EUROPEAN COMMISSION

Community research

NEWLANCER

New Member States Linking for an Advanced Cohesion in Euratom Research

Contract Number: 295826

D5.5 FINAL REPORT (R)

Authors: Daniela Diaconu, Marin Constantin, Akos Horvath, Metka Kralj, Gerard Cognet, Georgios Glinatsis, Grazyna Zakrzewska –Trznadel, Pavlin Groudev, Leon Cizelj, Artūras Šmaižys, Didier De Bruyn, Claire Mays, Marc Poumadere, Ivan Vassilev Ivanov, Iztok Tiselj, Petre Ghitescu, Pavel Gabriel Lazaro, Chiara Pocattera, Bruno Mourenza, Nadja Železnik, Jeremy Edwards

Reporting period: 01/11/2012– 31/10/2013

Date of issue of this report: **20.12.2013**

Start date of project : **01.11.2011** Duration : **24 Months**

Project co-funded by the European Commission under the Seventh Euratom Framework Programme for Nuclear Research &Training Activities (2007-2011)		
Dissemination Level		
PU	Public	X
RE	Restricted to a group specified by the partners of the NEWLANCER	
CO	Confidential, only for partners of the NEWLANCER project	

NEWLANCER

EURATOM

DISTRIBUTION LIST

Name	Number of copies	Comments
Katerina Ptackova	1	EC
Daniela Diaconu	1	INR
Marin Constantin	1	INR
Akos Horvath	1	MTA EK
Nadja Železnik	1	ARAO
Metka Kralj	1	ARAO
Gerard Cognet	1	CEA
Dominique Maziere	1	CEA
Georgios GLINATSIS	1	ENEA
Grazyna Zakrzewska –Trznadel	1	INCT
Pavlin Groudev	1	IRNE-BAS
Leon Cizelj	1	JSI
Artūras ŠMAIŽYS	1	LEI
Didier De Bruyn	1	SCK.CEN
Claire Mays	1	SYMLOG
Marc Poumadere	1	SYMLOG
Ivan Vassilev Ivanov	1	TUS
Iztok Tiselj	1	UL
Petre Ghitescu	1	UPB
Pavel Gabriel Lazaro	1	UPB
Chiara Pocattera	1	APRE
Nadja Železnik	1	REC
Ozma Taylor	1	NNL

Contents

Executive summary

NEWLANCER intended to pave the way for a sustainable participation of the research institutes and universities from NMS in nuclear energy research as framed by European policies and initiatives.

NEWLANCER consortium consists of 17 partners representing nuclear research institutes (INR, INRNE, LEI, JSI, INCT, MTA EK, CEA, ENEA, SCK • CEN, APRE, NNL), universities (UPB, UL, TUS), implementers (ARAO) and SME (SYMLOG, REC) from both New and Old MS. All partners worked together to identify the best applicable solutions to increase the future NMS participation in the Euratom research, exploring three directions: strengthening and catalyzing the full R&D potential at national level, increasing cohesion between NMS and improving cooperation with OMS research centers.

A complex multi-level network gathering a large number of experts in nuclear fields not only from partners' organisations, but also from many other institutes and universities from the six NMS of the consortium (Bulgaria, Hungary, Lithuania, Poland, Romania, and Slovenia) have been created having as major objective to link national and regional experts in the Euratom fields and connect them to OMS research centers with large participation, as well as to the European Technological platforms (SNETP, IGD-TP, MELODI) and other related associations or networks (EERA, NUGENIA, Euratom NCP). Involving around 160 specialists in nuclear safety, Gen III and IV, advanced materials, radioactive waste management, radioprotection, education&training this network ensured a good national and regional representativeness. Structured into 19 National Experts Groups and 5 Regional Expert Groups, the network provided deep insights on NMS participation starting from the specialist level up to the organizational management, national and EC polices, strategies and programmes, and also a regional view on the common driving factors, difficulties and barriers in NMS involvement in Euratom.

At national level, the networking activities consolidated the links among scientists as well as their connections with national structures (ministries, research agencies, nuclear authorities) responsible for the construction/implementation of the national research policies, strategies, and programmes. At regional level, activities centered on building advanced cohesion among NMS specialists, as well as among OMS and NMS expertsfacilitated the access to information and strengthened collaboration between specialists and creation of teams able to plan new projects.

The good practices reflecting NEWLANCER experience in Euratom projects highlighted how different elements identified as promoters in the success stories could be used to increase future involvement of NMS in Euratom research.

Recommendations designed to be used by a large spectrum of end users from scientists and research management, to national authorities and European organisations have been distilled starting from the major findings of the project: driving forces at individual, organisational, national and European level that favoured participation, the main obstacles which limited it, existing research potential, and critical success factors identified in the 6-country SWOT analysis regarding future participation.

The first results of the NEWLANCER approach become already visible: 4 new ongoing projects MACSIMA, EAGLE, and ASAMPSA_E and ARCADIA rooted in NEWLNCER activities and embarking the NMS partners ensure continuity in NMS participation in FP7 Euratom and contribute to the enlargement of their future involvement. A special mention deserves ARCADIA, which represents a successful proposal originated and developed by NEWLANCER partners as a follow–up of the project and enrolls under the Romanian coordination organisations with small (CITON, NCBJ) or none previous participation (UPIT, CLOR).

1. Concept and project objectives

During the last decade the European Union enlarged significantly from EU15 to EU28 through the accession of a large number of Central and Eastern European countries having in common a socialist past with a totalitarian regime. This legacy, among others, included:

- excellent links between the specialists of NMS (New Member States) and OMS (Old Member States) were scarce, and some setbacks existed in the NMS in the use of advanced techniques and information in nuclear research; the accession process reduced these differences but some gaps still persist;
- significantly smaller nuclear programmes in NMS compared to some OMS, with a different reactor fleet (CANDU, VVER, RBMK) that understandably focus national research on specific aspects, which are not largely reflected within the Euratom research topics;
- fragmentation of national research, not always very well interconnected and competing at national level for very small research funds barely sufficient for survival.

In the beginning of the last decade, the IAEA noticed that the research and development institutes (RDIs), and nuclear RDIs in particular, had failed to adapt to the changing science and technology (S&T) paradigm, and consequently risk 'lagging behind' in management, structure, planning, and funding, all of which directly affects the sustainability of the institution. Before 2000, RDIs in Central and Eastern Europe used to receive funding and guidelines from their governments. In the transition to the market economy, the mechanisms used to fund RDIs are changing, and the responsibility for defining the institutes' role and strategy is transferring to the institutes themselves. Therefore, the IAEA initiated a Technical Cooperation project (TCP) in 2004 with two major aims:

- Map the status of nuclear RDIs with current up-to-date data,
- Assist top managers and senior scientists in nuclear RDIs, to improve their management practices and improve access to national and international funding opportunities.

The work done within this TCP (see the report[1], published in 2009) was focused on 25 nuclear RDIs in 15 Central and Eastern countries including 8 from the EU (Bulgaria, Czech Republic, Hungary, Poland, Romania, Slovakia, Slovenia). However, despite several recommendations generated by this study, because of the large differences between countries and RDIs and because of the limitation of IAEA action, the capacity to work inside a regional network, as it is possible in the Euratom Framework Programme, has not yet been thoroughly investigated.

The NMS were allowed to participate in Euratom Programmes starting with the FP5. With FP6 NMS involvement increased continuously but slowly and often carried out predominantly by one or few research institutes or universities in each country.

The European Commission (EC) considers that NMS participation in the 7th Euratom Framework Programme is still low compared to the OMS involvement despite initiatives to facilitate greater contributions to European research (such as the NCP network, bonus evaluations for the proposals including NMS partners, events promoting Euratom FP in each NMS, etc.).

[1] "Nuclear Research and Development Institutes in Central and Eastern Europe" IAEA report, June 2009, ISBN 978–92–0–107009–8

Greater involvement of NMS is seen by the EC as a part of necessary efforts in the nuclear energy area to increase cooperation, reduce fragmentation and avoid duplication, and also to improve the standard of research, to reinforce safety and environmental issues within projects, to improve operations, emergency planning, etc. Other European structures (such as Sustainable Nuclear Energy-Technological Platform-SNE-TP, European Sustainable Nuclear Industry Initiative - ESNII, European Energy Reaserach Area - EERA) have also endorsed in their programmatic documents the need for extended participation and integration at European level of the nuclear competences and infrastructures, including those of the New Member States.

NMS themselves are aware that across Europe a common future in nuclear energy, especially regarding safety aspects, reducing of the potential risk for human health and environment, and emergency planning have to be developed and the NMSs must actively contribute to this process. A broader and deeper involvement and integration of NMS research and education institutions is the only way to succeed. But how to achieve greater and sustainable involvement in the Euratom programme?

There are different reasons for the current level of NMS participation, some shared, others country specific. To overcome these "obstacles" it is important to:

- analyse the present participation of relevant institutes in the NMS in order to find the weaknesses and the strengths of each partner (organization level and national level) and catalyze the existing potential and opportunities for its application.
- identify complementarities among the NMS organizations and efficiently promote the existing research potential at European level.
- create national clusters for each NMS based on the active research centers and interconnect them with other research institutions less active but having the potential to contribute on the Euratom scene.
- enhance cohesion at regional level, improve cooperation with OMS research centers, through e.g. invitation of OMS high level experts and their association in important national research topics and decisions, and thereby strengthen the national research.
- ensure greater visibility across Europe of the high-level technical expertise developed in the NMS.
- analyze the success stories of the OMS research organizations and on this basis develop recommendations for the NMS organizations for enhancing their success factor in participating in the Euratom FP.

NEWLANCER addressed all these aspects, through a collaborative study of the NMS partners, helped and guided by the OMS partners with more significant experience in Euratom programmes.

The main objective of this Coordination Action was:

- to identify and implement effective and efficient actual solutions leading to enlarged NMS involvement in future Euratom Framework Programmes by strengthening and catalyzing the full R&D national potential, by increasing cohesion between New Member States institutions, and by improving their cooperation with Old Member States research centres.

The specific sub-objectives of the Coordination Action were to:

- review and assess NMS research capabilities and participation in Euratom R&D Programmes (key issues, gaps, good practices and barriers, challenges, etc. with increased attention to the risk, safety and environmental aspects)
- create a multi-level regional network having as mission to enhance cohesion and interact with national and European levels in order to strengthen future participation in European research.

- collect and analyze relevant cases on New and Old MS participation in Euratom Programmes in order to draw up good practices and recommendations addressed to a large end-users spectrum: scientists, research managers, national authorities, EC structures (SNE-TP, IGD-TP, EERA, ESNII) – interested in better use of entire research potential.
- ensure broad visibility of NEWLANCER achievements, 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.

2. Main results

2.1. Analysis of skills and current participation of NMS in Euratom Projects

Current status of New Member States participation in Euratom

Participants from New Member States (NMS) which joined the EU after 2004 were beneficiaries of only about 5% of the total EURATOM FP6 and FP7 budget [1] as illustrated in Figure 1, while their contribution to the GDP is 7% and the share in nuclear generating capacity is 9%. Similar or larger part of the budget was spent on third countries and international cooperation.

