

# STRENGTHS, WEAKNESSES, OPPORTUNITIES AND THREATS – SWOT ANALYSIS REGARDING THE ROMANIAN PARTICIPATION IN EURATOM PROGRAMMES ON NUCLEAR SAFETY TOPIC

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## ABSTRACT

In the frame of FP7-NEWLANCER project, SWOT analysis (Strengths, Weaknesses, Opportunities and Threats) was performed by each partner from New Member States (NMS) in order to provide valuable input for the development of policies aimed to increase the participation of the NMS in Euratom programmes on the following topics: Generation III and IV systems and materials, Nuclear safety, Radioprotection, Radioactive waste management, and Education and training. The final objective of SWOT analysis performed by National Expert Groups on Nuclear Safety (NS) topic was to propose strategies, in order to reduce the influence of identified negative factors and to enhance influence of identified positive factors, regarding Romanian participation in Euratom programmes.

**Key words: (SWOT, National Expert Groups, Nuclear Safety, R&D)**

## 1. Introduction

Institute for Nuclear Research (INR) Pitesti coordinates the New Member States Linking for an Advanced Cohesion in Euratom Research (NEWLANCER) project, in the seventh Euratom Framework Programme (FP7). The project started in November 2011 and has 24 months duration. NEWLANCER consortium consists of 16 partners representing universities, nuclear research institutes and consulting organizations from both New Member States (NMS) and Old Member States (OMS). An important part of the NEWLANCER was devoted to networking activities for advanced cohesion in NMS and OMS nuclear research, grouped in Work Package 2 (WP2). As part of WP2 activity SWOT analysis (Strengths, Weaknesses, Opportunities and Threats) was performed, by each partner from NMS, in order to provide valuable information for development of the policy to increase the participation of the new member states in Euratom programs on the following topics: Generation III and IV systems and materials, Nuclear safety, Radioprotection, Radioactive waste management and waste disposal, Education and training. The final objective of SWOT analysis performed by National Expert Groups on Nuclear Safety (NS) topic was to propose strategies, in order to reduce the influence of identified negative factors and to enhance influence of identified positive factors, regarding Romanian participation in Euratom programmes. The main steps of the analysis and the most important aspects of the analysis will be presented: description of situation regarding participation on NS topic of Romanian R&D organizations in Euratom programmes,

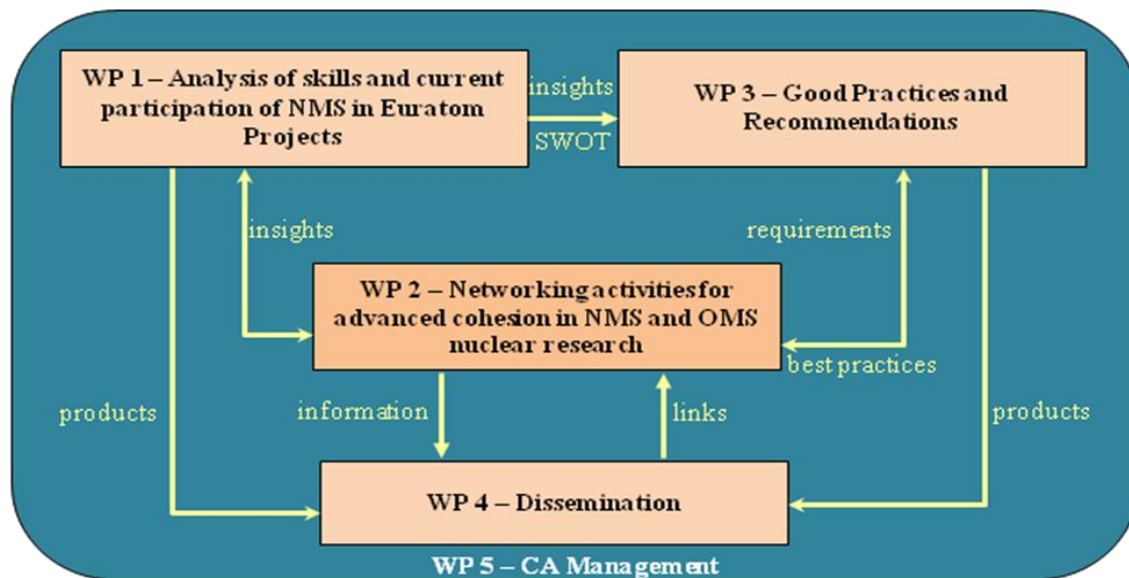
the objectives of the participation, the critical success factors, the list of strengths, weaknesses, opportunities and threats, and the strategy proposal.

