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INSC Assistance on Improvement of Safety of Waste Management and Decommissioning Worldwide

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Abstract

As part of the Instrument for Nuclear Safety Cooperation (INSC) implementation the European Commission (EC) provides extensive assistance to countries in the field of safety of radioactive waste management and decommissioning. The programme is directed at ensuring the safety of radioactive waste management facilities and activities and provides assistance to national nuclear regulatory authorities and operator organizations. Assistance is based on European Union (EU) legislation, international safety standards and calls upon the extensive expertise and experience within Member States of the EU. It is also designed to address countries' needs in waste management, remediation and decommissioning and to support the development of sustainable infrastructure in the beneficiary countries. This paper describes the current INSC programme until 2013, key areas of cooperation, trends and lessons learned.

1. INTRODUCTION

Since the beginning of the nuclear industry development in the 1940s radioactive waste has been generated mainly from past activities related to mining and milling of uranium and other ores, operation of nuclear facilities (nuclear power plants - NPPs, research reactors, fuel processing facilities, etc.), development of military programmes, remediation of contaminated sites and last but not least as a result of nuclear accidents (e.g. Chernobyl).

At present, work in the field of radioactive waste management worldwide is focused on the cleanup and remediation of contaminated sites, minimisation of waste generation during operation and decommissioning, and effective and safe long term management and disposal of waste (including disused sealed radioactive sources with known and unknown origin/ownership). In addition, 61 reactors are being constructed in 13 countries [1] and a number of countries (UAE, Jordan, Indonesia, Turkey, etc.) are developing plans for new facilities (e.g. NPPs) that will lead to generation of additional radioactive waste that will need to be safely managed and disposed of.

The European Commission (EC) has recognised the importance of enhancing and maintaining safety of radioactive waste management activities and facilities in the EU and around the world and has taken legal and technical measures to assist EU Member States, neighbouring and also third countries. More specifically the EU:

- adhered to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management [2];

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- recently developed two directives applicable for EU countries, i.e. the directive 2009/71/Euratom on nuclear safety of 2009 [3] and the directive 2011/70/Euratom on radioactive waste and spent fuel of 2011 [4], and a number of regulations and decisions [5].

With respect to providing technical assistance to third countries the EU has established two main mechanisms for pre-accession countries (IPA[4]) [6] and for other non-EU countries (INSC) [7]. The latter, established in 2007, is a continuation of the technical assistance to non-EU countries accomplished by the TACIS (Technical Assistance to the Commonwealth of Independent States – CIS) programme [8, 9, 10 and 11].

2. INSC PROGRAMME TO DATE

The Technical Assistance to the Commonwealth of Independent States (TACIS) programme commenced in 1991 and was completed in December 2006. Part of this programme was focused on nuclear safety improvements in Armenia, Kazakhstan, Russia and Ukraine and more specifically in the following areas [12]:

- design safety analysis, on-site assistance to NPPs with supply of equipment;
- regulatory and licensing activities;
- radioactive waste management and contributions to international initiatives (Chernobyl closure, Shelter Implementation Plan (SIP), and Nuclear Safety Account (NSA)).

On 19 February 2007 Council Regulation (Euratom) No 300/2007 [7] was adopted to finance measures to support the promotion of a high level of nuclear safety, radiation protection and the application of efficient and effective safeguards of nuclear material in third countries through the Instrument for Nuclear Safety Cooperation (INSC). On that basis a Nuclear Safety Strategy 2007-2013 for Community Cooperation Programmes was developed [13] and revised in 2009 [14] and it has been implemented through three Indicative Programmes, i.e.:

a) Indicative Programme 2007-2009 of 1 August 2007 [13] for the period 2007-2009 with a total allocation of 217 M Euro, of which 20% for projects in the field of safety of radioactive wastes and spent fuel management. This includes environmental remediation of former nuclear sites and decommissioning.

b) Indicative Programme of 8 December 2009 for Community Cooperation Programmes in the Field of Nuclear Safety for the period 2010-2011 with total allocation of 143 M Euro, of which over 8 % dedicated to radioactive waste management projects [15].

c) Indicative Programme 2012-2013 [16] of about 147 M Euro, 24% of which is dedicated to radioactive waste management. The programme is being finalized and expected to be submitted for approval to INSC committee in June 2012. Three main aspects have particular impact on this programme, namely the Fukushima accident in 2011, the EU policy on Central Asia and the increased contribution of the EU to the Chernobyl Shelter Fund.

