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International Cooperation 2016–2020

Nuclear safety, Nuclear security, Non-proliferation

DSA

Norwegian Radiation and Nuclear Safety Authority

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Abstract
The report describes the international cooperation in the period 2016-2020, mainly performed by the International Nuclear Safety and Security section.

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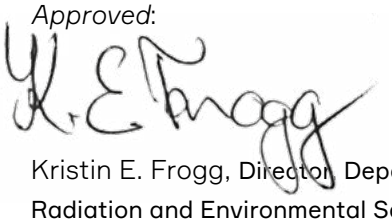
Internasjonalt samarbeid. Internasjonal atomsikkerhet, Atomhandlingsplanen. Ikke-spredning. Atomsikkerhet.

Resymé
Rapporten beskriver internasjonalt samarbeid i perioden 2016-2020, primært fra seksjon Internasjonal atomsikkerhet.

Head of project: Ingar Amundsen.
Approved:



Kristin E. Frogg, Director, Department of Radiation and Environmental Safety

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DSA,
P.O.Box 55,
No-1332 Østerås,
Norge.

Telephone: 67 16 25 00
E-mail dsa@dsa.no
dsa.no

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Content

1 Foreword

The Norwegian Radiation and Nuclear Safety Authority (DSA) (formerly the Norwegian Radiation Protection Authority – NRPA) is the national authority and expert organization in matters concerning nuclear security, radiation use, natural radiation and radioactive contamination in the environment.

DSA carries out assignments on behalf of the Ministry of Health and Care Services, the Ministry of Foreign Affairs and the Ministry of Climate and Environment. In addition to our national mandate for safety, security, and safeguarding, we have international tasks related to promoting radiation protection, nuclear security, nuclear safety, disarmament and non-proliferation.

We are the responsible authority and expert organization for nuclear security, for all use of radiation, for natural radiation and for radioactive contamination of the environment.

We chair and serve as the secretariat for nuclear preparedness in Norway and are the point of contact for reporting national and international nuclear events.

We are the national reference laboratory for units of measurement related to radiation and radioactivity. We participate in the Centre for Environmental Radioactivity (CERAD), which has been designated a Centre of Excellence by the Research Council of Norway.

The purpose of this report is to give an overview of the international work DSA was specifically engaged in during 2016-2020 related to nuclear safety and security and non-proliferation. It is not intended to present all international work we do or international foras were we participate. Due to the Covid19 pandemic, the activity level has been decreased recently, as many projects, international meetings and exercises have been postponed or cancelled.

2 International Nuclear safety and security section - general description

The Norwegian Radiation and Nuclear Safety Authority (DSA) has extensive activity as an adviser for the Ministry of Foreign Affairs in international issues in the areas of nuclear safety, nuclear security and non-proliferation. A priority area is the Government's Action Plan for Nuclear Activities and the Environment (Nuclear Action Plan). The purpose of the nuclear action plan is to support concrete measures that contribute to reduced risk of serious accidents from nuclear facilities and storages. Other tasks are to prevent nuclear and other radioactive material from falling into the wrong hands. Russia and Ukraine are focus areas, but activities in other FSU countries are also included.

The International nuclear safety and security section was established in 2013. A strategy for DSAs international work has been worked out and is available on our website. The main tasks of the section are to take counselling tasks for the Ministry of Foreign Affairs, follow up on international forums and conventions with which Norway is affiliated and following up tasks in the nuclear action plan. The section also has specific expertise on risk- and environmental impact assessments.

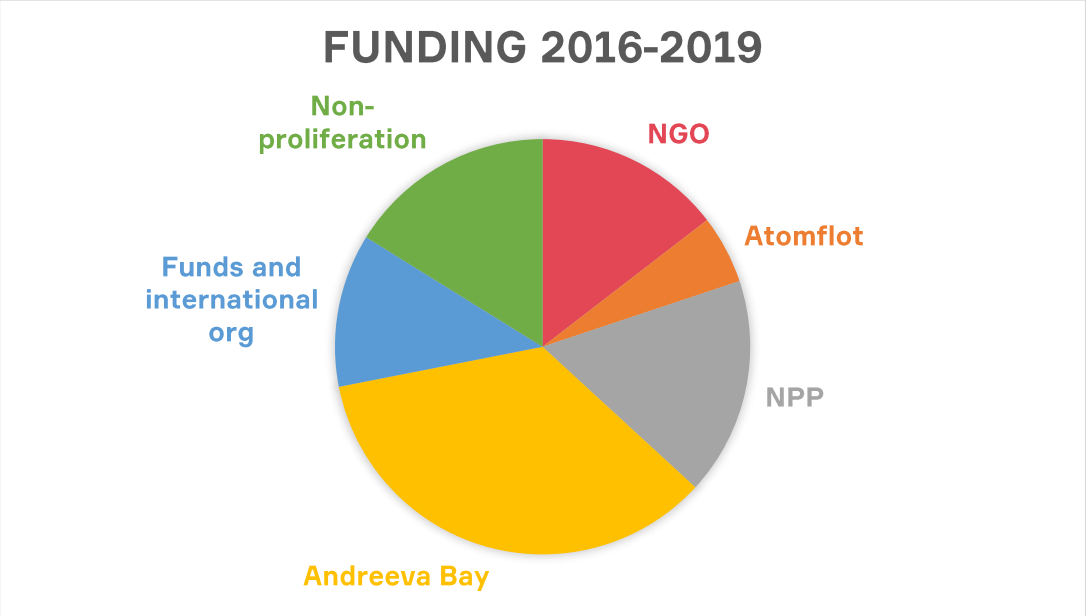
3 The Norwegian Government's Action Plan for Safety and Security

Norway's Nuclear Action Plan provides the basis for its cooperation on nuclear safety and security with Russia and Ukraine and other countries in Eurasia.

The primary objectives for activities are to reduce the risk of serious accidents and radioactive contamination, and to prevent nuclear and other radioactive material from falling into the wrong hands.

The Nuclear Action Plan has focus on cooperation with relevant authorities and organizations in the areas of interest. It shall provide capacity building in the areas of safety and security at nuclear facilities and at legacy waste storages. Furthermore, it shall promote nuclear security and non-proliferation. Through cooperation we also build up first-hand knowledge of the main challenges that are important for Norway's interests in the area of nuclear safety, nuclear security and environmental protection.

The Norwegian Government first adopted a nuclear action plan in 1995. It has since been revised regularly, with the last revision being in 2018. The Norwegian parliament has allocated close to NOK 2 billion to this cooperation. DSA has since 2014 been responsible for administrating the funds. In the period 2016-2019 NOK 183 million has been allocated to projects that help achieve the nuclear action plan goals.

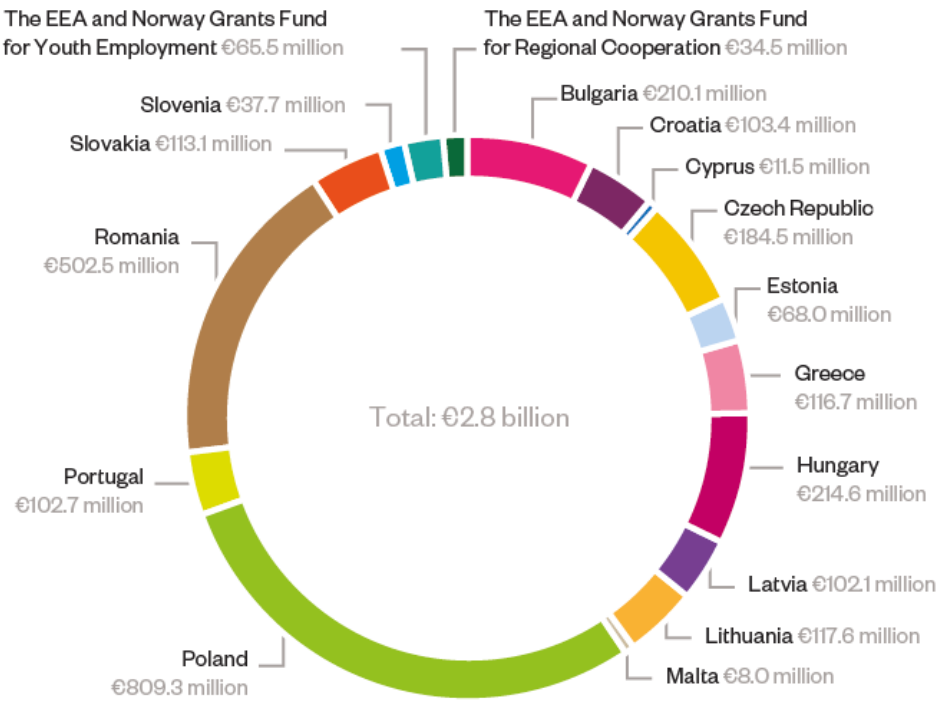


4 The EEA and Norway Grants

The EEA Grants and Norway Grants represent the contributions of Iceland, Liechtenstein and Norway to reducing economic and social disparities and to strengthening bilateral relations with 15 EU countries in Central and Southern Europe and the Baltics.

The EEA and Norway Grants have their basis in the EEA Agreement. Under this agreement, Iceland, Liechtenstein and Norway are part of the European internal market. The agreement sets out the common goal of working together to reduce social and economic disparities in Europe and strengthening cooperation between European countries. For this purpose, the EEA and Norway Grants have been established.

Our objectives are two-fold: to reduce economic and social disparities in Europe, and to strengthen bilateral relations with our beneficiary countries. This improves the functioning of the internal market and contributes to building a stronger Europe. In total, Iceland, Liechtenstein and Norway have provided €3.3 billion through consecutive grant schemes between 1994 and 2014. A further €2.8 billion has been made available in the 2014-2021 funding period. The support is mostly channelled through individual programmes covering a range of different sectors.



The distribution of the Funds between the supported EU countries for the financing period 2014-2021 (source: www.eeagrants.org).

The EEA Grants and Norway Grants are set up for five-year periods. For the period 2014-2021, €2.8 billion has been set aside under the Grants. The EEA Grants (€1.5 billion) are jointly financed by all three donors and available in all 15 countries. The Norway Grants (€1.3 billion) are financed solely by Norway and available in the 13 countries that joined the EU after 2003.

