

SUSTAINABLE ELECTRICITY PRODUCTION AND MANAGEMENT

PROGELEC

2011 Edition

Call for proposals closing date
7th april 2011 at 13h00 Paris local time

Call for proposals publication address
<http://www.agence-nationale-recherche.fr/PROGELEC-2011>

KEYWORDS

Electrical energy, sustainable development, materials for energy, stationary applications, on-board applications, photovoltaic, hydrogen, hydrogen production, hydrogen storage, PEMFC fuel cells, batteries, supercapacitors, components management, components integration, intermittent energy management, smart-grids.

IMPORTANT DATES

CLOSING OF THE CALL FOR PROPOSALS

The project proposals must be submitted on the ANR submission web site - see address in link on page 1 - before the call for proposals closing deadline:

ON 7TH APRIL AT 13H00 (1 P.M.) (PARIS TIME)

(see § 5 "Submission conditions")

SIGNED AND SCANNED DOCUMENT

Each partner must confirm participation in the proposal by signing its administrative and financial document (the "submission document"). This document is generated from the ANR submission site after closure of the call for proposals. Once scanned in PDF format, the coordinator must upload it to the submission web site no later than:

27th april at 13h00 (1 p.m.) (Paris time)

(see § 5 "Submission conditions")

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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 ANR funding (<http://www.agence-nationale-recherche.fr/documents/uploaded/2007/reglement-modalites-attribution-aide.pdf>) before submitting a research project proposal.

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1. CONTEXT AND OBJECTIVES FOR THE CALL FOR PROPOSALS

1.1. CONTEXT

The European Commission's climate and energy plan provides for an overall objective of 20% renewable energies in final energy consumption by 2020, for the twenty seven Member States, between now and 2020, including all uses, electricity, heat and fuel oils. In this context, France's objective is to reach 23% renewable energies in final consumption by 2020. European and French roadmaps, which include figured objectives for mature and almost mature electricity production chains, have been specified¹ for supporting the development of renewable energies. In order to reach this target, it is essential to develop technologies that are feasible from the technical, economic, social and environmental points of view.

With the introduction of renewable energies, which are often decentralised and intermittent in nature, the management of electricity therefore becomes a major challenge for the 21st century with regards to:

- significantly reducing fossil fuel consumption and CO₂ emissions, through increasing electrification of means of transport, and more particularly of cars;
- improving energy efficiency in industrial systems, the service sector and housing;
- ensuring better quality in terms of electrical energy supplied and contributing to the security of the networks;
- integrating renewable energies into the energy mix.

This programme is open to European projects coming under the ERANET "Electromobility +" initiative.

1.2. PROGRAMME OBJECTIVES

In this context, the objective of the PROGELEC programme is to accelerate French research into the use of renewable energies on a massive scale and for the integration of innovative systems, allowing optimised electricity management. Its aim is to reinforce partnerships between the industrial and scientific communities, and to improve the competitiveness of French technologies by promoting technological breakthroughs. This programme is also intended to support more fundamental research, allowing new industrial orientations to be prepared in the middle and long-term.

Results are principally expected for innovative and economically competitive solutions making it possible to:

- develop innovative systems for electricity production on the basis of renewable energies, in particular photovoltaic solar energy;

¹ *Feuille de route ADEME: Réseaux et systèmes électriques intelligents intégrant les énergies renouvelables* ["ADEME roadmap: Intelligent networks and power systems that include renewable energies"]

SET Plan – Investing in the development of Low Carbon Technologies (EU-COM 519, 2009)

- manage intermittent production through the development of buffer storage systems;
- develop high-performance on-board and stationary storage and/or production systems;
- organise domestic and mobile uses of electricity;
- design reliable and “intelligent” energy management devices from multiple sources.

1.3. CALL OBJECTIVES

The PROGELEC programme fits into the framework of the new energy-planning programme of the ANR [Agence Nationale pour la Recherche, French National Agency for Research] (2011-13). Its structuring is largely based upon the foundations of the three former programmes “Habitat Intelligent et Solaire Photovoltaïque [Intelligent Housing and Photovoltaic Solar Energy] (HABISOL)”, “Stockage Innovant de l’Energie [Innovative Energy Storage] (Stock-E)” and “Hydrogène et Piles à Combustible [Hydrogen and Fuel Cells] (H-PAC)”.

The 2011 call for proposals is structured around photovoltaic electricity production, thermoelectricity, hydrogen production and its use in fuel cells, electricity storage, management and hybridisation of components and centralised and decentralised electricity management. It is constructed to complement the “Energy Efficient and Decarbonised Systems” (Systèmes Énergétiques Efficaces et Décarbonés / SEED), Sustainable Buildings and Cities, Bio-Materials and Bio-Energies (Bio-Matériaux & Bio-Energies, BIOM&E), Sustainable Land Transport (SLT) and Innovative Societies programmes, whilst also taking the DGA’s Scientific Policy and Objectives (POS) document² into account. PROGELEC is also positioned in order to complement the more generic MatetPro (“Functional materials and innovative processes”) and P2N (Nanotechnologies and Nanosystems) programmes, whose objective is to improve performances and synthesise specific materials entering into the composition of electricity production/conversion and storage systems. Research into processes making it possible to recycle the constituents of the various systems is to be channelled towards the ECOTECH (Sustainable Production and Environmental Technologies) programme.

For its 2011 edition, the *Agence Nationale de la Recherche* (National Agency for Research) is issuing the call for proposals in partnership with the *Direction Générale de l’Armement* (“Directorate-General for Ordnance” / DGA).

² DGA (2010) – Politique et objectifs scientifiques. Orientations 2011-2012

2. THEMATIC LINES

The PROGELEC programme is intended to deal with the scientific and technological deadlocks connected with renewable electricity production and management, for the most effective adjustment of supply to demand.

In working out their proposals, project bearers should take the criteria of industrialisation and carbon footprint, cost, security, longevity, acceptance by the public, availability of raw materials and end-of-life components recycling into account. They are also invited to consider innovative solutions of systems design and assembly, making it possible to increase energy efficiency while improving integration (volume/weight/flexibility gains) and respecting the cost aspect of manufacture/security. They can also take account of assembly eco-design (use of reversible glues etc.), use of manufacturing techniques generating less waste and reducing costs, use of recyclable materials and processes with less harmful environmental impact and new designs making it possible to facilitate systems recycling.

2.1. THEMATIC LINE 1: PHOTOVOLTAIC ELECTRICITY PRODUCTION

In a context of very strong rivalry between Europe and Asia, it is necessary to break scientific and technical-economic deadlocks with regard to materials and processes. The fundamental competitiveness criterion is the cost of photovoltaic electricity and its positioning in relation to that of traditional electricity. Traditional electricity varies from a base cost of €0.04/kWh to a sales price in France of €0.12/kWh. This latter value can be as much as €0.25/kWh in other countries. The objective is to reach a system cost of less than €0.20/kWh by 2015, for average sunshine in France.

