ANDRA’S CALL FOR PROPOSALS
2014 EDITION

OPTIMIZATION OF POST
DISMANTLING RADIOACTIVE
WASTE MANAGEMENT

Call for proposals closing date
09/03/2015 at 13h00, Paris local time

Call for proposals publication address

KEY WORDS
Radioactive waste, post-operational clean-out, decommissioning, radionuclides, toxic species, metrology, analytical techniques, mineralisation, instrumentation, recycling, valorisation, sorting, decontamination, packaging, disposal, composite materials, technical and conventional ceramics, sensors, non-destructive testing, rapid diagnosis, surface treatment, social and human sciences, governance, socio-economic analysis, regulation, case studies.
IMPORTANT DATES

CLOSING OF THE CALL FOR PROPOSALS

The project proposals must be submitted on the ANR submission website (link available on ANR website on the page dedicated to the call for proposals, the address of which is indicated on page 1) before the call for proposals closing deadline:

**ON 09/03/2015 AT 13H00 (1 P.M.) (PARIS TIME)**

(see section 2)

SIGNED AND SCANNED DOCUMENT

Each partner must confirm participation in the project proposal by signing its administrative and financial document. This document can be printed from the ANR submission website after closure of the call for proposals. Once scanned in PDF format, the Project Coordinator must upload all the signed administrative and financial documents to the submission website no later than 2 weeks following closure of the submission website, that is to say:

**on 23/03/2015 at 13h00 (1 p.m.) (Paris time)**

(see section 2.4)

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It is important to read carefully the present document in its entirety and the "regulations concerning the conditions of allocation of Andra funding applicable for the Andra call for proposals", available on the call publication page, before submitting a research project.
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1. CONTEXT AND OBJECTIVES OF THE CALL FOR PROPOSALS

1.1. CONTEXT

The decommissioning of nuclear facilities (power reactors, fuel cycle plants, research facilities) represents a global industrial challenge. France has already launched several decommissioning work sites, which include 12 nuclear reactors; it has more specifically created a high-performance industrial environment and an appropriate legislative and regulatory framework. In this respect it has undeniable assets to valorise and develop, for its own needs and at international level. The management of nuclear decommissioning waste nevertheless constitutes a key avenue for optimisation and a major challenge from the technical, economic, financial and societal aspects. The progressive shutdown of nuclear facilities will result in large-scale decommissioning work sites by the years 2020-2030, a situation that we must start preparing for as of now.

Decommissioning sites are in effect sources of very large quantities of waste. Current forecasts\(^1\) predict a volume of very low level radioactive waste (VLLW) of the order of 1,300,000 m\(^3\) by 2030, that is to say twice the present disposal capacities for this type of waste (650,000 m\(^3\)), a significant proportion of which will be decommissioning waste (rubble, contaminated soils, metallic components).

Volume reduction of decommissioning waste, and more broadly the optimising of waste management, notably in terms of management routes, has thus been given priority status by the Government in the context of the PNGMDR (French National Radioactive Material and Waste Management Plan). This objective necessitates a comprehensive reflection on all the waste management solutions, from the design of the new facilities and determining the decommissioning scenarios through to the disposal of the waste.

The scientific and technical problems involved do not concern the nuclear sector alone however, and significant innovations can be brought by the technologies and know-how developed in other sectors of activity.

It is in this context that Andra (Agence nationale pour la gestion des déchets radioactifs - the French national radioactive waste management agency), supported by the State under the «Programme d’Investissements d’Avenir», has decided to rally to the cause through an ambitious call for proposals. This call for proposals is funded by Andra as part of the "Nuclear power of the future" action under the «Programme d’Investissements d’Avenir»; it is managed by ANR on behalf of Andra.

1.2. Objectives of the Call for Proposals

The objective of the Andra call for proposals is to give impetus to the R&D and foster the emergence of innovative initiatives in the area of the management of radioactive waste from decommissioning, from the characterizing of the site and facilities to be decommissioned to the sorting, processing, packaging and disposal of the resulting waste. This scientific and technical work also involves asking questions relative to the setting up of processing and recycling routes, in terms of governance, the process economics, testing the scientific and technical choices, and the resulting arbitrations which are often complex.

This call for proposals is addressed equally well to industrially-oriented R&D projects (Industrial Research or Experimental Development) that are compatible with the schedule of the first decommissioning operations, as to more fundamental projects (Fundamental Research), proposing highly innovative solutions that break away from the conventional paths of exploration. Its prime aim is to promote the transposing to radioactive waste management technologies and know-how that exist or are being developed in other areas of...
application. A wide range of technology readiness levels (TRL) is thus covered, typically from TRL 1 to 7 (see section 5). There will be two editions of the call for proposals, in 2014 and 2015 respectively, for a total maximum budget of 45 million euros drawn from funds managed by Andra within the framework of the «Programme d’Investissements d’Avenir». The projects shall be supported for a minimum of two years and up to a max. of 4 years. This call for proposals is open to all types of structure, from Research Organisations to Companies (large and small). Funding for Fundamental Research projects is however reserved for Research Organizations with a maximum of 5 million euros divided among all the projects supported. The large majority of the remaining funding (40 million euros maximum) will be devoted to collaborative Industrial Research and Experimental Development projects, in which the participation of the academic world and SMEs (small and medium-sized enterprises) and ETIs (intermediate-sized enterprises) is strongly encouraged. This call for project proposals is subject to "regulations concerning the conditions of allocation of Andra funding applicable to the Andra call for proposals" to which project principal investigators are asked to refer (see link on page 2). The regulations propose two funding instruments according to the project research category (Fundamental Research / Industrial Research and Experimental Development) with specific rules on the nature of the Partners, the level of funding granted and intellectual property management.

1.3. THEMES

This call for proposals is divided into four broad themes, including one cross-cutting theme specific to social and human sciences:

- Characterisation,
- Waste sorting and processing,
- New materials for disposal,
- Innovation and society.