## 2. NEWLANCER short description

The involvement and participation of NMS in the Euratom programmes (in terms of number of projects and budget) is still low, despite the European Commission (EC) initiatives to facilitate and attract them. In this context, NEWLANCER project proposes to identify and implement the best applicable solutions to increase the NMS involvement and participation in future Euratom Framework Programmes by three directions: strengthening and catalyzing the full R&D potential at national level; increasing cohesion between NMS institutions and improving their cooperation with OMS research centres. Four specific objectives, covered by four work packages, contribute to realizing of the above main objective [1]:

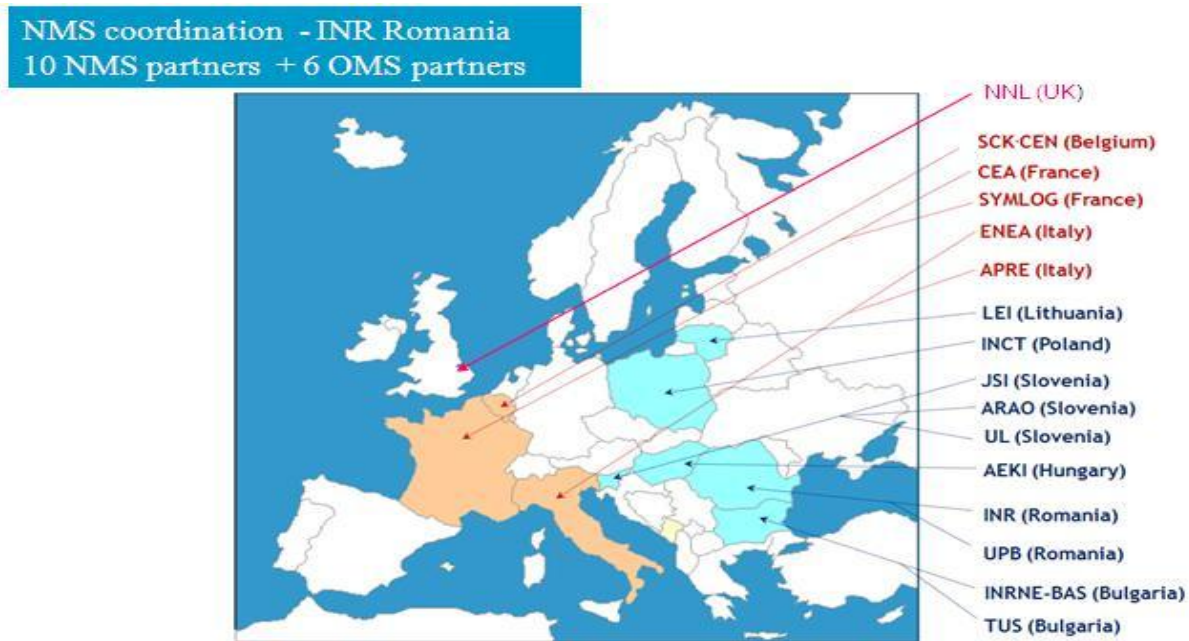
- Analysis of skills and current participation of NMS in Euratom Projects (WP1), in order to review and assess NMS research capabilities and participation in Euratom R&D Programmes;
- Network for advanced cohesion in NMS nuclear research (WP2) aiming to create a multi-level regional network with mission to enhance cohesion and interact with national and European levels in order to strengthen future participation in European research;
- Good Practices and Recommendations (WP3) in order to collect and analyze significant cases on NMS and OMS participation in Euratom Programmes and draw up good practices and recommendations addressed to scientists, research managers, national authorities, EC structures (SNE-TP, IGD-TP, EERA, ESNII), interested in better use of entire research potential;
- Visibility and Connectivity (WP4) aiming to ensure broad visibility of NMS research potential in Europe, to promote actual activities shared between networking partners, to publicize the project outcomes, and to create links with European structures with a major role in the configuration of nuclear research programmes.

The project approach is shown in **Figure 1**.



**Figure 1** The NEWLANCER approach

As is shown in **Figure 2**, in this project there are 10 NMS partners from Romania, Bulgaria, Hungary, Slovenia, Poland and Lithuania and 6 OMS partners from Belgium, France, Italy and UK, representing 3 universities, 11 nuclear research institutes and 2 consulting organizations from 6 NMS and 4 OMS.



