

**Developing an Enhanced Framework for Networking And
Cooperation in Rd&D for Radioactive Waste Disposal
in The European Union (Eu)**

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ABSTRACT

Management of radioactive waste is a priority area of research in the 6th Euratom Framework Programme (2002-2006) and geological disposal of spent fuel and high-level long-lived nuclear waste is a key topic within this priority area. The ongoing programme is a culmination of previous European Union-supported projects, and maintains continuity with previous research activities efforts in this field. Investment in knowledge has become a priority for the EU's objectives of growth, competitiveness and sustainability. Not only should the scale and impact of investment in research and innovation be increased for Europe to strengthen its position as technologically advanced economy but it is also recognised that there is significant added value in coordinating activities at the European level. In particular, there is a need for more in-depth co-ordination between the respective efforts in EU Member States in the field of management of radioactive waste, and to develop a model of sustainable networking that could improve the cooperation on RD&D on geological disposal among the main stakeholders. The CARD initiative described in this paper is a one-year project that started in November 2006 to investigate whether the Technology Platform model, a concept that has been widely taken up by a range of R&D sectors in Europe, is applicable to the nuclear waste community and how it can be used to improve the effectiveness of future research in the 7th Euratom Framework Programme (2007-2011) and in following Framework Programmes.

STATUS OF EURATOM RESEARCH IN GEOLOGICAL DISPOSAL

The Euratom Framework Programme (FP) is providing an essential service to Member States in the field of geological disposal in supporting collaborative research projects. The funded research aims at establishing a sound scientific basis for demonstrating the safety and feasibility of geological disposal in the Member States. In implementing the successive programmes, the European Commission (EC) has been actively encouraging more cooperation between the waste

¹ The views expressed in this paper are those of the authors and do not necessarily reflect those of the European Commission.

management organisations and research bodies in Europe. This is demonstrated by the degree of cooperation achieved in research projects and the greater integration of work over the last twenty years of programme [1]. The introduction of the new funding instruments in FP6 (2002-2006) was an opportunity to improve still further the degree of collaboration between research actors.

To attract EU support, research groups were encouraged to join forces in collaborative partnerships called Networks of Excellence (NoE) and Integrated Projects (IP). An NoE is a means to create sustainable integration of key research organisations in a given area. The EU funding is specifically to cover the additional costs of integration rather than research that would have been carried out in any case, and the aim is to encourage these organisations to function as a single entity with a common programme of research, thus stimulating the strive for scientific excellence and eliminating needless duplication of effort. An IP on the other hand is a project that brings together as many of the key research players as possible in order to achieve ambitious aims that can go beyond the current state of the art. The expertise and advanced knowledge gained through IPs in FP6 are certainly generating greater visibility of research and facilitate wider dissemination of results within Europe.

Current research projects in FP6 include one NoE (ACTINET) in the field of actinide science, which is an important cross-cutting activity touching many areas of the programme and dealing, in the case of geological disposal, with studies on the speciation and migration of nuclides in a repository system, and four IPs covering various aspects of the demonstration of the feasibility and safety of geological disposal (Table 2). The latest IP to be implemented, PAMINA, will run until 2009 and is looking at developing integrated performance and safety assessment methodologies across EU and will complement work carried out in the earlier projects launched in 2004 and 2005 on improving the fundamental understanding of key processes in the near field (NF-PRO) and in the far field (FUNMIG) [1]. A further IP, ESDRED, will also run until early 2009 and is developing technology demonstrators based on the various disposal concepts of EU waste management agencies.

Table 2: FP6 – Management of Radioactive Waste – IPs in Geological Disposal running in 2006

	Instrument	Coordinator/ partners	EC contribution / total cost	Start date & duration
ACTINET Network for Actinide Sciences	NoE	CEA, FR 27	6.35 M€/ 10.5 M€	01/03/04 4 years
NF-PRO Key processes in the near-Field and their coupling for different host rocks and repository strategies	IP	SCK.CEN, BE 40	8.0 M€/ 16.8 M€	01/01/04 4 years
FUNMIG Fundamental processes of radionuclide migration	IP	FZK-INE, DE 54	8.0 M€/ 15 M€	01/01/05 4 years

ESDRED Engineering Studies and Demonstrations of Repository Designs	IP	ANDRA, FR 13	7.3 M€/ 18.1 M€	01/02/04 5 years
PAMINA PA methodologies and tools in application of the safety case	IP	GRS, DE 25	4.0 M€/ 7.6 M€	01/10/06 3 years

NEW PROSPECTS IN EURATOM RESEARCH

The EC is now on the point of launching the 7th Framework Programme, FP7 [2]. The orientation and structuring of FP7 were announced in a policy document in 2004 indicating how it intends to address the outstanding issues facing European research – innovation, competitiveness, the need for cooperation, the need to support fundamental research and encourage Member States to work closer together [3]. This represents a radical rethink of the role and objectives of EU research, and is fundamentally linked with the aims of the Lisbon Agenda, signed up to by the EU heads of government in 2000, which aims to make Europe “the world’s most dynamic knowledge-based economy geared to growth by the year 2010”.

