radiation detections at borders, more sophisticated on-site measurements and analyses in response to border monitoring alarms.

A division between safety, security and safeguards need often not be emphasised in our daily work, as they are all intertwined and all necessary for accomplishing STUK's mission: protecting the people, society and environment from the harmful effects of radiation.

2 Themes of the year 2007

2.1 Onkalo: Nuclear safeguards today pave the way for receiving nuclear materials into the future final disposal facility

In order to prepare for the final disposal of spent nuclear fuel, an underground rock characterisation facility (Onkalo) is under construction in Eurajoki, Finland, since 2004. As Onkalo is expected to become a part of the future final disposal facility for spent nuclear fuel, STUK has decided – as early as in 2003 – to start applying safeguards to it. Subsequently, the company Posiva Oy, which is in charge of the whole final disposal project, was required to implement nuclear safeguards from the beginning of the Onkalo excavation and extending to the future closure of the final disposal site. This marked the start of safeguards activities for final disposal in Finland. These activities have at least four objectives:

(i) to ensure that all necessary information about the final disposal facility will be available in due time;
(ii) to be able to confirm that there are no undeclared activities relevant to nuclear non-proliferation at or around the final disposal site;
(iii) to enable the IAEA to perform integrated nuclear safeguards activities in Finland in a cost efficient way;
(iv) to enable the IAEA and the European Commission to plan for their future safeguards activities.

Important dates (past and planned) relevant to nuclear safeguards in the schedule for the final disposal project in Finland

1999 *Posiva applies for a decision in principle*
2001 *Decision in principle enters into force*
2003 *Civil construction permit is granted for Posiva*
2003 *STUK sends basic information on the plan for the final disposal facility to the IAEA and the European Commission, national safeguards for final disposal begin*
2004 *Posiva starts to excavate the underground rock characterisation facility (Onkalo)*
(tbd) Relevant information on the disposal facility due to be sent to the Commission
2008 *Commission assigns the MBA code W0LF to the future final disposal facility*
2012 *Posiva to apply for a nuclear construction license for the final disposal facility (tbd) Basic technical characteristics (BTC) on the disposal facility due to be sent to the Commission **
2018 *Posiva to apply for the operating license*
2020 *Final disposal to begin*

** As per article 4 of the Commission regulation (Euratom) No 302/2005, relevant information about the facility is due 200 days prior to the start of construction and about basic technical characteristics 200 days prior to the receipt of the first batch of nuclear material.*

The final disposal of spent nuclear fuel in an underground facility challenges the planning and implementation of safeguards with an unprecedented scenario: the nuclear material cannot be re-verified once it has been encapsulated and emplaced. This and other questions are put to the group of experts for Application of Safeguards to Geological Repositories (ASTOR) by the IAEA, which has the group at its disposal to support in the development of international safeguards for final disposal. Finland, naturally, has a vested interest in this development and in ASTOR.

Today's safeguards activities by STUK consist of auditing Posiva's nuclear safeguards system, reviewing Posiva's reports and confirming by on-site inspections that the Onkalo underground space corresponds to Posiva's as-built documentation.

In June 2007 Posiva hosted a visit for representatives of the IAEA, the European Commission, the Swedish Nuclear Power Inspectorate (SKI) and the Finnish Ministry of Trade and Industry (now the Ministry of Employment and the Economy), accompanied by STUK. This included, in connection with one of STUK's regular on-site inspections, a trip down into Onkalo (at approximately –200 m at the time) where also the visitors could compare the tunnel and shafts against the most recent as-built information.

2.2 External and internal audits aim for continuous improvement

STUK's Nuclear Materials Section was audited by a fellow state authority, the Swedish Nuclear Power Inspectorate (SKI) in January 2007. The audit team from SKI consisted of Mr. Göran Dahlin, who is the head of the Section of Safeguards and Export Control and Ms. Martina Dufva, who is responsible for nuclear material accountancy and inspection planning. The audit took one day and concluded that STUK had developed a very good system of accountancy and control of nuclear material, through guides for the licence holders as well as internal guides. Having said that, the auditors gave recommendations for improvement and had a range of findings both of good practices and needed improvements. All these recommendations have been collected in an action plan by the head of the STUK Nuclear Materials Section and are either completed, under way, planned or under consideration. The audit and its findings were found most useful.

In 2007 the Nuclear Materials Section started its own internal audit process for purposes of continuous self-guided development. The audit process aims to assess the effectiveness and efficiency of the national nuclear materials regulatory control system by reviewing selected elements of it each year. The assessment of effectiveness was started by setting up a 10-point list of tasks that the system must perform in order to allow for cost-efficient international nuclear safeguards in Finland and to provide the international inspectorates with the products they need from a state nuclear safeguards system. The two first points on the list were assessed. Assessment of efficiency was started by looking at STUK's own nuclear materials control system, as a nuclear material holder. The first internal audit reported to the head of the Nuclear Materials Section who commented on its findings and endorsed the implementation of its recommendations. While the major issues seem to be in good order, several recommendations for practical improvements were made and prioritised. The two most important recommendations have been passed on to STUK directors and the next two are underway. A schedule for implementing the rest of the recommendations will be prepared in 2008.

2.3 20 years of supporting IAEA

A Finnish Support Programme to the IAEA Safeguards (FINSP) was established in 1988 and it is funded by the Ministry for Foreign Affairs. This programme has been one element of Finland's consistent commitment to nuclear non-proliferation. It has been the understanding in Finland that the IAEA appreciates R&D and training support from the IAEA Member States, as such support enables the IAEA to accomplish its tasks effectively and efficiently. The FINSP budget for 2007 was 190 000 euros. In the past years the strongest areas of FINSP activity have been safeguards training and the development of new verification methods. The FINSP also has a light administration structure and a network of experts at its disposal, which enables flexibility and fast response.

A valuable lesson learned to date is the importance of understanding IAEA's needs. In an ideal situation the IAEA clearly identifies how it best benefits from the tasks, experience and expertise of FINSP. Several cases have shown that the successful implementation of FINSP depends on a common understanding based on in-depth identification of IAEA's needs.

The FINSP is one important cooperation channel between Finland and the IAEA. Contacts with the IAEA through the programme have benefited the practical implementation of INFCIRC/153, 193 and 540 type agreements.

In the future the FINSP continues to concentrate on its traditionally strong areas of activity: development of new verification methods and inspection tools together with supporting IAEA inspectors' training.

3 Activities in 2007

3.1 Regulatory control of nuclear materials

3.1.1 Declarations, complementary accesses and approvals of new international inspectors

All the relevant license holders sent their updated information for the national declaration, which is compiled by STUK, in time, by 1 March 2007.

STUK submitted annual declaration updates to the IAEA on 14 May 2007 and the European Commission submitted its declaration updates 2 May 2007.

