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Implementing nuclear non-proliferation in Finland

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

Annual report 2014

Olli Okko (ed)

Säteilyturvakeskus
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Radiation and Nuclear Safety Authority
STUK

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Executive summary

The regulatory control of nuclear materials (nuclear safeguards) is a prerequisite for the peaceful use of nuclear energy in Finland. In order to uphold the Finnish 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).

The results of STUK"s nuclear safeguards inspection activities in 2014 continued to demonstrate that the 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.

Safeguards are applied to nuclear materials and activities that can lead to the proliferation of nuclear weapons. These safeguards include nuclear materials accountancy, control, security and the reporting of nuclear fuel cycle-related activities. The main parties involved in a state nuclear safeguards system are the facilities that use nuclear materials – often referred to as "licence holders" or "operators" – and the state authority. A licence holder shall take good care of its nuclear materials and the state authority shall provide the regulatory control to ensure that the licence holder fulfils the requirements. The control of nuclear expert organisations, technology holders and suppliers, to ensure the non-proliferation of sensitive technology, is also a growing global challenge for all stakeholders. In Finnish legislation, all these stakeholders are dealt with as users of nuclear energy. At then end of 2013, the new STUK regulations – called YVL Guides – entered into force. All the stakeholders were requested to prepare their safeguards manuals as a part of their quality managements systems. The approval process will continue in 2015.

Finland has quite significant nuclear power production, but the related nuclear industry is rather limited. Most of the declared nuclear materials (uranium, plutonium) in Finland reside at the nuclear power plants in Olkiluoto and Loviisa. Additionally, there is the research reactor in Espoo, as well as a dozen minor nuclear material holders in Finland. Nuclear dual-use items and instrumentation for the third reactor under construction at the Olkiluoto site are being imported and installed. The import licences are reviewed as applicable to ensure the peaceful use of the technology. The International Atomic Energy Agency (IAEA) and the European Commission made their site visits to the construction site prior to the installation of safeguards instrumentation and fuel delivery.

The planning and design of the fourth reactor at the Olkiluoto power plant and at a new nuclear power plant site Hanhikivi in Pyhäjoki were authorised in 2010. The safeguards systems for these new reactors will be designed together with facility design and development. Similarly to the Olkiluoto 3 reactor that is under construction, the import licences for the new facilities are reviewed as applicable to ensure the peaceful use of the technology and sensitive information. The operators have submitted the preliminary

Basic Technical Characteristics to the European Commission and obtained Material Balance Area codes for the future reactors before the vendor companies were selected. In December 2013, Fennovoima announced that the Hanhikivi reactor will be supplied by Rusatom Overseas. This was not included as an option in the application of 2009, and thus the re-evaluation of the conditions for the previous authorisation was carried out in 2014, resulting in new Decision-in-Principle endorsed by the Parliament in December 2014. In parallel with this, the TVO application to extend the time line for the fourth unit was denied by the Government. Owing to these decisions, the construction licence applications are expected in 2015.

Uranium production as one of the by-products of nickel at the Talvivaara mine was given approval from the Government in accordance with the nuclear energy legislation in March 2012. In 2013, the company constructed the uranium extraction plant, but the Supreme Administrative Court rescinded the approval, owing to claims of environmental and economical issues in December 2013 before the commissioning of the plant. The difficulties continued in 2014; and, finally in November 2014 the Talvivaara Sotkamo Ltd. filed for bankruptcy. Currently, uranium residuals are extracted from the nickel at Harjavalta Nickel Refinery and at Freeport Cobalt in Kokkola, and reported to STUK.

STUK maintains a central national nuclear materials accountancy system and verifies that nuclear activities in Finland are carried out in accordance with the Finnish Nuclear Energy Act and Decree, European Union legislation and international agreements. These tasks are performed to guarantee that Finland can assure itself and the international community of the absence of undeclared nuclear activities and materials. In addition to this, the IAEA evaluates the success of the state safeguards system, and the European Commission participates in safeguarding the materials under its jurisdiction.

The number of the routine inspection days of the international inspectorates has been reduced significantly due to the state-level integrated safeguards approach for Finland, which has been in force since 2008. The number of international inspection days per year is approximately 25. Neither the IAEA nor the Commission made any remarks nor did they present any required actions based on their inspections during 2014. By means of 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. STUK continues with 40 annual inspections and 60 inspection days. In 2014, the number in inspection days was significantly higher owing to the extensive survey campaign carried out at Onkalo, the planned geological repository. In total, 65 working days were required for the one-week long scanning of the tunnels.

The application for the construction licence for the disposal facility, which consists of the encapsulation plant and the geological repository, was submitted to the government in December 2012. The licensing of the facility was one of the main topics over the year as a whole at STUK. During 2013 and 2014, the IAEA and the Commission defined the requirements for the safeguards equipment for the encapsulation plant in an interactive process with STUK and Posiva. This document will be included in the STUK statement to be finalised in 2015.

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) in the CTBT International Monitoring Network (IMS). The main task of the FiNDC is to inspect data received from the International Monitoring System 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 detection. 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.

The human resources development at the Nuclear Materials Section during 2014 was focused on nuclear material control: in particular, information security issues were addressed. This was partly due to the need to regulate the construction of the final disposal facility for spent nuclear fuel at the Olkiluoto repository site.

In addition, STUK contributed to educational workshops and training courses for authorities who represent nuclear newcomers: countries that aim at uranium production or nuclear power in cooperation with the IAEA. STUK and Finnish Customs continued the joint multi-year border monitoring development project. The project covers customs officers training as well as the updating of technical equipment and of operational procedures. In 2014, the partnerships programme between King Abdullah City for Atomic and Renewable Energy (K.A.CARE), Kingdom of Saudi Arabia, and STUK began supporting Saudi Arabia's nuclear energy programme. In the field of safeguards and nuclear security, STUK's safeguards and security experts initiated practical cooperation with their colleagues at K.A.CARE.

Contents

1 Nuclear non-proliferation implementation in Finland

The regulatory control of nuclear materials is a prerequisite for the peaceful use of nuclear energy in Finland. In order for Finland to have nuclear industry, most of which consists of nuclear energy production, it must be ensured that nuclear materials, equipment and technology are used only for their declared peaceful purposes. The basis for nuclear safeguards is the national system for the regulatory control of nuclear materials and activities. Nuclear safeguards represent an integral part of nuclear safety and nuclear security and are applied to both large- 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 monitoring compliance with the Comprehensive Nuclear-Test-Ban Treaty (CTBT).

In Finland, STUK is the competent authority with regard to the implementation of nuclear non-proliferation. In November 2012, a new STUK strategy for the period 2013–2017 was announced, and the organisation was renewed to support the implementation of the new strategy. This does not considerably affect the mandatory implementation of non-proliferation control at STUK, but it provides a good framework for the interaction between nuclear safety, security and safeguards. Parallel to this, STUK regulations were under renewal and were finally issued on 1 December 2013. In the new STUK safeguards regulation, the requirements concerning nuclear material accountancy, safeguards-based procedures and the implementation of the Additional Protocol are being merged in one updated regulation, the regulatory Guide YVL D.1 "Regulatory Control of Nuclear Safeguards". This instructs all stakeholders in the Finnish nuclear field in how to comply with the current national and international safeguards regulations. During 2014, the licence holders were obliged to review their manuals and evaluate how the requirements can be implemented. At the outset of 2015, STUK will make decisions on the implementation practices.

1.1 International safeguards agreements and national legislation

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 the peaceful use of nuclear energy. When Finland joined the EU, the bilateral agreements with Australia, Canada and the USA were partly substituted with the corresponding Euratom agreements (see Appendix 3 for the relevant legislation).

Finland was the first state where an INFCIRC[1]/153-type comprehensive 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

[1] INFCIRC = IAEA Information Circulars

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 on 30 April 2004, once 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 the EU as a Member State and thereby obligated itself to the Euratom nuclear safeguards, a comprehensive national safeguards system was still maintained and further developed. The basic motivation for this is the responsibility assumed by Finland for its nuclear safeguards and nuclear security under the obligations of the NPT, and also to ensure fulfilment of the Euratom requirements.

The national nuclear safeguards derive their mandate and scope from the Finnish Nuclear Energy Act and Decree. These were amended during 2008 as a result of the general constitution-based renewal of the Finnish nuclear legislation system. The operator's obligation to have a nuclear material accountancy system and the right of STUK to oversee the planning and generation of design information for new facilities was introduced from STUK regulations to the Decree.

As stipulated by the Act, STUK issues detailed regulations on safety, security and safeguards (the YVL Guides) that apply to the use of nuclear energy. STUK's safeguards requirements for all users of nuclear energy during all phases of the nuclear fuel cycle are set in Guide YVL D.1 "Regulatory Control of Nuclear Safeguards". Areas covered include the obligations and measures stemming from the Additional Protocol for the Safeguards Agreement and recent developments. All stakeholders must describe their own safeguards system in written form (as a nuclear materials handbook or safeguards manual), in order to ease their task of fulfilling their obligations and to guarantee the effective and comprehensive operation of the national safeguards system. In the new guide, there are also specific national requirements for the final disposal of spent nuclear fuel in a geological repository.

The new Guide YVL D.1 "Regulatory Control of Nuclear Safeguards" entered into force on 1 December 2013. Nuclear safeguards control applies to:

- nuclear material (special fissionable material and source material)
- nuclear dual-use items (non-nuclear materials, components, equipment and technology suitable for producing nuclear energy or nuclear weapons as specified in INFCIRC/254, Part 1)
- licence holders' activities, expertise, preparedness and competence
- R&D and other activities related to the nuclear fuel cycle as defined in the Additional Protocol
- design and construction of new nuclear facilities.

1.2 Parties of the Finnish nuclear safeguards system

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

1.2.1 Ministries

The Ministry for Foreign Affairs (MFA) is responsible for national non-proliferation policy and international agreements. The MFA is responsible for the export licensing of nuclear materials and other nuclear dual-use items, including sensitive nuclear technology. The Ministry of Employment and the Economy (MEE) is the highest authority for the management and control of nuclear energy. MEE is responsible for the legislation related to nuclear energy and is also the competent authority mentioned in the Euratom Treaty. Other ministries as well, 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

As per the Finnish nuclear legislation, STUK is responsible for maintaining the national nuclear safeguards system in order to prevent the proliferation of nuclear weapons. STUK regulates the licence holders' activities and ensures that the obligations of international agreements concerning the 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 materials and nuclear dual-use items. STUK is in charge of Finland's approval and consultation process for IAEA and European Commission inspectors. STUK approves an inspector as long as there are no such issues related to the person in question that may 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 licences 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 the Nuclear Materials Section of STUK cover all typical measures of a State System of Accounting for and Control of Nuclear Materials (SSAC), together with many other activities. STUK reviews the licence 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. Most of the working hours are invoiced to the users of nuclear energy (see Figure 12) for the distribution of the compiled working days). 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, physical protection of nuclear materials, and monitoring compliance with the Comprehensive Nuclear -Test-Ban Treaty (CTBT). Nuclear safety and particularly nuclear security objectives are closely complemented by safeguards objectives. For this reason, the research, development and regulatory units in the fields of safety, security and safeguards at STUK cooperate under the non-proliferation framework. STUK issued a new strategy and consequently a matrix organisation in 2013. The scope of non-proliferation work of the Nuclear Materials Sections is linked with many organisational units of STUK (Fig. 1). In the organisation, the competences in

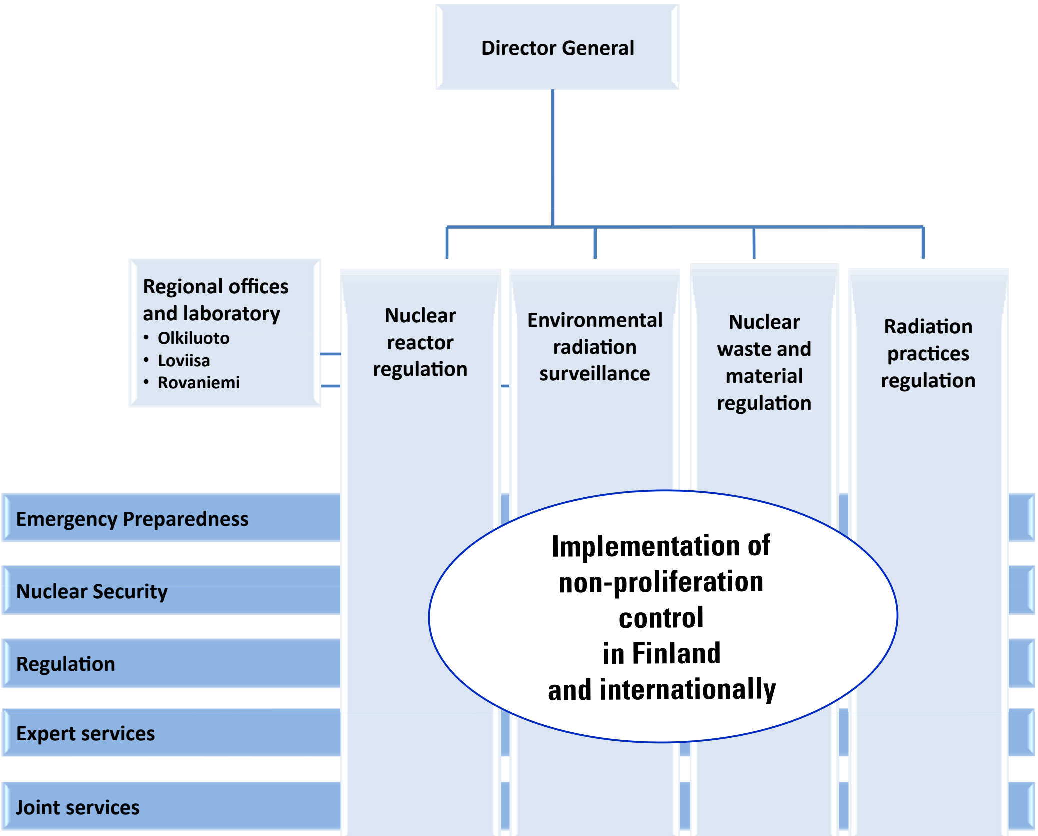

Figure 1. Non-proliferation framework covers most of the operational areas of STUK.

