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**External evaluation report on the implementation of Council Regulation (EURATOM)  
N.300/20047 (Instrument for Nuclear Safety Cooperation) in the period 2007-2009**

*Accompanying the document*

**Report from the Commission to the European Parliament and the Council on the  
evaluation of the implementation of the Instrument for Nuclear Safety Cooperation  
(INSC) during its first three years (2007-2009)**

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**EVALUATION**  
**OF THE IMPLEMENTATION OF**  
**THE COUNCIL REGULATION (EURATOM) N° 300/2007**  
**(INSTRUMENT FOR NUCLEAR SAFETY COOPERATION)**  
**IN THE PERIOD 2007 – 2009**

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The contents of the present report do not necessarily reflect the official views, opinions or policies of DG Aideo of the European Commission. The opinions and conclusions contained within the report represent the views of the individual authors only.

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## INTRODUCTION

The Nuclear Safety component of the TACIS programme<sup>1</sup> started in 1991 as a priority area for assistance to the nuclear facilities in the Former Soviet Union (FSU) countries. It was replaced in 2007 by a new Instrument for Nuclear Safety Cooperation (INSC) with global coverage.

This INSC is established in Council Regulation No. 300/2007<sup>2</sup> for the period 2007 – 2013. Some 524 MEuro are foreseen for its implementation.

The general objectives of the INSC Regulation are:

- 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.

The Regulation specifies eight measures that can be supported within INSC. These are:

1. Promotion of an effective nuclear safety culture at all levels, in particular through:
  - (i) continuous support for regulatory bodies, technical support organisations, and the reinforcement of the regulatory framework, notably concerning licensing activities,
  - (ii) drawing notably on the experience of the operators, on site and external assistance programmes as well as consulting and related activities aiming at safety improvements of the design, operation and maintenance of nuclear power plants that are currently licensed and other existing nuclear installations so that high safety levels can be achieved,
  - (iii) support for the safe transport, treatment and disposal of spent nuclear fuel and radioactive waste, and
  - (iv) the development and implementation of strategies for decommissioning existing installations and the remediation of former nuclear sites;
2. Promotion of effective regulatory frameworks, procedures and systems to ensure adequate protection against ionising radiations from radioactive materials, in particular from high radioactive sources, and their safe disposal;
3. Establishment of the necessary regulatory framework and methodologies for the implementation of nuclear safeguards, including the proper accounting and control of fissile materials at State and operators level;
4. Establishment of effective arrangements for the prevention of accidents with radiological consequences as well as the mitigation of such consequences should they occur, and for emergency-planning, preparedness and response, civil protection and rehabilitation measures;

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<sup>1</sup> TACIS (Technical Assistance to the Commonwealth of Independent States) is the European Commission programme to assist 12 countries of Eastern Europe and Central Asia (Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine and Uzbekistan) and Mongolia in their transition to democratic market-oriented economies.

<sup>2</sup> Council Regulation (EURATOM) No 300/2007

5. Measures to promote international cooperation (including in the framework of relevant international organisations, notably IAEA) in the above fields, including the implementation and monitoring of international Conventions and Treaties, exchange of information and training and research.

The activities of INSC are implemented by the European Commission Services (AIDCO) by centralised management. Detailed programming is performed on an annual basis through annual Action Programmes (APs) containing the projects defined jointly by the Partner Countries' Organisations and the Commission Services. The content of the APs follows the orientations given in the Nuclear Safety Strategy for Community Cooperation Programmes 2007 – 2013 and the multi-annual Indicative Programme 2007 – 2009, previously adopted by the Commission, after consultation of the EU Member States in the INSC Committee. The content of the AP 2010 was developed in accordance with the revised strategy of the Commission for the period 2010-2013 and the subsequent Indicative Programme 2010 – 2011. The awarding of contracts follows the rules and procedures laid down in the European Commission Financial Regulations.

The Joint Research Centre Institutes<sup>3</sup> provide technical support to the Commission External Services in the definition and implementation of the projects.

During the TACIS Nuclear Safety Programme 857 MEuro was spent on hundreds of projects in various technical and administrative areas to improve nuclear safety in these countries.

In the first three years of implementing the INSC programme 193 MEuro has been allocated to 50 projects in 12 countries; in the fourth year (i.e. AP 2010) a further 61 MEuro for 16 projects in 10 countries has been approved.

This report summarises an evaluation of the implementation of the INSC Regulation in the first three years 2007 – 2009, as required in the Regulation<sup>4</sup>.

## 1. METHODOLOGY AND DATA

Article 21 of the INSC Regulation requires an evaluation of the implementation of the INSC Regulation in its first three years together with, if appropriate, a legislative proposal introducing the necessary modifications to the Instrument.

This report provides an overview of the projects accepted within the first three years, 2007-2009, of INSC programming, as well as their actual status of implementation. The evaluation has also taken into account the indicative programming for the period 2010-2011, in particular AP 2010 in order to assess strategic changes regarding programme objectives, the extent of global coverage and its evolution.

This overview of projects and their status is outlined in the Sections 3 – 8, whereas the developments, achievements and impact are discussed in Section 9. In Section 10 the organisation of the implementation of the INSC Regulation is evaluated. The conclusions and recommendations of this evaluation are presented in Section 11.

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<sup>3</sup> Institute for Energy, Petten (NL); Institute for Transuranium Elements Institute, Karlsruhe (DE); Institute for the Protection and the Security of the Citizens, Ispra (IT).

<sup>4</sup> Council Regulation No 300/2007, article 21.

The evaluation addresses the following main issues:

- (i) the extent to which the approved projects comply with the INSC objectives;
- (ii) the coverage of the various objectives and measures of the INSC Regulation by the approved projects, both technically and geographically and how this is evolving;
- (iii) the efficacy of programme implementation, and
- (iv) the extent to which recommendations made in a review<sup>5</sup> of the TACIS Nuclear Safety Programme for improving implementation, in particular in the regulatory area, have been taken into account in the implementation of the INSC Regulation.

For the purpose of this evaluation the eight measures for support, foreseen in the INSC Regulation, were grouped into the following four main areas of cooperation, namely:

- Strengthening regulatory authorities;
- Improving operational safety of nuclear facilities;
- Strengthening nuclear safeguards, and
- Developing responsible management of spent nuclear fuel and radioactive waste, decommissioning and site remediation.

For each of these four areas of cooperation an evaluation of cooperation was made separately for each of the main geographical regions. Exceptions are made for the Russian Federation where cooperation, across all technical areas, is covered in one single, self contained section (Section 2) and for the cooperation to strengthen nuclear safeguards, which is also covered by a single section (Section 5).

Projects that do not fall within one or other of the four main areas of cooperation are evaluated in Section 8.

The evaluation is based on an analysis of programme documentation including Commission Strategic Papers concerning the INSC programme, the Annual Action Plans, the project-specific Action Fiches, the Terms of Reference of the Technical Specifications, Result Oriented Monitoring Reports, project-specific reports from contractors, unpublished letters and protocols from meetings. In addition, information on financial and organisational aspects of the projects was obtained from the database of the European Commission and from Commission officers.

For each of these four areas of cooperation the number of projects in each cooperation area accepted in each AP, the budget and the number of countries involved are summarised below<sup>6</sup>.

	AP 2007***	AP 2008	AP 2009	Total 2007-2009	AP 2010
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<sup>5</sup> The TACIS Nuclear Safety Review Report, May 2010, by Italtrend. European Commission, EuropeAid Co-operation Office (AIDCO A4) contract N° 172067. (Report presented by the Commission to the INSC Committee).

<sup>6</sup> A detailed categorisation of the projects according to the eight measures, outlined in the INSC Regulation, is presented in Appendix I.

	budget	number		budget	number		budget	number		budget	number	budget	number		
	M€	projects	countries	M€	projects	countries	M€	projects	countries	M€	projects	M€	projects	countries	
Regulatory Authorities	4.6	3	3**	11.2	8	5**	10.7	6	6	26.5	17	13.0	7	7	
Operational Safety	30.9	8*	3	20.9	4	3	27.8	4*	4**	79.6	16*	16.0	3	3**	
Nuclear Safeguards	-	-	-	0.5	1	1	-	-	-	0.5	1	-	-	-	
Waste Management etc	11.5	2*	1	36.7	5*	2	31.7	5	3	79.9	12*	32.6	6	5**	
Others	1.5	1	2**	2.0	1	1**	3.5	2	1	7.0	4	-	-	-	
<b>Total</b>	<b>48.5</b>	<b>14*</b>	<b>4**</b>	<b>71.3</b>	<b>19*</b>	<b>8**</b>	<b>73.7</b>	<b>17*</b>	<b>10**</b>	<b>193.5</b>	<b>50*</b>	<b>61.6</b>	<b>16</b>	<b>10**</b>	

\*) Some projects have been split into several different sub-projects, which are contracted separately.

\*\*\*) Some projects concern more than one country.

\*\*\*\*) Budget for AP 2007 is exclusive the funds (28.3 M€) allocated to cooperation projects with the Russian Federation.

## 2. COOPERATION WITH THE RUSSIAN FEDERATION

The 2007 and 2008 annual Action Plans for the Russian Federation contained eleven cooperation projects aimed at strengthening the capabilities of the regulatory body, improving operational safety of NPPs and improving radioactive waste management, decommissioning and remediation activities. Failure to conclude the necessary Financing Agreements for AP 2007 and AP 2008 resulted in these important projects being cancelled by the Commission. All of these projects had a lengthy history, were well prepared and fully compliant with INSC objectives and were intended to further improving nuclear safety and the nuclear safety culture in the Russian Federation.