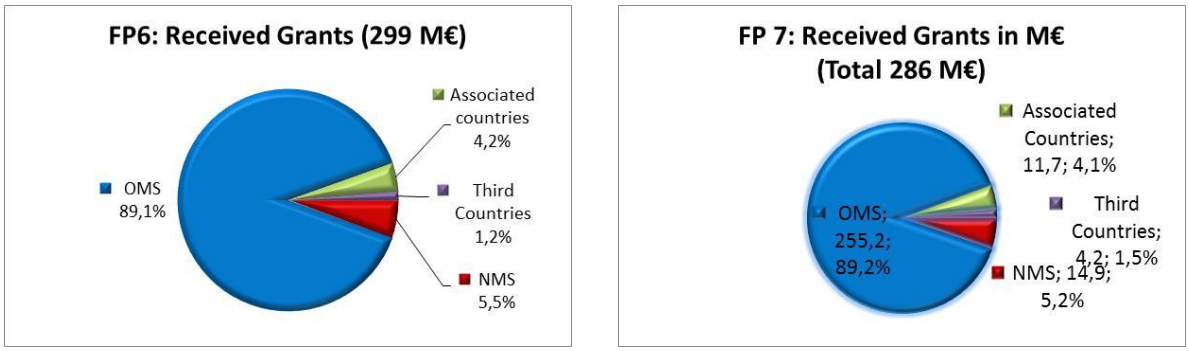

Figure 1 Shares of received EURATOM grants by groups of countries in FP6and FP7

The NMS share is dominated by Czech Republic both in FP6 and FP7. Comparing participation in the two Framework programmes (FP6 and FP7) a slight redistribution can be observed. Hungary, Poland, Romania, Lithuania, Slovenia (all NEWLANCER partners) increased their share in the FP7 grants received by NMS, while Czech Republic, Slovakia, Bulgaria and Latvia diminished their share Figure 2.

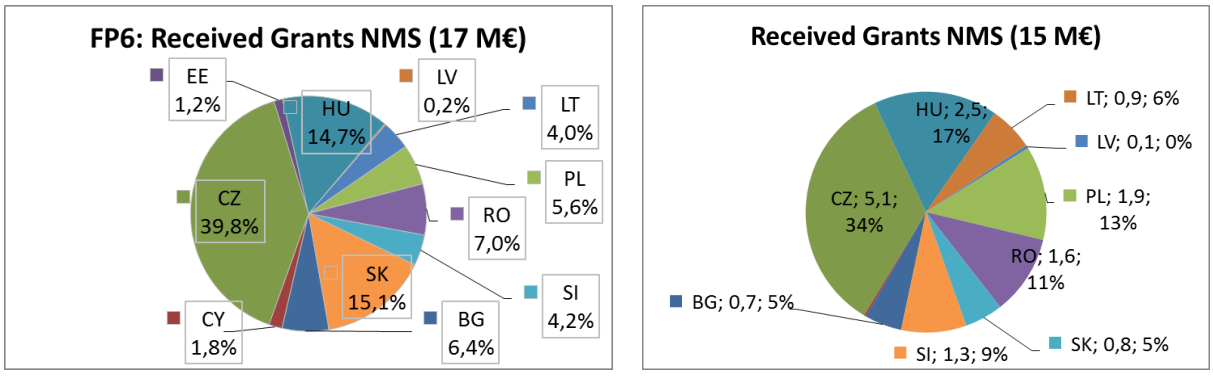

Figure 2 Shares of requested and received FP7 EURATOM grants by NMS

The OMS research centers with large participation are generally much larger organisations compared to the NMS research entities. Figure 3 clearly shows positive correlation between the success rate in the FP7 (Calls 2008-2011) and the size of the participating organisation quantified by the number of full time researchers. This correlation is much more pronounced for the research organisations from NMS than for those research organisations from OMS. An opposite trend is however observed for the NMS universities. It is noted that the research groups in both NMS research centres and NMS universities are substantially smaller than those at the OMS research centres participating in NEWLANCER.

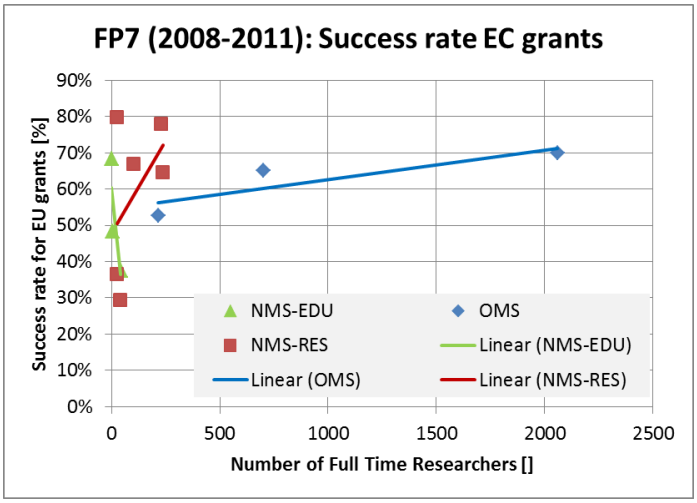

Figure 3 Success rates of NEWLANCER partners with respect to the number of full time researchers

The country success rates slowly decreased in FP7 both for NMS and OMS. As Figure 4 shows, in FP6 it depends somehow on the share of nuclear electricity production in the respective countries: increasing the share of the nuclear electricity increases the country success rate for the OMS, while for the NMS increasing the share of the nuclear electricity clearly decreases the country success. In FP7 increasing the share of the nuclear electricity increases the country success rate for both the OMS and NMS. The correlation is however somewhat weaker for the NMS.

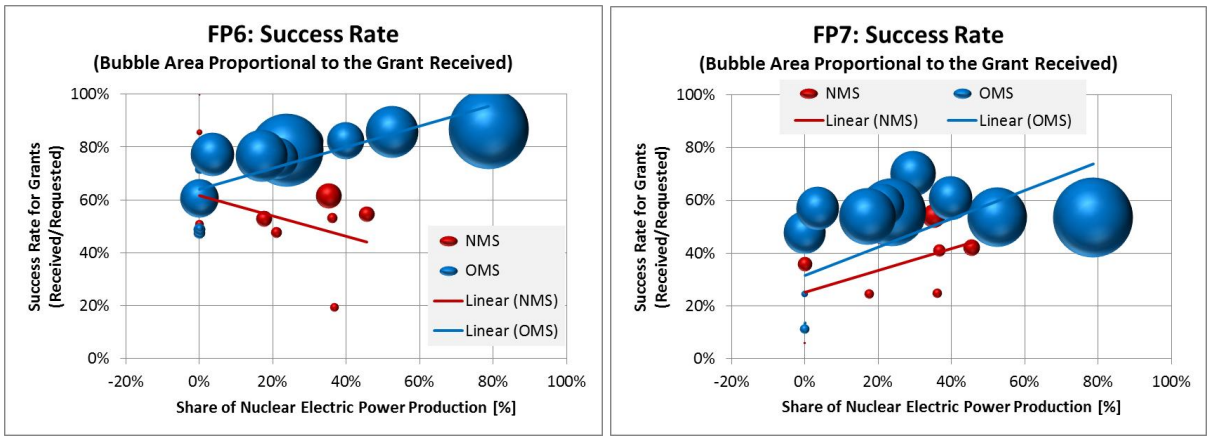

Figure 4 Success rates of NMS and OMS in FP7 EURATOM calls as a function of nuclear energy share in electricity production

The selection process in both FP6 and FP7 clearly strengthened the relative position of the research organisations, preserved the relative position of the private for profit enterprises and weakened the relative position of the universities. The strengthening of research organisations and weakening of the universities is much more pronounced for the NMS [1].

Organizations from NMS seem to struggle both with the national and EURATOM research programs. It seems that strategic research management and funding of these organisations only marginally affect the success in EURATOM projects. It is possible that the current success depends mainly on the excellence and connections of individuals rather than from systematic approach of the organisations and/or nations.

Structure of organisations requesting grants varied considerably between OMS and NMS. The universities from NMS were much more aggressively after the grants than universities from the OMS and dominated the share of requested grants by the NMS. The requests from OMS were clearly dominated by the research organisations while the share requested by the OMS universities was rather small as compared to the NMS. It is noted that public and other organisations from NMS have almost double share of grants as compared to the OMS.

The success of coordinators from the OMS and NMS was compared and shown that the OMS clearly dominated the scene with success rate of 52% as compared to 29% of the NMS. The difference in success rates has however notably shrunk as compared to FP6.

The Czech Republic was the only NMS coordinating a substantial project in FP6 and FP 7 EURATOM. In FP7, Bulgaria and Romania joined the club of coordinator countries.

Only very few common topics have been indicated by the New and Old MS organizations as the most important research topics to be strengthened in the future EURATOM research programs. A detailed list ranking the R&D topics for the two groups of countries is presented below:

for OMS - RES	**for NMS - RES**	**for NMS - EDU**
Gen IV&advanced systems	Gen IV&advanced systems	Gen IV&advanced systems
Safety of existing reactors	Safety of existing reactors	Safety of existing reactors
	Radioprotection, radiobiology, medical applications	
	Waste management and disposal	
Innovative fuel&fuel cycle	Nuclear materials	
	Life time management	
	Education, training, knowledge management	Education, training, knowledge management
	Reactor Physics	
	Graphite treatment & disposal	
	Polymeric materials ageing	
	Secondary side water chemistry	
Demonstrators		
Large infrastructure		
Nuclear security		

In the national research programs, the most important research topics to be strengthened are:

for OMS - RES	for NMS - RES	for NMS - EDU
Gen IV&advanced systems	Gen IV & advanced systems	Gen IV & advanced systems
Waste management& disposal	Waste management and disposal	Waste management and disposal
Radioprotection, radiobiology, medical applications	Radioprotection, radiobiology, medical applications	
Advanced fuel	Nuclear materials (including life time) management	
	Education, training, knowledge management	Education, training, knowledge management
	Safety of existing reactors	Safety of existing reactors
	Reactor physics	
Large infrastructure	Demonstrators	
Crisis management		
Nuclear security		

Disagreement between OMS and NMS is again rather pronounced. It is to be noted that the organisations from OMS are again more after broad research topics, while the organisations from the NMS are more after smaller, well defined research topics. Again, this could possibly be at least in part explained by the size of establishments involved: the much larger institutions from the OMS are clearly looking after broad projects or programs aiming at the definition of the future of nuclear energy.

The NMS organisations on the other hand are possibly trying to secure and advance the resources, which may be essential for the survival and occasionally also some modest development of expertise and/or infrastructure at the organisational or national level.

Reasons for success in EURATOM Fission Programs

The main reasons that made NEWLANCER partners successful in the EURATOM projects are different from Old and New MS partners, and also from research centers and universities.

Excepting reasons such as unique interests, competences and experience, unique infrastructures and broad international networks identified for all groups of organizations, OMS partners mentioned as motivation driving their participation in Euratom projects:

- targeted participation in topics with personnel and experience
- high involvement in European networks and ETPs platform
- high national coordination of participants in Euratom programs
- bilateral partnerships established with some key European research organizations
- nuclear programs strongly supported by national authorities

For NMS research organizations, participation in Euratom is motivated and driven especially by:

- Scientific excellence
- Personal contacts, determination and persistence
- Access to experimental results, key experts and large infrastructures
- Financial contributions (from both EU and national sources)
- Enlargement of small domestic research groups.
- while for Universities the main reasons are:
- Access to experimental results and key experts
- Financial contributions (from both EU and national sources)

The organizations from OMS have assumed a leading role and seem to be mainly interested in organizing, directing and of course also performing the large scale research projects with impact directed to the future of nuclear energy.

