

# National Energy Research Strategy

## December 2016

### Executive summary

The energy issue is part of a complex framework that must address several major challenges: guaranteeing and securing access to energy for populations and organizations at an affordable and competitive cost, avoiding fuel poverty, tackling climate change mitigation and adaptation, preserving human health and the environment, and providing a sustainable energy mix. Through the Energy Transition Law for Green Growth and the ratification of the Paris Agreement, France is resolutely committed both to orienting technological and societal choices and to supporting a research and development (R&D) effort required for continuous improvement of existing energy sectors and the emergence of new solutions to meet these major challenges.

Article 183 of the Energy Transition Law for Green Growth (LTECV) provides for the development of a National Energy Research Strategy (SNRE), agreed by the Ministers for Energy and Research and taking account of the National Low Carbon Strategy (SNBC) and the Multi-Year Energy Program (PPE). This strategy, which specifies the energy component of the National Research Strategy (SNR), aims to identify the R&D and scientific barriers to be lifted at different time horizons and along the innovation chain in the field of energy to meet the objectives of the law, while taking a broader international perspective. The development of the SNRE, conducted jointly by the Directorate General for Energy and Climate (DGEC) and the Directorate General for Research and Innovation (DGRI), was based on a steering committee including the stakeholders.

The strategy is organized along four main strategic directions, each with proposals for structuring actions.

#### **Strategic direction 1: Target key transformational themes for energy transition**

Strategic direction 1 makes possible to reflect the objectives set by the law and the SNBC reference scenario (diversification of the energy mix and development of renewable energies - RES, strengthening energy efficiency in all sectors of activity, reduction of fossil resources uses, etc.) by listing the associated scientific and technological challenges (flexibility of systems for integration of RES, decentralization and multi-scale governance of energy systems, increased role of consumers, continuous improvement of nuclear...)

In this context, it is proposed:

- to increase the interdisciplinary nature of energy R&D (link between energy transition and digital revolution, environmental issues and inclusion in the circular economy, economic and social issues to involve consumers and accompany systems decentralization) by joint works of research alliances and companies in each area, through appropriate programming of funding and specific calls for projects and through increased inter-ministerial coordination. These cross-cutting dimensions must also be systematically taken into account in the Energy R&D sectorial roadmaps;

- to carry out, in a systemic approach, comparative assessments of the various flexibility solutions under development (demand response, production control, storage, coupling of networks and vectors, etc.) in order to provide the future iterations of SNBC and PPE with a consolidated vision of short, medium and long-term technological options. This research will complement the numerous ongoing efforts in the various innovative means of production (e.g. ocean energy) or demand control (e.g. materials and processes for the energy renovation of buildings).

### **Strategic direction 2: foster R&D and innovation in relation to territories and the industrial network, in particular SME-ISE**

Strategic direction 2 highlights the economic challenges of maintaining and improving the most competitive mature sectors and developing new sectors, dealing with an international context, beyond the needs of the energy transition in France. In order to accelerate the technologies transfer from the R&D centres to the market, a collaborative approach between public and private sectors and an experimental approach are required. These include:

- amplifying the approach of supporting the demonstration of new technologies and solutions, particularly in the territories, in relation to local authorities (e.g. through the action of the next Investment for the Future Programme (PIA3), or calls for projects as those already in place for pilot territories on smart grids or hydrogen), and using all financial instruments (State aids or equity);
- supporting the development of small and medium enterprises (SME) /intermediate-sized enterprises (ISE), not only through financial support (e.g. with calls for projects such as Ademe's SME initiatives, in partnership with the competitiveness clusters) but also by supporting market positioning (networking with industry). Major energy groups and research organizations, Carnot Institutes or Energy Transition Institutes (ITEs) can play a role to this end;
- structuring the French sectors, reinforcing existing initiatives at the French level (see plans of the "Nouvelle France Industrielle", strategic sector committees), conducting regular assessments of the positioning of French players on the international scene and mobilizing these players to participate in European or global initiatives (Horizon 2020 European Program, Mission Innovation initiative launched at COP21 ...)

### **Strategic direction 3: Develop skills and knowledge for and through R & D & I**

Strategic direction 3 aims to develop skills, both for the consolidation of an energy research community and for the training and information of the different interested publics (professionals, civil society, decision-makers). A strong emphasis is placed on multidisciplinary approach (see Strategic direction 1) and the creation of a community of basic sciences for energy, including the humanities and social sciences. It is proposed for this purpose:

- to strengthen international collaborations and the global visibility of French R&D players in the field of energy;

- to develop thematic networks of researchers, such as the one on electrochemical energy storage (RS2E), making possible to build critical masses around existing laboratories of excellence, for example in the field of materials for energy; to rely also on large research infrastructures to develop programs for energy;
- to develop the capacity for modeling and prospective analysis, with a view to developing scenarios integrating the various dimensions of energy systems and making it possible to characterize and orient the choices of the energy mix;
- to develop new training courses for energy transition trades, with support from higher education institutions or institutes such as ITE;
- to involve civil society in demonstration projects in the territories and feedback from these demonstrations, in order to facilitate the society debates and choices and the adoption of the technologies bringing the best services.

**Strategic direction 4: Create a light and efficient governance to enable a dynamic operational management of the national strategy (SNRE)**

The latter strategic direction emphasizes the need to co-ordinate the implementation of the SNRE with existing initiatives at different geographical scales, from local (especially regional) to international (especially at European level with the Horizon 2020 program and the SET Plan) and to consolidate governance for efficient implementation beyond the strategy development phase (as recommended by OPECST). To this end, it is proposed:

- to convene the stakeholders committee on an annual basis following the adoption of the SNRE, to initiate and monitor its implementation and to prepare its future revision, following a five-year cycle coordinated with those of the SNBC, the PPE and SNR;
- to provide for an ex post evaluation of the SNRE by OPECST, which had already assessed in 2009 the previous 2007 SNRE;
- to establish a regular exchange with regional authorities on R&D support actions, priorities and funding data, in order to allow a coordinated evolution of the respective strategies, to generate synergies and to consolidate feedback from demonstrations in the territories within a "national observatory of experiments";
- to monitor France's commitment to the doubling of R&D funding for clean energy by the State, as part of the COP21 Mission Innovation initiative;
- to ensure that R&D funding arrangements both at French and international level are complementary. For example, France will be able to defend at European level the reinforcement of funding for the Horizon 2020 program on upstream research (low TRL) and ensure that the future Innovation Fund to be set up in the framework of the carbon market (revised ETS Directive) will provide an additional source and suitable tools for financing low carbon innovation for large-scale projects.

Given the specific nature of the energy sector, the overcoming of all scientific, technological and systemic barriers can only be achieved through actions supported both by public and private research including a collaborative approach. The mobilization of all actors for the implementation of this national energy research strategy is therefore crucial.