The funding foreseen for these cancelled projects was 28.3 MEuro in 2007 and 13.5 MEuro in 2008. The former was lost from the budget available for INSC programming but the latter was saved by reallocation to projects in other countries. Since then no new proposals for cooperation within INSC have been developed with the Russian Federation but the situation remains under continuing review.

Implementation of several soft and hard<sup>7</sup> OSA projects of the AP's 2004, 2005 and 2006 for cooperation with the Russian Federation within the TACIS programme was ongoing in the

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<sup>7</sup> Hard-OSA projects are characterised by the delivery of specific components or equipment intended to enhance the safety and/or reliability of the nuclear power plant or related systems.



early years of the INSC programme. Therefore, several soft on-site assistance contracts with EU Utilities were renewed for those NPPs where such projects were ongoing, in particular the following:

**Kola NPP:** The soft OSA activities being implemented under INSC are all on schedule. Regarding the underlying ongoing Plant Improvement Project (PIP) at Kola NPP, good results have been reported: Factory Acceptance Testing (FAT) has been completed for the supply of special valves and for the supply of a radiation monitoring system. The quality of the results for the methodology and dosimetric equipment supply of an ALARA improvement project was excellent.

**Kalinin NPP:** Implementation of an ongoing PIP at Kalinin NPP was delayed by a year due to the poor quality of the equipment and software provided by Russian subcontractors. The renewed soft OSA contract under INSC will guide the further completion of this PIP and provide the transfer of operational experience on the following: severe accident management; development of a human factor approach; risk analysis in work preparation; and training and exchange of experience. The transfer of knowledge and methodology has been very efficient consequent upon the long term cooperation between the teams from Kalinin and Tihange NPP.

**Beloyarsk and Smolensk NPP:** A wide range of soft OSA topics are being addressed in this follow-on project including: improvement of safety organisation; inspection and instrumentation and safety systems; development of a near miss reporting system; enhancement of safety culture; review of plant maintenance according to OSART guidelines; and a continued programme of exchange of operators. In addition, support is being provided for Plant Improvement Projects at the respective NPP. These are concerned with the replacement of safety related parts of the Fast Breeder Reactor BN-600 at Beloyarsk and the design of a new Radwaste Treatment Facility and equipment for analysis, process and monitoring control at Smolensk. Most activities are on schedule and there is a strong commitment of the local experts to ensuring the success of the projects.

The contract for the Joint Management Unit, JMU, in Moscow, an implementation-support and liaison office for nuclear safety issues, was renewed by the end of 2009, though scaled down substantially in size, scope and duration.

Monitoring reports on these follow-on soft OSA and JMU services are very positive regarding the quality of services provided, their punctuality and their positive impact on the ongoing projects and negotiations related to a possible restart of cooperation within INSC.

This discontinuation of cooperation with the Russian Federation is a most unfortunate development in the steady improvement of the safety culture and nuclear safety in the Russian Federation that started with the TACIS programme in the early 90's. Considering the neighbourhood aspects, the fact that the RF is a substantial exporter of nuclear technology and given the considerable mutual benefits that would result from further cooperation between the EU and the RF on improving nuclear safety and further developing the nuclear safety culture in the RF within the scope of the INSC programme, the Commission should be encouraged to continue exploring mechanisms that could end the current impasse.

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Soft-OSA projects are characterised by an exchange of knowledge towards key personnel, based on training, quality assurance, documentation systems, and improvement of safety awareness, safety management, and project management in general, as well as a whole host of similar activities provided by or facilitated by the on-site assistance Utility.

### 3. COOPERATION TO STRENGTHEN REGULATORY AUTHORITIES

#### 3.1. 3.1. ENP-East and Central Asia

Cooperation with regulatory bodies in countries covered by the European Neighbourhood Policy – East (ENP-East) and Central Asia was well established during the TACIS programme. It is being further consolidated under INSC and extended to other countries in Central Asia.

##### 3.1.1. 3.1.1. Ukraine

Cooperation with Ukraine was the most extensive in this region in the past and is likely to continue under the current INSC strategy for 2007 - 2013 (as well as under the revised strategy for 2010 – 2013) given the scale and diversity of the nuclear installations in the country, the continuing legacy of the Chernobyl accident and plans to expand significantly the installed nuclear energy capacity. Six cooperation projects have been approved in the annual AP 2007 – 2009 but none has yet begun with all still being at one or another stage of the procurement process. Ukraine is also involved in a regional cooperation project with Armenia. All of the projects are very well conceived and are more strategically focused than in the past. They can be expected to make a major contribution to achieving the national strategy<sup>8</sup> of enhancing the capabilities of the regulatory body and in harmonising Ukrainian regulatory approaches with best international practice.

Cooperation is foreseen across a wide range of important areas including: the development of regulatory frameworks for research reactors, the control of highly active radioactive sources and the transport of spent nuclear fuel and radioactive waste; the use of more risk informed approaches to regulation; developing regulatory requirements for severe accident management and for assessing the safety of reactor pressure vessels; the installation of the RODOS decision support system<sup>9</sup> for the management of any future nuclear accident; strengthening the regulatory capacity for assessing the safety of and licensing all types of waste management facilities; and harmonising regulatory requirements with the Western European Nuclear Regulatory Authorities (WENRA).

The success of some project tasks will require effective cooperation with operational safety projects being implemented in parallel (see Section 4). Difficulties were encountered in the TACIS programme with the effective integration of interlinked regulatory and operational safety projects but procedures were developed to overcome them, albeit not always fully implemented. Steps should be taken to ensure that these procedures are properly followed in relevant ongoing and future INSC projects.

##### 3.1.2. 3.1.2. Other ENP-East and Central Asia

###### *Armenia:*

Cooperation with the Armenian regulatory body, ANRA, covers a wide range of topics including emergency planning and preparedness, training of new staff, developing licensing and inspection procedures, reviewing probabilistic safety analyses, licensing numerous safety

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<sup>8</sup> SNRCU, Programme for Development and Improvement of Ukraine's Nuclear Regulatory System (Strategy Paper), 2005.

<sup>9</sup> RODOS is the Real time On-line DecisiOn Support system, developed with support from the EURATOM research programme and is used to support the management of emergency situations in NPPs in several European countries.

improvements on the operating reactor, evaluating improvements in seismic safety, and quality management. Two cooperation projects have been accepted in AP 2007 and AP 2009; the former began in late 2008 and the latter is still to be implemented.

Cooperation could be more strategically focused in future. The quasi-continuous support being provided in ongoing projects by EU consultants to senior management in ANRA will help in this respect. Some concerns persist over the absorption capacity of ANRA given the scale and diversity of the cooperation but these have moderated following more recent improvements in staffing levels; this issue, however, warrants continuing oversight. The licensing of the numerous safety improvement measures, many of which are being implemented in operational safety projects (see Section 4) is the most challenging and important issue in the short term.

#### *Belarus:*

Cooperation with Belarus is a continuation of that begun under the TACIS programme, albeit at a much enhanced level following the decision of the Belarus government to proceed with the exploitation of nuclear energy. The focus of the foreseen cooperation is on the establishment of legislative and regulatory frameworks for nuclear safety that are broadly in accord with best international practice. Two projects (AP 2008 and AP 2009) have been accepted and are in one or another stage of the contracting phase. Both are well conceived and are addressing key issues. A national action plan will be developed for establishing a strong, independent and competent regulatory body. The functions in the key areas of licensing, inspection and enforcement will be established along with capabilities for carrying out regulatory reviews of safety analyses reports, environmental impact assessments and probabilistic safety analyses. The sole aspect of the ongoing cooperation that is questionable is the support foreseen for the purchase of radiological monitoring equipment. While such equipment will doubtless be useful, it is arguable whether it is a priority at this time and/or whether the timing of its purchase could have been better optimised.

#### *Georgia:*

Cooperation with Georgia is a continuation of that started in the TACIS programme. It has a narrower scope than that in most other countries and focuses on the development of regulations for the use of radiation in medicine and for waste management, training in regulatory practice and safety evaluation, and supporting the re-assessment of the safety of existing waste management facilities, all of which are important issues in the Georgian context. Implementation of the project has been delayed due to the very limited absorption capacity of the Georgian regulatory body.

#### *Regional activities:*

In addition to the projects in each country, an important regional project involving Ukraine and Armenia is being undertaken. Policy and technical advice and training are being provided to support the two regulatory bodies in the preparation of future INSC cooperation projects. An assessment is also being made of the impact of previous nuclear safety projects. The

project is about half completed and appears to be making reasonable progress. However, this can only be assessed later in terms of tangible improvements in the quality of future proposals for cooperation and whether the indicators used to measure impact can be used more widely (i.e., for INSC).

### **3.2. 3.2. ENP-South and Middle East**

*Egypt, Jordan and Morocco:*

Egypt, Jordan and Morocco are at varying stages in the development of nuclear energy for electricity production and/or water desalination. In parallel, strong, able and independent nuclear regulatory authorities are being established and underpinned by appropriate legislative provisions. Cooperation with, and transfer of knowledge and experience from, regulatory bodies in the EU will facilitate these developments and ensure that the regulatory approaches adopted reflect best international practice.

