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MAY 2023

Highlights of International Cooperation for Safety

Security and Safeguards in 2022

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Abstract

The Radiation and Nuclear Safety Authority (STUK) is an independent governmental organisation for the regulatory control of radiation and nuclear safety in Finland (Safety, Security and Safeguards). The basis for STUK's international cooperation is maintaining and increasing the awareness and effectiveness of the work carried out by the authority. International cooperation is also the practical tool for STUK to address global radiation and nuclear safety questions. At STUK, the International Cooperation Unit is responsible for coordinating and liaising for the activities carried out in co-operation with our international partners, such as the International Atomic Energy Agency (IAEA) and regulators across the globe. The unit also manages the international support and service projects of STUK and supports the leadership of STUK in its work on international fora. This report includes highlights of STUK's international activities in 2022, a year that brought dramatic changes to the security environment in Europe. The report also highlights the fostering of partnerships between organisations and individuals across borders, the need to continuously improve skills and knowledge through active participation, the hosting of training programmes and promotion of diversity, and the cross-cultural understanding of regimes for the peaceful use of nuclear energy.

Tiivistelmä

Säteilyturvakeskus (STUK) on riippumaton valtionhallinnon organisaatio, joka valvoo säteily- ja ydinturvallisuutta Suomessa (3S). STUK:n kansainvälisen yhteistyön perustana on viranomaisen työn tunnettuuden ja vaikuttavuuden ylläpitäminen ja lisääminen. Kansainvälinen yhteistyö on STUK:lle myös käytännön väline käsitellä maailmanlaajuisia säteily- ja ydinturvallisuuskysymyksiä. STUK:n kansainvälisen yhteistyön yksikkö vastaa kansainvälisten yhteistyökumppaneiden, kuten Kansainvälisen atomienergiajärjestön (IAEA) ja eri puolilla maailmaa toimivien sääntelyviranomaisten kanssa yhteistyössä toteutettavien toimien koordinoinnista ja yhteydenpidosta. Yksikkö hallinnoi myös STUK:n kansainvälisiä tuki- ja palveluhankkeita ja tukee STUK:n johtoa sen työskentelyssä kansainvälisillä foorumeilla. Tämä raportti sisältää nostoja STUK:n kansainvälisestä toiminnasta vuonna 2022, joka toi dramaattisia muutoksia Euroopan turvallisuusympäristöön. Vuosiraportissa korostetaan myös organisaatioiden ja yksilöiden välisten kumppanuuksien edistämistä yli rajojen, tarvetta jatkuvaan parantamiseen ja tiedonjakoon aktiivisen osallistumisen avulla. Lisäksi esitetään koulutusohjelmien isännöintiä ja monimuotoisuuden edistämistä sekä ydinenergian rauhanomaisen käytön järjestelmien kulttuurienvälistä ymmärtämistä.

Sammanfattning

Strålsäkerhetscentralen (STUK) är en oberoende statlig organisation som ansvarar för tillsynen av strål- och kärnsäkerheten i Finland (3S). Grunden för STUK:s internationella samarbete är att upprätthålla och öka medvetenheten om och effektiviteten i det arbete som myndigheten utför. Internationellt samarbete är också STUK:s praktiska verktyg för att ta itu med globala strål- och kärnsäkerhetsfrågor. STUK:s enhet för internationellt samarbete ansvarar för samordningen av och kontakterna för den verksamhet som bedrivs i samarbete med våra internationella partner, såsom Internationella atomenergiorganet (IAEA) och tillsynsmyndigheter runt om i världen. Enheten sköter också STUK:s internationella stöd- och serviceprojekt samt stöder STUK:s ledning i dess arbete på internationella forum. Denna rapport innehåller höjdpunkter från STUK:s internationella verksamhet under 2022, ett år som medförde dramatiska förändringar i säkerhetsmiljön i Europa. I rapporten betonas också vikten av att främja partnerskap mellan organisationer och individer över gränserna, behovet av ständiga förbättringar och informationsutbyte genom aktivt deltagande. Värdskap för utbildningsprogram och främjande av mångfald samt interkulturell förståelse av fredliga kärnenergisystem föreslås också.

A Turbulent Year of International Cooperation

The year 2022 surprised us and strongly affected the focus of our international cooperation. The Covid-19 pandemic was not yet over, but we learned how to live with it. The war of aggression initiated by Russia at the end of February 2022 caused an immediate need to review our priorities in international cooperation and to freeze the traditional cooperation with Russia regarding the safety of the nuclear power plants close to the Finnish border.

Highlights of 2022 include:

- Launching STUK's International Cooperation Unit and completing major projects carried out in 2021.
- The new unit has enabled us to react quickly to international events that require attention. We have proven our ability to adapt in the new situation, for example by working equally efficiently both in person and virtually.
- Moving to our new open office premises in Jokiniemi, Vantaa (How to reach STUK, p. 28).
- Continuing to actively learn and to share experiences on the international forum. In the current situation, it is very important to increase cooperation with other stakeholders like ministries, but also to coordinate STUK's international activities.

The new International Cooperation Unit, hosted by the Department of Coordinated Expert Services, was established on 1 February 2022. After 24 February, almost all plans had to be reviewed: the cooperation with the Russian regulator and the Leningrad and Kola nuclear power plants near the Finnish border was frozen. The new situation really required new ways of working. Cooperation with the other international organisations and state regulators, especially those near to us, was more important than ever. I am happy to say that the experts working with me are eager to find ways of managing our work in the changing environment with a resilient attitude. My team of international cooperation experts consists of

- Mr Ossi Lång, senior specialist
- Mr Jukka Mettälä, inspector
- Mr Henri Niittymäki, senior inspector
- Mr Kim Söderling, project manager
- Dr Aapo Tanskanen, principal advisor
- Ms Irene Olkonen, project manager

Altogether, this team has more than one century of expertise in international cooperation.