Achieving the necessary rapid progress towards this goal requires a new ambition and effectiveness in European research. All actors – national governments, research establishments, industry – have their role and need to commit themselves to stimulating research and innovation. Not only should the scale and impact of investment in research be increased if Europe is to strengthen its position as a technologically innovative economy, but it is recognised that there is significant added value in coordinating activities at the European, national and regional levels. Areas of potentially significant economic impact and with high societal relevance need the mobilisation of a wide range of stakeholders in order to develop a shared vision for the technology in question and define a strategic research agenda setting out the necessary medium- to long-term objectives of that technology. European Technology Platforms (ETPs) which have been set up since 2003 in several key European industrial sectors are playing a key role in this respect.

Like in the other themes of European research, Euratom FP7, including the area of geological disposal, has been designed to maximise the leverage and impact of research spending. However, for a full development of this strategy, Technology Platforms also are needed; currently, none exist in the nuclear field.

Introducing Technology Platforms

The FP6 funding instruments such as the NoE have encouraged the partners to enter into a profound and sustainable programme of integration. However, there are other ways to enhance the necessary cooperation amongst research partners. One that is currently being promoted as a solution to at least some of Europe's research problems is the Technology Platform (TP). There are already 29 European platforms in existence in other research and technological fields, though

it is too early to know whether they all are effective some of them being still at the initiation stage [4].

Essentially, a TP should bring together all the key research stakeholders in a particular sector – industry, academia, regulatory authorities, research community and national research coordinators. This 'forum' will then be responsible for the planning of the future "Strategic Research Agenda" in this field and then implementing this agenda. The stakeholders need to decide amongst themselves how best to conduct future research and must bring their own research programmes under the control of the platform. Indeed, the original idea behind such platforms was that they should enable more private funding to be brought to key areas of research, in line with the Barcelona objective of raising research spending to 3% of GDP. However, the platform concept has turned out to be a much more flexible mechanism than first imagined, being adaptable to the peculiarities of different sectors. Clearly, though, well-defined ground rules need to be established and high-level participation from the partner organisations is essential, especially when committing these organisations to follow the platform's agenda. Above all, the stakeholders need to have a shared vision regarding the direction in which the research should go and be willing to collaborate in order to further the platform's agenda.

A TP is not an EU-funding instrument per se. Indeed, since it is not a legal entity, it cannot receive direct funding, though if the conditions were right and the motivation sufficient, one could imagine a platform evolving into a sort of joint venture company with its own legal status. The EC can be instrumental in providing the initial impetus and high-level political support needed to start up a platform, and once the strategic Research Agenda has been agreed it would be a simple matter for the EC to orient the FP Calls for Proposals to fit in with this agenda. In this way, the EU can bring a significant degree of support to the platform's activities, though it must be stressed that a platform is not merely a lobby group to obtain EU funding, each of the stakeholders must contribute his own research effort if success is to be assured.

The CARD initiative on geological disposal

In the field of geological disposal the most important stakeholder group is the national radioactive waste management agencies. These agencies are responsible for the management of national waste arisings and the implementing of national waste management programmes. As such, they are the "drivers" of the research effort in the EU and are involved in the majority of the projects at EU level. There is broad agreement amongst them on the common objectives for research. Their vision is also shared amongst the other research stakeholders – for example the national research institutes – and is reflected in national programmes. There is also a good degree of cooperation amongst the agencies in the ongoing research projects, and the relatively small number of existing underground research laboratories (URLs) also promotes a converging of national research programmes. Several important bi- or multilateral collaborative actions between national programmes exist, complemented by NEA and IAEA activities at the international level that also contribute to the development of a shared vision in Europe. Such collaborations exist because of common strategies (e.g. host rock characterisation, safety assessment, technology development, etc.) or through sharing research means and facilities such as URLs, though they could often be better formalised and geared towards a true integration of R&D programmes.