These themes are intended to be consistent with the recommendations of the OECD 2014 report "R&D and innovation needs for decommissioning nuclear facilities", in the listing of the "Technologies clés 2015" in the report "Des technologies compétitives au service du démantèlement durable" (Competitive technologies serving sustainable decommissioning) published in 2012 by the Strategic Analysis Committee and in the "PNGMDR 2013-2015".

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4 The technologies associated with work in irradiating environments (robotics, cutting processes, remote operation) are already the subject of considerable R&D actions and are therefore not included in this call for proposals.

The proposed projects shall find an application in the management of radioactive waste from decommissioning and/or the recovery of legacy waste. Only theme 3 may be applied to all types of radioactive waste.

**THEME 1: CHARACTERISATION**

Characterisation is a first and crucial step in decommissioning operations. It provides the input data that are vital for defining decommissioning scenarios (protection of workers, technical choices concerning sorting, cutting, processing, packaging of radioactive waste), with direct consequences on radioactive waste management (recycling, disposal), volume reduction and associated disposal costs.

Characterisation applies to the radiological issues (inventory, location of radionuclides in the waste), chemical issues (concentration and speciation of radionuclides and toxic elements such as heavy metals) and physical issues (cracking/deformation of materials, possible degassing) alike. These data, which are essential for decommissioning operations, are also used in the possible future decontamination and recycling phases, and for studies of waste behaviour in disposal conditions.

Lastly, even if characterisation obviously concerns the facilities in themselves (engineering structures, equipment) and their near environment (air, soil, vegetation), it is also an essential step in legacy waste retrieval operations prior to waste disposal. This latter case often involves packaged waste whose precise composition is no longer known or whose available characterisation no longer corresponds to current specifications.

Owing to this, characterisation is dependent on the development and optimisation of sampling and measuring techniques that can be deployed readily, rapidly and reliably with an acceptable level of uncertainty. The projects targeted in this theme shall take these various requirements into account in their analysis and explain the potential improvements over current practices and ongoing research. They shall fall within one or more of the following R&D sub-themes:

- **Improving measurement sensitivity and accuracy**

  Certain radionuclides and chemical species are very difficult to detect or measure with precision. These difficulties can be associated with very low or attenuated concentrations or characteristic radiation emissions (e.g. alpha emitters), but also excessive ambient background noise. The aim of this sub-theme is therefore to improve chemical and radiological characterisation, whether from the aspects of detection limits, levels of uncertainty or determination of the speciation of species of interest (chemical form, location).
The proposed projects can for example include the development of reference materials (analytical standards), the introduction of tracers during the design of facilities or materials, the setting up of standardised analysis methodologies and their instrumental layout in the laboratory or in situ, the improvement of current analytical techniques (lowering of the detection limits and level of uncertainty), or even the development of new analytical procedures. The improvement of chemical and/or radiological characterisation in complex matrices (cementitious materials, soils, etc.…) is also targeted.

- **Innovative analytical techniques**
  Today many radiological and chemical characterisation techniques rely on destructive laboratory analyses, sometimes involving complex, long and costly analytical procedures. The aim of this sub-theme is therefore to develop and improve the analytical tools in terms of simplicity of use, automation, resistance to irradiation (hardening) and miniaturisation, in order - for example - to be able to envisage direct use in situ or on mobile characterisation units installed in the immediate vicinity of decommissioning sites. This sub-theme includes the development of rapid diagnosis technologies and sensors for screening purposes.

- **Sampling and representativeness**
  Characterisation requires taking samples directly from within the facilities to be decommissioned and the surrounding environment, as well as from the waste and waste packages resulting from the decommissioning. The aim in this context is to improve the sampling representativeness (required density of measurements, management of local heterogeneities, quantity to sample, etc.) and to optimise the techniques for determining sampling procedures and taking samples. Attention shall be focused, for example, on the development of micro-coring techniques, geostatistical tools and the possibility of combining boring and analytical tools.

- **Characterisation of engineering structures and equipment**
  Concretes and metallic materials are very widely used in the nuclear sector and consequently constitute a significant proportion of the volume of decommissioning waste. Their characterisation is a key step in the preparation of decommissioning scenarios:
    - From the mechanical aspect their “state of health” (cracking, deformation, corrosion) must be monitored and characterised;
    - From the radiological aspect, their contamination profile must be determined as accurately as possible (depth of contamination and associated radionuclides).

Attention shall be focused in particular on the development or optimisation of non-invasive in situ techniques for characterising the structural materials and equipment in real time.
THEME 2: WASTE SORTING AND PROCESSING

This second theme aims at promoting the development of innovative processes and techniques for sorting and processing radioactive waste in order to facilitate its disposal or possibly to envisage recycling solutions. On this account the developed processes must satisfy one or more of the following objectives:

- reduce the volume or activity of the waste in order to optimise the use of the disposal resources;
- transform/stabilise the waste in a physical-chemical form that is as inert as possible with respect to the disposal requirements (limit the production of gases, chemical reactivity, etc.);
- allow the disposal of waste that cannot be accepted as is.

The proposed projects must be conducted with a process approach. Eco-design tools (life-cycle analysis in particular) can be implemented for this purpose. The management of the generated waste (processing residues, liquid/gaseous effluents, waste resulting from the process) and its stabilisation in an appropriate form for disposal must more specifically be taken into account.

The scope of this theme covers the following different R&D sub-themes:

• **Waste sorting and recycling**
  
  Sorting is an intermediate step that consists in transforming a stream of mixed waste into several waste fractions in order to facilitate the processing, packaging or recycling/valorisation operations. To give an example, in conventional waste management, manual sorting operations are increasingly being replaced by automatic sorting systems. In the case of radioactive waste, such systems could limit personnel dosimetry, facilitate downstream processing(conditioning operations (compacting, incineration), or even pave the way for recycling solutions. On-line radiological monitoring could also be linked to the sorting system. This sub-theme also focuses on processes for recovering rare materials and certain radionuclides with a view to valorising them.