In the previous period of 2009-2014, Norway set aside €804.6 million. For the 2014-2021 period, the funding is €1.3 billion. The decision-making body for the grant scheme is the Norwegian Ministry of Foreign Affairs. Norway also provides 96% of the funding to the EEA Grants.

DSA has been involved in several EEA and Norway Grants projects as Donor Project Partner since 2009. In the period between 2016 and 2019 we have been cooperated in the following projects:

4.1 Regional Excellence Project on Regulatory Capacity Building in Nuclear and Radiological Safety, Emergency Preparedness and Response in Romania (2013-2017)

Joint CNCAN, DSA and IAEA scientific visit at Ontario Power in Canada in 2015

The Project represented a platform for sharing experience and best practices between the Romanian National Commission for Nuclear Activities (CNCAN), NRPA and the international nuclear community through the active involvement of the IAEA. During the project implementation one of the main roles of DSA was to plan, organize, and conduct an emergency preparedness and response exercise in Romania involving nuclear security, radiation protection, and consequences management aspects. Additionally, DSA was involved in joint activities with CNCAN for sharing experience and best practices in the area of safety analysis, inspections, radioactive waste management, and decommissioning of nuclear installations. During the implementation of the project IAEA provided training to CNCAN and DSA staff on the subject matters of eight identified focus areas, and assisted CNCAN in acquiring various software, hardware, models, databases, and equipment needed for its regulatory activities. The involvement of the IAEA facilitated the implementation of the project activities according to the latest updated international standards and with the participation of top international experts.

4.2 Cross-border cooperation project for enhanced detection and interception of illicit CBRN materials on the Slovakian-Ukrainian border (2015-2017)


Searching radioactive materials in a joint CBRN exercise in Slovakia in 2017 (source: Roland Kovacs, DSA).

The project objective was to enhance the capabilities of the Presidium of Police Force of the Slovak Republic and the State Border Guards Services of Ukraine and their partners at the border in the areas of CBRN threats through exchange of experiences, best practices and capacity building with DSA and other experts and organizations. Special equipment for the detection of CBRN materials and special protective equipment for the training and operation of specialized units of security forces was purchased. An extensive education and training of police officers, the Financial Directorate of the SR officers, the judiciaries and the officers of Ukrainian security forces was undertaken, as well as the creation of strategic project documents – Joint Threat Assessment and Draft of the Joint Concept of Operation for the reaction of security forces on a CBRN incident at the SK-UA border. A joint SK-UA exercise was carried out with the participation of

DSA. There have been study visits to Iceland, Norway and France, during which cooperation with relevant state institutions was established and valuable knowledge on the procedures of the security forces in cases of CBRN materials was collected. The most significant benefits were the networking education of SK and UA relevant security forces and joint SK-UA exercises during which the participants were examined in simulated conditions of the SK-UA border in cases where simulated transport of dangerous radioactive and chemical material occurred. It has highlighted the urgent need to develop a standardized education system in this field.

Study visit in Kirkenes with Slovakian police and SBGS of Ukraine in 2016 (source: Roland Kovacs, DSA).

Promotional materials have been developed. They are usable for the general public and the police and customs officers who are usually the first persons who come into contact with such material. The partners very specifically identified and described the national practices of the security forces in the case of CBRN incidents and drew up a proposal for a common procedure for these security forces, which could be used in practice if a CBRN incident occurred in the SK-UA border or in its vicinity with the possibility of cross-border threat. 469 members of Police Force, Customs Service, SBGS, National Police of Ukraine and prosecutors were trained at different levels of knowledge (Basic education for first responders, Enhanced education for criminal police and other units and Special education for decision makers and judiciaries).

4.3 Enhancement of Nuclear Safety and Security in Romania – Improvement of Disaster Resilience and Preparedness for Radiological and Nuclear Events (2019-2023)


Situation briefing during Valahia 2016 exercise in Romania (source: Synne M. Egset, DSA).

The main objectives in the project are: Alignment of the Romanian national framework and regulatory practices with the latest international IAEA standards and European Union legislation in the field of nuclear safety and protection against ionizing radiation; the implementation of recommendations from the international missions in Romania on nuclear safety, detection and response to events involving nuclear and radioactive materials not subject to regulatory control, cyber security for nuclear installations and training and intervention in case of emergency; implementation of several activities of the national action plan associated with the National Strategy for Nuclear Safety and Security; the implementation of the new responsibilities that CNCAN has in managing the nuclear emergency situations, as well as improving emergency preparedness and response by implementing lessons learned.

The national partners for this project in Romania are the National Commission for Nuclear Activities Control (CNCAN), as project promoter, together with the General Inspectorate of the Romanian

Gendarmerie, the General Inspectorate of the Romanian Police, the General Inspectorate of the Romanian Border Police, General Inspectorate for Emergency Situations and the Ministry of Internal Affairs (MAI). This project is being carried out in partnership with the Norwegian Radiation and Nuclear Safety Authority (DSA) and the International Atomic Energy Agency (IAEA).

5 Bilateral Cooperation

DSA has many bilateral agreements with both sister organizations, governmental bodies, institutions etc in a variety of countries (Australia, Belarus, France, Germany, Great Britain, Ireland, Lithuania, Netherlands, Poland, Russian Federation, Sweden, Ukraine and USA). The agreements cover a variety of purposes including exchange of information, cooperation, technical assistance and early notification in case of incidents and accidents.

Bilateral activities with countries like UK, France, Australia, Ireland and the Nordic countries are mainly in the form of cooperation with regulatory authorities on common issues of concern and information sharing. Specific topics have included issues regarding Sellafield, where UK authorities have kept DSA up to date with the decommissioning work and reprocessing. Radon strategies have also been compared and discussed as part of our bilateral work. Cooperation with Australia has also included looking at procedures for radiological assessment of visits to port by nuclear powered submarines, as such visits have been on the increase in Norway during this period.

5.1 Cooperation with Russia

The bilateral cooperation with Russia started in the early nineties and has been very comprehensive on a number of topics concerning nuclear safety, nuclear security, radiation protection, emergency preparedness, non-proliferation and environmental protection. At present many cooperation fora's have been established to ensure safe and effective project implementation; e.g. regulatory cooperation, cooperation on environmental monitoring (Expert Group) and cooperation related to emergency preparedness. The main fora covering all bilateral activities with Russia is the "Commission Meeting" headed by the deputy minister of Foreign Affairs in Norway and by the deputy Director General of Rosatom for the Russian part. These yearly meetings take place in Russian and in Norway alternately.

One of the largest bilateral activities with Russia concerns remediation of the former Russian navy base at Andreeva Bay to aid and enable the removal of spent nuclear fuel from the Soviet era nuclear powered submarine fleet. The military base was used for refueling of nuclear submarines and the handling and storage of solid and liquid radioactive waste. After operation of the base ceased in the 1980's, little maintenance was performed, and parts of the base are very contaminated with radioactivity. The radioactive waste and spent nuclear fuel (SNF) from approximately 100 submarine reactors have been stored at the site and an accident at the base can have serious consequences. Norwegian authorities started projects with Russia already in 1997 to improve storage conditions. Several other European countries have also contributed to the establishment of conditions necessary for safe removal of spent nuclear fuel and radioactive waste. Russia is responsible for the removal of the spent nuclear fuel which started in June 2017 and is estimated to continue until 2025. By end 2019 several transports have been completed successfully. The spent nuclear fuel is transported to Mayak in Russia, 150 km from Yekaterinburg, for storage and reprocessing. It is transported with Russia's special ships, Serebrianca and Rossita, to Murmansk where it is transported onwards in special rail carriages. The retrieval of SNF from the current storage and transfer to the new containers is very complex and represents many safety challenges.

About 35 % of the moneys allocated in the Norwegian Action Plan during the period 2016-2019 have been utilized for preparing for safe retrieval of SNF and for infrastructure at Andreeva Bay (roads, water and electricity supplies and some building work). The bilateral cooperation also resulted in the joint publication "Strålevern Rapport 2017:9, Environmental Impact Assessment of The Removal of Spent Nuclear Fuel (SNF) From Andreeva Bay", written and edited by scientists from SevRAO and DSA, respectively. In addition, about 5 % of Action Plan finances have contributed to improving safety and security measures at

Atomflot, the port area where SNF removed from Andreeva Baay, and other former navy bases in North-West Russia, is loaded from ship to rail for transport to Mayak PA in Southern Ural.

Funding from the Norwegian Action Plan has also been used to transport one shipment of spent nuclear fuel from Andreeva Bay in 2019. This is an important contribution towards decreasing the amount of radioactive material at the site and decreasing the potential risk of radioactive contamination of the surrounding marine and terrestrial ecosystems.

Other bilateral activities with Russia include work related to emergency preparedness with regard to protocols and procedures for early warnings in the event of a nuclear incident, observing inspections at nuclear power plants and participating at emergency preparedness (detection and measurement) exercises.

5.2 Cooperation with Ukraine

Since early nineties there has been cooperation activities with Ukraine with funding from the nuclear action plan. In the early phase this was mainly related to activities regarding the accident at the Chernobyl nuclear power plant and related to environmental contamination and reducing consequences caused by elevated levels of radionuclides in food products. The focus on nuclear safety and security in Ukraine was increased after the Norwegian Prime Minister Solberg's Initiative at the Nuclear Security Summit in Hague in April 2014.

Ukraine and Norway work together to reduce the risk of nuclear and radiation accidents and incidents, so as to reduce the risk of radioactive contamination, by improving the nuclear safety regime and the regulatory framework, by strengthening the positions of state bodies responsible for nuclear safety and security, as well as through promotion of education in this field.

On 18 October 2016 the Agreement Between the Cabinet of Ministers of Ukraine and the Government of the Kingdom of Norway on Technical and Financial Cooperation was signed in Oslo. The Agreement creates framework conditions for the provision of financial and technical assistance from the Government of Norway, as well as defining the types and forms of this assistance, the mechanisms for the approval of technical assistance projects, privileges and immunities for the Norwegian side in the framework of the implementation of the projects.

Due to the increased cooperation with Ukraine in the nuclear field, involving several authorities and agencies, it was a mutual interest to establish a fora for overall coordination of the bilateral activities. A working group was established for this purpose, headed by the deputy minister of Norwegian Foreign Affairs from the Norwegian side and the deputy minister of Energy in Ukraine. The first meeting took place in Kiev in June 2019, and an MoU describing the cooperation was developed.