Planning and implementing international cooperation requires long-term work. STUK has been operating in its area of responsibility for 65 years, a respectable length of time. The journey has included impressive international visibility and cooperation between different actors in the field. Radiation and nuclear safety, security and safeguards have formed the central content of STUK's international work. Non-proliferation and the effective control of nuclear materials form the basic conditions for the peaceful use of nuclear energy. Long experience as the supervisor and control authority of these contractual principles, combined with a will and proactive approach in sharing these regulatory experiences, has brought STUK a strong international reputation. Sharing our accumulated knowledge and gaining knowledge from others is a core task of our international unit.

In 2023, our main task will be to ensure that we have available the necessary expertise and preparedness to facilitate STUK's international cooperation in the future too. 2023 will be an exciting year because we are leading new projects, which encompass several different corners of the world. We are embarking on an ambitious safeguards programme on the African continent, working closely with the radiation and nuclear safety authorities of the various countries to support Ukraine's regulator in its times of hardship, and we are continuing the exchange of regulatory information with partners across the globe on emerging topics such as SMRs.

I wish you all good and rewarding moments with the report. Comments and suggestions are welcome to improve the content and normativity of the report.

Elina Martikka
Head of Unit, International Cooperation

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1 Addressing Regional Radiological and Nuclear Concerns

Recognising that safety, security and safeguards are core competences of STUK, international cooperation in these fields requires a transparent way of working and proactive efforts with our partners. The aim is to develop and maintain cooperation with our international counterparts. In this way, we enable positive effects on our own operations to ensure safety, safeguards and security.

Change has become commonplace in our daily work because of the altered security environment. Consequently, it has been important to find new ways of working with different branches of the national regulatory authority to ensure the continuous flow of information, situational awareness and the ability to react. Nuclear-related activities are there, and the aim of protecting human health and environment remain unchanged. As long as there are needs that could affect Finnish and global interests, it will be important to maintain cooperation on safety, security and safeguards. Addressing regional radiological and nuclear concerns will ensure that our work in this area continues to be important in the future.

1.1 Standing with Ukraine: Providing Support

Communication with the Ukrainian authority (SNRIU) and its technical support organisation SSTC NRS had been established before the start of Russia's war of aggression against Ukraine, onding to future incidents, for example highlighting areas where emergency response plans need to be addressed together. The aim was to ensure that the necessary resources and expertise are available in the EU to mitigate the impacts of such incidents. Overall, learning from this experience is essential to improving preparedness and response to radiological and nuclear incidents.

As early as March 2022, STUK sent a rotating team of experts trained to respond to questions related to radiological and nuclear incidents to the European Emergency Response Coordination Centre (ERCC) in Brussels. The purpose of this assistance was to provide advisory support to ERCC to help it build a picture of the radiological situation in Ukraine. Four STUK experts worked closely for over a month with ERCC experts and connections from around the EU to coordinate a timely and effective response to the emergency in Ukraine. This period provided valuable lessons and best practices for responding to future incidents, for example highlighting areas where emergency response plans need to be addressed together. The aim was to ensure that the necessary resources and expertise are available in the EU to mitigate the impacts of such incidents. Overall, learning from this experience is essential to improving preparedness and response to radiological and nuclear incidents.

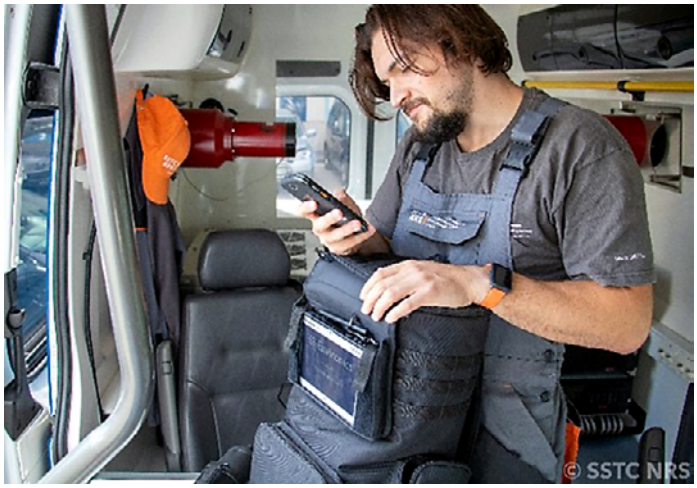
Immediate response to a crisis is important, as time is of the essence and delays can lead to further challenges. In April 2022, STUK donated the first dosimeters to be delivered to Ukraine. This donation was implemented in cooperation with the Ministry of the Interior (MOI) and the National Emergency Supply Agency (NESA) and delivered to its destination via the EU Civil Protection Mechanism.

The next shipment of support to the conflict zones was carried out in July–August 2022 in response to urgent requests from the State Nuclear Regulatory Inspectorate of Ukraine (SSTC NRS). The shipment included equipment for mobile radiation detection backpack RanidPro200, Vaisala weather stations and Air Sampler Goblin 200 Arctic.

On 27 September 2022, a Memorandum of Understanding was signed between SNRIU and STUK for cooperation and exchange of information in the field of nuclear and radiation safety. Through Nordic cooperation, STUK also participated in the provision of assistance to for the laboratories of the Chernobyl exclusion zone (see Chapter 1.2).

PICTURE 1: A closer look at the Memorandum of Understanding (MoU) signing in Vienna September 2022. Photo STUK.

PICTURE 2: Supporting Ukraine's regulatory technical support organisation: RanidPro200. Photo SSTC NRS, Ukraine.



PICTURE 3. Enhancing air monitoring in Ukraine: Air sampler Goblin 200 and Vaisala Weather Station. Photo SSTC NRS, Ukraine.