The NMS organizations on the other hand are more in a role of followers. Their focus seems to be more in finding niches within the large projects. They may be investing the existing scientific excellence and personal networking for some additional funding, which may help them to maintain or hopefully improve their dwindling human resources and facilities.

The *main common reasons that prevented* NEWLANCER partners from being successful in the EURATOM projects were also addressed.

The set of common reasons include limited resources, national strategies, large efforts needed to prepare a proposal and finding the right set of partners. It is clear however that the lack of resources may be much more detrimental for the future of the research in the NMS.

There are no OMS specific reasons. The NMS specific reasons seem to indicate specific conditions of NMS establishments, as for example small size of research groups, insufficient incentives for domestic networking, insufficient resources for international networking and specific national competences not connected to the OMS interests.

Size and tradition of establishments together with societal and economic variations between the OMS and NMS to some extent support the above observations.

The main observations that follow from the qualitative assessment of the involvement of OMS and NMS in the EURATOM fission programs in FP6 and FP7 include [1, 2]:

- Research centres in OMS are generally much larger that research centres in NMS. The size alone may provide a sufficient margin for significantly better success in EURATOM programs. Evident advantages of larger organisations include more versatile administrative support, larger variety of expertise available and hands on experience with large projects.
- The cost of researchers in the OMS organisations is by a factor (2-10) larger than in NMS.
- Organizations from OMS developed rather optimal strategic research management and funding and are better adapted for coexisting in EURATOM and national programs. The size and tradition of these establishments together with relatively stable societal and economic conditions in the last few decades are certainly strong factors.
- The organizations from OMS have assumed a leading role and seem to be mainly interested in organizing, directing and of course also performing the large scale research projects with impact directed to the future of nuclear energy.
- The lack of resources is a common threat to establishments form OMS and NMS. It may however be much more detrimental for the future of the research in the NMS.

Review of national strategies and competences

The National Nuclear Strategies and Nuclear R&D programs in the NMS are in different rate available and developed – more in Hungary and Romania as independent documents, and only as parts of other general country documents for energy policies, electrical systems, educational programs, etc. in Bulgaria, Slovenia, Lithuania and Poland. The National Nuclear Strategies and Nuclear R&D programs in the OMS are comparatively more representative for the nuclear activities, intentions and perspectives for further development in the relevant county (for France and Italy that could be mentioned), as they are closer to the European strategy which is defined by the SNETP.

The availability and applicability of NMS national strategies related to nuclear R&D and/or energy is rather diverse. There is needed process of vertical harmonisation of the National Nuclear Strategies first with the European strategy defined by the SNETP and hence in greater horizontal harmonisation between separate NMS and also OMS.

There are good preconditions and opportunities for joint actions for more successful participation of NMS in R&D EURATOM programs, underlined especially in the fields of "Nuclear Safety" and "Radioactive Waste and Spent Fuel Management".

NMS research organizations own competence and infrastructure not very well known at European level, some of them unique and not yet used in the European projects.

SWOT analysis in NMS

The final objective of SWOT analysis was to support strategic decision making and to point out the internal factors that could be helpful in improving the capabilities of organization to achieve a larger participation in future Euratom research. As results of the national SWOT analyses, the following national aspects were found [3]:

In Bulgaria, INRNE and TUS identified the main objectives: exchange and upgrading of knowledge, financial resources for research, training and development, participation in networks and projects, influence on policy making for nuclear safety, encouraging the study in the field of nuclear energy, establishment of an effective system for training and career development of personnel in the nuclear sector, and getting references. For successful participation in FPs the following critical factors were listed: good national and institutional policy and defined priorities and programmes, with view to support the long time R&D activities, cooperation of all nuclear activity holders, for innovations' application understanding, especially for safety strengthening concentration of resources, establishing a favourable environment to increase the interest of young people towards nuclear energy through improved education and training at all levels, encouraging of new and support of existing teams of researchers. Matching strengths and opportunities can be used to improve FPs participation,

In Hungary, MTA EK concluded that participation in Euratom programs is supported because of getting access to financial resources for research and development, improving management skills, international references and knowledge exchange. Success of participation in Euratom projects critically depends on national policy and strategy, defined operative programmes, defined short-term and long-term priorities of involved institutions, and investments into R&D. Strategy of using national strengths to take advantage of opportunities was proposed as most appropriate, while increasing capabilities seems to be less feasible.

In Lithuania, LEI identified that the main objectives of participation in Euratom FPs are: experience increase; cooperation with research centers and institutions in different countries; possibility to gain

knowledge and information on up-to-date R&D in nuclear related fields; possibility to access R&D infrastructure of other research institutions which is locally not available; financial benefits for research activities; visibility of the institution. SWOT analysis has revealed that the most feasible strategy is to reduce influence of identified negative factors and to enhance influence of identified positive factors in Lithuania, i.e. use strengths to take advantage of opportunities.

In Poland, INCT found that objectives of Polish participants in FPs are connected with their ambition to join long-term international project in order to provide access to specialised facilities, technology, financial support, opportunity to gain experience and to participate in projects which could not be done by Polish institution alone, to get access to additional education for experts, to be prepared for future requirements. Critical factors for successive participation in FPs were stable national strategy and policy, cooperation of institutions, modernisation of the laboratories and new equipment, construction of nuclear facilities, and increase the number of students studying natural science and engineering. In order to achieve success the cooperation with local and international contact points is necessary and stronger financial support is needed. Taking into account the knowledge of experienced researchers in the field of science expertise and project management would be beneficial. Older and young researchers should work as partners.

In Romania, INR and UPB concluded that participation in EURATOM FPs deals with opportunities for advanced knowledge, information and practice exchange, getting additional funds, access to advanced technology and European research infrastructure, education and training for young scientists, harmonization of national policies and curricula with European ones. The following elements were recognized as critical success factors: well defined national strategy in the field of nuclear technology, promotion and support to participation in EURATOM projects, short-term and long-term priorities in the organizations, sufficient number of young and experienced researchers in the field, experts' exchange and common use of European experimental infrastructures. Proposed strategies leading to successful participation in Euratom projects mainly use the strengths, and partly reduce the weak points. They include measures for implementation better strategic planning on national level and to reduce deficiencies in management of research institutions, as well as a better use of existing personnel experience used when applying for Euratom projects.

In Slovenia, the participation is left to individual or institutional interest mainly in research area. The national strategic documents support international cooperation although there is no national strategy dealing specifically with participation in EU programs. SWOT analysis of opportunities for participation in Euratom research projects showed that Slovenia has competent interdisciplinary teams covering most areas of nuclear engineering, has some good experience with participation in EU programs, and there are possibilities for additional funding from EU structural funds and fund for NPP decommissioning. Obstacles for successful projects lie in unsystematic planning and human resources management, too much effort in applicative research, but limited cooperation with "end users", Slovenia can't afford to execute large research programs. Main objectives for participating in Euratom projects are: access to large infrastructure, networking, knowledge exchange and upgrade, improving the quality of education and research, financial resources for research, involvement in projects that are not yet on national agenda, especially in projects on SF management.

Regional Integration of SWOT analysis

From regional perspective, SWOT analyses showed some **common issues** in all participating NMS and in all fields [3]:

In most countries the *potential of human resources* is evaluated as *strength*, although they find that the number of good experts is not sufficient and is even decreasing due to retirement and insufficient interest of young and talented students for nuclear field.

Some countries have current investments in nuclear research and technology, and also some kind of stable funding provided by special funds, but the risk of sustaining these opportunities in future is great. *Investment in the nuclear technology* field is appreciated as *important factor for promotion of participation* in Euratom programs.

Lack of systematic planning on institutional and national level and *deficient management* in research institutions is the *most important weakness/threat* described. Consequently, the competitiveness of institutions and research groups from NMS in Euratom tenders is reduced.

Topics of Euratom calls are *not always reflecting the interests and needs* of NMSs, NMS with small nuclear programs could manage to participate if they were able to participate in smaller projects.

Prevailing objectives for participation in Euratom programs were the following:

- knowledge preservation, exchange and upgrade,
- access to research infrastructure, additional financial resources for education, training, research and development,
- opportunities for networking and influencing national policy making,
- improving education, training and career development of personnel in the nuclear sector, development of human resources by training courses and expert visits,
- participation in projects which could not be done by NMS alone, mainly due to lack of human, technical and financial resources,

The following **critical success factors** for participation in Euratom projects were pointed out:

- improving institutional and national policy making, strategic planning and setting the nuclear research and education among priorities,
- improving cooperation between all activity holders in nuclear research and development, including cooperation with universities and postgraduate students,
- including information on Euratom projects and policy in nuclear study programs.

Priority was given to Strengths - Opportunities strategy, which indicates better use of strong potential of the NMSs in future Euratom projects.

SWOT analysis looked in detail to particular competence in each nuclear field. Infrastructure in each participating organisation was also listed by all NMS project partners [3].

All information on research potential of NMS partners was organized in a catalogue intended to a wide disseminated among OMS research centers with an extended participation in Euratom programme.

All information on research potential of NMS and OMS partners of NEWLANCER organized in the *"Catalogue of NMS Research Potential for Broader Participation in EURATOM Programs"* [4] was widely disseminated among OMS research centers with view to help for an extended NMS' participation in Euratom programmes.

2.2. Networking activities for advanced cohesion in NMS and OMS nuclear research

NEWLANCER approach aimed to increase national and regional cohesion in nuclear research consists of the creation and functioning of a multi-level network. Its mission was to create links among experts and also to interact with the European and national levels in order to strengthen future participation in European research. This networking was targeted toward R&D polices at EU and national level, in a participatory approach (from experts to authorities). This multi-level network was intended to directly connect:

- experts at national and regional level
- NMS with OMS experts
- NMS experts with their national research authorities
- NMS experts with European structures: ESNII, SNETP, IGD-TP, MELODI, EERA
- in order to identify by the end of the project a list of common objectives and priorities in nuclear research creating the base of new proposals

Expert groups networking at national level

National Expert Groups (NExGs) were created in each participating NMS on the main nuclear topics: Generation III and IV, nuclear safety, radioactive waste management, radioprotection, education and training. At regional level Regional Expert Groups (RexGs) were created by merging national representatives of each NexGs [5].

The activities of the groups were directed to:

- **interact at national level** with representatives of authorities and nuclear industry invited to attend the national meetings
- **create links with policy makers** in the field (research agencies/ministries, nuclear authorities)
- **identify the existing research potential** and the future needs in nuclear research in order to prepare new collaborative projects
- **contribute to the harmonization** of national nuclear R&D programmes to the European vision.

The creation process of NExGs was based on the definition at the start of the project of the Selection Criteria and on a general mapping of the national competences in each proposed field. The groups have elected leaders and also representatives for the regional level. Also they defined and approved rules for functioning as well the communication plan between meetings. The composition of the NEGs showed a good stability during the two years of functioning supported by the project.

19 National Expert Groups (NExGs) were created in the six participating new member states (Bulgaria, Hungary, Lithuania, Poland, Romania and Slovenia), according to the existing competences, the availability of experts, and of the interests of the national R&D organizations:

- 2 groups for Materials for Fast Nuclear Reactors and ADS
- 3 groups for Generation III&IV systems
- 4 groups for Nuclear Safety;
- 4 groups for Radioactive Waste Disposal
- 2 groups for Radioprotection;
- 4 groups for Education and Training

The major targets of the NExGs were to identify the research potential at organizational and national level and the needs to capitalize it in new collaborative projects. At the same time efforts were devoted to create links with national structures defining the national research policies (such as research agencies/ministries, nuclear authorities) [6].