Some of the most important agreements and statements related to the cooperation are shown below.

- → Regulatory Agreements NRPA-SNRIU (November 2014, revised 2018)
- → Joint Statement on Nuclear safety and security cooperation between Ukraine – Norway Sweden (November 2014)
- → Nuclear Safety Agreement NRPA-Energoatom (May 2015)
- → Statements by Norwegian PM during NSS (2014, 2016)

The first meeting of the Ukrainian-Norwegian Working Group on Nuclear Security, Nuclear Safety and Emergency Preparedness 5. June 2019.

5.3 Cooperation with Belarus

The Norwegian Radiation and Nuclear Safety Authority (DSA) and the Polessie State Radiation – Ecology Reserve (PSRER) of the Republic of Belarus, the responsible authority for management of the Belarusian Chernobyl Exclusion Zone, have collaborated actively over the past 10 years with respect to the consequences of the Chernobyl Accident on the territory of Belarus. Collaboration has focused on the impacts of the accident on the area and the mitigation of those impacts as well as improving contact and experience exchange between DSA, the Belarusian authorities and other Nordic countries. Collaboration has been conducted under various funding mechanisms and programs including NATO Science for Peace, Nordic Nuclear Safety (NKS) and the Norwegian Ministry of Foreign Affairs. Collaborative efforts have included high resolution mapping and delineation of contamination along the border between Belarus and Ukraine with harmonization of approaches to assessing contamination on both sides. Forest fires have been of increasing concern in the contaminated regions of Belarus and Ukraine and collaboration between Norway and Belarus has resulted in enhanced information as to the long-term effects of fires on radioactive contaminants within the exclusion zone. Forestry plays and important role in the socio-economic recovery of impacted areas of Belarus and joint Norway-Belarus projects have provided means for rapid, cost effective assessment of contamination levels in forest stands prior to felling, reducing waste, costs and environmental impacts of forest utilization.

The experiences of Belarus in the decades after the Chernobyl accident play an important role in developing and improving emergency preparedness systems in other countries and joint Norwegian-Belarusian activities have served to share this experience and technical know-how with the Nordic countries. Activities have included Nordic-Belarusian exercises within the exclusion zone involving mobile contamination measurement systems and in-situ methods for assessing contaminant levels. Joint Belarus-Norway activities within the Chernobyl Exclusion Zone have served as active means of collaboration and information exchange and such activities provide a useful platform as the contaminated areas face new challenges in a changing environment.

Nordic and Belarusian participants in the NKS funded GAMFAC project.

In September 2016 an MoU between the radiation protection authorities in Belarus, Norway, Sweden and Finland was signed. The MoU describes intentions and areas for cooperation to strengthen the Belarusian regulatory body in light of the Belarussian plans for building their first nuclear power plant. Norway and Belarus are now preparing a bilateral early notification agreement, to be finalized prior to the start of the nuclear power plant. When this is finalizes it is planned that Belarus establish similar bilateral agreements with Finland and Sweden.

Nordic and Belarusian participants in the NKS funded GAMFAC project.

5.4 Cooperation with the USA

As part of the international engagement for cooperation to assist Ukraine in the nuclear non-proliferation, security and safety area, Norway engaged in a comprehensive partnership with USA. Also activities in Moldova and Belarus have been carried out, partly funded by Norway. In a three year period, a number of activities were performed based on MoUs with Department of Energy (DOE) and with Department of State (DOS) signed by the Norwegian Ministry of Foreign Affairs (MFA).

- → MOU Non-proliferation Agreement between MFA-US DOE (May 2014, renewed Sep 2018)
- → MOU Non-proliferation Agreement between MFA-US State Department (February 2016)

Some of the DOE activities were directed to providing equipment and training to Ukrainian Boarder Guard service on border crossings. The aim was to enhance the capabilities to detect and deter smuggling of nuclear and other radioactive materials. The cooperation with DOS has focused on cooperation between relevant Ukrainian authorities (Police, customs, radiation protection authorities, border guards) responsible for preventing and handling a nuclear smuggling incident. There have also been activities to enhance the capabilities of the regulatory authorities for controlling radioactive sources.

In 2019 Norway supported a project in Belarus. The office of Nuclear Smuggling Deterrence and Detection (NSDD) of the U.S Department of Energy, National Nuclear Security Administration's DOE/NNSA was the implementing partner. The beneficiaries of the project were Belarusian State Border Committee (SBC) and Polesie State Radioecological Reserve.

The project aim was to ensure capability to detect and deter smuggling of nuclear and radiological materials across the border with Ukraine within Chernobyl Exclusive Zone. Activities included procurement

of multiple border control equipment and training of personnel. The project falls into the Nuclear action plans objective to prevent nuclear and other radioactive material from falling into the wrong hands. It was partly funded from the Norwegian Nuclear Action Plan with 5.000.000 NOK in 2019.

The scope of a project in Moldova implemented in 2019 includes a combination of personal protection equipment and radiation monitoring capabilities. A table-top exercise was performed to incorporate the new equipment and test the alarm response capabilities to a strategic radiological facility. The achievement of the project falls into the Nuclear action plans objective to prevent nuclear and other radioactive material from falling into the wrong hands. The Office of Radiological Security (ORS) at the U.S Department of Energy, National Nuclear Security Administration's DOE/NNSA was the implementer of the activities with funding from Norway. The beneficiaries of the project were the following state bodies in Moldova: National Police, Civil Protection and Emergency Situations Service, National Agency for the Regulation of Nuclear and Radiological Activities, and Waste Repository Special Object

The project in Moldova was supported with 500.000 NOK from the Norwegian Nuclear Action Plan

5.5 Cooperation with Sweden

In the period 2016-2020 a number of projects have been carried out in cooperation with Sweden. The aim of these projects has predominantly been to enhance nuclear security in Ukraine and in Russia. For some projects Norway (DSA) has co-funded Swedish (SSM) projects, and for some projects SSM has contributed to Norwegian-led projects. On 18 November 2014, a Trilateral Statement on the Ukrainian-Norwegian-Swedish cooperation was signed by the heads of the three countries' radiation protection authorities concerning cooperation on nuclear safety and security at the country's nuclear power plants, as well as improving regulatory guidelines, safety analyses, monitoring systems and upgraded physical protection systems. At this signing in Kiev, the Norwegian Prime minister Erna Solberg was present. This agreement forms the basis for the Norwegian-Swedish cooperation in Ukraine.

One project, implemented in 2018, was to enhance the physical protection at Khmelnitsky power plant in Ukraine. A second phase of this project was initiated in 2020. Other activities were to support the regulatory authority SNRIU and Energoatom with software related to probability safety analysis (PSA), which is an essential tool to reduce the risks of accidents. Norway and Sweden have also supported the yearly national security conference in Ukraine.

DSA has cooperated with its sister organizations in Sweden and Finland to support Russia, mainly in activities to reduce the risks of accidents at Kola and Leningrad nuclear power plants. Projects were related to emergency preparedness at Kola, visualization of radiation fields and decommissioning activities.

6 Multinational Cooperation

DSA and Norway have for the last five years been actively engaged in several multilateral fora. In this chapter we will describe some of them. The ones selected below are mainly those where Norway has allocation resources into funds or where there is information exchange and coordination of activities where several donor countries are engaged bilaterally. Norway has contributed to funds to specific international organizations/funds that work to decrease the risks posed from nuclear or other types of radioactive materials largely originating from earlier Soviet activities in Russia, Ukraine, Central Asia or in other former Soviet Union states. DSA has been actively engaged in a number of other important international fora which are not specifically addressed in this chapter, e.g. through the international atomic energy agency (IAEA).

6.1 EBRD (European Bank for Reconstruction and Development)

EBRD - established in 1991, is the first Multilateral Development Bank with an explicit requirement in its mandate to promote environmentally sound and sustainable development. Five different funds are now focusing on nuclear safety. Norway has contributed to several of these funds, to a total of approximately 22.5 million Euro. Below we describe the three funds where Norway has been specifically engaged for the last years.

6.1.1 Norther Dimensions Environmental Partnership (NDEP)

The EU's Northern Dimension Environmental Partnership (NDEP), administered by the EBRD, was established in 2001, aiming to ensure good implementation of complex and costly projects in North-West Russia. The fund is divided into two areas: “nuclear” and “environmental protection”. The “Nuclear Window” complements Russian and bilateral activities in nuclear legacy issues in North West Russia, providing safe and secure handling of spent nuclear fuel and other radioactive waste. The NDEP” Nuclear window fund” have, amongst other things, contributed to infrastructure for the removal of spent nuclear fuel from the Andreeva Bay facility and the removal of spent nuclear fuel from the storage vessel “Lepse”. In 2020, it was proposed to use the remaining funds to investigate the possibility of raising of the sunken submarine K-159.

When the fund was established, a strategic master plan (SMP) was prepared with proposals for how to solve the nuclear challenges in northwestern Russia. The SMP has been an important decision-making tool for targeted efforts for both multilateral and bilateral cooperation in the region. The two NDEP funds were schedule to end in 2017. First, they were prolonged until 2022. At the EBRD NDEP Assembly meeting in November 2020 it was decided to prolong them even further, to 2027.

Norway has allocated approximately EUR 17.9 million to the NDEP Nuclear window fund.

6.1.2 Environmental Remediation Account for Central Asia (ERA)

ERA- (CA) was established by EU in 2015 to collect funds to remediation from mining sites in Central Asian countries such as: Kyrgyzstan, Uzbekistan, and Tajikistan to remediate some of the most dangerous sites left by uranium production.

CA served as an important source for uranium in the former Soviet Union and uranium was mined for over 50 years. A large amount of radioactively contaminated material was placed in mining waste dumps and tailing sites. The hazards associated with uranium tailings which are unprotected or not well-maintained are

radon emissions and the seepage of radionuclides, gamma-radiation emitters, heavy metals and other contaminants with the possible pollution of ground and surface water.

The accumulated amount of radioactively contaminated material in the region is a threat to the environment and to the health of the population as also recognized by the 2013 UN resolution 68/218, calling on the international community to assist Central Asia with addressing this urgent issue.

A Strategic Master Plan has been developed by the IAEA which contains detailed analysis as well as cost and schedule estimates for priority remediation tasks in CA.