1.2 Nordic Cooperation

Since the collapse of Soviet Union, the Nordic authorities have cooperated in the provision of assistance to the former Eastern European countries in accordance with the European Neighbourhood Policy, whose aim is to maintain the stability and security in these areas and to promote economic, political and social development. The Russian invasion of Ukraine caused an immediate cancellation of all the planned support projects with the Soviet-era Russian nuclear power plants near the Finnish border. Simultaneously, the Russian invasion dramatically increased the need of support in Ukraine.

In response to the new challenging situation, the Nordic partners STUK, SSM and DSA started to organise biweekly videoconferences in order to share information about the situation and the support needs of Ukraine, and to coordinate the support activities. Later during the year, DEMA and the IAEA, which has a coordinating role with regard to international support activities related to radiation and nuclear safety, also joined these coordination meetings. During the meetings, each party shared information about its support for Ukraine. Thanks to the meetings, Nordic support for Ukraine has been coordinated and effective.

In 2022, STUK participated as a co-financing partner together with DSA in a support project led by SSM. The support package included dosimeters and laboratory equipment that were delivered to Ecocentre, an organisation responsible for environmental radiation monitoring in the Chernobyl exclusion zone. The aim of the project was to provide replacement equipment for those lost during the Russian occupation. The support reached Ecocentre in September 2022.

PICTURE 4:
Devices donated in 2022 to Exclusive Zone.
Photo Nordisk Sikkerhet AS.

1.3 Regional Cooperation in the Baltic Sea and the Arctic

The Baltic Sea and the Arctic region are important regions of regional cooperation for Finland. The recent events and potential developments in these regions call for stronger cooperation between like-minded countries in order to ensure safety, security and sustainable development in the Baltic Sea and the Arctic regions. Therefore, STUK has an interest in participating in the relevant cooperation fora of the regions, and is actively looking for cooperation opportunities with the aim of promoting mutual benefits and strengthening regional radiation and nuclear safety, as well as first-hand knowledge, awareness and cooperation in monitoring and emergency preparedness.

In 2022, STUK started to work more closely with Estonia. There were several meetings between STUK and Keskkonnaamet of Estonia, and STUK expertise was used in the review of the interim report of the Estonian working party that is examining what the launch of a nuclear energy programme would mean for Estonia. In August 2022, STUK organised, together with the Ministry of Interior and TVO, a meeting with the Estonian governmental delegation to familiarise it with the Finnish Nuclear Security Regime. The presentations of the visit included information about the role of each governmental organisation in the overall Nuclear Security Regime, and highlighted the importance of seamless cooperation between the various governmental entities.

In September 2022, experts from across the Baltic Sea states gathered at STUK in Vantaa for a Council of the Baltic Sea States (CBSS) meeting. It was seen that there are several reasons for cooperating and coming together to work towards common goals. For this reason, STUK will continue to emphasise the need for discussion with all relevant stakeholders from the Baltic Sea region states (see Chapter 2.2).

In 2021, STUK received a call from the Polish Atomic Agency (PAA), asking for expertise in the nuclear regulatory field. Poland plans to expand its nuclear energy programme and it wants to ensure the new build will be as safe as possible. STUK welcomed this opportunity for cooperation, and soon launched a series of meetings remotely.

The cooperation between STUK and PAA continued in June 2022 during the two-day Nordic Nuclear Forum held in Helsinki. The collaboration between the regulators proved to be valuable and helped to establish a connection to improve safety. STUK looks forward to further cooperation through STUK International Ltd (see Chapter 2.4).

1.4 Cooperation with the Russian Federation: A Frozen Connection

Since the early 1990s, STUK has cooperated with the Russian Leningrad and Kola nuclear power plants. There are Soviet-era reactors at these sites that are close to the Finnish border. Past cooperation includes the delivery of several safety-related systems and equipment representing Western technology. Diagnostic and analysis tools and training have also been offered as a part of the support. More recently, the main emphasis of cooperation shifted to the maintenance of the equipment that had been delivered earlier. In early 2022, the planned bilateral cooperation between STUK and the two Russian NPPs was frozen. The planned activities and support deliveries were cancelled, and the already procured equipment was either sold or donated to Ukraine.

Assessment of the safety prospects of the Russian nuclear power plants near the Finnish border

An assessment on the safety prospects of the Russian nuclear power plants near the Finnish border was carried out in 2022. The aim of the study was to assess the potential nuclear safety concerns resulting from sanctions and Russia's exclusion from international communities and cooperation. Some conclusions based on the assessment include:

- Spare parts for automation and electrical equipment using Western components are likely to face availability challenges.
- Western non-destructive inspection equipment obtained for the plants is unlikely to remain in working order for very long without international cooperation. However, this presumably does not pose a major safety threat, as there is also Russian equipment available for inspections. This may not be as high-quality, but larger faults will be detectable even with these devices.
- In longer term, the greatest threat to the nuclear safety of the Russian installations is caused by the possible decline in the safety culture and abandoning the good practices established by international cooperation.
- In the RBMK reactors (LNPP Units 3 and 4), the service life had been extended by 15 years (originally 30 years) and units were supposed to shut down by 2025. After the start of the war, the plant made the decision to extend the service life of the plants by another five years. The current user licence is valid until 2025. Most likely, the plant is currently preparing to extend the service life of units 3 and 4s. One of the main safety risks of the Leningrad RBMK plant is the aging of the graphite stacks. For this reason, the decision to extend the service life of RBMK units 3 and 4 for another five years is a cause for concern.

STUK continues to monitor the development of the situation regularly, using publicly available information.

