European Investment Bank  
FAO: Adrian Aupperle (Communication Department)  
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L-2950  
Luxembourg  

31 December 2012  

Dear Mr. Aupperle  

The European Investment Bank reviews its Energy Sector Lending Policy - Call for public views  

EDF Energy is one of the UK’s largest energy companies with activities throughout the energy chain. Our interests include nuclear, coal and gas-fired electricity generation, renewables, and energy supply to end users. We have over five million electricity and gas customer accounts in the UK, including residential and business users. Our comments reflect the market situation in the UK only.

The European Investment Bank should facilitate the implementation of measures that help meet EU energy policy targets. In particular, the lending policy of the EIB should support the achievement of the CO2 reduction targets. The EIB’s policy should be neutral towards any one individual technology, since this avoids distorting the market by supporting one type of low carbon resource more than other types, and minimises the risk of supporting a fundamentally uneconomic technology. We would suggest a focus on generating assets rather than transmission or interconnector assets, as the latter are more likely to secure funds under their price controls.

It would have been interesting to see the EIB’s risk mandate elaborated in the consultation, particularly to know what type and value of risk the bank is willing to take. Furthermore, with low carbon technologies having high initial capital costs and low operating costs not linked to volatile fossil fuel prices, we would prefer more detail on how the EIB proposes to take on the new analytical challenges entailed by such projects.

We believe that nuclear power has a compelling investment case that is consistent with both national and European energy objectives. Nuclear power will have an important role in the UK’s generation mix in respect of both proposed and existing plant. Existing nuclear plant is essential to help bridge the gap created by the decommissioning of existing fossil fuel plants.
Our detailed responses are set out in the attachment to this letter. Should you wish to discuss any of the issues raised in our response or have any queries, please contact Nigel Edwards on +44(0)20 3126 2506, or myself.

I confirm that this letter and its attachment may be published on EIB’s website.

Yours sincerely,

Denis Linford
Corporate Policy and Regulation Director
Attachment

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 question asks if there is a trade-off between possibly competing energy policy objectives. The premise would be true if spending on measures to lower carbon emissions were not wealth creating activities in themselves.

We note that

- A competitive energy supply will provide energy at least cost within the limits of any technology mix, however that is configured.
- Security of supply is a multi-dimensional concept and therefore difficult to pin down from a policy perspective. Using low-carbon generation technologies will reduce geo-political risk traditionally associated with fossil fuel dependency, but may (depending on the technology chosen) simply exchange that risk for risks associated with wind, solar and precipitation intermittency.
- Projects to create environmentally sustainable assets often do not have a fixed cost profile. Innovation can and has reduced costs through the development cycle.

We would argue that investment in the energy system in itself will have a positive impact on the economy (as we will demonstrate below).

Finally, we note that the case for energy investment has been made by the European Commission, IEA and member state Governments, with the IEA World Energy Outlook estimating a required European spend of €1 trillion up to 2020.

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?

We believe the development and maintenance of an efficient and secure low-carbon energy infrastructure is key to allowing industry in general to grow and to maximise employment across all regions of the European Union. Investors will not be attracted to regions where availability of energy is uncertain, uneconomic or produced with a high carbon footprint. In the development of nuclear power in the UK, EDF Energy has undertaken a series of investments that are indicative of the positive benefits in investing in nuclear energy for one plant in the West of England:
• We have announced investment of £1.5 million in a Construction Skills Training Centre (which will deliver more than 1,200 training places) and £3 million in an Energy Skills Centre, in Bridgwater Somerset.

• There is further investment of £1.6 million in West Somerset Community College. It includes training in enterprise skills and how to run a successful business, so that people will be prepared for the opportunities arising from Hinkley Point C.

• We are also in the process of expanding our £3.5 million Nuclear Academy at Barnwood in Gloucestershire, which currently helps train some 2,500 employees each year.

• Separately, we are also investing £15 million to establish a world class training centre for our industry in partnership with Bridgwater College.

• In the current difficult economic climate, we want to bring as many people as possible into work within this project. So, working with Government agencies, we have set up an employment brokerage scheme, to be the main access point into construction jobs on site.

• We are also leading the way for our industry through our Access to Apprenticeships initiative, which has been designed to help those who are not formally qualified for full apprenticeships to gain recognised skills. It builds upon EDF Energy’s already successful apprenticeship scheme, which currently has 250 participants.

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

From the UK perspective, energy demand has been depressed and it may not be until 2015 that the UK will match its 2005 consumption.