Table 1. Status of regulatory documents for material balance areas in Finland at the end of 2014.

MBA, location	BTC, last upd.	Site (AP), founded	PSP, in force	FA, in force	Licence/DiP, in force (from/until)	SG Manual, approved
WLOV, Loviisa	31.1.2012	S SF LOV1, 8.7.2004	Yes, 4.5.1998	No	Operation, LO1 until 31.12.2027 LO2 until 31.12.2030	Yes, 30.11.2012
WOL1, Olkiluoto	9.4.2014	S SF OLK1, 8.7.2004	Yes, 7.6.2007	No	Operation, until 31.12.2018	Yes, 4.12.2012
WOL2, Olkiluoto	9.4.2014	S SF OLK1, 8.7.2004	Yes, 7.6.2007	No	Operation, until 31.12.2018	Yes, 4.12.2012
WOLS, Olkiluoto	24.9.2013	S SF OLK1, 8.7.2004	Yes, 7.6.2007	No	Operation, until 31.12.2018	Yes, 4.12.2012
WOL3, Olkiluoto	11.4.2013	S SF OLK1, 8.7.2004	No	No	Construction, granted 17.2.2005	Yes, 4.12.2012
WOL4, Olkiluoto	12.11.2012 (prel. DI)	S SF OLK1, 8.7.2004 (add. 2013)	No	No	DiP, 1.7.2010	No
WOLE, Olkiluoto	27.5.2014	S SF POS1, 31.3.2010	No	No	DiP, 1.7.2010 (last upd.)	No
WOLF, Olkiluoto	17.9.2014	S SF POS1, 31.3.2010	No	No	DiP, 1.7.2010 (last upd.)	Yes, 13.6.2014
WFV1, Pyhäjoki	4.7.2013 (prel. DI)	No	No	No	DiP, 1.7.2010	No
WRRF, Espoo	31.12.2014	S SF VTT1, 8.7.2004	Yes, 9.7.1998	No	Operation, until 31.12.2023	Yes, 31.3.2011
WFRS, Helsinki	10.4.2014	S SF STUK, 8.7.2004	No	No	Not required (for STUK)	Prepared in 2014
WHEL, Helsinki	8.11.2006	S SF HYRL, 8.7.2004	No	No	Operation, until 31.12.2017	Prepared in 2014
WKKO, Kokkola	30.5.2013	No	No	No	Operation, until 31.12.2019	Prepared in 2014
WNNH, Harja-valta	16.11.2010	No	No	No	Operation, until 31.12.2019	Prepared in 2014
WTAL, Talvivaara	29.11.2010	No	No	No	No	No, drafted in 2013
WDPJ, Jyväskylä	14.5.2012	No	No	No	Operation, until 31.12.2024	Prepared in 2014

MBA (material balance code), BTC (Basic Technical Characteristics, i.e. Design Information), AP (the Additional Protocol), PSP (Particular Safeguards Provisions set by the European Commission), FA (Facility Attachment prepared by the IAEA), DiP (Decision-in-Principle, date of Parliament approval, in force 5 years).

non-proliferation control were split into several organisational units. Only the core competences were maintained in the Nuclear Materials Section of the Nuclear Waste and Material Regulation. Consequently, interaction and cooperation between the reorganised units have been activated.

1.2.3 Licence holders and other users of nuclear energy

The essential parts of the national nuclear safeguards system are the licence holders and other users of nuclear energy – in nuclear terminology, often called the operators and other stakeholders. In the Finnish legislation, the term "use of nuclear energy" comprises a wide range of nuclear-related activities, e.g. those defined in the Addition Protocol. These stakeholders, in particular the license holders, perform key functions in the national safeguards system: control of the authentic source data of their nuclear materials in addition to accountancy for nuclear materials at the facility level for each of their material balance areas (MBA). Each licence holder or other user of nuclear energy must operate its safeguards system in accordance with its own nuclear materials handbook or safeguards manual. The requirements of the Additional Protocol are integrated in the handbook to facilitate safeguards-based implementation at the site, including the material balance areas. Other stakeholders too, as users of nuclear energy, are requested to have a safeguards manual to facilitate safeguards implementation. The nuclear materials handbook or safeguards manual is a part of the operator's quality system and is reviewed and approved by STUK.

With the basic technical characteristics (BTC) submitted by a licence holder or by other stakeholder as groundwork, the European Commission adopts particular safeguards provisions (PSP) for that licence holder. PSPs are drawn taking operational and technical constraints into account in close consultation with both the person or undertaking concerned and the relevant member state. Until PSPs are adopted, the person or undertaking shall apply the general provisions of the Commission regulation No 302/2005. A facility attachment (FA) is prepared in cooperation with the IAEA for each facility to describe arrangements specific to that facility. Status of the regulatory documents for the Finnish material balance areas is shown in Table 1.

A total of 99.8% of all nuclear materials in Finland reside at the nuclear power plants (NPP). The amounts of nuclear materials (uranium, plutonium) in Finland in 1996–2014 are presented in Figures 2 and 3.

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 including nuclear.

The nuclear power plant operated by Fortum Power and Heat is located on the Hästholmen Island in Loviisa on the southeast coast of Finland. This first NPP to have been built in Finland hosts

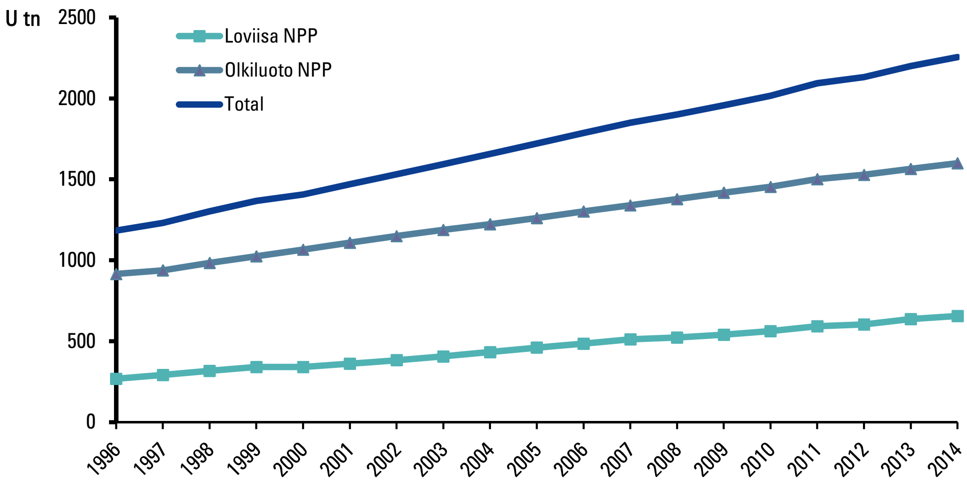

Figure 2. Uranium accumulation in Finland in 1996–2014.

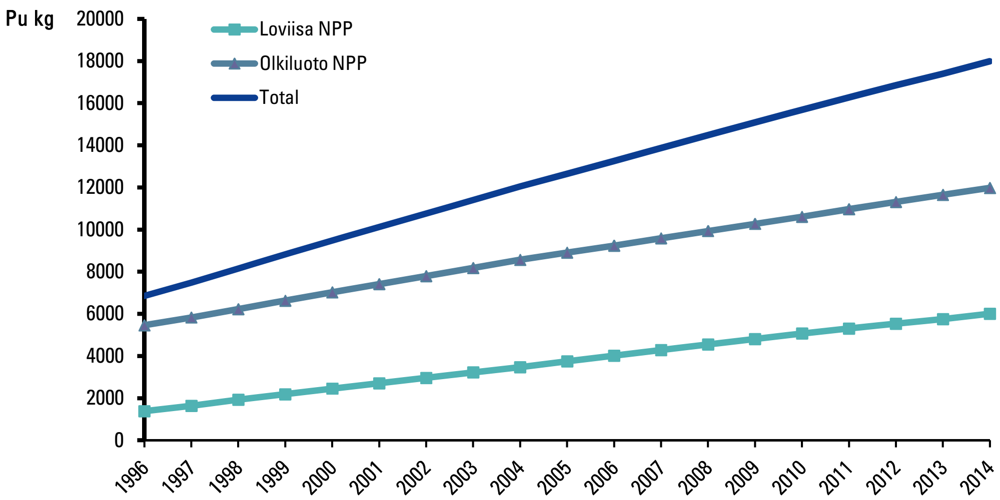

Figure 3. Plutonium in spent nuclear fuel in Finland in 1996–2014.

two VVER-440 type power reactor units, with a current net electrical output of 496 MW for each of the units, Loviisa 1 and Loviisa 2. Loviisa 1 started its electricity production in 1977 and Loviisa 2 in 1980. These two units share common fresh and spent fuel storages. For nuclear safeguards accountancy purposes, the entire NPP is counted as one material balance area (MBA code WL0V). The electricity generated by the Loviisa NPP constitutes about 10% of electrical production in Finland as a whole.

Most of the fuel for the Loviisa NPP has been imported from the Soviet Union/Russian Federation. The spent fuel of the Loviisa NPP was returned to the Soviet Union/Russian Federation until 1996 and since then has been stored in the interim storage due to a change in Finnish nuclear legislation, which currently forbids, the import and export of nuclear waste in general, including spent fuel.

As per the requirements of the Additional Protocol, the Loviisa NPP site (SSFLOV1) comprises Hästholmen Island as a whole and extends to the main gate on the mainland. Particular Safeguards Provisions for the Loviisa NPP, which define the European Commission's nuclear safeguards procedures for the facility, have been in force since 1998. The Facility Attachment of the Safeguards Agreement INFCIRC/193 has not been prepared for the Loviisa NPP.

Teollisuuden Voima (MBAs W0L1, W0L2, W0LS, W0L3 and W0L4)

Teollisuuden Voima Oyj (TVO) owns and operates a nuclear power plant on the Olkiluoto Island 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. These units have been upgraded to the current output of 880 MW. The Olkiluoto NPP is responsible for about 17% of all electricity production in Finland. There are three active material balance areas (MBA codes W0L1, W0L2, W0LS) at the Olkiluoto NPP.

Presently, the uranium in TVO's nuclear fuel is mainly of Australian, Canadian and Russian origin. This 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 to prevent the proliferation of nuclear weapons was approved by STUK. The construction and assembly work of the reactor unit is under way. The European Commission has assigned the MBA code W0L3 for Olkiluoto 3.

The decisions for new nuclear facilities were granted by the government on 6 May 2010. One of these was the Olkiluoto 4 reactor. The selection of the vendor and the supply organisation will take place in the near future. Although the reactor type has not been specified yet, TVO submitted the preliminary basic technical characteristics (BTC) in November 2012 in order to obtain the MBA code W0L4 for future correspondence.

TVO owns most of the area of the Olkiluoto Island, but the NPP site (SSFOLK1) as per the requirements of the Additional Protocol currently comprises the fenced areas around the reactor units, the spent fuel storage and the storage for low and intermediate level waste, and the Olkiluoto 3 construction site. Particular Safeguards Provisions for the Olkiluoto NPP have been in force since 2007. The Facility Attachment of the Safeguards Agreement INFCIRC/193 has not been prepared for the Olkiluoto NPP.

