EDF Group welcomes the opportunity to respond to EIB’s consultation in respect of its lending policy towards the energy sector.

This consultation comes at a critical stage for the European energy policy as:

(i) Industry is facing the challenge of huge investments in generation means and networks in order to upgrade its facilities and meet the ambitious targets set by the European 2020 agenda;
(ii) The financial and economic crisis have led to demand destruction and sharply lower market prices impacting the financial performance of most operators for the foreseeable future in merchant markets;
(iii) Project financing from commercial banks in general and for the energy sector has severely contracted as a result of the forthcoming banking regulation (Basle 3) and the investment community which has been increasingly keen on investing in infrastructure asset class, while it is regulated has been much more timid on greenfield projects;
(iv) The access to corporate bond markets has remained good so far given the sizeable liquidity in markets but could be impacted by deteriorating balance sheets of utilities and project bonds remain in the infancy.

In this context, we strongly believe that the European Investment Bank (EIB) should play a critical role in ensuring that the three main objectives of the European energy policy should be met: security of supply, competition and sustainability. This is key to restore energy policy as one of the pillars of the European construction as it was the intention of the founding fathers.

In our response to this consultation, we recall EDF Group’s commitment and interest in the EIB effort to support low-carbon and technologically neutral investments.

Going forward, we consider that the EIB should take more risk alongside energy companies to the extent it is now more risky to make investments in capital-intensive low-carbon projects (e.g. hydro-pump storage, nuclear safety related investments, smart systems, electro-mobility solutions...). The EIB role should also be very significant in financing innovative investments on low-carbon technologies that have yet to reach maturity (e.g. new renewable technologies, new "customer-oriented" energy services, etc.).

We at EDF have developed over the years a strong relationship with EIB on a number of fields. Our group is already using the support of the EIB to help finance several investment projects not only in the EU but also outside Europe. In this regard, the role of the EIB is also seen as particularly important to contribute to future investments not only in Europe but beyond, in particular in the peripheral countries and the Ultra-Peripheral Regions of the EU.
About EDF

EDF Group is in a leading position in the power industry in Europe, not only in the electric sector but also in the gas sector, through the full control of Edison and the recent development of new gas infrastructure such as the Dunkirk re-gasification facility in France. EDF Group is active on the whole power value chain, from generation to supply, including network management and optimization and trading of energy. Its’ very low carbon footprint, with 87% of its power output being CO₂ free, thanks to its large nuclear and hydro/renewable energies generation mix, places it at the forefront of environmental objective. In addition, the sheer size of its R&D efforts, with 2000 engineers and an annual budget of half a billion € make it an innovator in the energy field.

Its investment program, of close to €12 Billion annually explains the importance attached to financing matters in general and EIB’s policy in particular.
Chapter 4.1 General energy and economic context

When considering future investments in the energy sector in Europe, three main drivers must be taken into account:

- The investment horizon: The energy sector main characteristic is to enrol in long-term investment: today’s investment decisions will still have an effect 40 years from now. They can even last up to 60 years in the nuclear industry;
- Despite the likely slow down of the global energy demand, electricity demand is expected to grow: electricity usage as an energy vector is increasing (smart home appliances, electromobility solutions, etc) and its share in the energy mix needs to rise to achieve a decarbonized European economy;
- Future investors will invest where energy availability is certain, economic and with a high carbon footprint.

Particularly in the current economic climate, is there a trade-off between promoting a competitive and secure energy supply and one which is environmentally sustainable? Where should the balance lie and what implications does this have for energy sector investments?

The consistency between the different energy and climate policy targets appears to be an increasing and challenging issue for EU policy makers: the simultaneous pursuit of the “3x20 objectives” has failed create a more stable environment for investments in the energy sector. On the contrary, investment choices are now facing an even greater level of uncertainty in Europe.

