ARCADIA PROJECT - SUPPORT FOR ALFRED DEMONSTRATOR IMPLEMENTATION IN ROMANIA

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Contents

- What is ALFRED?
- ARCADIA project in support of ALFRED
- Some preliminary results
- Conclusions
ALFRED = investment of 1 billion Euro + 0.3-0.5 bil. for preparatory phase
LFR Concept

- LFR Technology – one of the 6 GEN IV reactor options established by GIF (Generation IV Forum) at worldwide level (2000)

- ALFRED is included in the Europe technology energy policy (SET-Plan)

- Significant differences from existing commercial reactors.

- LFR expectations:
  - Inherent/passive safety: no emergency planning
  - High competitiveness: compact design, low O&M costs
  - Very high rate of uranium resources utilization: at least 95%, 1000 y
  - Low nuclear waste volume and radioactivity: 10 times lower than current technologies.
  - Proliferation resistance.

- Demonstration phase is a critical and compulsory step toward the commercial development (2040-2050) - ALFRED
ALFRED: The Reference Site

- **Siting reference option:** **Mioveni.**
- This side includes four organizations: RATEN, INR, FCN (CANDU Fuel Plant), and AN&DR branch.
- Two nuclear research reactors (TRIGA SSR, and ACPR), post irradiation laboratories, fuel fabrication, waste treatment plant are the main nuclear facilities on the site.
- **Estimated surface (total footprint area) for ALFRED site = 325m x 300 m** is available and it is in the property of the Romanian state.
- This surface is incorporated in the actual site and in physical protected area.
- Additional land is available close to the site. In is covered by forest partially in the public property, partially in private property.
Elements of DMP – short history

- 2006-2010 FP6-ELSY project – EU LFR, 600 MWe
- 2010-2013 FP7-LEADER project – conceptual design for ALFRED demonstrator
- 2009-2014 ADRIANA, SEARCH, MATTER,
- 2013-2016 MAXIMA, MARISA, ESNII+, MATISSE
- 2011 Memorandum of Romanian Gov., Availability of Romania to host ALFRED
- **2012, February, MoU (ICN, Ansaldo, ENEA)**
- **2013, December, FALCON Consortium (ICN, Ansaldo, ENEA)**
- **2014, Memorandum of Romanian Government “Construction of LFR demonstrator, ALFRED, in Romania”**
- **2013-2016 ARCADIA project**, support for the investigation of ALFRED implementing feasibility in NMS
- **2014 FALCON working groups**, activities supporting ALFRED (review of design, needs for E&T, risk analysis, licensing, promotion, enlargement, common projects, legal entity, …)
- **2014 Set up of Inter-ministry WG (M.Energy, M.European Funds, M.Education and Research)**
- **2014 CVR (Czech Republic) joined FALCON**
ARCADIA Project - support for ALFRED

- Coordination and support actions for ALFRED
- Objectives correlated with feasibility of ALFRED in NMS (competences, legal entity, preparatory activities for licensing and siting, elements of feasibility)
- Elements of governance (set up ALFRED Working Group and ALFRED Local Group) and approach for involvement of the stakeholders in DMP
- Links with other initiatives and European structures
- Transfer of experience in using SF (Czech Rep.-SUSEN project)
- Methods and tools for competences updating and creation
ARCADIA Project - Structure

- **WP1**: Skills & Infrastructures
- **WP2**: Licensing Framework
- **WP3**: Feasibility and Roadmap
- **WP4**: National & Regional Support & Structures
- **WP5**: Cooperation & Dissemination
- **WP6**: RR Networking for LFR technologies and improved LWR safety
Skills & Infrastructures

- List of competences needed to implement ALFRED (design, licensing, operation, E&T, management, RWM, etc.)
- List of existing competences
- List of the infrastructures
- Gaps
- How to fill the gaps?
  - Approaches, Methods, Tools.
  - Suppliers and Costs
  - Recommended Approach
Licensing

**Licensing Framework**
- National context
- Regional analysis
- European context
- International recommendations
- Needs for demonstrations and competences

**Siting (for reference site)**
- Siting requirements
- Process and procedures
- Key stakeholders
- Public participation
- Local stakeholder group & ALFRED group
- Needs for competences

**SDC**
- Assess if SDC defined for water reactors and SFR
- See if ALFRED comply with this SCD criteria
- 90 criteria
Key Elements for Feasibility Study

- Benefits for Society (local, regional, national and EU level)
- Opportunities
- Approach for Implementation (ALFRED in strategic documents, legal entity, management)
- Identification of risks
- Risk management
- Investigation of financing approaches
ALFRED Project– Social Impact

**Benefits for Romanian society:**

- Implementation of a high technology and consolidation of the position of the country in the nuclear sector, including also aspects derived from intellectual property and quality of the research and development.
- Possibility to increase the sustainability of the use of natural resources.
- Improvement of the experimental and testing infrastructure leading to a deep involvement of the country in Generation IV development.
- Stimulation of the national research by active involvement of the R&D organizations and industry in programmes of international interest.
- Contribute to the reduction of loss of high qualified human resources and young talents (ALFRED as an infrastructure with high interest RDI themes, international environment).
- Stimulation of RDI sector, generation of new projects and international co-operations.
- Creation of new jobs, stimulation of local and regional development, strengthening of RDI poles in South-Muntenia region.