• **Processing waste that has no disposal route**
  
  Even if disposal routes exist for the majority of radioactive waste today, some types of waste, due to their radiological and/or physical-chemical characteristics, cannot be disposed of or accepted in existing processing/packaging facilities. This waste "with no disposal route" is
currently stored pending the finding of a management solution (certain oils and organic liquids in particular). Research will therefore focus on the development of processing solutions enabling the disposal of such waste to be envisaged. As this waste generally represents very small volumes (ranging from a few litres to a few tens of cubic metres), priority shall be given to processing solutions:
- that offer a degree of flexibility with regard to the waste composition range that can be accepted or the conditions of implementation in order to envisage the grouping of waste, for example;
- suited to the processing of small streams of waste at a reasonable cost.

• Waste activity reduction processes and techniques
The development and improvement of processes and techniques for reducing the activity of waste encompasses the decontamination processes, "preventive" systems and design factors that prevent or limit contamination or activation. These techniques must not only optimise the distribution of waste between disposal routes and pave the way for recycling solutions but also increase the service life of certain elements. The proposed improvements can concern, for example, the geometry of contaminated parts (complex surfaces, confined areas), processing rates, the volume and physical-chemical form of the generated waste, or the decontamination levels achieved.

• New waste conditioning processes and matrices
This sub-theme addresses the development of new matrices / processes for the conditioning and immobilising of radioactive waste in view of disposal. The objectives can vary according to the nature of the waste and its final outcome, from simple immobilising to long-term containment, a reduction in reactivity (production of gases for example) or of waste volume. Whatever the case, the matrices and processes developed must minimise expansion and have physical and chemical behaviour that is compatible with the conditions of waste disposal.

THEME 3: NEW MATERIALS FOR WASTE DISPOSAL
The radioactive waste disposal solutions currently implemented or under development are based on well-known materials (cementitious materials, steels) and robust processes. However, some radioactive waste will not be disposed of for several years, which leaves openings for prospective complementary developments, concerning both the materials used in disposal and package design.

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6 See PNGMDR 2013-2015: [http://www.developpement-durable.gouv.fr/Plan-de-gestion-pour-la-periode.html](http://www.developpement-durable.gouv.fr/Plan-de-gestion-pour-la-periode.html)
In this context, the aim of this theme is to develop the R&D, at different levels of technology readiness, on the materials used in disposal (packages, structures), their production and utilisation processes, their behaviour in the disposal facilities (durability, leak-tightness), as well as the technologies for inspecting the packages and structures and monitoring how they evolve through time.

The proposed projects must include tests on prototypes and endeavour, insofar as possible, to be adaptable to the different disposal concepts (depth of disposal, type of host rock). The projects can apply to any type of radioactive waste, without being limited to decommissioning waste.

The supported projects must therefore fit into one or more of the following sub-themes:

- **Durable materials for waste disposal**
  This study sub-theme aims at developing new materials (composites, nanomaterials/nanocomposites, biomimetic materials, etc.) that are particularly durable under the disposal conditions or improve the durability of the materials used in disposal (surface treatment for example). These materials can be envisaged for all or part of the packages and disposal facility structures. They can be designed specifically for this application (development on the basic constituents) or be inspired by existing applications. Whenever possible, the research will include the following different study levels:

  - production and forming processes (such as surface treatment, embedment/welding, etc.);
  - understanding and qualification of the performance of the material;
  - identification/development of appropriate non-destructive testing systems for mapping and characterising internal and external defects;
  - ageing and durability of these materials under the disposal environment conditions.

It is to be noted that Fundamental Research projects on new materials for the high activity (HA) waste overpacks are excluded from this call for proposals because they are covered by the NEEDS-Waste call for proposals.

- **Smart materials for monitoring the disposal site**
  The notion of "smart" material refers to particular properties of materials to react to their environment all by themselves, i.e. to adapt themselves in response to external stimuli as well as instrumentation on a micro-scale.

  Research shall focus on the development of new materials and sensors integrated in the structure of waste packages and/or cell structures enabling a “structural health monitoring” and a control of the content, as well as simplifying inspection operations. Particular consideration must be given to durability and autonomy issues for the monitoring
operations. Research into sensors transduction, signal transmission and data treatment is also targeted.

**THEME 4: INNOVATION AND SOCIETY**

Innovation in the processing and packaging of radioactive materials and waste introduces unprecedented problems in this area, relating in particular to the intertwining of the industrial, social, economic, political, safety and ethical aspects with respect to present and future generations. It fits into the framework of the initial construction of a new market within the nuclear power sector, whose economic organisation and political regulation have to be thought through and planned for, and which will require numerous arbitrations by the private actors and public authorities alike.

Multidisciplinary studies in Social and Human Sciences (economy, politics, law, geography, sociology, anthropology, history, social psychology, etc.), and more particularly stemming from the "Sciences, Technologies and Innovations in Society" (STIS) research field, can be proposed to address this general issue in accordance with the following sub-themes.

- **Socio-economic organisation and political regulation prior to disposal**

  The standardisation and oversight of exchanges, of the qualification and the modes of transport of radioactive materials and waste constitute essential issues for fostering technological innovation prior to disposal. The absence of harmonised international legislation on the status of waste, and more particularly the release threshold applicable to recycled products from the decommissioning of nuclear facilities, radically challenges, for example, the current division in France between what is in the public domain and what could be left to the global market that is currently being created. Nevertheless, changing the existing policy frameworks at political and regulatory level also implies reorganising the conceptual frameworks, the relations of trust and the positioning of the actors, as well as the subtending socio-technical imaginations.