Based on these links the expert groups contributed to the harmonization of national nuclear R&D programmes with the European vision. The input to the national authorities was based on analyses performed in WP1 and on the conclusions of WP2 meetings. NExGs and RExGs acted as dialogue arenas and produced useful input for WP1 and WP3. The groups reviewed the main outcomes of WP1 and WP3 such as Catalogue, Good Practices and Recommendations. A schematic view of the relationships between NExGs, RExGs, WP1, and WP2 is presented in Figure 5.

Two national meetings of NEGs were planned and organized along the project [6]:

- **1st meeting** devoted to create the groups, review and analyze the current participation in Euratom projects and connected motivations and attitudes at organizational and individual level;
- **2nd meeting** devoted to discuss the contributions of the groups to the outcomes of the project, to discuss national policies, strategies, and programme in the context of harmonization with the vision of Horizon 2020, to identify approaches to capitalize existing competences and capabilities, to formulate recommendations for researchers, organizations, and national authorities aimed to improve the future participation in European projects, with focus on Euratom programme.

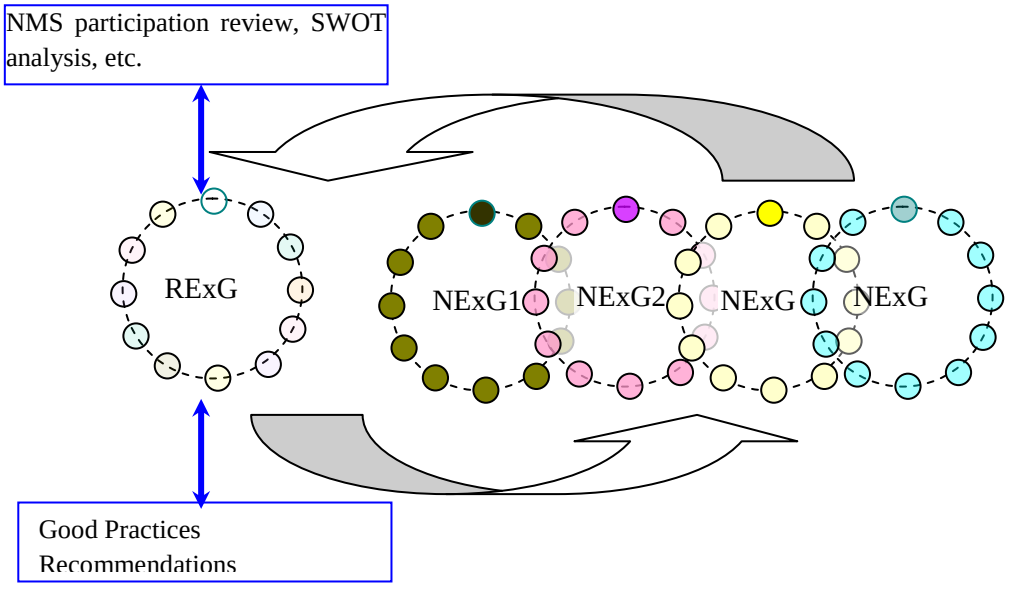

Figure 5 Relation between NExGs, RExGs, and other project activities

Gathering all together 159 specialists in all Euratom fields from research organizations, universities, regulatory bodies, NPPs, waste organizations and other stakeholders in the NMS, the NExGs contributed to the NEWLANCER investigations aimed to review the current participation of the 6 NMS in Euratom programme, performed SWOT analysis, identified organizational national competences and capabilities, selected good practice, and formulated recommendations for researchers, organizational management, and policy-makers.

These investigations were approached by debates during the two national planned meetings, during additional meetings organized case by case or by using other adopted approaches (Skype conferences, brainstorming sessions, phone conversations, e-mail exchanges). The input provided by this large community of experts from different sectors (research, education, industry, regulator, etc.) covered the different thematic areas proposed by the NEWLANCER investigations and produced meaningful outcomes for the regional context of NMS.

An important activity of NExGs was oriented to open a dynamic dialogue and create links with national structures (such as ministries, research agencies, nuclear authorities) having clear responsibilities in the construction and/or implementation of the national research policies, strategies, and programmes. The objective of these links was to include in the debate the vision of experts on the appropriate national actions to increase the participation of RDI organizations in international projects. Finally a contribution of the debates to the construction of the national policies, strategies, and programmes or to update the existing ones was expected.

NExG activities had a real impact in increasing awareness of national policy-makers on the importance of the participation and on the real motivations to participate, on the existing difficulties and barriers in the six participating NMS. In some cases discussions in the NExGs determined a direct involvement of specialists. For example a representative of the Romanian Expert Groups effectively participated in the elaboration of national RDI Strategy 2014-2020 and also participation of the Expert Group in radioactive waste management in the elaboration of the Romanian RWM Strategy was planned. In these cases an impact on short term is expected in the term of the new framework created or updated for RDI activities.

Although the short duration of the process, taking into consideration the 18-20 months of functioning of (the NExGs were created in January-March 2012), these groups acted as favorable factors to stimulate the cooperation among national organizations in order to improve their participation in international projects. Involvement of organizations with a very small participation in Euratom such as CLOR and NCBJ from Poland, BME from Hungary, and CITON and UPIT from Romania in the new FP7 EAURATOM project ARCADIA proposed under the pilot exercise in NEWLANCER is a clear positive result of these activities.

It is to notice the groups worked together by using a common methodology in order to prepare important elements aimed: to investigate current participation, fto perform SWOT analysis, to analyze the competences and capabilities, to identify good practices and recommendations, etc. Due to the effective and efficient work of all NEGs, a continuation of the activities is expected beyond the project by the support of the national organizations.

Taking into consideration that all NEWLANCER partners from NMS are already involved in the ARCADIA project (started in November 2013) a straightforward continuation is to include NExGs in the activities of ARCADIA. These groups may contribute to a real debate on the safety, feasibility, legislative framework for licensing process, roadmap adaptation to the sitting process, identification of the competences needed, selection of the appropriate approaches for competences building, defining the frame and rules for creating the entity responsible with the implementation of ALFRED in a specific country. All Expert Groups (Nuclear Safety, RWM, GenIII and IV, Nuclear materials, Radiation protection, Education & Training) can play clear roles in the achievement of ARCADIA objectives.

In future, the NExGs could play a similar role in other EURATOM' projects initiated and/or as NMS partners. On the other hand in each participating NMS specific national activities may be identified involving a significant role of NExGs. For example in Romania the NExG in Radioactive Waste Management will contribute to the future activities to build national RWM Strategy.

Another possible solution is to maintain the future functioning of NExGs based on in-kind contribution of all national interested partners.

Interacting activities at regional level

Each NExG has elected a representative for the Regional Expert Group (RExG) in order to participate into a process aimed to build an advanced cohesion at regional level. Each thematic field had a specific structure, depending on the number of the involved countries and links with national authorities and European structures. RExGs were created for the following thematic fields:

- Nuclear Safety;
- Gen IV and Nuclear Materials
- Waste Management
- Radiation protection
- Education and Training

with the following major targets:

- to identify common aspects and/or complementarities,
- to discuss how to better exploit this potential in future common projects
- to establish ways for a durable cooperation
- to produce a common vision on the future participation in EU projects
- to contribute to the harmonization of national policies with European one.

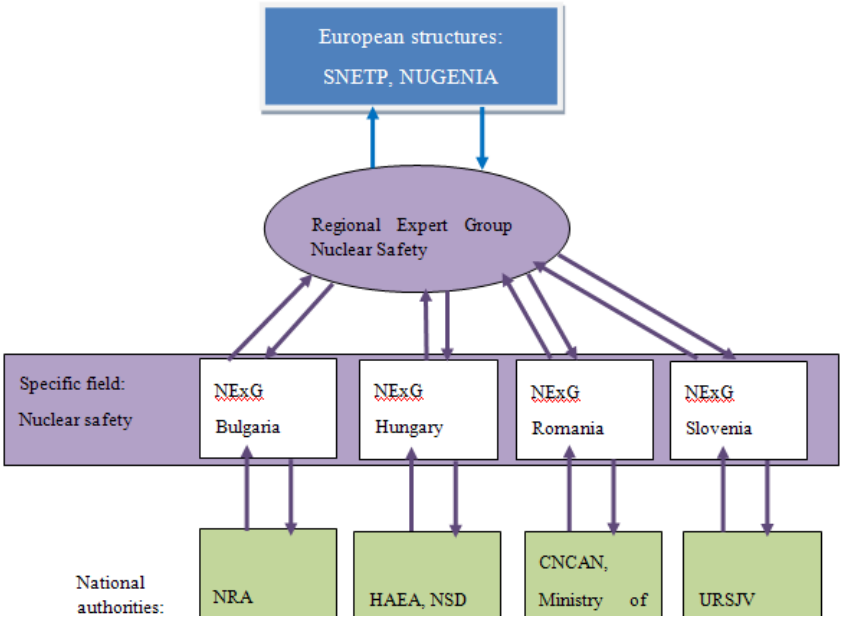

Figure 6. National and regional level of the networking dedicated to nuclear safety issues

A picture of the network for the specific field of Nuclear Safety is presented in ***Figure 6*** including its connections with national and European levels. Similar structures are working for all nuclear fields included in NEWLANCER activities.

Four Regional Workshops were organized, having the following purposes [7]:

- inform and discuss on the state-of-the-art in each thematic field, research works and programmes, directions, needs;
- analyze and discuss scientific aspects of NMS participation in Euratom
- produce working plans for cooperation

Technical visits coupled with the Regional workshops were organized in order to:

- explore NMS current capabilities, both as research infrastructure and as human resources;
- identify regional capabilities vs. opportunities

Expert Groups networking at regional level contributed to the creation of a common vision on the future participation in European projects and also to the harmonization of national policies with European one.

Participation of OMS experts in the Regional Workshops have contributed to clarify the relevance of the identified common topics for the OMS and in general for the European research, and to define ways to promote them both at national and European level.

Discussion and debates were based on the presentations made by NMS and OMS organizations on the specific topic and also on the visited infrastructure of the hosting partner. After each Technical Visit a discussion on the main aspect of the capabilities of NMS with a focus on the hosting partner's capabilities was moderated by the coordinator in order to identify possible cooperation and common participation in future projects.

All Regional Workshops activities were designed to produce the following outcomes:

- creation of direct contacts among experts and teams;
- better knowledge and understanding of partners R&D priorities and potential (existing expertise and infrastructure);
- building mutual knowledge;
- identification of the potential sources for participation enlargement at: institutional, national, regional and European level ;
- identification of the expectations of OMS experts from NMS;
- conveying NMS expectations regarding OMS future support R&D objectives.
- understanding the requirements for "internal re-organization" of NMS institutions.

They revealed that the infrastructure of NMS has some strong points. One of them is the existing research reactors at INR Romania, JSI Slovenia, MTK EK Hungary and INRNE Bulgaria; modernization activities were already performed or are in progress for all these reactors; Another point consists of the presence of several laboratories able to analyze the materials including post-irradiation effects and an important equipment together with the associated knowledge. The identification of collaboration is strongly dependent on the detailed analysis including the existing local competences.