IAEA carried out a complementary access (with a 24-h advance notification) for the exempted nuclear material at University of Jyväskylä, Department of Physics on 6 June 2007. The Commission participated in this access. Furthermore, the IAEA carried out a complementary access at Metso Materials Technology in Tampere on 27 September 2007, in accordance with article 8 of the Additional Protocol, where the state invites the IAEA to the access.

In 2007, altogether 28 IAEA and 9 Commission new inspectors were approved to perform inspections at nuclear facilities in Finland.

3.1.2 The Loviisa NPP

In 2007, STUK granted Fortum three licenses: one for the transport of nuclear fuel, one for the import of equipment and one for the import of automation technology information. STUK accepted Loviisa NPP's updated nuclear material handbook in February and approved in June the new person to be appointed responsible for nuclear safeguards at the Loviisa NPP.

Based on previously granted import licences, 219 fuel assemblies containing 26.9 tons of uranium were imported to the Loviisa NPP: 111 fuel assemblies from Spain and 108 from the Russian Federation. The receipts of fuel assemblies are included in Table 1, and the total amounts of nuclear materials at the Loviisa NPP are presented in Table 2 and Table 3 (Appendix 1).

The refuelling and maintenance outage of Loviisa 1 took place in the period 18.8.–7.9.2007 and that of Loviisa 2 in the period 8.–23.9.2007. For both units 102 fresh fuel assemblies were loaded into the core. In the Loviisa 2 unit, 6 spent fuel assemblies were replaced with assemblies that were already irradiated in previous cycles. Before the closing of each reactor, STUK, the IAEA and the European Commission identified the fuel assemblies in the reactor cores and verified/item counted the loading ponds. The Loviisa 1 core was inspected on 26 August 2007 and the Loviisa 2 core on 15 September 2007, in connection with the physical inventory verification (PIV). In addition to the PIV and the core controls, four routine inspections were carried out with the IAEA and the Commission in March, May, August and November. The post-PIV inspection took place in September. In addition to inspections performed together with the IAEA and the Commission, STUK identified the fuel followers to be loaded into the reactor in August.

At the Loviisa NPP STUK performed two NDA verification measurement campaigns on spent fuel elements in 2007. The first campaign, 12–13 April, was carried out by upgraded SFAT equipment with a CdZnTe-gamma spectrometer. Traditionally, a SFAT device is equipped with a lower resolution NaI detector. Altogether 235 fuel elements were verified. The second campaign, 8–9 November, was carried out with FORK equipment on 18 spent fuel elements. FORK equipment delivers a gross gamma signal from an ionisation chamber and a neutron count rate from a fission chamber. STUK's FORK equipment is sometimes referred to as eFORK (enhanced FORK), because it incorporates a CdZnTe-gamma spectrometer. The measurements at the Loviisa NPP did not indicate any inconsistencies in the reporting by the operator.

In 2007 STUK collected one environmental sample at the Loviisa NPP.

On the basis of its assessment as well as IAEA and Commission inspection results, STUK concluded that Fortum's Loviisa NPP has complied with its nuclear safeguards obligations in 2007.

3.1.3 The Olkiluoto NPP

For the Olkiluoto NPP the Particular Safeguards Provisions that define the European Commission's nuclear safeguards procedures for the facility entered into force in the summer of 2007.

In 2007, STUK granted to TVO 6 import licences for fresh nuclear fuel for the period from 2007 to 2008. In total, 232 fuel assemblies containing 40.2 tons of uranium were imported to the Olkiluoto NPP in 2007, 114 from Spain and 118 from Sweden. 123 spent fuel assemblies were transferred from both the Olkiluoto 1 and Olkiluoto 2 units to the Olkiluoto spent fuel storage. The receipts and shipments of fuel assemblies are included in Table 1, and the total amounts of nuclear materials at the Olkiluoto NPP are presented in Table 2 and Table 3 (Appendix 1).

The refuelling and maintenance outage of Olkiluoto 1 took place in the period 6.–15.5.2007 and that of Olkiluoto 2 in the period 20.5.–6.6.2007. At the Olkiluoto 1 unit, 128 fresh fuel assemblies and at the Olkiluoto 2 unit, 120 fresh fuel assemblies were loaded into the core. Before the reactors were closed STUK, the IAEA and the European Commission identified the fuel assemblies in the reactor cores and verified/item counted the loading ponds. Olkiluoto 1 was inspected on 12 May 2007 and Olkiluoto 2 on 30 May 2007. STUK, the IAEA and the Commission verified the physical inventory in the Olkiluoto spent fuel storage on 12 November 2007. 4 routine inspections were performed by STUK, the IAEA and the Commission, an inspection for each MBA at the Olkiluoto NPP: in March, June, September and November.

At the Olkiluoto NPP STUK performed three NDA verification measurement campaigns on spent fuel elements in 2007.

The first campaign, 3–5 April, was carried out at the Olkiluoto spent fuel storage with upgraded SFAT equipment with a CdZnTe-gamma spectrometer. Traditionally, the SFAT device is equipped with a low resolution NaI detector. During the previous campaign in November 2006 the SFAT was found to be defective and the campaign had to be suspended. The device was repaired and serviced at STUK during the first quarter of 2007 and the detector was upgraded from a 3″×3″ NaI crystal to 1500 mm^3 CdZnTe-semiconductor with far superior resolution. The upgrade was successful, the detection capability was greatly enhanced and measurement times required to collect statistically significant fission product signals were notably shortened. During the campaign 71 elements were verified. The elements were selected from all types of assemblies present at the spent fuel storage. The equipment could be used in verification of all types of fuel, which is a significant improvement from the earlier setup with the NaI-detector.

During the second campaign, 19–21 June, STUK performed Gamma Burnup Verification (GBUV) measurements at the Olkiluoto 1 reactor hall. Altogether 30 spent fuel assemblies and 2 hermetic bottles were verified. One of the hermetic bottles was confirmed to be empty as declared by the operator. This campaign was observed by an inspector from the IAEA. The campaign was unique as this was the first time when GBUV measurements were made at the Olkiluoto 1 reactor hall. Also the detector was new: an electrically cooled HPGe-detector with accompanying electronics. Some of the assemblies had only been cooled for 3 weeks; hence it was also possible to detect many short-lived fission products, such as La-140 and I-131.

During the third campaign, 8–9 November, STUK carried out measurements at the Olkiluoto spent fuel storage with upgraded SFAT equipment with a CdZnTe-gamma spectrometer. Altogether 126 spent fuel elements were verified. The measurement campaigns at the Olkiluoto NPP did not indicate any inconsistencies in the reporting by the operator.

In 2007 STUK collected one environmental sample at the Olkiluoto NPP.