Cooperation with Egypt and Jordan began in late 2009 and early 2010, respectively; that with Morocco is expected to begin in 2011. Broadly comparable projects are being implemented in each country, albeit with some differences in scope and content reflecting national specificities and needs. The projects are focusing on a number of key preparatory issues, in particular the development of a strategy for establishing a competent and independent regulatory body and how cooperation under INSC can facilitate its achievement, the establishment of a regulatory framework, development of criteria for prospective tendering of a NPP, and enhancing and strengthening professional knowledge on regulatory matters. Initial monitoring of progress in both the Egyptian and Jordanian projects has been undertaken. Both were found to have been well designed and were being implemented effectively. The commitment, at both policy and operational levels in each country, and the large and active participation of national experts in workshops held so far, augurs well for the success and sustainability of both projects.

Continuity of cooperation is critical at this formative stage and preparations are already well advanced for follow on projects in both Egypt and Jordan to begin in late 2011 and early 2012, respectively. These follow-on projects will focus on further refining the strategy of the regulatory body taking account of actual needs, providing more comprehensive training and knowledge transfer on a broad range of regulatory issues (i.e., licensing, inspection, enforcement, establishing a 'regulatory pyramid' of regulations and associated guidance, methods for reviewing safety assessments, environmental impact statements, siting studies, etc).

### **3.3. 3.3. Latin America**

Nuclear energy is used in several Latin American countries (Argentina, Brazil and Mexico) for the generation of electricity and its future use is under consideration by others (e.g., Chile, Venezuela). Increases in the installed capacity are planned in Argentina and Brazil. Cooperation with regulatory bodies in Latin American countries has been evaluated and priority given to those countries with existing reactors. Projects with Brazil and Mexico are at an advanced state of preparation and cooperation with Argentina is currently being actively explored. Cooperation with other countries is being considered and, if needed, is likely to be implemented through the Ibero-American Forum of Nuclear and Radiological Regulators (FORO) of which Spain is an active member.

*Mexico:*

Cooperation in Mexico will focus on issues identified in a recent review of its regulatory body, CNSNS, by IAEA. The project will have a major strategic focus involving the development of knowledge management, training strategies and a Quality Management System. In addition, a strategy or action plan for further enhancing the capabilities of the regulatory body will be developed and used as the basis for identifying priorities for future cooperation. The project is expected to make a major contribution to the resolution of issues raised by the IAEA review and is likely to begin in 2011.

*Brazil:*

Cooperation in Brazil will address a number of issues where the regulatory body, CNEN, needs to enhance its capabilities in order to effectively regulate improvements being made to the existing reactors and license a new reactor under construction. The main objective will be to establish a sustainable capacity within CNEN for carrying out independent assessments, as part of the licensing process, of: the safety of digital I&C systems; severe accident management strategies/guidelines; and deterministic assessments of fuel performance. Training will be a key element of this project, both for existing staff and new recruits who will be increasingly needed in the next few years to replace an ageing workforce. As in most other cooperation projects, a strategy or action plan for further enhancing the capabilities of the regulatory body will be developed and used to guide future cooperation. The project will be highly beneficial to CNEN but its efficacy may be diminished by possible constraints on its recruitment of new personnel. The project is ready to begin as soon as the Financing Agreement is signed.

### **3.4. South-East Asia**

An evaluation<sup>10</sup> was made, in terms of the Council criteria<sup>11</sup>, of the potential for cooperation with regulatory bodies in a number of countries in South East Asia, namely Indonesia, Malaysia, the Philippines, Singapore, Thailand and Vietnam. Vietnam and the Philippines were identified as priorities for cooperation consequent upon a governmental decision in the former to use nuclear energy for electricity production and, in the latter, to evaluate the feasibility of refurbishing the 'mothballed' Bataan NPP which, if successful, may be followed by an application for regulatory approval for its licensing and operation. Cooperation on regulatory or policy aspects of waste management was also identified as a priority in many of the countries, albeit for the longer term and customised to the specificities of each country. Cooperation between regulatory authorities on emergency management within a South-East Asian regional context was also judged to be desirable.

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<sup>10</sup> Assistance to the European Commission in the Preliminary Definition and Critical Assessment of Proposals for Cooperation in the Field of Nuclear Safety in China and South East Asia – Needs and Potential Areas for Cooperation between EC and Indonesia, Malaysia, the Philippines, Singapore, Thailand and Vietnam in the Area of Nuclear Safety, Contract NSI 2008/168-930, Final Report, ATOS Origin, May 2009.

<sup>11</sup> Council Conclusions on assistance to third countries in the field of nuclear safety and security, 2913<sup>th</sup> Transport, Telecommunications and Energy Council meeting, Brussels, 9 December 2009.

### *Vietnam and the Philippines:*

Cooperation projects in both Vietnam and the Philippines are at an advanced stage of development and are expected to begin in 2011, subject to signature of the respective Financing Agreements.

Both projects will focus on developing and/or strengthening the legal framework and managerial and technical capabilities of the respective regulatory bodies and their technical support organisations. The two projects will have many common elements, in particular the development of a strategy or action plan for the further development of the regulatory body and a cooperation plan to facilitate its achievement, improving the regulatory framework, enhancing the capability for independent review of deterministic and probabilistic safety assessments, and a human resources plan and training programme for regulatory staff.

Both projects and any necessary follow-up should provide a high degree of assurance that the regulatory approaches followed will be broadly comparable with best international practice.

### **3.5. 3.5. China**

A project to enhance the capabilities of the technical support organisations supporting the Chinese regulatory authority was accepted in AP 2010. The project will focus on capacity building in a broad range of safety and regulatory functions, standards development and radioactive waste management. The project will fund specified activities within a broader Technical Cooperation Programme agreed between China and IAEA. In addition to its direct benefits, the project will broaden insights that will enable more informed judgements to be reached on the needs and potential scale and nature of future cooperation with China.

### **3.6. 3.6. Multi-country project**

A multi-country project concerned with developing training and tutoring (or mentoring) for experts from regulatory bodies and their technical support organisations was accepted in AP 2010. It will be coordinated with ongoing IAEA activities in this area. This is an ambitious project with the potential to make a major contribution to enhancing regulatory capabilities in a sustainable manner. There is, however, a risk of overlap with training in individual INSC country projects given that training is a key element of most, if not all, of these projects. This risk is recognised and, in principle, will be avoided by focusing on more generic training/tutoring in the multi-country project leaving more specific or specialised training to individual country projects. In practice, maintaining such a clear separation may be difficult and appropriate programming and management arrangements should be put in place to ensure that it is achieved.

## **4. COOPERATION TO IMPROVE OPERATIONAL SAFETY**

### **4.1. 4.1. ENP-East and Central Asia**

#### *4.1.1. 4.1.1. Ukraine*

Ukraine has 15 nuclear power units operated by NNEGEC Energoatom at four sites. Numerous improvements have been made to the safety of the operating NPPs in recent years, several with support from the TACIS programme. Physical protection of nuclear facilities and the establishment of a national infrastructure for personnel training have been a main concern.

The operational safety projects implemented within the INSC programme are a logical continuation of the previous actions but now emphasise the ‘soft’ approach.

Seven projects have been accepted in AP 2007 to AP 2010. Three are currently being implemented and the others are at various stages of development. The scope and progress of each is summarised below.

The first project began in June 2008 and is a continuation of a previous utility OSA project at South Ukraine NPP. It includes both ‘soft’ and ‘hard’ elements. The soft activities include: severe accident management: approach to human factors in event analysis; adaptation of software for optimisation of the documentation of the behaviour of the plant reactor core, and support to seismic qualification of the structures, systems and components. The hard activities include follow-up of the ongoing PIP during the warranty period till signature of the Final Acceptance Certificates. This project has progressed effectively and is on schedule. It is expected to achieve all foreseen outcomes by the project completion date.

The second project is also a continuation of a previous utility OSA project and is concerned with safety improvements (ongoing PIP) at Khmelnytsky NPP. It began in November 2008 and is scheduled for three years. Its main activities include: the development and introduction of an operator information and support system; risk-informed optimisation of technical maintenance and repair of safety systems; and safety improvement during operation and maintenance of facilities for low radioactive waste treatment. The project has progressed effectively and is on schedule. The PIP involves upgrading of the electrical equipment of the reactor control protection system and the neutron flux monitoring system and is proceeding well.

The third project is key for the sustainable implementation of a safety culture in Ukraine. It involves the completion of the National Maintenance and Management Training Centre at Zaporozhe NPP. This Centre has been under development since 1992 but its completion has been delayed on several occasions for economic reasons. Major construction activities began in 2002 but were suspended in 2004. In 2007 a decision was taken to restart the construction with completion foreseen for the end of 2011. This completion will be supported within INSC. The project began in 2009 and is being implemented in three parts. The first part comprises a review of best international practices in maintenance and management training, an analysis of training needs for maintenance and management personnel, the development and delivery of training programmes and materials, the development of specifications for technical training tools of a general and specific nature, and training of trainers and implementation of pilot training courses. The inception report for this part was strongly criticised and a revised version was prepared in February 2010. The second part involves the supply of general equipment (e.g., projectors, computers, office devices, furniture, standard tools, instruments, etc) for pre-simulator training and specialised classrooms. The third part involves the supply of more specialised equipment including full-scope and local simulators. In principle, no institutional or financial problems are foreseen on the Ukrainian side regarding the implementation of the project. Contracting the supply of these second and third parts of the project has, however, been delayed.