Furthermore, bad debt in the supply business has risen and the numbers in fuel poverty have increased\(^1\) from 2.8 Million in 2007, to over 3.5 million households – though this has reduced slightly from its peak in 2009.

At the same time investment in energy assets is needed, not only to meet environmental considerations but also to replace the assets arising from the large scale investments made in the late nineteen sixties and early seventies.

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?

By using this approach, the bank simply chooses a strategic direction which favours high-risk investments. It potentially introduces the problem of moral hazard into the decision making process, as the policy could induce investments that economically should not have been made. Furthermore, this approach creates little pressure for cost reduction, if the loan terms are too generous.

At the same time, investment in mature technologies carries less risk and will have a more immediate impact on the sector. One of the biggest issues facing renewable low-carbon generation is the high initial capital costs followed by close to zero marginal costs of operation. It would make sense to invest in technologies that reduce this investment hurdle.

What evidence is there that the cost of emerging renewable technology is falling?

No comment

What level of investment in RE do you expect in the short and medium term? What are the barriers to investment in renewable energy outside Europe? How might these be overcome?

No Comment

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

Yes, there is significant scope for investment in renewable heating and cooling. For example in the UK context, we believe that an increased emphasis on renewable heat, with a corresponding reduction in the emphasis on renewable electricity, provides an opportunity to deliver the UK’s climate change target more cost effectively. Our analysis shows that technologies such as heat pumps can compete on a £/MWh of renewable energy cost basis with offshore wind farms. We also believe that the opportunities to reduce the costs of renewable and low-carbon heat technologies through wide-spread deployment of scalable technologies, such as heat pumps, are much greater than those that still exist for offshore wind. This sets an important benchmark in harnessing the UK energy industry’s efforts and implementing policy to achieve the UK renewable energy targets.

What are the barriers to investments in this sector and how might these be overcome?
The key barrier is the significantly higher initial capital costs of such solutions, as compared with alternative fossil fuel solutions. Low cost finance reflecting the wider benefits would also be helpful in lowering this barrier. Consideration should also be given to any opportunities for European countries to mirror the approach taken by the UK Government in establishing the Renewable Heat Incentive for both the domestic and non-domestic sectors.

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

We believe the main barriers are the high initial capital costs and lack of senior leadership engagement in companies to maximise the beneficial outcomes that can be gained through energy efficiency investments. A credible carbon price will have a positive impact on investment in energy efficiency upgrades.

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

ESCOs can help remove barriers to energy efficiency investments by providing clear business cases to enable industry to take forward the optimum solutions. Therefore market solutions should be encouraged and incentivised to enable such organisations to become established.

**What is the potential for energy efficiency outside Europe?**

No comment

**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% requirement is not clear. It would seem more reasonable for the outcome of any actions to be reviewed on a case-by-case basis. We recommend that this is set as a guideline for the level of impact that would be deemed appropriate for any investment to demonstrate.

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

Low carbon transition entails an increase in Renewable Energy Sources (RES) of generation connected to the transmission system, especially in Scotland. It also entails the decarbonisation through electrification of, by 2030, the majority of our domestic heating and personal transport.
Both these changes come with significant challenges for the electricity industry at both HV (“transmission”) and LV (“distribution”) network level.

The accommodation of extra RES in Scotland is being addressed in two ways so far:

1. Through a range of upgrades, including a new 400 km sub-sea north-south 2,000MW HVDC link, to enable more power to flow to England and Wales;

2. Through a new licence condition, ensuring that, where National Grid (NG) has to temporarily limit the output of generators in places like Scotland, the compensation price specified by the generator is not excessive.

However, there is a third change we would also like to see. Currently, the maximum flow allowed on each overhead line in Scotland is fixed for each season of the year, and is set assuming there is no wind. The lines can carry up to 100% more power when it is windy due to enhanced cooling, but NG’s systems do not take account of this in Scotland. This technical inflexibility means wind farms have been instructed not to generate, and so are compensated, on occasions when this constraint should not be necessary. This is achievable, as NG has introduced the correct technique for calculating maximum flows on key circuits in England, where it owns the transmission system as well as operating it.

In respect of low voltage distribution networks (DNs), there are some less tractable issues. The electrification of home heating and transport will cause domestic demand to grow very significantly. The high voltage National Grid should, broadly speaking, be able to cope with this. However, the parts of the DNs networks that are closest to homes are already nearly fully loaded. If the new demand develops without further intervention, it will tend to peak at the same time as existing demand peaks, and street cables in the affected area will fail, since street cables lack remote monitoring and protection against sustained overload (unlike Transmission assets). Consequent repairs can take 10 days before service is resumed.