Fennovoima (MBA WFV1)

Fennovoima was founded in 2007 to be a new nuclear power operator in Finland. Fennovoima started preparatory works with several vendor candidates for this purpose and submitted its application for a nuclear power plant in 2009. The Government approved a Decisions-in-Principle in 2010 for the new operator Fennovoima to construct a new nuclear power plant at a new site. The applicant was requested to submit its nuclear construction licence application within five years and to submit a plan for its nuclear waste management within six years. The preliminary Basic Technical Characteristics (BTC) was submitted to the European Commission in summer 2013, and the MBA code WFV1 was assigned to the future material balance area once the selection of the future Hanhikivi site at Pyhäjoki was decided. However, after negotiations with the original vendors and a new candidate, Fennovoima announced on 21 December 2013 that the plant supplier would be Rusatom Overseas. Owing to the changes in ownership and reactor type described in the ratified application, a reassessment of the Decision-in-Principle was initiated in 2013. The reassessment was completed on 5 December 2014 when the Parliament endorsed the Decision-in-Principle of 2010 for the different reactor type, with a requirement for reasonable domestic ownership. The Hanhikivi site will be declared stepwise as the construction proceeds from a virgin green site to the nuclear power plant.

VTT FiR1 research reactor (MBA WRRF)

Small amounts of nuclear materials are located at facilities other than nuclear power plants. The most significant of those facilities is the VTT research reactor FiR1 (MBA code WRRF), located in Otaniemi, Espoo. The research reactor was the first nuclear reactor built in Finland at the Technical Research Centre of Finland (VTT). It reached criticality on 27 March 1962. On 12 July 2012, the Ministry of Employment and the Economy and VTT announced the plan to close down the reactor and to launch the decommissioning process. A new building, the VTT Centre for Nuclear Safety, for experimental nuclear research will, however, be built at the Espoo premises of VTT. The preliminary BTC for the new building, already under construction, was submitted to the Commission by the end of 2014. Both these decisions will have long-lasting effects, due to the need for permits, contracts and environmental impact assessment. This also affects safeguards, as the nuclear materials must be kept under the control of competent personnel at both facilities.

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 Facility Attachment of the Safeguards Agreement INFCIRC/193 has not been prepared for the research reactor.

The VTT FiR1 site (SSFVTT1), as per the requirements of the Additional Protocol, consists of the whole building around the research reactor, though there are non-nuclear companies and university premises in the same building.

STUK (MBA WFRS)

Small quantities of nuclear materials are stored by the Radiation and Nuclear Safety Authority (STUK) – mainly materials no longer in use and hence taken into STUK's custody. STUK was founded in 1958 and has been located at 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 (SSFSTUK), as per the requirements of the Additional Protocol, consists of the premises of STUK's headquarters located in Helsinki. The storage at Olkiluoto is included in the NPP's site declaration.

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 at the Kumpula university campus in Helsinki.

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

Freeport Cobalt Oy (MBA WKK0)

The by-products of the Kokkola Chemicals facility's cobalt purification process contain uranium, which qualifies these by-products as nuclear material. Thus, the Kokkola Chemicals has an operating licence to produce, store and handle nuclear material. In 2013, Freeport-McMoRan Copper & Gold Inc acquired the ownership of the OM Group. The operator is Freeport Cobalt Oy, and the facility is located in Kokkola on the west coast of Finland.

Norilsk Nickel Harjavalta (MBA WNNH)

Norilsk Nickel Harjavalta Oy operates the nickel refining plant at Harjavalta in western Finland. The plant was commissioned in 1959, expanded in 1995 and again in 2002. Norilsk Nickel Finland became a part of the Russian-based Norilsk Nickel as a result of the OM Group's nickel business acquisition in 2007. The refinery of Norilsk Nickel Harjavalta employs a technique of sulphuric acid leaching of nickel products. Uranium residuals will be extracted from the nickel products, e.g., from the Talvivaara mine. In March 2010, STUK granted a licence to extract less than 10 tonnes of uranium per year. The Norilsk Nickel Harjavalta company submitted the basic technical characteristics (BTC) to the European Commission in December 2010.

Talvivaara Sotkamo Ltd. (MBA WTAL)

On 9 February 2010, the Talvivaara Sotkamo Ltd mining company announced its interest in investigating the recovery of uranium as a separate product from its sulphide ore body. The environmental impact assessment was carried out in 2010 and, according to nuclear energy legislation; the licence to recover uranium was granted by the government in March 2012. The Basic Technical Characteristics (BTC) were submitted to the European Commission in 2010, and the MBA code WTAL is assigned to the future uranium extraction plant that is constructed as a separate part of the mineral processing plant. The production of uranium was expected to commence in 2013. However, the claims concerning the uranium extraction licence were approved by the Supreme Administrative Court on 5 December 2013, and the processing of the licence application to extract uranium was returned to the government. Moreover, Talvivaara Sotkamo Ltd filed for bankruptcy on 6 November 2014. The consequences are not yet known, but near-future progress is not foreseen to include uranium production.

Other nuclear material holders

There are about ten minor nuclear material holders in Finland. One of them is an actual material balance area: the University of Jyväskylä, Department of Physics (JYFL, MBA code WDPJ), but in fact the nuclear material at 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 the purposes of international nuclear safeguards. Most of these have depleted uranium as radiation-shielding material.

Posiva (MBAs W0LE and W0LF)

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 at Eurajoki since 2004, and thus preparing for the construction of the final disposal facility. While neither a nuclear licence holder nor a nuclear material holder yet, Posiva and its activities are highly relevant to the national safeguards system, because Posiva is seen as developing a new type of facility, the geological repository, where the nuclear material cannot be re-verified once it has been encapsulated and emplaced. In the IAEA safeguards approaches, it has been suggested that the geological formation should be under safeguards during the whole lifetime of the underground facility. For this reason, Posiva has been required to develop a non-proliferation handbook, such as a nuclear materials handbook, to describe its safeguards procedures and reporting system already before becoming a nuclear material holder. By the end of 2012, Posiva submitted an application to the government to construct the final disposal facility, which will consist of the encapsulation plant and the geological repository. Based on the updated drawings in the application, the preliminary BTCs were prepared for both facilities separately and submitted to the Commission on 27 June 2013. The MBA codes assigned for the future facilities are W0LE for the encapsulation plant and W0LF for the geological repository. As the geological repository will be under continuous development, it has been suggested that the BTC for the underground part will be updated annually. However, the Facility Attachments of the Safeguards Agreement INFCIRC/193 have not been prepared for these new facilities. The installation without nuclear materials but having the two BTCs for these future Material Balance Areas constitutes a site according to the Additional Protocol. The Posiva site (SSFPOS1) covers the fenced area around the buildings supporting the construction of the facilities.

Other stakeholders

Nuclear expert organisations, technology holders and suppliers that serve nuclear and other industry are obliged to take care that non-proliferation sensitive technology does not get into the hands of unauthorised actors and thereby contribute to nuclear proliferation. The introduction of the Additional Protocol (1996) extended the scope of safeguards to the non-proliferation control of nuclear programmes and fuel cycle-related activities. These also include research and development activities not involving nuclear materials, but are related to process or system development of fuel cycle aspects defined in the Protocol. Additionally, the United Nations Security Council Resolution 1540 (April 2004) requires every state to ensure that export controls, border controls, material accountancy and physical protection are efficiently addressed, and calls all states to develop appropriate ways to work with and inform industry and the public regarding their obligations. The control of nuclear expert organisations to ensure the non-proliferation and peaceful use of sensitive technology and dual-use items is a growing global challenge for all stakeholders.

Nuclear safeguards are commonly seen as the traditional nuclear material accountancy and reporting system, the main stakeholders of which are the international, regional and local authorities and the operators. In accordance with the extended non-proliferation regime and the amendments to the Finnish legislation, the stakeholders, universities, research organisations or companies that have activities defined in the Additional Protocol are under reporting requirements and export control. These stakeholders as users of nuclear energy are required to prepare the nuclear safeguards manual and to nominate responsible persons for nuclear safeguards arrangements.

1.3 IAEA and Euratom safeguards in Finland

The IAEA and the European Commission (Euratom safeguards) both have independent mandates to operate in Finland. These two international inspectorates have agreed on cooperation, which aims to reduce undue duplication of effort. The operators report to the Commission as required by Commission Safeguards regulation No 302/2005. It is the Commission's task to audit the licence holders' accounting and reporting systems.

The IAEA 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 routine interim inspections decreases. In contrast to this, the IAEA additionally performs 1–3 unannounced or short-notice inspections per year in a state that has a number and type of nuclear installations similar to the situation in Finland. The IAEA has annually drawn conclusions confirming its confidence that all nuclear activities and materials are accounted for and are in peaceful use in Finland.

IAEA regular inspections:

Facilities at nuclear power plants (NPP):

- *Physical Inventory Verification (PIV) / Design Information Verification (DIV) 1/year*
- *Random Interim Inspection (RII) at 24 h notification (at least 1/year)*

Spent fuel storages at NPPs

- *PIV/DIV 1/year*
- *RII at 48h notification (at least 1/year)*

Research reactor and locations outside facilities (LOF)

- *PIV/DIV 1/4–6 years*

New reactors, under construction

- *DIV and PIV later like at the NPPs*

Repository (Onkalo), under construction

- *PIV/DIV most likely as at spent fuel storages*

Complementary accesses at 2/24 h notification to verify declared activities or to detect undeclared activities.

The number of IAEA and Euratom routine inspections decreased significantly in 2009, as defined in the state-level safeguards approach for Finland, which was negotiated during 2007 and 2008. The time difference between the unannounced inspections at the two spent fuel storages (i.e. 2 hours for Loviisa and 48 hours for Olkiluoto) was decided on due to the difference in the surveillance at the storages and reasonable access time for a STUK inspector. At the trilateral meeting (IAEA/EC/STUK) in September 2013, it was agreed that no unannounced inspections with two hours' notice time would be performed in Finland after the beginning of 2014. Thus, all short notice inspections are expected to take place with 48 hours' advance notice. STUK continues with annual routines consisting of approximately 40 field inspections, which enables the reduction in the effort of the international inspectorates. At the trilateral meeting (IAEA/EC/STUK) in September 2014, STUK requested the IAEA to finalise the Subsidiary Arrangements and Facility Attachments of the Safeguards Agreement. This is considered to be urgent for the specification of inspections procedures.

According to the Finnish Nuclear Energy Act, STUK must be present when the IAEA and Euratom are having inspections in Finnish facilities. Thus STUK has increased preparedness for short-notice and unannounced inspections and complementary access (abbreviated SNUICA). Every weekday, one of STUK's inspectors is prepared to attend a possible IAEA inspection.

1.4 Verified declarations for state evaluations

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 has been nominated a site representative, as per European Commission regulation No 302/2005. STUK collects, inspects and reviews the relevant information and then submits the compiled declarations in timely fashion to the Commission and the IAEA.

In Finland, there are currently six sites in the sense of the Additional Protocol: the two nuclear power plant (NPP) sites in Loviisa and Olkiluoto respectively, the geological repository site in Olkiluoto, and three minor sites: the Technical Research Centre of Finland (VTT), the Radiation and Nuclear Safety Authority (STUK) and the Laboratory of Radiochemistry at the University of Helsinki (HYRL). STUK reviews and verifies the correctness and completeness of the information about the sites provided by the stakeholders.

STUK annually reviews 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 an account of the exports of specified equipment and non-nuclear materials, as listed in Annex II of the Additional Protocol.

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, for example, the enrichment of uranium as well as the burn-up and cooling time of nuclear fuel. The technical analysis methods in use are non-destructive assay (NDA), environmental sampling and satellite imagery.

STUK employs three NDA methods to verify spent nuclear fuel. One method lends itself to 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. On the other hand, the other two methods allow confirming the correctness of the declared burn-up and the cooling time with greater confidence. With the most precise method, the absence of a fuel pin or pins from a fuel element can be discovered. STUK reports to the Commission and the IAEA about the NDA measurement campaigns.

All nuclear materials leave traces of their identity, source of origin and treatment. Safeguards environmental samples (ES) are used to investigate these traces, which provide further information for establishing whether the nuclear activities are in accordance with the declarations. In the Finnish nuclear safeguards system, environmental samples are collected as surface swipes. The IAEA may collect independent environmental samples during its complementary access type of inspections.

Satellite imagery is applied to verify the site declaration in accordance with the Additional Protocol. Timely imagery is used to monitor different kinds of activities at the sites or elsewhere in Finland. STUK contributes to the work of the satellite image analysts of the IAEA and the Commission.

1.5 Licensing and export/import control of dual-use goods

As per the Finnish Nuclear Energy Act, other nuclear fuel cycle-related activities in addition to nuclear materials are under regulatory control. A licence is required for the possession, transfer and import of non-nuclear materials, components, equipment and technology suitable for producing nuclear energy (nuclear dual-use items). The list of these other items is based on the Nuclear Suppliers' Group (NSG) Guidelines (INFCIRC/254 Part 1). The licensing authority is STUK. The Ministry for Foreign Affairs is responsible for granting NSG Government-to-Government Assurances (GTGA) when necessary. The ministry usually consults with STUK before giving the assurances. The licence holder is required to provide STUK with a list of the above-mentioned items annually. Moreover, the export, import and transfer of such items must be confirmed to STUK after the action.