An important contribution to the development of this shared approach was provided by the project NET.EXCEL of FP5 [5]. It has shown that a high potential for future cooperation among the European waste management agencies does exist and a greater integration of research activities is possible. The EC considered this FP5 network as a useful basis on which to build the foundation of a European TP in the field of R&D for geological disposal and encouraged the waste management agencies to propose, as part of the final call for proposals of FP6 in 2005, a one-year study (so-called "Coordination Action") to assess the feasibility of such a TP, thereby ensuring that all avenues for increased integration in this field are explored and as large a stakeholders base possible is involved.

The CARD project is the result. It was proposed by a consortium of nine European waste management organisations and one implementation-oriented research organisation. The proposal was favourably reviewed by the independent experts during the evaluations following the final call. The Commission subsequently entered into contract negotiations with the partners and the project officially started on 1st November 2006.

CARD objectives and scope

The overall objective of the proposed work is to assess the feasibility of a European TP that would provide a framework for networking and cooperation in the context of R&D for radioactive waste disposal in the EU. In the light of that assessment, the project will then define the structure, functions and practical requirements of such a TP.

The study will describe the basis for sustainable networking among key implementers (i.e. national radioactive waste management agencies) and establish the principles for interfacing with other stakeholders (in particular regulators, public authorities and research centres). This requires the definition of relevant structural and organisational arrangements of the framework for networking that is proposed, and in particular to determine the optimal way in which other stakeholders can be given access to, and influence upon, the operation of structure such as a Technological Platform.

CARD was launched by a two-day start-up meeting in November 2006, which fixed the final objectives of the project while instilling a shared understanding of desired outcomes. This paves the way for the first major action, namely the preparation of a questionnaire to solicit input and opinions from the various research stakeholders across the sector in general. This initial survey is seeking feedback from a maximum number of stakeholder groups active in the various national programmes in Europe, as well as organisations in other EU Member States other than those represented in the consortium.

An important output from this analysis will be to distinguish between the preferences of the various types of consultee so as to establish their likely role in the TP and the amount of effort they would be prepared to deploy. This analysis is to be targeted at developing a model structure or structures that best meets the needs and constraints of the potential contributors.

The structure of the proposed TP could take many possible forms. Two structures are considered in priority. The first is a traditional committee structure with a series of detail-level committees to represent particular interests. These interests could be the various types of organisation (waste management organisations, regulators, research institutes etc.), or technical disciplines (e.g. repository host rock types). These committees then make recommendations to higher committees with more executive functions. Such structures are useful where organisations are in a position to make substantive inputs to the decision-making process. They are, however, time- and labour-intensive and may be less effective for networking purposes because, necessarily, participants are largely confined to 'their' committees so they are exposed to a narrower range of views.

Moving away from the traditional committee approach, one could envisage, as a second possibility, a less hierarchical and more streamlined approach that starts with concrete recommendations for future work being formulated by a sub-group of waste management organisations (perhaps those with advanced programmes) and then presented and debated at a symposium or workshop. This places a much smaller burden of work on the non-waste management organisations but provides fewer opportunities for them to make substantive inputs. Moreover, the quality of the inputs may be affected by the necessity of providing them in the intimidating environment of a public forum. In this case, networking is achieved in an informal and unstructured way by simply bringing many different people together in the same place.

These two examples serve to illustrate that different TP structures will produce different demands on resources and different outcomes in terms of opportunities for networking, promoting collaboration and the ability to influence decision making.

While the different TP structures produce different outcomes, the various organisations involved may also have quite different expectations in terms of the amount of effort they are prepared to deploy and the degree of influence they seek to exert on the end product e.g. a future programme of work. It is possible, for instance, that regulators and public authorities will be satisfied with simply being able to influence the direction of future work programmes, whereas waste management organisations and research institutes may have views about the detailed work content. Similarly, organisations will have different requirements with respect to networking. It may be, for instance, that for some organisations this is already catered for by existing groupings (e.g. NEA and IAEA). Moreover, some regulators and public authorities may wish to maintain their relationships with the waste management organisations on a more formal footing.