On the basis of its assessment as well as IAEA and Commission inspection results, STUK concluded that TVO's Olkiluoto NPP has complied with its nuclear safeguards obligations in 2007.

3.1.4 The VTT FiR1 research reactor

In 2007, STUK approved VTT FiR1 research reactor's updated nuclear material handbook.

STUK, IAEA and European Commission safeguards inspectors verified the nuclear material inventory of VTT on 11 June 2007. The nuclear material inventory was concluded to be correct. STUK made a few remarks on imperfections in the nuclear material reporting. In its follow-up inspections on 25 June 2007 STUK concluded that the required corrective actions had been acceptably taken and the remarks were closed. The IAEA or the Commission did not have any clarification requests on their inspection. The inventory of nuclear materials at the FiR1 research reactor in the end of 2007 is presented in Table 3 (Appendix 1).

On the basis of its verification and assessment, STUK has concluded that the VTT FiR1 research reactor had complied with its nuclear safeguards obligations in 2007.

3.1.5 Minor nuclear material holders

STUK, the IAEA and Euratom carried out a physical inventory verification (PIV) inspection at the Laboratory of Radiochemistry at the University of Helsinki on 16 October 2007 and at STUK on 17 October 2007. A nuclear safeguards inspection by all three inspectorates took place also at OMG Kokkola Chemicals, on 28 September 2007.

On the basis of its assessment, STUK has concluded that the minor nuclear material holders have complied with their nuclear safeguards obligations in 2007.

3.1.6 Nuclear dual use items, export/ import control and licenses

In 2007 STUK issued seven licences for importing and one licence for exporting nuclear equipment, and two licences for exporting nuclear technology. STUK reviewed three inventory listings on nuclear dual use items. In 2007 there were no licence applications for uranium or thorium ore or ore concentrates.

In 2007 an amendment to the Finnish Nuclear Energy Act and Decree was drafted by STUK and the Ministry of Trade and Industry (now the Ministry of Employment and the Economy). One key issue was to update the regulations concerning export control of nuclear items. The amendment draft proposed that export licensing of nuclear materials and nuclear dual use items be transferred to the Ministry for Foreign Affairs. The amendment of the act was accepted by the Government and was forwarded to the Parliament for final approval. The degree will be amended later in 2008.

3.1.7 The final disposal facility

In order to confirm that the excavated underground space corresponds to documentation, STUK carried out three regular on-site inspections and one extra demonstration inspection at Onkalo in 2007. The demonstration inspection was arranged in connection with an IAEA–European Commission technical visit to Posiva and Onkalo in May 2007. The purpose of the visit was to familiarise the international inspectorates with Posiva's and STUK's non-proliferation activities for Onkalo and for their approaches to the future safeguards for final disposal. All parties considered the visit very useful. The IAEA and the Commission participated as

Figure 5. STUK demonstrates the inspection to IAEA and European Commission in Onkalo in May 2007.

Figure 6. Laser scanning in Onkalo.

observers also in regular on-site inspections, the Commission in June and the IAEA both in June and in November.

STUK and Posiva arranged for the European Commission's Joint Research Centre (JRC) an opportunity to document the Onkalo underground space by digital laser scanning. The result was compared with Posiva's own laser scanning results, which they use routinely to document the excavated tunnel as it is built (hence the term as-built information). Consequently, STUK got an independent verification of the underground space at the time and of the validity of Posiva's method.

STUK audited Posiva's nuclear safeguards system in 2007. This was done mainly by documenting the observations made throughout the year in connection with report reviews and on-site inspections. As a result of the audit STUK requested that Posiva update its procedures in its non-proliferation handbook. The update is partly due to developing methods at Posiva and partly intended to clarify the descriptions of some of Posiva's practices. Overall, Posiva's safeguards system is well fit for purpose.

STUK provided to the IAEA and to the Commission its annual report on its safeguards activities related to Onkalo and final disposal on 23 April 2007. STUK also declared the Onkalo project within article 2a(x) of the Additional Protocol to the Safeguards Agreement.

3.1.8 Transport of nuclear and other radioactive materials

In 2007, STUK performed four inspections of the transports arrangements of the nuclear safety licensees. It was evident that not all licensees were fully aware of the regulations on the transport of dangerous goods. Therefore STUK required several clarifications, where the safety licensee had to present additional documentation focusing on the safety of the licensee's transport procedures. One application for transport with special arrangements was delivered to STUK. The application was later withdrawn, as the transport turned out not to be necessary. STUK received one testing plan where the aim was to demonstrate the safety of a package to be used in the transport of a liquid radioactive material. The plan could not be approved as such and the end result of the process was that the package is not in use.

In 2007, fresh nuclear fuel was imported to Finland from Spain, Sweden and the Russian Federation. In relation to these imports, STUK granted one new transport licence and approved four transport plans. STUK inspected one transport of fresh nuclear fuel that was imported to Finland from the Russian Federation. The inspection covered the transport activities from the Finnish side of the border to the power plant. Furthermore, STUK approved three package designs for packages to be used in the transport of fissile material.

3.1.9 International transfers of nuclear material

In 2007, TVO reported to STUK about its international fuel contracts, fuel transfers and fuel shipments. STUK carried out an on-site inspection where TVO's nuclear material accountancy on the fresh fuel imported in 2007 was verified against the original shipment documents covering the international transfers. Based on the findings, STUK concluded that TVO has complied with its safeguards obligations in purchasing the nuclear fuel and managing its international transfers.

Figure 7. Labelling, placarding and radiation measurements are checked in a transport inspection.

Most fuel assemblies used at Fortum's facilities are purchased in and imported from the Russian Federation: the uranium is of Russian origin and all phases of the uranium processing and of the fuel manufacturing take place in the Russian Federation. In 2007, fuel assemblies containing uranium of not only Russian but also Kazakh origin were delivered to the Loviisa nuclear power plant (NPP). The Loviisa NPP has reported that it has no immediate plans to continue international transfers.

3.2 Preparing for the IAEA's integrated nuclear safeguards in Finland

In a bilateral IAEA–STUK nuclear safeguards meeting on 13 December 2007, the IAEA informed STUK about the implementation of integrated safeguards in Finland. Integrated safeguards include traditional nuclear safeguards as per INFCIRC/193, and safeguards activities in accordance with the Additional Protocol, fitted together. While this should not lead to an increase in inspections, it should enable the IAEA to assure itself of the absence of undeclared nuclear activities in a state. In practice the number of IAEA inspections is expected to decrease. However, the IAEA will perform 1–3 unannounced inspections per year in a state that has a number and type of nuclear installations that resembles the situation in Finland. The IAEA's integrated nuclear safeguards are expected to enter into force in Finland sometime during 2008.