Terms of Reference for the fourth project were issued in December 2010 and project start is expected in 2011. The project is concerned with the development of a strategy for long-term safety management of Ukrainian NPPs in accordance with best international practice. It comprises the following elements: recommendations and practices for pilot plants (including ageing management programmes and ageing related topics of the Periodic Safety Review; recommendations for the scope of Systems, Scope and Components subject to ageing management and on the capabilities and organisational structure of utility's technical support organisations; development of methodological guidance for ageing management programmes for SSCs at pilot plants; development of a database to support plant ageing management programmes; training of personnel; and development of a programme to disseminate the results of the project to other (non-pilot) plants.

The fifth project is concerned with improving operational and maintenance procedures and safety management. Its results will be implemented at a 'pilot' NPP first and subsequently be 'rolled out' to the other NPPs. The following aspects will be addressed: guidelines for severe accident management; operation of reactor equipment during shutdown; improvement of NDT methodologies for in-service inspection of safety-important components; improvement of training for operators; and improvement of the control and minimisation of discharges of tritium and carbon-14. Terms of Reference for this project were completed in July 2010.

The remaining two projects are at varying stages of development following their approval. They are concerned with making improvements in each of the following areas at NNEGC Energoatom and its NPPs: operational and maintenance procedures and safety management; cultural, procedural and technical capabilities; and enhancing the effectiveness of operations, safety performance and human resources.

#### *4.1.2. 4.1.2. Other ENP-East and Central Asia*

##### *Armenia:*

The Armenian NPP uses a WWER-440/230 reactor of the so called 'first generation' which cannot be upgraded under reasonable economic conditions to current safety standards due to its specific design. The EU has taken the firm position that it should be shut down as soon as possible. However, due to the lack of replacement electricity generation capacity and the country's needs, the Armenian Government decided that the power plant would need to continue operating for several more years. A Joint Donors Working Group was set up in 2005, at the initiative of the IAEA, to agree on priorities and provide funding for urgent nuclear safety improvements (IAEA Category II to IV safety issues) while the plant remains in operation.

Three larger projects in the area of operational safety were accepted in the APs 2007-2009.

One project consisting of six sub-projects in the area of operational safety has been accepted in the AP 2007. These six sub-projects deal with modernization measures in the following areas: primary circuit in-service inspection; steam generator in-service inspection; sump clogging prevention; analysis and provision for the design solution of the high energy pipe integrity; and boron concentration monitoring system. 95% of the budget of 6.4 MEuro has been contracted and all sub-projects except one are largely completed.

The second project consisting of several sub-projects in the area of operational safety has been accepted in the AP 2008. The sub-projects are concerned with improvements in the



following areas: operation of the emergency core cooling system in the long term cooling mode; upgrading of the radiation protection system at ANPP which was installed in 1976 and which is deficient in many respects; installation of a remote shutdown panel and a post accident monitoring system; and enhancing the functioning of the main control room during both the operating life and in the post-shutdown phase until the plant is decommissioned. Improvements in remote shutdown and post accident monitoring and in the functioning of the main control room have been identified by IAEA as safety critical issues. In the latter case improvements are needed in instrumentation and control, in fire safety, in safe shutdown and protection from external hazards. The upgrading of the radiation protection system is almost largely completed. Implementation of the three other sub-projects is expected to begin in 2011.

The third project, concerned with supporting the nuclear operator has been accepted in AP 2009. This support involves: improving the training of the main control room operators; improving maintenance practices; development of a decommissioning concept and related licensing documents; implementation of a pilot decommissioning project and improving the reactor confinement spray system. The Financing Agreement was signed in September 2010 and the project details are currently being developed.

#### **4.2. 4.2. ENP-South and Middle-East**

No proposals for cooperation have yet been developed with ENP South and Middle-East countries for the improvement of operational safety.

#### **4.3. 4.3. Latin America**

Cooperation on the improvement of operational safety has been agreed with Brazil. Initial discussions have been held with Mexico and Argentina and are expected to come to successful conclusion in 2011.

##### *Brazil:*

Brazil has a medium-sized civilian nuclear sector with activities of research or operational nature covering many stages of the fuel cycle. It has developed a National Energy Strategy (10 years energy expansion starting in 2014) which includes the construction of several nuclear power plants. The nuclear operator, Eletronuclear, is part of Eletrobras S.A., the Brazilian state company for the production and distribution of electricity. Eletronuclear operates the Angra 1 and Angra 2 NPPs and has Angra 3 NPP, a replica of Angra 2, under construction. Eletronuclear is facing a number of major challenges consequent upon the lack of investment over the past 20 years and an ageing workforce that will need to be replaced. There is a pressing need for a number of modernisation activities and training of new personnel, in particular in the field of nuclear safety. This has motivated their interest in cooperation under the auspices of INSC.

One project, consisting of three sub-projects has been accepted for cooperation in AP 2009.

The first sub-project is concerned with severe accident management guidelines for Angra 2 and aims to: transfer best international practice and experience in NPP safety assurance at design and beyond design basis; reduce the probability of human errors during diagnosis and decision making while responding to severe accidents; integration of the severe accident management guidelines into the emergency documentation system thereby improving the effectiveness of the Eletronuclear accident management strategies and of defence in depth.

The second sub-project is concerned with safety assessment of human factors engineering for Angra-1. Its objectives are: to ensure that Angra-1 incorporates the most important lessons learned from the Three Miles Island accident (TMI, USA, 1979) and is adopting best international practice concerning human factors engineering and safety upgrades, in particular as implemented in similar modern nuclear power plants; to contribute to improving safety performance and management during operations and maintenance; and to enhance the overall safety culture.

The third sub-project is concerned with improving safety through an upgrade of the Instrumentation and Control (I&C) system for Angra-2. This sub-project will enable the transfer of best EU and international know-how on operational safety culture to the Brazilian utility. Suitable I&C equipment and technical and regulatory requirements will be identified and a replacement strategy developed to upgrade the existing (obsolete) I&C systems important for safety. It is expected that modern digital technology will be recommended to replace the existing system and that this will be in compliance with current licensing requirements, whilst having a minimal impact on plant operation. Based on the outcome of this sub-project, Angra-2 NPP will develop documentation necessary for tendering the supply of the I&C equipment.

Terms of Reference have been agreed and these sub-projects are ready to start subject to signing of the Financing Agreement.

#### **4.4. South-East Asia**

No proposals have yet been developed with countries in South-East Asia regarding cooperation on the improvement of operational safety.

### **5. COOPERATION TO STRENGTHEN NUCLEAR SAFEGUARDS**

One project, accepted in AP 2008, is concerned with strengthening nuclear safeguards in Armenia.

The Terms of Reference for this project are currently under preparation and tendering is envisaged for

2011.

Other accepted (AP 2008) nuclear safeguard activities were cancelled due to failure to conclude the related Financing Agreement.

The Instrument for Stability, IFS<sup>12</sup>, is also concerned with cooperation aimed at strengthening safeguards. The strategies of the INSC and IFS would benefit from clarifying which measures are eligible for support from these programmes.

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<sup>12</sup> Regulation (EC) No. 1717/2006

## 6. COOPERATION TO DEVELOP RESPONSIBLE MANAGEMENT OF RADIOACTIVE WASTE AND SPENT NUCLEAR FUEL

### 6.1. ENP-East and Central Asia

#### 6.1.1. 6.1.1. Ukraine

Cooperation projects in Ukraine regarding the management of spent nuclear fuel and radioactive waste and nuclear decommissioning are implemented through multi-lateral or bi-lateral cooperation with the Ukraine. Multi-lateral cooperation concerning the Chernobyl site is implemented through financial contributions to funds which are implemented through EBRD. Bi-lateral cooperation is implemented through AidCo. One bi-lateral cooperation project comprises several sub-projects, one of which is also a multi-lateral project aiming at improving the management of spent high radioactive sources in Ukraine.

#### Multi-lateral projects implemented through EBRD:

Two international donor funds have been established to support major investment projects at the Chernobyl site. These are the Chernobyl Shelter Fund and the Nuclear Safety Account. Both funds are managed by the EBRD. In the period 2007 – 2009 the Commission contributed 15 MEuro to the NSA and 45.4 MEuro was contributed to the Chernobyl Shelter Fund. This brings the total financial contribution of the Commission to the Chernobyl Shelter Fund to 239.6 MEuro.

In AP 2010 a further 17 MEuro is scheduled to be contributed to the Chernobyl Shelter Fund.

Additional funding will be required due to important delays and cost overruns. Current estimates are that there is a financial gap of 740 MEuro overall.

The Court of Auditors, in an audit in 2008, recommended that the Commission should seek for a greater involvement in the management of the Fund. A response of the Commission and of other donors has resulted in the establishment in October 2009 of a G8 NSSG – EBRD Chernobyl Contact Group. The purpose of the Contact Group is to ensure an efficient, more detailed and continuous exchange of information to achieve a common understanding among donors and the EBRD on the technical issues, corresponding cost implications and associated risks. A complete overview of the situation concerning cost and schedule is being prepared.

#### Bi-lateral projects, implemented through AidCo:

Four cooperation projects regarding the management of radioactive waste have been developed within the APs 2007-2009.