The indicative scenarios of the Energy Roadmap 2050 do not provide a clear direction to Energy policy in Europe. Too many objectives, sometimes contradictory, are sought at the same time. For instance, renewable energy sources and gas are presented as the two pillars for a low-carbon energy system. But costly and possibly even hardly affordable storage might be needed in the scenarios and policies. Similarly, phasing out nuclear power plants will make it very difficult to meet the CO₂ emission reduction targets if RES roll-out is not industrially or economically sustainable. Nuclear power’s high load factor, low emission profile and low operating costs also have to be seriously considered when it comes to the economic impact of meeting climate objectives. In addition, the Roadmap evaluation of the impact on the energy prices is questionable.

Regarding the implications for the energy sector investments, EDF considers that the EU energy policy makers should promote investments, which will make an efficient contribution to lower CO₂ emissions and to ensure security of supply in the long-run. The role of low carbon power technologies should grow in the long term if the EU CO₂ emission targets are upheld. This should create an opportunity to develop not only renewable energies and energy efficiency solutions, ideally combined with storage energy solutions, but also nuclear power plants, which are producing CO₂-free electricity at competitive price. Additionally, clean fossil-fuels (gas, supercritical coal) technologies when coupled with CCS, should be encouraged as they can contribute to meeting peak demand while reducing their carbon foot-print.
It goes without saying that the economic crisis and a lower demand influence investments in the energy sector. **In the current economic climate, closer attention should be paid to the fact that final prices must remain competitive, especially in the short term, as long as the economic situation in Europe remains sluggish.**

Most European energy companies are ending a period of heavy investment, which lasted ten to fifteen years and weighed on their balance sheets. The European policy framework within which the EIB works will set its parameters but argue that investment perspective in terms of risk and payback and other investment criteria is still the most suitable approach (pas clair). Therefore, finding the right balance between objectives arises from **investing, case by case, in projects that have proved to be economically efficient.** Being highly selective by giving priority to economic efficiency criteria is crucial in times of crisis.

| How does investment in the energy sector contribute to growth and employment? Are investments in all energy sub-sectors equally valuable? And how does investment in the energy sector rank relative to other investments in the economy which support growth and employment? |

The energy sector contributes to economic growth in many ways, as an investor, an employer and an important purchaser of goods and services.

The development of key technologies for the development of complete competitive energy systems and related equipment "made in Europe" should be actively supported. In reverse, the financing of power plants outside the EU by the EIB can be seen as an additional opportunity to indirectly support the export of European energy facilities in those countries.

As a general principle, at EDF, we consider that the development and maintenance of an efficient and secure low-carbon energy infrastructure is key to allow industry growth and maximize employment across all regions of the European Union, providing that cost efficient technologies and investments are given priority.

| What impact do you consider the current economic crisis will have on the energy sector (demand, policies, supply)? |

Investments in the energy sector decided by utilities in Europe might decrease next year and potentially beyond:

- **Energy companies are affected by the weakness of the demand**: consumption fell by 9.2% in 2011 for gas and 1.5% for electricity, according to the Observatory of European energy markets.
- **Looking forward**, the European Directive on Energy Efficiency, passed last September, will, as an example, force operators to reduce the consumption of their customers by 1.5% per year.
- **So far the economic crisis has made** several countries cut their subsidies for renewable energies and **increase taxes on energy**.
- **Bad debt in the supply business** has risen and the number of persons suffering from fuel poverty is constantly increasing.
One after the other, electricity and gas operators have adjusted downwards their ambitions (reduction in investment, asset disposal programs) for next year, affected both by the economic crisis and the regulatory and tax environment. In the short term, lack of resources to invest and renovate existing production tools could force the energy companies to close production capacities in Europe.

Other implications for the future of investments in the energy sector are the increase in regulatory risk.

Nevertheless, despite the instability of the business and the regulatory environment, the power capacity needed should not decrease in the medium term, to the contrary, new investments in many EU regions will be needed for two main reasons:

- improve security of supply in period of peak demand (the need is notably reinforced by the growing integration of renewables into the grids);
- meet the gradual increase in electricity demand.

This should result in the development of two types of complementary power plants: additional base and semi-base load power generation (eg nuclear plants) and flexible power generation to back-up renewable energy sources (e. g. gas and clean coal power plants).

At the same time, massive investment in infrastructures (grid reinforcements and new lines) will be necessary to ensure market integration, to cover the end of isolated markets within the EU and to increase the overall security of supply in Europe.

