



## Re-assessing Costs in the European Power Sector

July 2013

The rise in non-conventional energy production in the United States along with the need to rebuild Europe's economy has led to a new focus and narrative for energy policy, with the rise of the mantra on the need for 'competitiveness'. In a speech in May, entitled, "EU Energy Policy Beyond 2014", Commissioner Günther Oettinger, mentioned competitiveness, affordable or costs effective, nine times, compared to 4 times for secure or security or 4 times for climate or energy<sup>1</sup>.

The renewed call for a more competitive energy sector is being taken by some, including the Industry Commissioner Antonio Tajani, that new climate targets should not be set until the financial crisis is over,<sup>2</sup> and that expanding its climate goals "*would mean higher costs for European businesses and they would be forced to leave Europe.*"<sup>3</sup> While this remains a minority view, the growing exasperation with the current economic situation and the drive for austerity, does mean that greater attention has been placed on government energy expenditures and support schemes.

However, not all the costs that society has to bare from the use of particular energy sources are included in the final price to consumers. Those that are not included are either subsidies, where the state pays the costs, or externalities, in which the costs are spread across wider society or in the case of those relating to environmental damage maybe remain unpaid by the current energy users. Moreover the EU is at investment crossroads as up to two thirds of the existing power plants will need to be replaced in the coming decades. It needs to strike a balance between ensuring that these investment costs happen while guaranteeing affordable costs for consumers. Therefore, the easiest solution to bring down costs, especially for European business and consumers, is to drastically increase efficiency and produce the remaining needs from renewables.

The scope of this paper is to provide background for an open and transparent discussion of the cost trends for different power technologies and their associated environmental or social externalities. This is needed at the current time, since Heads of Government concluded at their meeting in May that "*the revision of state aid rules to allow for targeted interventions to facilitate energy and environment investment, **should ensure a level playing field***"<sup>4</sup>.

This paper illustrates the **absence** of a level playing field between different power technologies.

### Changing technology or capital costs:

In most cases as technologies mature their costs fall. This is clearly demonstrated, in recent years in the renewable sector. According to Bloomberg New Energy Finance, the module price for PV has fallen 80% since 2008, while wind turbine prices have fallen by 29% in the same period<sup>5</sup>. On the other hand actual and forecasted construction costs for nuclear power, in Europe have

<sup>1</sup> Günther Oettinger, "EU Energy Policy Beyond 2014", 17<sup>th</sup> May 2013,

<sup>2</sup> European Voice, "Commission floats 2030 targets on emissions and renewable energy", 4<sup>th</sup> April 2013

<sup>3</sup> Deutsche Welle, "Will the EU roll back renewables to cut energy costs", 22 May 2013

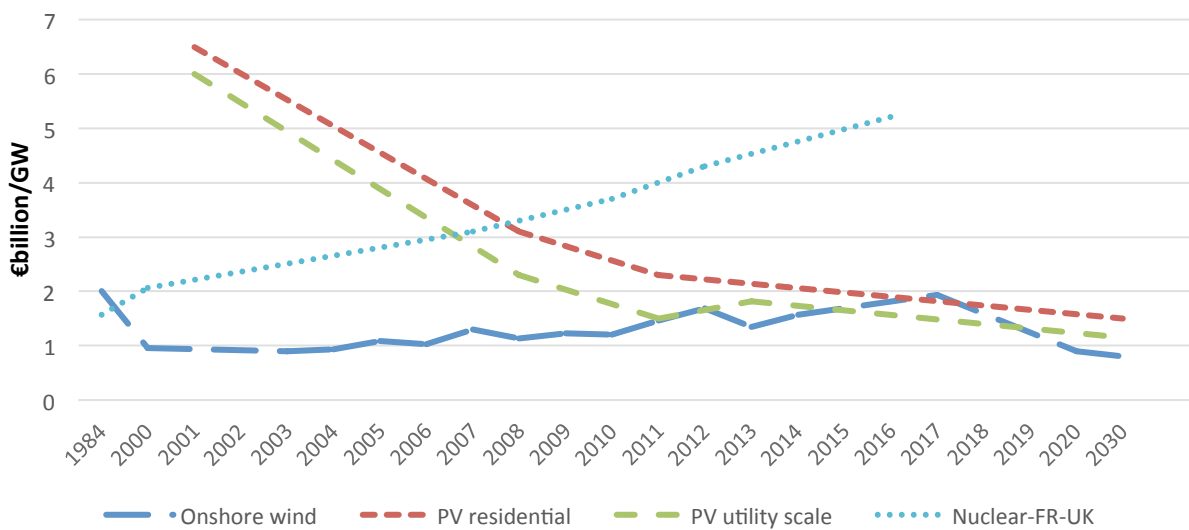
<sup>4</sup> EUCO 75/13, European Council Conclusions, 22 May 2013, paragraph 5c)