STUK organised information meetings on the effects of integrated safeguards for the nuclear power plant operators, at the Loviisa NPP on 28 September 2007 and at the Olkiluoto NPP on 25 October 2007.

3.3 Safeguards development focussed on the IAEA-European Commission-EU Member State relationship

In the international nuclear safeguards development fora, one major topic during the year 2007 were the roles, responsibilities and practices of the three levels of safeguards in place within the EU: those of the IAEA, the European Commission and the EU Member States. Discussions resumed in constructive atmosphere, with the objective to enhance cooperation and improve (cost-) efficiency. It appears that a state nuclear safeguards system is more highly valued than ever.

In 2007 STUK participated in the European Safeguards Research and Development Association's (ESARDA) working groups, especially the Integrated Safeguards Working Group (IS WG). STUK contributed to the 29th Annual Meeting of ESARDA in Aix-en-Provence with three presentations, two posters and other contributions. STUK participated in the ESARDA Executive Board meetings in 2007 and STUK's representative started her term as the Vice-President of ESARDA at the beginning of 2007.

During 2007 STUK's expert participated in the work of the Atomic Questions Group (AQG) of the Council of the European Union and contributed to the Safeguards Experts meetings organised by Germany in Bonn on 14 February and by the Commission in Luxembourg, 12–13 September. STUK's expert also contributed to the AQG-meetings where nuclear safeguards matters were on the agenda.

STUK sent an expert to the meeting of representatives of nuclear operators on "Implementing Euratom Treaty Safeguards" organised by the Commission in Luxembourg, 23–24 October 2007.

STUK contributed to the work of IAEA's Standing Advisory Group on Safeguards Implementation (SAGSI) in 2007 through the participation of one expert as a member of this group.

STUK's expert participated in the IAEA's International SSAC Advisory Service (ISSAS) mission in Ukraine in November 2007.

In 2007, the group of experts for Application of Safeguards to Geological Repositories (ASTOR) met in Mol, Belgium. There were three participants from Finland, two from STUK and one from Posiva.

3.4 Bilateral cooperation and peer-to-peer exchanges strengthen regional security

Finland's cooperation programmes in the area of non-proliferation are directed towards our neighbouring countries outside the EU and are motivated by the continued need for enhancement of the regional security environment. Accordingly, STUK continued its cooperation programme with the Russian Federation in 2007. The focus in 2007 was on the cooperation with the Russian nuclear security and safeguards authorities, mainly through peer-to-peer exchanges. Collaboration with

Ukraine in search for mutually beneficial areas for future cooperation led to an agreement about a programme for the next 2–3 years and tasks for the 2008 programme. The total annual budget allocated to these cooperation programmes is now 200 000 euros.

3.4.1 The Russian Federation is extending safeguards to non-nuclear radioactive materials

The cooperation programme with the Russian Federation to date has covered the review of six regulations, dealing for example with the quality assurance of some fuel cycle activities and the accountancy and control of radioactive materials and waste. The regulations reveal a change in the role of the authority of the Russian administration: they are required to put out the requirements for the industry to comply with and to audit and inspect the performance to ensure compliance. Thus, the administrative philosophy is in transformation from instruction oriented to performance oriented. The challenge is unprecedented, namely to maintain the strength of the instructive inspection discipline and complement that with system audits. Long term peer support is considered very beneficial.

The new Russian regulation in the area of control of radioactive materials other than nuclear represents something unique in the world. The principles and practices of nuclear material accountancy are to be applied in this area in a practical way. The required effort has already been accomplished at the nuclear power plants. The major challenge now is to establish the initial inventories in all areas of national economy. Peer support is again desired. It is expected that technical, expert and financial support will be required by the Russian Federation to accomplish this effort with a credible outcome.

The spent fuel measurement device (SFAT) programme did not proceed further during 2007. The demonstration and delivery of the complete product to Rostechnadzor is planned to take place in the autumn of 2008.

A joint training course for the Finnish and Russian Customs Authorities was organised in April 2007. There were 24 participants from several Customs points in both countries. The first part of the course included lectures at STUK and excursions to the Helsinki port, to the Vainikkala railway border crossing station and to the Vaalimaa highway border crossing station, which handles cars and trucks. The second part of the course, which focussed on technical details and practical exercises, was conducted at St. Petersburg Customs Academy and at the St. Petersburg seaport. The good experiences from this course warrant expecting that a similar bilateral training and learning exercise will take place in 2008. Representatives of the IAEA participated as course observers and they gave also lectures. It was considered that the course elements may well fit to IAEA's Material Security Programme's deliverables.

A new regional border control event, which would be organized within the Baltic Sea States co-operation framework, was discussed in July 2007 with the Russian Customs Authority and the IAEA.

3.4.2 The programme with Ukraine is in the definitions phase

In 2007 cooperation with Ukraine was limited to support in implementing the Additional Protocol obligations and in determining the programme for the future and in defining tasks to be implemented in 2008. The programme's perspective for the next 2–3 year period includes activities and tasks in the following areas: assessment of regulatory documents in the area of nuclear safeguards and nuclear material security, including physical protection; specification of ways and technical means which will enable reliable and efficient monitoring and investigation of incidents involving nuclear or other radioactive materials or waste (mobile laboratory); support of the development of nuclear material fuel verification capacity of the Ukraine national nuclear safeguards system, particularly for spent fuel; information technology support for building inspector capacity in the areas of nuclear safeguards and security, including physical protection; coordinated support for establishment of a functional web-based information portal (Infoatom) for the State Nuclear Regulatory Committee of Ukraine.

3.5 Nuclear security activities rely on cooperation between authorities

3.5.1 National border control developments to counter illicit trafficking are in progress

During 2007 STUK was involved in the planning of the radiation detection system for the new seaport of Helsinki, which is under construction at Vuosaari. While the implementation of radiation monitoring at borders is fully under the jurisdiction of the Finnish Customs, STUK's role is to provide expert advice, particularly on the detection concept and equipment specifications. This is a part of the long and successful history of the cooperation between STUK and the Finnish Customs. STUK also provided conceptual guidance to the Customs on their comprehensive plan for the ongoing maintenance and development of the Finnish border monitoring system.

Cooperation regarding the Customs officers' training in radiation detection is covered in chapter 3.4.

3.5.2 International nuclear security meetings are on the increase

Successful nuclear security, along with the whole field of nuclear safeguards, relies heavily on international cooperation. One sign of its apparent importance is the number of international meetings held on these topics. STUK's Nuclear Materials Section participated in a few of those meetings in 2007:

- CBRN Conference, the Netherlands, November 2007
- IAEA International Conference on Illicit Nuclear Trafficking: Collective Experience and the Way Forward, Edinburgh, November 2007
- Proliferation Security Initiative (PSI) Interdiction Exercise "Eastern Shield 2007", Odessa, October 2007 (participation as observer)
- ITWG (International Technical Working Group on Combating Illicit Trafficking) 12th Annual Meeting, Umeå, June 2007
- EU 2nd Radiological Risk Reduction Seminar, Brussels, June 2007
- Workshop: Multi-country project on combating illicit trafficking of nuclear material, Karlsruhe, April 2007
- Europol 3rd Seminar on Trafficking of Radiological and Nuclear Materials, the Hague, March 2007.