Mining and mineral processing operations aiming to produce uranium or thorium are also under nuclear safeguards and regulatory nuclear safety control. In order to carry out these activities, a national licence and an accounting system to keep track of the amounts of uranium and thorium are required. A national licence is also required to export and import uranium or thorium ore and ore concentrates. These activities are also controlled by the Euratom Supply Agency and the European Commission. Mining and milling activities as well as the production of uranium and thorium must be reported to STUK, the Commission and the IAEA.

Finland's export control system is based on EU Council Regulation (EC) No 428/2009 of 5 May 2009, which sets up a Community regime for the control of exports, transfer, brokering and transit of dual-use items. This regulation was amended in 2014. The export of Nuclear Suppliers' Group (NSG) Part 1 and Part 2 items is regulated by the Finnish Act on the Control of Exports of Dual-use Goods. An authorisation is required to export dual-use items outside the European Union as well as for EU internal transfers of NSG Part 1 items, excluding non-sensitive nuclear materials. The licensing authority is the Ministry for Foreign Affairs. Before granting an export license, it takes also care of NSG Government-to-Government Assurances. The ministry asks STUK's opinion on all applications concerning NSG Part 1 items.

1.6 The regulatory control of transport covers nuclear materials

The 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, SSR-6, and their purpose is to protect people, the environment and property from the harmful effects of radiation during the transport of radioactive material. Based on these regulations, STUK is the competent national authority for the regulatory control regarding the transport of radioactive material.

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

1.7 STUK's contribution to international safeguards development

Nuclear non-proliferation is, by its nature, an international domain. STUK therefore actively participates in international nuclear safeguards-related cooperation and development efforts. The practices obtained at the current construction projects in Olkiluoto have emphasised the need to bring in the safeguards requirements at an early stage of facility design. In order to improve and facilitate the future implementation of safeguards at new facilities, STUK initiated negotiations with all stakeholders to have the 3-S (safety, security, safeguards) concept included in the design requirements of new facilities. The experience has been shared with the IAEA, several international fora and also in bilateral cooperation with several countries.

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 in several working groups.

Upon request by the IAEA, STUK's experts have contributed to the IAEA's international missions. The current experience obtained from the planning, design and construction of new nuclear facilities in Finland has increased the number of requests to participate in different kinds of international cooperation.

STUK keeps close contacts with the respective Nordic authority organisations. The development of the final disposal of spent nuclear fuel in geological repositories is strengthening cooperation between Finland and Sweden.

The Finnish Safeguards Support Programme to the IAEA Safeguards, FINSP, was established in 1988. The aim of FINSP is to provide the IAEA with educational and technical support in the field of non-proliferation of nuclear weapons. FINSP is funded by the Ministry for Foreign Affairs and implemented by STUK.

In 2014 the partnership programme between King Abdullah City for Atomic and Renewable Energy (K.A.CARE), Kingdom of Saudi Arabia, and STUK was launched. The initiative is to give expert support to the atomic energy programme in Saudi Arabia. In the field of safeguards and nuclear security, STUK's safeguards and security experts have started practical cooperation with their colleagues at K.A.CARE.

1.8 The Comprehensive Nuclear-Test-Ban Treaty

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 test explosions in any environment. This ban is aimed at constraining the development and the qualitative improvement of nuclear weapons, including 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. It 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. The IMS is almost 90% ready, and is providing data from almost 300 measuring stations all over the world to more than 1,200 organisations in more than 120 countries. In addition to monitoring compliance with the treaty, the data from IMS is used in disaster mitigation. CTBTO is actively providing data to the global Tsunami Warning System and, since 2012, the CTBTO has been a member of the Inter-Agency Committee on Radiological and Nuclear Emergencies (IACRNE) and a co-sponsor of the Joint Radiation Emergency Management Plan of the International Organisations (JPLAN) led by the IAEA. Within this framework, the CTBTO is responsible for gathering and providing close to real-time radionuclide monitoring data to the IAEA and other participating organisations.

Finland signed the CTBT on its day of opening in 1996 and ratified it less than three years later. In addition to complying with the basic requirement of the CTBT of not carrying out any nuclear weapons tests, Finland actively takes part in the development of the verification regime.

In the CTBT framework, the Finnish national authority is the Ministry for Foreign Affairs. STUK has two roles: it operates the Finnish National Data Centre (FiNDC) and one of the 16 radionuclide laboratories in the IMS (RL07). The most

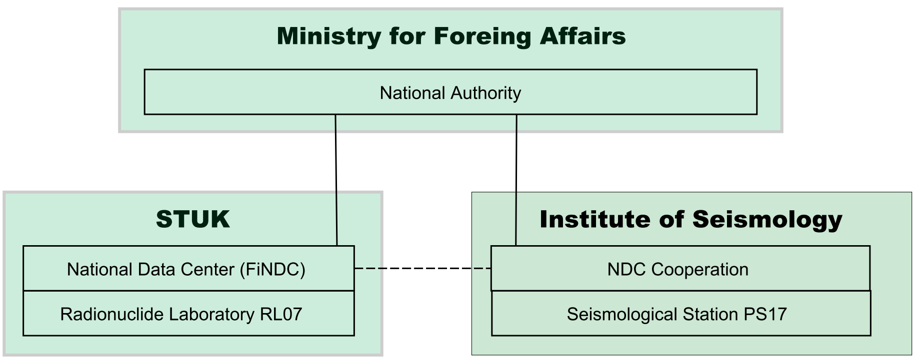

Figure 4. The Finnish CTBT organisation.

Comprehensive Nuclear-Test-Ban Treaty (CTBT) Status (31 December 2014)

- *CTBT Member States* 183
- *Total Ratifications* 163
- *Annex 2 Ratifications* 36

important task of FiNDC is to inspect data received from IMS and inform the national authority about any indications of a nuclear test explosion. The radionuclide laboratory contributes to 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 an IMS seismology station (PS17 in Lahti) and provides analysis of waveform IMS data (Figure 4).

1.9 Interfaces between nuclear safeguards and security

STUK is the national authority for the regulatory control of nuclear and radiological safety, security and safeguards (3 S). All these three regimes have a common goal: the protection of people, society, the environment and future generations from the harmful effects of ionising radiation. As nuclear security aims to protect nuclear facilities, nuclear material and other radioactive material from unlawful activities, it is clear that the majority of the activities that aim at non-proliferation of nuclear weapons, nuclear materials and sensitive nuclear technology contribute to nuclear security. Physical and information security measures at nuclear facilities and for nuclear materials including technology, sensitive information and knowledge also contribute to non-proliferation by providing detection and delay of and response to security events. On the other hand, nuclear material accountancy and control measures may supplement security measures through a deterrence effect.

The Finnish regulatory system for nuclear security was audited by an IPPAS mission in 2009, followed by an IPPAS follow-up mission in 2012. One of the recommendations arising from the audit – namely, the need for more detailed security requirements for minor holders of nuclear materials – was part of the Nuclear Materials Section's area of responsibility. As a result, the new Guide YVL D.1 on regulatory control of nuclear safeguards contains more detailed security requirements for these minor holders. Guide YVL D.1 complements Guides YVL A.11 "Security of a Nuclear Facility" and YVL A.12 "Information Security Management of a Nuclear Facility". STUK safeguards and security sections are working in close cooperation to set detailed requirements for all the users of nuclear energy and to verify that requirements are complied. This ensures that both safeguards and security in all use of nuclear energy are taken care of as well as possible and national and international requirements can be fulfilled. In 2014, STUK created a new assessment type for 3S approach, called site walk, where inspectors for safety, security and safeguards jointly review licence holder's processes and practices.

2 Themes 2014

2.1 New STUK Guide YVL D.1

As part of the extensive reformation work on the YVL guides, the safeguards requirements in former YVL 6.9 and YVL 6.10 have been compiled while also taking into account changes in safeguards since the late 1990s. New areas covered include the obligations and measures stemming from the Additional Protocol for the Safeguards Agreement and recent developments in the area of nuclear safeguards. The need for the revision of STUK regulations was recognised when applying the existing regulations to the construction of the new reactor, Olkiluoto 3. During the reformation work, the international reviews and stress tests performed after the Fukushima accidents were also taken into account. The nuclear safeguards requirements were addressed, mainly stemming from the Olkiluoto 3 experiences by fitting the safeguards, security and safety interfaces of a new nuclear facility into the bidding phase. The early interaction (often referred as safeguards-by-design) between the various disciplines (often referred to as the 3-S concept) was included in the high-level Guide YVL A.1 "Regulatory Oversight of Safety in the Use of Nuclear Energy". The Guide YVL D.1 "Regulatory Control of Nuclear Safeguards" covers obligations and requirements to all users of nuclear energy in all phases of the nuclear fuel cycle. All stakeholders will have to describe their own safeguards system in written form (as a nuclear materials handbook or safeguards manual) to ease their task of fulfilling their obligations and to guarantee the effective and comprehensive function of the national safeguards system. In the new guide, there are also specific national requirements for the final disposal of spent nuclear fuel. The Guide YVL D.1 on nuclear safeguards was issued together with the other STUK regulations on 15 November and entered into force on 1 December 2013. The operators were requested to review their safeguards procedures during 2014. STUK also informed all nuclear material holders and other stakeholders about their duties in accordance with new YVL D.1 requirements.

The main safeguards requirement is to describe operator's nuclear material accountancy and control system in nuclear materials manual and also describe necessary security measures (including information security) in a separate document (security plan) annexed to the safeguards manual. This nuclear material manual and security plan shall be submitted to STUK for approval. This requirement was also adapted to those users of nuclear energy who are performing research and development activities referred in the Additional Protocol. STUK is currently assessing these safeguards manuals and security plans and some of these manuals are already approved by STUK. The aim is that all users of nuclear energy are acting in accordance with an approved manual by the end of the year 2015.

2.2 Licensing of the final disposal facility

At the end of 2012, Posiva submitted an application to the Ministry of Employment and the Economy for a licence to construct a final disposal facility for high level nuclear waste in Olkiluoto. The facility will consist of an encapsulation plant for spent nuclear fuel above ground and a geological repository buried about 400 metres deep in the bedrock. In addition to the licence application documents, Posiva submitted to STUK the material identified in the Section 35 of the Nuclear Energy Degree. This included "A plan for arranging the safeguards control that is necessary to prevent the proliferation of nuclear weapons" as stated in the Degree. During early 2013, STUK made a preliminary check of the documents submitted by Posiva (docketing), and started requiring additional information where needed. The process of inspecting the application documents has been an ongoing project at STUK since mid-2013, which is foreseen to end in early 2015.

In the area of nuclear safeguards, necessary safeguards requirements also needed to be developed and amended, as the facility is the first of its kind to be built. In accordance with the principles of Safeguards by Design, STUK has been working closely together with Posiva, the European Commission and the IAEA to develop such requirements. Several technical meetings were held, in Luxembourg, Vienna, and as videoconferences. Based on this work, the IAEA and the Commission were, in 2014, able to create a common requirement document "Equipment Infrastructure Requirements Specification for the Encapsulation Plant Operator in Finland". This work was also presented at the IAEA 2014 safeguards symposium by all parties involved. The work on developing a similar plan for the geological repository is still ongoing.

STUK has been monitoring the construction of the underground rock characterisation facility, called Onkalo, from the very beginning, since the plan is to include this non-nuclear part into the future geological repository. During this construction work, Posiva has also been active in developing nuclear safeguards for this kind of facility; e.g., the safeguards manual has been continuously updated and submitted to STUK for approval. Posiva submitted separate Basic Technical Characteristics for the Encapsulation Plant and the Geological Repository to the Commission in 2013, and updated them in 2014. The IAEA and the Commission have made satisfactory yearly safeguards inspections at the site, since 2010. When evaluating Posiva's safeguards plan together with the information generated through the processes mentioned above, STUK could reach a positive conclusion. STUK submitted its acceptance of Posiva's above-mentioned plan to Posiva in December 2014, including demands that Posiva takes the requirement document by the IAEA and the Commission into account in its further planning and implementation of the encapsulation plant and that Posiva takes future requirements by the IAEA, the Commission and STUK into account in their further planning and implementation of the underground repository. STUK's acceptance of Posiva's plan will become part of the review of Posiva's application for a construction licence that STUK is submitting to the Ministry of Employment and the Economy in early 2015.

2.3 Introduction of remote data transmission

Remote Data Transmission (RDT) means unattended transmission of information generated by IAEA containment and/or surveillance or measurement devices from the facilities to the IAEA headquarters. The basic principle of the RDT link is the creation of a Virtual Private Network (VPN) tunnel between the fully isolated existing data acquisition system (i.e. optical surveillance system) inside the Loviisa and Olkiluoto nuclear power plants and the isolated collecting server at the Commission office in Luxembourg. The data is simultaneously forwarded to a storage server and to the IAEA headquarters in Vienna using a second VPN tunnel. In the secured review room at the Luxembourg office, dedicated systems can connect to review the acquired inspection data on the Storage Server.