Following the IAEA' "Strategic Master Plan" EBRD has identified seven areas/projects for actions which is to be covered through the ERA projects a total cost of 85 million euros. In Kyrgyzstan 3 projects, in Uzbekistan 2 projects, and in Tajikistan 2 projects.

ERA activities will build on the results of international cooperation as well as bilateral donors.

Norway support: 6 million. NOK to EBRD-ERA fund in 2017 and 25 million NOK in 2020.

6.1.3 The Chernobyl Shelter Fund (CSF)

The Chernobyl Shelter Fund (CSF) was set up by the EBRD in 1997 to assist Ukraine in making the site of the temporary shelter over Chernobyl's destroyed reactor 4 stable and environmentally safe. The shelter (New Safe Confinement (NSC)) is designed to prevent the release of contaminated material from the original shelter structure built around the reactor and protect the site from external impacts such as extreme weather. The NSC is 108 meters high and 162 meters long, and has a span of 257 meters, with a design-lifetime of a minimum of 100 years. It also provides a safe working environment equipped with heavy duty cranes for the future dismantling of the temporary shelter and waste management activities at the site.

6.2 NATO

The project "Disposal of radioactive waste at Tsybuleve" was implemented under the terms of the NATO Partnership for Peace (PFP) Trust Fund (TF) policy, prepared by the NATO Support and Procurement Agency (NSPA) in close consultation with appropriate authorities in Ukraine.

Significant quantities of radioactive waste were buried by the Armed Forces of the Former Soviet Union in 1960-1990 across Ukraine. One of the contaminated areas is Tsybuleve, Kirovograd region, about 350 km south-east of Kyiv. The site doesn't meet national and international standards concerning the physical protection of critical infrastructure for disposal sites containing sealed radioactive sources.

The aim of the project was to prepare a status survey report that provided a historical site investigation followed by a radiological and an environmental survey, to provide recommendations for the work to be executed. The project also included support to the retrieval of the radioactive waste from the location to an authorized regional interim storage managed by the Ukraine State Corporation "Radon".

Norway contributed 6,2 mill NOK to the NATO Trust fund in 2018 and 2019. Germany was the largest international donor to this project.

6.3 UNICRI (United Nations Interregional Crime and Justice Research Institute)

Georgia, Moldova and Ukraine, with the support of UNICRI, have assessed their needs and identified national and regional priorities. One of the main concerns identified by Georgia, Moldova and Ukraine is the need for increasing regional cooperation in the Black Sea region due to the transnational nature of trafficking incidents of radioactive materials. The first step of the project was to organize a trilateral conference between Georgian, Moldovan and Ukrainian security services and law enforcement authorities to discuss current issues, challenges, knowledge gaps and future joint actions to prevent the trafficking of radiological and nuclear (RN) material in the Black Sea region. The results of the conference were followed up with preparing, planning and carrying out different training sessions for security, law enforcement and other relevant officials on preventing RN trafficking, with a focus on intelligence operations and investigations. Finally, the outcomes were reviewed, and a regional roadmap was developed for further strengthening regional cooperation.

Norway's contributed to these activities in 2019 with 1,5 mill NOK.

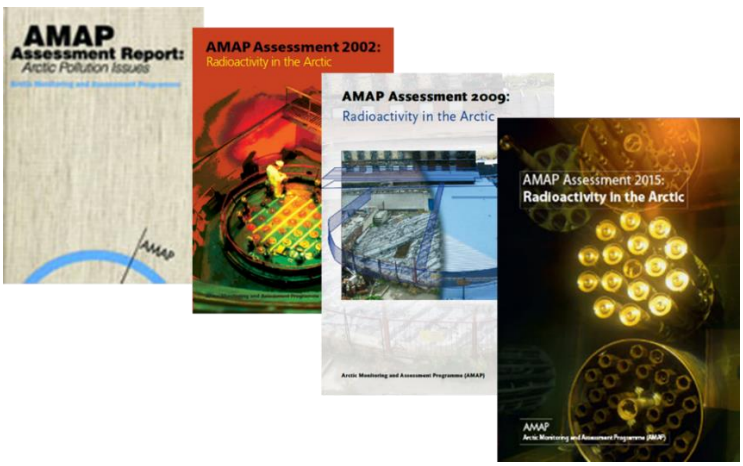
6.4 AMAP Arctic Monitoring and Assessment Program

AMAP is a working group of the Arctic Council. Since its creation in 1991, AMAP has produced a series of high-quality reports describing the Arctic's climate and pollution issues, including policy-relevant science-based advice to the Arctic Council and governments.

AMAP has the following mandate:

- → To monitor and assess the status of the Arctic region with regards to pollution and climate change issues.
- → To document levels and trends concerning different contaminants, pathways and processes and effects on ecosystems and humans, and to propose mitigation measures to reduce the associated threats.
- → To produce sound scientific, policy-relevant assessments and public outreach products to inform policy and decision-making processes.

DSA has led the AMAP radioactivity expert group together with Russia in the period 2016-2019 and will continue with that role. The most important milestone in this period was the publication of "AMAP Assessment 2015: Radioactivity in the Artic" in 2016. Work on the next report (to be published in 2022/23) is already underway, with a special focus on climate-related topics in connection with radioactivity in Arctic areas.



6.5 G7 Global Partnership

In June 2002, the G8 countries launched the Global Partnership Against the Spread of Weapons and Materials of Mass Destruction (G8GP). They undertook to provide USD 20 billion over a 10-year period to support projects in this field, initially in Russia. The Global Partnership initially defined four priority areas: nuclear and radiological security, dismantling of nuclear submarines, destruction of chemical weapons and employment of former weapons scientists. Norway joined the Global Partnership in June 2003, and pledged contributions equivalent to EUR 100 million over a 10-year period. At the 2011 G8 Summit, it was agreed to extend the Global Partnership beyond this period. For the period 2013–22, the Partnership has also expanded its geographical scope, so that its activities now have global reach. Russia left the partnership in 2014 due to the crisis in Ukraine.

The Nuclear and Radiological Working Group (NRSWG) is a working group under G7GP. In 2017 and 2018 DSA co-chaired the working group under the Italian and Canadian presidency, respectively. The NRSWG is guided by the following principles:

- → To be an effective at bringing together resources with identified requirements and facilitating new partnerships to deliver work in new priority areas;
- → To implement the Global Partnership Action Plan agreed during the 2016 Nuclear Security Summit (NSS), and other relevant commitments arising from the NSS Process;
- → To complement the work of other organizations and initiatives working in this field;
- → To focus on implementation and facilitation of partnerships related to nuclear and radiological security thematic areas.

Thematic areas for the NRSWG include:

- → Physical Protection measures at facilities housing nuclear and other radioactive material
- → Radiological source security (whole-of-life management)
- → Prevention of illicit trafficking as well as detection and response to material outside regulatory control
- → Nuclear Security Culture including training and Nuclear Security Training and Support Centers
- → International legal frameworks related to nuclear security
- → Nuclear Forensics
- → Information and Computer Security
- → Transportation Security
- → Disposition and Conversion of nuclear materials

6.6 ISTC (International Science and Technology Center)

The ISTC is an intergovernmental organization connecting scientists from Kazakhstan, Armenia, Tajikistan, Kyrgyzstan, and Georgia with their peers and research organizations in the EU, Japan, Republic of Korea, Norway and the United States.

ISTC facilitates international science projects and assists the global scientific and business community to source and engage with CIS and Georgian institutes that develop or possess an excellence of scientific know-how.

Norway is a member of the ISTC and contributes with annual financial support. DSA is also participating in the regional project between ISTC and Central Asia (CA) funded by the EU as a Foreign Collaborator. The project is on the development of legal acts related to remediation in CA and DSA contributes with experience gained during the bilateral projects with CA.

The results of the proposed project will have direct influence for the ISTC, EU, IAEA, and EBRD-ERA ongoing activities.

6.7 GICNT

The Global Initiative to Combat Nuclear Terrorism (GICNT) is a voluntary international partnership of 88 nations and six international organizations that are committed to strengthening global capacity to prevent, detect, and respond to nuclear terrorism. The GICNT works toward this goal by conducting multilateral activities that strengthen the plans, policies, procedures, and interoperability of partner nations.

All partner nations have voluntarily committed to implementing the GICNT Statement of Principles (SOP), a set of broad nuclear security goals encompassing a range of deterrence, prevention, detection, and response objectives. The eight principles contained within the SOP aim to develop partnership capacity to combat nuclear terrorism, consistent with national legal authorities and obligations as well as relevant international legal frameworks such as the Convention for the Suppression of Acts of Nuclear Terrorism, the Convention on the Physical Protection of Nuclear Material, and United Nations Security Council Resolutions 1373 and 1540.

The United States and Russia serve as Co-Chairs of the GICNT, while Finland leads the Implementation and Assessment Group (IAG) under the guidance of the Co-Chairs. To date, the GICNT has conducted over 90 multilateral activities and ten senior-level Plenary Meetings. The GICNT is open to nations that share in its common goals and are actively committed to combating nuclear terrorism on a determined and systematic basis.

6.8 Information Sharing Initiative – nuclear security in Ukraine

“Nuclear and radiological material (R/N) security in Ukraine - information sharing, lessons learned, and coordination”

The rationale for such a meeting was to share information and lessons learned where countries had carried out similar types of bilateral projects in Ukraine in the field of nuclear and radiological security. The need for sharing information and discussing lessons learned has shown to be of utmost importance. While not under the official auspices of the G7 Global Partnership (G7GP), the newly formed Information Sharing Initiative (ISI) is consistent with the Global Partnership members’ commitment to coordination and collaboration in Ukraine. The G7GP meetings have been, and will continue to be, an important forum for discussion on a political level and for matchmaking activities on a global scale. Observations from the G7GP meetings have revealed a need for more in-depth discussions at the technical project level, especially regarding Ukraine, with whom many countries engage. The ISI seeks to support the work in the G7GP Nuclear/Radiological sub-working group (NRSWG).

This information sharing initiative brings together key Ukrainian state partners, the international donor community, and organizations actively engaged in collaborative projects in Ukraine, (collectively, the “participants”). The primary goal is to help ensure relevant international donor efforts in Ukraine are well coordinated to ensure compatibility at the project implementation level. The ISI is also intended to help to reduce undesired overlap, de-conflict scope and schedules, and provide opportunities to share lessons learned. The goal is to help assist participants in identifying project prioritization and resolve issues or barriers to effective cooperation, where possible.