There appears to be a widely shared general view of illicit trafficking and malicious acts that involve nuclear or radiological materials. The international nuclear security community considers that the threat remains real, while the probability of a major incident is perceived as low. Presently there are international conventions and resolutions in sufficient numbers and scope, the implementation of which, on the other hand, could benefit from stepping up. In the past years implementation of technical detection methods has greatly advanced. This development could steer the next detection efforts towards standardisation and networking. At the same time, prevention and response continue to merit our vigilant attention.

3.5.3 The national unofficial network of security authorities held its third meeting

STUK convened a meeting of Finnish authorities involved in various fields of nuclear security in September 2007. The meeting was the third of its kind and as the previous two, included a roundtable briefing into the current nuclear and radiological security matters of each participating organisation. Another topic for the meeting was to address further development of the procedures for first responders in an acute radiological incident.

3.5.4 One incidental recovery related to nuclear materials

In 2007 there was one detection related to illicit trafficking – an incidental recovery – that involved nuclear materials in Finland. A piece of depleted uranium arrived to Finland among a shipment of recycled metal. This was detected at the port of entry. STUK was notified and the object was delivered to STUK headquarters where it was taken into nuclear material accountancy.

3.6 The Finnish National Data Centre for the Comprehensive Nuclear-Test-Ban Treaty

3.6.1 International cooperation is the foundation of CTBT verification

During 2007 The Finnish National Data Centre (FiNDC) participated in meetings of the Working Group B (WGB) of the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO), which is a policy making organ for the technical development of the verification regime. By participating in the work of WGB and its subsidiaries (workshops and expert groups), FiNDC can provide technical expertise to the CTBTO, while also attending to the Finnish national interests.

3.6.2 The analysis pipeline has become a well established daily routine

The FiNDC continued developing its own routine monitoring system for the data received from the International Monitoring System's network (IMS). The FiNDC routinely analyses all radionuclide measurement data generated at the IMS radionuclide stations across the world. The IMS network is still developing, and the number of operational stations was about 50 at the end of 2007 (in the final stage there will be 80). The operational stations generated approximately 600 spectra per day for the FiNDC analysis pipeline to handle. The analysis pipeline is linked to the LINSSI database and equipped with an automated alarm system, to enable efficient and fully automated screening of the data.

3.6.3 Noble gas measurements are gaining momentum

The nuclear test by North Korea (DPRK) in 2006 provided valuable insight into the importance of noble gas (xenon) monitoring for the verification system. This has inspired worldwide accelerated development of the xenon monitoring capabilities of the IMS network. Also the FiNDC has responded to this challenge: in 2007 the FiNDC developed a prototype version of the "bgpeaks" analysis software. This software is capable of both batch and interactive analysis of 3D beta-gamma coincidence spectra. In 2007 the FiNDC also installed the "Aatami" software in its automated pipeline. Aatami has been developed at the CTBTO for analysis of xenon gamma spectra by high-resolution germanium (HPGe) detectors. As a result the FiNDC now performs fully automated analysis of all xenon spectral data generated at IMS stations in a beta-test mode.

4 Conclusions

4.1 Nuclear safeguards: what matters most is well

The results of STUK's nuclear safeguards inspection activities in 2007 continued to demonstrate that the Finnish licence holders take good care of their nuclear materials. There were no indications of undeclared materials or activities and the inspected materials and activities were in accordance with the licence holders' declarations. STUK remarked on the nuclear safeguards systems of two licence holders in 2007, setting required actions for them to correct their reporting and to update the descriptions of their procedures. Neither the IAEA nor the European Commission made any remarks nor did they present any required actions based on their inspections. By their nuclear materials accountancy and control systems, all license holders enabled STUK to fulfil its own obligations under the international agreements relevant to nuclear safeguards and non-proliferation.

In 2007 STUK performed 27 safeguards inspections at the Finnish nuclear power plants (NPP), 10 at the Loviisa NPP and 17 at the Olkiluoto NPP. The Commission took part in 20 and the IAEA in 21 inspections. STUK performed 5 NDA measurement campaigns, 2 at the Loviisa NPP and 3 at the Olkiluoto NPP. At other facilities, STUK performed 5 safeguards inspections, of which the Commission and the IAEA took part in 4. At Onkalo, STUK performed 4 safeguards inspections, of which the Euratom took part in 1 and the IAEA in 2 inspections. The IAEA and the Commission made a technical visit to Onkalo, accompanied by STUK and hosted by Posiva. The IAEA carried out complementary accesses at University of Jyväskylä and Metso Materials Technology in Tampere. IAEA sent its safeguards statements to the Commission, which amended them with its own conclusions and forwarded them to STUK. The conclusions by the Commission were in line with the IAEA remarks as well as STUK's findings; there were no outstanding questions by the IAEA or the Commission at the end of 2007. Inspections and inspection person days of STUK, the IAEA and the Commission in 2007 are presented in Table 5 (Appendix 2). The progress of inspection amounts and inspection person days from 2002 to 2007 are presented in Figures 8 and 9.

One of the very few abnormal radiation detections in Finland in 2007 involved nuclear material: a piece of depleted uranium was recovered in an incoming shipment of recycled metal at the port of entry. The object was delivered to STUK and taken into nuclear material accountancy.

4.2 Transport of radioactive materials: awareness promotion a theme for the near future

In the field of transport of non-nuclear radioactive material in 2007, several defects and faults were detected in the safety licensees' transport procedures. Based on these indications, STUK concluded that there is a lack of knowledge regarding the transport regulations among the safety licensees. It was also at times evident that the safety requirements for transport were not perceived as particularly important, as the safety licensees did not emphasise them in their work. When encountering a lack of knowledge or interest, STUK took steps to increase the awareness of transport safety and security and to strengthen good safety culture. Close cooperation with the safety licensees and promotion of safety culture will continue also in the future.

In the field of nuclear material transport, safety culture is a definitive leading principle. In 2007 STUK concluded that in the transport of nuclear material the transport plans approved by STUK were followed and that the transports were carried out in accordance with the Finnish legislation. Thus far the number of on-site inspections has been very low, and in the future STUK aims to increase this effort.