<sup>5</sup> Michael Liebrich, "Bloomberg New Energy Finance Summit", 23 April 2013

continued to rise. The three major nuclear construction projects in the EU are all experiencing delays and cost over-runs. The construction at Mochovce in Slovakia restarted on 3 December 2008. At the time the completion was expected to cost €2.8 billion with commercial operation to commence in 2012 and 2013<sup>6</sup>. However, it is now expected that they will be completed in 2014 and 2015, at revised costs of €3.8 billion<sup>7</sup>. While the European Pressurised Water Reactor (EPR) under construction in Finland at Olkiluoto, is now over six years later and an estimated current construction cost of €8 billion. While a similar reactor at Flamanville in France is now four years late with an expected cost of €8.5 billion<sup>89</sup>. Figure 1 shows the changing capital costs for nuclear, solar and wind in Europe.

**Therefore, while the technology costs for renewable energy power continue to fall, leading to lower electricity production costs, the costs of nuclear are only increasing.**

Figure 1: Changing Capital Costs for Nuclear and Renewable Energy in Europe (€billion/GW)



Sources: BNEF, Pure Power III, EPIA, EIC<sup>10</sup>

**Comparison of costs for environmental externalities and support schemes:**

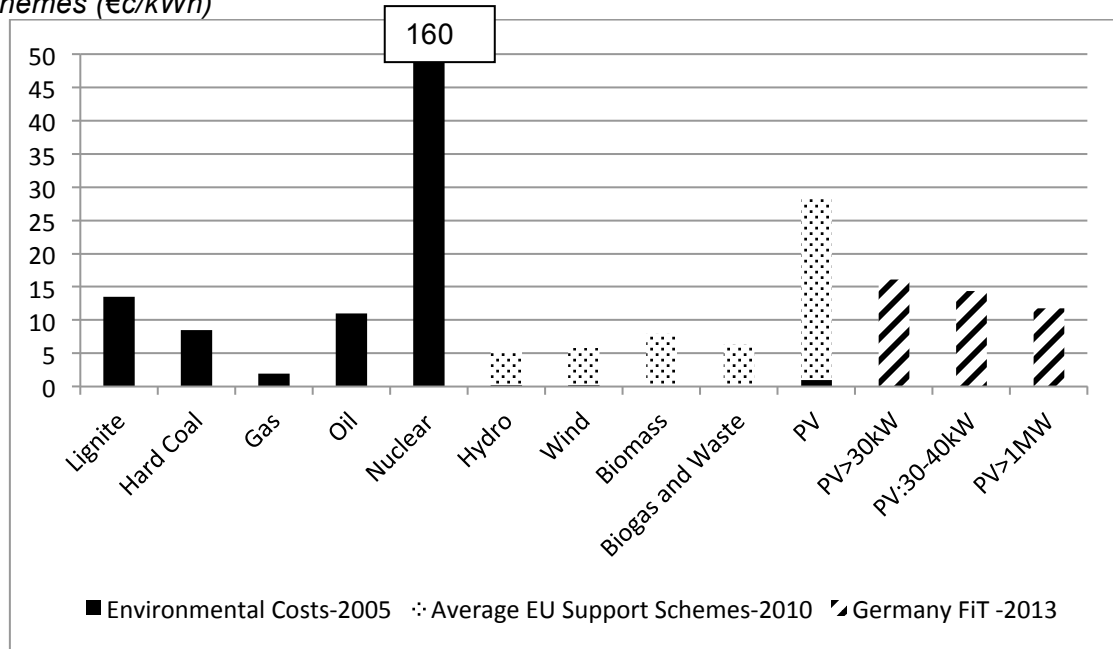
Numerous studies have documented and assessed the cost impact of the various environmental externalities. On the EU level, this included ExternE, which ran from 1995-2003<sup>11</sup> and more recently (2008), the European Environment Agency (EEA) published an assessment of External costs of electricity production.<sup>12</sup> The study notes that the external costs have fallen between 1990 and 2005, but that “the costs are significant and reflect the continued dominance of fossil fuels in the generation mix”.