DNs need to move from being passively-operated networks. The cost of upgrading the DNs to cope with the increase in peak demand would be approximately £80bn, and this is not currently allowed for by regulators. In addition, there are physical limits to how quickly the work could be completed. We believe that domestic demand side response (DSR), involving as much demand as possible being time-shifted to times of lower demand, is vital to avoid or defer this reinforcement; but there are some clear barriers to the development of this.

Demand Side Response:

Smart Meters

Smart meters are an absolutely vital enabler to the development of demand side response, as they inform individual consumers, and potentially their appliances, of what unit price is
payable at each time of day – and meter their consumption by half hour. If they choose a tariff that varies by time of day, for instance as part of the decision process in buying an electric car, they are likely to try to make sure they take power at the cheapest times of day.

**Heat Pumps and DSR**

Heat pumps are often retrofitted to a home that already has a central heating boiler, which the heat pump replaces. In a conventional boiler system, the radiators were sized to keep the home just warm on the coldest days, when water was provided at 80 degrees from the central heating boiler. When they are fed with water at 55 degrees from a heat pump, they need to be doubled in size to keep the home warm in similar cold conditions. This upgrading has not been normal practice, and so in a significant proportion of actual installations, to maintain temperature in cold weather, homeowners will turn on a 3 kW element booster to increase the water temperature, thereby creating significant decreased demand on the coldest days.

There is a policy measure to ensure new homes are “heat-pump-ready”, by mandating that any new home embody a network of plastic pipes in its concrete floor to facilitate later economical fitting of a heat pump. A concrete floor heating system gives an excellent transfer of heat into the home, even if the floor surface is carpeted, and also good heat storage, meaning that the heat pump could be shut down over the peak.

**Wet Appliances**

Washing machines and dishwashers are in theory ideal for demand side response. However, currently if their power supply is interrupted during operation, they will not usually re-start when their power is re-established, without another press on the start button.

A solution is to build a Home Area Network (HAN) receiver module into the appliance, so that it can be programmed to run against cheap prices (established by the Smart Meter communicating with the HAN) without manual intervention. Manufacturers say the cost should be small – from one to five pounds per appliance. Mandation via EU eco-appliance standards of a HAN receiver in washing machines and dishwashers could seem warranted as a policy measure.

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

No comment

**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 Energy believes that gas-fired generation has a number of strengths and that it will play a reduced, but nevertheless important role, in a diverse energy mix as part of the trajectory towards a decarbonised power sector in the 2030s.

Gas-fired generation is a proven technology, is well understood by developers and has an established and secure global supply chain for the plant. It has the advantage of a fast build time of around 2½ years once consents have been obtained. Development consents in the UK exist for approximately 15GW of new Combined Cycle Gas Turbines (CCGTs), which could be taken forward at relatively short notice if the need for this capacity materialises. However, we believe that the best way for the UK and Europe to ensure maximum delivery of low-carbon generation is to remove, as far as is possible, the need for new CCGT plant beyond that which is already planned.

Gas-fired generation also benefits from a well developed wholesale gas market in the UK, supported by adequate import infrastructure and short-term gas storage facilities. We believe that gas-fired generation can play a role in providing the reliable and flexible generation required to meet peak demand. It will also help balance, in the short to medium term, the increasing amounts of intermittent renewable generation envisaged for the electricity system, as other balancing technologies such as significant electricity storage may continue to be developed for the long-term.

While hydrocarbon gas generation has lower CO₂ emissions (circa 40%) than coal-fired generation (essentially pure carbon), it is important to note that gas generation, unless fitted with carbon capture and storage, still remains a significant source of carbon emissions in its own right. We believe it will also be important to consider the carbon footprint of long distance gas transportation systems, including Liquefied Natural Gas (LNG) and long-distance pipelines. For the UK, this could be significant in some cases, as its supply starts to move increasingly away from UK Continental Shelf supply to a greater reliance on imported gas. Another frequently discussed potential weakness from importing more gas is exposure to greater short-term price volatility, long-term price uncertainty and supply insecurity as global demand continues to increase.

**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?**

No Comment

**What will be the role of local coal supplies as input for highly efficient CHPs?**

Irrespective of the thermal or energy efficiency of any CHP plant, burning coal will to emit significant CO₂ unless there is also an efficient CCS unit attached.
What evaluation criteria should the Bank use to assess the economic, environmental and financial viability of coal and lignite fired generation?