These developments will thus require massive financial support for the 2014-2020 period. Within this framework EIB’s role is critical, encouraging a resumption of investment in the energy sector from 2014.

**Chapter 4.2 Renewable Energy**

The Bank’s economic justification for supporting emerging renewable energy technologies, whose cost is significantly above that of conventional and mature renewable energy technologies, is that continued investments in these technologies will eventually lead to cost reductions and will ultimately be the least-cost approach to meeting the EU’s renewable energy targets. Do you agree with this approach? Is there an alternative approach to the economic justification of these technologies which you consider more appropriate?

From an economic point of view, the deployment of emerging renewable technologies should gradually lead to decreasing costs. However it appears now that some technologies might need more time than initially expected before reaching parity with conventional generation.

Onshore wind is not far from such a situation. Other technologies are going down a learning curve which can possibly lead to costs equal to conventional generation, but the pace of rolling out should be controlled in order to follow an economically sustainable path. EDF believes that in the long run the main driver of investment should be the carbon price signal and subsidies to operation should
be phased out. Some renewable technologies will be developed in this regulatory framework and will play a significant part in the future power mix.

One of the biggest issues facing renewable low-carbon generation is the level of initial capital costs followed by close to zero or relatively low marginal costs of operation. It would make sense to invest in technologies that reduce this investment gap. Investing in mature technologies implies lower risk levels and will have a more immediate impact on the sector. Immature technologies, not yet ready for large-scale market uptake, should be supported as pilot projects rather than with renewable energy subsidies with extensive scope and costs for taxpayers or power consumers.

As a consequence, EDF recommends EIB to assess carefully the maturity of the technology in question, and choose the measures accordingly.

**What level of investment in RE do you expect in the short and medium term?**

Renewable energy technologies represent a structural choice to reduce CO₂ emissions in Europe in the long-run but at the same time, a rather unpredictable area of investment in Europe.

Support schemes for renewable energy have been the main drivers for investments in recent years and they have led to fast increase in renewable power generation. But as a result market price signals that reflect the demand and availability of supply is now decorrelated from investments. For this reason, in some regions support schemes are leading to overcapacity or to such an increase in variable renewable capacity that power systems are struggling to adapt in a corresponding speed (necessary network investments, lag behind, etc).

According to recent studies the 2020 targets are likely to be met. After 2020 the regulatory framework is uncertain and investment volumes are very difficult to forecast.

In any case EDF is convinced that in order to restore investors’ confidence, support to renewable energy should aim at developing the necessary generation capacities in a cost effective way and at integrating energy from renewables sources in the market.

**Do you agree that there is significant scope for investment in renewable heating and cooling?**

Renewable heating and cooling comprises various technologies such as heat pumps, solar heat, pellets and renewable district heating and cooling. The potential for utilisation of these technologies depends both on the characteristics of the relevant technology, and the current infrastructure and heating and cooling needs. The same cost-effective approach in support policies as in the power sector is relevant.

In any case, additional investments in renewables for heating and cooling should be considered in particular in areas where appropriate resources are available.
Chapter 4.3 Energy Efficiency

What do you think are the main barriers to energy efficiency investments? What might be done to overcome these?

Over the past years, state aids, tax exemptions, and subsidized loans have been widely used among Member States to promote Energy Efficiency, with variable success. EDF wishes to underline that the following principles should be taken into account to get an efficient public support for energy efficiency:

1. **Foster structuring of the EE branch: public support should focus on structuring the highly fragmented sector of energy efficiency in buildings** and promote efficient players to ensure a real level playing field, avoid deadweight effects and have a dynamic competitive market. **This could be done by setting sufficiently high investment floor requirements**, and by allowing big EE programs for households or SMEs to compete.

2. **Be cost-efficient: all projects should be evaluated and ranked in terms of “energy AND CO₂ efficiency” performance** to be sustainable, consistent with the 3x20 objectives, and not distortive between energies. Energy efficiency projects are not always the most cost efficient way to reduce CO₂ emissions, and the total avoided cost of energy is not systematically lower than energy prices.

What role can Energy Service Companies (ESCOs) play in developing energy efficiency investments?