4.3 The Comprehensive Nuclear-Test-Ban Treaty: awaiting Entry into Force

2007 was a difficult year for activities related to the Comprehensive Nuclear-Test-Ban Treaty (CTBT). The international political climate in the field of test-ban related non-proliferation was harsh and the Provisional Technical Secretariat (PTS) of the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) was straining under budget constraints, due to outstanding financial contributions from some major state signatories. However, by sacrificing work in other areas, the PTS was able to continue the development of the International Monitoring System. Going into 2008, the outlook seems to be brightening somewhat, and the next few years might be of paramount importance for the future of the CTBT.

A major goal of all current CTBT related activities is the entry into force of the CTBT itself. To reach this goal, major steps have to be taken in the political arena, and an important prerequisite for positive political action is that the verification system of the CTBTO is functioning and able to provide assurance to all parties that it is impossible to make a clandestine nuclear test without getting detected. FiNDC is committed to its own role in the common endeavour so that the verification system of the CTBTO can accomplish its detection task. While still incomplete, the verification system has already demonstrated its potential for detecting nuclear tests.

Figure 8. The number of inspections from 2002 to 2007.

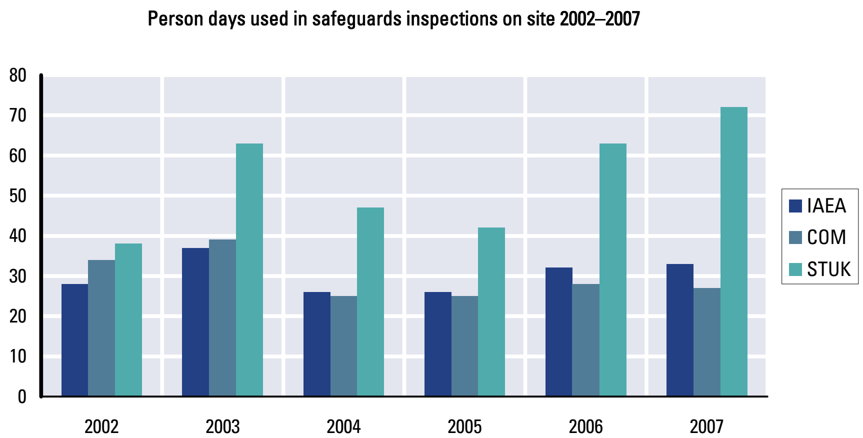

Figure 9. Inspection person days from 2002 to 2007.

5 Publications

Fritzell, A., Honkamaa, T., Karhu, P., Okko, O., Håkansson, A., Dahlin, G., C/S in Final Disposal Processes – Swedish and Finnish perspectives, ESARDA Bulletin, 2008, accepted for publication.

Hämäläinen, M., Lahkola, A., Martikka, E., Safeguards Manual: Nuclear Materials Handbook, Proceedings of ESARDA 29th Annual Meeting, Aix-en-Provence, 2007, accepted for publication.

Karhu, P., Kuukankorpi, S., Lahkola, A., Illicit trafficking and border control – extended second line of defence, Proceedings of ESARDA 29th Annual Meeting, Aix-en-Provence, 2007, accepted for publication.

Martikka, E., Honkamaa, T., Karhu, P., Okko, O., Nuclear safeguards and security call for cooperation, Proceedings of ESARDA 29th Annual Meeting, Aix-en-Provence, 2007, accepted for publication.

Okko, O., Sovellettu geofysiikka ydinsulkuvalvonnassa (sovelletun geofysiikan neuvottelupäivät 7.–8.11.2007, Oulu), Kaikkonen, P., Vaittinen, K. (toim.), Abstraktikokoelma, Vuorimiesyhdistyksen sarja B, nro 87, s. 71, Oulu, Vuorimiesyhdistys, 2007.

6 Abbreviations and acronyms

ADR
European Agreement concerning the International Carriage of Dangerous Goods by Road

AP
Additional Protocol to the Safeguards Agreement

AQG
Atomic Questions Group of the Council of the European Union

ASTOR
Application of Safeguards to Geological Repositories

BTC
Basic Technical Characteristics

CA
Complementary Access

CBRN
Chemical, biological, radiological and nuclear (such as in "protective measures taken against CBRN weapons or hazards")

CdZnTe
Cadmium zinc telluride

CTBT
Comprehensive Nuclear-Test-Ban Treaty

CTBTO
Comprehensive Nuclear-Test-Ban Treaty Organization

DPRK
Democratic People's Republic of Korea

DU
Depleted uranium

eFORK
enhanced FORK with a CdZnTe-gamma spectrometer (see FORK)

ES
Environmental Sampling

ESARDA
European Safeguards Research and Development Association

EU
European Union

FA
(1) Facility Attachment according to the Safeguards Agreement (INFCIRC/193), (2) Fuel Assembly

FiNDC
Finnish National Data Centre for the CTBT

FINSP
Finnish Support Programme to the IAEA Safeguards

FORK
Spent fuel verifier with gross gamma and neutron detection

GBUV
Gamma Burnup Verifier

GICNT
Global Initiative for Combating Nuclear Terrorism

HEU
High-enriched uranium

HPGe
High-Purity Germanium

IAEA
International Atomic Energy Agency

IMS
International Monitoring System (of the CTBTO)

INFCIRC
Information Circular (IAEA document type, eg. INFCIRC/193, Safeguards Agreement, or INFCIRC/140, the Non-Proliferation Treaty)

ISSAS
International SSAC Advisory Service

ITWG
International Technical Working Group for combating illicit trafficking of nuclear and other radioactive materials

LEU
Low-enriched uranium

LINSSI
an SQL database for gamma-ray spectrometry

MBA
Material Balance Area

MEEC
Ministry of Employment and the Economy

NDA
Non-Destructive Assay

NM
Nuclear Material

NPP
Nuclear Power Plant

NPT
The Treaty on the Non-proliferation of Nuclear Weapons (INFCIRC/140, “Non-Proliferation Treaty”)

NSG
Nuclear Suppliers’ Group

Onkalo
Underground rock characterisation facility (for the final disposal of spent nuclear fuel)

PIV
Physical Inventory Verification

PSP
Particular Safeguards Provisions

PTS
Provisional Technical Secretariat (to the Preparatory Commission of the CTBT)

Pu
Plutonium

RL07
Radionuclide Laboratory to the CTBT hosted by STUK (FIL07)

SAGSI
Standing Advisory Group on Safeguards Implementation

SFA
Spent Fuel Assembly

SFAT
Spent Fuel Attribute Tester

SKI
Swedish Nuclear Power Inspectorate

SSAC
State System of Accounting for and Control of Nuclear Materials

STUK
Radiation and Nuclear Safety Authority

Th
Thorium

TVO
Teollisuuden Voima Oyj

U
Uranium

UNSC
United Nations Security Council

VTT
Technical Research Centre of Finland

WGB
Working Group B (of the CTBTO)

APPENDIX 1 Nuclear materials in Finland in 2007

Table 1. Summary of nuclear materials receipts and shipments in 2007.