At the same time there is an significant progress in the field of R&D for Radioactive Waste Management especially from the point of view of the increasing of the knowledge on the methods and tools to simulate the associate phenomenology; experimental activities represent a crucial point and an effective collaboration with OMS is needed since their infrastructure in the field is already developed and important steps in the RD were achieved.

As a good example of collaboration in the field of Nuclear Safety the participants mentioned the severe accident issues. Different approaches were used by the NMS: R&D organizations from Hungary participated in Euratom programmes by activities involving their infrastructure, organization from Bulgaria preferred to use fellowships and experts exchange in order to use the NMS experimental installations for severe accidents and also to capture the knowledge for computer simulations, organizations from Romania, Slovenia, and Lithuania have been mainly involved in computer code simulations in order to validate the tools against experimental results or NPP simulations, and also in computer code adaptation or development. A good knowledge transfer from OMS to NMS was achieved and the perspective of collaboration is clearly open for these NMS.

Experts from Romania, Bulgaria, and Hungary have identified common R&D issues for the next period. There are related to the cooling capacity of the nuclear power plants owned by these countries (CANDU at Cernavoda in Romania, VVER at Kozloduy in Bulgaria, VVER at Packs in Hungary) taking into consideration the influence of extreme weather characterized by severe droughts in the summer, possible flooding, severe winter with possible freezing of the water in Danube river. A common R&D project may be proposed in the future Euratom competitions or IAEA framework.

In the field of Education and Training a good participation in international projects exists and as a consequence a real exchange of information about different E&T system and used methods and tools both in NMS and OMS occurred. This is an important gain and good approach to improve the quality of the graduates. A common issue for NMS consists of a decreasing tendency of youngsters interest for nuclear education and consequently in reduction of the nuclear education share at the level of universities. Related to nuclear training some challenges related to the implementing Generation IV systems in NMS connected with ALLEGRO and ALFRED demonstrators exist and also with the preparation of technicians to operate the existing and future nuclear installations.

In the field of Generation III and IV systems there is a major interest of Romania in implementation of Lead Fast Reactor demonstrator (ALFRED), and of Hungary, Slovakia, Czech Republic and Poland for the implementation of Gas Cooled Reactor demonstrator (ALLEGRO). There are some in-progress common projects and also real perspectives to continue the collaborations between NMS and OMS, and a real involvement of other NMSs is expected for the next years.

For Nuclear materials area a good integration of NMS in R&D activity was noticed in case of Romania, Lithuania, and Hungary; however the participation should be increased both as efforts and involved experimental installations. In connection with GenIV development there are clear expectations for Romania, Hungary, Czech Republic and Poland to increase their efforts in nuclear material activities.

In Radiation protection field there is a clear gap between New and Old Member States. An important motivation for the current reduced participation of NMSs in the European projects devoted to this issue is the orientation of the R&D NMS organizations RATHER to the operational radiation protection than on the fundamental research as the low dose effects that is the main topic of the MELODI platform. Another aspect is the fragmentation of the competences (in Poland for example) or the reduced team (for example in Hungary and Romania). A good approach is to maintain the contact with MELODI, to increase the teams, to produce a real cohesion between the small groups that are incorporated in different institutes, universities, health organizations etc., and also to pass from the operational radiation protection to interdisciplinary activities.

Integration of teams from NMS into existing groups already formed by OMS R&D organizations and having a long time cooperation is quite open, but it is strongly dependent on the visibility of the organization and researchers itself, and also of the existing expertise. Thus the national framework is very important to support the local competence development to reach an adequate level of participation in European projects. The lack of national support for a specific subject creates real difficulties including co-financing aspects.

Regional Workshops contributed to the creation of a common vision on the future participation of six NMS (Bulgaria, Hungary, Lithuania, Poland, Romania, and Slovenia) in future European projects and also to the harmonization of national policies with European one. A first approach to increase the participation is to use the current involvement as a starting point and to attract more people and more experimental infrastructures in the process. A second possibility is to develop a local infrastructure on the real interest research themes in the Europe by using national and European funding. Another possible way is to launch R&D activities and projects having strong local specificity (for example CANDU in case of Romania) and with the involvement of existing expertise in the other NMS and OMS.

Thematic visits were organized at the hosting organizations of the Regional Meetings in order to explore their current capabilities, both as research infrastructure and as human resources. Main infrastructures visited during the meetings were discussed in order to find the way to include them into new collaboration projects. A success example is the project MAXIMA that included Romanian TRIGA

ACPR research reactor as an important infrastructure to perform the test for the nuclear fuel for MYRRHA.

From far the most important result of the regional networking produced during the pilot exercise project consists in the three new proposals for the Euratom Call 2013, all accepted by the EC, contributing to an enlarged participation of NMS in Euratom.

Interface and interaction with EU structures and national R&D authorities

Strengthening collaboration with European Platforms and other EC structures (associations, alliances, networks) having responsibilities in defining the nuclear research directions and priorities was one of the three ways considered by NEWLANCER to increase NMS participation in Euratom R&D programme.

An unbalanced representation in these structures between the Old and the New MSs occurs, especially at the executive level. Consequently NMS research priorities are not adequately supported and promoted at European level. The major purpose of the project in this regard was to pave the way for a stronger representation of NMSs needs in the nuclear research programmes contributing therefore to improve NMS participation in Euratom [8].

Since an important role in this undertaking is played by the national authorities, the multi-level network established links with research ministries/agencies and/or nuclear authorities at one side, and with European structures at the other side, intending to act as a leverage group for an optimum harmonization of national R&D policy in nuclear research, leading to a common research space of high quality and competitiveness, including broad involvement of NMS competences.

In parallel, a direct dialogue between the NEWLANCER specialists and the Technological Platforms SNETP, IGD-TP and MELODI, as well as with EERA and NUGENIA was established and activities for an active involvement in some concrete actions, according to their agendas were identified. The main objective of these activities was to promote the New MS needs and priorities and find practical ways to include them in the future research agendas.

Collaboration with ETPs was mainly based on the NEWLANCER findings, particularly on the obstacles limiting NMS participation identified in the analysis of NMS participation in Euratom, in SWOT analysis, or during the networking activities and intended to identify solution for an improved involvement in the future research programmes.

Collaboration with SNETP and NUGENIA

The NEWLANCER contact with NUGENIA was established during the 3rd General Assembly meeting, November 30, 2011, when this association on nuclear safety emerged from the SNETP invited NEWLANCER to join it. Representatives of the project (INR, JSI, LEI, TUS) attended NUGENIA meetings and promoted NMS needs and priorities in this field.

They found that the concept of project incubator (NOIP) developed by NUGENIA could be of immense value to both NMS and OMS R&D organizations, in increasing involvement of NMS organizations in nuclear safety research. Unfortunately at this moment only the NUGENIA members can access this incubator.

NEWLANCER noted the concept of the NUGENIA honorary member, which allows for groupings (consortia, associations, networks, clusters, platforms, federations, organisations with particular status)

act as representative of a number of different organizations which are not at all, or only some of them, members of the NUGENIA Association. The NEWLANCER community qualifies to become honorary member. The status of an honorary member would however not strengthen the influence of the NEWLANCER community within the NUGENIA. It would merely enable a more resource efficient access to the NUGENIA NOIP project incubator.

Most of the NEWLANCER partners are members of the SNETP and contributed before to the elaboration of its documents. During the project deployment (2011 – 2013), SNETP launched a revision of the Strategic Research Agenda collecting members' opinion and necessary updates after the Fukushima accident. NEWLANCER specialists reviewed the SRA and sent their proposals reflecting the current national priorities. The new version of the SRA included the NEWLANCER input, improving to a certain degree reflection of the NMS priorities in this document.

Collaboration with IGD-TP

The dialogue between NEWLANCER and the IGD-TP pointed out that NMSs participation in the platform activity is quite low and NMSs are only symbolically represented in the Executive Group. IGD-TP is not very well known among the NMS specialists in radioactive waste disposal and its vision and its research directions are quite different from NMSs concerns in this field.

Necessity to increase NMS representation in IGD-TP was strongly promoted at national level through the NExGs. As result of these actions Romanian and Polish waste agencies registered in IGD-TP and moreover the Romanian Agency became members of the Executive Group. Other three Polish organizations developing activities in the radioactive waste disposal field became IGD-TP members.

A more active collaboration with the IGD-TP started inside the SecIGD2 WP2 project intending to identify solutions to improve the current situation and facilitate a broader participation of NMS in projects dedicated to waste disposal. This collaboration consisted in a fruitful exchange of information on the existing NMS expertise, needs for improved competence, and requests for access to large infrastructure and to technical documents. Two common major requests falling within the IGD-TP scope were identified:

- assistance for the elaboration of the strategy for deep geological repository and associated program
- access to existing open technical information on the experimental tests developed by more advanced disposal programs
- and suitable solutions were discussed and identified to assist NMSs in their progress towards the geological disposal [9] such as:
- raising awareness among the NMS specialists on the benefits of the participation in relevant projects since NEWLANCER analyses found this is the best vehicle for enhancing information dissemination and education&training;
- organisation of mini-exchange forums as interactive sessions focused on specific topics, with large NMS participation;
- increasing visibility of the key contacts for each of the strategic themes;
- widen the audience of the EC projects conferences through the organisation of a larger conference attended not only by the project participants as usually happens

The general consensus of these discussions was that it is very useful to identify common research needs and to create partnerships between countries with common targets / interests to make better use of both financial and human resources available to each geological disposal program. In addition, NMSs can use

research facilities (such as underground laboratories) already existing in countries with advanced programs and can visit storage sites selected in the advanced countries. These could be a starting point useful in shaping research directions in planning geological disposal in less advanced countries.

Two events organized by the IGD -TP will include priorities of these countries:

- GEODISPOSAL Conference organized by the IGD -TP in Manchester, 24-26 June 2014 with special sections devoted to less advanced programs
- Meeting to support new states in building the strategy and associated geological disposal program, scheduled for March 2014 in Brussels.

The GEODISPOSAL 2014 expects a large number of participants from the NMS facilitated by the bursary scheme available to support attendance for individuals associated with less-advanced programmes. NEWALNCER contributed to the dissemination of this event through the complex network created inside the project linking national and regional experts in the field from Bulgaria, Lithuania, Poland, Romania and Slovenia.

IGD-TP finds useful the functioning beyond the project of the NEWLANCER network, which could act as a relay in the communication with the NMS as long as they are poorly represented in the Executive Group.

Collaboration with MELODI

NMS participation in Euratom research is low, but participation in the radioprotection research is almost negligible. None of the NMS partners in NEWLANCER has been involved in a project targeting radioprotection aspects, despite their participation in IAEA or other international networks, joint activities, benchmarks, etc.

Moreover in the beginning of the project, the MELODI platform vision, its research agenda and implementation plan, its research activities were not known among the NEWLANCER partners. To improve this situation, MELODI platform and NEWLANCER agreed a collaboration facilitated by the OPERRA project through the Joint meeting NEWLANCER - OPERRA organised in conjunction with the 4th Regional Meeting in Bucharest, on September 5th, 2013 [10]. The main objectives were to capture the findings of the NEWLANCER project after almost 2 two years of activities dedicated to find out practical solutions to widen NMS participating, to meet researchers involved in the field, and to understand what will be the new procedure for the participation in the radioprotection research in the H2020 programme.