Russia has a long tradition of using nuclear power and a highly developed, largely self-sufficient nuclear industry. Western sanctions on Russia do not yet apply to Rosatom or nuclear technology, but many Western companies have exited the Russian market, and both economic sanctions and sanctions on some specific key technologies may have indirect effects on the safety of the Russian NPPs. In conclusion, it can be stated that the situation does not presumably pose a major danger to nuclear safety or the safe operation of the nuclear power plants in Finland's immediate vicinity.

1.5 EU Civil Protection Mechanism

Finland and STUK enhance preparedness for Chemical Biological and Nuclear (CBRN) threats through rescEU's stockpiling capacity application

In the summer of 2022, Finland, under the leadership of the Ministry of the Interior, applied for the development and maintenance of the rescEU CBRN storage capacity at EU level, which is part of the EU Civil Protection Mechanism, in cooperation with the Ministry of Social Affairs and Health, the National Institute for Health and Welfare, the National Emergency Supply Agency and the Radiation and Nuclear Safety Authority. Preparatory work for the project began in 2020. Finnish application was approved by the European Commission in December 2022. Finland's future rescEU capabilities will enhance the strategic preparedness and readiness of the entire European Union to respond to CBRN threats, especially in Northern Europe and the Baltic Sea region. The CBRN storage package includes CBRN protective equipment, measuring instruments, support equipment and CBRN drugs and vaccines. The total cost of the project is €242 million and the planned duration of the project 1 January 2023–30 September 2026. Finland's strategic objective is to continue to maintain the capacity beyond this period if the commission's budget packages in future periods allow it.

The purpose of the project is to produce new first-hand information and expertise for STUK on the implementation of CBRN storage capabilities. In the project, STUK will participate in the definition of training in the use of RN measuring devices with the Ministry of Social Affairs and Health (MSAH) and in the support given to the NESA to ensure the best possible procurement, storage and functionality of RN personal protective equipment and measuring equipment.

PICTURE 5: Strengthening Disaster and Accident Capacity: Introducing Radiation Measurement Vehicle. Photo: STUK.

Expert project to provide efficient support for the ERCC – Emergency Response Coordination Center

The European Civil Protection Mechanism is coordinated by the Emergency Response Coordination Centre (ERCC) in Brussels. In April 2022, the EAHSP-RN service project, funded by the European Commission, was launched in which a consortium led by the Belgian Nuclear Research Centre (SCK CEN) provides advisory support to ERCC with regards to radiological hazards. STUK is a member of the consortium and, together with SCK CEN, has the capability of initiating advisory support on radiological hazards on a 24/7 basis. The service project consists of three functions:

1. expert support in the event of radiological and nuclear hazards,
2. exercises related to the expert service (e.g. practising the process of service activation and the production of a situational picture for ERCC),
3. training for ERCC staff.

The first sub-assignment started in August 2022. Three times a week, STUK has prepared a summary of the radiation and nuclear safety situation in Ukraine based on the situational information received through the cooperation network.

The functioning of the EU Civil Protection Mechanism is based on the resources provided by the Member States and made available to the disaster-stricken country's response operation. In connection to this is the rescEU project launched by the EU to create a common European disaster capability pool. The stockpiling period is until autumn 2026.

2 Cooperation and Knowledge Sharing

Finland has been utilising nuclear energy for a long time. We are also expanding our nuclear energy programme. Today, more than one third of energy in Finland is produced by nuclear, and this amount will increase once Olkiluoto 3, one of the biggest nuclear reactors, is in full operation. With the experience we have gained, we have been able to establish an efficient and effective way of regulating safety, security and safeguards. We have the responsibility to share what we have learned, and provide useful experiences, especially to nuclear newcomer countries.

The aim of STUK Cooperation and Knowledge Sharing activities in 2022 was to foster collaboration and the exchange of expertise among professionals and organisations in the field of nuclear safety and radiation protection.

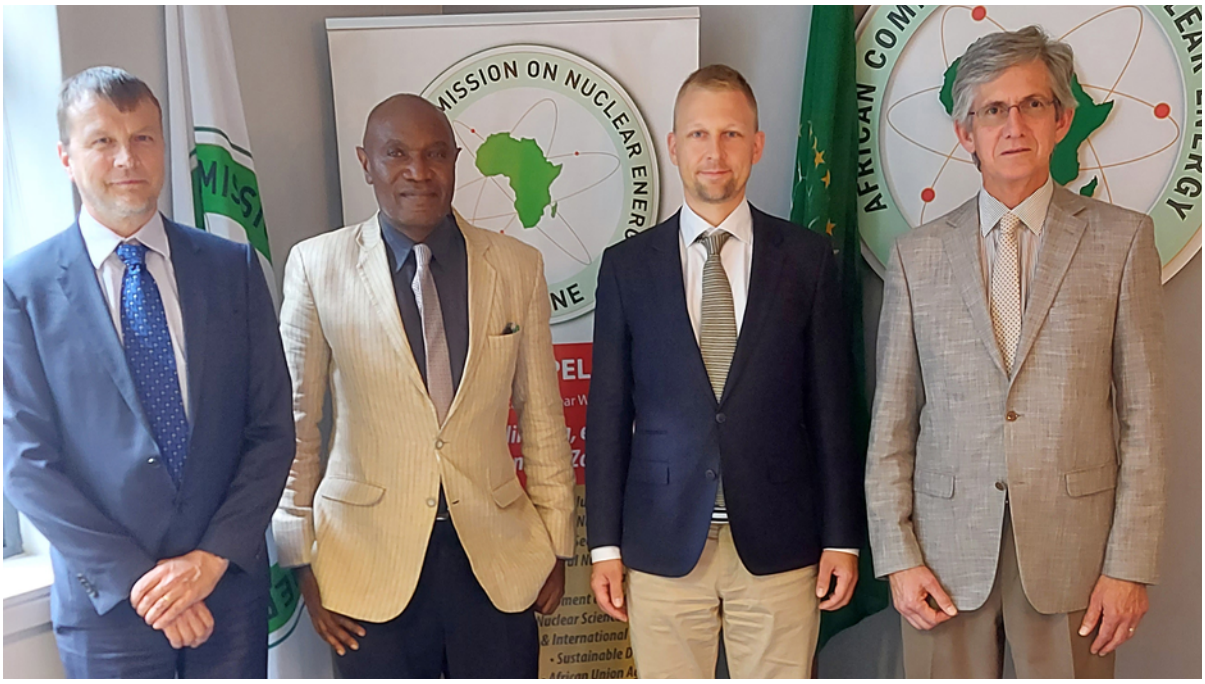
In 2022, STUK organised events, workshops and training to facilitate cooperation and knowledge sharing among stakeholders, including regulators, operators, researchers and other experts in the field. These activities covered a wide range of topics related to nuclear safeguards, safety, emergency preparedness and response, radiation monitoring and waste management.