  The proposed studies must explore these issues, particularly from the aspect of governance and socio-economic evaluation, and will pay particular attention to the stances and the queries of all the parties involved. They can be based on original methodologies, and make use of comparative analyses, particularly in relation with Germany or other countries, or with other industrial areas, and tackle the issue on different territorial scales. Research into the beliefs, social representations and confidence between the actors involved could be envisaged. Research into the socio-technical imaginations, which are included in the evaluation systems, could also be carried out in this context.
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- Evaluation and testing of scientific and technical choices (case studies)

The choices concerning the recycling of radioactive waste and the different modes of processing and disposal are subject to scrutiny, often public, which takes place each time in a specific manner. These choices necessitate assessments and complex arbitrations, often controversial, between dissemination and concentration of the radioactivity and on the environmental and socio-economic impacts, which are forcibly unequal and on different spatial and temporal scales. The in-depth case study can be proposed to help decide among the different possible choices. These studies shall preferably integrate a methodological reflection and a comparative part relative to other industrial domains. They can refer to the preceding sub-theme and use the same approaches. The reason for this is that the advantages and drawbacks of the processes that could facilitate the disposal or valorisation of waste are not equivalent from the techno-economic, dosimetric or societal viewpoints. Comparing them for a given specific issue is all the more complex given that the parties concerned and their areas of intervention are often different. To give some examples: incineration, by concentrating the radioactivity, can bring a change in the management solution for some waste; the melting of metals can bring the possibility of reuse in the nuclear sector (this is the only possibility in France, whereas most other countries have a release threshold), the reconditioning and on-site disposal of radioactive waste, and therefore the change of status of the corresponding facilities, can sometimes prove interesting from an industrial point of view, etc. But each new configuration implies recomposing heterogeneous factors which concern, for example, technical feasibility, regulations, industrial or political interest, transport, responsibility, discharges (radioactive or not), economic models, or social acceptability.

2. Submitting a project proposal

2.1. Who can submit a project proposal?

This call for proposals is open to Research Organizations and Companies alike. The funding conditions differ however, depending in particular on the technology readiness level of the proposed projects. The applicants should therefore consult the regulations concerning the conditions of allocation of Andra funding (see link on page Erreur ! Signet non défini.).
The project proposal is submitted by a project Coordinator. Each project Partner is represented by a Scientific Supervisor.
When a project is chosen for funding, Andra makes a contract with one (or more) organization(s) (legal entity) and not with the Scientific Supervisor (natural person). The Scientific Supervisors of each Partner must therefore ascertain, before submitting the proposal, that the organisation(s) (Research Organisation or Company) is (are) committed to validating the project proposal which, if approved, will be funded in the name of the beneficiary organisation.

2.2. CONTENT OF THE SUBMISSION FILE

The project proposal comprises:
  - a form to be filled out on line;
  - an administrative and financial document to be filled out on line, then be printed and signed by each Partner and uploaded to the submission website.
  - a scientific document to be uploaded to the submission website.

The project proposal shall be considered complete, and therefore eligible if these three elements have been filled out and made available on the submission website on the closing date indicated on page 1.

IMPORTANT

No additional elements will be accepted after closing of the call, the date and time of which are indicated on page 1 of this call for proposals.

The information can be modified up until closure of the call for proposals.

It is strongly recommended:

• to start on-line entry of the administrative and financial data at the latest one week before the closing date of the call for proposals;

7 See definitions in the regulations relative to the conditions of allocation of grants from Andra (see link on page 2).
• to register the information entered on the submission website before leaving each page;
• not to wait until the call for proposals closing deadline date to finalise the project
  submission procedure.

The project Coordinators will receive an e-mail acknowledging submission when the call for
proposals closes, on condition that a document has been uploaded to the submission site
AND the funding application has been completed (total not zero).

2.3. On-line form

The following non-exhaustive information is to be entered on line (the link to the submission
website is available on the call for proposals publication page of the ANR website at the
address specified on page 1):

- Project identity (acronym, title in French and in English, duration, etc.);
- Identification of the Partner(s) (full name, acronym, category and calculation basis for
  the funding base; type and number of unit, management and hosting authorities for a
  Research Organisation laboratory; the business registration number (SIRET in
  France); employee headcount for Companies, etc.);
- Identification and function of the project Coordinator;
- Identification of the Scientific Supervisors for each Partner;
- Financial data (distributed per item of expenditure and per Partner);
- Scientific abstracts (4000 characters maximum per field): Scientific summary (non-
  confidential) of the project in French and in English, overall objectives,
  scientific/technical barriers, work programme and scientific, technical and economic
  spin-offs. These summaries are intended more specifically to be transmitted to the
  experts called upon in the selection process. It is recommended to take particular care
  when writing your project proposal so that it can be evaluated with due diligence
  and to enhance the chances of approval by the experts examining it;
- Experts not desired for the proposal evaluation (optional information).

2.4. Administrative and financial document

The administrative and financial document is generated (printed) from the submission
website once the information has been entered on line.
Applicants are to note the fact that the submission site does not provide the possibility of
checking that the data entered satisfy the recommendations and project examination criteria

as specified herein. Furthermore, details of the budget information entered will be requested subsequently for the selected projects when setting up the Funding Agreement.
For the "Research Organisation" Partners, the administrative and financial document must be signed by the Scientific Supervisor, by the person authorised to represent the Research Organisation and by the head of the laboratory or hosting unit.
For the "Company" Partners, the document must be signed by the Scientific Supervisor and the legal representative.
The non-beneficiary Partners must also fill out the administrative and financial document.

Once signed by each Partner, the administrative document must be scanned (in PDF format) and uploaded to the ANR submission website by the Project Coordinator no later than the date indicated on page 2. The project proposal is considered complete, and therefore eligible, if this document is signed and available on the submission website.

2.5. SCIENTIFIC DOCUMENT

The scientific document comprising 50 pages maximum is uploaded to the submission website in PDF format (generated from a word-processing application, not scanned) without any protection. The number of pages is ALL-INCLUSIVE, NO appendix will be accepted. The submission website will refuse the uploading of a document that does not satisfy these requirements.
It is recommended to use a layout that makes for comfortable reading of the document (A4 format, Times New Roman font, size 11 or equivalent, single spaced, margins of 2 cm, page numbering, table of contents).
It is recommended to produce a scientific document written in English given that the evaluation may be carried out by non-French-speaking people. If it is written in French, an English translation may be requested.

\[8\] See definitions in the regulations relative to the conditions of allocation of grants from Andra (see link on page 2).
The scientific document of the project proposal shall include the following information and its structure shall follow the call for proposals evaluation criteria (no model document will be provided):

- Reminder of the project proposal acronym, the call for proposals and the year in the document header
- **FULL TITLE of the project proposal (in bold)**
- Reminder of the project technology readiness level: Fundamental Research / Industrial Research and Experimental Development AND TRL at start of project AND expected TRL at end of project, see section 5.
- Call for proposals theme under which the project is submitted
- Reminder of the total cost of the project, the amount of the funding requested and the percentage funding requested
- Reminder of the duration and the location(s) of the project
- Table of contents
- Summary of the project as entered on line on the submission website

1. **Relevance of the proposal with regard to the call for proposal themes (1 page):**
   The content of this section serves to assess the "Relevance of the proposal with respect to the call for proposals themes” evaluation criterion. Broadly introduce the problem addressed in the project and its positioning with respect to the context of the call for proposals and its themes. Situate the project with respect to the societal, economic, regulatory, environmental, industrial, etc. implications at national, European and international level, according to the project objectives.

