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Report of STUK Activities in FINSP, IPNDV and GICNT Initiatives in 2021

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SÄTEILYTURVAKESKUS
STRÅLSÄKERHETSCENTRALEN
RADIATION AND NUCLEAR SAFETY AUTHORITY

Säteilyturvakeskus

Yhteiset asiantuntijapalvelut -osasto

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1 Finnish expertise for a safer world

The Treaty on the Non-Proliferation of Nuclear Weapons (NPT) entered into force in Finland in 1970. For fifty years, the treaty has been a key prerequisite for the peaceful use of nuclear energy in Finland, a country that, as a user of nuclear energy, has had solid grounds for preventing the proliferation of nuclear weapons.

The Ministry for Foreign Affairs of Finland (MFA) is financing the projects which are related to the non-proliferation, nuclear security and disarmament. The Radiation and Nuclear Safety Authority (STUK) has the technical expertise to offer for the projects. The good cooperation between MFA and STUK deepen the common understanding between the political and technical fields and enable Finland to have the best possible knowledge in international negotiations.

Finnish Support Programme to the IAEA safeguards (FINSP)

STUK coordinates and implements the Finnish Support Programme to the IAEA safeguards (FINSP). The objective of FINSP is to provide the IAEA support in well managed tasks related to development of safeguards verification methods and safeguards concepts, assisting safeguards implementation in the Member States and provide opportunities and support to the IAEA inspector training.

Global Initiative to Combat Nuclear Terrorism (GICNT)

Finland coordinated a development of a Joint Statement on National Nuclear Detection Architecture to the 2016 Nuclear Security Summit. This has and will continue to be an important document steering Finland’s contribution to the international nuclear security detection activities. This has enabled an active involvement of STUK experts in both the IAEA and GICNT nuclear security detection activities.

International Partnership for Nuclear Disarmament Verification (IPNDV)

IPNDV, established by the USA in 2014, is currently on its third phase. Third phase started in the beginning of 2020. The coronavirus pandemic has significantly hampered the implementation of ongoing phase. STUK acts as technical advisor to the MFA on International Partnership for Nuclear Disarmament Verification. This has enabled STUK experts to participate actively in the project since its beginning.

2 Finnish Support Programme to the IAEA Safeguards (FINSP)

2.1 Summary

The Radiation and Nuclear Safety Authority (STUK) coordinates and implements the Finnish Support Programme to the IAEA safeguards (FINSP). FINSP is financed by the Ministry for Foreign Affairs of Finland (MFA). MFA and STUK have made an agreement for implementation of FINSP for the term of three years 2019 – 2021. For 2021 MFA reserved funding of 224 000€. Actual expenditures of the Programme in 2020 was 195 161,59 €.

The main results of the FINSP are presented in this report. Main goals of the FINSP are training of IAEA inspectors and development of IAEA safeguards methods and concepts. FINSP had an annual review meeting with the IAEA on 23dr November as a videoconference.

Some goals of the programme were difficult to achieve because of travel restrictions due to the COVID-19 pandemic. Newcomers course to the embarking countries was once again cancelled. However, FINSP managed to arange three training events in November.

At the end of the year 2021 FINSP has 17 active tasks. Four new task proposals were accepted. One task was completed during 2021.

2.2 History and introduction

The Member States' Support Programmes (MSSPs) mechanism is specifically developed to support IAEA safeguards R&D needs. IAEA safeguards has no dedicated budget for research and development activities and the IAEA has neither specialized training facilities to train new Safeguards inspectors or to field test emerging technical development. Therefore, the IAEA is making use of voluntary support from the Member States. To meet this need, the Support Programme Mechanism was created. The first Member States Support Programme (MSSP) was established in 1978 by the United States of America. In Finland, different kinds of NDA verification methods were developed in the beginning of 1980's and measurement campaigns were organised in Loviisa and Olkiluoto nuclear power plants in cooperation with the IAEA. Officially FINSP was established on 31 May 1988.