As one of the obstacles identified in the joint meeting was the lack of visibility of the existing institutions and individuals having competence in radioprotection who may be contacted for further cooperation it was agreed to provide OPPERA and MELODI a list of experts to be included in the dissemination list of OPERRA project and MELODI platform. The list of contacts for the MELODI contains the members of the National Experts Groups established in Romania Poland, Bulgaria and Hungary.

As a follow-up of interacting activity of NEWLANCER' partners with MELODI the TUS proposal "Improvement of the Knowledge and Access to the research infrastructures and strengthening of the Low Dose Research by the Irradiation Diagnostic" – IKARID in the 3rd Call for additional partners from NMS in the Network of Excellence DoReMi could be mentioned.

Concluding, collaboration with the MELODI platform allowed first of all a better mutual knowledge of the current research priorities on the activities undertaken by each part. Secondly, but equally important,

it allowed creation of a direct link with the specialists, which opened a real possibility for future participation in the European radioprotection research.

2.3 Good Practices and Recommendations

Success stories in FP6 and FP7 Euratom Programmes collected from each partner were analyzed in order to identify common elements leading to:

- more intensive national involvement;
- continuity in participation;
- larger scope of cooperation.

Using a common methodology based on three sets of criteria addressing scientific, organizational and respectively economic aspects, together with associated features, events and processes, NEWLANCER consortium identified general factors contributing to a successful participation in Euratom programmes:

Opportunity – in terms of in time information and/or appropriate contacts, future job and educational opportunities (i.e. PhD studies);

Willingness – manifested in individual initiative and enthusiasm

Support – insured by the organization as co-finance and helpful administrative and technical teams, and/or as government financial support;

Competence and commitment – representing existing or created expertise paired with continuous involvement during the project realization;

Relevant added value for the organization – open or extending a new research field/activity, solving a domestic problem, creating competence;

Continuity in the research topic – coming from the quality of work and reliability as partner

Cooperation between national and local levels, between different stakeholders, etc.;

Communication with the public and improving its knowledge;

Organisation management in defining priorities and objectives early on and clearly, transmission of best practices, detailed organisational programs, etc.;

Efficient transfer of information

Fair and balanced participation of all involved parties

Strong international collaboration

EC financial support coming from participation in EU framework program

Using these evaluation criteria in the analysis of 30 success stories a large number of factors influencing the successful participation have been identified. Common elements could be found among the NMSs regarding the elements contributing to their participation in Euratom projects and the major obstacles which limited a larger involvement.

Careful analysis of factors influencing the participation of New and Old Member State organizations showed that although there are many common factors (such as high quality of proposals, good expertise, sufficient human resources) significant number of factors is different (Table 1).

Table 1. Factors influencing OMS and NMS participation in Euratom projects

OMS	NMS
Factors influencing successful participation:	**Factors influencing successful participation:**
High quality of proposals: - Innovative character of research proposed; - Competent, experienced consortia; - A good sense of subject - projects address very timely issues; The expertise covers all aspects of Euratom topics; Large contribution from industry with long-term strategy of industry participation; Good organisation of work at every stage of proposal preparation and project development; Interests of participating countries from national strategy point of view; Consistency with general trends in nuclear field and industrial expectations; Participation of strong partners who are capable to share the costs; a possibility to propose large projects; Experience from being partner in Euratom projects.	Participation in international events; Possibility of research implementation in NMS market - necessity to find end-user for developed technology, new approaches; Openness to new challenges and new fields of research; Support and stimulation from the organization management; availability of scientists for participation; 2way harmonized conditions for NMS participation; Financial support in the preparatory phase of the project granted by the organization and/or government Educational programs aligned to the existing systems in Europe; Education oriented to the nuclear research topic; Active local support organisation, like national contact point.
Limiting factors, obstacles:	**Limiting factors, obstacles:**
Not too many NMS partners participating in successful projects – NMS potential is not sufficiently used; Too less industrial partners; from the point of view of industry sometimes participation is a risky business.	The collaboration culture and practice are not sufficient, rather at national level than in European programs; Financial support from the budget is limited; Insufficient human resources; gap between generations; Lack of experimental facilities; The contribution of NMS to the projects are often limited to development of the software and codes, simulations and calculations (since there is high competence in computing in the NMS) due to the lack of advanced infrastructure Insufficient practice in project coordination (only CA projects); low chances for large project coordination.

Compiling these findings, NEWLANCER proposed a set of measures helping to align the skills in NMS with OMS expertise.

Table 2. Measures to be a valuable partner in Euratom

How to align the skills and abilities to be valuable partner in Euratom?	
At national level:	**At European level:**
Have stable, targeted national strategy better structured at national level; Make efforts to update national research strategy (if possible) adapted to Euratom priorities; Strive to strengthen own institution: create the new infrastructure, find competent staff, permanent financing; Be opened for innovation and cooperation with industry; Create opportunities for further career development for young, talented scientists.	Try to find and promote the field of competence or unique specialty (unique infrastructure that can be shared); competence building; Try to enhance the participation in Euratom programmes by presenting national competence and your colleagues achievements, when it is possible; Track current calls of Euratom to be informed in time; Be active in EU initiatives (platforms, networks) in order to influence the calls content; - Respond to Euratom requests: questionnaires, expressions of interest, etc., - Maintain contacts with experienced colleagues from whom you can learn a lot. Continuously develop international cooperation; Do not ignore the projects that may affect the strengthening of participation of NMS (e.g. NEWLANCER); Be visible; take part in international events, not only scientific conferences, but also in brokerage events, fairs and exhibitions.

It seems that NMS countries wishing to participate in European programs must make a greater effort to be visible and be valuable partners for the consortia. They should be involved in European brokerage events; they should still present and remind their skills to convince partners about their value for the projects. They have to be open to new fields of research and to improve continuously their competences.

The collaborative culture in NMS is still not sufficient to form strong pressure groups for lobbing in their interests. To align their abilities with OMS skills they should be permanently present in European research area, they should actively and cooperatively display their competences on national and international levels.

NEWLANCER Recommendations for a broader participation

The *NEWLANCER recommendations for a broader participation in future Euratom RDI programmes* represent the synthesis of the joint activities carried out by all 17 organisations from New MS (Bulgaria, Hungary, Lithuania, Poland, Slovenia and Romania) and from Old MS (Belgium, France, Italy and UK) participating in the project.

Recommendations have been distilled starting from the major findings of the project: driving forces at individual, organisational, national and European level that favoured participation, the main obstacles which limited it [1], existing research potential [4], critical success factors identified in the 6-country SWOT analysis regarding future participation [3], namely:

- Improving institutional and national policy making, strategic planning and setting the nuclear research and education among priorities (implementing priorities with resources for training, modernized infrastructure, support…)
- Improving cooperation between all activity holders in nuclear research and development, including cooperation with universities and postgraduate students
- Including information on Euratom projects and policy in nuclear study programs
- Ensuring visibility and presence on the European scene, including academic dissemination, researcher networking, scientific lobbying.

and the best practices emerging from the NEWLANCER Success Stories analysis on almost 30 Euratom projects involving 5 NMSs and 3OMSs [11], which revealed the common critical factors for the NMS involvement in Euratom H2020.

Figure 7 NEWLANCER recommendation brochure – front cover

These findings were complemented by an extended review by all NEWLANCER partners [12] of relevant documents identified by SYMLOG, in order to assess and provide context to the recommendations. The agreed recommendations and supporting desk study – containing a wealth of useful information for future H2020 participants – are made available to the public in a printed brochure [13] (Figure 7).

NEWLANCER findings can be synthesized in the diagram seen in Figure 8, which illustrates the factors influencing sustainable participation and their dynamic relations.

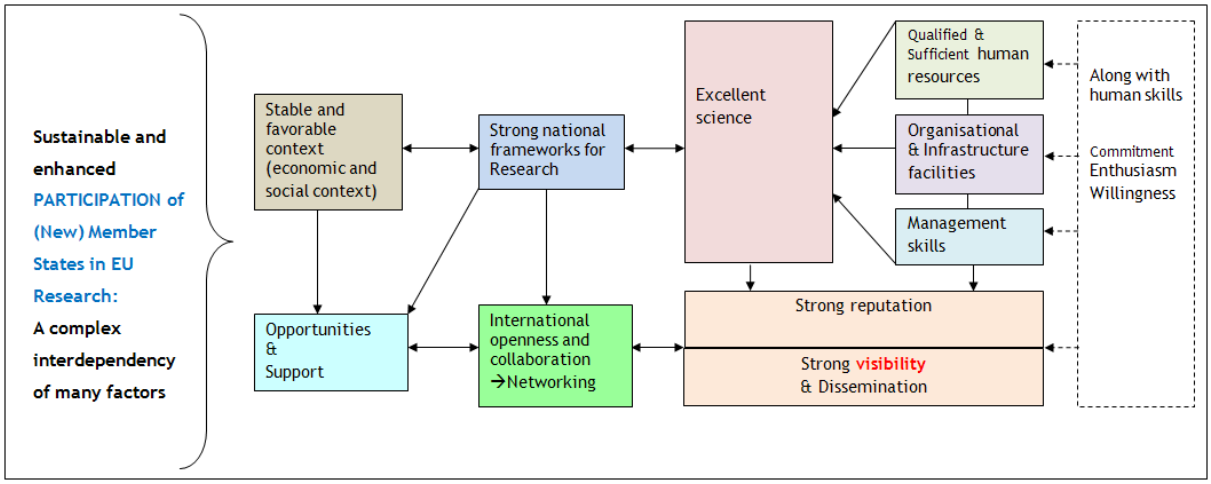

Figure 8. NEWLANCER synthesis diagram of factors influencing sustainable participation in EU research

NEWLANCER Recommendations [13] aim to help New Member State (NMS) stakeholders leverage the NMS research potential and experience in the nuclear domain. This endeavour takes place within the

general Euratom perspective and more precisely on a short term targeting participation in the R&D framework program Horizon 2020.

Therefore, NEWLANCER recommendations were designed to be useful for a large spectrum of end users from scientists and organisation management, to national authorities and European organisations. Since participation processes evolve and different stages rely on different actions, NEWLANCER recommendations were clearly structured by the stage of play, in order to make them easily applicable. They are very concise, clearly indicating the concrete short- and mid-term actions helping NMS to become more significant "players" or participants in Horizon 2020 projects.

- The *research managers* interested to involve their organizations in Euratom programmes are advised to prepare and implement a strategic program starting with an active participation at national and European level in development of national strategies in parallel with building national networks, and increasing the visibility of the existing research potential at European and international level
- promoting national priorities in the EU initiatives (platforms, networks) to influence the calls content,
- answering questionnaires and expressions of interest,
- joining and participating in European scholarly and professional associations.
- In the preparation of their participation, both scientific community and research managers are advised to be connected to events and links providing information on Euratom calls and participation in EU projects.

To start being a participant in Euratom, they have to join a first project to learn, to create links and extend them. Since a new research framework has just been lunched, it is important to clear understand its philosophy “harmonized and integrated research programme” and to find out the key elements of a success proposal.

Once entered in the arena, the focus should be oriented to keep individual and institutional competence at high level applying a suitable human resources policy, and to create opportunities for further careers development.

To maintain a sustained participation, the management policy should be open for new challenges, should seek out innovation and cooperation with industry and non-traditional partners and be receptive to the innovative research ideas. Development of research collaborations at national and European level and implementation of a strong dissemination plan complement the measures recommended to consolidate and continuously extend the participation in European research programmes.