**Benefits for Europe:**

- Consolidation of the European role in LFR technology.
- High performance, unique, open access EU research infrastructure.
- Reduce disparities of development.
- Boosting EU cooperation in GenIV.
Financing

- Multi-source approach
- Most important component: Structural Funds
- National Contributions, Industry (in kind)

- ALFRED in national and EU strategic documents - key issue
- ALFRED in connection with regional smart specialization;
  Regional Strategy - vehicle to recommend financing by SF scheme
- Operational Programme - Competitiveness - ALFRED as a major project
Steps to the implementation ALFRED Groups...

Romanian Government - Memorandum

**IWG**
*Inter-Ministry Working Group*

Ministry of European Funds  
Ministry of Energy  
Ministry of Education and Research

**ALFRED Working Group**

Composition: nuclear specialists, policy makers, regulator, industry, lawyers, economists, and financial experts

Role: Debate on safety aspects, as well as on social and economical impacts, identify the benefits, needed steps and resources

**ALFRED Local Group**

*Nuclear 2015, Pitesti, 2015, May, 27th - 29th*
**ALFRED Local Group**

- **Creation of ALFRED Local Group**
  - January 2015 - based on discussion (ICN, Local Council Mioveni, Mayor)
  - **Structure**: 10 representatives of local community (5 elected as members of the LC, 5 representatives of citizens) + 3 representatives of ICN
  - Invited experts: according with the Agenda

- **First Meeting: 2015 March 5th, Local Council Mioveni**
  - 3 presentations
    - **ALFRED projects** - socio-economic, investment and management aspects
    - **ARCADIA project** - support for ALFRED implementation
    - **ALFRED local group** - role, objectives, functionality
  - Debate
identified risks:

- List of risks (totally 98 risks included)
  - Technical risks (1.1 - 1.23)
  - Financial risks (2.1 - 2.15)
  - Political risks (3.1 - 3.10)
  - Market risks (4.1 - 4.4)
  - Management risks (5.1 - 5.26)
  - Relationship risks (6.1 - 6.12)
  - Governance risks (7.1 - 7.9)

- Approach for evaluation of the elements by Matrix of Risks
  - Likelihood (1 to 5 from, Non-credible to Highly likely)
  - Impact (1 to 6, from Negligible to Very high impact)

- Excell Application: to produce the final results (average of marks, grouping the risks in categories)
Matrix of Risks Approach

Nuclear 2015, Pitesti, 2015, May, 27th -29th
Risk Management
Identification of threats

The main risks are connected with:

- increasing of the implementation costs in comparison with the planned costs with significant impact on the local efforts to cover the investment costs in order to achieve the final objectives
- procurement difficulties created by the uniqueness of some equipment (lead pumps, steam generators) and national legal context
- insufficient coordinated planning of national and local resources
- large investment needs for ALFRED
- decreasing of international commitment in case of postponing of tasks and objectives
- current technological limits such as coating of materials for large surfaces
- siting and licensing issues
Risk Management
Prevention strategy

- transfer of good practices and also analysis of the difficulties in the procurement process (SUSEN, ELI-NP, and from other available international experience)
- reducing as much as possible the misinformation about costs at the level of the planning and act for a realistic approach in all estimations
- phasing for ALFRED and also a step by step approach (implementation in some stages) for the other supporting facilities in direct relation with the specific conditions of the national calls for structural funds
- organizing real debates of the investment involving all stakeholders (including general public and local communities) to allow the civil society to voice the criticism and to support of forecasts; knowledge generated in this way will be integrated in planning and decision making
- keep a strong connection between implementer, local and national decision-makers in order to produce a better coordination
Risk Management
Prevention strategy (cont.)

- produce realistic planning of the tasks and deadlines in accordance with the predicted resources and a strictly respect of the proposed timeline
- intensify the RD efforts to clarify the existing open issues and to identify appropriate solutions; keep the interest of international community (including Horizon 2020 framework) on the progress on the field
- early identification of the specificity of the national regulations for licensing and siting, systematic communication with the regulators in the process by initiation of a pre-licensing process, early involvement of the public in the debate and decision making process
- consistent approach to performance and progress monitoring based on key milestones
Risk Management
Mitigation strategy

- management team will immediately analyze any deviation from the planning and estimated costs and will identify the appropriate corrective measures
- if necessary a re-planning of the tasks will be rapidly performed and implementation measures will be ensured
- creating an effective and flexible team to monitor the evolution of the impacts of the risks
- appointment of a cost control consultant if a significant impact of the escalation of the costs will occur and a continuously updating of the market study; identification of the solutions that allow reducing the cost while keeping the project within the intended level of quality.
- solving disputes taking into account good practices in similar projects and situations
ALFRED project – some conclusions

- Long term project
- Major investment
- International environment
- Knowledge transfer and competence building as key-factors
- Major step - demonstration of the technology - towards the commercial deployment
- Need of HR, very promising young people
- Generator of new projects, RD themes, innovation
- Economic growth and new jobs creation
Thank you for your attention!