

# European Energy Markets Observatory

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In collaboration with

# Contents

<b>A Strategic Overview of the European Energy Markets</b>	<b>4</b>
<b>Energy Regulation and Policies Overview</b>	<b>20</b>
Governance and Coordination across Europe	20
Sustainability and Climate Change Targets	26
<b>Electricity Markets</b>	<b>30</b>
Electricity Generation	30
Electricity Transmission and Distribution	40
Electricity Wholesale Markets	45
<b>Gas Markets</b>	<b>50</b>
Upstream Gas	50
Gas Transmission and Distribution	58
Gas Storage	62
Gas Wholesale Markets	64
<b>Customer Transformation</b>	<b>68</b>
<b>Companies' Overview</b>	<b>82</b>
Finance and Valuation	82
Strategy and Organizational Challenges	90
<b>Appendix Tables</b>	<b>95</b>
<b>Glossary</b>	<b>108</b>
<b>Country Abbreviations and Energy Authorities</b>	<b>112</b>
<b>Team and Authors</b>	<b>113</b>

## Tables

Table 1.1 Major energy events (2011 and H1 2012).....	24
Table 2.1: 3x20 European Union climate change objectives (status as of 2010 with 2011 provisional data).....	27
Table 3.1 Peak load, generation capacity and electricity mix (2011) .....	31
Table 3.2 Installed and decommissioned generation capacity per type of source (2011 versus 2010).....	31
Table 3.3 Growth rate of renewable energy sources (2005 to 2010 or 2011).....	32
Table 3.4 Real margin versus theoretical margin (2011) .....	33
Table 3.5 Map of generation capacities projects in MW (as of May 2012) .....	35
Table 3.6 Cancelled generation capacity (2011 versus 2010 and January to May 2012) ..	35
Table 4.1 Investments from selected electricity TSOs in their national grid (2005 to 2011).....	41
Table 4.2 Investments plans for selected electricity TSOs .....	41
Table 4.3 Map of interconnections levels and interconnections projects (2011).....	42
Table 5.1 Commodity prices (2011 and H1 2012) .....	45
Table 5.2 Yearly (2010 and 2011) and winter (2010/2011 and 2011/2012) average electricity spot prices.....	46
Table 5.3 Electricity spot prices on the main European markets (2011 and H1 2012) .....	47
Table 5.4 Electricity futures prices (year ahead) on the main European markets (2011 and H1 2012).....	49
Table 6.1 Domestic gas production versus piped gas and LNG imports (2011) .....	51
Table 6.2 Map of gas imports (2011) .....	53
Table 6.3 Shale gas development status in Europe (as of July 2012).....	56
Table 7.1 Investments from selected gas TSOs in their national grid (2008 to 2011).....	58
Table 7.2 Investments plans for selected gas TSOs.....	59
Table 8.1 Gas storage projects (as of May 2012).....	62
Table 9.1 Gas spot prices (2011 and H1 2012) .....	64
Table 9.2 Gas futures prices (summer 2013 and winter 2013/2014) .....	66
Table 10.1 Total electricity consumption and size of I&C and residential markets (2011) .....	69
Table 10.2 Total gas consumption and size of I&C and residential markets (2011) .....	69
Table 10.3 Residential gas prices – all tax included and with PPP (H2 2011 and % change with H2 2010) .....	70
Table 10.4 Residential electricity prices – all tax included and with PPP (H2 2011 and % change with H2 2010) .....	71
Table 10.5 Aggregated European electricity switching rates (2011) .....	73
Table 10.6 Smart meters deployment status in Europe (as of August 2012).....	77

Table 11.1 Utilities sector EBITDA margin evolution (2000 to 2012e) .....	83
Table 11.2 Utilities sector debts evolution (2005 to 2012e).....	84
Table 11.3 Utilities sector capex to revenues ratio (2000 to 2012e).....	86
Table 11.4 10-year Utilities sector performance versus the MSCI Europe index (base 1 on 1 January 2001).....	88
Table 11.5 Utilities sector P/E, Europe and US .....	89
Table 11.6 Utilities sector dividend yield (dividend/stock price) since 1 January 2000....	89
Table 12.1: M&As deals (2011 and 2012) .....	94