Apart from the objective with regard to cost, the aspects of aesthetics and of integration into the environment should be taken into account.

SUBTOPIC 1.1: CRYSTALLINE SILICON SECTOR

The crystalline silicon production chain is set to remain a major photovoltaic sector and should increase its competitiveness compared with the thin-film sectors, by exploring new directions capable of creating breakthroughs with regard to cost. The question of positioning in relation to the competition is also a point to be considered.

The challenges for crystalline silicon technology are principally connected with the processes of manufacture and putting into form. To meet these challenges, research is necessary into:

- processes using upgraded metallurgical-grade silicon, of types p and n; this requires the development of industrial techniques for managing impurities, in order to maintain high productivity;
- processes for manufacturing crystalline silicon photovoltaic cells and modules, making it possible to significantly increase energy conversion efficiency (greater than 20%), and which are transferable to the industrial sector at a competitive cost. In particular, this means facilitating the transition to cells with reduced thin silicon wafers (reduction in thickness from 180µm to around 100µm);

- associated facilities for increasing materials outputs. Indeed, it is essential that the development of photovoltaic cells and modules should be accompanied with innovative equipment (ovens, crucible, saws, etc.);
- research into very high yields (>30%) by developing multi-junction type architectures with the III-V compounds for example;
- exploration of methods making it possible to dispense with the cutting stages, through casting or ribbon drawing processes.

SUBTOPIC 1.2: THIN-FILM SECTOR

Today the thin-film production chain is undergoing unprecedented expansion, in a context of continuous increase in annual production of photovoltaic modules. Today, this expansion is essentially attributable to the CdTe sector, which shows the lowest production costs in the whole market. The thin-film silicon sector is also undergoing numerous developments, with the use of micromorph-type tandem cells in particular. The third sector, known as CIS, is based on copper indium diselenide and its derivatives, containing gallium and/or sulphur. It possesses the same characteristics as the CdTe sector, but with the possibility of obtaining higher yields. It is also possible to replace indium with other common elements such as the $\text{Cu}_2\text{SnZnS}_2$ compound, known as CZTS, which can represent a particularly advantageous alternative to CIS.

This subtopic is therefore intended to accelerate and anticipate the development of thin-film based photovoltaic sectors, by taking a leading place in international competition. The scientific issues in this field are:

- developing high quality materials and interfaces, in order to increase the record yields;
- developing very high-output and low-cost processes on large surface areas, with yields of 12-15% per module;
- ensuring operational stability for 20 to 30 years with decrease in yield of less than 10%.

The use of light, flexible substrates is a means to be explored, in parallel with glass substrates.

SUBTOPIC 1.3: INNOVATIVE DESIGNS AND PROCESSES

This subject concerns more particularly upstream research, which combines fundamental research work, modelling and experimental validation. Certain areas are to be given priority:

- characterisation and understanding of the mechanisms for developing the materials (crystallisation, growth) and their interfaces;

- development of innovative structures, improving the devices' optoelectronic characteristics;
- use of nanostructures in order to improve the performances of devices (nano objects of nanocrystal type or silicon nanowires, carbon nanotubes or doped graphenes, etc.);
- optical research for improving the performance of the cells and modules and research into new processes designed for the obtainment of complex multi-layer architectures;
- innovative processes - if necessary generic and using several technologies - for the completion of one of the cell stages: deposit of transparent conductive materials, texturing, metallisation etc.;
- new designs making it possible to increase yields beyond the limit of 30% associated with single junctions, by using multi-junctions, photon conversion, hot carrier systems etc.

In order to make progress in the development of the organic materials sector (if necessary combined with inorganic materials), research efforts should be focused in priority on the stability of organic photovoltaic cells, on encapsulation and the replacement of indium and tin oxide electrodes. The reliability and effectiveness of the connector technology constitutes an important issue (lifespan, corrosion resistance etc.).

2.2. THEMATIC LINE 2: PRODUCTION USING THE THERMOELECTRIC EFFECT

Today thermoelectric materials represent one of the alternative solutions for producing electricity while limiting environmental impact, in particular from heat-loss sources. The Seebeck effect offers the possibility of converting heat into electrical energy that can be used for powering an external charge. Thermoelectric systems are attractive because of their simplicity, their reliability and the absence of mobile parts and pollution from greenhouse gas emissions. These advantages offset the manufacturing costs, which are still relatively high – due to the absence of mass production – and the low energy efficiency (typically less than 5%) of these materials. In recent years, nanostructuring of the materials has made possible a marked increase in their thermoelectric figure of merit (ZT), from 1 to more than 1.5, and therefore their effectiveness.

The fields of research to be developed concern:

- nanostructuring of p and n materials (or new materials or nanocomposites) with the aim of markedly increasing their thermoelectric figure of merit, in particular around room temperature;
- techniques for putting these materials into form, promoting high density and optimisation of their thermo-mechanical behaviour;
- reduction of the devices' electrical resistance and thermal conductance;
- application of new device architectures, optimising thermal and electrical coupling, contributing to gains in terms of thermodynamic efficiency.

2.3. THEMATIC LINE 3: HYDROGEN ENERGY CARRIER : PRODUCTION, STORAGE AND CONVERSION IN A FUEL CELL

In the medium term, one of the PROGELEC programme's objectives is to contribute to the introduction of hydrogen and fuel cells into the energy mix. Hydrogen, obtained through electrolysis, can play a role in the storage of intermittent renewable energies and as a clean energy carrier in fuel cells (FC). In the longer term (by 2020 or 2030), fuel cells / FC, after having demonstrated their effectiveness in stationary systems, could take their place in on-board electric generating sets in vehicles, as primary (propulsion) or secondary (battery recharging) energy sources. The programme is focusing on fields with a large margin for technological progress, such as the production of hydrogen and fuel cells and their auxiliaries.

SUBTOPIC 3.1: HYDROGEN PRODUCTION THROUGH THE ELECTROLYSIS OF WATER

This subtopic is intended to optimise the conversion of electricity into hydrogen by means of:

High-temperature electrolysis of water with a ceramic membrane cell

This line of research involves the development of low-cost centralised production. Innovative means need to be developed so as to improve the technical and economic performance of electrolyzers, in particular in the context of operation at intermediate temperatures (500°C - 800°C) and/or under pressure (5-100 bars). Developments are expected at the level of materials, components, cells and stacks.

The PROGELEC programme encourages researchers specialised in ion-conductive ceramics to combine their skills, in association with the research into high-temperature electrolysis, with materials for which the problems dealt with show the same features as those concerning the SOFC.