Generally speaking, a competitive EE market already exists for big industrial, services, and trading companies in several countries and ESCOs have shown some ability to structure themselves, with limited State intervention, where demand for energy service was growing. However, in some countries in Europe, the EE sector is not well developed, even for big consumers. In that case, investment banks like EIB should play a role to decrease the entry costs of these new markets.

On the other hand, the sector of energy efficiency in buildings, especially for SMEs and households, is mainly composed by very small companies, whose natural market is too narrow to be really competitive, and with a very complex segmented value chain. In this sector, we are convinced that there are needs to create a real playing field where “ESCOs for small consumers”, which are quite rare today, should be promoted.

Last, we strongly believe that big ESCOs, as players with competence and responsibilities on a growing and profitable market, should get some public support only when really needed, and should be incentivized to maximize the use of their skills, competences and resources and making the most of synergies with other players e.g. energy suppliers.
What is the potential for energy efficiency outside Europe?

The potential for energy efficiency is recognized to be huge by almost all stakeholders. A lot has been done already in several Countries in Europe, and it would certainly be sensible to promote energy efficiency abroad.

Do you consider the criteria used by the Bank to categorise projects as Energy Efficiency projects appropriate (see Annex 1)? What alternative would you propose?

The justification for the “20% savings” requirement used by the Bank is not clear, and probably not sufficient to really be able to rank and select efficiently the projects. We would support a common approach between the criteria used for energy efficiency and the ones used for renewables:

- **Mature EE technologies** are numerous, and usually commercially mature, provided that the EE sector is correctly structured. In these cases, in order to be considered for Bank financing these projects should demonstrate that (criteria 1) the total avoided cost of energy is, on the long-term, comparable to energy prices or less, and that (criteria 2) the total avoided cost of CO₂ is, on the long-term, comparable to CO₂ prices. In order to promote sector structuring, only projects above a sufficiently high cost floor should be eligible (criteria 3).

- **Emerging EE technologies**: in this case projects should show their potential to become economically competitive (criteria 1) and, (criteria 2) the total avoided cost of energy should be below a maximum acceptable cost in € per MWh, and that (criteria 3) the total avoided cost of CO₂ should be below a maximum acceptable cost in € per tCO₂.

- **Highly innovative EE technologies**: these projects should be considered for financing as RDI projects.

Chapter 4.4 Security of Supply

Is the traditional model for electricity transmission and distribution changing? What implications does this have for future investments in electricity networks?

The traditional model of transmission and distribution of electricity in Europe has so far ensured a good balance between supply and demand, avoiding major interruptions in the electricity delivery. This good level of security of supply has been reached thanks to large scale investments made at countries level in the late nineteen sixties and early seventies on the one hand and to a good level of cross-border cooperation between the European TSOs in periods of stress on networks on the other.

This massive investment cycle is long past and the question of the **renewal of the oldest facilities has now to be raised**. New massive investments are required to ensure power supply to the 500 million European consumers at all times of day and night. Investments in energy assets are needed
for asset replacement, not only to maintain or replace existing plants but also to strengthen networks.

At the same time, the EU is facing a gradual changes of paradigm that disrupt the traditional model and make it more risky to manage security of supply during the transition period. The increasing share of renewable energy sources, especially wind and solar, has implications not only for TSOs but for the whole electric system, from generation to distribution. It requires the use of multiple options to increase flexibility within the whole power system.

Altogether a total investment of €200 billion is needed into European networks by 2020. Drivers for electricity networks investments include the need to ensure local and regional stability and balancing, integration of renewables, new use of energy like electrical cars and heat pumps, energy efficiency and demand response. The electrical system is gradually “moving” from customers’ connections towards a multi-dimensional and more complex to manage system with the implementation of smart meters, electric vehicles, distributed generation, etc.

This gradual change of paradigm also points out the need to complete integration of wholesale electricity market at the same time, which has implications for all stakeholders. For example regional balancing markets should be further promoted.

What is the future role of smart grids, offshore grids and energy storage solutions?

Smart grids, offshore grids and energy storage solutions enable the decarbonisation of power systems.