## Appendix Tables

Table A.1 Average European temperature (October 2009 to June 2012).....	95
Table A.2 Current (2012) and future (2025) electricity capacity mix (as of June 2012).....	96
Table A.3 Generation market concentration (2011) .....	97
Table A.4 Proven conventional gas reserves in Europe (1980-2011).....	98
Table A.5 Map of pipelines and LNG terminals projects (2011).....	98
Table A.6 LNG imports to Europe (2011) .....	99
Table A.7 Gas storage capacities (2011).....	99
Table A.8 I&C electricity prices – VAT excluded (H2 2011 and % change with H2 2010).....	100
Table A.9 Status of electricity price regimes (as of August 2012).....	100
Table A.10 Electricity retail market size (2011) .....	100
Table A.11 Residential electricity price breakdown (as of June 2012).....	101
Table A.12 Potential annual savings from switching electricity retailer (H1 2012) .....	101
Table A.13 Electricity retail market concentration (2011) .....	102
Table A.14 I&C gas prices – VAT excluded (H2 2011 and % change with H2 2010).....	103
Table A.15 Status of gas price regimes (as of August 2012).....	103
Table A.16 Gas retail market size (2011) .....	103
Table A.17 Residential gas price breakdown (as of June 2012) .....	104
Table A.18 Potential annual savings from switching gas retailer (H1 2012).....	104
Table A.19 Gas retail market concentration (2011) .....	105
Table A.20 Main financial characteristics of European Utilities (2011).....	106
Table A.21 5-year Utilities sector performance versus the MSCI Europe index (base 1 on January 1, 2007) .....	107
Table A.22 H1 2012 Utilities sector performance versus the MSCI Europe index (base 1 on January 1, 2012) .....	107

## Topic Focus

Capacity mechanism: the symbol of current isolated national energy policy against the EU internal market?.....	22
Barriers for the development of energy efficiency: an illustration from Spain.....	28
What are the stakes of short-term power market integration in Europe?.....	48
Capgemini Consulting's model to develop a suitable retention strategy .....	72
The importance of a new style of consumer communication to draw the benefits from smart meters roll-out.....	75
Tariff deficit in Spain: end of the story? .....	85

Smart Energy Services.....	38
Digital Utilities Transformation .....	80

# A Strategic Overview of the European Energy Markets



Editorial by Colette Lewiner

## Many events happened during the period of observation

### **Economic situation**

The period covered by the Observatory is 2011 and the first two quarters of 2012. During the first half of 2011 the economy in the European Union (EU) was relatively good even if questions surrounding sovereign debt and the need to restore national financial balance sheets were already appearing notably in Greece. In the second half, the financial crisis developed, during which the euro and the euro zone started to be threatened.

In 2012, the financial crisis accelerated. Southern European countries (Spain and Italy in addition to Greece) experienced tough situations with the urgent need to rescue their banks in difficulty and to finance the country's debt at bearable rates. In order to rescue these countries and to keep the euro zone's credibility, it is necessary to strengthen the EU's control on Member States' budgets and maintain balance in their banking systems, as more successful EU countries (Germany

for example) are reluctant to continue to lend money to less successful ones without a stronger control. As a consequence and over time, the EU will have to be entitled to a much larger political role. This crisis started to impact other regions in the world, the United States first and more recently developing countries (China and Brazil), which saw their booming economies slow down. This slowdown has had a negative impact on the demand for key commodities such as oil and coal with resulting price fluctuations.

The crisis has also revealed the lack of clear and effective European governance and political unity in the energy sector particularly in the areas of energy security of supply, energy imports, climate change and energy efficiency. During the H2 2011 and 2012 economic crisis, electricity consumption decreased slightly compared to the first 2008/2009 crisis. The situation is similar for gas as year-to-date annualized weather-adjusted demand in seven European core countries is similar to 2011 but remains below that seen during the 2007-2010 period<sup>1</sup>.

<sup>1</sup> Deutsche Bank estimation

In Europe, during the relatively good economic times (H1 2011), greenhouse gas emissions increased while they declined by 2.5% on the whole year 2011 (compared to 2010). In 2011, emissions from the combustion sector, which accounts for 70% of the EU ETS<sup>2</sup> emissions, showed a 2.2% fall linked to lower energy demand due to mild weather and the economic downturn. It demonstrates (if needed) the dominant effect of the economic situation on CO<sub>2</sub> emission levels compared to the lower ETS impact. With an average certificate price as low as €7.4/tCO<sub>2</sub> since the beginning of 2012, and a notional overall EU ETS cumulative surplus by 2020 of more than 1,000 million allowances<sup>3</sup>, this system has become inefficient and has to be urgently reformed.

### **Arab spring and Iran threat**

In many Arab countries, the uprisings that happened end-2010 and early 2011 are probably the beginning of a long-lasting movement. For the moment, they led to the installation of democracies, where the Islamic movements, being the only organized opposition, won in several countries (Egypt and Tunisia). While the outcome of the Syrian revolution is unclear and could lead to important changes in the regional balance impacting Lebanon and even Iran, the unrest could spread to other countries such as Egypt or Libya and propagate to others like Yemen. If it reaches the Gulf monarchies, the unrest could have a large and long-standing impact on the worldwide oil supply.