The objective of FINSP is to provide the IAEA support in well managed tasks related to development of safeguards verification methods and safeguards concepts, assisting safeguards implementation in the Member States and provide opportunities and support to the IAEA inspector training.

At the end of 2020, altogether 21 Member States have a MSSP: Argentina, Australia, Belgium, Brazil, Canada, China, Czech Republic, Spain, Finland, France, Germany, Hungary, Japan, Netherlands, Republic of Korea, South Africa, Russia, Sweden, Switzerland, United Kingdom and United States. In addition, European Commission has one. Switzerland joined the group in 2021.

2.3 Administration and finance

FINSP is financed by Ministry for Foreign Affairs of Finland (MFA) and it is implemented and coordinated by STUK. In 2020 STUK has procured outside consultant services to assist in the implementation of the programme.

Cooperation with other MSSPs takes place in a majority of the tasks.

In STUK, FINSP is managed by Director Karim Peltonen and coordinated by Tapani Honkamaa.

In 2020, MFA budgeted altogether 224 000 € for FINSP implementation. Actual expenditures were 195 161,59 €. The expenditures were divided in three main categories: Training, development of methods and concepts and overall implementation. Budgeted and realized costs are shown in Table 1.

	Budgeted	Realized	Difference
Training 5550P-003601	125 000	119 680,27	5 319,73
Development of concepts and methods 5550P-003602	69 000	47 528,60	21 528,60
Implementation costs 5550P-003603	30 000	28 009,92	1 990,08
Total	**224 000**	**195 161,59**	**28 838,41**

Table 1. Budgeted and realized costs of FINSP in €.

2.4 Ongoing activities and tasks

At the end of December 2021 FINSP has 14 active tasks and one stand by task. The tasks are listed in Table 2.

ID	Title	MSSP POC	Official Start Date
FIN X 2635	Support for the 2022 Safeguards Symposium	HONKAMAA,Tapani	23/11/2021
FIN B 2601	Comprehensive Inspection Exercise (CIE) for New Inspectors	TUPASELA,Topi	05/05/2021
FIN X 2573	COMPASS: Comprehensive Capacity Building Initiative for SSACs and SRAs	MARTIKKA,Elina	03/02/2021
FIN E 2574	Support for an Improved Passive Seal System (IPSS)	HONKAMAA,Tapani	03/02/2021

FIN B 2566	IAEA Safeguards Traineeship Programme Support	HONKAMAA,Tapani	12/10/2020
FIN E 2528	Passive Tag Technology	HONKAMAA,Tapani	16/04/2020
FIN C 2507	Safeguards by Design for Small Modular Reactors	HONKAMAA,Tapani	18/12/2019
JNT A 2414 FIN	Support for testing of PGET new functionalities in attended, remote and unattended modes	HONKAMAA,Tapani	28/12/2018
JNT C 2415 FIN	Development of Safeguards Guideline for Facilities Under Decommissioning and Post-Accident Facilities	NIITTYMAKI,Henri	28/12/2018
FIN A 2390	Field-testing of an Unmanned Surface Vehicle and neXt generation Cerenkov Viewing Device	HONKAMAA,Tapani	26/10/2018
FIN C 2399	Umbrella Task - Technical Assistance on Methodology and Guidance for Implementation of Safeguards at the State-level	MARTIKKA,Elina	22/10/2018
FIN D 2330	Creation of e-learning modules, supporting the preparation of State declared information	HONKAMAA,Tapani	27/11/2017
FIN C 2290	Update of the Physical Model	HONKAMAA,Tapani	13/07/2017
FIN D 1996	Digital Declaration Site Maps (DDSM)	HONKAMAA,Tapani	09/04/2014
FIN B 1939	Support for Newcomer States Pursuing a Nuclear Power Programme	MARTIKKA,Elina	11/06/2012
FIN A 1628	Support for Instrumentation Technology Foresight	HONKAMAA,Tapani	25/07/2006
FIN B 1435	Spent Fuel Verification Training Course	TUPASELA,Topi	02/06/2003

Table 2 Active tasks of FINSP on 31/12/2021.