To	From	FA	LEU (kg)	Pu (kg)
WOL1	Spain	114	20 179	–
WOL2 (1/2)	Sweden	60	10 158	–
WOL2 (2/2)	Sweden	58	9 818	–
WOLS	WOL1	41	6 788	58
WOLS	WOL1	41	6 786	59
WOLS	WOL1	41	6 786	58
WOLS	WOL2	41	6 895	62
WOLS	WOL2	41	6 893	62
WOLS	WOL2	41	6 893	62
WLOV	Spain	111	13 940	–
WLOV	Russian Federation	108	12 945	–

WOL1, WOL2 & WOLS = Olkiluoto NPP, WLOV = Loviisa NPP, FA = fuel assembly; LEU = low-enriched uranium, Pu = plutonium.
Note: WOL1 and WOL2 shipments are marked only once into the table as WOLS receipts.

Table 2. Numbers of fuel assemblies at 31 December 2007.

MBA	FA/SFA *)	LEU (kg)	Pu (kg)
WLOV	4 410/3 565	510 970	4 281
WOL1	1 095/523	186 894	762
WOL2	1 137/567	191 143	845
WOLS	5 658/5 658	960 786	7 983

MBA = material balance area, FA = fuel assembly, SFA = spent fuel assembly

*) FAs in core are accounted as fresh fuel assemblies
(Loviisa 313 FAs and Olkiluoto 500 FAs per reactor)

Table 3. Amounts of nuclear material at 31 December 2007.

MBA	natural U (kg)	LEU/HEU (kg)	DU (kg)	Plutonium (kg)	Thorium (kg)
WL0V	–	510 970	–	4 281	–
W0L1	–	186 894	– [a)]	762	–
W0L2	–	191 143	–	845	–
W0LS	–	960 786	–	7 983	–
WRRF	1 511	60.1	0.002	–	–
WFRS	44.7	1.4	857.0	0.003	2.5
WKK0	2 419	–	–	–	–
WHEL	40.4	0.3	20	0.003	2.5
Minor holders	< 0.2	0.00116	931	< 0.01	0.134

MBA = material balance area, WRRF = VTT FiR-1/VTT Processes, WFRS = STUK, WKK0 = OMG Kokkola Chemicals, WHEL = Laboratory of Radiochemistry at the University of Helsinki, U = uranium, LEU =low-enriched uranium, HEU = high-enriched uranium, DU = depleted uranium.

[a)] TVO has ca. 10.3 kg DU samples for training and exhibition purposes at the Olkiluoto NPP.

Table 4. Amounts of nuclear material at the minor nuclear material holders.

Company	Nuclear material (kg)						MBA + use of NM
	DU	nat. U	LEU	HEU	Pu	Th	
Geological Survey of Finland (GTK)	–	–	–	0.00116	–	–	SF 0293 CA, Minor NM activities
Finnair Engineering	45.5	–	–	–	–	–	SF 0302 CA, DU radiation shielding
Rautaruukki, Raahe Works	231	–	–	–	–	–	SF 0303 CA, DU radiation shielding
Inspecta	321.4	–	–	–	–	–	SF 0304 CA, DU radiation shielding
Outokumpu Stainless*	0	–	–	–	–	–	W0KU, DU radiation shielding
Centre for Technical Training, Metal and Machinery	15.5	–	–	–	–	–	SF 0336 CA, DU radiation shielding
Polartest	152.6	–	–	–	–	–	SF 0339 CA. DU radiation shielding
MAP Medical Technologies	165	–	–	–	–	–	SF 0325 CA, DU radiation shielding
Metorex International	–	0.01955	–	–	–	–	SF 0337 CA, U-nat standards
University of Jyväskylä, Department of Physics	–	0.0044	–	~0	~0	~0.134	WDPJ, Basic research

DU = depleted uranium, Nat. U = natural uranium, LEU = low-enriched uranium, HEU = high-enriched uranium,
Pu = plutonium, Th = thorium, MBA = material balance area, NM = nuclear material.
*In 2007, Outokumpu Stainless sent all their DU shieldings (3 pieces) to Thermo Electron (Erlangen) GmbH, Germany and informed the Commission and STUK that they have finished all activities with NM.

APPENDIX 2 IAEA, European Commission and STUK safeguards field activities in Finland in 2007

Table 5. IAEA, Commission and STUK safeguards inspections on site.

General information			Inspections			Inspection person days		
MBA	**Date**	**Inspection type**	**IAEA**	**COM**	**STUK**	**IAEA**	**COM**	**STUK**
WLOV	6 March	Routine inspection	1	1	1	1	1	1
ONKALO	7 March	Routine inspection	0	0	1	0	0	1
WOL1,WOL2, WOLS	8–9 March	Routine inspection	3	3	3	3	3	3
WOLS	3–5 April	STUK SFAT (+ES)	0	0	1	0	0	6
WLOV	12–13 April	STUK SFAT (+ES)	0	0	1	0	0	4
TVO HQ	26 April	International NM transfers	0	0	1	0	0	1
ONKALO	9 May	Technical visit, IAEA/COM participated	1	1	1	1	1	2
WOL1	12 May	OL1 PIV	1	1	1	1	1	2
WLOV	29 May	Routine inspection	1	1	1	1	1	1
WOL1,WOL2	30–31 May	OL2 PIV + OL1 post-PIV	2	2	2	2	2	2
WDPJ	6 June	CA (exempted NM)	1	1	1	2	1	1
WRRF	11 June	PIV	1	1	1	1	1	2
WOL2, WOLS	13 June	OL2 post-PIV +KPA routine	2	2	2	2	2	2
WOL1	19–21 June	STUK GBUV (+ES)	0	0	1	0	0	9
WRRF	26 June	Extra	0	0	1	0	0	2
ONKALO	29 June	Routine inspection (IAEA/COM/SKI observers)	(1)	(1)	1	(2)	(2)	2
WLOV	16 August	Fuel followers identification	0	0	1	0	0	1
WOL1,WOL2, WOLS	21–22 August	Routine inspection	3	3	3	3	3	3
WLOV	25 August	Routine inspection	1	1	1	1	1	1
WLOV	26 August	LO1 core verification	1	0	1	1	0	1
WLOV	15 Sep.	LO2 core verification + PIV	1	0	1	1	0	1
WLOV	25–26 Sep.	post-PIV	1	1	1	1	1	1
Metso Materials Technology, Tampere	27 Sep.	CA, Finland invited IAEA	1	0	1	2	0	2
WKKO	28 Sep.	PIV	1	1	1	1	1	1
WHEL	16 Oct.	PIV	1	1	1	1	1	1
WFRS	17 Oct.	PIV	1	1	1	1	1	1
Vaalimaa-WLOV	23 Oct.	NM Transport inspection	0	0	1	0	0	2
WOLS	5–7 Nov.	STUK SFAT	0	0	1	0	0	6
WLOV	8–9 Nov.	STUK eFORK	0	0	1	0	0	4
WOL1,WOL2, WOLS	12–13 Nov.	Routine inspection	3	3	3	3	3	3
ONKALO	14 Nov.	System inspection + routine inspection (IAEA, SKB observers)	(1)	0	1	(1)	0	2
WLOV	15 Nov.	Routine inspection	1	1	1	1	1	1
TOTAL			**30**	**26**	**40**	**33**	**27**	**72**