Figure 2 compares these environmental externalities to the current cost associated with supporting the deployment of renewable energy across the EU. As can be seen the mean of the range of

<sup>6</sup> WNA, “Nuclear Power in Slovakia”, April 2013, <http://www.world-nuclear.org/info/Country-Profiles/Countries-O-S/Slovakia/#.UXeiual3vX4>  
<sup>7</sup> The Slovak Spectator, “Mochovce to be completed in 2014/15”, 8 April 2013  
<sup>8</sup> Le Monde, “Since 2007, Areva has sold more reactors”, 14<sup>th</sup> June 2013  
<sup>9</sup> ICIS, “EDF learned from previous nuclear electricity plant failures - UK’s Davey”, 13<sup>th</sup> June 2013  
<sup>10</sup> Energy Industries Council, EIC Datastream accessed 07/07/2013. <http://www.the-eic.com/EICDataStream/EICDataStreamExtracts.aspx>  
<sup>11</sup> Externe, [http://www.externe.info/externe\\_d7/?q=node/47](http://www.externe.info/externe_d7/?q=node/47)  
<sup>12</sup> EEA, “External Costs of Electricity Production”, EN 35, 1 November 2008. <http://www.eea.europa.eu/data-and-maps/indicators/en35-external-costs-of-electricity-production-1>

costs for the support schemes associated with renewables is in general below the mean external cost associated with coal, oil and nuclear.

Figure 2: Central Estimates for Environmental Externalities, Average EU and German Support Schemes (€/kWh)



Sources: CEER<sup>13</sup>, EEA<sup>14</sup>, BWE<sup>15</sup>, Öko-Institut compilation  
Externalities for Biomass were not included in the EEA study.

A study undertaken by Versicherungsforen Leipzig, for the German renewable energy sector in 2011, following Fukushima, assumed a cost range for a nuclear accident in Germany of between €150 billion to €6.3 trillion. If these cost are included in the electricity price they concluded that the range insurance premium would increase the cost of between €0.14-67.3/kWh<sup>16</sup>. The French official authority for nuclear security (IRSN) has calculated similar cost estimates ranging from €760 billion to €5.8 trillion. The Fraunhofer ISI estimates of the external cost of nuclear power range from €0.1/kWh to €320/kWh, thus diverging by a factor of 3,200<sup>17</sup>, a central estimate of this study is used in the graphic. The extent of these ranges is largely due to uncertainty over the costs of potential accidents.

The costs of the Fukushima accident exceeded €100bn leading TEPCO the national electricity utility, into bankruptcy. The chief Executive of Munich RE was quoted as saying that insurance protection, without government support, against **the risk of nuclear accidents is unaffordable**

<sup>13</sup> CEER, “Status Review of Renewable and Energy Efficiency Support Schemes in Europe”, European Energy Regulators, Table 8, December 2012, page 22

<sup>14</sup> EEA, “External Costs of Electricity Production”, EN 35, 1 November 2008.

<http://www.eea.europa.eu/data-and-maps/indicators/en35-external-costs-of-electricity-production-1>

<sup>15</sup> Cited in BWE and Greenpeace, “The full costs of power generation, A comparison of subsidies and societal cost of renewable and conventional energy sources”, August 2012

<sup>16</sup> Versicherungsforen Leipzig (2011), “Calculation of a risk-adjusted insurance premium to cover the liability

risks resulting from the operation of nuclear plants”, April 2011

<sup>17</sup> Cited in BWE and Greenpeace, “The full costs of power generation, A comparison of subsidies and societal cost of renewable and conventional energy sources”, August 2012

**for insurance and plant operators.**<sup>18</sup> In the EU the minimum insurance requirements for nuclear operators fall far below the actual what is required, for example in Bulgaria it is €49 million, France €91million and the Netherland €340 million.

It is important to note that, in addition to dwindling costs of a nuclear accident, there still remain other areas of uncertainty, such as waste management and decommissioning. For example the costs of addressing the historic nuclear waste in the UK are estimated to be over €100 billion<sup>19</sup>. It is unacceptable that nuclear industry does not pay its fair share for risk costs, waste management nor decommissioning.