2.1 Strengthening Nuclear Material Control Systems in Africa moving to implementation

In 2022, STUK partnered with the African Commission on Nuclear Energy (AFCONE) to develop a programme called Strengthening the Nuclear Material Control Systems in Africa. The plan for this ambitious five-year programme was finalised by the end of the year, and its implementation will begin during the first half of 2023. The programme aims to collectively uplift nuclear safeguards in Africa under the leadership of AFCONE, with the expert support of STUK. It is financed by the European Union's European Instrument for International Nuclear Safety Cooperation (INSC) with up to €4,400,000, and co-financed by the Ministry for Foreign Affairs of Finland with up to €500,000, during 2023–2027.

The main goal of this programme is to provide support for the development of efficient and effective safeguards for nuclear material and installations as a key element of nuclear non-proliferation to State Parties of the African Nuclear-Weapon-Free Zone Treaty (Pelindaba Treaty), and to support AFCONE in ramping up its role as the regional knowledge hub and coordinator of safeguards activities. Safeguards are a prerequisite for cooperation in the peaceful use of nuclear energy. IAEA Safeguards are designed to ensure nuclear non-proliferation and therefore contribute to peace and security in the region, and globally. As

effective safeguards also reduce certain risks and threats related to nuclear materials, they also improve the security of people, and their freedom to live without such risks. In this way, the programme also contributes to the human rights-based development policy of Finland and the EU.



PICTURE 6: Visiting research reactor Safari 1 at Pelindaba site of the South African Nuclear Energy Corporation (NECSA) during a fact-finding mission to Pretoria, South Africa, in August 2022. Photo NECSA.

PICTURE 7: Speakers by the podium before the kick-off event of the programme in November 2022 in Vienna. The event was hosted by Ambassador Pirkko Hämäläinen (middle) and speakers (from the left) were Executive Secretary of AFCONE Enobot Agboraw, State Secretary to the Foreign Minister of Finland Johanna Sumuvuori, Director General of STUK Petteri Tiippana and Head of Department Nuclear Security and Safeguards Willem Janssens from the EC Joint Research Centre. Photo STUK

During the programme, various training activities and practical exercises will be carried out and organised by AFCONE and STUK. These training activities will enable AFCONE and the national regulatory authorities of participating states to advance the implementation and strengthening of IAEA Safeguards and the safeguards obligations under the Pelindaba Treaty.

It is planned that the programme will be implemented in phases. The first implementation year (2023) will focus on a needs assessment and learning by doing, while providing an extensive training programme to the participating states. Lessons learned during the first year of the programme, such as practical implementation issues, priority areas and best practices, will be taken into consideration when planning for the upcoming years of the programme.

2.2 Fostering International Cooperation

In 2022, STUK's International Unit started to develop a new type of Regional Cooperation Programme, which will act as an umbrella for all STUK's regional activities. The programme will be managed by a programme manager within the International Unit, and will focus on bilateral and multilateral projects and cooperation with the authorities and operators of countries bordering Finland and Europe to promote nuclear and radiation safety. The objective of the programme is preparedness for emergencies, radiation and nuclear safety, and to closely monitor that the environment is being maintained and ensured. Through the programme, STUK also aims to promote the Non-Proliferation Treaty and nuclear waste management.

Workshop to strengthen the cooperation on Radiation Monitoring between Baltic Sea States (CBSS)

The Ministry of Interior of Finland and the Radiation and Nuclear Safety Authority STUK jointly organised a 2-day workshop on Radiation Monitoring Strategies in Finland in November 2022. A total of 50 participants attended the event. This event discussed and identified common needs and gaps for RN monitoring during nuclear and/or radiological emergencies. The two-day event consisted of seminar lectures and workshops that aimed to identify actions needed to foster RN response in the Baltic Sea region. In addition, the brand new Finnish National Radiation Monitoring Strategy was introduced. This event was aimed at policy-makers and experts working in RN and emergency response in ministries, rescue authorities and radiation protection authorities.

The security environment in the Baltic region has changed: there are new threats and challenges including radiological and nuclear (RN) threats. Cooperation and Resilience, nationally and internationally, are the key words for effective RN preparedness and response. There are shared core tasks like situational awareness to support decision-making. Authorities in the Baltic Sea region work on the same issues but have different approaches and structures. Comparing benchmarking authorities' practices was seen as beneficial by the participating authorities. Technological development can bring us better tools to cope with CBRN threats. STUK found that frequent sharing of experiences on this topic with other regulators would be

beneficial. By building a strong network of stakeholders, we are better prepared to cope with CBRN threats.

The first lesson from this seminar was to coordinate the different communication systems so that information would flow seamlessly between the different actors. The second was to consider the experience of the war in Ukraine in their own activities and thus improve crisis preparedness. The third point was to evaluate whether seminar that was held has been useful and made an important contribution. Participants felt that they had gained a new perspective on their own activities (best practices). A request was made that the seminar be recurring. It brought together people working in the field from the Baltic Sea countries and many got to know each other for the first time. Organising the seminar again to address more practical topics is currently under consideration.