Research into the following subjects is expected:

- development and application of conductive ceramics for electrolytes and electrodes meeting the specifications of an industrial cell; the research is aimed at anion conductors operating between 600 °C and 800 °C, as well as proton conductors operating between 500°C and 600°C;
- development and use of coatings allowing lasting reduction of Ohmic loss at stack interfaces;
- design and construction of cells, lay ups or stacks of variable power using innovative architectures, in particular, allowing operation at reduced temperature, and/or under pressure, and/or with start-stop cycles;
- modelling of the mechanisms at work in the operation of electrolyzers;

- development of new high-temperature electrolysis designs aimed, for example, at the joint production of $H_2 + CO$, oxygen utilisation, or the production of alcohols that can be put to advantage by electro-reduction of CO_2 in the presence of electrolytic hydrogen, etc.

Low-temperature electrolysis of water

This line of research fits into the strategy for the development of technologies for the electrification of isolated sites, through the use of intermittent renewable energies, coupled with decentralised hydrogen production through low-temperature and high pressure electrolysis, hydrogen storage and its conversion within fuel cells.

Research into the following subjects is expected:

- breakthrough research on materials (membranes, separators, catalysts, collectors) in order to improve the performance and durability of PEM and alkaline-type electrolyzers;
- development of technological innovations in electrolyzers with a view to improving their compactness, their energy efficiency and operational parameters;
- exploration and technological validation of new designs, aimed at getting the best out of electrolyzers.

SUBTOPIC 3.2: HYDROGEN STORAGE

High-capacity hydrogen storage

This line of research concerns high-capacity, sealed hydrogen storage systems with a view to establishing coupling between intermittent energy sources and the electrical networks. It concerns buffer storage tanks, if necessary combined with, or even integrated into a supply infrastructure (gas pipelines), as well as underground storage tanks in geological formations.

Research into the following subjects is expected:

- designs of high-volume storage tanks;
- development of materials compatible with hydrogen;
- feasibility of underground hydrogen storage processes;
- design basis of solutions adapted for various scenarios representative of the control of electrical networks powered by intermittent energies;
- technical-economic studies of the above solutions;

Solid hydrogen storage

Storage of hydrogen by absorption/adsorption into solids, and the supply of hydrogen by decomposition of hydrides (hydrolysis, pyrolysis), will involve materials which performance has already been established. More particularly, it will be concerned with lowering the temperature of operation, increasing storage capacity and increasing reaction kinetics and cyclability. The integration of these materials into tanks, of sizes that are representative of the applications, should take into account the questions of putting into form, thermal conductivity, heat transfers, heat management and safety under the required conditions of use. Research projects into new materials requiring design breakthroughs shall be subject to the non-thematic programme.

SUBTOPIC 3.3: PROTON EXCHANGE MEMBRANE FUEL CELLS (PEMFC)

This subtopic is aimed at stationary, on-board and mobile applications. More particularly, the actions should concern the development of prototypes of cells aimed at newer specialised markets, by focusing on stack designs and systems optimisation in use cycles that are representative of the applications.

Research into the following subjects is expected:

- better control of fluid behaviour at the level of the electrode, with a view to promoting catalyst use levels, hydration of the active layer and cell lifespan;
- improvement of performance (for lifespan in particular) of the core cell components; development of membranes operating at intermediate temperatures (in the order of 120 °C, or even 180°C) and/or requiring little or no humidification; development of less expensive high-performance catalysts (without platinum, multi-metallic catalysers containing little platinum, bio-inspired, etc.); development of catalysts that are more tolerant of the impurities and pollutants contained in the gases feeding the anode or the cathode; stability improvement of the carbon support and research into new support materials.
- design of stacks allowing, in particular, the integration of breakthrough membrane electrode assemblies (MEA) and design of bipolar plates for these operating conditions and/or these MEAs;
- development of systems that are integrated and optimised in terms of fluidic, thermal, electric and energy management, and validation in real conditions of operation;
- development of test protocols, optimisation study and qualification of PEMFC system auxiliaries (air compressor, pressure regulators, humidifiers, cooling systems, etc.) according to clearly identified specifications.

2.4. THEMATIC LINE 4: ELECTROCHEMICAL STORAGE OF ELECTRICITY

Storage is a key element in the chain of production – management – and use of electricity. The fundamental objectives in this area are reducing the cost per kWh obtained from storage from €0.4/kWh to €0.1/kWh and multiplying the lifespan of the systems by 4, increasing it from 5 years to 20 years, for stationary systems in particular.

In accord with the creation of the “Réseau National de Recherche et Technologie sur les Batteries” (“National Network for Battery Research and Technology”), this subtopic will very largely focus on lithium batteries and supercapacitors. However, research projects involving other innovative electricity storage methods, both non-electrochemical (magnetic superconductor storage, mechanical storage, etc.) and electro-chemical, are acceptable.

SUBTOPIC 4.1: BATTERIES

Lithium-ion batteries

The research should be aimed at optimising the electrodes, electrolytes and interfaces:

- Positive electrode: the objective is to offer radically new solutions for increasing energy return and lifespan and for reducing the cost.
- Negative electrode: the objective can be set of doubling the reversible capacity, with a discharge potential in the order of 0.5 V vs. Li, by replacing graphite with innovative nanocomposites or nano-alloys;
- Electrolyte: in the case of liquid electrolytes, it is necessary to make progress in order to stabilise the negative electrode passivation layer and deactivate the positive electrode's catalytic properties. It is also necessary to extend the using temperature range, reduce flammability and improve the wetting properties of separator and electrodes.

Generic research aimed at improving the intrinsic safety and lifespan of high-capacity lithium-ion cells, for stationary and car applications, is expected.

Lithium-Metal-Polymer batteries

The lines of research to be promoted are, in particular, as follows:

- development of new polymer/salt complex derivatives operating at lower temperature and of gelled electrolytes;
- stabilisation of the existing materials and development of less oxidizing materials in order to increase the calendar lifespan;
- increasing the faradic yield for lithium dissolution/deposit, and reduction of parasitic reactions at the positive/electrolyte interface;
- increasing the safety of the systems.

Nickel-metal hydride batteries

Research should investigate new families of negative electrode materials making it possible to improve the energy and power densities, lifespan and cost of the cells. Efforts should also be made to develop innovative materials making it possible to overcome problems of availability of certain elements of the family of the rare earth elements.

Long-term systems

For more long-term applications requiring new solutions, research into new couples (metal-air or oxygen, lithium-sulphur etc.) should be intensified, in particular, to specify their potentials in terms of energy density, cyclability, cost and safety. Research on couples with high potential for electricity management (Redox flow cells, Semisolid flow cells, lead-carbon batteries, etc.) is also expected. Micro-batteries intended for certain “top-of-the-range” applications also come within the scope of this call for proposals.