A TP that provided a European framework for networking and cooperation would, no doubt, have general functions concerned with improving dialogue and efficiency, allowing non-waste management organisations to influence the R&D programme and promoting collaboration. But there may be more specific functions or objectives that would increase its usefulness, or even provide it with a unique role. Another key output from this work analysis will be to identify such specific functions. Key points that will be addressed are:

- Development of methods for ensuring effective resource utilisation across Europe; there are many objectives held in common across a number of Member States' programmes that could be met by the effective deployment of resources in specialised facilities (e.g. underground laboratory) or of specialised research groups or institutes;

- Establishing a shared knowledge basis applicable to the development of safety cases, facility designs etc. This would include developing criteria for: identification of relevant data bases (including consideration of quality assurance requirements and intellectual property rights); methods for access arrangements to libraries and associated bibliographies; methods for identification of suitably qualified and experienced experts to be available for peer review; and methods for selection from and accessing available technologies. Potential issues linked with Intellectual Property Rights will also be discussed to identify ways to resolve them;
- Mapping competences and excellence available in participating organisations and their national programme contacts;
- Advising the European Commission on the most relevant topics to be tackled at the level of EC Framework Programmes (including identification of the greatest international added-value).

All these objectives will be achieved if the principles for interfacing with stakeholders (in particular, regulators, public authorities and research centres) within a potential Technology Platform are clearly established. This will require the definition of the relevant structural and organisational arrangements of the framework for networking that is to be proposed and in particular, to determine the optimal way in which other stakeholders can be given access to and influence upon, the operation of a framework such as a TP.

If a European framework for networking and cooperation is to be successful and sustainable, it will need to recognise and accommodate several important constraints. First amongst these is the level of human resources that the various contributing organisations can afford to deploy for this work. This places limits on the numbers of participants, on the number of committees, on the way in which organisations are represented on committees and on the frequency of meetings. Among other constraints is the issue of intellectual property, which could affect the dissemination of information and the creation of an information centre.

Without doubt, the most important factor working in opposition to these constraints is the usefulness of the framework – if the framework is useful, participants will want to be represented and will find the needed resources. If, on the other hand, the framework merely duplicates functions provided by other arrangements, interest will dwindle and the framework will not be sustainable.

CARD outcomes.

At the end of the CARD project in October 2007, there will be an EC sponsored workshop to present the key elements of the preferred option resulting from the one-year assessment work. Other options considered in the project will be outlined, along with the results of the assessment. Broad representation will be sought from the stakeholder groups consulted in the survey. The workshop will be facilitated to ensure that the stakeholders' views are expressed and documented. The recorded output from the workshop will be used as a further source of review development of the final report and recommended option. It will in particular help to bolster the proposal for a Technology Platform, or equivalent structure, that would best meet the requirements regarding a European framework for networking and cooperation on R&D for geological disposal identified

in the project. The proposal to set up a TP or equivalent will include a description of all the practical steps needed to achieve this objective.

The European Commission is prepared to provide support to the scientific secretariat of the new TP through direct funding via FP7. This support will ensure the smooth and effective operation of the TP, including the all-important networking between partners necessary in the elaboration of the Strategic Research Agenda (SRA). Once formally approved by the TP, the SRA serves as an important feedback to the planning of the FP7 annual work programmes. In this way the EU can tailor its annual planning to fit in with the TP's agenda, for instance by including relevant topics in the annual FP7 call for proposals. This would be the EU's contribution to the crucial 2nd stage of the TP's activities – actual implementation of the SRA jointly by the members of the platform.

CONCLUSIONS

As part of FP6, the project CARD is currently investigating the development of improved organisation and utilisation of European R&D on geological disposal, thereby facilitating implementation of permanent nuclear waste management solutions in EU Member States. The main outcome of this one-year project is expected to be a proposal for the establishment of a Technology Platform, ensuring the effective use of existing knowledge, information and technology and the efficient use of specialised resources and research funding to meet identified priorities.

The partners involved in CARD represent the most advanced national programmes in Europe in terms of R&D investment towards the realisation of geological disposal. All have engaged in siting studies, at least as far as detailing geological characteristics that are appropriate for their respective waste management programmes, and between them have studied all the classically accepted host-rock types for disposal below the water table. As participants, in most cases, in EU projects of past and current Framework Programmes, they have gained considerable experience of collaboration at European level, and of the benefits that this can realise. When brought together, these experiences and insights will be invaluable in producing a sustainable arrangement for a strategic network to support all European Member States.

The European Commission is prepared to support the implementation of a TP, which would not only build confidence amongst a wide stakeholder group, but also provide assurance that European resources are devoted to real cases (as opposed to generic ones), boost the progress towards implementation of the first repositories in Europe and thus pave the way for similar developments in other countries' programmes, both in terms of R&D and public confidence.

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