National authorities (ministries, regulatory bodies) are also playing a role in supporting NMS participation in Euratom research. NEWLANCER recommends them to get acquainted with the possibilities of H2020 participation and with the actual research potential of the national institutions, fostering cooperation among them and with the operators. Preparing the entering the arena, a particular role is played by building /updating coherent, stable, structures and harmonized national strategies based on a large national consultation involving research community, and on elected legislators involvement.

To help research organizations starting their participation, national authorities are advised to accept participation as end-user, or as advisory board member, and actively be involved in the Euratom platforms.

A constant and efficient lobby at European bodies by permanent country representation is recommended to influence decision making and shape the future topics of the calls, or to defend strategic priorities.

European bodies could further facilitate NMS participation especially convincing the OMS that "business as usual" would means losing the large European innovation potential in the NMS, affect the overall European economy and miss opportunities to further consolidate our shared nuclear safety. NEWLANCER recommends EC to invite research proposals from NMS national level and through technology platforms promoting initiatives consistent with national programs and national needs.

Reinforced special provisions for NMS participation, maintaining diversity of national research and better training and visibility for the NCP would be the most useful measures supporting NMS play and fostering their sustained power in the European research.

Pilot exercise for writing project proposals

The pilot exercise for new project proposal was intended to transfer the experience of NEWLANCER consortium (existing or acquired during the project) to less-experienced organizations and to guide them in the process of project elaboration and submission following all necessary steps.

Participation of almost all NEWLANCER partners in the currently on-going projects EAGLE, ASAMPSA_E, ARCADIA, according to their competence and interests, is a consequence of the pilot exercise practiced by all partners who made evolve their project ideas to successful proposals and finally ongoing projects.

EAGLE – Enhancing educAtion, traininG and communication processes for informed behaviors and decision-making reLatEd to ionizing radiation risks was the initiative of ARAO, INR, INCT, REC, UPB, JSI and was prepared under the SCK.CEN coordination.

EXTEENS - *Extreme External Events - Impact and Improvement of the NPP' Safety* initially a NEWLANCER proposal coordinated by TUS, was later included in the IRSN' proposal ASAPMSA_E – *Advanced Safety Assessment : Extended PSA*, which covers also the internal events and hazards.

SARRAH - *Sustainable Approach for Regional Competence Active Integration in Horizon 2020* - addressing widening involvement in the 'Fission, Safety and Radiation Protection' Programme was prepared by the all NEWLANCER partners under the INR coordination. SARRAH intended to continue the networking of experts with policy makers, utilities, nuclear industry and safety authorities on one side, and with the European consortia and structures (Technological Platforms, European Initiatives) defining the future research frame, on the other side. During the negotiation process, SARRAH was asked to merge with WINSR proposal - *Widening Involvement of New Member States to Horizon2020 in Nuclear Safety Research*, and focus the joint resources on two major areas included in the Strategic Research and Innovation Agenda of SNETP: ESNII, through the support of the ALFRED project towards its realization in Romania, and NUGENIA, approaching remaining safety aspects of Gen III/III+ that could be built in some NMSs

As result of a successful fusion of the two proposals, ARCADIA project was born. It continues with an extended consortium the consolidation of the regional capability focusing on two important priorities of the research agenda: evolutionary reactors safety and innovative reactors development. It integrated in its consortium new comers and organizations with low participation level in Euratom research such as CLOR and NCBJ from Poland, BME from Hungary and CITON and UPIT from Romania, preparing the frame for their durable and broader involvement in important European projects such as Gen IV.

All these projects carry forward NMS participation in Euratom adding a plus of confidence in the NMS capabilities and research potential and proving also NEWLANCER reached its objective.

3. Potential impact

The NEWLANCER project was designed and conducted to respond to the improvement of NMS participation in research activities of Euratom Framework Programmes and their advanced integration in EU research area.

The main achievements of the project are expected to have a socio-economic and societal impact at national, regional and European levels.

At ***national level***, the national clusters represented by the experts groups built inside the project will improve the national collaboration culture and will raise the competence level in nuclear research as result of their larger involvement in the Euratom Programmes.

NEWLANCER network and its approach created and tested mechanisms able to integrate more research teams and organizations, and promote national priorities contributing to a high level of science in nuclear and ultimately to the improvement in nuclear safety, radioprotection and education&traning. Increased participation in the European research will request additional human resources based on a carrier oriented policy and new employment of young scientists, which means new jobs at higher level of education. Larger participation in Euratom projects could also facilitate the allocation of larger funds for infrastructure investment for high quality research.

NEWLANCER promoted also the European governance principles applied in national strategies elaboration, underlining the important role played by the scientists. This will have a positive impact on the future approach of strategies elaboration and on their improved coherence at national level. Participation of a very large number of researchers in NEWLANCER activities increased their awareness in the role they should play in decision making and ultimately in their involvement in society development.

At regional level, identification of complementarities as result of a better connectivity between research centers will bring an improvement in the collaboration culture at regional level, reducing fragmentation in nuclear research and increasing therefore the efficient use of resources. Cohesion at regional level means a real potential for larger projects with regional relevance addressing common priorities related to nuclear safety, waste management, radioprotection, education and training. A wider involvement of regional competences in European projects will contribute in decreasing the existing gap between New and Old MS research level.

At European level, NEWLANCER network improved the dialogue and information exhange of the national teams with abroad research centers having as major impact an increased visibility of NMS research potential in the Euratom fields.

As a result of the networking activities with European structures (SNE-TP, IGD-TP, ESNII, EERA) a bottom-up and also a top-down harmonization of the short and medium term objectives and research themes is expected. As a consequence of these links a better harmonization of national research policies with European research objectives was stimulated started from the expert group level and promoted to the policy-makers level.

NEWLANCER project will also contribute to increasing the natural process of team construction and consolidation/strengthening based on skills, expertise, complementarities and power to produce valuable research themes and results. Collaboration between research centers and nuclear education developed within the project will contribute in the implementation of an educational program adapted to the actual research needs.

4. Dissemination activities

All along the project, dissemination of NEWLANCER objectives, expectations, progress and results was constantly performed by most of the consortium partners. In order to achieve a large visibility of NMS research potential available for future participation in Euratom projects, information on NEWLANCER outcomes was directed equally towards other NMS and OMS organizations, other on-going Euratom projects, Technology Platforms and other European structures.

Based on the initial dissemination strategy [14] and on its updated version [15], activities for NEWLANCER presentation were constantly carried out during the reporting period in order to make known the project evolution, its main findings and its products. A particular attention was granted to the presentation of NEWLANCER project in the Technology platforms and European structures [16, 17].

Also, the Catalog of NMS Research Potential for Brooder Participation in EURATOM Programs was largely disseminated during the reported period in Europe.

The dissemination activities initially planned in the DoW consisted in:

- up to 7 presentations in the major international events organised in their countries, such as: Sustainable Development through Nuclear Research and Education – in Romania, Nuclear Energy for New Europe – Slovenia, BULATOM-Bulgaria given by the partners from the hosting country
- 3 presentations in the public events of the European structures (SNE-TP, IGD-TP, EERA, etc.) given by the coordinator
- at least 1 presentation in meetings of other relevant Euratom on-going projects (NUCL-EU, etc) given by APRE
- at least 2 publications of major outcomes (NMS participation review and analysis, SWOT analysis, network activity, etc.) in relevant European newsletters and journals.

Part of them was performed in the first reporting period. During the second part of the project, as more results and products became available, the dissemination activity significantly increased.

NEWLANCER Presentations in New Member States

It was important for the NEWLANCER mission to communicate to the other NMS research institutes and universities from the NEWLANCER participating countries and not only, the most important findings regarding NMS participation, the limits but also the opportunities, in order to increase the awareness on their potential that could be included in future Euratom programme.

The international scientific events organised by NEWLANCER countries (Bulgaria, Romania, Slovenia) having a large national audience from all stakeholders in nuclear field, represented therefore an excellent audience to disseminate information on the open links to the NEWLANCER network and to share the best practices and forward recommendations identified by the project consortium.

In particular, the two editions of *New Europe Nuclear Energy Conference* hosted by Slovenia (NENE 2012 and NENE2013) offered the opportunity to make known the NEWLANCER project and to invite all NMS participants, and especially the Croatian nuclear specialists participating in large number in this event, to its networking activities.

The following presentations were made in these meetings:

- Diaconu D. - NEWALNCER: Identifying and implementing solutions for an enlarged involvement in Euratom programmes, NUCLEAR 2013 – 6th International Annual Conference on Sustainable Development through Nuclear Safety and Education, Pitesti, Romania, May 22-24, 2013
- Apostol, M, Constantin, M. Diaconu D. - Strengths, Weaknesses, Opportunities and Threats – SWOT Analysis Regarding the Romanian Participation in Euratom Programmes on Nuclear Safety Topic - NUCLEAR 2013 – 6th International Annual Conference on Sustainable Development through Nuclear Safety and Education, Pitesti, Romania, May 22-24, 2013
- Groudev, P., Ivanov, I., Vryashkova, P. - Presentation of NEWLANCER Project of 7FP of EC and Bulgarian project' activities" (poster) - BULATOM' 2013 - Bulgarian Nuclear Energy - National, Regional And World Energy Security, Riviera Holiday Club, Bulgaria
- Groudev, P., Ivanov, I., Vryashkova, P. - Presentation of NEWLANCER Project of 7FP of EC and Bulgarian project' activities" (poster) - Annual International Conference of the Bulgarian Nuclear Society Nuclear Power For The People' 2013", Sunny Beach, Bulgaria,September 18-21, 2013
- Groudev, P., Ivanov, I., Vryashkova, P. - Presentation of NEWLANCER Project of 7FP of EC and Bulgarian project' activities - INTERNATIONAL ENERGY FORUM 2013, International Home of Scientists "F. J. Curie", Seaside Resort, "St. St. Constantine and Helena", Varna, Bulgaria June 12-15, 2013
- Groudev, P., Ivanov, I., Vryashkova, P. - NEWLANCER Project of 7FP of EC and Bulgarian project' activities - NENE'2013 - 22nd International Conference Nuclear Energy for New Europe, Bled, Slovenia, September, 9-12, 2013
- Ghitescu, P., Pavel, G.L - Enhancing Cooperation in EURATOM FP7 Projects, NENE'2013 - 22nd International Conference Nuclear Energy for New Europe, Bled, Slovenia, September, 9-12, 2013
- G. Zakrzewska et al.- New MS Linking for an Advanced Cohesion in Euratom (NEWLANCER), Science and Technology for challenges of construction of the nuclear power plant „MĄDRALIN 2013", 13-15 Feb. 2013, Warsaw, Warsaw University of Technology, Conference Abstracts, p.74.

Other two technical presentations apparently without a direct connection to the project made in tow important events organize in NMS (NUCLEAR 2013 and NENE2013) can be added to the previous list since both in fact presented topics open for future collaboration and addressed a clear invitation to the NMS to join ENEA's or other OMS's specialists teams.