To accomplish these goals, ISI participants plan to:

- → Share experiences and lessons-learned, providing participants with a broad overview of their R/N security assistance projects
- → Identify concrete challenges in project prioritization, both in Ukraine and within the donor environment
- → Stemming from those challenges, develop an informal plan to enable good communication, prioritization, and collaboration
- → Discuss and address administrative obstacles to project implementation, such as project registration, tax exemption issues, liability issues and other “bottle necks” that must be overcome to start and continue effective project implementation
- → Populate a «matrix of projects» which will serve as a reference guide for ongoing and proposed R/N security projects in Ukraine.

ISI events: Oslo 2016, Kyiv 2017, Stockholm 2018, Odesa 2019,

6.9 Espoo Convention

The Espoo Convention on Environmental Impact Assessment in a Transboundary Context. The objective of the Convention is to prevent, reduce and control significant adverse transboundary environmental impacts. Espoo (EIA) Convention sets out the obligations of Parties to assess the environmental impact of certain activities at an early stage of planning. It also lays down the general obligation of States to notify and consult each other on all major projects under consideration that are likely to have a significant adverse environmental impact across boundaries.

7 Regulatory Cooperation

DSA has for many years been actively involved in the enhancement of regulatory regimes, in the areas of nuclear safety, radiation protection and environmental protection in the Russian Federation and Ukraine. For several years, DSA has also been involved in regulatory cooperation with the former soviet republics in Central Asia: Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan. The Program has brought tangible results; more than 60 regulatory documents were revised and updated or newly developed.

The cooperation program has been flexible enough to address a broad range of activities, mainly focusing on the solution of specific safety problems. Program includes discussions with interested parties, sharing of information in working groups during the preparation and review of draft documents, promotes and supports the neighbourly cooperation via discussions in wider international forums that include all project beneficiaries and Western experts.

Norway provides expertise and international experience with respect to IAEA Safety Standards and recommendations. However, each country participating in the program takes responsibility for the final version of developed documents and the approval process.

7.1 Russian Federation

DSA has a history of over 15 years of fruitful cooperation with several authorities in Russian Federation. Over 30 regulatory documents have been developed, and a broad range of topics included.

The Regulatory Cooperation Program is oriented towards a holistic approach to problems in radiation protection, emergency preparedness and response, monitoring and safety culture in relation to different types of nuclear legacy, which need to be addressed in the nearest future in the area of Barents Sea coastline, particularly at Site for Temporary Storage (STS) facilities, mainly in Andreeva Bay. An important feature of the cooperation is support of scientific development, which is the key booster to regulatory activities.

The lack of maintenance and necessary infrastructure in Andreeva Bay, after termination of the active operation resulted in significant degradation of the SNF and RW and of the storage facilities. Because of the lack of information about the condition of the SNF, and the complexity of technology for SNF and RW management applied for the first time in these abnormal circumstances, these facilities required improved methods of radiation monitoring and radiation protection of workers.

Technological hall of Building 153 (in the foreground - DSUs 2A and 2B, in the background - DSU 3A), Reloading container for SFA, Transport package container (source: SRC-FMBC).

Occupational Radiation Protection-optimization of radiation protection of workers during remediation is among the crucial issues during handling SNF. A joint project under the program, envisaged the improvement of the analytical task of the surface contamination density mitigation based on AEDR grids to monitor the dynamics of the radiation situation. Mapping computer databases were developed, including integrated computer images of facilities for SNF and RW management. The capabilities of software, developed in the course of DSA-FMBA cooperation, through the input of the initial radiation monitoring data, and frequent prompt updating, helps to obtain information on the occupational radiation situation inside the premises and, based on the site working routes and locations of workers established by the operator, automatically calculates prospective doses to workers at the planning stage of particular work activities.

Personnel reliability monitoring- improvement of regulations on personnel training are among key outputs of the program. In the course of the project remote tools were developed, as well as methods and criteria for the professional reliability monitoring of the facilities involved in decommissioning/management of spent nuclear fuel and radioactive waste. Software is considered as a working tool to make management decisions to prevent potential threats relating to the personnel overexposure.

Radio-ecological monitoring activities under the program, are focused on the radio-ecological monitoring at Andreeva Bay during SNF removal operations. Monitoring includes the marine offshore water area contamination. It is anticipated to assess the dynamics of radioactive contamination over the entire monitoring period including the impact of SNF removal operations on the radio-ecological situation at the site.

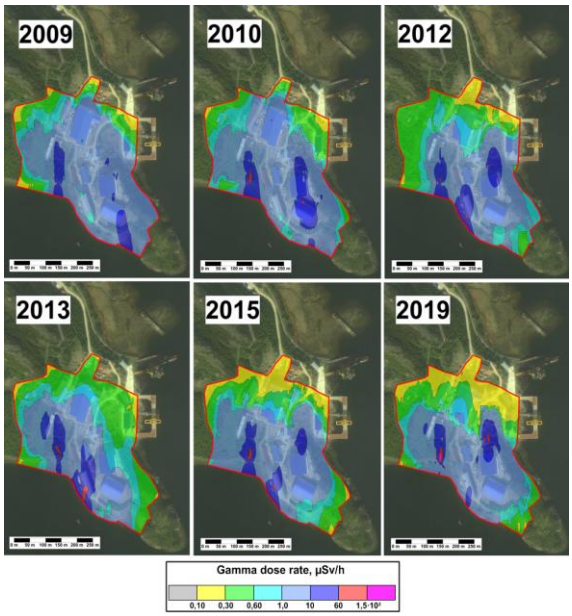


Fig. Dynamics of gamma dose rate at the industrial site over 2009-2019. (source: SRC-FMBC).

To enhance the progressive improvement of emergency preparedness and response, the strategy should be strengthened by practical activities. Accordingly, in 2016, the research emergency exercise (REE) was conducted at the premises of the NWC SevRAO Andreeva Bay site. During REE the effectiveness of participants was assessed using the advanced methods of the radiation situation simulation, measures were taken to enhance psychological training of the personnel and medical staff for the radiological accident aftermath operations.

In 2018, in the course of the joint exercise with the cooperation with the responding organizations of the SC Rosatom, the sequence of decision-making on personnel and population protection measures in case of the simulated radiation accident (RA) during the management and transportation of SNF and the implementation of the necessary radiation-hygienic and medical measures in the early phase of a radiation accident were exercised.


Practical approach to the optimization of the radiation protection at Andreyeva Bay, Joint emergency exercise in Andreyeva Bay October 2018 (Source: SRC-FMBC).

7.2 Ukraine

DSA established cooperation with the Ukrainian regulatory body in 2014. A Ukrainian Regulatory Threat Assessment (Strålevern Rapport 2016:10) was first developed to assess the primary nuclear and radiation threats to safety from a regulatory perspective, with the objective of identifying key challenges, threats and gaps in the Ukrainian regulatory framework. In the next stage joint projects were implemented to resolve the most crucial gaps revealed by the analysis in the areas of waste management, uranium mining and processing as well as on the use of radiation sources in medicine, safety during the transport of radioactive materials, radioactive source management, decommissioning of nuclear facilities, emergency preparedness and response including joint exercises.

Bilateral DSA-SNRIU meetings and workshops.

A holistic approach to cooperation requires clear ideas and good communication including flexibility in perspective that produce tangible results. Important aspects of cooperation are bilateral meetings and joint workshops allowing for the active involvement of DSA's and SNRIU`s experts in the development of regulatory documents according to the newest international recommendations and best practices.

New projects were implemented during 2016, 2017 and 2018 with the objective of the development or review of regulatory documents.

Since the first edition of the Ukrainian Threat Assessment Report in 2016, several measures have been implemented and a series of events have taken place in the Ukrainian nuclear sector. DSA's projects implemented together with SNRIU contributed to solving 45% of all regulatory threats recognized during primal knowledge gap analysis. Based on this, it was decided to reassess the situation and implement a joint project, with general objective to obtain data on the current state of the Ukrainian legislative framework on nuclear and radiation safety and to update the findings of the 2016 report.

New gaps existing in the Ukrainian regulatory system of nuclear and radiation safety were recognized. The revised report provides information on current and planned SNRIU activities aimed at overcoming the identified threats and sets basis for planning of further activities and implementing new projects. In 2018 the cooperation was expanded with nuclear security. A project was implemented with the objective to perform gap analysis of regulatory practice in Ukraine for physical protection and security of nuclear installations, nuclear materials, radioactive waste and other radiation sources. The project included analysis of IAEA and EU documents on nuclear security issued under Nuclear Security Series, INFCIRC, TECDOC, etc., and development of the list of nuclear security issues subject to state regulation in Ukraine. A key output will be definition of regulations on nuclear security to be developed, revised or cancelled.

7.3 Central Asia

DSA through the “Regulatory support program” supported Central Asian (CA) countries to analyse the regulatory situation related to nuclear safety and security and identify threats namely Kazakhstan, Kirgizstan, Tajikistan and Uzbekistan (first phase 2008-2015). Identified threats have been related to legacy sites due to inadequate regulation, poor knowledge and resources, lack of a clearly articulated national policy and strategy for radioactive waste management and weak regulatory infrastructure, as detailed into published reports Strålevern Rapports 2011: 5 and 2016: 6.

In 2018 DSA resumed its cooperation with CA regulatory bodies and a workshop was planned for August 2018. The objective was to discuss current regulatory situation in radiation and nuclear safety in Kazakhstan, Kirgizstan, Tajikistan and Uzbekistan, to explore implementation of documents developed previously in cooperation with DSA in the period 2009-2015 and to discuss the possibilities for cooperation and support from DSA, based on the updated Threat Assessment Report from each country.

The second phase of the cooperation has been resumed in 2018 with extended analysis of the regulatory situation in the field of nuclear and radiation safety in Central Asia. The analysis covered the following areas: 1) Organization and general principles of the regulatory body, 2) Safety of Installations,3) Transport of radioactive materials, 4) Radiation Safety, 5) Emergency Preparedness and Response, 6) Radioactive waste management including decommissioning and remediation, 7) Radiation safety. Identified gaps in the regulations have been prioritized and directions for further cooperation highlighted in a “Roadmap” 2020-2024.