SUBTOPIC 4.2: SUPERCAPACITORS

This technology has great potential for the stabilisation of networks and should rapidly make its appearance in Stop & Start systems and in energy harvesting. A large part of the research effort should be concerned with the improvement of energy density so as to widen the field of application of these systems.

The research may be concerned in particular with:

- optimisation of the compatibility of the porous carbon/organic electrolyte couple;
- use of new organic electrolytes characterised by high-conductivity, a wide electrochemical window and increased safety (in particular to replace acetonitrile);
- hybrid and asymmetrical systems, composed of a negative electrode made from a lithium intercalation compound or other pseudo-capacitive materials, and a positive electrode of nanoporous carbon.

Protic media supercapacitors

Research is expected into symmetrical and asymmetrical supercapacitors in protic media (aqueous or ionic liquid), because of the high potential for innovation which exists with regard to these systems, as well as for their economic, environmental and safety advantages. The proposals should be exclusively concerned with configurations allowing optimisation of energy density. Power, lifespan and low-temperature operation (-20 °C) will be the predominant criteria in the definition of choices.

2.5. THEMATIC LINE 5: COMPONENTS MANAGEMENT AND HYBRIDISATION OF PRODUCTION/CONVERSION SYSTEMS

The various sources of energy, each meeting different requirements, should be integrated with carriers and platforms. This combination of sources leads to combining it with a “core”, for controlling the functions of energy management and distribution, control of charging and discharging and the reliability and safety aspects.

SUBTOPIC 5.1: COMPONENT MANAGEMENT

Reliability and thermal management are two very important parameters in the operation of the energy production/conversion and storage components. Premature ageing methodologies should be developed and perfected with the objective of understanding the physical mechanisms and processes of deterioration of these components and determining the fault indicators, the real signs of the state of health of the devices.

The research work should be concerned with:

- the study and modelling of the components aging in their use environment (ageing through cycling, scheduled ageing). The correlation between these two types of ageing should make it possible to determine a premature ageing protocol, representative of the component;
- the development of electric and thermic models, making it possible to simulate the ageing of components according to the constraints linked to their operational environment;
- the development of robust methods of diagnosis, which are as little intrusive as possible, with a view to predictive maintenance of the components during their operation;
- the development of prognostic tools, making it possible to plan the maintenance of components;
- the development of software and/or hardware tools making it possible to identify and control the state of functioning of the component, or of a basic group of components.

SUBTOPIC 5.2: HYBRIDISATION OF SYSTEMS

In on-board and stationary systems, developments are concerned with the use of multiple sources, of various different natures. This subtopic therefore focuses on this aspect of hybridisation, or coupling of different types of sources.

The research work should be concerned with:

- the study of (internal and external) hybridisation of sources, based on components of different kinds with complementary characteristics (overall improvement of gravimetric and volumetric energy density, gravimetric and volumetric power density, and lifespan);

- the development of power electronics (reliable in terms of efficiency, mass and volume) and its control, in order to adapt power levels between energy sources and storage and/or charging components; the work should be concerned with innovative architectures for converters and their control law;
- the development of electrical simulation and thermal management tools for multi-source systems according to the conditions of use;
- study and modelling of the interaction of electronic interfaces in the intrinsic performance and lifespan of the components, in particular at high frequency;
- the establishment of optimal design tools for hybrid systems combining hybrid devices, to meet given requirement specifications;
- the development of energy management tools, taking into account the constraints linked to the application, as well as to the reliability of the devices. These studies should lead to the optimisation of system management through prediction and virtual simulations.

2.6. THEMATIC LINE 6: LOCAL ENERGY MANAGEMENT, ELECTRICAL SYSTEMS AND INTEGRATION OF MEANS OF PRODUCTION/CONVERSION AND STORAGE

The programme is focused on the production of photovoltaic electricity. However, for integration, this does not exclude other renewable means of production, such as marine, wind and geothermal energies, etc.

SUBTOPIC 6.1: INTEGRATION OF RENEWABLE ENERGIES IN ELECTRICAL SYSTEMS

The research should be concerned, in particular, with future architectures for the control and management of production/conversion and storage resource portfolios, so as to allow optimal integration of the various types of resources in smart grids, taking real time data exchange into account:

- with traders in energy management at the various timespan levels (D-1/day-ahead markets, intra-day markets and balance markets);
- with network operators for the management of very rapid system services (frequency control, voltage control, harmonics compensation);
- with production/conversion and storage resource operators.

These architectures will cover the various strategic elements of energy production/conversion, from electronic power systems to battery management systems, and will include tools allowing optimal positioning of battery capacities in relation to the external Smart Grids environment.

Research is also necessary in order to improve the integration of new energy production methods into power systems. Since the production volumes generated are becoming significant, and are set to grow still further, the challenge is, in particular, to guarantee that these renewable energy-based production systems have a certain level of insensitivity to disruptions to the electrical system (short circuits, quick variations of voltage or frequency, etc.), in order to avoid their disconnection. This also means involving these means of production in the security of the electrical system, in particular through the supply of system services: participation in adjustment of voltage and network frequency.

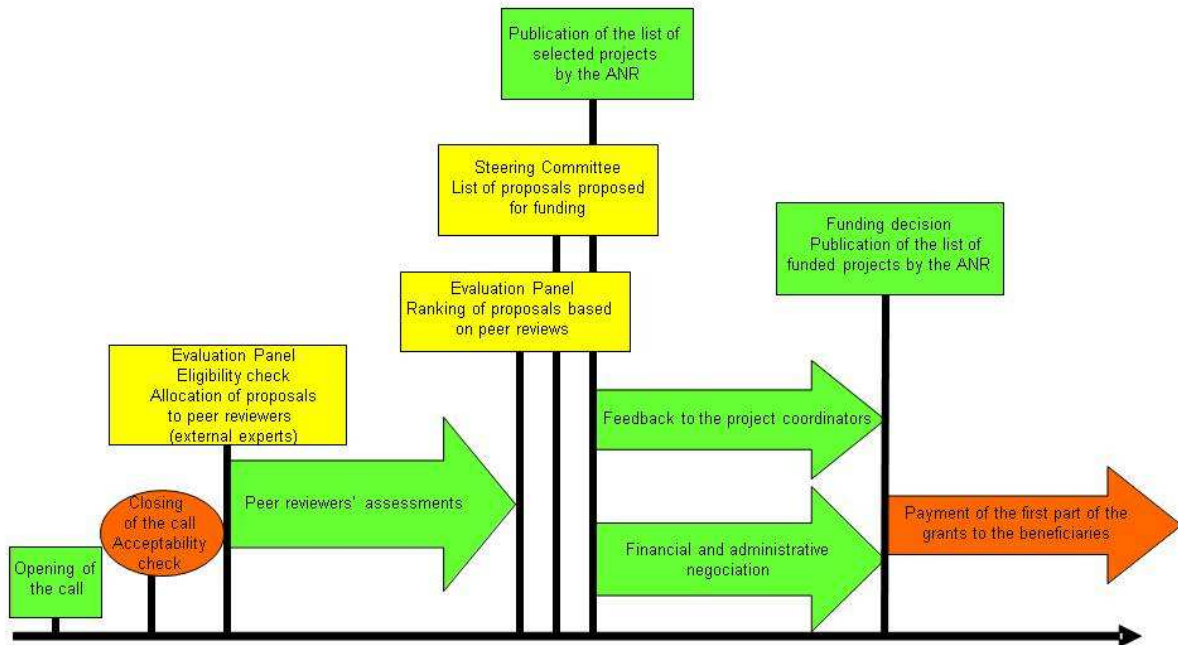
SUBTOPIC 6.2: TECHNICO-ECONOMIC ASSESSMENT WITHIN THE FRAMEWORK OF FUTURE SMART GRIDS