The project initiated in 2007 involves the supply of additional equipment for the ICSRМ project in Chernobyl and providing additional services. This project is split into two parts: a contract for the supply of a ventilation system for a facility in Chernobyl for the temporary storage of high radioactive waste and a service contract supporting the licensing and providing supervision of the hot testing of the ICSRМ facility. The Technical Specifications of the supply contract were approved by the end of 2008, subsequently contracted and

completed successfully by the end of 2010. The service contract was also contracted and is still ongoing.

Two other projects, initiated in 2008, are focusing on improving the long term management of radioactive waste. The first is concerned with improving radwaste classification and management in Ukraine. Its Financing Agreement was signed in December, 2009. The latter concerns cooperation with the development of a feasibility study and a preliminary design for a near-surface facility for the long-term interim storage (ISF) of long-lived and high level radioactive waste at the Vektor complex in the Chernobyl Exclusion Zone.

The first project is split into several subprojects.

The contract for the first sub-project was signed in April 2010 and is part of a multi-lateral cooperation to improve the system for the management of highly active spent radioactive sources in the Ukraine. Its implementation is coordinated by the Department of Energy and Climate Change, DECC, in the UK.

The second sub-project concerns the improvement of the infrastructure for radioactive waste management in the Chernobyl Exclusion Zone. This requires additional facilities for the Buriakovka radioactive waste disposal site which are needed to meet present and future demands. The envisaged enlargement of the site must enable the safe disposal of the expected waste generated in the decommissioning of the Chernobyl NPP and in the frame of other major radioactive waste management projects in the Chernobyl Exclusion Zone and also improve the overall safety of the operation of the disposal site. This sub-project encompasses amongst others a feasibility study of the potential solutions, the development of the basic design of the intended interim storage facilities, the preparation of an environmental impact study, a safety assessment report and the development of the necessary licensing documentation.

The third sub-project is concerned with the improvement of radioactive waste management by supporting the preparation of a radwaste classification scheme. The latter will be in accordance with the internationally agreed safety standards and based primarily on long term safety considerations and final disposal routes. It is expected to contribute to the reduction in costs by enabling the more efficient management of waste.

The fourth sub-project is dedicated to the development of recommendations to improve the existing radioactive waste treatment system, minimise the operational waste generated, and implement integrated systems for radioactive waste accounting and control at Ukrainian nuclear power plants and for radioactive waste arising from shut-down and decommissioning of nuclear power plants in Ukraine. Recommendations will be developed on: available technologies for the decontamination of metallic components, civil structures, and large components and for the treatment of liquid effluents; detailed indication and analysis of the characteristics of the technologies available on the market and cost-benefit analysis, as well as a concept for the transport of large contaminated components. Training of nuclear power plant staff in waste minimisation procedures, waste pre-treatment and treatment techniques will also be included.

The fifth sub-project will contribute to the improvement of operational safety for the transfer of processed radioactive waste to the Exclusion Zone disposal and storage facilities in Ukraine. A feasibility study and a cost-benefit analysis will be prepared for the construction

of a railway branch connecting the Vektor and Buriakovka sites with the national railway system.

The Terms of Reference for these latter four sub-projects have been developed in 2010. Tendering started in the summer of 2010 and implementation is expected to start in 2011.

The second project of AP 2008 concerns cooperation on the development of a feasibility study and a preliminary design for a near-surface facility for the long-term interim storage (ISF) of long-lived and high level radioactive waste at the Vektor complex in the Chernobyl Exclusion Zone. The radioactive waste to be stored will include that generated as a result of the construction activities for the Chernobyl Shelter and the dismantling operations of units 1 to 3 of the Chernobyl NPP. The ISF is intended to provide for the reliable and safe storage of LL-ILW and HLW for up to 100 years. The Terms of Reference for this project were endorsed in May 2008. Because the Financing Agreement covering this project had not been concluded by March 2010, derogation was granted to start procurement. Tendering took place in summer 2010 and implementation is expected to start in 2011.

The project accepted in AP 2009 will support the establishment of a national waste management organisation and the improvement of the radioactive waste management infrastructure in Ukraine. The Terms of Reference for this project have been drafted and the Financing Agreement was signed in November 2010.

In AP 2010 a project was accepted to provide support for radioactive waste management in Ukraine. This will be elaborated in 2011.

#### *6.1.2. 6.1.2. Other ENP-East and Central Asia*

Project proposals regarding cooperation in the improvement of radioactive waste and spent nuclear fuel management in other countries in ENP-East and Central Asia have been included in the APs 2008, 2009 and 2010.

##### *Armenia:*

A project aimed at establishing a radioactive waste management strategy in Armenia was accepted in AP 2009. It will address the responsible management of all radioactive waste generated in Armenia with special emphasis on the wastes arising during the future shutdown and decommissioning of ANPP at Medzamor. The Terms of Reference are currently being developed.

##### *Georgia:*

A project aimed at improving the management of radioactive waste in Georgia was accepted in AP 2008. A survey and strategic assessment of the currently operated radwaste disposal and interim storage sites will be made with the aim of improving their safety. A mission to analyse the situation in more detail took place October, 2010. This analysis confirmed the scope of this project and it concluded that further discussions would be needed to avoid duplication with support from other donors and to fill gaps. A meeting between donors is envisaged in January 2011. Terms of Reference are currently being drafted.

A second cooperation project on the same subject is included in AP 2009. This project aims to support the operators in the preparation of safety assessment reports for the radwaste disposal

and interim storage sites. Its implementation is likely to be delayed as it is dependent on the availability of data being collected in the first project.

#### *Central Asia:*

No projects have been developed for Central Asia within the first three years of implementation of the INSC programme. Two cooperation projects have been accepted in AP 2010 concerning the remediation of uranium production legacy sites. The first project involves cooperation with Uzbekistan for an integrated environmental impact assessment and feasibility study for the management and remediation of uranium production legacy sites of Charkesar and Yangiabad. The second project involves regional cooperation in establishing a legislative and regulatory framework for the remediation of uranium mining legacy sites in Central Asia, establishing a regional watershed monitoring system and for capacity building in analytical techniques, training and education and information exchange.

Both projects are expected to begin in 2011 or 2012, the actual timing being largely determined by when the Financing Agreements are signed.

#### **6.2. 6.2. ENP-South and Middle-East**

No proposals have yet been developed with ENP South and Middle-East countries in this area.

#### **6.3. 6.3. Latin America**

Preparatory discussions were held with Argentina and Brazil in 2009 and 2010 but an agreed proposal for cooperation in this area of cooperation has yet to materialise. Potential cooperation will be further explored in both countries in 2011.

#### *Mexico:*

There is currently no national policy for the management of spent nuclear fuel and radioactive waste in Mexico resulting in several radiological liabilities and unclear responsibilities. Parliament has requested the government to develop a national policy. This has led to a request to the Commission for cooperation within INSC. A project has been accepted in AP 2010 aiming at the development of a policy and strategy for the management of spent nuclear fuel (including provisions for its safe interim storage) and radioactive waste in Mexico in cooperation with international experts. The Terms of Reference for this project have been drafted and are being discussed with the Partner country. Project start is expected in 2011. The project will enable the effective transfer of the development of legislation and of experience gained. It is likely to have a significant impact on national waste management policy.

#### **6.4. 6.4. South-East Asia**

No proposals have yet been developed with countries in South-East Asia for cooperation in this area. Cooperation on waste management was, however, identified as a priority in a

number of countries in South-East Asia during a recent evaluation of regional needs, albeit on a longer timescale than for other areas of nuclear safety (see Section 3.4).

## **6.5. Multi-country project**

A multi-country project was approved in AP 2010 with the objective of connecting existing networks for enhancing communication and training in radioactive waste management, decommissioning and environmental radiation. IAEA is carrying out related activities in this area and appropriate coordination will be established.

## **7. COOPERATION WITH THE IAEA**

The global reach of the INSC programme places even greater importance on establishing effective coordination and/or cooperation with other organisations concerned with promoting nuclear safety, notably the IAEA. This need is fully recognised and measures are being taken to exploit synergies and existing structures within the Commission and IAEA. Cooperation is in place at various levels ranging from discussion of needs and identifying priorities, through joint development of project specifications, to the co-financing and joint management of projects. Maintaining effective cooperation between the Commission and IAEA, particularly regarding the INSC programme, will be challenging but is in the mutual interest of both entities and, more importantly, that of potential beneficiary countries.

IAEA is implementing a number of multi-country projects with INSC support. These are being implemented under IAEA's contracting arrangements but are jointly managed with the Commission. These multi-country projects are generally more ambitious in scope and content and, as a consequence, are often more demanding in terms of project management and ensuring effective oversight and control.

Three such projects have so far been programmed and are at varying stages of implementation. They are concerned with enhancing national and regional preparedness for responding to radiation incidents and emergencies and contributing to projects being carried out by IAEA within their Technical Cooperation and Nuclear Installations Safety programmes, respectively. The first project has a narrow focus while the other two address a wide range of disparate issues including: safety culture and the management of safety in operating NPP in Latin America; enhancing the safety of research reactors in Uzbekistan; enhancing seismic safety through support for the International Seismic Safety Centre; strengthening regulatory capabilities for countries embarking on nuclear power, in particular in North Africa; regional capacity building in Asia, in particular building on the success of the Asian Nuclear Safety Network (ANSN); advising Central Asian countries affected by the legacy of uranium mining and processing; transfer experience on occupational exposure in the nuclear industry and in other uses of radiation; supporting African countries, in particular in complying with the Code of Conduct on research reactors; promoting compliance with the Code of Conduct on the safety and security of radioactive sources in the Mediterranean region; and reinforcing the regulatory framework in countries within Eastern Europe, the southern Caucasus and Central Asia.