Figure 2 gives the central costs for support schemes across the EU and therefore does not highlight the fact that the costs of many support schemes are falling and a growing number are significantly below the average. Therefore also included in the figure are the costs for FiT in Germany across a range of different scale solar plants. This shows that the in 2013 above 1 MW projects, were receiving €c11.78/kWh, while the smallest systems €c16.14/kWh. Further falls are expected in 2013 and 2014. For wind in 2012 in Germany initial FiTs are for between 5-20 years set at €c8.9 /kWh and then fall to €c 4.8 /kWh for a further 5-15 years, depending on the quality of the site.

While the exact details of the proposed support scheme, through a strike price for the Hinkley Point C reactor in the UK has not been made public, it is suggested that the price will be fixed for potentially up to 40 years at around £95/MWh<sup>20</sup>, this is around €c11.1/kWh, with further additions expected to allow for inflation. Important to note here is that the strike price for nuclear would be guaranteed over 40 years whereas renewables generally have a 15-20 year guarantee. The UK Treasury have published the draft strike prices for renewable energy these show that the price for onshore wind by 2018-19 will be at £95/MWh (€113/MWh), with further falls expected. Furthermore, offshore wind in 2014-15 will be £155/MWh (€180/MWh) but by 2018/19 be £135/MWh (€157/MWh), while large scale solar will go from £125/MWh (€145/MWh) to £110/MWh (€127/MWh) over the same period.<sup>21</sup> Assuming the regress rates continue by the mid 2020s the strike price for nuclear will be more expensive than onshore and offshore wind as well as solar.

As of early July 2013, the Government and EdF have yet to reach an agreement on the strike price for Hinkley. However, if a deal is reached between the two parties in the UK it will then require State Aid approval from the European Commission which would be illegal under current conditions.<sup>22</sup>

**In conclusion it is, in most cases, already cheaper to pay the costs of the renewable support schemes than use conventional power sources when the environmental costs are included.** Furthermore, the costs of the renewable energy support schemes is based on payments made in 2011 and as has been seen in Figure 1, these costs will continue to fall as technology and installation costs fall and with higher operation.

### **Assessment of the total power price:**

Figure 3 shows the levelized cost of electricity (LCOE), which is an economic assessment of the lifetime cost of a generating power plant as well as the central environmental externalities in studies produced in 2012. It should be noted that capital intensive projects such as renewables and nuclear are very sensitive to both the costs of capital (these cases have all applied a 10 per

<sup>18</sup> InsureReinsure.com, "Nuclear Risk Too Expensive To Underwrite?" 21 March 2011

<sup>19</sup> Sunday Times, "Nuclear cleanup to take 120 years and cost £100bn" 9 December 2012

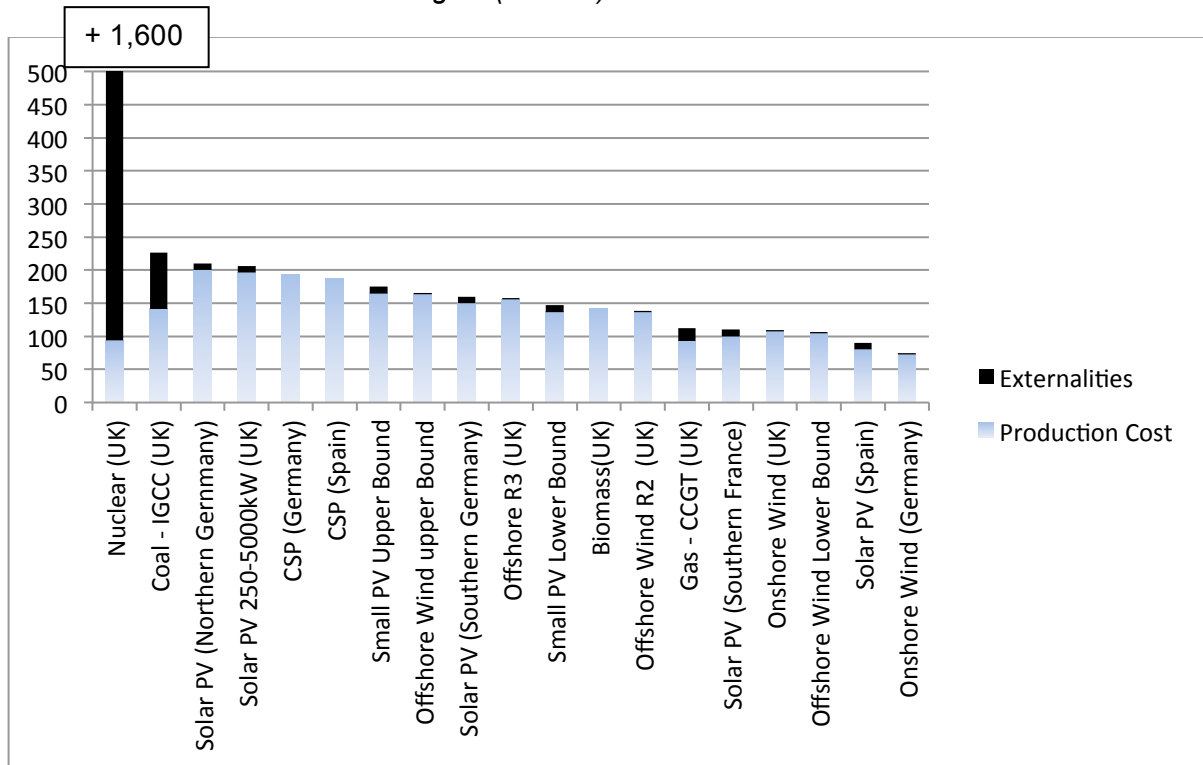
<sup>20</sup> Bloomberg, "EdF said to Seek at Least 95 pounds for UK Nuclear Output", 26<sup>th</sup> February 2013