Six tasks (FIN B 1435, FIN B 1939, FIN B 1949, FIN D 2330, FIN B 2566, FIN X 2573) are related to training and others related to R&D of conceptual or technical development.

In the following some of tasks are highlighted:

2.4.1 Spent Fuel Verification Course

Spent Fuel Verification Training is an elemental part of the training programme of IAEA inspectors. The IAEA training section has established an NDA course, which includes two in-field exercise parts: 1) verification training and 2) Cerenkov observation technologies. Verification training has been hosted by FINSP and Loviisa

NPP in the years 2010, 2011, 2013, 2014, 2015, 2016, 2017 and two courses in 2018. The instructors are provided by the IAEA, but Loviisa and STUK provide access to the fuel pond and experts that follow the conduct of the course and declare necessary fuel information, provide their insights about the recommended ways to work safely and efficiently in an NPP environment and offer information about related activities in Finland.

The NDA methods used in the course are SFAT, IRAT and FDET1. The conduct of the course has found its path and is efficiently implemented. The year 2021 courses were the first ones where PGET (Passive Gamma Emission Tomograph was trained to the IAEA inspectors). Adding the new device into the course schedule was successfully and efficiently implemented. Special thanks goes to the professional IAEA trainees and flexible attitude of Loviisa NPP personnel.

Inspector's NDA training in full speed. PGET console is on the left and FORK on the right. Picture: Loviisa NPP, November 2021

2.4.2 COMPASS: Comprehensive Capacity Building Initiative for SSACs and SRAs

Launched in 2020, COMPASS is a new IAEA initiative that involves partnering with States to help them strengthen the effectiveness of their national authority responsible for safeguards implementation (SRA) and of their respective system of accounting for and control of nuclear material (SSAC). COMPASS provides assistance and services tailored to a State's needs.

Cooperation between a State and the IAEA is essential in ensuring that nuclear safeguards are implemented effectively and efficiently. The Agency devotes resources to assist the State in developing required safeguards capabilities, including

[1] For more information about these methods, please see the IAEA report "Safeguards Techniques and Equipment 2011 Edition" https://www-pub.iaea.org/MTCD/Publications/PDF/nvs1_web.pdf

the provision of guidance to enhance a State's understanding of its safeguards obligations. Support is provided also through MSSP tasks. Altogether 12 MSSPs have accepted the task. FINSP has been actively involved into the task from the beginning.

Involvement of MSSPs is important for the success of COMPASS initiative. SSACs in supporting MSSP states can interact with the partnering states at the same level, sharing their own experiences and understanding what practises fits for SSAC and SRA purposes. Activities are initially planned by the IAEA and elaborated together with partnering states and MSSP experts to best meet the objectives for the state concerned.

The work in 2020 has been consisting of overall planning and preparing terms of references planning and conducting webinars and live training events, sharing information on procedure.

2.4.3 Support for Instrumentation Technology Foresight

Support for Instrumentation Technology Foresight task objective is to identify and exploit technical innovations. FINSP has offered together with Finnish Nuclear Plant operators locations where to test these innovations in real nuclear facility environments.

In 2021 IAEA tested its new Cerenkov viewing device in TVO spent fuel storage. IAEA and FINSP are also planning to test its newly developed floating robot in TVO spent fuel storage in 2022. The robot collects Cerenkov signal at the surface of the spent fuel pool. This task in now mainly being done manually with handheld instruments.

In large storage facilities the verification activity takes several days and is being done annually. Deploying robots would decrease greatly amount of routine and consuming verification work of the IAEA inspectors in field. Also, the quality of verification will be improved.