All of the topics included within these multi-country projects are priorities within the INSC programme and the projects can reasonably be expected to make a significant contribution to enhancing radiation protection and nuclear safety in the countries concerned. In practice, success will depend on the efficacy of programming, project management and timely and rigorous external monitoring, all of which will be challenging given the scale and diversity

(both geographically and technically) of the issues being addressed. The current project specifications, understandably at this stage, are concerned with broad objectives and contain little by way of detail on what will be done and where. More detailed specification of each sub-project will be needed prior to its start and should be subject to careful scrutiny, in particular ensuring clarity over what is to be achieved, when and with measurable outcomes.

Many of the topics being addressed in the multi-country projects are also being addressed in past, ongoing or planned INSC cooperation projects with individual countries. Appropriate programme management and oversight arrangements will be needed to avoid duplication and ensure complementarity.

In addition to the multi-country projects, IAEA was also responsible for implementing a single country project in Ukraine concerned with assessing compliance of Ukrainian NPP with IAEA safety standards in the areas of design safety, operational safety, waste management and decommissioning and regulatory issues. This project, which was jointly managed with the Commission, was completed successfully and concluded that the Ukrainian NPPs and the regulatory body were compliant with by far the majority of the IAEA safety standards and that the level of safety being achieved was satisfactory. In all cases of non- or partial-compliance measures were being taken to remedy the situation.

## **8. COOPERATION ON OTHER ISSUES**

A regional project, which commenced in June 2009, is being implemented in Belarus and Ukraine through UNICEF with the objective of improving the health status of children, women and families living in Chernobyl-affected territories of Belarus and Ukraine. A number of initiatives are being taken including greater provision of quality health care for babies, access to better parenting programmes, prevention of iodine deficiency diseases through increased use of iodised salt in households, greater access to youth friendly services providing information and knowledge on the prevention of STI and HIV infections, the supply of medical equipment to children's hospitals, maternity centres and youth friendly health centres, and capacity building among health care professionals.

The project builds on previous initiatives. It was, however, contracted rather late due to difficulties in establishing effective cooperation with UNICEF and ensuring appropriate visibility for the contribution of the Commission. It now appears to be proceeding well and is expected to result in significant improvements in the health of those targeted.

However, many of the health conditions being addressed have no known association with exposure to radiation. Moreover, the health problems experienced in these Chernobyl affected regions are not unique and occur in other economically and socially deprived areas of both countries.

It is arguable, therefore, whether cooperation on this issue within the INSC programme is appropriate. In future, it may be more effective to address this issue at a national level and seek assistance from organisations whose role is specifically focused on the improvement of health. Such an approach would have the further benefit of ensuring that resources were allocated to where there was greatest health need.



## 9. DEVELOPMENT, ACHIEVEMENTS AND IMPACT

### *Regulatory Assistance:*

All of the 24 accepted projects in the regulatory assistance area (AP 2007 – 2010) are well conceived and fully compliant with the objectives of the INSC Regulation.

Five projects have already been contracted and, based on limited monitoring information, appear to be proceeding well. The remaining 19 projects are at one or another stage in their development and/or procurement process.

The time between acceptance (annual Action Plan) of a project and its start (contract) appears to be unduly long in many cases. For the five projects that have already been contracted, the average time to start is about two years, albeit with wide variation between projects ranging from 1 to 3 years. The average time of project start for those yet to begin is likely to be of a similar magnitude or even longer (i.e., many of the projects approved in AP 2008 have yet to start some two years after their approval). The time taken to sign Financing Agreements (typically about one year, albeit with significant variation between countries) is a major contributor to delay between the acceptance of a project and the start of its implementation. Other factors, however, are also important given that the average time between signature of a Financing Agreement and project start is also about 1 year, albeit again with significant variation between projects. The length of this further delay is surprising, in particular for regulatory assistance projects which are not subject to a tendering process and are concluded by direct agreement.

Overall, a well conceived but slow start has been made in the regulatory assistance area of the programme. In addition to continued cooperation with countries that participated in the former TACIS programme (except RF), cooperation with a further eight new countries has been achieved. This is a commendable outcome in the relatively short time since the INSC programme began, in particular given the challenges of establishing effective working relationships at both policy and operational levels with new countries and the perceived complexity of the contracting and financial arrangements. These new countries are fully compliant with the criteria of eligibility as laid down in the Council Conclusions on assistance to third countries<sup>10</sup>; most are either embarking on new nuclear energy programmes or are in the process of expanding their programmes after a long period of stagnation.

### *Operational safety:*

All 19 projects accepted in the area of operational safety are well conceived and are fully compliant with the INSC objectives.

Those concerned with the continuation of soft on-site assistance in support of Plant Improvement Projects (PIPs) at NPPs have been contracted on time, are progressing well and are providing effective support in implementing these PIPs.

The other projects in the area of operational safety are suffering from slow or delayed implementation (see Section 4). Very few of the accepted projects have so far been contracted and this is a matter of concern given the importance of the projects for improving nuclear safety and the considerable time that has elapsed since their acceptance. Late signing of Financing Agreements is an important contributory factor as is the time spent in developing

Terms of Reference compliant with AidCo procurement rules, at least for many of the projects.

#### *Nuclear safeguards:*

The sole project on nuclear safeguards, accepted in AP 2008, is still at a preparatory stage of development. Other approved nuclear safeguard activities were cancelled due to the failure to conclude the Financing Agreements. Strengthening safeguards is also eligible for support through another rather new instrument, the Instrument for Stability, IFS. The INSC and IFS strategies should be clarified with respect to the nature of cooperation in the area of nuclear safeguards that will be eligible for support from the respective programmes.

#### *Management of spent nuclear fuel and radioactive waste:*

All 18 projects accepted in AP 2007 – AP 2010 to support the development of responsible management of radioactive waste and spent nuclear fuel, decommissioning and remediation of polluted sites are well conceived and fully compliant with the objectives of the Instrument for Nuclear Safety Cooperation.

During the period, 2007 – 2010, cooperation on the management of radioactive waste and spent nuclear fuel gradually shifted towards support for the development or improvement of national strategies and management systems rather than support for individual nuclear facilities. This is fully compliant with the INSC objectives and also in line with the recommendations made in the TACIS Overall Review Report<sup>4</sup>.

The time taken to implement these projects, following approval of the respective annual AP, appears to be unduly long. Apart from the financial contributions to the ongoing larger construction projects in Ukraine, implemented under the responsibility of the EBRD, and a small bi-lateral sub-project for the supply of a ventilation system none of the bi-lateral projects of AP 2007 or later have yet been completed. And apart from one multi-lateral sub-project, to be implemented under coordination of DECC, none of the 6 projects accepted in AP 2008 or later were contracted by summer 2010. Consequently, it is not possible at this stage to make an evaluation of their actual achievements or monitored impact.

#### *Cooperation with IAEA:*

Synergies between INSC and IAEA programmes have been exploited through the establishment of effective coordination mechanisms. These are to the mutual benefit of the Commission and IAEA and, more importantly, the potential beneficiaries. Maintaining effective coordination with IAEA will be important given the global reach of INSC and ensuring that targeted resources are effectively used for improving nuclear safety. Careful and timely oversight will be needed of the larger and generally multi-country projects being implemented by IAEA with INSC support, in particular to ensure that the sub-projects are well formulated and implemented effectively, to avoid duplication and ensure complementarity with other past or ongoing INSC projects.

#### *The global development of the INSC programme:*

The global character of the INSC programme is developing steadily.

Cooperation within INSC started in 2007 with four partner countries (Armenia, Belarus, Ukraine and the Russian Federation). In 2010 cooperation has been expanded to more than fifteen countries (Armenia, Belarus, Brazil, China, Egypt, Georgia, Jordan, Mexico, Morocco, Philippines, Ukraine, Uzbekistan, Vietnam, the Russian Federation and several countries in Central Asia). Cooperation with other countries is being explored.

The initial focus for cooperation with new countries was strengthening regulatory authorities but progressively cooperation is being extended to improvement of operational safety and the development of responsible management of spent nuclear fuel and radioactive waste, decommissioning and site remediation.

## 10. DISCUSSING INSC PROGRAMME IMPLEMENTATION

### Compliance of projects with INSC objectives:

Nearly all projects accepted in the APs 2007 – 2009 appear to comply with the objectives set out in the INSC Regulation.

Perhaps one exception (see Section 8) is the project aimed at improving the health of children living in areas affected by the Chernobyl accident. Unfortunately, the health problems in these areas are not unique and are prevalent in other economically and socially deprived areas in the affected countries. Consequently, it may be more effective in future to address this issue in a broader context and seek assistance or cooperation from organisations whose role is specifically focused on the improvement of health. Such an approach would have the further benefit of ensuring that resources were allocated to where there was greatest health need.

### Coverage of the various measures, eligible for support within INSCs:

The first three INSC measures within “promotion of an effective safety culture” are used well in many of the projects accepted in the APs 2007 – 2009. Only the fourth INSC measure, “development and implementation of strategies for decommissioning existing installations and the remediation of former nuclear sites” has been used well by Ukrainian projects but hardly not by projects of other countries. This is improving for projects accepted in AP 2010.