2. **Context, positioning and objective of the project proposal (8 to 12 pages)**
   The content of this section serves to assess the “Scientific, technical and innovation quality” evaluation criterion. Present the project objectives and the scientific and technical barriers to be lifted during the project. Emphasise the ambitious and/or innovative nature of the proposal. Describe the end-product(s) developed if applicable, and present the expected results. Present the current state of knowledge on the subject. If necessary reiterate the context and indicate the position of the project with respect to the context: with respect to concurrent, complementary or previous projects and research work, patents and standards, etc. Position the project at national level (indicate whether there is a link with a regional/national structure or platform, with a project supported under the «Programme d’Investissements d’Avenir», etc.), and at European and international levels. Indicate any contributions from the project proposal Partners to the state of the art.
Indicate any preliminary results. Where project proposals follow on from previous project(s), give a detailed report of the results obtained and clearly describe the new problems posed and the new objectives.

3. Scientific and technical programme, project organisation (10 to 15 pages)
The content of this section serves to assess the "methodology and quality of project construction and coordination" and "matching resources to project" (in addition to the administrative and financial document).
Describe the scientific programme. Present and justify the work programme breakdown into tasks (as a tree structure for example), consistently with the intended objectives. The schedule of the different tasks and their dependencies can be presented, if considered necessary, as a graph (Gantt chart for example).
For each task, describe the objectives and any success indicators, the person responsible and the Partners involved, the detailed work programme, the deliverables, the contributions of the Partners ("who does what"), a description of the methods and technical choices and the way of bringing the solutions, the risks and the envisaged fallback solutions. Indicate the research category in which each task belongs (in relation with the funding ceilings defined in section 4.6 of the regulations concerning the conditions of allocation of Andra funding, see link on page 2).
Provide a scientific and technical justification, Partner by Partner, for the resources requested, as filled out on the submission website, by major item of expenditure (excluding management or structure expenses): equipment, personnel, operating expenses. Specify any complementary funding obtained and/or expected.

4. Presentation of the partnership (2 to 6 pages)
The content of this section serves to assess the "quality of the Consortium" evaluation criterion.
Give a brief description of the persons the most involved in the project and of each Partner. A table summarising the resources involved in the project, based on the model shown below, will be inserted here.

Table summarising the resources involved in the project:

<table>
<thead>
<tr>
<th>Partner</th>
<th>Surname*</th>
<th>First name*</th>
<th>Current job</th>
<th>Involvement over total duration of project in person-months*</th>
<th>Role &amp; Responsibilities in project (4 lines maximum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example University X/ Company Y</td>
<td>CALCULUS</td>
<td>Cuthbert</td>
<td>Professor</td>
<td>12.6</td>
<td>Scientific coordinator&lt;br&gt;Characterisation of recombinant transcription factors in an in-vitro system...</td>
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<tr>
<td></td>
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<td></td>
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<td>Scientific supervisor (partner No.x)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Other member (partner x)</td>
</tr>
</tbody>
</table>

* The surname and first name are optional for persons other than the Scientific Supervisor and Project Coordinator.
Provide information for assessing their qualification for the project (“why who does what”). This can consist of past achievements, indicators (publications, patents, products, scientific prizes), etc.

Show the complementarity and added value of the cooperation between the different Partners. The interdisciplinarity and the openness to diverse collaborations shall be justified in accordance with the project orientations. Conversely, the absence of a collaborative nature to the project shall be clearly justified (only applicable for Fundamental Research projects).

The provisions concerning intellectual property and the rights of use of the results shall be specified in this section, in accordance with the “regulations concerning the conditions of allocation of Andra funding” (see link on page 2); they shall be taken up in the Agreement signed between Andra and the Partners.

5. Strategy for valorisation, protection and utilisation of the results, overall impact of the proposal (1 to 8 pages)

The content of this section serves to assess the “overall impact of the project” evaluation criterion.

The different levels of impact of the project as described in the “overall impact of the project” evaluation criterion shall be described in this section. Aspects that could be addressed include scientific communication, valorisation of the expected results while reiterating the broad lines of the modes of protection and utilisation of the results, the scientific, technical, industrial, economic spin-offs, etc. Specify the location of the different works and of the developed facilities/equipment. The impact of the project on the management of radioactive waste must be clearly described (reduction in waste volume, analysis - possibly quantitative - of the expected reduction in decommissioning costs compared with the existing situation, etc.)

For the Industrial Research and Experimental Development projects, indicate the position of the project in the industrial strategy of the project partner Companies, the incentive effect of the grant, an analysis of the competition and review of the freedom of utilisation (state of the art of the patents nearest to the envisaged project). Detail the time frames and nature of the expected techno-economic spin-offs, the possible impact on employment, the creation of new activities, the targeted markets and the commonly practised margins. The other spin-offs (standardisation, information for public authorities, etc.) shall also be indicated.

6. Complementary documents

CV of Project Coordinator, documents certifying the existence and/or financial
7. References

The project proposal is **eligible** if the scientific document complies with the format specified above: compliance with the registration format, total number of pages and the indicated plan (including table of contents and table summarising the persons involved in the project).

### 2.6. Recommendations

The following recommendations are provided to help prepare the project proposals in the context of this call for proposals.

**Recommendations concerning personnel involvement**

The relevance of any deviation from these recommendations will be appraised from the viewpoint of the "methodology and quality of project construction and coordination" and "matching resources to project" evaluation criteria.