**Figure 2** The partners of NEWLANCER project

### 3. NEWLANCER network

The network for advanced cohesion in NMS and OMS nuclear research represents the “core” of NEWLANCER project, and consists in creation of national and regional expert groups, organization of national workshops, regional seminars, technical visits and support activities for these events. Also, networking activities consists of the creation and functioning of a complex and dynamic network, able to interact with European and national levels in order to improve the harmonization of nuclear research policies in each participating NMS, with European objectives. A schematic view of the network is presented in **Figure 3**.

The first step in the multi-level regional network building process consisted of the creation of national expert groups (NEGs) in each NMS, on the following topics: Materials for Fast Nuclear Reactors and ADS; Generation III and IV systems and materials; Nuclear safety; Radioactive waste management and waste disposal; Radioprotection; Education and training.

According to the existing competences, a number of 19 NEGs (around 130 experts) were created in the NMS participating in the project (**Table 1**). The process of creation of NEGs followed the next steps:

- definition of the selection criteria for members of each NEG;
- producing a preliminary list of experts;
- contacting the experts;
- producing a final list of experts;
- preparation of national Meetings;
- NEGs meetings.

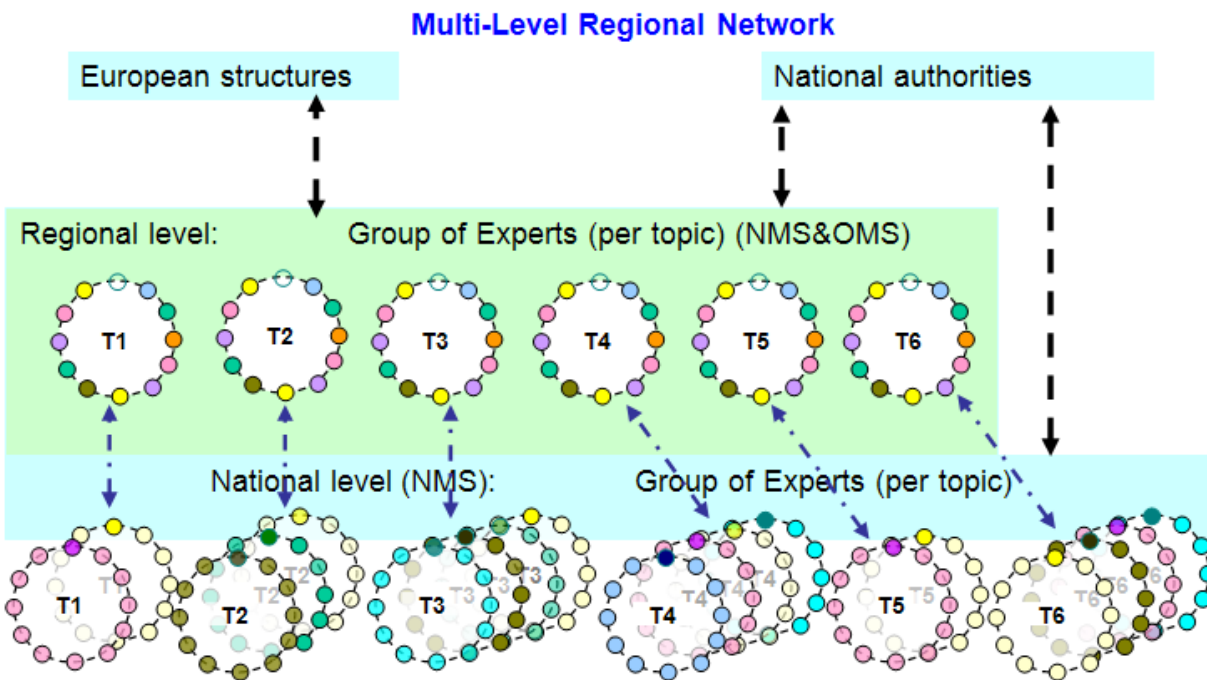


Figure 3 NEWLANCER Network

Table 1 Topics and National Expert Groups

Materials for Fast Nuclear Reactors and ADS	Poland (INCT)		Romania (INR)	
Generation III and IV Systems	Bulgaria (TUS)	Hungary (AEKI)	Romania (INR)	
Nuclear Safety	Bulgaria (INRNE)	Hungary (AEKI)	Romania (INR)	Slovenia (JSI)
Radioactive Waste Disposal	Lithuania (LED)	Poland (INCT)	Romania (INR)	Slovenia (ARAO)
Radioprotection	Poland (INCT)		Romania (INR)	
Education and Training	Bulgaria (TUS)	Poland (INCT)	Romania (UPB)	Slovenia (UL)