Advancing Marine Environmental Protection through HELCOM-MORS: The Integrated Monitoring and Assessment Programme of the Baltic Sea Region

All the Baltic Sea countries have ratified the Helsinki Convention, i.e., the Convention on the Protection of the Marine Environment of the Baltic Sea. The Helsinki Commission (HELCOM) coordinates international cooperation ensuring the implementation of the agreement. Commission Recommendation 26/3 defines a programme to control the occurrence, transport and quantity of radioactive substances in the Baltic Sea. All the countries bordering the Baltic Sea will contribute to the monitoring. Finland's contribution is to take more than 100 samples of the water, bottom sediment, fish and other organisms from the Baltic Sea every year, to analyse the radioactive substances in them and to report the results to the commission's database. The Radiation and Nuclear Safety Authority is responsible for Finland's share of the programme. Joint reports on the results are prepared periodically. In addition, STUK maintains a release register in which releases of radioactive substances from all nuclear power plants operating in the Baltic Sea region are reported annually.

The work of the Helsinki Commission was interrupted when Russia launched a full-scale invasion of Ukraine. Despite the interruption of the commission's work, Finland implemented its share of the monitoring programme under the Helsinki Convention in 2022 due to national interests. During 2022, HELCOM experts met informally without Russia to coordinate the monitoring programme and exchange information on the state of radioactivity in the Baltic Sea. Vesa-Pekka Vartti and Meerit Kämäräinen participated in the work.

PICTURE 8: Ensuring the Safety: Exploring STUK's activities and response related to Radiation Monitoring in the Baltic Sea region. Photo STUK.

Arctic Council – A Collaborative Effort towards Sustainable Development and Environmental Protection in the Arctic Region

The work of the Arctic Council was also interrupted after Russia launched its full-scale invasion of Ukraine. STUK participates in the work of two different working groups in the Arctic Council:

- The project started in 2021 by the Emergency Preparedness, Prevention and Response (EPPR) group on modelling the consequences of accidents involving nuclear-powered vessels and floating nuclear facilities was implemented during 2022 as an internal project of STUK with IBA funding from the Ministry for Foreign Affairs. The final report of the project will be published in 2023, and the EPPR Group met informally without Russia in late 2022 to launch a Norwegian Arctic preparedness assessment project. Aleksi Mattila, Mikko Voutilainen and Tuomas Peltonen participated in the work.
- The Arctic Monitoring and Assessment Program (AMAP) is preparing a new assessment report on radioactivity in the northern regions, the development trend of the radiation situation and the risks posed by radioactive substances. The evaluation report had progressed to the national assessment stage prior to the international peer review, which was carried out in January–February 2022 before the Russian invasion of Ukraine. An article was published in the Journal of Environmental Radioactivity. The authors were from Canada, Finland, Sweden, Norway, Iceland, the United States and Poland. Ari-Pekka Leppänen and Sinikka Virtanen participated in the work.

2.3 International Training Activities

In 2022, coordinated by the newly established International Cooperation Unit, STUK continued its international training activities aimed at promoting nuclear and radiation safety globally. STUK's training programmes are designed to provide participants with the necessary knowledge and skills to effectively manage and mitigate potential nuclear and radiation risks.

STUK's international training activities in 2022 covered a range of topics including safeguards, nuclear safety, emergency preparedness and response, and regulatory oversight. These training sessions were tailored to meet the specific needs of participants from different countries and organisations and were delivered by experienced experts in their respective fields. Through its training activities, STUK aims to enhance the capacity of its international partners to strengthen global efforts to ensure the safe and peaceful use of nuclear energy. With over 60 years of experience in nuclear and radiation safety, STUK has become a trusted partner for many countries and international organisations in their efforts to improve nuclear and radiation safety.

Overall, STUK's international training activities in 2022 represented a continuing commitment to promote nuclear and radiation safety worldwide, and to share expertise and experience with the international community.

Master of Safeguards Collaboration with European Nuclear Education Network (ENEN)

In 2021, the Master of Safeguards programme implemented in cooperation with ENEN, IAEA and Polytechnic Milano was completed. The training programme was designed for professionals who work in the nuclear industry, regulatory authorities or other organisations that deal with nuclear materials. Master of Safeguards is based on the requirements of the IAEA and is accredited by the European Safeguards Research and Development Association (ESARDA). The programme is offered in collaboration with universities and research institutions across Europe and is open to participants from around the world.

Overall, Master of Safeguards provides professionals with the knowledge and skills necessary to effectively implement nuclear safeguards measures and contribute to the global effort to prevent the proliferation of nuclear weapons. In addition to its own expertise, STUK also brought to the course the opportunity to implement the advanced laboratory work of two students at STUK in September 2022.

PICTURE 9: Mastering Nuclear Safeguards: Luana Cognini (left) and Triphine Niryrakundo, students of the Master's degree programme at STUK. Photo STUK.

IAEA COMPASS initiative

Launched in 2020, COMPASS is a new IAEA initiative that works with states to help them strengthen the effectiveness of their National Nuclear Safeguards Authority (SRA) and their Nuclear Safeguards System (SSAC). COMPASS offers assistance and services tailored to the needs of the state. STUK has been participating in the IAEA's COMPASS initiative since the beginning of 2020.