The IAEA right to use the attended and unattended transmission of information is based on the Additional Protocol to the Safeguards Agreement. This also stipulates the IAEA right to make use of internationally established systems of direct communication. Details of the implementation shall be specified in the Subsidiary Arrangements and at facility level in the Facility Attachments.

STUK was informed about IAEA's interest in having RDT in use in Finland in October 2010 during IAEA director Muroya's visit Finland. The first official meeting with all the counterparts (the IAEA, European Commission, STUK and facilities) was held in Helsinki in May 2011. After this meeting, official letters to implement RDT in Finnish facilities were received from the IAEA and the Commission. It was soon noticed that implementation of RDT is not only a matter of safeguards, but also that security measures must be handled in the proper manner. Therefore, STUK submitted a letter to the IAEA and EC in January 2013 in order to take into account the national 3S approach and requirements set for the facilities while implementing RDT. Consequently, the IAEA-EC-STUK-facilities meeting, in which facilities security persons were also requested to participate and present their concerns, was held in June 2013. In close collaboration a security plan for RDT was created. In February 2014, director Muroya urged the implementation of the practical steps during an IAEA-STUK technical meeting in Vienna. Thereafter, the new generation cameras needed for remote data transfer were installed at the Loviisa power plant just before the pre-PIT inspections in July 2014. The old telephone cables that were suitable for the data transfer were connected to the system during the outage, and the RDT started at the Loviisa NPP in September with the transfer of data since July. The installation of the equipment and cabling at the Olkiluoto NPP is still under negotiation.

2.4 Partnership between K.A.CARE and STUK

King Abdullah City for Atomic and Renewable Energy (K.A.CARE) and Radiation and STUK agreed to form a strategic partnership in 2014. Under the agreement, STUK is a strategic partner to the K.A.CARE to develop the necessary infrastructure for the establishment of a national authority dedicated to regulate and monitor nuclear safety in Saudi Arabia.

The initiative is considered to be the first of its kind, aiming to achieving the K.A.CARE's objectives of developing a peaceful and safe nuclear energy programme that would provide Saudi Arabia with an alternative and highly sustainable source of electric power. Through this partnership that will be extended over several years, STUK will provide the technical support and knowledge required to regulate the atomic energy in the Kingdom and will assist the development and selections of resources required and develop the necessary training programmes required to establish a national nuclear regulator.

STUK and K.A.CARE experts met first time on 8–11 September 2014 in Riyadh to chart the situation and to launch the practical technical cooperation in the field of safeguards and nuclear security. The K.A.CARE organised the IAEA Workshop on Safeguards Implementation on 2–4 December in Riyadh, where the STUK experts took part too. On 15–19 December, STUK organised, for the experts of K.A.CARE, "the SSAC Workshop" in Finland. The cooperation has been good and fruitful and will continue with many training, guideline, inspection practices workshops over the next few years.

Figure 5. STUK visit to K.A. CARE.

Figure 6. Familiarisation with the SSAC.

3 Safeguards activities in 2014

3.1 The regulatory control of nuclear materials

STUK continued with national safeguards measures as in the past. Nuclear material inventories at the end of 2014 are shown in Tables A1 and A2 in Appendix 1. The development of inspections and inspection person days per Material Balance Area (MBA) is presented in Figures 7 and 8. Inspections by STUK, the International Atomic Energy Agency (IAEA) and the European Commission in 2014 are presented in Appendix 2.

The application of integrated safeguards began in Finland on 15 October 2008. Thus, in 2009 the number of IAEA inspections was reduced from approximately 30 person days to 15. Similarly, the Commission reduced its inspection activities significantly. In 2010, the number of inspection days rose somewhat, due to the first inspections at the geological repository site, additional inspection days at the Loviisa Nuclear Power Plant (NPP), and the increased number of random inspections in Finland. Since 2010, the number of regular in-

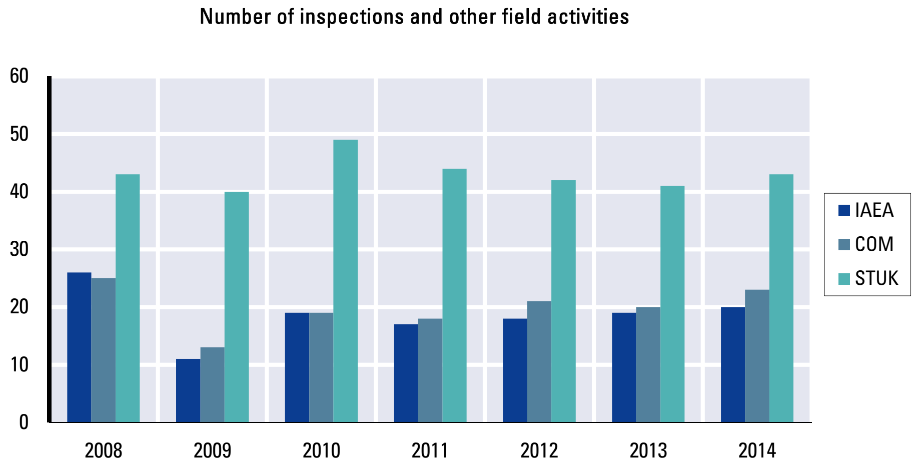

Figure 7. The number of inspections from 2008 to 2014.

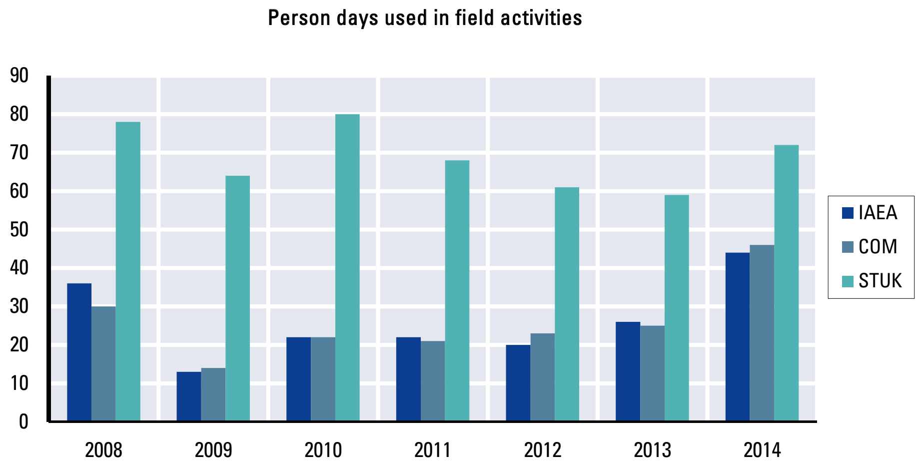

Figure 8. Inspection person days from 2008 to 2014.

spections has remained at the same level, i.e. the current number of annual IAEA inspection days is about 25 person days in Finland. In 2014, the IAEA and the Commission carried out an extensive inspection in the planned geological repository. During the one-week long survey campaign in Onkalo, 65 person days ware spent by the inspectors, technicians and supporting JRC staff. Only the inspector days are estimated in the figures.

3.1.1 Declarations and approvals of new international inspectors

All the relevant licence holders sent their updated information for the national declaration, which is compiled by STUK, in time by 1 April. STUK submitted Finland's annual declaration updates to the IAEA on 15 May 2014 as required. Additionally, STUK submitted the quarterly declarations on exports in February, May, August and November.

In 2014, altogether 21 IAEA and 10 Commission inspectors, newly appointed, were approved to perform inspections at nuclear facilities in Finland.

3.1.2 The Loviisa nuclear power plant site

In total, STUK performed 14 safeguards inspections at the Loviisa NPP in 2104. The routine refuelling outage of the Loviisa 1 reactor unit took place during the period 20 July – 10 August 2014 as well as the outage of the Loviisa 2 reactor unit during the period 16 August – 20 September 2014. STUK, the IAEA and the Commission performed a Physical Inventory Taking (pre-PIT) inspection before the outage, on 15 – 17 July 2014. Temporary surveillance cameras were installed in the reactor halls for the outage period, and removed during the Physical Inventory Verification (PIV) carried out after the outage, on 1 – 2 October 2014. During the outage and before the closing of each reactor, the IAEA, Commission and STUK verified partially filled transfer casks whenever a transfer to/from a reactor took place, while the reactor lid was open. In 2014 three such inspections took place, on the 21 and 22 August and on 3 September. STUK identified the fuel assemblies in the reactor cores and item-counted the fuel assemblies in the loading ponds. The Loviisa 1 core was inspected on 27 July 2014 and the Loviisa 2 core on 6 September 2014. In addition to the PIV and the core controls, STUK carried out one routine inspection on its own and two together with the IAEA and the Commission. One three-day inspection was performed by the IAEA, Commission and STUK to install equipment for remote data transmission (RDT), Figure 9.

On the basis of its own assessment as well as

Figure 9. Installation of surveillance equipment for remote data transmission at the Loviisa NPP.

that of the IAEA and Commission inspection results, STUK concluded that Fortum's Loviisa NPP complied with its nuclear safeguards obligations in 2014.

3.1.3 The Olkiluoto nuclear power plant site

In 2014, STUK granted to TVO three import licences for importing fresh nuclear fuel.

The refuelling and maintenance outage of the Olkiluoto 1 reactor unit took place during the period 11–29 May 2014, and that of the Olkiluoto 2 reactor unit during the period 1–9 June 2014. The PIV was carried out after the outage on 12 June 2014 in the two reactor units. The spent fuel storage PIV was carried out separately on 25–26 June.

During the refuelling and maintenance outage, STUK identified the fuel assemblies in the reactor cores and verified as well as item-counted in the loading ponds before the reactors were closed. The Olkiluoto 1 reactor was inspected on 26 May 2014 and the Olkiluoto 2 reactor on 7 June 2014.

STUK carried out two additional routine inspections at the Olkiluoto site and the material balance areas (MBA) at the Olkiluoto NPP. During the year, the spent fuel storage enlargement project reached the final stages, and the first ones of the ponds were covered with the massive shielding plates that will prevent regular verification activities in the future.

The annual design information verification inspection in the Olkiluoto 3 unit was carried out on 5 November 2014. The MBA code W0L4 was assigned to Olkiluoto 4 unit already in 2013. During 2014 there was no progress with regard to safeguards at the new unit. TVO applied for an extension for Decision-in-Principle granted for 5 years in 2010. STUK evaluated the application and did not oppose the extension, but the application was denied by the Government. Thus, the timeline to submit the nuclear construction licence application for unit 4 remains summer 2015.

In 2014, STUK approved one person as the safeguards responsible person, and one person as a deputy for the safeguards responsible person for the Olkiluoto power plant.

On the basis of its own assessment as well as the IAEA and Commission inspection results, STUK concluded that TVO's Olkiluoto NPP complied with its nuclear safeguards obligations in 2014.

3.1.4 The Hanhikivi nuclear power plant project

The Government approved a Decisions-in-Principle in 2010 for the new operator Fennovoima to construct a new nuclear power plant at a new site. STUK initiated negotiations with the operators and the Commission as well as with the IAEA in 2011 to prepare for the implementation of safeguards in good time, simultaneously with the facility development. As a consequence, the company could request the vendor organisations to facilitate safeguards implementation; for example, to improve proliferation resistance and facilitate nuclear material verification and surveillance at the future plant. In the meantime, Fennovoima created an organisation for safeguards and prepared for the implementation of safeguards.

One of the first steps in the construction process is the control of nuclear technology, such as sensitive information obtained from the bidding companies. During 2014, STUK granted to Fennovoima four licences for the import and possession of nuclear technology (nuclear information), and two of them also included transfer of the technology to the subcontractors. It was obvious that the first version of the nuclear materials handbook should focus on the current needs to control the nuclear technology and dual-use equipment. Thus, Fennovoima submitted its safeguards manual "Fennovoima Managements System: Nuclear Materials Manual" to STUK for approval in May 2014. STUK approved the manual on 4 July 2014.

As the option of having Rosatom as a vendor candidate was not included in the application ratified in 2010, the re-assessment of the already approved application began in 2013 for technical and organisational changes since the Decision-in-Principle. STUK gave its updated preliminary safety evaluation to the Ministry Employment and the Economy on 23 May 2014. STUK stated that the proposed AES-2006 plant can be constructed to fulfil the Finnish safety requirements at the Hanhikivi location specified by Fennovoima. However, in STUK's opinion, Fennovoima must strengthen its expertise and develop its management system in general. From the safeguards point of view, the safeguards procedures have improved and important experience has been gained by the new stakeholder during the bidding phase. On 5 December 2014, the Parliament endorsed the

Decision-in-Principle of 2010 for the new reactor type with a requirement for reasonable domestic ownership. Owing to this, the nuclear construction licence application is expected to be submitted in 2015 in accordance with the 5-year timeline of 2010.