- G. Glinatsis - Coolant Void Effect Investigation. Case of a Na-Cooled Fast Reactor-NUCLEAR 2013 – 6th International Annual Conference on Sustainable Development through Nuclear Safety and Education, Pitesti, Romania, May 22-24, 2013
- G. Glinatsis - FRs Deployment Strategy. Some Constraints and Consequences - NENE'2013 - 22nd International Conference Nuclear Energy for New Europe, Bled, Slovenia, September, 9-12, 2013

Presentations in the public events of the European structures

Presentations made by the Coordinator and by other NEWLANCER representatives in important events organised by the European Commission, by European Technology Platforms (SNETP, IGDTP), by other European structures (NUGENIA, EHRO-N, ERDO) during the second part of the project are listed below:

- Diaconu D. - NEWLANCER: Steps towards a broader participation of the New Members States in the Euratom research - 4th IGD-TP Exchange Forum, Prague, October 29-30, 2013
- Diaconu D., Kralj, M. - A multi-level network for a wider participation of the New Members States in the Euratom Research - Joint meeting of ERDO-WG, EU Commission-DG ENER and ENEF - Supporting small European Member States in responding to and reporting on the EU Waste Directive, Luxembourg, December 4-5, 2013
- Diaconu D.- Romanian Nuclear HR and E&T Report - EHRO-N Senior Advisory Group, Amsterdam, Nederland, September 23-24, 2013
- NEWLANCER (poster) - FISA201, Vilnius, Lithuania, October 14-17, 2013
- Cizelj, L., Diaconu, D,. Ghitescu, P., Ivanov I., Tiselj, I., Železnik,N. - Advancing national and joint nuclear research in the European union : the NEWLANCER project - ENC 2012: The European Forum to discuss Nuclear Technology Issues, Opportunities & Challenges, 9-12 December 2012,Manchester, United Kingdom

Presentations in meetings of other relevant Euratom on-going projects

Exchange of information with other on-going Euratom projects relevant for NEWLANCER objectives was another activity followed during the project, particularly linked to WP2.

- Diaconu D., Bucur C., Zakrzewska G, Šmaižys A., Groudev P., Kralj M. - Priorities and Needs in RWM Research in NEWLANCER Partner Countries - SecIGD2 Project – WP2 Meeting, London, UK, May 9, 2013
- Bucur C. - RWM Competences in Research Directions in Romania - SecIGD2 Project – WP2 Meeting, London, UK, May 9, 2013
- Diaconu, D. et al - NEWLANCER project: main achievements - Joint NEWLANCER – OPERRA meeting, Bucharest Romania, September 5, 2013

The common meeting with the NU-CLEU project organized in Brussels on July 5, 2012 under the title *Training for Euratom and Energy NCPs* targeted also NEWLANCER activities dissemination to other NMS among which Latvia and Estonia. All participants have been invited to follow the NEWLANCER events announced on the website, pointing out the *Pilot exercise for new project proposal* held on November 2012 in Warsaw.

NEWLANCER in relevant European newsletters and journals

NEWLANCER was presented in the SNETP and IGD-TP Newsletters pointing especially the multi-level network created under the project and the potential, sometimes unique, developed in the NMS institutes and universities, in different nuclear fields. The project approach and main findings were also integrated in papers or works included in different documents issued at European or international level such as the 2012 Interdisciplinary Study elaborated by European and Social Committee, or Developing a Nuclear E&T Program elaborated by the American Nuclear Society.

The papers presenting NEWLANCER activities and achievements in different European and international publications are listed below:

- NEWLANCER- Improving New Member States Participation in Euratom Programme - SNETP Newsletter n ° 9, 2011
- 3rd NEWLANCER Regional Meeting in Ljubljana - IDG-TP Newsletter Issue 1, September 2013

- Poumadère, M - Defining priorities for Euratom fission research and training - 2012 Interdisciplinary Study - Benefits and Limitations of Nuclear Fission for a Low Carbon Economy: (pp. 151-156), European and Social Committee (EESC), Brussels
- Ghitescu, P., Pavel, G.L - Cooperation between Newcomers and Experienced Nuclear Energy Countries in Developing a Nuclear E&T Program, Proceedings of ICAPP 2013 Jeju Island, Korea, April 14-18, 2013 Paper No. FA 130
- Ghitescu, P., Pavel, G.L - Developing a Nuclear E&T Program – Cooperation between Newcomers and Experienced Nuclear Energy Countries a Success Story?- http://www.ans.org/const/international/ansglobe/docs/2013-6.pdf
- Zeleznik,,N., Kralj, M - SWOT Analysis of NMS Participation in Euratom Projects - Proceedings of NENE 2013 – 22nd International Nuclear Conference Nuclear Energy for New Europe, Bled, Slovenia, September 9-12, 2013

NEWLANCER products dissemination

Beside the project findings, NEWLANCER products – the Leaflet and the Catalogue of NMS Research Potential for Broader Participation in Euratom Programs - were largely distributed during the most important European events such as:

- Pilot exercise meeting, Warsaw, November 2012
- 3rd IGD-TP Exchange Forum, Paris, November 2012
- Benefits and Limitations of Nuclear Fission for a Low Carbon Economy, Brussels, February 2013
- SecIGD2 WP2 meeting, London, May 2013
- Joint NEWLANCER-OPERRA meeting Bucharest, September 2013
- EHRO-N Senior Advisory Group, Amsterdam, September 23-24, 2013
- Annual International Conference of the Bulgarian Nuclear Society Nuclear Power For The People' 2013", Sunny Beach, Bulgaria, September 18-21, 2013
- FISA 2013 and EURADWASTE2013, Vilnius, October 14-17, 2013
- SNETP General Assembly, Vilnius, October 18, 2013
- ERMSAR-2013, Avignon (France), October, 2-4 2013
- 4th IGD-TP Exchange Forum, Prague, October 2013

Dissemination of the NEWANCER outcomes continued also after project completion in European and international events, such as:

- Horizon 2020, Energy Information Day - 2014 and 2015 calls, 5 December 2013, Charlemagne, Brussels
- H2020 Energy Brokerage Event, 6 December 2013, Hotel Bloom, Brussels
- THE 2ND WORLD EMERGING INDUSTRIES SUMMIT (WEIS 2013), Wuhan city, Hubei Province, China, Nov. 21-23, 2013

NEWLANCER partners took the opportunity of other national, European or international events to directly or indirectly make known this project and forward its messages. The presentations are:

- Diaconu D., Constantin, M. - NEWLANCER: Steps towards a broader participation of the New Member States in Euratom Research - ICSI 2013 - Conference on Cryogenics and Isotopes Separations, Calimanesti – Caciulata, Romania, October 10-11, 2013

- Poumadère, M. - Fukushima and beyond: Towards integrating the social and psychological dimensions into severe accident research - ERMSAR-2013 – the 6th European Review meeting on Severe Accident Research, Avignon (France), Palais des Papes, October, 2-4 2013.
- Ghitescu, P., Pavel, G.L. - Developing a Nuclear E&T Program – Cooperation between Newcomers and Experienced Nuclear Energy Countries a Success Story?- CONTE 2013- Conference on Nuclear Training and Education, Jacksonville, USA, February 3-6, 2013

5. Exploitation of results

The NEWLANCER findings, outcomes and products can be integrated in 4 main exploitable achievements:

1. Understanding of the current status and factors influencing the NMS participation in Euratom research programmes;
2. Approach on increasing cohesion of nuclear research community at national and regional level
3. Recommendations for a broader NMS involvement in H2020
4. New project proposals in Euratom calls

The *analysis of current participation of NMS and OMS in Euratom Program* offers to policy makers, R&D managers and researchers the understanding of the difficulties and driving forces in participation in Euratom. Based on critical factors identified by SWOT analysis of participation in Euratom projects in each NMS participating country and its integration at regional level appropriate measures may be introduced at each level to stimulate and support an increased participation of these states. The *Catalogue of NMS Research Potential for Broader Participation in EURATOM Programs* elaborated is a useful tool in increasing the visibility of the competence and infrastructure owned by the NMS research centers, which are available for new projects.

NEWLANCER approach on increasing cohesion of nuclear research community at national and regional level based on a flexible and dynamic multi-level network of experts coupling national and regional levels, and interacting with European bodies and with OMS research centers can be continued by each organization. The NEWLANCER network represents a good basis for information exchange between experts both at national and regional level, and allows extending it incorporating new participants and organisations. The network activity as proposed and implemented during the project to capitalize the existing expertise and complementarities will continue to be a space for discussion and elaboration of future project proposals.

Recommendations for a broader NMS involvement in H2020 synthesizing all NEWLANCER findings represent a set of practical and meaningful advices addressed to scientific community and research managers, national authorities (regulatory bodies, ministries) and European bodies, per stage of play. Available as printed brochure and as electronic document, these recommendations propose clear strategic measures for concrete short and mid-term actions helping NMS to become more significant players or participants in H2020 projects.

The last but not the least, 4 on-going European projects linked to NEWLANCER activities (MACSIMA, EAGLE, ASAMPSA_E and ARCADIA) represents the most relevant results of the approached promoted by the project. They insure not only the continuation of NMS participation in Euratom but offers new opportunities for a extended involvement of the NMS research in H2020.

List of Tables

List of Figures

References

1. Cizelj,L.,Ivanov, I. - Review of current participation of NMS and OMS in Euratom Program and assessment of national strategies, NEWLANCER Report D1.1/2012
2. Cizelj,L., Diaconu,D., Ghitescu,P., Ivanov,I., Tiselj,I. - *The NEWLANCER project: Advancing National and Joint Nuclear Research and Higher Education in European Union,* 21st International Conference Nuclear Energy for New Europe (NENE)**,** Ljubljana, September 5-7, 2012
3. Zeleznik,N.,Kralj,M. - SWOT Analysis of NMS Participation in EURATOM Projects, NEWLANCER Report D1.2/2012
4. Ivanov,I. et al. - Catalogue of NMS Research Potential for Broader Participation in EURATOM Programs, FP7 NEWLANCER project, 2013
5. Constantin,M. et al - *Report on the national expert group creation*, NEWLANCER Report D2.1/2012
6. Constantin,M et al. - Report on the Networking Activities at Regional Level, NEWLANCER Report D2.8/2013
7. Constantin,M et al. - Report on the Networking Activities at National Level, NEWLANCER Report D2.3/2013
8. Diaconu,D. et all - *Report on interacting activities*- - FP7 NEWLANCER project – Deliverable, October 2013
9. Kowe, R., Beattie, T., - *IGD-TP working group on RD&D dissemination* - IGD-TP 4th Exchange Forum, Prague, 2013
10. Apostol, M. et al - Minutes of the 4th Regional Meeting - FP7 NEWLANCER project, deliverable D2.7, 2013
11. Zakrzewska-Trznadel, G. et al, *Good practices for participation in Euratom programme* , NEWLANCER project, Deliverable D3.1, September 2013
12. Schneider, N. et al - Recommendations broader and sustainable participation of the NMS in Euratom research programme, NEWLANCER project, Deliverable D3.2, October 2013
13. NEWLANCER, Recommendations for Broader and Sustainable Participation of New Member States in Euratom Horizon 2020, print and downloadable brochure, December 2013
14. Pocattera, C. et al - *Dissemination strategy*, NEWLANCER project, Deliverable 4.2, April 2012
15. Pocattera,C. et al - *Updated dissemination strategy*, NEWLANCER project, Deliverable D4.3, June2013
16. NEWLANCER- Improving New Member States Participation in Euratom Programme - SNETP Newsletter n ° 9, 2011
17. *3rd NEWLANCER Regional Meeting in Ljubljana* - IDG-TP Newsletter Issue 1, September 2013