In the spring of 2022, STUK contributed to the IAEA's COMPASS initiative by supporting the Türkiye Nuclear Regulatory Authority (NDK) through the IAEA support programme mechanism (FINSP). Through COMPASS, STUK gets the opportunity to work with the states that are taking their first steps in the use of nuclear energy. COMPASS provides support in terms of training, software and hardware, as well as legal aspects and regulations. Cooperation between the State and the IAEA is essential to ensuring that safeguards are implemented effectively. The IAEA uses its own resources and, in addition to these, the authority resources of the IAEA support programme countries (incl. STUK) to assist the State in developing the necessary safeguards, including providing guidance on how to better understand the State's oversight obligations.

In September, a technical visit and a training week were carried out at STUK for 12 experts (Jordan, Saudi Arabia, Türkiye) within the framework of the COMPASS initiative. The week included a one-day visit to TVO, Olkiluoto.

IAEA Newcomers Course

At the end of November 2022, STUK organised a course: "Interregional Training Course on Implementation of National Requirements for Nuclear Power Programmes". Participants came from Argentina, Armenia, Bangladesh, Egypt, Kenya, Nigeria, Poland, Romania, Saudi Arabia, Slovakia, Türkiye, the Czech Republic and Hungary. During the course week, in addition to lectures by IAEA experts, STUK's experts from all fields of comprehensive security as well as on communication and preparedness shared their experiences and practices. Reinforcements also came from Fortum and the former Fennovoima. The course visited the final disposal facility and the encapsulation plant for spent nuclear fuel at Olkiluoto, as well as the emergency response centre of STUK. The course was implemented as FINSP activity (see Chapter 3).

PICTURE 10: An overview of the IAEA Newcomers Course's 2022 visit to Olkiluoto for hands-on learning. Photo STUK.

2.4 Cooperation with Nuclear Newcomer and Expanding countries together with STUK International Ltd.

Due to the need for transitioning to CO2-free energy production and the need to cut the dependency on Russian energy resources, many European countries are considering the introduction or extension of the use of nuclear power for energy production.

STUK International Ltd, formed in 2016, is a 100% state-owned company that enables STUK to provide radiation and nuclear safety expert services globally. Customers of the company are regulators in the field of radiation and nuclear safety. The services offered by STUK International Ltd. are based on the internationally recognised expertise and highly skilled professionals of STUK.

In 2022, in cooperation with STUK International Ltd, STUK reviewed the interim report on the development of the governmental infrastructure required for a nuclear power programme, prepared by the Estonian Working Party on Nuclear Energy. The main objective of the review was to provide comments that would help Estonia to prepare for the IAEA Integrated Nuclear

Infrastructure Review (INIR) mission scheduled for 2023. STUK caried out the review using the IAEA Milestones Approach and the related IAEA publications as a reference. of STUK's comments focused mainly on the identification of gaps in the consideration of infrastructure issues.

In 2022, STUK International also supported ANVS from the Netherlands in benchmarking the Finnish oversight procedures in the new nuclear builds. Other projects carried out by STUK in cooperation with the company included, the development of safeguards regulation with NRRC of Saudi Arabia and establishing a partnership with the Polish Authority PAA to develop the authority's capabilities in the construction of the peaceful use of nuclear energy.

3 Expert Support in International Projects

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 non-proliferation, nuclear security and disarmament. The Radiation and Nuclear Safety Authority (STUK) has technical expertise to offer the projects. The good cooperation between the MFA and STUK deepens the common understanding between the political and technical fields, and enables Finland to have the best possible knowledge in international negotiations. This work is an important part of STUK's international cooperation. In addition, STUK participates in the non-proliferation and safeguards-related working groups ESARDA and NSG. A summary of the results for 2022 is presented next.

FINSP – Finnish Support Programme for the IAEA Safeguards

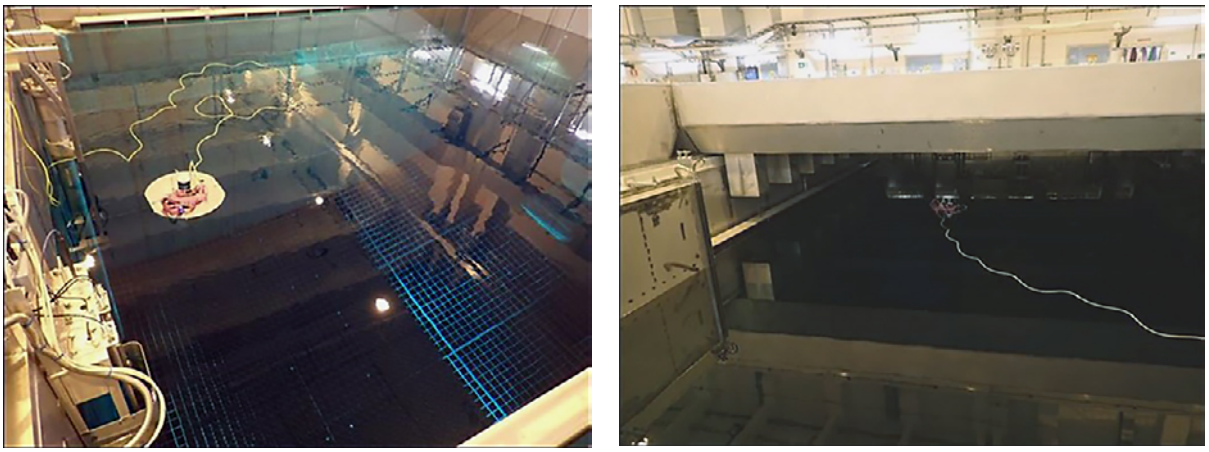
The objective of FINSP is to provide the IAEA with support in well-managed tasks related to the development of safeguards verification methods, safeguards concepts and IAEA inspector training. MFA and STUK have made an agreement for the implementation of FINSP for a term of three years 2022–2024. For 2022, MFA set aside funding of €149,000. The actual expenditure of the programme in 2020 was €138,590.93. COMPASS and Newcomers activities were a part of FINSP activities in 2022, and they are presented in Chapter 2. The other main results of the FINSP are presented in this chapter.