Based on the meetings on the implementation of safeguards and the control of nuclear technology with Fennovoima's staff, STUK concludes that awareness and preparedness for safeguards procedures are at an adequate level in the new organisation preparing for the new project.

3.1.5 The VTT FiR1 research reactor site

In 2014, the preparations for decommissioning the research reactor and those for the new nuclear safety centre building continued at the Technical Research Centre of Finland, VTT. STUK reviewed the decommissioning plans and made its statement about the Environmental Impact Assessment to the Ministry of Employment and the Economy.

In 2014, STUK carried out one interim inspection at the research reactor site of VTT. In addition, the site declaration and, in particular, the progress in construction activities, were checked a few times during the year. STUK and the Commission verified the nuclear material inventory of VTT on 3 October 2014. The nuclear material inventory was concluded to be correct during the inspection. However, the internal reporting of small amounts and batches was addressed and a few remarks were made. Also, the need to update the BTC was notified due to new nominations for responsible contact persons at VTT.

STUK and VTT responsible persons met twice and discussed future actions to ensure appropriate safeguards procedures. The update of the BTC for the reactor and the preliminary BTC for the new building of the VTT Centre for Nuclear Safety under construction were submitted to the Commission on 31 December 2014. The small amounts of nuclear material used in the laboratories located in the reactor building will be moved to the new building once it is commissioned. The current target is at the beginning of 2016. The aim is to have separate MBAs for the two separate VTT buildings with different activities. The site delimited according to the Additional Protocol covers only the reactor building. In addition, VTT prepared a separate safeguards manual to cover the responsibilities to report and control the research and development activities defined in the Additional Protocol. These activities are carried out in several buildings in the research campus area in Espoo.

On the basis of its assessment and inspection results, STUK concluded that VTT complied with its nuclear safeguards obligations in 2014.

3.1.6 STUK site

STUK Nuclear Materials Section verified the physical inventory, and inspected the site declaration and basic technical characteristics during the inspection on 10 December 2014. Also, the draft for the new safeguards manual was reviewed. Thus, it can be concluded that the operating unit at STUK fulfils the requirements for national safeguards arrangements.

3.1.7 University of Helsinki site

STUK carried out its inspection to the University of Helsinki site on 5 March 2014 to verify the site declaration and the inventory. The University prepared its nuclear material handbook in June 2014. The manual covers the control and reporting procedures for nuclear materials and also the action for reporting the research and development activities as defined in the Additional Protocol were added to the handbook. All these activities are carried out in the same building.

On the basis of its assessment and inspection results, STUK concluded that the University of Helsinki complied with its nuclear safeguards obligations in 2014.

3.1.8 Minor nuclear material holders

In 2014, STUK inspected the reports from the minor nuclear material holders. One minor holder reported termination of possession of nuclear material. The licence of the University of Jyväskylä was renewed; and, a new licence was granted to Aalto University. The minor holders were requested to prepare their nuclear materials handbooks as required in the new STUK regulation, the Guide YVL D.1. These were prepared during the year, but the approval process will continue in 2015.

On the basis of its assessment, STUK concluded that the minor nuclear material holders complied with their nuclear safeguards obligations in 2014.

3.1.9 Front-end fuel cycle operators

The operators at Harjavalta and Kokkola report monthly to the Commission and STUK. The extraction of uranium from industrial purification processes is considered to be a pre-safeguard activity and therefore not subject to IAEA safeguards. With the entry into force of Guide YVL D.1 imminent, the operators are preparing their procedures to fulfil the new requirements. In particular, the nuclear safeguards manual are to be incorporated into the quality managements systems. During the year 2014, STUK reviewed the draft versions of the manuals prepared by Norilsk Nickel Harjavalta and Freeport Kokkola. On the basis of its assessment, STUK concluded that these operators complied with their nuclear safeguards obligations in 2014.

During early 2011, STUK evaluated the licence application of Talvivaara Sotkamo Ltd to begin uranium production as a by-product at the Talvivaara nickel mine. On 1 March 2012, the Finnish government granted a licence in accordance with the Finnish nuclear legislation to Talvivaara Sotkamo Ltd for the extraction of uranium from the Talvivaara mine. According to the licence conditions, STUK must ensure that all relevant arrangements are in place, including the nuclear safeguards manual and responsible persons for nuclear materials accountancy before the plant is commissioned. During 2011–2013, the uranium extraction plant was built as a new unit in the mineral processing complex. Progress in uranium extraction was halted on 5 December 2013 when the Supreme Administrative Court revoked the licence of 1 March 2012 to extract uranium for reassessment by the Finnish government. According to the Supreme Administrative Court, there were several changes in the operations of Talvivaara Sotkamo Ltd following the permit decision, including corporate reorganisation. Before the ruling, the government must reassess the licence application documentation and, if needed, obtain additional information on the economic and safety-related requirements set forth in the Nuclear Energy Act. Moreover, during 2014 the Talvivaara Sotkamo Ltd. continued for restructuring and finally filed for bankruptcy on 6 November 2014. The parent company Talvivaara Mining will provide support for the bankruptcy proceedings. There were no safeguards activities at Talvivaara in 2014.

3.1.10 The final disposal facility site for spent nuclear fuel

After the submission of the nuclear construction licence application in 2012, several meetings were arranged between STUK, the Commission and the IAEA during 2013 and 2014, in order to clarify and facilitate safeguards measures for the final disposal of spent nuclear fuel. These meetings focused on the verification issues prior to spent fuel encapsulation. The requirement document for the IAEA/EC equipment to be installed in the encapsulation plant was prepared and finalised in 2014.

In order to clarify the inspection procedures in the future repository, a technical meeting was arranged by the IAEA, to take place in Vienna on 23 September June 2014. This was followed on 24 September 2014 with the trilateral meeting where it was confirmed that “scanning of the Onkalo tunnels using 3D laser will be important, not only for Safeguards but for future generations to be provided with a full and well-defined picture of where the nuclear material is located”.

Before the September meetings at the IAEA Posiva submitted an update of the Basic Technical Characteristics (BTC) for the geological repository on 17 September 2014. However, during 3 – 7 November 2014, four survey teams consisting of the Commission, JRC/Ispra and the IAEA inspector and technicians independently mapped the underground premises using laser scanning devices (Figures 10 and 11), as agreed in the September meetings. All teams were escorted by operator’s staff. The access tunnel was reserved for the surveyors and, in addition one meeting room was reserved for the data processing team for the whole week. Finally, the underground premises were confirmed to correspond to the drawings that were available at the construction site, with a minor remark on drawing accuracy. Owing to the security-relevant nature of the detailed information, all the data collected and drawings inspected were left in several sealed copies at the site.

Posiva updated its safeguards manual in spring 2014 mainly to correspond to organisational changes and current safeguards practices. During 2014, STUK approved the manual update and carried out two interim inspections at the underground premises. These focused on the completeness and correctness of the operator’s data, drawings and reports. On the basis of its assessment and inspection results, STUK concluded that Posiva complied with its nuclear safeguards obligations in 2014.

3.1.11 Verification of spent fuel

In January 2014, STUK tested the prototype of a Passive Gamma Emission Tomography (PGET) device with hexagonal fuel at the Loviisa NPP, with promising results. The PGET is designed to be able to detect even single-pin diversions from spent nuclear fuel. The PGET technology is a strong candidate for the NDA verification of spent nuclear fuel before the fuel is placed in the final repository. There is a special need for good verification at that stage, as the fuel becomes impossible to reach for

Figure 10. 3D laser scanner in Onkalo (photo: JRC).

Figure 11. Design information verification in Onkalo (photo: JRC).

verification once it has been deposited deep in the bedrock. All measured fuel elements were verified to hold spent nuclear fuel in a pin configuration corresponding to operator data. One of the measured fuel elements had three pins substituted by zirconium pins, and they were correctly detected with the measurement. The test at Loviisa showed that the device is capable of detecting single pin diversion from hexagonal fuel. In addition to STUK and TVO staff, technical experts of the device and observers from the IAEA and the Commission participated in the campaign. The elements measured during the campaign were also measured with a Fork device, to provide data for comparison.

In November 2014 STUK performed a Gamma burn-up verification (GBUV) measurement campaign at the Olkiluoto NPP. During the campaign, 49 fuel elements were measured and verified as spent fuel. One fuel element with a missing pin provided a result that differed significantly from the expected value, showing the power of this verification method.

A planned FORK measurement campaign at the Loviisa NPP in December was aborted, due to technical problems with the fuel transfer machine at the storage pond.

3.1.12 Nuclear dual-use items, export licences

In 2014, the Ministry for Foreign Affairs issued seven export licences for NSG Part 1 items: two individual licences to the Russian Federation and one to the UK, together with four global licences for exporting nuclear technology (nuclear information) for a nuclear power plant.

3.1.13 Transport of nuclear materials and nuclear waste

In 2014, fresh nuclear fuel was imported to Finland from Germany, Sweden and the Russian Federation (Table A1, Appendix 1). In relation to these imports, STUK approved three transport plans and one transport package design. Furthermore, STUK approved one plan and permit for transport with specific arrangements in category 7 materials and nuclear waste treatment outside Finland.

STUK inspected fresh nuclear fuel transports in accordance with the inspection plan (two inspections). The inspections were performed in cooperation with the police.

3.1.14 International transfers of nuclear material

In 2014, TVO reported to STUK about its international fuel contracts, fuel transfers and fuel shipments. Based on the document inspection findings, STUK concluded that TVO has complied with its safeguards obligations when purchasing the nuclear fuel and managing its international nuclear material transfers. The other operators purchase fuel as an end-product, and thus their accountancy does not need to cover the purchase chain abroad. In 2014, STUK approved one person as a deputy for the safeguards responsible person with the responsibility for the international transfers of TVO's nuclear material. Furthermore, STUK approved the safeguards manual concerning TVO's international transfers of nuclear material.

3.1.15 Other stakeholders

In 2014, STUK granted three licences to expert organisations to possess and transfer nuclear technology (nuclear information) related to the Fennovoima project.

In 2014, research organisations and universities that perform research and development work defined in the Additional Protocol were requested to nominate their responsible persons and prepare a safeguards manual. Since the work does not need a licence, these contact persons were not officially approved by STUK. The approval of the manuals will take place in 2015.

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

3.2.1 International cooperation is the foundation of CTBT verification

During 2014, 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). WGB 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), the FiNDC can provide technical expertise to the CTBTO, while also attending to Finnish national interests.

3.2.2 The analysis pipeline is a well established daily routine

The FiNDC routinely analyses all radionuclide measurement data generated at the IMS radionuclide stations across the world. 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. The IMS network is still developing, and the number of installed air filter stations was 66 at the end of 2014 (in the final stage there will be 80).

The number of IMS stations equipped with radioxenon measurement capabilities was 30 at the end of 2014. 22 IMS radioxenon systems were certified by the CTBTO at the end of 2014. Radioxenon measurements are especially important for CTBT verification, because xenon, as a noble gas, may also leak from underground tests, which seldom release particulate matter. The operational stations generated more than 1,000 gamma and beta-gamma spectra per day for the FiNDC analysis pipeline to handle. The particulate pipeline is well-established and has been running stably for many years, while FiNDC still needs some refinement of its xenon analysis capabilities.

In 2014, there were no indications of nuclear testing in the data provided by the CTBTO; neither were there any alarms by the Finnish Institute of Seismology or any other indications of possible nuclear tests that would have required the special attention of the FiNDC. Xenon radioisotopes released from medical isotope production facilities and NPPs are regularly measured all around the globe. Anthropogenic nuclides with CTBT relevance, mainly ^{99}Tc, ^{131}I from medical isotope production and ^{137}Cs from Chernobyl and Fukushima fallout are regularly measured at some particulate stations.

3.3 International cooperation

The implementation of safeguards in Finland was addressed at several meetings with the IAEA and the Commission. In addition, STUK continued its participation in the ESARDA working groups, executive board and the steering committee meetings. The head of STUK's Security Technology Laboratory continued his term as the chairperson of the ESARDA Novel Approaches/Novel Technologies Working Group. A STUK safeguards expert was invited to take over the vice-chair of the Verification Technologies and Methodologies (VTM) Working Group. The IAEA organised the workshop on synergies between safety, security and safeguards especially for the nuclear newcomer states, and the STUK expert recounted experiences of existing and new Finnish nuclear programmes. STUK experts also provided a few presentations at the INMM annual meeting, and in particular at the IAEA safeguards symposium in October 2014.