### 3.1. National Experts Group on Nuclear Safety topic in Romania

In Romania, the process of creation of National Expert Group (NEG) on Nuclear Safety (NS) topic started in November 2011 with the definition of the following selection criteria:

- Notoriety of the person based on his/her expertise;
- Participation in national and international projects (EURATOM, IAEA, bilateral, etc.);
- Voluntarism;
- National representation of all organization having expertise in the field;
- The ability to work in the NEWLANCER team.

During the first National Meeting (NM1), hosted by INR Pitesti in January 2012, the list of experts was finalized. NEG on NS topic consists of experts from INR Pitesti (6), Subsidiary of Technology and Engineering for Nuclear Projects (1), University “Politehnica” Bucharest (2) and Horia Hulubei National Institute of Physics and Nuclear Engineering Bucharest (1).

NEG on NS topic works in accordance with general and specific rules. The general rules refer to: scope and objective, creation framework, duration; selection criteria, minimal number of members; national meetings; funding; structure and responsibilities (leader, deputy, Regional Group (RG) representative); elections; role of moderator, minutes, protocol; quorum; communication between meetings; interface with WP2. The specific rules were adopted during NM1.

NEG on NS topic interacts at regional level with experts from Bulgaria, Hungary, Slovenia, and a Regional Experts Group (REG) on this topic was created during the first Regional Meeting, which took place in Hungary, in April 2012. The REG activity is guided by the OMS participants (having an extended and longtime participation in Euratom programmes), to permit NMS participants to understand better their opportunities and use their research potential.

#### **4. SWOT analysis. A short description of the methodology**

An important outcome of NEWLANCER project was the SWOT analysis, started at organizational level, and extended to national and regional level. SWOT analysis is a management tool used in strategic planning, provides the background data on the organization/project and the environment where the organization/projects functions and helps to focus on key issues on organization/project performance [2]. Results of SWOT identify strong and weak aspects of the organization/project functions and serve in development of its strategy. The objective of SWOT analysis (NEWLANCER specific) is to analyze the most important factors which influence the participation of NMS in research activities of Euratom FPs in the 6 fields presented in **Table 1**. The methodology comprises the following steps [2, 3]:

- describe the situation regarding each participating organization and the environment where it functions, taking into account the economic, political, cultural, legal and technological aspects;
- define the objectives of the participation in EURATOM FPs , in discussion during the national expert group meeting;
- define critical success factors which directly influence the future performance of organizations and achieve the objectives;
- define strengths, weaknesses, opportunities and threats (S-W-O-T);
- fill the SWOT matrix;
- combine the factors and propose strategies.

##### **4.1. SWOT analysis performed by NEG on NS topic**

The objective of SWOT analysis is to provide relevant information for development of the policy to increase the Romanian participation in Euratom programmes, on NS topic.

##### **4.1.1. Description of situation regarding Romanian participation on NS topic in Euratom FPs**

National Strategy on Research, Development and Innovation 2007-2013 (RDI Strategy), is based on the vision on the role of science, technology and innovation in the knowledge and society development. The themes corresponding to Euratom program are missing in the Strategy. *The nuclear research is included in the priority area “Innovative materials, processes and products” only under the theme “Nuclear technologies”*. Nuclear research, especially R&D in supporting nuclear power development, is covered also by the National Strategy for Nuclear Field Development implemented through the Action Plan called

Nuclear National Plan approved by Governmental Decision in 2002 concerning “the increasing of the nuclear share in national total electric energy production with respect of the society sustainable development principles, in cost competitive conditions and assuring nuclear safety at the international standard requirements”. A New R&D Strategy targeting the period 2014-2020 is currently under development.

In the field of Nuclear Safety, Romania is outlined the following aspects:

- Safety of the main existing nuclear installations (Cernavoda NPP U1&2, TRIGA research reactor from INR Pitesti, VVR-S Research Reactor - which is in decommissioning, from IFIN-HH Bucharest);
- Construction of Cernavoda NPP U3&4;
- Long term options regarding Gen IV systems, especially focused on LFR, ALFRED demonstrator project.