8 Environment Impact and Consequence Assessments

DSA conducts consequence assessments with respect to sources and potential sources of radioactive contamination that may impact Norway or the Norwegian environment.

Section INT performs environmental impact and consequence assessments for many of the potential radiological hazards and sources identified in the Norwegian Governments Nuclear Action plan, AMAP and elsewhere. In recent years, assessments have included those involving the dumped nuclear submarine K-27 in Stopovogo Fjord (Hosseini et al., 2016) and sunken nuclear submarine B-159 in the Barents Sea (Hosseini et al., 2017). Typically, the assessments require the characterisation of an accident scenario and source term informing us how much radioactivity can potentially be released to the environment. Advection-dispersion models for the atmosphere and oceanic system are then used to simulate the behaviour of radionuclides with time. Models are subsequently employed to simulate the transfer of radionuclides in food-chains and provide estimates of potential doses to humans and the environment. Finally, this information is contextualised in various ways using international guidance and benchmarks considered to be protective of life.

INT's assessment work is exemplified by the project entitled "Feasibility Study and Preparation for the Implementation of an Action Plan Concerning the Safe and Secure Management/Disposal of Sunken Radioactive Objects in the Arctic Sea". This was initiated with the support of the European Commission's Directorate General for International Cooperation and Development (EuropeAid). The main purpose of the project was to carry out a feasibility study, where the results would be the basis of an action plan for the safe and secure management/disposal of the radioactive waste and nuclear objects sunken in the Arctic Ocean, with focus on the Barents and Kara Seas. The project was subdivided into three main study areas:

1. Evaluation of the present situation of the sunken objects at the Kara and Barents Seas, involving data collection and critical analysis, specification of legal and regulatory requirements and description of the available Infrastructures for managing radioactive waste.
2. A task linked to the establishment and the characterization of the top (5 or 6) most hazardous nuclear objects. Initially this involved a screening analysis involving the development and application of selection criteria. Once selected, the analysis, for each hazardous object, involved (a) source term specification (i.e. how much radioactivity could be released) under various (including accident) scenarios, (b) modelling of the dispersion of radioactivity in the atmosphere and marine environments, (c) simulating potential transfer through food-chains and assessing radiological impacts to man and the environment.
3. Performing a feasibility study for the comprehensive management of the most hazardous sunken objects identified previously. The task involved an optioneering approach whereby the information collated earlier in the project was assimilated and various management options were evaluated. Several aspects were considered in this process including, inter alia, nuclear safety, the costs associated with various management options, potential impacts on humans and the environment and technological, economic and legal requirements.

Recommendations were also prepared to optimise the administrative and technical infrastructures for the future management/disposal of the selected sunken objects. The conclusions from this work included the drafting of a comprehensive Cost/Benefit Action Plan.

DSA is further engaged in activities in relation to assessing the potential consequences for Norway of the transport of spent nuclear fuel from Andreeva Bay as well as the potential consequences of an accident involving the floating nuclear power plant Akademik Lomonosov.

DSA is engaged in an ongoing basis in the evaluation and follow-up of consequence assessments conducted in other countries, especially those conducted for facilities or activities where an accident or incident could have potential implications for Norway, Norwegian citizens or interests.

The nuclear submarine K-159 with the four floatation pontoons strapped to it prior to being towed. It sank during towing in August 2003. Photo: The Russian Northern Fleet.

9 Safety and Security at nuclear power plants (NPP's)

Since the 1990s Norway has cooperated on nuclear safety and security with two Russian nuclear power plants, Kola NPP south of Murmansk, and Leningrad NPP, outside St. Petersburg. Norway has also cooperated with Ukraine on nuclear safety and security for many years and specifically after 2014. We have established cooperation with Rivne NPP and Khmelnitsky NPP, in western Ukraine, and Chernobyl NPP which no longer have reactors in operation. The main aim of the cooperation is to reduce the risk for accidents and prevent malicious acts.

In 2016-2019 DSA supported 15 projects on nuclear safety and security, 8 in Russia and 7 in Ukraine, with a total budget of around 31 million NOK. Most of the projects have been implemented by Institute of Energy Technology (IFE). Many of these projects have in different ways been coordinated and sometimes co-financed with the Swedish Radiation Safety Authority (SSM) or the Finnish Radiation and Nuclear Safety Authority (STUK), and there are regular meetings to coordinate these efforts.

The projects have been covering three main areas: safety, security and decommissioning.

The nuclear safety projects aim to enhance the safe operation of the plant without prolonging the lifetime. The projects have enhanced the safety culture, improved the diagnostic capacity and the handling of accident scenarios. Nuclear safety projects have been implemented at Kola, Leningrad and Rivne NPP. One example is a project where equipment to measure and analyse water quality in critical systems was delivered and installed at Kola NPP. It is important as reduced water quality may lead to corrosion and leakages.

The decommissioning projects aim to improve the process of dismantling a nuclear power plant. The projects have enhanced the knowledge about decommissioning through exchange of experience with other countries and delivered equipment that enhance the safety of decommissioning activities. Decommissioning projects have been implemented at Leningrad and Chernobyl NPP. One example is a project at Chernobyl NPP where a visualisation software tool was delivered. The software can be used to improve the planning of dismantling activities or movement of radioactive material. Such activities may result in high radiation doses to personnel and therefore need careful planning.

The nuclear security projects aim to reduce the risk of sabotage and terrorist attacks at nuclear power plants. The projects have improved the surveillance and control of the nuclear power plant and its perimeter. One example is a project at Khmelnitsky NPP in Ukraine, which was implemented together with SSM, where equipment such as video cameras, different types of detectors and computer hardware were delivered.

NRPA and SSM together with Energoatom, visiting Khmelnitsky NPP in Ukraine, July 2018

10 Non-proliferation and Verification

10.1 Nuclear Disarmament Verification

Since 2007 DSA, together with Norwegian partners Defense Research Establishment (FFI), Institute for energy technology (IFE) and NORSAR have been working on developing tools and methodologies for nuclear disarmament verification.

Based on the recognition that that a credible verification regime in which all States have confidence will be essential for reaching and maintaining a world without nuclear weapons, DSA and the other partner Norwegian institutions launched a first of a kind collaboration between a non-nuclear weapon state and a nuclear weapon state through the UK-Norway Initiative in 2007.

International interest in the topic of nuclear disarmament verification has been steadily increasing, and in 2014 the International Partnership on Nuclear Disarmament Verification (IPNDV) was launched. The initiative includes more than 25 countries with and without nuclear weapons. Together, the Partners are identifying challenges associated with nuclear disarmament verification and developing potential procedures and technologies to address those challenges.

In 2015 the Quad Nuclear Verification Partnership (the Quad) was initiated. The Quad seeks to contribute solutions to the challenges associated with verifying that nuclear disarmament has occurred. This partnership was established in 2015 between Norway, Sweden, the United Kingdom, and the United States. The work of the Quad builds on experiences from the UK-Norway Initiative as well as previous UK-US verification and arms control exercises. In October 2017, the Quad held the first ever multilateral nuclear verification exercise, called LETTERPRESS, at the former nuclear weapons storage base RAF Honington in the United Kingdom (pictures below).

Source: AWE

DSA has been, and will continue to be, an active participant in these on-going initiatives.

10.2 The nuclear agreement with Iran and DSA's role

In December 2015, Norway and the Norwegian Radiation and Nuclear Safety Authority (DSA) contributed to fulfilling the nuclear agreement with Iran.

In July 2015, an agreement was signed between Iran and the P5 + 1 countries (the five permanent UN Security Council countries and Germany), with a number of conditions that Iran had to fulfill to ensure that Iran's nuclear activities are for civilian use and not to produce nuclear weapons. The International Atomic Energy Agency (IAEA) has the role of verifying that Iran fulfills its obligations under the agreement. According to the agreement, Iran could exchange its enriched uranium in an "economically equivalent" amount of natural uranium. After a query from the United States, Norway (Ministry of Foreign Affairs) decided to contribute to the implementation of the agreement by financing the purchase and transport of 60 tons of natural uranium from Kazakhstan to Iran. In total, Norway contributed about $ 6 million.

Experts from DSA verified and controlled the transportation of natural uranium from Kazakhstan to Iran. On December 27th, 2015, 60 tons of natural uranium was transported to Iran, and on December 28th a ship carrying 11 tons of enriched uranium left Bushehr in Iran for St. Petersburg in Russia. This contributed Iran to fulfill its obligations under the nuclear agreement. The sanctions against Iran, related to Iran's nuclear program, were lifted on January 16th, 2016.

DSA and a representative from the Norwegian embassy in Astana inspects the natural uranium in Kazakhstan in drums (above) and when loaded on the aircraft (below).

11 Seminars and Conferences arranged or (co)funded by DSA

11.1 Ukrainian conferences on nuclear material physical protection, accounting and control

DSA co-financed together with the Swedish radiation protection authority (SSM) the 13th, 14th, 15th and 16th Ukrainian conferences on nuclear material physical protection, accounting and control (held at Rivne NPP, South Ukrainian NPP, Zaporizhia NPP and in Lviv City). The conferences have been attended by 50-60 experts. The key objectives were to exchange experience and knowledge among experts in physical protection and accounting and control of nuclear materials, with the practical focus on physical protection of nuclear facilities in the context of hybrid war, information and cyber security, training nuclear security personnel, physical protection of radioactive waste and synergies between nuclear safety and security cultures.

11.2 Joint US/Nordic Workshop on Nuclear Security and Forensics in the Nordic Region

The Department of State of the United States in partnership with DSA, the Swedish Radiation Safety Authority (SSM) and the Radiation and Nuclear Safety Authority in Finland (STUK) hosted the Joint US/Nordic Workshop on Nuclear Security and Forensics in Oslo, Norway on the 17th to 19th of January 2017. The workshop was part of ongoing collaboration between the Nordic authorities and the United States in the area of nuclear security. More than 90 nuclear security and forensic specialists from the United States, the Nordic countries and European countries contributed to the workshop. Experts from Norway, Sweden, Finland, the United States, the United Kingdom, Slovakia, Ukraine, Hungary and international organizations such as the International Atomic Energy Agency (IAEA), INTERPOL and the European Commission participated. The workshop was conceived and developed in order to provide a comprehensive information and knowledge exchange on the subjects of nuclear security and forensics, as well as relevant information on case studies involving nuclear forensic examinations for the purposes of investigations of smuggling of nuclear and other radioactive materials. The workshop was also intended to raise awareness of the subject matter among non-expert actors with a role to play in nuclear security and forensics and promote cross-sectoral cooperation and collaboration within the Nordic region.