<sup>21</sup> HM Treasury, "Investing in Britain's future", June 2013

<sup>22</sup> Steve Thomas, and Dörte Fouquet, "The new UK nuclear power programme- a FIT for nuclear and a blueprint for illegal state aid?" January 2013.

cent discount rate) and the placement (areas with higher renewable resources will have a lower LCOE). The figure is showing that wind power is becoming the cheapest source of power in the EU. While the costs of solar continue to fall, in Germany in 2006 a 100kW system cost €5000/kWp, but by 2013 this had fallen to €1575/kWp. Therefore currently, when externalities are included in the price, renewables are across the board have lower cost than coal and nuclear and often natural gas, but within a few years, other renewables will be competitive with conventional sources even with the existing market distortions.

Figure 3: Levelized Cost of Electricity in 2012 and Central Estimates for Environmental Externalities for various technologies (€/MWh)



Source: DECC (2012<sup>23</sup>), EEA<sup>24</sup>, BWE (2012)<sup>25</sup>, Fraunhofer (2012)<sup>26</sup>, Note: An exchange rate of 1 Euro to 0.78 USD and 1.16 GBP has been used. The central range of externalities for nuclear power are so large that they exceed the scale, but the total costs are in excess of €1600/MWh

Furthermore, given the learning curves presented in Figure 1, renewable energy sources will become more competitive, over time and more technologies in more locations cheaper than conventional sources. With growing concern over the competitiveness of Europe’s energy sector opening up a new and long term financial commitment to nuclear power and further fossil fuel plants make no sense from economic or environmental perspectives.

**Main conclusions:**

**1) Over the last 30 years renewables have shown falling costs whereas costs for nuclear power are rising**

<sup>23</sup> DECC, “Electricity Generation Costs”, October 2012

<sup>24</sup> EEA, “External Costs of Electricity Production”, EN 35, 1 November 2008.

<http://www.eea.europa.eu/data-and-maps/indicators/en35-external-costs-of-electricity-production-1>

<sup>25</sup> Cited in BWE and Greenpeace, “The full costs of power generation, A comparison of subsidies and societal cost of renewable and conventional energy sources”, August 2012

<sup>26</sup> Fraunhofer ISE, “Study Levelised Cost of Electricity, Renewable Energies”, May 2012

- 2) Nuclear will never be able to cover its associated risk costs due to accidents, decommissioning and waste and will therefore require greater and longer term policy and fiscal support than renewable energy.**
- 3) If environmental costs are included in the price, then renewables produce cheaper power than both nuclear and fossil fuel sources.**
- 4) The non-inclusion of these associated risks and environmental costs creates a huge unfair level playing field between the different technologies**
- 5) Public support to nuclear through a guaranteed price such as currently planned in the UK at Hinkley Point will further distort the already unfair level playing field especially between nuclear and renewables.**