- The **Project Coordinator** should devote at least 30% of his/her research time\(^9\) to the project (possibility of the time being unevenly distributed over the project duration).
- The project proposals shall ensure a balance between permanent personnel and temporary personnel. On this account, the total (in person-months) of the non-permanent personnel receiving Andra funding should not exceed 50% of the total of the personnel (permanent and non-permanent) assigned to the project.
- The funding duration for each post-doctoral participant should not be less than 12 months.

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\(^9\) **Calculation of research time**: the evaluation of the time devoted to the project is based on the time devoted to research (considered at 100%). Thus a lecturer-researcher (or a Company employee who is responsible for activities other than research who devotes all of his/her research time to a project for one year shall be considered as participating to the extent of 12 person months. However, for the calculation of the project Overall Cost, the person's salary shall be counted on the actual full-time basis (for example 50% of the salary of a lecturer-researcher).
RECOMMENDATION CONCERNING THE NUMBER OF PARTNERS

In order to correspond to the criteria concerning the quality of the consortium and project organisation, it is recommended not to exceed five partners at the most.

RECOMMENDATION CONCERNING PROJECTS INVOLVING NON-BENEFICIARY PARTNERS

The scientific document submitted to Andra includes the contribution of all the Partners, Beneficiaries or not. The non-Beneficiary Partners are asked to stipulate in the scientific document:
- whether the activities are carried out using their own funds,
- whether they already have ongoing funding for their contribution to the project (amount, requested funding schedule, nature of funding entity), or
- whether they have requested funding for project participation while sending the same project proposal to another funding body. If this is the case, provide the full contact details of the funding body and the name, function, e-mail address and telephone number of the Head of the Programme.

The non-beneficiary Partners shall enter their identification information on the submission website, particularly in the administrative and financial document.

3. EXAMINING PROJECT PROPOSALS

3.1. PROJECT EXAMINATION PROCESS

ANR organizes the project examination process on behalf of Andra by involving various actors with the following respective roles:
- The evaluation panel is tasked with evaluating the project proposals taking into account the external expert appraisals and classifying project proposals with respect to one another. The panel comprises French or foreign members of the research communities concerned, from the public or private sector;
- The peer reviewers (external experts) designated by the evaluation panel give a written opinion on the project proposals. At least two experts are designated for each project;
- The role of the steering committee is to propose to the Prime Minister a list of projects to be funded, in compliance with work of the evaluation panel. It is made up of

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10 See definitions in the "regulations concerning the conditions of allocation of Andra funding (see link on page 2).
members of the steering committee of Investments for the Future in charge of the State/Andra agreement of 3rd August 2010.

The persons involved in project proposal evaluation undertake to comply with the provisions of the ANR’s code of ethics, and in particular those relating to confidentiality and conflicts of interest. The ANR code of ethics and the conditions of functioning and the organization of the evaluation panel and steering committee are described in documents available on the ANR website11.

Once the list of selected projects has been published, the composition of the evaluation panel and selection committee will be posted on the ANR website12.

The selection procedure comprises the following main steps:

• Examination of the eligibility of the project proposals by ANR in accordance with the criteria stipulated in section 3.2
• Consultation by ANR of the peer reviewers (external experts) proposed by the evaluation panel.
• Development of opinions by the peer reviewers (external experts) in accordance with the criteria stipulated in section 3.3
• Assessment of the project proposals by the evaluation panel after receiving the opinions of the experts.
• Examination of the project proposals by the steering committee, and proposal of a list of projects to fund.
• Establishing of the list of projects selected by the Prime Minister13 and publication of the list on the ANR website on the page dedicated to the call for proposals.
• Sending the project Coordinators a summary notice proposed by the panels/committees.
• Revision and finalisation of the scientific, financial and administrative files for the selected projects (exchanges between ANR, Andra and Project Coordinator). For the Companies, as indicated in section 4
  - verification of their capacity to be funded in the framework of State aids to research, development and innovation (RDI),
  - verification of their capacity to assume the financial aspects of their project commitments,
  - establishing the incentive effect of the grant.

12 See website address indicated on page 1
13 This validation can take place in several stages.
• Signing of the Funding Agreements between the Partners and Andra,
• Publication of the list of projects selected for funding on the ANR website on the page dedicated to the call for proposals.
• First payments to the beneficiaries in accordance with the rules set in the "regulations concerning the conditions of allocation of Andra funding" (see link on page 2).

3.2. Verification of eligibility

IMPORTANT

ANR verifies eligibility on the basis of the information available on the call for proposals closing date. Ineligibility shall be established, including if this information is lacking, incorrectly completed or if there is disagreement between the information entered on line and that developed in the scientific document.

The project proposals considered ineligible will not be evaluated and will not be able to receive Andra funding.

The project proposal is eligible if it satisfies all the conditions below:
- it is complete and complies with the format specified in section 2;
- it enters into the scope of the call for proposals described in section 1;
- its duration is between 2 and 4 years;
- it must not be judged similar\(^\text{14}\) to a project that is already funded or is currently being evaluated under a call for proposals in the ANR programme planning;
- it must be of singular nature\(^\text{15}\);
- for the Industrial Research / Experimental Development projects, it involves at least 2 Partners, of which at least one is a Company.
- The Project Coordinator has submitted a single proposal under this call for proposals;
- The Project Coordinator is not a member of the evaluation panel or of the steering committee for this call for proposals. More specifically, the Andra teams cannot be Partners in a project.

\(^{14}\) Similarity is established when two project proposals (taken as a whole or in part) describe identical main objectives or result from a simple adaptation, AND involve teams that are largely identical

\(^{15}\) The non-singular nature is established when the project proposal draws from or copies, in whole or in part, earlier written work, the sources of which are not cited.
3.3. Evaluation of Project Proposals

**Important**

Only project proposals that satisfy the eligibility criteria will be evaluated by the peer reviewers (external experts) and the members of the evaluation panel. The labelling of projects by a competitiveness cluster is encouraged and can be specified in the scientific document, but will not be included in the project evaluation criteria.