3 Global Initiative to Combat Nuclear Terrorism (GICNT)

To the 2016 Nuclear Security Summit (NSS) Finland coordinated a development of a Joint Statement on National Nuclear Detection Architecture (http://www.nss2016.org/document-center-docs/2016/4/1/joint-statement-on-national-nuclear-detection-architecture). This has and will continue to be an important document steering Finland's contribution to the international nuclear security detection activities. It has also had significant national impact. Among other things, the updated national nuclear detection architecture is currently in the printing process. The activities described in the Statement are quite practical, which is why related contributions are also mainly conducted at expert level. The agreement between the Ministry for Foreign Affairs (MFA) and STUK covers international work carried out by STUK experts in accordance with the Statement. This has enabled an active involvement of STUK experts in both the IAEA (International Atomic Energy Agency) and GICNT (Global Initiative to Combat Nuclear Terrorism) nuclear security detection activities.

The GICNT was established by Russia and the USA in 2006 (https://www.gicnt.org/). They continue to co-chair the initiative. GICNT is a voluntary international partnership of 89 nations and six international organizations. GICNT has three working groups: Nuclear Detection, Nuclear Forensics and Response & Mitigation. Their work is coordinated by the Implementation and Assessment Group. In 2021, a STUK expert served on GICNT's Leadership Team and as interim chair of its Nuclear Detection Working Group (NDWG). In these roles, a STUK expert participated in the preparation of future GICNT events, the orientation of the new chair of the NDWG, as well as various other meetings and events. For the STUK expert the preparation of the Watchful Viking exercise was the largest individual GICNT effort during 2021. Among other things Watchful Viking exercise focuses on regional cooperation and exchange of information. Norway and Finland were due to host it in Oslo in autumn 2021, but the difficult coronavirus situation did not allow this. A new date sometimes in late 2022 is now being sought for the event.

GICNT and the IAEA cooperate closely. STUK expert has also contributed to this cooperation. In addition, STUK expert has supported the IAEA directly in their nuclear security detection related efforts. In November 2021, STUK expert for example gave a webinar presentation on Nuclear Security Detection Architecture Strategy, Design and Planning - A Perspective from Finland.

All 2021 GICNT and IAEA nuclear security detection related activities were carried out virtually.

4 International Partnership for Nuclear Disarmament Verification (IPNDV)

STUK acts as technical advisor to the Ministry for Foreign Affairs (MFA) on International Partnership for Nuclear Disarmament Verification (IPNDV, https://www.ipndv.org/). The agreement between FMA and STUK covers the work done by STUK experts in IPNDV. This has enabled STUK experts to participate actively in the project since its beginning.

IPNDV, established by the USA in 2014, is currently on its third phase. Third phase started in the beginning of 2020. The coronavirus pandemic has significantly hampered the implementation of ongoing phase. All meetings in 2021 have been held virtually. During the third phase of IPNDV, a STUK expert participates the work of Technical and Host Working Groups. In 2021, among other things, a report on the results of the Belgium measurement campaign was prepared and published (https://www.ipndv.org/wp-content/uploads/2021/11/IPNDV_Report_2021_TechDemoSCK_FINAL.pdf).

The objective of the measurement campaign was to examine the performance and suitability of various radiation measuring equipment for the nuclear disarmament verification use. Well characterized MOX (Mixed OXide) nuclear fuel was employed in the measurement campaign. The published report also includes a section coordinated by Finland, which focused on the testing of a protype neutron detector. This detector is being developed at Imperial College, London. In addition to detecting neutrons, it produces information on the energy distribution of neutrons and the location of the neutron source. Thus, the detector can provide more accurate and comprehensive information about the object to be verified. On the other hand, the more versatile information produced by the detector may lead to the fact that the detector cannot be used in a real situation without the so-called information barrier. In practice, this means that the computer processes the sensitive data collected by the detector and produces a result for the user that is useful but does not reveal confidential information.

In addition, during 2021, the future operation of IPNDV was planned. The Plenary meeting in December 2021 was the culmination of this process. Continuing the experimental work is one of the priorities.