At the end of 2022, FINSP had 13 active tasks. The highlights of 2022 were related to supporting IAEA Member states, and FINSP hosting a training course under the task "Support for Newcomer States Pursuing a Nuclear Power Programme". Another task in this direction was active participation in the "COMPASS: Comprehensive Capacity Building Initiative for SSACs and SRAs". FINSP also provided one full day of training for IAEA trainees from developing countries and invited three experts from Ukraine to participate in the IAEA symposium in Vienna on from 31 October to 4 November.

FINSP was also active in assisting IAEA in helping to develop new technical methods. In August 2022, FINSP arranged a campaign together with TVO Power at the Olkiluoto nuclear power plant. During the campaign, a new unit of IAEA's Passive Gamma Emission Tomograph (PGET) was thoroughly tested and data was collected to facilitate the use of instruments for unattended operation. IAEA also made a highly successful test of a floating robot. Interest has been shown in the device around the globe. It is expected that the robot will be widely

deployed by IAEA in the coming years, making IAEA verification activity in wet spent nuclear fuel storages more effective and efficient.

FINSP had an annual review meeting with IAEA on 7 November 2022.



PICTURE 11: Floating CVD robot in action at Olkiluoto spent fuel storage in August 2022. Photos TVO.

IPNDV – International Partnership for Nuclear Disarmament Verification

The International Partnership for Nuclear Disarmament Verification (IPNDV) was established on the initiative of the United States in 2014. The other participants in IPNDV come from both nuclear and non-nuclear weapon states. A third phase of IPNDV started at the beginning of 2020. IPNDV develops methods and procedures for the verification of nuclear disarmament. Finland has been participating in IPNDV since its inception. STUK's tasks in IPNDV have always been connected to the development of technological verification methods.

In 2022, two in-person meetings were organised. In Finland, the University of Jyväskylä joined IPNDV research and development. STUK and the university implemented a neutron measurement campaign in STUK's irradiation hall. The data were analysed and presented at the December IPNDV Plenary Meeting in Australia. The results of the study will be published in 2023 and they will also be included as part of a doctoral dissertation.

GICNT – Global Initiative to Combat Nuclear Terrorism

Nuclear Security activities often include cooperation between multiple authorities. Nuclear Security also has a strong international aspect. The Global Initiative to Combat Nuclear Terrorism, GICNT, established in 2006, has been one of the most important international fora for nuclear security. In total, 89 states and six international organisations have participated to the work of GICNT. Member states' nuclear security capabilities and cooperation are developed, for example by organising exercises.

The activities of GICNT are at a standstill due to the war in Ukraine. Different countries are now organising nuclear security events outside the GICNT umbrella. Finland is actively participating in these events. From the Finnish point of view, the most significant event in 2022 was the Watchful Viking exercise hosted by Norway, Finland and the USA in Oslo.

ESARDA and INMM – International Non-Proliferation Organisations

STUK is a member of the ESARDA and has appointed experts to its committees and most of the working groups. STUK has a board member in the ESARDA Executive Board and the Editorial Committee. At the end of 2022, a STUK expert was the Chair of the Export Control Working Group and another the Chair of the Implementation of Safeguards Working Group. ESARDA's annual meeting was held in hybrid form in May 2022 in Luxemburg. STUK's experts contributed to the meeting with several presentations and papers and in panel discussions.

NSG – Nuclear Suppliers Group

The Nuclear Suppliers Group (NSG) is a multilateral export control regime and a group of nuclear supplier countries that seek to prevent nuclear proliferation by controlling the export of materials, equipment and technology that can be used to manufacture nuclear weapons. It has 48 participating governments. Finland is represented on the NSG forum by the Ministry for Foreign Affairs. NSG meetings were again cancelled due to the pandemic. STUK technical expert participated in NSG Technical Expert Group (TEG) meeting in April 2022.

4 Abbreviations and acronyms

AFCONE	African Commission on Nuclear Energy
AUKUS	Enhanced trilateral security partnership between Australia, the United Kingdom and the United States
DEMA	Danish Emergency Management Agency
DSA	The Norwegian Radiation and Nuclear Safety Authority
ENEN	European Nuclear Education Network
ERCC	Emergency Response Coordination Centre
ESARDA	European Safeguards Research and Development Association
EU	European Union
FINSP	Finnish Support Programme to the IAEA Safeguards
GICNT	Global Initiative for Combating Nuclear Terrorism
IAEA	International Atomic Energy Agency
INIR	Integrated Nuclear Infrastructure Review (INIR), IAEA
INMM	Institute of Nuclear Materials Management
INSC	European Instrument for International Nuclear Safety Cooperation
IPNDV	International Partnership for Nuclear Disarmament Verification
MFA	Ministry for Foreign Affairs
MoU	Memorandum of Understanding
MOI	Ministry of Interior
MSAH	Ministry of Social Affairs and Health
NESA	National Emergency Supply Agency
NPP	Nuclear Power Plant
NSG	Nuclear Suppliers' Group
PAA	National Atomic Energy Agency Poland
RBMK	Reaktor bolshoy moshchnosti kanalnyy, high-power channel-type reactor
rescEU	Uprated EU Civil Protection Mechanism to protect citizens from disasters and manage emerging risks.
SMR	Small Modular Reactor
SNRIU	State Nuclear Regulatory Inspectorate of Ukraine
SSAC	State system of accounting for and control of nuclear material
SSM	The Swedish Radiation Safety Authority
SSTC NRS	State Scientific and Technical Center for Nuclear and Radiation Safety of Ukraine
STUK International Ltd.	State company which enables STUK to provide radiation and nuclear expert services globally
TVO	Teollisuuden Voima Oyj

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