In electrical systems, the necessity of maintaining balance between electricity production and consumption at all times is a fundamental issue.

Three main research areas are distinguished:

- with the integration of intermittent energies, new systems tools should be developed in order to assess the economic and environmental impacts/benefits of storage. It is also necessary to develop multi-objective control and/or reconfiguration tools in order to allow rational, dynamic planning of the electrical energy to be stored, taking future economic conditions into account, in particular a rise in the cost of fossil fuels;
- in an electrical system with various different economic actors, it is necessary to try to define profitable models of activity and storage systems for certain actors (producers, network managers etc.) confronted with various different issues (deferral of investments, optimisation of power system management, supply of reserve capacities, supply of system services, etc.);
- knowing that the storage technologies are different for dealing with peaks of one to two hours per day, and for longer timescales (around 2,000 hours and over per year), the technologies on which development efforts need to be focused must be defined in order to obtain profitable economic results, under the conditions of regulation as they exist or as they are to be developed.

3. EXAMINATION OF PROPOSALS



The selection procedure involves the following steps:

- Examination of the acceptability of the proposals by the ANR in accordance with the criteria stipulated in § 3.1.
- Examination of the eligibility of the project proposals by the evaluation panel in accordance with the criteria stipulated in § 3.2.
- Peer reviewers (external experts) are appointed by the evaluation panel.
- Peer reviewers issue their assessments based on the evaluation criteria specified in § 3.3.
- The evaluation panel reviews research proposals upon reception of the peer reviewers' assessments, and drafts a scientific evaluation report.
- Examination of the project proposals by the steering committee, which proposes a list of projects to be proposed for funding by the ANR (consult the steering committee grid on the web page dedicated to the call).
- Publication of the list of projects selected by the ANR (main list and possibly reserve list) on the ANR web site dedicated to the call for proposals.
- Sending the coordinators of non-selected projects a consolidated panel evaluation report.
- Finalising of the scientific, financial and administrative files for the selected projects.

- Publication of the list of projects selected for funding on the ANR web site dedicated to the call for proposals.
- First payments to the beneficiaries in accordance with the rules set in the regulations pertaining to the conditions of allocation of ANR funding (see link on ANR web site given on page 2).

The respective roles of the principal actors of the selection procedure are as follows:

- The peer reviewers (external experts) designated by the evaluation panel issue a written assessment for all proposed projects. Each project is reviewed by at least two experts.
- The evaluation panel comprising members of the research communities concerned, whether French or foreign, whose fields of expertise correspond to the requirements of the call and from the public or private sectors. The evaluation panel is mandated to evaluate the projects on the basis of the external experts' assessments, and to rank them into three categories: A (priority), B (non-priority), and C (rejected).
- The role of the steering committee, which comprises qualified prominent figures and institutional representatives, is to propose a list of projects to be funded by the ANR in accordance with the work of the evaluation panel.

The persons involved in project selection undertake to comply with the provisions of the ANR's code of ethics, and in particular the rules pertaining to the confidentiality and conflict of interest. The ANR code of ethics is available on the ANR web site³.

The operational and organisational procedures that apply to evaluation panels and steering committees are stated in documents available on the ANR web site³.

Once the list of selected projects has been published, the compositions of the evaluation panels are available on the ANR web site⁴.

³ <http://www.agence-nationale-recherche.fr/DocumentsAgence>

⁴ <http://www.agence-nationale-recherche.fr/Comites>

3.1. ACCEPTABILITY CRITERIA

IMPORTANT

Project proposals that do not meet the acceptability criteria will not be submitted to the evaluation panel and will not be granted ANR funding under any circumstances.

- 1) The electronic and scanned **submission file** (see content in § 5.1) must be submitted **duly completed within the deadline**, and produced **in the format requested**.
- 2) **The scientific document** produced in the format provided **must not exceed 40 pages**, appendices excluded.
- 3) The project **coordinator** must not be a member of the evaluation panel or the programme steering committee.
- 4) The project **duration** must be between 24 months and 48 months.
- 5) **Minimum number of partners** (including the coordinating partner): **2**

3.2. ELIGIBILITY CRITERIA

IMPORTANT

Project proposals that do not meet the eligibility criteria after examination by the evaluation panel will not be granted ANR funding under any circumstances.

- 1) The project must **enter into the scope** of the call for proposals described in § 2.
- 2) **Type of research:** this call for proposals is open to:
 - Fundamental research projects⁵,
 - Industrial research projects⁵,
 - Experimental development projects⁵.**Consortium composition :** This call for proposal is open
 1. To partnership research projects (research organization/private company¹) which consortium includes at least two partners, and at least one from each of the following categories:
 - i. Research organization (university, EPST, EPIC, etc.)¹
 - ii. Private company¹
 2. To collaborative research projects, which consortium includes at least two partners, including at least one research organization category (university, EPST, EPIC,...)¹.
- 3) This call for proposal is also open to European projects related to the Eranet "Electromobility+" program in which at least one of the partners is French.

⁵ See definitions of research categories in § 6.4.

3.3. EVALUATION CRITERIA

IMPORTANT

The submission files, appendices excluded, must contain all the information necessary for the evaluation. Only project proposals that satisfy the acceptability and eligibility criteria will be evaluated according to the criteria specified below.