The most important Romanian R&D organization acting in the field of nuclear research, NS topic, is INR Pitesti. It has a role of scientific and technological support for the National Nuclear Power Programme.

In Euratom programs, on NS topic, INR Pitesti has participated in the following projects: PHEBEN2, SARNET, SARNET2 and NULIFE. It has to mention an important contribution of INR Pitesti in APSA Network - Incorporating Ageing Effects into Probabilistic Safety Assessment, network supported by JRC. The management of INR has sustained and sustains the institute’s participation in Euratom programs. The researchers are interested in participation, but the lack of stimulation measures, lead to a participation less than the existing potential. At organization’s level, some barriers against participation in Euratom projects were identified: insufficiency of commercial computer programs for safety evaluation; the mismatch of existing research infrastructure with the trends of Euratom research themes; lack of experimental facilities which simulate important phenomena; delay in infrastructure’s modernization – especially regarding the experimental facility realization for severe accidents; the research themes are focused on CANDU and this fact reduces the collaboration possibilities at European level; lack of juridical personality which creates difficulties in introduction of incentives and in human resources policy; realization in an adequate way of information about possibilities of participation or projects’ initiation; difficulties in approaching new-comers entrance in already built teams.

On short term challenges regarding significant involvement in Gen IV R&D activities and transfer of experience towards new generations require successful human resources policies, including a continuous education and optimal knowledge transfer between generations. Also, a modernization of research infrastructure and work tools (including the software) are necessary, in order to decrease the gap beside research institutes from EU. A rethink of safety analyses approaches in post-Fukushima context is necessary, too. Regarding the management of the risks concerning financial support, a solid place on national and European market is necessary, by adequate marketing and by increasing of the expertise.

#### **4.1.2. Objectives of the participation in EURATOM FPs**

In discussions during the national expert group meeting, the following objectives of the participation in EURATOM FPs, were defined:

- Knowledge exchange and upgrade;
- Financial resources for research and development;
- Increase the visibility of Romanian R&D organizations;
- Improvement of experts’ competencies;
- National synchronization with European research;
- Education and training for young scientists;
- Harmonization of national policies with European ones;
- Access to European experimental infrastructures.

#### 4.1.3. Critical success factors

The below critical success factors which directly influence the future performance of Romanian organizations and achievement of the above objectives were defined:

- Short-term and long-term priorities in the organizations are defined;
- Number of financed projects compared with proposals;
- Number of involved researchers;
- Organizational and national involved effort for each project (person\*months);
- Mobilities, experts' exchange and common use of European experimental infrastructures;
- Number of young scientist that participate in E&T international activities.

#### 4.1.4. List of S-W-O-T issues

The internal (strengths and weaknesses) and external (opportunities and threats) factors were generated starting with brainstorming sessions and continued by desk analysis.

##### **S – strengths:**

- Existence of groups with adequate professional education and expertise for Euratom fields;
- Development of computer codes, methodologies, applications and safety analyses, for CANDU type reactors;
- Continuity of participation in Euratom projects;
- Assurance of co-financing for participation in Euratom projects by the majority of institutions;
- Existence of some collaboration agreement and common projects with famous European R&D organizations;
- Existing experience in projects management;
- Existence of modern infrastructure elements, some of them unique in region;
- Including of increase of participation in Euratom projects among the objectives of the development strategy;
- Expertise in CANDU type reactors, unique in EU;
- Existence of important centres, acting as development poles of research in national nuclear energy field;
- Affiliation of Institute for Nuclear Research (INR) Pitesti to SNETP, ESNII, NUGENIA;
- Existing determination at INR level for GEN IV systems development (ALFRED demonstrator).

##### **W –weaknesses:**

- Deficiencies in institutional culture regarding working in a team and existence of individual interests, stronger than team/group interests;
- Lack of financial motivation for the personnel involved in Euratom projects;
- A reduced financial autonomy of projects;
- Insufficiency of experimental facilities, dedicated to important Euratom topics;
- Computer codes base is incomplete; lack of validated codes or commercial codes which are used by the partners;
- The existing competence, often limited to CANDU specific aspects, is leading predominantly to national projects involvement;
- A low visibility of experts at European scientific community level;
- Few persons that can write competitive projects;
- Loss of competences by retirement, in absence of knowledge management measures;
- A high mean age of researchers and a reduced number of young people with low participation in Euratom project;

- Low level of research work load, who entails a participation with small budget in Euratom projects, in conditions of similar efforts;
- Too general professional training program; lack of specific training modules for each group; simplified evaluation; low number of specializations by exchange of specialists, training, etc.
- Insufficient operating personnel for modern apparatus;
- A reduced dialog with groups from other national organizations;
- Inexistence of juridical expertise and expertise regarding the intellectual property rights;
- Lack of juridical personality for INR Pitesti;
- Absence of a national fund for maintenance of unique facilities which exist in INR.