The common challenges for their developments are to:

- meet a controlled costs strategy while related investments have yet to demonstrate their economic relevance;
- maintain the quality and reliability of the electrical system.

Smart energy systems

Smart energy systems might play three main roles in the future:

- Improve system performance for the customer (through electrical system and service quality optimization);
- Contribute to a better integration intermittent renewable energies, both globally and locally, through the activation of new levers of flexibility;
- Improve customers’ satisfaction enabling them to increase the energy efficiency of their facilities through new services, using the information generated by the system, without – if possible - added complexity.

But, for the time being, the development of smart energy systems in Europe has not reached maturity: the cost issue is still at the heart of future developments and there is important
uncertainty concerning the market design(s). In particular, expected shift in users’ behavior that smart energy systems might create are not easy to identify.

In this context, finding the economic optimum of the power system to ensure both performing and cost effective solutions for all is not an easy task. To create the conditions for industrial development at a reasonable cost, many conditions have yet to be filled to help structure the market: international standardization, and pricing and tariffs policy can be seen as two main prerequisites. A more comprehensive understanding of behavioural effects is also necessary. EDF Group is very much involved in advanced pilots in order to better understand those potential behavioural effects.

Energy storage solutions

The electrical storage can smooth out supply and demand, thereby helping to keep the system balanced. To do so, it performs various functions:

- a postponement of low energy demand periods (off-peak) to more consistent ones (peak);
- a participation in the service system;
- a contribution to lift constraints on electrical networks (transit, high voltage).

But storage also plays a complementary or alternative cost-efficient role to other functions, such as:

- increasing flexibility of conventional generation plants;
- strengthening networks;
- developing demand-side management.

In the future, there will be a growing need for extensive energy storage capacities in order to manage the effects of intermittency caused by the increasing integration of renewables.

To face these issues, EDF is convinced of the necessity of helping to invest on hydro-pumped storage accordingly. As a matter of fact, hydro-pumped storage is:

- the only mass electrical storage means;
- the only mature storage technology;
- it offers a wide range of services (energy transfer, setting primary and secondary frequency tertiary reserve, high reactivity, black start...) that could prove to be particularly helpful to reinforce security of supply by 2020.

Other electrical storage solutions, still at an early-development stage, will not be able to play a significant role before 2020.
Chapter 4.5 Fossil Fuel

**Gas is an important bridging fuel source in the transition to a low carbon economy: to what extent and under what conditions should gas-fired generation be supported?**

EDF does not approve any specific support for gas-fired generation but believes that energy policy framework should allow all power generation technologies to compete in the market. At the same time, the emissions trading should be used as the main instrument to reduce carbon dioxide emissions and in the long run should drive generation investment.

**What role will coal and lignite fired generation have in the EU power system in the medium term, with or without CCS, and how is this consistent with the EU’s Climate Action goals and its security of supply objectives?**

Substitution of old, less efficient coal-fired power stations with newer and more efficient ones can be, in some specific cases, a step towards reaching the climate goals. New Best Available Technology (BAT) coal and lignite fired generation can produce environmental benefits when replacing old and inefficient generation capacity with obsolete technologies or of very low efficiency, and can guarantee as well security of supply. Using BAT such as super-critical coal technology could reduce CO$_2$ emissions by 22% and air pollutants too (at least Sox and dust emissions reduced by 5 and NOx by half).

Nevertheless, all projects to replace oldest coal-fired plants with clean-coal technologies will have to be fully Carbon Capture Ready to fit with the climate goals. CCS readiness may contribute to increase the environmental performance of these generation units once CCS technologies will be commercially available.

**What is the scope for the development of shale gas resources in the EU?**

According to the study published on the European Commission’s website, “Unconventional Gas: Potential Energy Markets impacts in the European Union” (European Commission, JRC, 2012)”$^1$ the best estimate for Western Europe is 12 Tcm and for Eastern Europe it is 4 Tcm”. Other reports estimate that the amount of recoverable shale gas in Europe might be slightly higher (up to 17,7 Tcm) while others insist on the fact that commercially recoverable volumes might not be more than 4,4 Tcm. In fact, no one report is viewed as a definitive reference source and most of the reports reviewed contain sufficient caveats to acknowledge that the estimates provided are liable to change.