No Comment

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

No comment

Do you expect the share of natural gas in EU primary energy consumption to grow further?

In lieu of access to primary data, EDF Energy has conducted a comprehensive review of the available literature on shale gas and other unconventional gas resources. However, 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.

The literature suggests that the shale gas volumes in place in the UK are substantial, up to 5 trillion cubic metres (tcm)\(^i\). However, estimates of technically recoverable reserves range between 150 billion cubic metres (bcm)\(^ii\) and 570 bcm\(^iii\), and this represents 2-7 years of UK gas demand in 2011\(^iv\). As annual production volumes are likely to be small (Pöyry forecasts a maximum 4 bcm per annum\(^v\)), the UK will still need to import around three quarters of its forecast gas demand by 2030\(^vi\).

The estimates for the amount of shale gas in Europe are also very uncertain, ranging from 16 tcm\(^vii\) to 157 tcm\(^viii\). Within this, technically recoverable gas is estimated at around 3.8 tcm\(^ix\) to 17.7 tcm\(^x\), and commercially recoverable volumes up to 4.4\(^xi\) tcm. In the most optimistic scenario, shale gas will offset the decline in EU domestic gas production, still leaving a need to import at least 60 per cent of gas demand by 2030\(^xii\). This is likely to come from Norway and Russia, or by diverting LNG cargoes away from Asia.

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

While shale gas may make a contribution towards the EU’s energy needs, the region is forecast to be dependent on imports of gas for at least 60% of its demand by 2030\(^xiii\). Global conditions will therefore continue to influence regional market prices. Gas prices currently remain strong despite weak gas and power demand as a result of the world recession.

Given the large uncertainty on future gas demand, what is the risk that investment in natural gas infrastructure may be stranded?
Gas also plays a significant role in heating, with 81% of home heating in the UK fuelled by this source. Therefore, there is some degree of certainty in demand for gas in the medium term.

However, further investment in any unabated gas generation plant (whether fuelled by conventional or shale gas), beyond the minimum that is required to bridge the gap to the transition to low-carbon technologies, would introduce significant challenges in meeting the UK’s legally-binding climate change objectives (as set out in the Climate Change Act 2008). This is because, while gas-fired generation has lower CO₂ emissions than old coal fired generation, without carbon capture and storage (CCS) it is still a significant source of carbon emissions in its own right.

The Government’s commitment to move to a low-carbon economy is likely to mean that fossil fuel plant such as CCGTs will in the future operate at lower load factors than historically has been the case. This is likely to lead to increased revenue uncertainty, which could lead to under-investment and lower levels of reliable capacity. Therefore, we welcome the UK’s Government’s proposal to introduce a capacity market to help address security of supply concerns.

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

We expect nuclear power to continue to play a central role in the European energy market. Over 25% of the electricity produced in the European Union is generated by nuclear power, and 14 out of 27 member states currently make use of nuclear power for electricity generation. Nuclear power is essential within the electricity generation mix if Europe is to meet its obligations to reduce carbon dioxide emissions.

The UK has a legally binding greenhouse gas emissions reduction target of 80% by 2050 vs. 1990. The UK Government has adopted the 4th carbon budget – a legally binding target of 50% reduction by period 2023-27. It is anticipated that around 40% of UK generating assets are expected to close by 2025, meaning that large amounts of new capacity are required. Figure 1 shows how quickly generation will be decommissioned. Investment required is in the order of £110bn.

**Figure 1 Existing and under construction capacity in the UK GW**
Nuclear generation has a number of advantages as a technology:

- Nuclear power is a low carbon technology, with full lifecycle emissions per kWh comparable to or lower than wind, and significantly lower than photovoltaic.
- Recent studies for the UK Department of Energy and Climate Change have confirmed that nuclear is amongst the cheapest low-carbon technologies, along with onshore wind (P6 Power electricity generation costs update to DECC, Jul 2011)
- European companies have over 50 years of building and operating nuclear power stations, and have a proven capability to decommission nuclear facilities.
- Compared with onshore wind generation, the requirements for land use per MW of capacity are modest.
- Nuclear power is able to provide baseload generation reliably, and can also be designed to provide load following capability if required.

Nuclear power can provide secure, stable and reliable electricity, enhancing security of supply. When compared with other fuels and energy policy objectives including security of supply, nuclear power is reliable at peak times and has a high degree of both price and volume certainty. There are no significant issues associated with sourcing nuclear fuel when compared with the geo-political issues associated with oil and gas, for example (see figure 2)
Low-carbon nuclear generation can make a substantial contribution to reducing Europe’s dependence on fossil fuels for energy.