[4] Instrument for Pre-accession Assistance [6]

2.1. 2007-2013 Activities

The TACIS Nuclear Safety programme focused on nuclear safety assistance mainly to four countries of the former Soviet Union and including, to a large extent, supply of equipment ('hard assistance'), while the INSC has a broader objective to enhance cooperation with a view to improving nuclear safety worldwide, with much less emphasis on the supply of equipment and more on development of staff skills and operational practices ('soft assistance').

The main areas of INSC activities to date can be summarised as follows [17]:

- improving nuclear safety, particularly in terms of regulatory framework or management of nuclear plant safety (design, operation, maintenance, and decommissioning);
- safe transport, treatment and disposal of radioactive waste;
- remediation of former nuclear sites and protection against ionising radiation from radioactive materials;
- emergency preparedness (accident prevention, as well as response in the event of an accident);
- promotion of international cooperation in the field of nuclear safety.

The INSC activities in the 2007-2013 period focus on areas where greatest impact can be achieved with limited resources such as building technical competence of regulatory authorities, safety culture and safety analysis capabilities, radioactive waste management, decommissioning planning, etc. For countries having decided to embark on a nuclear power programme for the first time, assistance to the regulatory authorities is provided aiming at establishment and implementation of adequate legal and regulatory basis in these countries in line with international safety standards and best EU practice [14].

The ongoing (INSC and remaining TACIS) project activities in EU neighbouring countries (e.g. Ukraine, Armenia, Georgia), Asia, Africa, and Latin America are being implemented through national or multi-country projects as presented in Table 1 (see Fig. 1). The definition of the projects is based on technical and other criteria (geographical proximity, etc.) for EU assistance outlined in Refs 14 and 18.

Table 1 Current Assistance to Countries in the Field of RAW Management

National	Neighbouring countries	Armenia, Georgia, Russia and Ukraine
	Asia	China, Iraq, Jordan, Kyrgyzstan, Mongolia, Tajikistan, Uzbekistan and Vietnam
	Africa	Morocco
	L. America	Mexico
Multi-county projects	Asia*	China, Kyrgyz, Mongolia, Tajikistan, Turkmenistan and Uzbekistan
	Asia, Africa, L. America and Europe**	Argentina, Armenia, Belarus, Brazil, Egypt, Georgia, Jordan, Mexico, Morocco, Philippines, Russian Federation, Tunisia, Ukraine, and Vietnam. This list is not limitative

* remediation of uranium mining sites

**training and tutoring of regulatory authorities and their technical support organisations

At present the main INSC project activities are grouped as follows: (i) support to NPP operators or on-site assistance (OSA), (ii) support to regulatory authorities; (iii) radioactive waste management and decommissioning; (iv) international cooperation (e.g. contribution to the Chernobyl Shelter Fund, IAEA[5] projects), and (v) cross-cutting projects. It is important to observe that the only area of technical assistance with expected increase of funding is radioactive waste management as presented in Table 2. One of the main reasons for this increase is the further contribution of the EU to the Chernobyl Shelter Fund.

Table 2 Contributions of Annual Action Programmes [%]

Area of assistance (classification)	**Indicative Programmes**		
	2007-2009	**2010-2011**	**2012 -2013**
Support to operators (incl. Design Safety and OSEP[6])	30,0	22,0	4,8
Support to regulatory authorities*	10,0	28,7	17,7
Radioactive waste management and decommissioning	20,0	8,4	23,9
Accounting and Control of Nuclear Materials	14,0	1,7	1,3
International cooperation	-	7,0	6,8
Contribution to International Funds (CSF[7], NDEP[8], NSA[9])[10]	20,0	28,0	42.9
Cross-cutting projects**	6,0	4,2	2,6

*Includes also assistance in the field of regulation of radioactive waste management
**Includes technical support to EC (e.g. by JRC-Petten)

For the annual programme for 2012 eight projects related to improvement of radioactive waste management safety are being considered by the INSC Committee[11] and are planned to be to be launched in 2014, i.e.:

- Support to the Armenian and Ukrainian regulatory authorities;
- EU Contribution to the Chernobyl Shelter Fund;
- Equipment of a Radiochemical Laboratory and Establishment of a Mobile Radiochemical Laboratory (Iraq);