The progress at the Olkiluoto 3 unit, which has been under construction since 2003, and the more current authorisation of the planning and design of new nuclear facilities in 2010 have given STUK practical experience in implementing safety, security and safeguards for new nuclear facilities. Owing to this, STUK experts have been invited on several occasions to provide guidance and share their experiences. Some of this activity has been facilitated via the Finnish Support Programme to the IAEA, but there have also been other mechanisms available to contribute to the worldwide cooperation. In addition, the new facilities at the front- and back-ends of the fuel cycle – i.e. the extraction of uranium in mining and milling and the development of the geological repository – have widened the capabilities and scope of the Finnish national safeguards system.

Finland's bilateral cooperation programmes in the area of non-proliferation are directed mainly towards its neighbouring countries outside the EU and are motivated by the continued need to enhance the regional security environment. Accordingly, STUK continued its cooperation programme with the Russian Federation. Collaboration with Ukraine in mutually beneficial areas was re-established in 2008, and an agreement about a programme was made between STUK and the State Nuclear Regulatory Committee of Ukraine (since 2011, the State Nuclear Regulatory Inspectorate of Ukraine (SNRIU)). Due to constrained human and financial resources, STUK was not in a position to manage projects; however, STUK continued providing limited expert support to capacity building in 2014.

3.3.1 Support programme to the IAEA

The Finnish Support Programme to the IAEA Safeguards (FINSP) is financed by the Ministry for Foreign Affairs and coordinated by STUK. The FINSP was established in May 1998, and celebrated its 25th anniversary in February 2014 in Vienna with colleagues from the IAEA and other Member States Support Programmes. The history of FINSP was described at the INMM meeting in 2013. The total cumulative budget over these 25 years approaches €10M.

Politically, the FINSP can be seen as support to the NPT verification regime and as a demonstration of strong commitment to non-proliferation. Signing NPT and the Comprehensive Safeguards Agreement means an engagement to an undertaking to cooperate in order to enable efficient implementation of the IAEA safeguards system. A State Support Programme is an excellent voluntary mechanism to that end. However, from the technical point of view, FINSP helps the IAEA to develop its safeguards concepts and technologies.

The most demanding task in recent years has been the JNT A 1510 Proto-type Tomographic Spent Fuel Detector System. Its goal is to develop a passive gamma emission tomographic verifier. In 2012–2014, three successful campaigns were conducted. The first was held in Ispra in June 2012, the second in Olkiluoto in March 2013, and the third in Loviisa in January 2014. It is now shown that the prototype system is able to generate a cross-sectional activity map of a spent fuel item, and is able to detect a single missing pin inside a VVER-440 fuel assembly. IAEA and FINSP have opened another task for implementation support of the tomography. The aim is to develop the prototype into a functional and operational inspection tool for the IAEA.

Another task worth mentioning is the Newcomers Task: the FIN B 1939 Support for Newcomers States Pursuing a Nuclear Power Programme. Many new states want to join the "Nuclear Family" and are planning their nuclear power programmes. For the IAEA safeguards, this is a challenge and a source of extra workload. Under the task B 1939, Finland provides peer support to the newcomers and tries to provide answers to their practical questions. Our experiences are relevant, because in Finland there are nuclear power reactor construction projects actually going on. Regulatory Authority and nuclear operators are all involved in the task and in the issues of nuclear safety and security in the internal workshops. However, "one size does not fit all" and replicating Finnish system all round the globe as such is most likely not the correct solution. What FINSP can do is to show how the operator-authority interface works in Finland. FINSP hosted a workshop in Helsinki and in Olkiluoto on 1–5 September 2014. The contribution of TVO and Posiva is greatly appreciated.

FINSP has also organised NDA training for the IAEA inspectors. A Spent Fuel Verification Training Course was held at Loviisa NPP on 29–31 October 2014, with the support and cooperation of the NPP operator Fortum.

3.3.2 Final disposal programme and the ASTOR group

The programmes for a geological repository for spent nuclear fuel in Sweden and Finland have reached the licensing phase, and the safeguards measures must be agreed to by all parties: facility designers, operators and the inspectorates. Thus, the IAEA and the Commission presented their safeguards approaches at the last Application of Safeguards to Geological Repositories (ASTOR) group's meetings. In 2014, the group of experts met in Oskarshamn, Sweden on 19 – 21 May. There were almost 50 participants attending the meeting and excursions to the canister laboratory and underground spent fuel storage facility, as well as the Äspö hard rock laboratory. The next ASTOR meeting will be hosted by Korea in 2015.

A new task force consisting of the IAEA, the Commission and Finnish and Swedish authorities and operators was established at the 2012 ASTOR meeting. The first Lower Level Liaison Committee (LLLC) Encapsulation Plant and Geological Repository (EPGR) Liaison Group meeting was scheduled for January 2013 to discuss the draft versions for Basic Technical Characteristics of the encapsulation plant and the geological repository. The Committee did meet officially during neither 2013 nor 2014, but IAEA and the Commission representatives commented on the preparation of the BTC documents during spring 2013 as described in Chapter 3.1.10. Within this framework the requirement document for the IAEA/EC equipment to be installed in the encapsulation plant was prepared and included in the licensing conditions, as described in Chapter 2.2.

3.3.3 Cooperation with Rostechnadzor and Rosatom, Russia

Cooperation between Finnish and Russian authorities, technical support organisations, industrial partners and the status of the cooperation programme were reviewed at the regular meeting in February 2014. The fully functional spent fuel attribute tester (SFAT) measurement device for the Rostechnadzor was delivered from STUK for use by the inspectors of the Ural Regional Office at Mayak in 2014. To successfully complete the project training was provided by STUK for Rostechnadzor inspectors and operators of the Mayak reprocessing plant at STUK and at the Loviisa NPP autumn 2014. This bilateral work complements the work done within the EU financed TACIS project, which aims at improving the supervision and control of the handling of nuclear materials at the Mayak plant.

During 2014, the planning of the seminar aimed at enhancing control of radioactively contaminated scrap metal consignments continued. The seminar on knowledge-sharing on maritime transportation of nuclear and other radioactive materials in the Baltic Sea region was conducted by STUK on 11 – 12 February 2014, in cooperation with the Expert Group on Nuclear and Radiation Safety (EGNRS) of the Council of the Baltic Sea States and the Baltic Sea Regional Boarder Coordination Committee. In 2014, the Russian Federation – i.e. the Khlopin Radium Institute of Rosatom – took over the chairmanship of the ERGNRS, after the previous three-year position enjoyed by STUK.

3.3.4 Capacity building in Ukraine

From 2009 to 2010, the focus of the programme with Ukraine was on manufacturing and delivering a mobile laboratory vehicle for the use of the State Nuclear Regulatory Inspectorate of Ukraine (SNRIU). The mobile measuring laboratory called Sophisticated ON-site Nuclide Identification (SONNI) enables the identification and analysis of radioactive sources and nuclear materials in the environment, at industrial facilities and in cases of threatening situations. At locations where the vehicle cannot have access, a portable application with the same functionality can be used. The modern radiation measuring vehicle together with the portable application unit was donated to the IAEA and further to SNRIU in Kiev in December 2010. Since then educational sessions have been organised to train the new crews with field exercises. The capacity building in this area is financed by the Ministry for Foreign Affairs. As continuation to this training, a new project was approved by the European commission to strengthen SNRIU's capabilities to provide independent radiation monitoring using the mobile laboratory. The practical exercises in 2013 focused on territories with medical institutions that use radiation and nuclear technologies, and round uranium mining and milling facilities. Special emphasis was given to the use of the mobile laboratory as part of normal regulatory activities. These projects were successfully completed during in 2014.

In addition, another EU project was implemented to enhance border control functions by providing conventional radiation detectors and new technical means for protection against chemical, biological, radiological and nuclear (CBRN) threats. Training was arranged for border control officers at the selected border stations between Poland and Ukraine in November 2012. This EU-funded project was completed during 2013 and, as a consequence, Ukraine provided several project proposals to be coordinated and funded within the G8 Global Partnership process. The European commission also indicated its willingness to re-allocate funds for Ukraine in future.

3.4 Radiation monitoring at border crossing stations

STUK and Finnish Customs have a joint project for the radiation border monitoring of Finnish border-crossing stations. The upgrading project, RADAR, continues until 2015. In 2014, the project maintained the existing systems and planned the procurements, which will take place in 2015. Border monitoring has several aims: it helps to find sources which are beyond regulatory control, and it is also part of the detection architecture combating the illicit trafficking of radioactive and nuclear materials, the proliferation of weapons of mass destruction, and nuclear terrorism.

STUK was also involved in the development of nuclear detection architecture together with other authorities such as the Customs, Police and Border Guard, etc. This also has an international dimension in the Baltic Sea region, as described above in subsection 3.3.3. Finnish and Russian Customs authorities in cooperation with STUK organised a cross-border exercise in September 2014.

4 Human resources development

Nuclear materials safeguards implemented by the Nuclear Materials Section of STUK cover all typical measures of a State System of Accounting for and Control of Nuclear Materials (SSAC), and many other activities besides. The nuclear fuel cycle-related activities such as research and development activities not involving nuclear material or the manufacture of certain equipment as defined in the Additional Protocol have extended the scope of traditional safeguards. Nuclear safeguards on the national level are closely linked with the 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). The continuous analysis of the developments in the involved fields of both technology and politics is a daily, multidisciplinary task in the STUK Nuclear Materials Section. Most of the experts working in Nuclear Materials Sections have also been reserved to work for STUK's Emergency Preparedness as experts and in case of emergency. That is a good overall view of the whole scale work of STUK, and continuous training keeps experts in touch.

The personnel's competence is systematically developed, taking into account the needs of the organisation and the wishes of individuals. Those aiming at an expert's career are valued as highly as those interested in managerial duties. One of the inspectors attended the Euratom training course on European Nuclear Safeguards in Luxembourg. Nuclear material section has developed its activities in workshops. In 2014, one workshop was held on the subject of a good and effective working community.

Because of the restrictions of the State budget and its consequences for STUK's resources, STUK undertook a reorganisation in accordance with its primary tasks in 2014 and initiated the implementation of the consequent new organisation. Thus, when implementing the new strategy, it is important to launch a new kind of cooperation with other STUK units to optimise the use of skills and resources.

The work of a support group for the Nuclear Materials Section continued in 2014. The group provides the head of the Section with information and knowledge gathered by the group members during the years they have spent working in other organisations such as the IAEA. This enables discussion of important questions from various perspectives. The support group members are the directors of the Nuclear Waste and Material Regulation and four senior experts from a range of STUK organisational units. The group met only twice with a specific agenda on implementation of the Remote Data Transmission to the Finnish nuclear facilities.

The cooperation with other units is based on exchange of information, and consequent motivation and training. The Nuclear Materials Section held meetings with other STUK units to allocate synergies and activities which may be implemented in cooperation. For example, the spent fuel verification measurements in the current organisation are carried out by the staff of Environmental Radiation Surveillance. In this unit, there are experts on measurements and analysis, and they also play an important role in Emergency Preparedness because they prepare estimations of how the radioactivity from a reactor will disperse. It is also a challenge for them to familiarise themselves with the fuel and nuclear power plants. In addition, STUK Radiation Practices Regulation carries out regular inspections of organisations that use radioactive sources and small amounts of nuclear

The experts working for nuclear materials control. All staff members participate in the core safeguards tasks. Additionally, each person has some special areas of expertise to focus on.

Ms. Elina Martikka	Section Head	Management
Ms. Ritva Kylmälä	Assistant	Day-to-day business, archiving
Mr. Timo Ansaranta	Inspector	Control of operators' competence at facilities, inspections, declarations
Mr. Marko Hämäläinen	Senior Inspector	Safeguards regulation, Inspection coordination, Additional Protocol-related matters
Mr. Tapani Honkamaa	Senior Inspector	FINSP to the IAEA safeguards, measurements and verification methods
Mr. Mikael Moring	Senior Inspector	Finnish National Data Centre for the CTBT, safeguards for final disposal
Mr. Olli Okko	Senior Inspector	Safeguards for geological repository, Additional Protocol-related oversight of R&D activities
Mr. Timo Wiander	Senior Inspector	Safeguards inspections and information security

materials. During such inspections, it is possible to perform nuclear safeguards inspection in accordance with the training and check-list previewed by the Nuclear Materials Section. Nuclear security and safeguards may have varied aspects to the control of nuclear materials. Therefore, it is necessary to have close cooperation between these two units. Cooperation and good communication between different departments and units improve nuclear safety, security and safeguards in general. Information security is a joint concern of both units.

The distribution of the working days of the Nuclear Materials Section in the different duty areas is presented in Figure 12. Most of the working days are invoiced to the stakeholders. As seen in Figure 12, the duty areas are divided into those of direct oversight and inspections (basic operations), support functions including maintenance, development work for the regulatory functions and consultancy, including, e.g. international cooperation financed by the Ministry for Foreign Affairs or the EU. However, the state budgetary funding constitutes about 6% of the total funding of the Nuclear Materials Section.