Note: At the Olkiluoto NPP, inspections are counted per MBA. MBA = material balance area, PIV = Physical Inventory Verification, CA = Complementary Access, ES = Environmental Sampling, NM = nuclear material, SFAT/eFORK/GBUV = methods of non-destructive assay.

APPENDIX 3 The staff of STUK's Nuclear Materials Section and Director of Department of Nuclear Waste and Materials Regulation and his Deputy

Table 6. The staff of STUK Nuclear Materials Section and Director of Department of Nuclear Waste and Materials Regulation and his Deputy. All section staff participate in the core safeguards tasks. Additionally, each person has some special areas of expertise to focus on.

Ms. Elina Martikka	Section Head	
Mr. Marko Hämäläinen	Senior Inspector	Inspection coordination, handbooks, Additional Protocol implementation
Mr. Tapani Honkamaa	Senior Inspector	Non-destructive assay, FINSP to the IAEA safeguards
Mr. Olli Okko	Senior Inspector	Safeguards of research and development, final disposal
Mr. Jaakko Tikkinen	Senior Inspector	Advisor, transport and nuclear security
Ms. Paula Karhu	Inspector	Nuclear security, environmental sampling, internal audit
Ms. Anna Lahkola	Inspector	Transport of nuclear materials, central accountancy
Ms. Milka Holopainen	Inspector	Transport of radioactive materials, international inspectors
Mr. Antero Kuusi	Assistant Inspector	Data bases, non-destructive assay
Mr. Mikael Moring	Senior Inspector	Finnish National Data Centre for the CTBT, non-destructive assay, environmental sampling
Ms. Ritva Kylmälä	Secretary	

Figure 10: Staff of Nuclear Materials Section.

APPENDIX 4 International agreements and national legislation relevant to nuclear safeguards in Finland

Valid legislation, treaties and agreements concerning safeguards of nuclear materials and other nuclear items at the end of 2007 in Finland (Finnish Treaty Series, FTS):

1. The Nuclear Energy Act, 11 December, 1987/990 as amended.

2. The Nuclear Energy Decree, 12 February, 1988/161 as amended.

3. The Treaty on the Non-proliferation of Nuclear Weapons INFCIRC/140 (FTS 11/70).

4. The Agreement with the Kingdom of Belgium, the Kingdom of Denmark, the Federal Republic of Germany, Ireland, the Italian Republic, the Grand Duchy of Luxembourg, the Kingdom of Netherlands, the European Atomic Energy Community and the International Atomic Energy Agency in Implementation of Article III, (1) and (4) of the Treaty on Non-Proliferation of Nuclear Weapons (INFCIRC/193), 14 September 1997. Valid for Finland from 1 October 1995.

5. The Protocol Additional to the Agreement between the Republic of Austria, the Kingdom of Belgium, the Kingdom of Denmark, the Federal Republic of Germany, the Hellenic Republic, Ireland, the Italian Republic, the Grand Duchy of Luxembourg, the Kingdom of Netherlands, the Portuguese Republic, the Kingdom of Spain, the Kingdom of Sweden, the European Atomic Energy Community and the International Atomic Energy Agency in Implementation of Article iii, (1) and (4) of the Treaty on Non-Proliferation of Nuclear Weapons, 22 September 1998. Entered into force on 30 April 2004.

6. The Treaty establishing the European Atomic Energy Community (Euratom Treaty), 25 March 1957:
   - Regulation No 5, amendment of the list in Attachment VI, 22 December 1958
   - Regulation No 9, article 197, point 4 of the Euratom Treaty, on determining concentrations of ores, 2 February 1960.

7. Commission Regulation (Euratom) No 302/2005, 8 February 2005.

8. Council Regulation (EC) No 1334/2000 setting up a Community regime for the control of exports of dual use items and technology as amended.

9. The Agreement with the Government of the United Kingdom of Great Britain and Northern Ireland and the Government of the Republic of Finland for Co-operation in the Peaceful Uses of Atomic Energy (FTS 16/69). Articles I, II, III and X expired on 20 February 1999.

10. The Agreement with the Government of the Russian Federation (the Soviet Union signed) and the Government of the Republic of Finland for Co-operation in the Peaceful Uses of Atomic Energy (FTS 39/69). Articles 1, 2, 3 and 11 expired on 1.12.2004.

11. The Agreement between the Government of the Kingdom of Sweden and the Government of the Republic of Finland for Co-operation in the Peaceful Uses of Atomic Energy 580/70 (FTS 41/70). Articles 1, 2 and 3 expired on 5.9.2000.

12. The Agreement between Sweden and Finland concerning guidelines on export of nuclear materials, technology and equipment (FTS 20/83).

13. The Agreement between the Government of Republic of Finland and the Government of Canada and Canada concerning the uses of nuclear materials, equipment, facilities and information transferred between Finland and Canada (FTS 43/76). Substituted to the appropriate extent by the Agreement with the Government of Canada and the European Atomic Energy Community (Euratom) in the peaceful Uses of Atomic Energy, 6 October 1959 as amended.

14. The Agreement on implementation of the Agreement with Finland and Canada concerning the uses of nuclear materials, equipment, facilities and information transferred between Finland and Canada (FTS 43/84).

15. The Agreement between the Government of Republic of Finland and the Government of Australia concerning the transfer of nuclear material between Finland and Australia (FTS2/80). Substituted to the appropriate extent by the Agreement between the Government of Australia and the European Atomic Energy Community concerning transfer of nuclear material from Australia to the European Atomic Energy Community.

16. The Agreement for Cooperation with the Government of the Republic of Finland and the Government of the United States concerning Peaceful Uses of Nuclear Energy (FTS 37/92). Substituted to the appropriate extent by the Agreement for Cooperation in the Peaceful Uses of Nuclear Energy with European Atomic Energy Community and the USA.

17. The Comprehensive Nuclear-Test-Ban Treaty (FTS 15/2001). This treaty was ratified by Finland in 2001, but will not enter into force before it is ratified by all 44 states listed in Annex II of the treaty.