Combined with new restrictive environmental regulation that might be decided in different countries, the scope for the development of shale gas is very difficult to estimate for the time being.

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What would be the best approach to increase security of gas supply and reduce import dependency?

Fostering relations with multiple suppliers, both within and outside Europe is key to reduce overall European import dependency and put pressure on supply prices. Similarly, security of gas supply requires investments in midstream infrastructures (pipelines, LNG terminals and storages) to guarantee the availability of sufficient supplies during any period of the year and in every part of Europe, even in case of disruption on one of the supply routes.

Chapter 4.6 Nuclear

What role do you expect nuclear power to play in the European energy market?

Nuclear energy currently generates approximately one third of the overall electricity consumed in the EU and two thirds of its low-carbon electricity.

It is perceived mainly as stable and reliable baseload securing electricity supply in a competitive and CO₂ free way.

It provides security against interruption of fossil fuel supplies or price hikes and offers reliable baseload electricity as a complement to intermittent renewables.

It contributes significantly to alleviating the risks related to growing external dependency on imported fossil fuels. With its high availability and geo-politically stable fuel supply, nuclear remains a significant contributor to energy security and diversity. It provides security against interruption of fossil fuel supplies or price hikes and offers reliable baseload electricity as a complement to intermittent renewables.

The nuclear energy industry plays also an important role in the European economy and its global competitiveness. In Europe the industry currently employs around 500,000 people, including those in the associated supply chain. These are mostly highly qualified people covering a broad range of technical skills such as engineers, physicists, IT and safety specialists. European companies are world leaders in nuclear fuel fabrication, enrichment, reprocessing and waste management, as well as leaders in nuclear component manufacturing.

In the future, nuclear energy shows potential to reduce emissions and dependence on fossil fuels, and therefore, should be a major contributor to the European energy mix in 2020. Despite the accident at the Fukushima Daiichi plant in Japan, the number of nuclear power reactors under construction worldwide is still higher now than across the last two decades. France, Finland, the UK and Sweden have all reaffirmed their commitment to nuclear power, while Poland, Romania and the Czech Republic are also planning to push ahead with new units, following increased safety assessments. Those countries plan to decarbonise their economies by relying also on nuclear in their
future national energy mixes. Projects for new installed nuclear capacity in EU countries point to investment needs in excess of EUR 100 billion over the period to 2030.

Decarbonising the European economy without nuclear would significantly increase total costs and jeopardise the security of energy supply. Significant further decrease in nuclear capacity is likely to lead to increase in CO₂ emissions at least in the short term. This can be observed in Germany: data of AG Energiebilanzen shows, that lignite consumption increased by 5.9% and hard coal by 3.2% while gas demand decreased by 1.6% when comparing the first three quarters of 2012 to the first three quarters of 2011).

As nuclear power stations are ageing, should their life be extended (where possible) or should they be replaced with other generation sources?

The extension of a lifetime of a nuclear power plant should be assessed case by case. Firstly, all nuclear power plants have to meet enhanced safety requirements decided upon by national regulators. If they are met, it should be up to the power plant operator to estimate whether it is economical to extend the lifetime of a nuclear power plant. Whether nuclear units are replaced by other energy sources depends on the business case drawn by its operator, the national energy policy and available options for nuclear power, taking into account their costs, security of supply and emissions.

The extensions of operating life times (between 50 and 60 years) - after careful assessments both of safety and economics - will require modernisation programmes with important replacement and/or safety related investments, but will be a very efficient contributor to the low carbon economy targets agreed in the EU.

What will be the impact on electricity generation and climate action of the reconsideration of nuclear policies within EU member states, in particular after the Fukushima accident?

Currently, nuclear is providing a very significant and stable base load securing electricity supply at European level. Part of the 14 Member States (out of 27) which have nuclear power plants are continuing their commitment on nuclear energy either by extending the lifetimes of the power plants or building new ones, or both.