11.3 International Conference “Nuclear Security in the Black Sea region”

The conference was a part of research project conducted by SIPRI in cooperation with the Moldovan National Agency for Regulation of Nuclear and Radiological Activities (NARNRA), the Odesa Center for Nonproliferation (OdCNP) and the IFIN-HH, granted by the Carnegie Corporation of New York (CCNY). It had the following objectives: to review and summarize the current nuclear security threats in the Black sea region; to review and summarize the current state of nuclear security regimes in the region and to identify ways of their further improvement; to discuss and improve the draft policy paper and its recommendations concerning possible new cooperation projects; to enhance nuclear security cooperation in the region by providing another opportunity for direct communication between stakeholders. The project studies the impact of the crisis in and around Ukraine on nuclear security threats and nuclear security regimes in the Black Sea region.

11.4 Minimization of Highly Enriched Uranium

Highly enriched uranium (HEU) is one of the key ingredients for nuclear weapons but has for decades also been used in research reactors and in the production of medical isotopes. Minimizing the use of HEU in the civilian sector is an important step in reducing the possibility of nuclear proliferation.

Norway has been engaged in efforts to minimize and eliminate stocks and the use of highly enriched uranium [HEU] and in promoting non-HEU alternatives for more than a decade. In 2017 a group of 21 states, including Norway, made a commitment to minimize the use of HEU in civilian applications. The text of the Joint Statement was published by the International Atomic Energy Agency (IAEA) as INFCIRC/912.

DSA has hosted, or co-hosted, three international symposia on minimization of Highly Enriched Uranium (HEU) in civilian applications. The first in Oslo in 2006, the second in Vienna in 2012 and the third in Oslo in 2018. All three symposiums have been organized in cooperation with the International Atomic Energy Agency (IAEA).

The purpose of the 2018 Symposium was to continue to focus attention around the world on the issue of HEU minimization in the civilian nuclear sector (both as nuclear fuel and as targets in the production of e.g. medical radio-isotopes), to gain insight into the current status of the national and international efforts to minimize the use of HEU in the civilian sector, and to stimulate efforts to further minimize use of HEU in the civil sector. More than 85 participants from 27 countries, including experts, diplomats and civil society took part. The Chair's summary of the Symposium concluded that while challenges remain, significant progress had been made. Most countries, and complete regions of the world, are today HEU-free. Further minimization requires sustained technical, financial and political commitment. International cooperation is *crucial.*

11.5 The 7th International Conference on Radioactivity in the Arctic & Other Vulnerable Environments

With a focus on studies concerning the behaviour and fate of radioactivity within Arctic and other vulnerable ecosystems, the conference covered research dealing with the exposure of humans and the environment and detailed a wide range of radioactive sources (including naturally occurring and anthropogenic radionuclides). The conference continued the series established in 1993 in Norway and is an important forum for researchers, industry, regulators and other experts to meet and discuss their latest findings. Key themes of the conference were risk characterization & assessment, emergency preparedness, rehabilitation & management, radioactive waste management & disposal, radionuclides speciation & ecological transfer and environmental protection, surveillance & risk management.

11.6 International workshop on technical solutions for HEU-Thorium materials

Norway has challenges in depositing our own small quantities of HEU due to technical and legal challenges. Finding solutions for eventually removing this material is a high priority. Because of this, DSA hosted an International Technical Meeting on Minimization of Stocks of highly enriched uranium (HEU) in Uranium-Thorium Mixtures, in cooperation with the United States Department of Energy (DOE)/National Nuclear Security Administration (NNSA). The meeting took place in Oslo, Norway in January 2019, with 30 participants from eight countries. The objective of the meeting was to gain and share knowledge among countries either currently managing HEU-thorium material or possessing relevant expertise, by discussing potential technical solutions and disposition options.

11.7 Georgia / Moldova / Ukraine Trilateral Conference on Preventing Trafficking of Radiological and Nuclear Material in the Black Sea Region

The authorities in Georgia, Moldova and Ukraine have expressed a desire for better coordination of nuclear safety work around the Black Sea.

On 24-25 June, 2019, UNICRI organized trilateral workshop for Georgia, Moldova and Ukraine on countering the trafficking of radiological and nuclear (RN) material in the Black Sea region.

The conference was supported through the Nuclear Action Plan.

The workshop gathered representatives of security services, law enforcement and nuclear regulatory authorities from the three countries to discuss national efforts of countering nuclear trafficking, challenges and future regional action to enhance cooperation and communication between relevant State authorities.

11.8 Ukraine Regional Workshop on Insider Threat Mitigation

An insider's knowledge and access to safety and security systems presents unique threats to security at nuclear and radiological facilities around the world. Engaging the international community to address these threats is of the utmost importance. This regional workshop, which was a follow-up to the International Insider Threat Mitigation Symposium in Brussels, Belgium was organized in support of INF/CIRC 908. Through keynote talks by internationally recognized experts, interactive scenario-based sessions, and panel discussions this workshop was used as a forum to raise awareness of insider threats and radiological facilities in the Black Sea region and Eastern Europe.

The National Nuclear Security Administration at Department of Energy and the Ministry of Energy and Coal industry of Ukraine organized the regional workshop with the support from Norwegian Government.

12 Exercises and Trainings

12.1 Valahia 2016

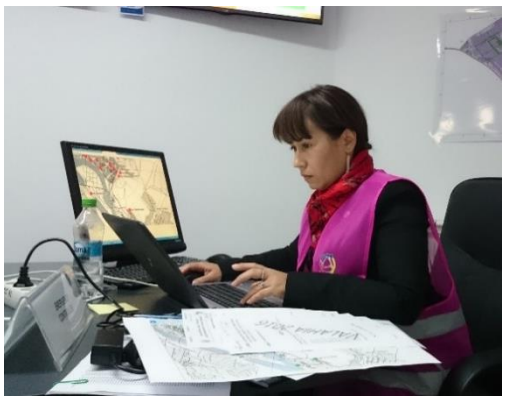
In October 4th - 6th 2016 Romania hosted a full-scale nuclear emergency response exercise (FSX), called Valahia 2016.

The overall purpose of Valahia 2016 was to test the preparedness of Nuclearelectrica, the Government and non-government agencies, and communities to respond to a “beyond design basis” accident at the Cernavoda Nuclear Power Plant in Romania. There were three levels of objectives; namely Tiers One, Two, and Three.

Tier One objectives were the overarching goals of the exercise that were agreed upon by the Exercise Design Team and all participating organizations.

The Tier One exercise objectives:

1. Test the various nuclear emergency plans and interfaces across emergency response organizations;
2. Test the related linkages, arrangements, governance structures and their implementation;
3. Test the understanding of roles, responsibilities, capabilities, and the integration across emergency response organizations; and
4. Identify current best practices, gaps and areas for improvement by conducting a Tier One Evaluation.



The Romanian exercise control and the main training audience in work during Valahia 2016 exercise (source: Roland Kovacs, DSA).

The six main nuclear response functions that were evaluated in point 4 above were:

- → Establish Emergency Response Organizations;
- → Protect the Public;
- → Protect Emergency Workers;
- → Scientific and Technical Data Sharing;
- → Ensure Effective Health Response; and
- → Public Communications Coordination.

Tier Two objectives are selected by individual organizations to allow the test and validation of specific response functions during the exercise. An example of a Tier Two objective would be to test and validate the CNCAN Emergency Response Plan.

Tier Three objectives are those objectives that are specific to an individual organization and are normally procedural in nature (e.g., test notification and activation within the plan). Not all organizations require Tier Three objectives to conduct the exercise and evaluate their response.

Participating Organizations:

- Cernavoda Nuclear Power Plant (CNPP)
- Cernavoda townhall
- Constanta (County)
- National Commission for Nuclear Activities Control (CNCAN)
- Ministry of Internal Affairs (MoIA)
- Ministry of Health (MoH)
- Ministry of National Defence (MND)
- Ministry of Environment, Water and Forests (MoEWF)
- Ministry of Transport (MoT)
- Ministry of Agriculture and Rural Development (MoARD)
- Government Operations Command Centre
- Bucharest Clinical Emergency Hospital (SCUB)

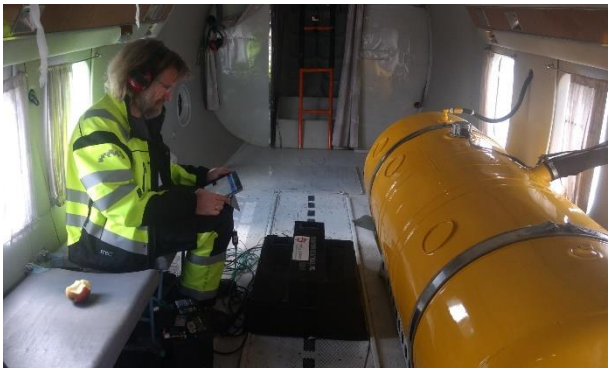


Photo left: DSA's detection equipment tested in a Romanian helicopter during Valahia 2016 exercise. Photo right: Romanian decontamination unit in work during Valahia 2016 exercise (source: Synne M. Egset, DSA).

Observing partners:

- IAEA
- Slovakia
- Hungary
- Serbia
- Moldova
- Bulgaria
- Norway (DSA)

12.2 LIONSHIELD – The first South East and Eastern Europe (SEEE) Regional Radiological Detection Exercise

The exercise in Tbilisi, Georgia, 5-8 June 2018 was implemented within the framework of the European Union (EU) Chemical Biological Radiological Nuclear (CBRN) Risk Mitigation Centre of Excellence (CoE)

Initiative, in partnership with the State Security Service of Georgia (SSSG), the United Nations Interregional Crime and Justice Research Institute (UNICRI), and the Science and Technology Center in Ukraine (STCU).