- 1) Relevance of the proposal with respect to the call for proposals orientations**
 - suitability with respect to the thematic lines of the call for proposals (cf. § 2),
 - suitability with respect to the recommendations of the call for proposals (cf. § 3.4).
- 2) Scientific and technical quality**
 - scientific excellence in terms of progress of knowledge with respect to the state of the art,
 - innovative character in terms of technological innovation or prospects of innovation with respect to the existing situation,
 - overcoming technological barriers,
 - integration of the different disciplinary fields.
- 3) Methodology, quality of project construction and coordination**
 - positioning with respect to the state of the art or technological innovation,
 - 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 management plan (experience, project financial and legal management), involvement of the coordinator,
 - strategy for the exploitation of the potential project results.
- 4) Overall impact of the project**
 - 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,
 - industrial or technological application prospects and economic and commercial potential, business plan, integration in the industrial activity. Credibility of the stated way of using the results,
 - benefit for society, public health, etc.
 - when appropriate, the response to questions of environmental impact.
- 5) Quality of the consortium**
 - level of scientific excellence or expertise of the teams,
 - appropriateness of the partnership for the scientific and technical objectives,
 - complementarity of the partnership,
 - openness to new players,
 - active role of the private partners in the project.

6) Appropriateness of project resources / Project feasibility

- schedule feasibility,
- appropriateness of the project management means implemented,
- appropriateness and justification of the requested funding,
- appropriateness of the coordination costs,
- justification of the personnel resources,
- justification of the temporary personnel resources (trainees, PhD students, post-doctoral students),
- proper estimate of the sum for investments and equipment purchases,
- proper estimate of the other financial items (missions, subcontracting, consumables, etc.).

3.4. IMPORTANT RECOMMENDATIONS

Any divergence from these recommendations is not necessary penalizing but must be clearly explained.

The evaluation panel will judge the appropriateness of the divergence from the recommendations.

RECOMMENDATION CONCERNING PERSONNEL INVOLVEMENT

- The project proposals shall ensure a balance between permanent personnel and temporary personnel, as indicated in §4.

RECOMMENDATION CONCERNING "FOLLOW-UP" PROJECTS

- Project proposals following on from previous project(s) financed by the ANR shall include a detailed report of the results obtained and clearly describe the new problems posed and the new objectives.

RECOMMENDATION CONCERNING PROJECTS INVOLVING FOREIGN PARTNERS WITHOUT A PRIOR BILATERAL AGREEMENT SIGNED BETWEEN THE ANR AND A FOREIGN FUNDING AGENCY

The foreign partner must ensure his/her own financing and explicit in the scientific and technical proposal:

- Whether the activities are carried out with already existing funds
- Whether the foreign partner has already received national funding for its contribution to the proposed project
- If not, indicate whether he/she requested a national funding for his/her participation in the project by sending out the same scientific proposal to a funding organisation of his/her country. In that case provide the complete details of the funding organisation as well as the name, function, e-mail and phone number of the programme director in his/her country.

RECOMMENDATION CONCERNING THE REQUEST FOR ANR FUNDING

In the framework of this call for proposals, applicants are invited to present projects justifying ANR funding to a level between 300 k€ and 1000 k€. This recommendation does not exclude the possibility that projects can be funded for amounts either below or above the range.

RECOMMENDATION CONCERNING PROPOSALS IN INTERNATIONAL PARTNERSHIP

Since research on electricity production and management is by nature intermittent, French researchers are suggested to apply for proposals with European partners (private companies, research organizations, etc.) within the frame of the financial conditions defined in §4.

- For partnership research projects (research organization/private company), one partner (at least) from each category should be French.
- For collaborative research projects, two partners (at least) should be French.

4. PARTICULAR FUNDING PROVISIONS

This section complements the general provisions set forth in § 6.1.

CONDITIONS FOR FINANCING TEMPORARY PERSONNEL

Temporary personnel (trainees, post-doctoral students, fixed-term contract employees, temporary employees, etc.) may be assigned to projects in this programme. Except for special cases, the manpower (in person months) funded by the ANR for the project as a whole should not exceed 50% of the total manpower engaged in the project.

RECRUITING PHD SCHOLARSHIPS

For the present programme, doctoral research students may be financed by the ANR. The financing of a doctoral research student by the ANR does not mean that the Graduate School has given its approval for the work. Doctoral research students are considered as temporary personnel for the application of the above condition for funding temporary personnel.

OTHER FUNDING CONDITIONS

In this programme, partnerships with industrial or research institutions located in other countries of the European Union are strongly encouraged, to the extent each foreign partner provides its own funding in the project.

5. SUBMISSION CONDITIONS

5.1. CONTENT OF THE SUBMISSION FILE

The submission file, appendices excluded, must include all the elements necessary for the scientific and technical evaluation of the project. It must be completed before the submission deadline, the date and time of which are indicated on p. 2 of this call for proposals.

IMPORTANT

No additional elements will be accepted after the submission deadline, the date and time of which are indicated on p. 2 of this call for proposals.

The submission file comprises two documents that must be entirely filled out:

- a) The project "administrative and financial document" (called submission document). It is generated by the submission site after entering the required information on line.
- b) The "scientific document" is the scientific and technical description of the project. The document template is available in Word format on the ANR web site on the page dedicated to the call for proposals. Once completed, this document is to be uploaded to the submission site in the "Scientific document" tab. This document must not exceed 40 pages in the proposed format, appendices excluded.

It is recommended to produce the scientific and technical description of the project proposal in English, except in cases where the use of the French language is necessary. For instance: project proposals in social sciences and humanities where the French language may be used in the framework of an international evaluation; project proposals with a strong potential of exploitation (industrial research) which, for specific economic reasons, should not be reviewed by a researcher residing abroad. In the case that the scientific and technical description is drawn up in French, a translation in English may be requested within a deadline compatible with the evaluation process.

5.2. SUBMISSION PROCEDURE

1) SUBMISSION SHALL BE MADE ON LINE ON THE DEDICATED SITE ACCESSIBLE FROM THE ANR WEB SITE AT THE ADDRESS INDICATED ON PAGE 1:

The project can be modified right up until the call for proposals is closed.

Only the information present on the submission web site at the time of the closure of the call for proposals will be taken into account.

ANY FILE CONTAINING A SCIENTIFIC DOCUMENT AND A POSITIVE FUNDING REQUEST WHEN THE CALL CLOSES WILL BE CONSIDERED SUBMITTED, AND IN THIS CASE AN ELECTRONIC ACKNOWLEDGEMENT OF RECEIPT WILL BE SENT TO THE COORDINATOR.

2) TRANSMISSION OF A SCAN (in PDF format) of the administrative and financial document (called submission document).

This document is generated by the submission site after entering the required information on line.

This document is to be downloaded from the submission site, printed, signed by all the French partners, then scanned (in PDF format) and uploaded to the ANR submission site by the French project coordinator no later than the date indicated on page 2.

Reminder: the scientific representative and the direction (or any person authorized to sign on behalf of the organisation) of each public organisation or research foundation that is partner in a project **must sign** the administrative and financial document (submission document).