**O – opportunities:**

- Existence of structural funds for development of research infrastructure;
- Development of GEN IV systems;
- Creation of a new R&D framework, with the condition of efficient adaptation of organizations to this framework;
- Existence of an European educational offer, by projects and specific programs, exchange of experts, mobility programs;
- Existence of a determination at national level for GEN IV systems development (ALFRED);
- Collaboration regarding sharing of European infrastructure;
- Capture of nuclear industry interest for participation in European projects;
- Collaboration with organizations / universities on problems of interest for nuclear field;
- Adequate legislative framework for participation in European projects.

**T – threats:**

- Nuclear power development is not enough represented in national R&D strategy;
- Maintenance of Euratom thematic beyond National Authority for Scientific Research (ANCS) competitive framework;
- Decrease of national research programs funds, for projects competitions;
- Strategic elements from HORIZON 2020 are oriented towards big projects, with a serious disadvantage potential for New Member States and small organizations or organizations with low visibility;
- Changes at the level of research market and financial mechanisms;
- The perspective of hiring of a personnel with slight qualification, due to education shortage for nuclear field;
- Gap emphasizing in expertise development, comparing to other similar European organizations;
- A limited area of human resources collecting, due to insufficient attractiveness of some institutions (salary + house + location + opportunities in career's development);
- Establishment in other European states of some major investments for modern research infrastructure;
- At this moment, national framework for projects' financing is inconvenient for some institutes (e.g. INR Pitesti).

#### 4.1.5. Strategy proposal

SWOT analysis performed by NEG on NS topic proposes 4 strategies in achieving a better participation in Euratom programmes:

- Improve the strengths that help increasing the participation of Romanian R&D organizations in Euratom programs on Nuclear Safety topic;



- Use the strengths to take advantage of opportunities (S-O strategy);
- Matching of strengths and opportunities
- Converting weaknesses to strengths and threats to opportunities could be also strategies for achieving the goals.

## 5. Conclusions

- (C1) Despite the EC initiatives to facilitate and attract broad participation of New Member States in the Euratom programme, their involvement in terms of number of projects and budget is still low. The aim of NEWLANCER project is to enhance the participation of NMS research institutions and academia in EURATOM research programme.
- (C2) Network for advanced cohesion in NMS and OMS nuclear research identified common aspects and/or complementarities, discussed how to better exploit the existing potential in future common projects in order to establish the appropriate ways for a sustainable cooperation.
- (C3) Creation of national expert groups (NEGs) in each NMS represents the first step in building the multi-level regional network, which is one of the main tools proposed by NEWLANCER to improve the participation of NMS in Euratom projects. In Romania, NEG on NS is an active group, interacting at regional level with experts from Bulgaria, Hungary, and Slovenia. This interaction led to creation of Regional Experts Group (REG) on NS topic. The REG activity is guided by the OMS participants (having an extended and longtime participation in Euratom programmes), permitting NMS participants to understand better their opportunities and to use their research potential.
- (C4) To improve participation in future European research programme it is necessary to understand what points are strong and what points are weak in each organization and in each NMS, what are the opportunities that favour participation and the threats that hinder it, and combining them, to propose strategies to a wider participation.
- (C5) SWOT analysis performed by NEG on NS topic proposes 4 strategies in achieving a better participation in Euratom programmes. Proposed strategies leading to successful participation mainly use the strengths, and partly reduce the weak points.

## 6. Acknowledgements

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## 7. References

- [1] Seventh Frame Programme, Theme Fission-2011-6.0.2, NEWLANCER, Description of Work, 2011-07-26
- [2] Metka Kralj, Nadja Zeleznik – SWOT analysis of NMS participation in EURATOM projects, 16.04.2012
- [3] Metka Kralj, Nadja Zeleznik – The NEWLANCER project: Procedure for SWOT analysis on NMS participation in research activities of EURATOM FPs, 1<sup>st</sup> Regional Meeting, April 2-4, 2012, Budapest, Hungary