The four-day “hands-on” field exercise provided an opportunity for countries of the South East and Eastern Europe (SEEE) CoE Region to test their capabilities for detection and initial response to radiological and nuclear trafficking incidents with an emphasis on fostering regional cooperation between participating sectors and States. The exercise identified best practices on nuclear detection and initial response, as well as on coordination required to investigate an incident involving radioactive and nuclear materials.

LIONSHIELD consisted of three field simulations based on three different scenarios. The scenarios focused on incidents involving trafficking of radioactive/nuclear materials in different settings (e.g. green border, airport terminal, etc.). Each scenario was played by units composed of representatives from two to three countries in the region.

Representatives from Albania, Armenia, the former Yugoslav Republic of Macedonia, Georgia, Moldova, Montenegro, Serbia, and Ukraine participated in the event while the International Atomic Energy Agency (IAEA) and the International Criminal Police Organization (INTERPOL) attended the exercise as evaluators. DSA, the Defense Threat Reduction Office (DTRO) and Department of Energy Office of the U.S. Embassy in Georgia also attended as observers.

The exercise was promoted by the EU CBRN CoE Initiative Regional Secretariat in Tbilisi, which supports nuclear security capacity building at the national and regional levels. The overall objectives of the Regional Secretariat based in Tbilisi, Georgia are to develop comprehensive cross-border cooperation between countries, to establish inter-agency structures for coordination, as well as to support the development and implementation of CBRN risk mitigation strategies and policies throughout the region.

The main objectives of the LIONSHIELD 2018 exercise were:

- → Improve cooperation between countries in the Western Balkan and in the eastern Europe/Black Sea sub-region;
- → Increase countries’ capacity and facilitate the exchange of experiences on countering illicit trafficking of radioactive and nuclear (RN) materials;
- → Increase visibility of the European Union as a mayor assistance provided on CBRN safety and security in the region;
- → The preliminary structure of the field exercise included 3 filed exercise scenario, focusing on detection of radio/nuclear materials at border crossing points and at the green border.

13 Appendix: List of projects, not exhaustive.

Abbreviations:

SSM – Swedish Nuclear Safety Authorities

STUK – Finish Nuclear Safety Authorities

IFE - Institute for Energy Technology

NSPA – NATO Support and Procurement Agency

DOE – US Department of Energy

Ukraine

Name	Topic/area	Budget	timeframe	Implementor / co-operation
Implementation of PSA software for monitoring of reactor components (Riskspectrum» and «Riskwatcher») at the NNEGC Energoatom Ukraine	Nuclear power plants safety and security	94 300 EUR/770' NOK. DSA share 48 000 EUR.	2017-2018	Funded together with SSM
Khmelnytskyi NPP Physical Protection System Improvement (central alarm station)	Nuclear power plants safety and security	Co-funded 4,8 mill NOK	2018-2019	Implemented by SSM
Khmelnitsky NPP, Physical protection and security equipment of central check point at Ukraine	Nuclear power plants safety and security	Co-funded 4 mill NOK	2020- 2021	Implemented by SSM
Rivne NPP Ukraine - Non-Destructive Test (NDT) equipment for nuclear safety systems	Nuclear power plants safety and security	6,2 mill NOK	2015 - 2000	Implemented by IFE
Modernization and improvement of Gamma Flaw Detectors for Radiographic Testing (RT) and equipment for X-ray images interpretation (RNPP-GFD)	Nuclear power plants safety and security	6,8 mill NOK	2020 - 2022	Implemented by IFE
Delivery of blind test samples for qualification of the inspection system for inspection of RPV welds	Nuclear power plants safety and security	7,2 mill NOK	2019-2021	Funded together with SSM

Name	Topic/area	Budget	timeframe	Implementor / co-operation
(Establishment of Ukrainian Qualification Body for qualification and personnel performing UT/ET of VVER RPV)				Implemented by IFE
Chornobyl Decommissioning Visualisation Center - ChNPP Planner extension & optimization	Decommission Nuclear safety and security	2006 – 2016 NOK 8.8 2017-2020 NOK 4,1 mill	2006-2016 and follow-up 2017-2020 extension of the ChNPP planner	Implemented by IFE
New equipment at two border crossings at the border with Moldova and 2 mobile radiation detection systems	Border control	Co-funding from Norway 1,2 mill USD	2014-2017	Implemented by DOE
Nuclear Smuggling Incident Protocol (NSIP) Table Top and Field Exercises	Non proliferation	Co-funding from Norway $300,000 USD	2016-2017	Conducted by the Bureau of International Security and Non-proliferation's (ISN) Office of Weapons of Mass Destruction Terrorism (WMDT)
Equipment for Maritime Border Guards Special Operations Unit	Non proliferation	Co-funding from Norway $480,000 USD	2016-2018	This project is managed by the ECC's Export Control and Related Border Security (EXBS) program in coordination and with the participation of NRPA
Project with the SBGS of Ukraine: Mukachevskyi border detachment	Non-proliferation	6 million NOK	2015-2017	Implemented by Nordisk Sikkerhet AS
RN material detection, protection, dosimetry equipment and training for	Non-proliferation	4 million NOK	2017-2018	Implemented by Nordisk Sikkerhet AS

Name	Topic/area	Budget	timeframe	Implementor / co-operation
Zhytomyrskyi border detachment, SBGS				
RN material detection, protection, dosimetry equipment and training for Lysychanskyi border detachment, SBGS Extended to also include equipment for National Academy	Non-proliferation	5,8 million NOK	2018-2019	Implemented by Nordisk Sikkerhet AS Co-funding by SSM
Preventing the smuggling of nuclear or radiological material through the Belarus-Ukraine border within the Polesie State Radioecological Reserve	Non-proliferation and border control	Co-funding 5.000.000 NOK	2019-2021	The U.S. Department of Energy, National Nuclear Security Administration's, Office of Nuclear Smuggling Detection and Deterrence
The disposal of radioactive waste stored in the radioactive waste burial site "Tsybuleve"	Environmental improvements	Co-funding 6,2 mill NOK	2018-2020	NSPA
Risk reduction, control of radioactive contamination, and improvement of the environmental monitoring system at the Pridniprovskiy chemical plant site in Ukraine	Environmental improvements	6,5 mill NOK	2019-2022	Implemented by Advansia
Risk assessment and development of remedial design for the "Veselovsky" unauthorized radioactive waste storage site in Kirovograd Region	Environmental improvements	5,3 mill NOK	2020 - 2022	Implemented by Advansia

Russia

Name	Topic/area	Budget	Timeframe	Implementor /co-operation
Kola NPP preparing for decommissioning of unit 1 and 2	Decommissioning of NPP	5,7 mill NOK	2017 -2020	Implemented by IFE

Name	Topic/area	Budget	Timeframe	Implementor /co-operation
Leningrad NPP preparing for decommissioning unit 1	Decommissioning of NPP	9,5 mill NOK 5,0 mill NOK	2014 – 2016 2019-2022	Implemented by IFE
Kola NPP Modernisation of data-collection and visualisations systems	Nuclear power plants safety and security	3 mill NOK	2019 - 2021	Implemented by IFE Co-funding by STUK
Kola NPP Upgrading of Multi-Functional Simulator	Nuclear power plants safety and security	4,1 mill NOK	2017-2019	Implemented by IFE Co-funding by SSM
Physical protection systems at Atomflot Several projects	Nuclear safety and security Non-Proliferation	12,7 mill NOK	2015-2021	Implemented by Nordisk Sikkerhet
Evaluation of the present radio-ecological situation in Andreeva Bay, adjacent offshore areas and the Kola	Environmental improvements	1,9 mill NOK	2017 - 2020	Akvaplan Niva

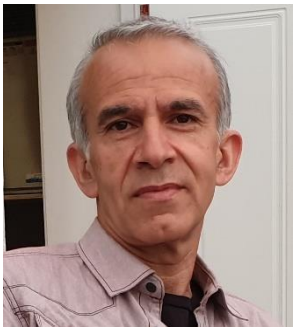
Other Countries

Name	Topic/area	Budget	Timeframe	Implementor / co-operation
Regulatory Capacity Building in Nuclear and Radiological Safety, Emergency Preparedness and Response in Romania	Capacity building (Norway Grants)	4,2 million EUR	2014 – 2017	Project partners: National Commission for Nuclear Activities Control (CNCAN) International Atomic Energy Agency (IAEA)
Enhancement of Nuclear Safety and Security in Romania – Improvement of Disaster Resilience and Preparedness for Radiological and Nuclear Events	Capacity building (Norway Grants)	3,5 million EUR	2019 - 2023	Project partners: National Commission for Nuclear Activities Control (CNCAN) General Inspectorate of Romanian Gendarmerie

Name	Topic/area	Budget	Timeframe	Implementor / co-operation
				(IGJR), General Inspectorate of Romanian Border Police (IGPF), General Inspectorate of The Romanian Police (IGPR), General Inspectorate of the Romanian Aviation (IGAv) International Atomic Energy Agency (IAEA)
Cross-border cooperation project for enhanced detection and interception of illicit CBRN materials on the Slovakian-Ukrainian border	Non proliferation (EEA Grants)	Co-funding from Norway 1,143 million EUR	2015-2017	Project partners: Ministry of Interior of Slovak Republic - Presidium of the Police Force, Administration of the State Border Guard Service of Ukraine (SBGS) Science and Technology Center in Ukraine (STCU) International Security and Emergency Management Institute (ISEMI)
Moldova TTX & Response Equipment	Physical security and capacity building	Co-funding 0,5 mill NOK	2019-2020	US Department of Energy, National Nuclear Security Administration
Control and measurement instruments, laboratory reagents, database equipment for State Regulatory Authority of Tajikistan	Environmental improvements	4 mill NOK	2019-2021	Implemented by Nordisk Sikkerhet

INT – section employees during the period 2016-2020


Ingar Amundsen, head of section


Ali Hosseini


Charles Streeper


Charlotte Birke


Hege Schultz Heireng


Hisham Jamal


Håkan Mattsson


Ingrid Lillehagen


Justin Brown


Katarzyna Siegien


Mahwash Ajaz


Mark Dowdall


Mikhail Iosjpe


Roland Kovács


Styrkaar Hustveit


Tamara Zhunussova


Taras Bobrovskyi


Tonje Sekse


William Standring

ISSN 2535-7379

dsa@dsa.no
+47 67 16 25 00
dsa.no

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DSA
Norwegian Radiation and Nuclear Safety Authority