5.3. SUBMISSION RECOMMENDATIONS

It is strongly recommended:

- Not to wait until the submission deadline to submit the project;
- 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;
- To register the information entered on the submission site before leaving each page;
- To download the full project summary in Excel format from the "Summary tables" tab to verify the information entered on line;
- To regularly consult the website dedicated to the programme at the address indicated on p. 2, which contains updated information concerning the applicable procedures (submission site user's guide, budget preparation guide, glossary, FAQs, etc.);
- To contact the project officers by electronic mail at the address(es) indicated on p. 2 of this call for proposals.

5.4. PARTICULAR SUBMISSION CONDITIONS FOR THE APPLICATION FOR LABELLING BY A COMPETITIVENESS CLUSTER⁶

The application for project labelling by one or more competitiveness clusters is made from the submission site using the following procedure:

- When submitting the project proposal, the partner can indicate the intention to request labelling by one or more competitiveness clusters in the clusters tab.
The coordinating partner must then download a prefilled form certifying project labelling by a competitiveness cluster and forward it to the cluster's governance structure.

Project partners are strongly recommended to contact the cluster in parallel to the project submission procedure.

5.5. PARTICULAR SUBMISSION CONDITIONS FOR PROJECT PROPOSALS IN COLLABORATION WITH ONE OR SEVERAL INTERNATIONAL TEAMS

- The ANR and its European partners agreed to foster cooperation between French research teams on the Eranet themes "Electromobility +"⁷.
- To be examined by the Eranet "Electromobility +", project coordinators must file their record also on the site for the submission of the Eranet

6. GENERAL PROVISIONS AND DEFINITIONS

6.1. ANR FUNDING

TYPE OF FUNDING

The funds allocated by the ANR to each partner will be provided as a non-refundable grant in accordance with the provisions of the "Regulations relative to conditions of allocating ANR funds", which can be consulted on the ANR web site⁸.

ANR funding is limited to project partners residing in France, the associated international laboratories of French research organisations and higher education and research institutions, and French institutions established abroad. Foreign partners may nevertheless participate on condition that each foreign partner ensures its own financing in the project.

IMPORTANT

The ANR will not allocate funding of less than €15,000 to a project partner.

⁶ See additional provisions related to clusters in § 6.3.

⁷ See website of European information and submission website <http://www.transport-era.net/electromobility.html>, contact ralf.engel@developpement-durable.gouv.fr

⁸ <http://www.agence-nationale-recherche.fr/documents/uploaded/2007/reglement-modalites-attribution-aide.pdf>

FUNDING RATES FOR PRIVATE ENTERPRISES

The maximum ANR funding rates for private enterprises⁹ for this call for proposals are as follows:

Type of research	Maximum funding rate for SMEs	Maximum funding rate for companies other than SMEs
Fundamental research ¹⁰	45% of eligible expenditure	30% of eligible expenditure
Industrial research	45 *% of eligible expenditure	30 % of eligible expenditure
Experimental development	45 *% of eligible expenditure	25 % of eligible expenditure

(*)For projects that do not involve a true collaboration between a company and a research organisation, the maximum funding rate is 35%.

There is true collaboration between a company and a research organisation when the research organisation underwrites at least 10% of the costs on which the funding request is based and when it retains the right to publish the results of the research, whenever these results are obtained from the organisation's own research efforts.

IMPORTANT

The incentive effect¹¹ of allocating ANR funding to companies other than SMEs must be established. Consequently, non-SMEs selected for funding under this call will be asked to provide the information necessary to evaluate this aspect during the finalizing of the administrative and financial files.

⁹ See definitions relative to structures in § 6.6.

¹⁰ See definitions of research categories in § 6.4.

¹¹ See definition of the incentive effect in § 6.7

6.2. REGULATORY AND CONTRACTUAL OBLIGATIONS

CONSORTIUM AGREEMENTS

For public/private partnership¹² projects involving a research organisation and a private enterprise the partners must conclude, under the supervision of the project coordinator, an agreement specifying:

- the distribution of the tasks, human and financial resources and deliverables;
- the sharing of the intellectual property rights linked to findings obtained within the framework of the project;
- the conditions of publication / dissemination of the results;
- the application and transfer of project findings.

These agreements shall enable the existence of any indirect financial support entering into the calculation of the maximum level of funding authorized under the European Community Framework for state aid for research and development and innovation (referred to hereinafter as the "EC Framework") to be determined.

It will be assumed that there is no indirect aid if at least one of the following conditions is satisfied:

- The beneficiary company, working within the EC Framework, underwrites all the project costs;
- where results cannot be protected by intellectual property rights, the beneficiary research organisation is free to use and disseminate its results;
- where results can be protected by intellectual property rights, the beneficiary research organisation retains ownership of these rights;
- the beneficiary company, working within the EC Framework, that benefits from a result developed by a beneficiary research organisation remunerates the latter in keeping with market conditions.

The project coordinator will send a copy of this agreement to the ANR or to its support unit along with a statement signed by the partners certifying the compatibility of the agreement with the provisions of the EC Framework and the convention(s) defining the conditions of project performance and financing. **The documents shall be sent within twelve months after the grant agreements come into force.**

The statement must therefore certify either that the consortium agreement fulfils one of the conditions listed above, or that all the intellectual property rights concerning the results and the rights of access to these results are allocated to the various partners in a way that reflects their respective interests and their level of participation in the project, including financial and other contributions. Failing this, the consortium agreement may be considered as a form of indirect funding, leading to a reduction in the percentage of direct funding allocated by the ANR.

¹² See definition of competitiveness cluster in § 6.4

MORAL RESPONSIBILITY

The funding of a project by the ANR does not relieve the project partners of their obligations concerning the regulations and code of ethics applicable to their area of activity.

The coordinator undertakes in the name of all the partners to keep the ANR and its support unit informed of any change likely to modify the content, the partnership or the schedule of project performance between the time of project submission and publication of the list of selected projects.

6.3. ADDITIONAL PROVISIONS

COMPETITIVENESS CLUSTERS¹³

The partners of a project can have their project labelled by one or more competitiveness clusters. The labelling of a project by a cluster reflects the acknowledgement of the interest of the project with respect to the strategic orientations of the cluster.

As the project labelling application requires the disclosure of strategic, scientific and financial information to the cluster, the partner behind the labelling initiative is asked to obtain the agreement of the other project partners beforehand. In the ANR selection process, the steering committee is informed if a project has a cluster label.

If the project is financed by the ANR, the partners undertake to communicate the project intermediate and final reports to the competitiveness cluster. The ANR reserves the option of inviting representatives of the competitiveness cluster to attend any project reviews or follow-up and assessment operations.

The ANR may allocate additional funding to the partners of a labelled project ¹⁴ if they are situated in the region(s) of the cluster(s) concerned.

If the partner is a company, this additional funding complements the initial project grant.

If the partner is a public research laboratory or a legal entity that is not subject to the EC Framework rules, this additional funding must be allocated to expenses that relate to the competitiveness cluster's activity (oversight and coordination, technological watch, project engineering, etc.)¹⁵.