[5] International Atomic Energy Agency
[6] Off Site Emergency Preparedness
[7] Chernobyl Shelter Fund
[8] Northern Dimension Environmental Partnership
[9] Nuclear Safety Account
[10] See http://www.ebrd.com/pages/sector/nuclearsafety/what.shtml
[11] Art. 19 of Council Regulation (EURATOM) No. 300/2007 of 19 February 2007

- Integrated Environmental Impact Assessment (EIA) and Detailed Feasibility Study (FS) for the Management and Remediation of the AK Tyuz Uranium Mining Legacy Site in Kyrgyzstan;
- Enhancing the Capacity and Effectiveness of the Regulatory Body of Malaysia and Developing its National Waste Management Strategy;
- EU Contribution to IAEA Technical Cooperation Projects on Nuclear Safety (in INSC eligible countries) in the Field of Management of Disused Sealed Sources;
- Regulatory Regime for Nuclear Energy, Enhancing Radiation Safety and Nuclear Safeguards in Mongolia;
- Infrastructure Improvement for Radioactive Waste Management, Remediation of Contaminated Sites and Decommissioning in Ukraine.

Fig. 1 Radioactive Waste Storage Facility in Georgia

As a continuation of the ongoing programme, a new INSC instrument (of about 631 M Euro) is under preparation for the period 2014-2020 [19]. It is envisaged to cover countries worldwide (including candidate countries for accession to the EU previously covered by the IPA, such as Turkey), and to provide assistance to regulators and also operators of NPPs and other facilities using radioactive material (e.g. research reactors). Specific attention is proposed to be given to remediation and cleanup of contaminated sites and radioactive waste management and applying a regional approach for assistance.

Nuclear safety and non-proliferation actions (including INSC projects) are implemented by the Directorate General Development and Cooperation - EuropeAid (DG DEVCO, previously DG Aidco), with the collaboration of other EC institutions such as the Joint Research Centre. The JRC-IET, Petten[12] has been supporting DEVCO in the definition of national and multi-country projects, their terms of reference, tender evaluations and project implementation since 1998. Also the JRC-IET has been working with DEVCO on the establishment of a web-based database[13] for dissemination of information on all completed TACIS and INSC contracts. To date summaries of about 990 contracts can be obtained with information about the project scope, objectives, activities, beneficiaries and value of each contract.

[12] Institute for Energy and Transport (http://iet.jrc.ec.europa.eu)
[13] http://nuclear.jrc.ec.europa.eu/tacis-insc/

2.2. Radioactive Waste Management and Decommissioning Assistance

The main expected objectives/activities in this area for the 2012-2013 programme are [16]:

- cooperation on development of guidelines and regulatory framework;
- development of national strategies for radioactive waste and spent fuel management;
- characterisation and sorting of radioactive waste and development of pilot installations;
- establishment of standards and methodologies for clearance of radioactive material and pilot installations for control;
- support in development of decommissioning plans and relevant licensing documentation;
- methods and technologies for management of decommissioning waste;
- safety issues related to management of radioactive sources;
- remediation of uranium mining and milling sites in Central Asia.

It is expected that the outcomes of this programme will lead to enhanced level of safety of radioactive waste management, stable technical and financial framework for long term management of waste, improvement of security and prevention of illicit trafficking [16].

In order to achieve the above objectives the INSC programme to date in the field of radioactive waste management covers 37 ongoing projects in different stages of their completion.

The target groups are mainly operators (e.g. NPPs) and regulators, their technical support organisations (TSO), as well as other governmental bodies such as the State Agency for Management of the Chernobyl Exclusion Zone, Ministry of Emergency of Ukraine, etc.

3. ASSISTANCE TO OPERATORS

The EU assistance on radioactive waste management is provided to operators of NPPs (e.g. Energoatom in Ukraine) and of waste management facilities (e.g. Georgia and Ukraine), as well as to the respective national authorities (e.g. ministries).

The scope of the technical assistance covers development of radioactive waste and spent fuel strategies (e.g. Armenia, Mexico); safety assessment and environmental impact assessment of legacy sites (e.g. mine tailings and other disposal facilities); feasibility studies and design/ construction of radioactive waste management facilities at NPPs (e.g. retrieval, treatment and conditioning facilities at the Rivne and Zaporozhe NPPs in Ukraine) and dedicated storage sites (e.g. for high level waste at Vektor site, Ukraine); assessment for future extensions or remediation of disposal facilities (Buriakovka in Ukraine, Saakadze site in Georgia); development of safety assessment reports for new facilities (e.g. incineration, Ukraine) or as part of the licence documentation development of decommissioning concepts (Metsamor NPP, Armenia); development of infrastructure (e.g. radioactive waste management organisation in Ukraine); improvement of analytical and characterisation capabilities (Iraq and Ukraine); and clearance of material (Ukraine).