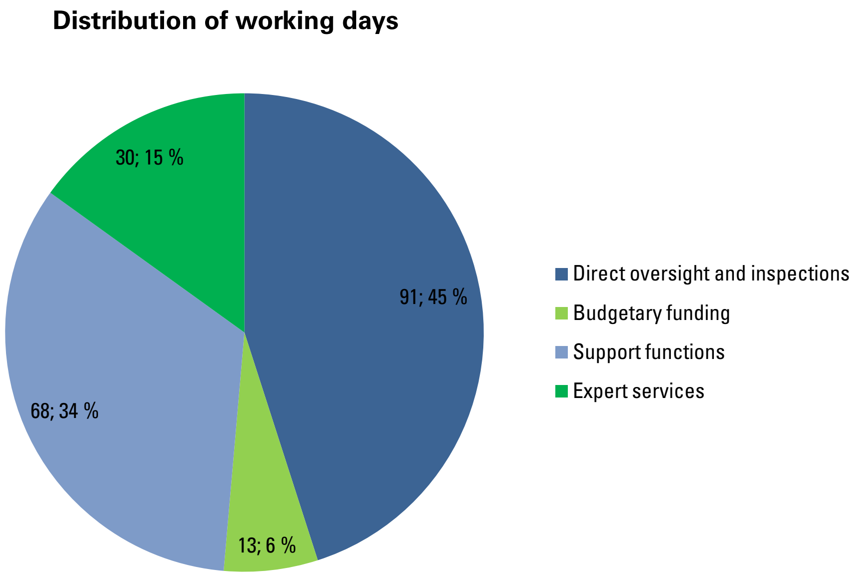

Figure 12. The distribution of working days of the Nuclear Materials Section in the various duty areas.

5 Conclusions

STUK continued with national safeguards measures and activities with 72 inspection days and 43 inspections. The implementation of the International Atomic Energy Agency (IAEA) integrated safeguards began in Finland on 15 October 2008. Since 2010, the number of IAEA and European Commission inspections annually has been close to 20. The implementation of the IAEA integrated safeguards reduces the total number of annual routine inspections days of the international inspectorates, but includes short-notice random inspections. In order to be present at all of the short-notice IAEA inspections, STUK has had a daily on-call inspector.

In 2014, STUK performed 32 safeguards inspections at the Finnish nuclear power plants (NPP), 14 at the Loviisa NPP and 18 at the Olkiluoto NPP. The Commission and the IAEA took part in 16 of these inspections. The number of inspections at Loviisa was higher than usual, due to the installation of new cameras that are suitable for remote data transfer. During the outages, the cask movements were also verified. At Olkiluoto NPP, the extension of the spent fuel storage and the installation of the pond covers resulted in some additional safeguards activities. STUK performed one non-destructive assay measurement campaign at the Loviisa NPP to test the passive gamma emission tomography prototype; the IAEA and the Commission participated in this campaign as observers. STUK performed one non-destructive assay measurement campaign at the Olkiluoto NPP. At other facilities, the Commission took part in the accountancy inspection and physical inventory verification at the VTT research reactor, and together with the IAEA in the BTC and design information verification of the planned geological repository at the final disposal site at Olkiluoto. The verification was carried out during a one-week long survey campaign by a joint team assisted by technicians from both inspectorates and the JRC. The total number of safeguards inspections in 2014 was 43 for STUK, 23 for the Commission, and 20 for the IAEA. The 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's remarks as well as with STUK's own findings; there were no outstanding questions by the IAEA or the Commission at the end of 2014.

The results of STUK's nuclear safeguards inspection activities 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. Neither the IAEA nor the Commission made any remarks, nor did they present any required actions based on their inspections. By means of 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 and non-proliferation. The main open concern at the IAEA was about the initiation of remote data transfer at the Olkiluoto NPP. In contrast to this, STUK pointed out the need to have safeguards requirements clarified for the geological repository before the licensing of the final disposal facility. In general, the subsidiary arrangements and facility attachments should be updated for old facilities, and prepared for new ones.

In 2014, STUK's Nuclear Materials Section cooperated closely with the IAEA in order to share experiences and train authorities' staff in countries that are aiming at nuclear programmes, i.e. uranium production or nuclear energy. STUK cooperated with Finnish Customs to offer expert advice in the development of radiation monitoring at borders, including training for Customs officers.

A major goal of all current Comprehensive Nuclear-Test-Ban Treaty (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 detection. 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 verification system has already demonstrated its ability to detect nuclear tests.

6 Publications

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Ingegneri M, Baird K, Park W-S, Coyne JM, Enkhjin L, Chew L S, Plenteda R, Sprinkle J, Yudin Y, Ciuculescu C, Koutsoyannopoulos C, Murtezi M, Schwalbach P, Vaccaro S, Pekkarinen J, Thomas M, Zein A, Honkamaa T, Hämäläinen M, Martikka E, Moring M, Okko O. Safeguards by Design at the Encapsulation Plant in Finland. IAEA Symposium on International Safeguards, 20–24 October 2014, Book of Abstracts, IAEA_CN-220-023, p. 207.

Martikka E, Ansaranta T, Honkamaa T, Hämäläinen M. Implementation Practices of Finland in Facilitating IAEA Verification Activities. IAEA Symposium on International Safeguards, 20–24 October 2014, Book of Abstracts, IAEA_CN-220-172, p. 189.

Okko O. (ed.). Implementing nuclear non-proliferation in Finland. Regulatory control, international cooperation and the Comprehensive Nuclear-Test-Ban Treaty. Annual report 2013. STUK-B 173. Helsinki: Radiation and Nuclear Safety Authority; 2014.

Okko O, Hack T, Hämäläinen M, Honkamaa T, Martikka E, Moring M. Developing Safeguards for Final Disposal of Spent Nuclear Fuel in Finland. IAEA Symposium on International Safeguards, 20–24 October 2014, Book of Abstracts, IAEA_CN-220-131, p. 206.

Peräjärvi K. Novel coincidence techniques, detectors and concepts for safety, security and safeguards. Acta Physica Polonica B 2014; 45: 533–544.

7 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

DIQ
Design Information Questionnaire

DIV
Design Information Verification

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)

INMM
Institute of Nuclear Materials Management

IPPAS
International Physical Protection Advisory Service

IRRS
Integrated Regulatory Review Service

IS
Integrated Safeguards

ISSAS
International SSAC Advisory Service

ITU
Institute of Transuranium Elements in Karlsruhe

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

JRC
The Joint Research Centre

KMP
Key Measurement Point

LEU
Low-enriched uranium

LINSSI
an SQL database for gamma-ray spectrometry

MBA
Material Balance Area

MEE
Ministry of Employment and the Economy

MFA
Ministry for Foreign Affairs

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

NRC
U.S. Nuclear Regulatory Commission

OECD/NEA
Organisation for Economic Cooperation and Development /Nuclear Energy Agency

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

PGET
Passive Gamma Emission Tomography

PIT
Physical Inventory Taking

PIV
Physical Inventory Verification

PSP
Particular Safeguards Provisions

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

Pu
Plutonium

RL07
Radionuclide Laboratory in the CTBT IMS network hosted by STUK (FIL07)

SA
Subsidiary Arrangements

SFAT
Spent Fuel Attribute Tester

SNRCU
State Nuclear Regulatory Commission of Ukraine

SNRI
Short Notice Random Inspection

SNRIU
State Nuclear Regulatory Inspectorate of Ukraine

SNUICA
Short notice, unannounced inspection, complementary access, on-alert inspector

SSAC
State System of Accounting for and Control of Nuclear Materials

SSM
Swedish Radiation Safety Authority

Th
Thorium

U
Uranium

UI
Unannounced Inspection

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 2014

Table A1. Summary of nuclear fuel receipts in 2014.

To	From	FA	LEU (kg)
Olkiluoto 1, WOL1	Germany	110	19 181
Olkiluoto 2, WOL2 (1/2)	Sweden	110	19 047
Loviisa NPP, WLOV	Russian Federation	162	20 314

FA = fuel assembly; LEU = low-enriched uranium.

Table A2. Fuel assemblies at 31 December 2014.

MBA	FA/SFA *)	LEU (kg)	Pu (kg)
Olkiluoto 1, WOL1	1 223/631	209 056	997
Olkiluoto 2, WOL2	1 242/666	207 214	1 000
Olkiluoto, spent fuel storage, WOLS	7 007/7 007	1 183 718	9 977
Loviisa NPP, WLOV	5 631/4 849	654 914	6 007

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

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

Table A3. Total amounts of nuclear material at 31 December 2014.

MBA	Natural U (kg)	Enriched U* (kg)	Depleted U (kg)	Plutonium (kg)	Thorium (kg)
WOL1	–	209 102	–	998	–
WOL2	–	207 260	-	1 001	–
WOLS	–	1 183 718	–	9 977	–
WLOV	–	654 915	–	6 007	–
WRRF	1 511	60.098	0.002	< 0.001	0.044
WFRS	0.632	0.537	369.0	~ 0	0.220
WKKO	2 709.7	–	–	–	–
WNNH	2 623.55	–	–	–	–
WHEL	49.716	0.293	20.010	0.003	2.942
Minor holders	0.834	0.00116	1 179.2	~ 0	0.341

MBA = material balance area, WRRF = VTT Research Reactor, WFRS = STUK, WKKO = Freeport Cobalt Oy, in Kokkola, WNNH = Norilsk Nickel Harjavalta, WHEL = Laboratory of Radiochemistry at the University of Helsinki, U = uranium. *) Less than 150 g of high-enriched uranium, mainly used in detectors.

APPENDIX 2 Safeguards field activities in 2014

General information			Inspections			Inspection person days		
MBA	**Date**	**Inspection type**	**IAEA**	**COM**	**STUK**	**IAEA**	**COM**	**STUK**
WOL2	12 February	SNRI	1	1	1	1	1	2
WOLF	20 February	As built DIV	0	0	1	0	0	1
WHEL	5 March	PIV, site check	0	1	2	0	1	2
WLOV	6 March	Extra (change of surveillance system memory cards)	0	1	1	0	1	1
S SF VTT1	16 March	Site check	0	0	1	0	0	1
S SF POS1	19 March	Site check	0	0	1	0	0	1
S SF STUK	19 March	Site check	0	0	1	0	0	1
WOL1, WOLS	3 April	Interim inspection, site check	0	0	3	0	0	3
WLOV	3 April	Interim inspection, site check	0	0	2	0	0	2
WOLF (Posiva)	23–24 April	System inspection (management system, safeguards with security)	0	0	1	0	0	4
WOL1,WOL2	29–30 April	Pre-PIT	2	2	2	2	2	2
WOLS	21 May	SNRI	1	1	1	1	1	1
WOL1	26 May	OL1 core verification	0	0	1	0	0	1
WOL2	7 June	OL2 core verification	0	0	1	0	0	1
WOL1, WOL2	12 June	PIV (BTC review)	2	2	2	2	2	2
WLOV	12 June	Interim inspection	0	0	1	0	0	2
WOL1,WOL2, WOLS	25–26 June	WOLS PIV + EOSS/DSOS service in WOL1/WOL2	3	3	3	6	3	3
WLOV	8–10 July	RDT equipment installation (replacement of DSOS with NGSS)	1	1	1	3	3	5
WLOV	15–17 July	Pre-PIT	1	1	1	3	3	3
WLOV	28 July	Lo1 core verification	0	0	1	0	0	1
WLOV	21 August	Transfer cask verification in Lo2	1	1	1	1	1	1
WLOV	23 August	Transfer cask verification in Lo2	1	1	1	1	1	1
WOLS	2 September	Pond covering (extra)	1	1	1	1	1	1
WLOV	3 September	Transfer cask verification in Lo2	1	1	1	1	1	1
WLOV	6 September	Lo2 core verification	0	0	1	0	0	2
WLOV	1-2 October	Post PIT, DIV	1	1	1	2	2	2
WRRF	3 October	PIV	0	1	1	0	1	2
WLOV (Fortum)	8-9 October	System inspection (management system, safeguards with security)	0	0	1	0	0	5
WOLS	4 November	Pond covering (extra)	1	1	1	1	1	1
WOL3	5 November	DIV	1	1	1	1	1	1
WOLF	3-7 November	DIV	1	1	1	13	15	5
WOL1	10 December	Interim inspection	0	0	1	0	0	1
WFRS (STUK)	10 December	System inspection	0	0	1	0	0	1
NDA MEASUREMENTS								
WLOV	13–17 January	PGET (also as equipment test, IAEA and EC as observers)	1	1	1	5	5	5
WOL2	4–6 November	GBUV	0	0	1	0	0	3
TOTAL			**20**	**23**	**43**	**44**	**46**	**72**

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

APPENDIX 3 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 2014 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 428/2009 setting up a Community regime for the control of exports, transfer, brokering, and transit of dual use items.

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.