¹³ See definition of competitiveness cluster in § 6.3.

¹⁴ A project can be labelled by several clusters; in this case the geographical perimeter considered will be that covered by all the clusters having labeled the project.

¹⁵ To learn more about the conditions of use of the additional funding, see: <http://www.agence-nationale-recherche.fr/partenariats-public-privé/poles-de-compétitivité/regles-de-calcul-et-d-utilisation-du-complément-lieu-label/>

RESEARCH TAX CREDIT

The expenses incurred by companies to finance research work may be eligible for the research tax credit - see article 244 quater B of the general tax code.

The tax credit for projects selected by the ANR may be allocated to companies as additional funding on the basis of the part of the research budget that is not covered by ANR funding.

A prior opinion on the eligibility of the operation for the French research tax credit (called CIR) can be obtained by filing a request with the ANR for an advance tax ruling (prior agreement) - see article L80B3 bis of the "Livre des procédures fiscales" (French fiscal procedures book). To benefit from this provision, companies must choose the system provided for by article 3bis of article L80B (see paragraph 1 of the application form which can be downloaded from the following address):

<http://www.agence-nationale-recherche.fr/CIR>

The completed and signed form is to be returned by registered mail with acknowledgement of receipt to the following address:

ANR, Département DPC/CIR, 212 Rue de Bercy, 75012 Paris cedex

The employees who examine the research tax credit (CIR) application files are held to professional secrecy, on the same account as the tax authority employees under the conditions provided for in article L103 of the "Livre des procédures fiscales" (French fiscal procedures book).

6.4. DEFINITIONS CONCERNING THE DIFFERENT RESEARCH CATEGORIES

These definitions figure in the EC Framework for state aids for research and development and innovation¹⁶. The following meanings apply:

Fundamental research: "experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena or observable facts, without any direct practical application or use in view".

Industrial research: "the planned research or critical investigation aimed at the acquisition of new knowledge and skills for developing new products, processes or services or for bringing about a significant improvement in existing products, processes or services. It comprises the creation of components of complex systems, which is necessary for the industrial research, notably for generic technology validation, to the exclusion of prototypes covered [in the definition of experimental development] [...]".

¹⁶ See JOUE 30/12/2006 C323/9-10

<http://www.agence-nationale-recherche.fr/documents/uploaded/2007/encadrement.pdf>

Experimental development: “the acquiring, combining, shaping and using of existing scientific, technological, business and other relevant knowledge and skills for the purpose of producing plans and arrangements or designs for new, altered or improved products, processes or services. These may also include, for example, other activities aiming at the conceptual definition, planning and documentation of new products, processes and services. The activities may comprise producing drafts, drawings, plans and other documentation, provided that they are not intended for commercial use.

The development of commercially usable prototypes and pilot projects is also included where the prototype is necessarily the final commercial product and where it is too expensive to produce for it to be used only for demonstration and validation purposes. In case of a subsequent commercial use of demonstration or pilot projects, any revenue generated from such use must be deducted from the eligible costs.

The experimental production and testing of products, processes and services are also eligible, provided that these cannot be used or transformed to be used in industrial applications or commercially.

Experimental development does not include the routine or periodic changes made to products, production lines, manufacturing processes, existing services and other operations in progress, even if such changes may represent improvements.”

6.5. DEFINITIONS CONCERNING PROJECT ORGANISATION

For each project, a single coordinating partner is designated, and each of the other partners designates a scientific representative.

Coordinating partner: research organisation or enterprise to which the coordinator belongs.

Coordinator: the person responsible for the scientific and technical coordination of the project, the setting up and formalizing of the collaboration between the partners, production of the project deliverables, holding of the progress meetings and communication of the results. The coordinator is the chief contact for the ANR and its support unit. The organisation to which the coordinator belongs is called the coordinating partner.

Partner: Unit of a research organisation or of an enterprise.

Scientific representative: each partner appoints a scientific representative who is the chief contact for the coordinator and is responsible for production of the partner’s deliverables.

Public private partnership project: research project for which at least one of the partners is a company and at least one of the partners belongs to a research organisation (see definitions in § 6.6 of this document).

6.6. DEFINITIONS CONCERNING THE STRUCTURES

Research organisation: "an entity, such as a university or research institute, irrespective of its legal status (organized under public or private law) or way of financing, whose primary goal is to conduct fundamental research, industrial research or experimental development and to disseminate their results by way of teaching, publication or technology transfer; all profits are reinvested in these activities, the dissemination of their results or teaching; undertakings that can exert influence upon such an entity in the quality of for example, shareholders or members, shall enjoy no preferential access to the research capacities of such an entity or to the research results generated by it¹⁷ .

Technical centres, save duly justified exceptions, are considered to be research organisations.

Enterprise: An enterprise is considered to be any entity engaged in an economic activity, irrespective of its legal form. This includes, in particular, self-employed persons and family businesses engaged in craft or other activities, and partnerships or associations regularly engaged in an economic activity¹⁸.

Small and medium-sized enterprise (SME): an enterprise that meets the European Commission's definition of an SME^{Erreur ! Signet non défini.}. More particularly, an SME is an independent company which employs fewer than 250 persons and which have an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million.

Microenterprise: Within the SME category, a Microenterprise is defined as an enterprise which employs fewer than 10 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 2 million.

Competitiveness cluster: A competitiveness cluster is an association of enterprises, research centres and training organisations, situated in a given geographical area and deploying a common development strategy with the aim of creating synergies around innovative projects conducted jointly and targeting one market or more¹⁹.

¹⁷ See Community framework for State aids for research, development and innovation, JOUE 30/12/2006 C323/9-11 (<http://www.agence-nationale-recherche.fr/documents/uploaded/2007/encadrement.pdf>)

¹⁸ See Recommendation of the European Commission of 6 May 2003 concerning the definition of small and medium-sized enterprises, JOUE 20/5/2003 L 124/39.

¹⁹ See <http://competitivite.gouv.fr/>

6.7. OTHER DEFINITIONS

Incentive effect: Having an incentive effect means, under the terms of the community provisions, that the aid induces the aid recipient to increase its R&D activities, by increasing their size, scope, amount spent or speed. The incentive effect shall be analysed by comparing a situation without aid a situation with aid being granted, using the answers to a questionnaire sent to the company. Various criteria may be used for this purpose: total project costs, R&D personnel assigned to the project, scope of project, level of risk, increase in the risk of the work, increase in the company's R&D expenditure, etc.

Working time of researchers employed by a university: the percentage of working time of researchers employed by a university is based on the research time (considered at 100%). Thus a researcher employed by a university who devotes his/her entire research time to a project for one year will be considered to represent 12 person months. For the calculation of the full cost, however, the person's salary shall be counted at 50%.