4. ASSISTANCE TO REGULATORY AUTHORITIES

In general the EU assistance is focused on supporting the regulatory authorities and their technical support organisations in order to strengthen their independence and technical competence and to enhance the legal and regulatory frameworks for radiation and radioactive waste safety.

The main areas of cooperation with neighbouring and other countries are; (i) assessment of regulatory authorities capabilities and identification of needs; (ii) support in licensing (e.g. review of safety assessment reports and other licensing documentation for existing or new facilities); (iii) support in development of laws and regulations; (iv) guidance on improvement of radioactive waste classification; and (v) strengthening capabilities of regulatory authorities and their TSOs through training and tutoring; etc.

Where possible the EU is applying the so called "2+2 approach" to assist both the operator and the regulatory authority, e.g. in Ukraine (SNRIU and Energoatom) for the implementation and licensing, respectively, of projects for the upgrade of NPPs or improvement of operational practices (including radioactive waste management). Also the EU has been collaborating with the IAEA on several projects, including notably the EC-IAEA-Ukraine joint project for the safety evaluation of Ukrainian NPPs. In addition to reviews of both the design safety and the operational safety of all 15 operational WWER reactor units in Ukraine, this project also included the review of the radioactive waste management safety and decommissioning planning at the NPPs as well as a review of the SNRCU (now SNRIU) practices in Ukraine [20]. The reviews were successfully completed in 2010 with specific recommendations and suggestions on bringing the regulatory and operator's practices in line with international safety standards (i.e. requirements).

5. OUTCOMES, TRENDS AND CHALLANGES

The assistance to date has contributed significantly to the development of capacities of operators (in particular through equipment supply but also through improvement of operational practices) and legal and regulatory infrastructure on radioactive waste management. Some of the lessons learned from the ongoing projects are related to continuation of the efforts on coordination of EU support with other international organisations (e.g. IAEA) in order to avoid duplication, involvement of regulatory authorities of Beneficiary countries to avoid to the extent possible delays in project implementation (e.g. "2+2" projects) and on provision of assessment to Member States of project implementation (according to Art. 18 of INSC Regulation [7]). Also there is a recognised increased need for assistance to both regulators and operators in the field of radioactive waste management, remediation and decommissioning in the coming years.

The EU intends to continue its efforts to ensure application of the highest standards of non-proliferation and safety within the Community and internationally. Therefore the Community is working on increasing cooperation with new countries such as Malaysia, Thailand and Indonesia. When negotiating and signing Euratom international agreements, the Community will continue encouraging beneficiary countries to adhere to all relevant international conventions (e.g. Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management).

The Commission's assistance will focus on studies, the development of legislation, institution building and in some exceptional cases of existing nuclear power plants on equipment.

Particular attention is planned to be given to safety training with the objective of developing capacity and trained human resources in the beneficiary countries.

Overall the support through the INSC programme has been and aims at ensuring sustainability after EU support has ceased [21].

The transfer of the EU know-how, experience and good practice is and remains EU priority in the INSC projects and where possible and practical in cooperation with other international organizations (e.g., IAEA) and initiatives.

An additional technical area considered by the EC and the INSC committee in the new indicative programme for 2012-13 [16] for future cooperation with third countries is the support to operators and regulators in the performance of stress tests for NPPs (i.e. Armenia and Ukraine).

In the implementation of the new programme and preparation of the new Instrument for 2014-2020 there are a number of challenges that need to be considered such as the increasing number of beneficiary countries and requests, defining the priorities for EU technical assistance within the financial and human limits of EU and the contracting organisations; as well as the reducing EC staff in the management of the projects.

The EC is working on addressing the above and other aspects and recommendations made by the Member States (e.g. through the INSC committee) in order to develop a technically sound, adequate and effective INSC programme that could contribute to the safety not only in Europe but worldwide in the long term.