The fifth INSC measure, “promotion of measures to ensure adequate protection against ionising radiation from radioactive materials, in particular from high radioactive sources”, is also well used by several projects.

The sixth measure, “establishing the necessary measures for the implementation of nuclear safeguards”, is to date being addressed by only one project, which has yet to be implemented. Other projects in this area were accepted but subsequently cancelled. Consideration needs to be given to whether the resources being allocated to this area are commensurate with its relative importance in the overall INSC strategy for cooperation and the need for improvements. The Instrument for Stability, IFS, is also concerned with cooperation aimed at strengthening nuclear safeguards at national and supra-national levels. The INSC and IFS strategies should be clarified with respect to the nature of cooperation in nuclear safeguards that will be eligible for support from the respective programmes.

The seventh measure, “establishment of effective arrangements for the prevention of accidents and mitigation of their consequences and for emergency-planning, preparedness and response, civil protection and rehabilitation measures” is also well used by a few accepted projects.

The eighth measure, “measures to promote international cooperation (including in the framework of relevant international organisations, notably IAEA), etc” has been widely used through the establishment of effective coordination between the Commission and IAEA. Cooperation is in place at various levels ranging from discussion of needs and identifying priorities, through joint development of project specifications, to the co-financing and joint management of projects.

During the period, 2007 – 2010, cooperation on the management of radioactive waste and spent nuclear fuel gradually shifted towards support for the development or improvement of national strategies and management systems rather than support for individual nuclear facilities. Also in the area of regulatory assistance much greater strategic focus in projects has been achieved.

#### Efficacy of programme implementation:

All bi-lateral cooperation projects in all main areas of cooperation the time taken between the approval of the well prepared project proposals and the start of their implementation (contracting) appears to be unduly long. On average, this period is about two years but varies significantly between projects and in some cases even exceeds three years. Only few bi-lateral projects have so far been contracted. This is a matter of concern given the importance of the projects for improving nuclear safety and the considerable time that has elapsed since their approval.

The underlying causes for these delays could not be established within the constraints of this evaluation. It is therefore strongly recommended that these be investigated by the EC with a view to identifying measures to improve the overall performance in this regard.

Some observations are:

- Late signing of Financing Agreements seems to be a major but not sole contributor to these delays.
- The time taken to develop Terms of Reference compliant with EC procurement rules seems to be a further contributor, at least for several of the projects.

Some suggestions could be:

- While the concluding of Financing Agreements is largely outside of the control of the Commission, the time needed for signature could be reduced by starting the preparation of the Financing Agreements and activating the related procedures earlier in the process.
- An improvement might be that an interested country in sending its formal request for cooperation within INSC to the Commission, should already commit its Government to cooperate in timely signing related Financing Agreements.
- Initiating the preparation of Terms of Reference as soon as the related AP is accepted also has the potential to significantly reduce the lead time before projects can actually start.
- A clear distinction should be maintained between those projects whose start has been deliberately delayed (i.e., to ensure the availability of sufficient absorption capacity within

a regulatory body, in particular those with limited resources, or to enable effective scheduling and interfacing between an ongoing and follow-on projects) and those where undue delay has resulted from weaknesses or deficiencies in procedures and/or their implementation.

- Due account should be taken of constraints on absorption capacity at the time when decisions are taken to include a project in a particular AP. When absorption capacity complications cannot be excluded it is recommended to allocate such projects to a later AP and to utilise available budgets to “more ready” projects.

#### Improvements in the INSC implementation in comparison to implementing the TACIS programme:

In a recent review<sup>4</sup> of the TACIS nuclear safety programme, a number of issues were identified where improvements could potentially be made to how the programme was being implemented in the area of regulatory assistance. The more significant are addressed below, in particular in the context of changes or further developments that have since been made in the implementation of the INSC programme.

##### *The need for greater strategic focus:*

The lack of a strategic focus was identified as a significant weakness for a number of TACIS projects which appeared to have been selected on an ‘ad hoc’ basis as opposed to addressing strategically important needs. This failing has, in principle, been overcome in the INSC programme where there is now an obligation on the regulatory body to develop a strategy for its improvement together with an action plan on how this is to be achieved. The strategy and action plan will underpin cooperation within INSC and facilitate decisions on when cooperation in one or other area can be sensibly concluded.

These plans will be key to successful cooperation and should be subject to rigorous and continuing scrutiny to ensure they remain of high quality throughout the cooperation.

##### *Longer term presence of EU experts in beneficiary countries and vice versa:*

The need for EU experts to spend longer periods in a beneficiary country and for regulators from the beneficiary country to spend longer periods working with EU regulators was identified in the TACIS review as an important means of enhancing the efficacy of cooperation. Improvements can be expected in both respects during the implementation of the INSC programme. Explicit reference is made in the indicative INSC programme for 2010-2011 to the need for ‘... long term training of experts in the EU Member States.....’ and for ‘... the long term presence of European experts in the beneficiary countries....’. Furthermore, the successful provision of quasi-continuous support to senior management in the Ukrainian regulatory body in a recent project is being ‘rolled out’ elsewhere. This is to be welcomed and its use should be encouraged more widely unless there are contrary indications.

The inclusion of explicit targets in ToR on the expected duration of stays of EU experts in beneficiary countries and vice versa is recommended along with related performance indicators and their active monitoring.

##### *Inclusion of measurable performance indicators:*

Performance indicators were not required nor explicitly included in a number of TACIS projects in the regulatory assistance area. In their absence, the efficacy of both the internal management of projects and their external review/monitoring was impaired. This deficiency appears to have been rectified in INSC where all projects now include measurable performance indicators.

*Proliferation in the number of EU organisations participating in projects:*

The number of EU organisations participating in some TACIS projects appeared to be larger than was strictly necessary or optimal and, in some cases, may have been detrimental to the effectiveness of the transfer of know-how and experience. These concerns have been largely overcome by the development of guidance in INSC on the preferred and/or maximum number of partners in projects depending on their size.

*Use of a single contractor for implementing regulatory assistance projects:*

Almost all of the regulatory assistance projects within TACIS were implemented using RISKAUDIT as the project manager. In the TACIS review it was recommended that this process be opened to competition in future; notwithstanding this, a decision has been taken to continue using RISKAUDIT in this role, in particular at a time when cooperation with many countries is at a formative or early stage of implementation. RISKAUDIT projects are, however, presently being subjected to enhanced contractual scrutiny and negotiation to ensure that they remain fully compliant with the requirements of the Terms of Reference as well as cost effective.

The current practice of using a single contractor for project managing all regulatory assistance projects should be kept under continuing review to ensure it remains optimal and well conceived. Two aspects warrant particular consideration: firstly the undoubted benefits that would result from competition and, secondly, the need to ensure that suitably qualified and experienced project management will continue to be available for these projects in future. Increasing demands for the services of organisations such as RISKAUDIT are likely to be experienced as a result of the nuclear renaissance. Moreover the global reach of the INSC programme will bring increased challenges, both geographical and cultural, for RISKAUDIT well beyond those encountered in the TACIS programme. In this context, the capacity of RISKAUDIT to effectively manage an increasing number of geographically widely dispersed projects should be carefully monitored.

*INSC committees and the role of the Regulatory Authorities Management Group (RAMG):*

The arrangements for supporting the Commission in managing the TACIS programme have been used, largely unchanged, in implementing the INSC programme to date. These arrangements are currently being revised in order to reinforce the role of the INSC Management Committee, streamline the existing technical advisory structures and provide more strategic and independent advice in the broader field of nuclear energy.

The main changes being proposed are:

- the INSC Management Committee will typically meet twice per year and give formal opinions on Annual Action Programmes and Action Fiches proposed by the Commission.
- the European Nuclear Safety Regulator Group (ENSREG) will provide strategic advice to INSC on nuclear safety
- the Nuclear Safety Expert Group (NSEG), comprising members acting in a personal activity, will take account of strategic advice on nuclear safety from ENSREG and will advise the Commission technically on the preparation of all matters to be submitted to the Management Committee for a formal opinion
- RAMG will cease to exist. Its former role concerned with the provision of technical advice on regulatory issues will be carried out by NSEG and, that concerned with the provision of strategic and policy advice on nuclear safety by ENSREG.

These new proposed arrangements are well conceived and should achieve the goals set for their revision. They will also largely remove concerns regarding potential conflicts of interest within RAMG.

## 11. CONCLUSIONS AND RECOMMENDATIONS

The evaluation presented in this report, in particular of achievements and impact, has necessarily been limited in scope because of the relatively early stage in the implementation of the INSC programme. Only a few projects have so far been contracted and even fewer have been completed. Much of the review has therefore focused on the extent to which the approved projects comply with the scope and objectives of the INSC Regulation, the coverage of the programme both geographically and technically, and the efficacy of programme implementation and how it has responded to recommendations made in a review of the TACIS Nuclear Safety Programme, in particular in the regulatory area.

Some 50 projects have so far been accepted in the APs 2007-2009 and are at various stages of implementation in a large number of countries. Several of these projects are split into a number of different sub-projects for separate contracting. A further 16 projects have already been accepted in AP 2010 and contracting documents are currently under preparation.

All projects (with possibly one exception) are fully compliant with the objectives of the INSC Regulation.