The peer reviewers (external experts) and members of the evaluation panels are required to examine the project proposals using the following evaluation criteria:

1) Relevance of the proposal with respect to the call for proposals orientations
   - appropriateness for the objectives of the call for proposals (see section 1.2)
   - appropriateness for one or more of the call for proposal sub-themes (1.3).

2) Scientific and technical quality and innovation
   - scientific excellence in terms of progress of knowledge with respect to the state of the art, conceptual break,
   - innovating in terms of technological innovation or prospects of innovation with respect to the international state of the art. This can involve disruptive or incremental innovations,
   - lifting of technological barriers,
   - original way of integrating the different disciplinary fields around a given object.

3) Methodology, quality of project construction and coordination
   - scientific and technical feasibility of the project, choice of methods,
   - structuring of the project, rigour in presenting the final results (deliverables), identification of milestones,
   - quality of the coordination plan (project management from the functional, technical, organizational, temporal and financial aspects), involvement of the Coordinator.

4) Matching resources to project
   - schedule feasibility,
   - appropriateness of the project management means implemented,
   - appropriateness and justification of the requested funding,
ANDRA CALL FOR PROPOSALS
2014 EDITION

- appropriateness of the coordination costs,
- justification of the personnel resources mobilised,
- evaluation of the sum for investments and equipment purchases,
- evaluation of the other financial items (missions, subcontracting, consumables, etc.).

5) Quality of the Consortium
- level of scientific excellence or expertise of the teams,
- appropriateness of the partnership for the scientific and technical objectives,
- functioning and complementarity of the partnership,
- openness to new players,
- collaborative nature of the project and level of involvement of the various Partners,
- For Industrial Research or Experimental Development projects, projects involving SMEs/mid-cap companies will be favoured and analysed in terms of the significance of the work and the economic spin-offs for these companies. The involvement of Research Organisations shall also be encouraged, though to a lesser extent.
- Technology readiness of the provisions concerning intellectual property and the rights of use of the results.

6) Overall impact of the project
- Strategy for valorising the project results,
- Scientific and technological impact: potential for utilization or integration of the project results by the scientific or industrial community or society, and impact of the project in terms of knowledge acquisition, increase in the TRL over the duration of the project
- Commercial and financial impact: industrial or technological application prospects and economic and commercial potential, business plan, integration in the industrial activity, credibility of the announced valorisation,
- Economic and social impact: economic spin-offs, interest for society, creation/maintaining of activities and jobs, security, etc.,
- Impact on radioactive waste management: reduction of waste volume, facilitation of acceptance at disposal site, reduction in decommissioning costs, time-frames, improvement in safety, etc.,
- Environmental impact, integration of project in waste management process (management of induced waste in particular, if applicable).
The project proposals are evaluated by at least two experts (external to the various panels) who are each asked to examine one or more proposals. The experts work individually and confidentially, without interacting with third parties. The only elements at their disposal are the constituents of the project proposal as submitted by the Project Coordinator at the call closing date.

The experts fill out an individual evaluation report in which each evaluation criterion is rated on a scale of 0 to 5 with written argued comments for each one.

<table>
<thead>
<tr>
<th>Rating</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Criterion not addressed or unable to be appraised with the information provided</td>
</tr>
<tr>
<td>1</td>
<td>Insufficient: criterion addressed superficially and unsatisfactorily.</td>
</tr>
<tr>
<td>2</td>
<td>Mediocre: criterion addressed relatively satisfactorily but there are serious shortcomings.</td>
</tr>
<tr>
<td>3</td>
<td>Good: criterion addressed correctly but improvements are necessary.</td>
</tr>
<tr>
<td>4</td>
<td>Very good: criterion very well addressed, and any shortcomings are minor.</td>
</tr>
<tr>
<td>5</td>
<td>Excellent: criterion perfectly addressed with no shortcomings</td>
</tr>
</tbody>
</table>

The project proposals are moreover evaluated by at least two members of the evaluation panel who have at their disposal the individual evaluation reports drawn up by the experts. They draw up their own individual evaluation report (applying the same criteria and the same rating system as the experts).

During the final meeting of the evaluation panel, the members briefly present the objectives of each proposal, making a synthesis of the experts' evaluation and their own opinion, highlighting the strong and weak points. The collegial discussion proposal by proposal allows a competitive evaluation of the proposals: it gives all the members the opportunity to compare the quality of the proposals they evaluated with respect to all the proposals evaluated by the panel. The panel's discussions result in a consensus expressed by a classification of the proposals with respect to one another in three categories: (A) excellent proposals that fully deserve to be selected, (B) proposals that raise minor remarks which could be selected depending on the available funding and (C) proposals that have not attained the level required for selection on the basis of the evaluation criteria. A final evaluation report synthesizes the consensus reached by the panel members.
3.4. Selection criteria

The steering committee proposes the final ranking of the project proposals in compliance with the work of the evaluation panel.

The following main arguments are used by the steering committee to determine its ranking:

- The scientific/technical value of the project and its innovative nature (disruptive or incremental innovation),
- The incentive effect of the grant (conducting of work that could not have been carried out without the requested funding, heightened ambition or speeding up of the work, increase in the volume of R&D work of the Partner, etc.)\textsuperscript{16},
- The strategic or priority nature of the project with regard to issues relating to radioactive waste management,
- The economic spin-offs of the project (creation/maintaining of employment, commercial objectives if applicable, etc.),
- The impetus resulting from the public intervention or of structuring of the industrial process (for example through the association of public and private Partners or SMEs/ETIs/Large Companies, through the involvement of new actors from outside the nuclear sector, the ratio of private funding to public funding, etc.).

3.5. Funding decision

The final decision to grant the funding is taken by the Prime Minister on the basis of the steering committee's proposal.

\textsuperscript{16} For Companies other than PMEs selected for Andra funding, a specific form shall be filled out.
4. CONDITIONS OF FUNDING THE SELECTED PROJECTS

The funding conditions are specified in the “regulations concerning the conditions of allocation of Andra funding applicable under the Andra call for proposals”17. The project Partners are advised to read this document carefully in order to set up their project - particularly from the budgetary aspect - in accordance with the provisions described therein.