6. CONCLUSIONS

The INSC instrument has proven to be an important EU vehicle for technical assistance for improving safety in neighbouring and other countries around the world. Started as a continuation of the TACIS programme with four beneficiary countries in 2007 it has broadened its scope, target countries and recipient organisations. The approach for assistance has also evolved from delivery of equipment to assistance in development of capacity in operators and regulators, and their respective TSOs. The tendency is to continue this support in order to ensure sustainability in nuclear programmes and high level of safety in the partner countries. At present the main EU assistance to the operator in the field of radioactive waste management is focused mainly on Ukraine (cooperation with Russian did not continue after the TACIS programme ended) due to the cleanup of the consequences of the Chernobyl accident, and more limited assistance is also provided to Georgia and Armenia.

As radioactive waste management is a long term activity, EU support in this field (including decommissioning and remediation) is envisaged to be continued in the new EU instrument to be launched in 2014. Specific attention is being paid to the support of regulators, adherence to international conventions and standards, coordination with other international projects and achievement of tangible results that could build confidence in EU Member States and partner countries. The JRC provides technical assistance to DEVCO in order to ensure that these goals are met in line with international safety standards and best EU practice.

REFERENCES

[1] Power Reactor Information System - PRIS (April 2012) http://pris.iaea.org/Public/WorldStatistics/UnderConstructionReactorsByCountry.aspx

[2] Council Decision 2005/84/Euratom of 24 January 2005 Approving the Accession of the European Atomic Energy Community to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.

[3] Council Directive 2009/71/Euratom of 25 June 2009 Establishing a Community Framework for the Nuclear Safety of Nuclear Installations.

[4] Council Directive 2011/70/Euratom of 19 July 2011 Establishing a Community Framework for the Responsible and Safe Management of Spent Fuel and Radioactive Waste.

[5] http://ec.europa.eu/energy/doc/energy_legislation_by_policy_areas.pdf

[6] Council Regulation (EC) No 1085/2006 of 17 July 2006 Establishing an Instrument for Pre-Accession Assistance (IPA).

[7] Council Regulation (Euratom) No 300/2007 of 19 February 2007 Establishing an Instrument for Nuclear Safety Cooperation (OJ L 81, 22.3.2007, p. 1).

[8] Council Regulation (EEC, Euratom) No 2157/91 of 15 July 1991 Concerning the Provision of Technical Assistance to Economic Reform and Recovery in the Union of Soviet Socialist Republics.

[9] Council Regulation (Euratom, EEC) No 2053/93 of 19 July 1993 Concerning the Provision of Technical Assistance to Economic Reform and Recovery in the Independent States of the former Soviet Union and Mongolia.

[10] Council Regulation (Euratom, EC) No 1279/96 of 25 June 1996 Concerning the Provision of Assistance to Economic Reform and Recovery in the New Independent States and Mongolia.

[11] Council Regulation (EC, Euratom) No 99/2000 of 29 December 1999 Concerning the Provision of Assistance to the Partner States in Eastern Europe and Central Asia.

[12] P. Chuilon, J.P. Joulia, H. Pauwels, Tacis and INSC Programmes for Nuclear Safety – Expectations of the European Union, Eurosafe (http://www.eurosafe-forum.org/files/)

[13] Commission Decision of 8 August 2007 Approving the Nuclear Safety Strategy 2007-2013 for Community Cooperation Programmes and Indicative Programme 2007-2009 [C(2007) 3758].

[14] Revised Strategy for Community Cooperation Programmes in the Field of Nuclear Safety for the Period 2010-2013, Rev Strategy 20091104.

[15] Indicative Programme of 8 December 2009 for Community Cooperation Programmes in the Field of Nuclear Safety for the period 2010-2011 C(2009)9820.

[16] Instrument for Nuclear Safety Cooperation Multi-annual Indicative Programme 2012 – 2013, Ares(2012)310103 (draft of 15 March 2012).

[17] http://ec.europa.eu/europeaid/how/finance/nsci_en.htm

[18] Council Conclusions on Assistance to Third Countries in the Field of Nuclear Safety and Security, 2913th Transport, Telecommunications and Energy Council Meeting, Brussels, 9 December 2008.

[19] 2011/0414 (NLE) Proposal for a COUNCIL REGULATION Establishing an Instrument for Nuclear Safety Cooperation {SEC(2011) 1472 final} {SEC(2011) 1473 final}

[20] International Atomic Energy Agency, Integrated Regulatory Review Service (IRRS) Follow-up to Ukraine, 20-26 November 2010, Kiev, Ukraine (http://www.snrc.gov.ua/nuclear/doccatalog/document?id=161824).

[21] Communication from the Commission to the Council and the European Parliament Addressing the International Challenge of Nuclear Safety and Security, COM (2008) 312 final