Each of the specific INSC measures is being addressed by one or more projects accepted in AP 2007 - 2009, though limited attention has so far been given to two aspects:

- (i) nuclear safeguards, and
- (ii) the development and implementation of strategies for decommissioning existing installations and the remediation of former nuclear sites (except for several projects accepted for Ukraine).

Whether this is a reflection of the interests, needs or priorities expressed by cooperating countries or prioritisation by the Commission and/or its advisory bodies is not apparent. The balance of the programme between areas should be the subject of continuing review, albeit remaining responsive to the needs and priorities of the potential beneficiaries and of the INSC programme.

One nuclear safeguards project has been accepted and implementation is ongoing; other approved nuclear safeguards activities have been cancelled by failure of signing Financing

Agreements. Since 2006 safeguards projects are also eligible for cooperation within the recently established Instrument for Stability (IFS).

***In order to prevent overlap and to enhance complementarity of these two Instruments in this regard it is recommended to clarify in the strategies for INSC and IFS which kind of nuclear safeguarding activities are eligible for cooperation within INSC and which might be eligible for cooperation within IFS.***

In AP 2010 several bi-lateral projects have been accepted concerning cooperation on developing strategies for decommissioning and site remediation in countries other than Ukraine.

The geographical coverage of the programme has increased steadily from four countries in 2007 to more than fifteen countries in 2010 and cooperation with others is being explored. The initial focus for cooperation with new countries was strengthening regulatory authorities but progressively cooperation is being extended to improvement of operational safety and the development of responsible management of spent nuclear fuel and radioactive waste, decommissioning and site remediation.

Significant improvements have been and continue to be made in the implementation of the INSC programme in light of experience of the TACIS programme and in response to recommendations made in a review of the latter. These will enhance the quality and independence of technical and policy advice being provided to the programme, ensure that future projects are more strategically focused and are responsive to more pressing needs.

The relatively long time, apparently 'required', to start many projects following their acceptance is a matter of concern identified in the evaluation of bilateral cooperation projects in all of the main technical areas. Typically, this is currently taking two to three years which is not in general commensurate with projects aiming to make significant and needed improvements in nuclear safety. The reasons for these long delays are not fully clear but these delays need to be reduced. The underlying causes for these delays could not be established within the constraints of this evaluation.

***It is therefore strongly recommended that these be investigated by the Commission with a view to identifying measures to improve the overall performance in this regard.***

Another matter of concern is the discontinuation in the cooperation with the Russian Federation in strengthening its regulatory body, in the improvement of operational safety and in establishing responsible management of radioactive waste, decommissioning and remediation activities. Major improvements in nuclear safety and in the safety culture in nuclear facilities in the Russian Federation have been achieved. Further improvements are, however, needed and continued cooperation on nuclear safety is in the mutual interest of the EU and the Russian Federation. In particular the strengthening achieved of the regulatory authorities needs to be consolidated and hardly any cooperation has yet been achieved in the development of a consistent and coherent national strategy and proper organisation of responsible management of radioactive waste and spent nuclear fuel, decommissioning and site remediation.

***Considering the needs identified, considering the neighbourhood aspects and considering the fact that the Russian Federation is an exporter of nuclear technology, it is recommended that the Commission continues exploring mechanisms that could end the current impasse.***



Within INSC no bi-lateral cooperation has yet been initiated with Kazakhstan, except for its partnership in a regional project concerning uranium mining liabilities, though this country was one of the priority targets under TACIS. Considering the status of its nuclear activities and their remains it is recommended that the Commission strengthens its cooperation with Kazakhstan and prioritises its cooperation objectives based on the EU policy objectives and Kazakhstan's national strategy.

The overall conclusions of this evaluation are that the INSC implementation is well targeted, the approved projects are well conceived and that the projects, once contracted are developing well. When successfully implemented these can be expected to contribute significantly in enhancing nuclear safety and nuclear safety culture.

The few concerns raised in respect of implementing the INSC Regulation, and how they might be mitigated, can be effectively addressed within the existing provisions of this Regulation.

Consequently there is no need for a legislative proposal to introduce modifications to the Instrument.

## **Abbreviations**

AIDCO	EuropeAid Cooperation Office
ALARA	As Low As Reasonably Achievable
ANPP	Armenian Nuclear Power Plant
ANRA	Armenian Nuclear Regulatory Authority
ANSN	Asian Nuclear Safety Network
AP	Action Programme
CIS	Commonwealth of Independent States
CNEN	Brazilian Nuclear Regulatory Authority
CNSNS	Mexican Nuclear Regulatory Authority
CSF	Chernobyl Shelter Fund
CUBA	Curves Book Automated Software
DECC	Department of Energy and Climate Change (UK)
EBRD	European Bank for Reconstruction and Development
ENP	European Neighbourhood Policy
NSREG	European Nuclear Safety Regulator Group
EU	European Union

NSEG	Nuclear Safety Expert Group
FORO	Ibero-American Forum of Nuclear and Radiological Regulators
FSU	Former Soviet Union
HFE	Human Factors Engineering
HIV	Human Immunodeficiency Virus
IAEA	International Atomic Energy Agency
I&C	Instrumentation and Control
ICSRM	Industrial Complex for Solid Waste Management
IFS	Instrument for Stability
INSC	Instrument for Nuclear Safety Cooperation
ISF	Interim Storage Facility
ISI	In-Service Inspection
JMU	Joint Management Unit
JRC	Joint Research Centre
JSO	Joint Support Organisation
MCR	Main Control Room
NDT	Non Destructive Testing
NPP	Nuclear Power Plant
NSEG	Nuclear Safety Experts Group
NSSG	Nuclear Safety and Security Group
OBE	Operating Basis Earthquake
OISS	Operator Information and Support System
OSA	On-Site Assistance
PAMS	Post-Accident Monitoring System
PIP	Plant Improvement Project
PSR	Periodic Safety Review
RAMG	Regulatory Authorities Management Group
RF	Russian Federation
RODOS	Real time On-line Decision Support system
RSP	Remote Shutdown Panel

SAM	Severe Accident Management
SNRCU	Ukrainian Nuclear Regulatory Authority
SSC	Structures, Systems and Components
SSE	Safe Shutdown Earthquake
STI	Sexually Transmitted Infections
SUNPP	South-Ukrainian NPP
TACIS	Technical Assistance to the Commonwealth of Independent States
TCP	Technical Cooperation Programme of the IAEA
TMI	Three Miles Island
ToR	Terms of Reference
TS	Technical Specifications
WENRA	West European Nuclear Regulatory Authorities
WM	(Radioactive) Waste Management

## Appendix I – Categorisation of projects

In the Indicative Programme of INSC the projects of AP 2007 – AP 2009 are categorised according to the intervention areas as defined in the INSC Regulation. The budgetary consequences of this categorisation are summarised in the following table 2:

**Table 2.** Summary of the budgets (Million €) of the projects, accepted in AP 2007 – AP 2009, as categorised according to the intervention areas as outlined in the Indicative Programme of INSC.

	AP 2007	AP 2008	AP 2009	Total
<b>Operational Safety/Design Safety*</b>	20,9	13,9	26,5	<b>64,1</b>
<b>Regulatory Authorities</b>	4,6	11,2	10,7	<b>26,5</b>
<b>Waste Management etc.**</b>	1,5	11,0	7,0	<b>19,5</b>
<b>Nuclear Safeguards</b>	0,0	0,5	0,0	<b>0,5</b>
<b>Multi-Country/ Regional projects</b>	1,5	0,0	0,0	<b>1,5</b>
<b>Chernobyl</b>	10,0	25,7	24,7	<b>60,4</b>
<b>IAEA</b>	2,0	1,0	6,5	<b>9,5</b>
<b>Others*</b>	0,0	8,0	3,5	<b>11,5</b>
<b>Total</b>	<b>48,5</b>	<b>71,3</b>	<b>73,7</b>	<b>193,5</b>

\*) In AP 2008 “Others” encompasses JMU(3,5), JSO (3,5) and other accompanying measures (1,0), whereas 2009 encompasses Technical Support (JRC; 2,5) and other accompanying measures (1,0)

For the purpose of evaluating the implementation of the INSC programme for the APs 2007 – 2009 the individual projects have been categorised more functionally into four main areas of cooperation, as described in Section 2 of this Evaluation Report. The budgetary aspects of this categorisation are summarised in the following table 1:

**Table 1.** Summary of the budgets (Million €) of the projects, accepted in the APs 2007 – 2009, as categorised by the evaluators of all projects into the four main areas of cooperation as described in Section 2 of the Evaluation Report.

	<b>AP 2007</b>	<b>AP 2008</b>	<b>AP 2009</b>	<b>Total</b>
<b>Operational Safety/Design Safety*</b>	30,9	20,9	27,8	<b>79,6</b>
<b>Regulatory Authorities</b>	4,6	11,2	10,7	<b>26,5</b>
<b>Waste Management etc.**</b>	11,5	36,7	31,7	<b>79,9</b>
<b>Nuclear Safeguards</b>	0,0	0,5	0,0	<b>0,5</b>
<b>Others</b>	1,5	2,0	3,5	<b>7,0</b>
<b>Total</b>	<b>48,5</b>	<b>71,3</b>	<b>73,7</b>	<b>193,5</b>

\*) OSA/DS covers also the JMU and JSO extension contracts and the two cooperation projects with the IAEA concerning safety of Nuclear Installations Safety (2007 and 2009)

\*\* ) WM covers also the Chernobyl projects