**Figure 2 Benefits of nuclear power compared with other technologies**

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<td>• Supply from politically stable countries • Stockholding (years) at stations</td>
<td>• Partly indigenous supply • Stockholding (months) at stations</td>
<td>• Long-term price uncertainty • Reliance on imports, some from less stable countries • Limited (days) storage nationally</td>
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Source EDF Energy

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

In general existing nuclear power station assets should continue to be run as long as it is safe and economic to do so. This means that the operator must be able to demonstrate to the satisfaction of the regulatory authorities that the power station is compliant with applicable safety standards and environmental regulations. Given the high capital costs (which are already sunk and largely amortised) and relatively low operating costs compared with fossil-fired alternatives, it generally makes economic sense to continue to operate nuclear power stations as long as possible. However, there must still be regard to the availability of fuel manufacturing facilities, and for spent fuel and radioactive waste storage and disposal.

Figure 3 illustrates the relationship between carbon intensity and generation mix in the UK, including a possible scenario looking forward to 2030. Existing nuclear still has a significant role to play in the UK’s energy mix to the extent that we will not be able to meet our targets without it. When the existing power stations do reach the end of their economic lives, i.e. when it would be uneconomic to continue to operate the plant because of rising costs to replace key components, then alternative low carbon generation sources will be needed if the UK is to meet its carbon reduction targets.
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?

In the UK, the Government has made a considered response following the catastrophe at Fukushima. Detailed consideration of the events at Fukushima and learning points for the UK have been made by the Chief Inspector for Nuclear Installations, and are set out in a report published in September 2011 by the Office for Nuclear Regulation. This concluded that existing power stations can continue to operate, and that the siting policy for new power stations did not need to change. A number of actions have been taken by the nuclear power station operators in order to provide greater resilience to extreme events.
Annual investments amounting to around £300m are also planned by EDF Energy in respect of its UK fleet.

UK Government policy on energy infrastructure, including nuclear, is set out in National Policy Statements that were designated in July 2011. The need for new generating capacity is set out, and nuclear power is free to contribute as much as possible to the need for new non-renewable capacity.

The Government has not changed its policy on nuclear power as a result of the events at Fukushima, and public opinion remains favourably inclined towards nuclear power as part of a balanced mix of electricity generating technologies.

While a small number of member states in the EU that currently use nuclear power have decided to accelerate the phase out of nuclear power, the application of so-called “stress tests” across all EU nuclear power plants did not lead to a requirement for closure of any reactors. The majority of member states have not changed their policies in respect of nuclear power, and a number of member states are continuing to look at building new nuclear power stations.

The greatest impact in terms of loss of nuclear generating capacity arises in Germany, which decided to close its oldest nuclear power stations shortly after the events at Fukushima, and to phase out the remaining units by 2022. This is likely to have long-term and far-reaching consequences, which at this stage are difficult to forecast in detail. However, it is likely that the cost of providing alternative low carbon generation will be high, that substantial investment in grid reinforcement will be needed, and that new fossil-fired capacity will be needed.

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

No comment

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

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?

No comment
In a developing market context, where should the balance lie between meeting local energy needs at least cost and reducing global greenhouse gas emissions – the trade-off between affordable energy for all and sustainable energy for all?

No comment

What should be the role of the EIB in promoting new technology and helping to transfer existing technologies to new markets?

No comment

Where can sources of low-cost finance be more effectively used by the private sector to develop energy projects?

No comment

What are the main barriers to developing sustainable energy sources in developing markets?

No Comment

EDF Energy
December 2012

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i British Geological Survey, The Unconventional Hydrocarbon Resources of Britain’s Onshore Basins, Shale Gas, 2011

ii EIA, World Shale Gas Resources: An Initial Assessment of 14 Regions Outside the United States, April 2011

iii BP Statistical Review of the World 2012 states 2011 UK gas consumption at 80.2 bcm

iv Pöyry, The Impact of Unconventional Gas on Europe, June 2011

v IHS CERA, Breaking with Convention, 2011

vi EIA - World Shale Gas Resources: An Initial Assessment of 14 Regions Outside the United States, April 2011

vii IHS CERA, Breaking with Convention, 2011

viii Wood Mackenzie total unconventional resource

ix EIA, World Shale Gas Resources: An Initial Assessment of 14 Regions Outside the United States, April 2011

x IHS CERA, Breaking with Convention, 2011

xi Ibid.

xii IHS CERA, Breaking with Convention, 2011