In this context, any reconsideration of nuclear policies within EU member States would have a direct impact on the electricity prices and thus, the overall contribution of the energy sector to the European competitiveness. Furthermore it might threaten the compliance with the emissions reduction targets of the EU and has disruptive effects on interconnected power markets across Europe.
Chapter 4.7 RDI

Which are the key innovative energy technologies under development? The development of which key innovative low-carbon energy technologies should receive most financial support?

EDF supports the exploration and development of all technologies that will enable in the medium-term to reduce CO₂ footprint at acceptable cost to the community:

- **Renewables technologies** and associated technologies. The objectives that are to be taken into account for future financing in this domain are:
  - identify technological breakthroughs in high-stakes competitive on different renewable energy (hydro, solar, wind onshore and offshore, solar thermal, biomass, marine energy, geothermal);
  - bring out industrially the most promising solutions.

- **Energy Efficiency related technologies and innovations**:
  - innovation related to more efficient buildings and innovation on new uses for electricity (electric mobility, heat pump);
  - integration of new information technologies and networks in the home, enabling customers to manage their energy flow;
  - Studies and experiments on direct and indirect behavioral effects related to innovative EE practices.

- **Smartgrids and smart cities**, enabling optimized networks management and a greater role for customers in their consumption. Pilots, involving EDF Group at European level, are ongoing to determine what could be the best solutions in this regard. They should continue to be supported. These innovations are vectors for industrial development and should also be accompanied by a commitment to the European and international standardization.

- **Nuclear technologies**: Gen 3 (extension of the life-cycle, enhanced security) but also Small Modular Reactor and nuclear Gen 4. In this regard, we can mention the recently launched European R&D initiative “NUGENIA²”. This will work as an open platform for the creation of projects aiming to improve the safety, reliability and efficiency of the operation of nuclear power plants. This platform will facilitate cooperation between its members for the applied R & D in particular within the European community of nuclear energy.

- **Storage technologies**, which will play an important role in the control of emissions of greenhouse gases of the electrical system: they are not yet economically viable and require significant research efforts.

- **Electro-mobility**: the European Union has undertaken to cut CO₂ emissions in order to help combat climate change. One aspect of this is expanding the use of electric and hybrid vehicles. Experiments and achievements in the field of electro-mobility are already at an advanced stage in Europe but a number of additional steps are still needed. They should continue to be supported appropriately by the EIB in the future.

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² NUGENIA regroups 56 members of 18 European countries, of which 9 utilities and 32 R&D centres and universities. EDF is member of NUGENIA.
• Clean-coal fossil fuel related technologies:
  o BAT, such as super-critical coal technology, in order to further improve their performance (increase the flexibility of GCC, increase their life or reduce maintenance and reduce their start time...)
  o Carbon capture and storage (CCS) which could potentially reduce the dependence on coal and gas. All of the decarbonisation scenarios suggest that climate change mitigation leaves no room for many additional high-emitting power plants that do not use CCS technology. This technology is still at a nascent stage with few demonstration projects having been implemented.

Which barrier(s) are hindering the deployment of innovative, low-carbon energy technologies most significantly?

Innovation is not incentivised which is one great barrier for investing for long term needs: as a matter of fact, investment in low carbon technologies must be supported continuously in time, avoiding “stop-and-go” effects, since their initial stage to the stage of commercial development.

Risk sharing is also a key element in bringing promising and strategically non-mature technologies like smart grids or CCS to the commercial stage.

Should financial support be spread across a large number of small research projects or be selective and concentrated on a few promising large research projects?

The meaningful size of financial support should depend on the technology in question and its level of maturity. While deployment of some technologies can be encouraged through small-scale projects, there are also technologies that require large research projects. Similarly, for a little mature technology, support for R & D is more effective than support for industrialization.

However, in most of the cases, the proposed funding should represent a significant amount as transaction costs for funding are high in general.
Chapter 4.8 EIB external and Cotonou mandates

EDF understands that around 20% of all EIB energy investments are external to EU. Our group is involved in many different projects outside the EU, either in its immediate periphery (Russia, Caucasus, Middle East, North Africa...) or beyond (South East Asia, China, Latin America, Central and Southern Africa...).

In this respect, it is important for our Group to keep the possibility of applying for the EIB’s support to its investment projects in these countries in the future.