BENEFICIARIES OF GRANTS FROM ANDRA

Only Research Organisations are eligible for funding for Fundamental Research projects. Companies can nevertheless participate as non-Beneficiary Partners. The collaborative nature is encouraged but is not compulsory.

It is mandatory for the Industrial Research and Experimental Development projects to be collaborative, that is to say to involve at least two Partners, including at least one Company.

FUNDING CEILINGS

The Andra funding cannot exceed €450,000 for Fundamental Research projects and €4,000,000 for Industrial Research or Experimental Development projects.

CONDITIONS OF FUNDING OF COMPANIES

IMPORATANT

The European Community supervision of State aids to Companies places a number of conditions on the allocation of Andra grants to companies. If these conditions are not fulfilled by a Company participating in a selected project, Andra will not allocate funding to that Company. Whatever the case, the non-funding of a company could call into question Andra’s funding of the entire project if it considers that the ability of the consortium to achieve the project objectives is compromised.

Companies in financial difficulty are not eligible for State aids for research, development and innovation (RDI). Andra will therefore ascertain for all the selected projects that any Partner

17 See link on page 2
Companies in the project are not considered to be companies in difficulty as defined in the community guidelines on State aid for rescuing and restructuring Companies in difficulty.

Companies that are subject to an outstanding recovery order in application of a European Commission decision declaring a grant illegal and incompatible with the domestic market are not eligible for State aids for research, development and innovation (RDI).

The maximum level of funding applicable to "Company" partners is specified in article 4.5 of the "regulations concerning the conditions of allocation of Andra funding". Andra will ascertain for all the selected projects that any Partner Companies in the research project are capable of financing the share of the work to perform that is not covered by Andra funding.

The incentive effect of allocating Andra funding to a Company other than an SME must be established. Consequently, non-SMEs selected for funding under this call will be asked to provide the elements necessary to evaluate this aspect during the finalizing of the administrative and financial files.

**CONSORTIUM AGREEMENT AND FUNDING AGREEMENT**

Andra will sign a Funding Agreement with all the Partners of each project, whether Beneficiaries or not. This Funding Agreement will indicate the conditions of cooperation between the various Partners (intellectual property and utilisation rights in particular) which must moreover by indicated in the scientific document submitted (in point 4 "Presentation of the partnership"). Consequently, no consortium agreement is mandatory.

**PROJECT MONITORING**

Andra will ensure the scientific, technical, administrative and financial monitoring of each funded project, assisted by ANR, during project execution and until one year after their completion. Regular monitoring meetings will be organised during which the Partners will present project technical and financial progress reports. Intermediate reports presenting project progress from the scientific, technical, human and financial aspects are to be planned for in the project deliverables. The Project Coordinator will be asked to submit a detailed quarterly budget review.

At the end of the project, the Partners shall provide a summary report assessing its results and indicating the prospects and any extensions.
The participation of the Partners in symposiums organised by ANR and Andra may moreover be requested.

Information on the impact of the project may be collected for up to 60 months after the end of the project.

The project proposals must include the corresponding work load in their work programme.
## 5. Scale of Technology Readiness Levels (TRL)

<table>
<thead>
<tr>
<th>TRL</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The basic principles have been observed and described</td>
<td>This is the lowest level of technology readiness. The military applications of the scientific research are starting to be evaluated, for example through publications analysing the fundamental characteristics of the technology.</td>
</tr>
<tr>
<td>2. Concepts of use and/or application proposals have been formulated</td>
<td>Start of the invention phase. It becomes possible to envisage practical applications from observation of the basic principles. These applications remain potential. There is no proof or detailed analysis to confirm them. Things are still at the on-paper studies stage.</td>
</tr>
<tr>
<td>3. First stage of analytical or experimental demonstration of the critical functions and/or certain characteristics.</td>
<td>Launching of analytical and laboratory studies concerning the validation of certain elementary bricks of the technology in order to physically validate the forward-looking studies.</td>
</tr>
<tr>
<td>4. Validation of the elementary bricks and/or basic subsystems in the laboratory environment</td>
<td>The basic constituents of the technology have been integrated, but in a relatively &quot;poorly representative&quot; form of a possible system, for example as a laboratory &quot;mock-up&quot;.</td>
</tr>
<tr>
<td>5. Validation of the elementary bricks and/or subsystems in a representative environment</td>
<td>The representativeness of the subsystems has increased significantly. The elementary bricks are integrated in a complete assembly allowing the technology to be tested in a realistic simulated environment, for example in the form of a &quot;highly representative&quot; laboratory integration.</td>
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<tr>
<td>6. Demonstration of models or prototypes of a system or subsystem in a representative environment.</td>
<td>A representative model or a prototype of the system, much more complete than that tested in step 5, is tested in a representative environment, which constitutes a key step in the demonstration of technology readiness, like for example the testing of a prototype in a laboratory providing a very accurate reconstitution of the environmental conditions or conditions of operational use.</td>
</tr>
<tr>
<td>7. Demonstration of a prototype system in an operational environment.</td>
<td>Demonstration of a prototype system in conformity with, or very close to, the operational system. Represents marked progress with respect to step 6, with the demonstration of an actual prototype in an operational environment, such as an aerial vehicle or platform, for example a flying test bench. It is at this stage that information shall be gathered to determine the supportability of this technology.</td>
</tr>
<tr>
<td>8. The actual completed system is qualified through tests and demonstrations.</td>
<td>The functioning of the technology has been proven in its final form and in the expected conditions of use. In the majority of cases this stage is the end of the demonstration, with for example the testing and evaluation of the system within the planned weapon system in order to determine whether it satisfies the required specifications, including for in-service support.</td>
</tr>
<tr>
<td>TRL</td>
<td>Description</td>
</tr>
<tr>
<td>-----</td>
<td>-------------</td>
</tr>
<tr>
<td>9.</td>
<td>The system is qualified following its use in successful operational missions.</td>
</tr>
<tr>
<td></td>
<td>Stage of application of the technology in its final form and in representative mission conditions, such as those that may be encountered in operational tests and evaluations, and in reliability tests, which includes for example use in operational mission conditions.</td>
</tr>
</tbody>
</table>