In other countries notably Libya the temporary shut-down of oil and gas exports was met with price increases

as opposed to supply disruptions. Elsewhere during 2012, Western countries and Israel have become more and more preoccupied by the Iranian nuclear policy suspecting that its objective is not only focused on energy but also has a military dimension. In order to bring the Iranian government to the negotiation table, Western countries imposed sanctions and an embargo on Iranian oil purchases that came fully into force on July 1, 2012. In August 2012, Iranian's oil exports fell to 0.8 mb/d<sup>4</sup> from 2.4 mb/d in early 2011.

In response to the announced sanctions, Iran threatened to close the Strait of Hormuz where 17 mb/d transit, representing 35% of oil maritime exchanges (20% of worldwide trading). This threat, combined with the booming economy in developing countries at the beginning of 2012 (and booming energy needs), resulted in high prices (up to US\$128/bl in March 2012). Due to the euro depreciation against the dollar, the oil price increase was accentuated in Europe.

However Saudi Arabia increased its production to a 30-year high and Iraq restored its oil output (20% increase). Moreover in mid-July 2012, Saudi Arabia and the United Arab Emirates opened two new pipelines that bypass the Strait of Hormuz whose capacity could cover about 40% of the Straits' transits. These effects combined with a slowdown in developing economies ensured the market had sufficient supply. As a consequence, during its June 2012 meeting, the OPEC members decided not to change their production ceiling at 30 mb/d even if the reality is at 31 mb/d.

<sup>2</sup> Emissions Trading Scheme

<sup>3</sup> Deutsche Bank estimation

<sup>4</sup> mb/d: million barrels per day

## Energy prices were volatile

**Oil prices** started to fall in May 2012 – and bottomed at US\$88/bl<sup>5</sup> on June 25 – in reaction to forecasts of an energy demand decrease resulting from weak global growth, and from a negative growth outlook for the euro zone countries. During the summer of 2012 and despite the expected slowdown in developing countries economies, oil prices went up again, reaching US\$117/bl on September 14, reflecting increased tensions on the Iran situation and the Iran oil embargo effect.

**Coal prices have** decreased in the US since April 2011 and since September 2011 in Europe. The low US spot gas prices (due to shale gas production in the US) pushed generators to switch from coal to gas (coal-fueled electricity generation should decrease by 8.5% at the 2016 horizon) and had a negative impact on US coal prices. This trend created extra coal tonnages that were shipped to Europe where prices were also pushed down.

In Europe and because of the low CO<sub>2</sub> emissions prices, coal is more competitive than gas for fossil-fueled plants. For example, in June 2012, the clean dark spread was positive both in Germany and the UK while the clean spark spread was positive in the UK but negative in Germany reflecting the higher gas price and the lower electricity price in Germany compared to the UK.

This trend should continue as demand slowed down from China, which is suffering from the fallout of the euro zone crisis, while the shale gas effect in the US continued to put downward pressure on the coal price.

**Gas prices:** Today gas exchanges are dominantly through pipelines creating regional markets as there is no global market for gas.

The LNG<sup>6</sup> proportion of total exchanges that use sea shipment is only around 10% of total consumption (whilst it represents 32% of the international exchanges). It would need to grow significantly to allow a global gas market to emerge. In this case, spot price would become the global price reference in contrast with oil-indexed gas prices as today in Continental Europe.

US producers are exploiting shale gas at very competitive costs while in Europe, spot exchanges are still proportionally small and long-term contracts are dominant with prices indexed for 70% on oil prices and 30% only on spot prices.

This very fragmented market structure explains the huge discrepancies in prices: roughly speaking European British spot gas price is 350% higher than the US spot price, and the continental European prices are 50% higher than the UK spot prices. Following the Fukushima accident and the Japanese nuclear plants closure, Japan increased its LNG imports, creating tensions pushing for higher prices on the Asian LNG markets: the Asian markets prices are 35% higher than the continental European prices thus around 700% higher than the US spot.

Except for seasonal variations and notably a sharp peak in February 2012 due to the very cold temperatures in Europe, the UK gas spot price (NBP) grew moderately (in €). Over the same period, the continental long-term price followed the upward oil prices tendency.

Contrarily, the US spot prices were on a downward trend in \$ and bottomed at less than US\$2/MBtu (million British thermal units) in April 2012, after increasing again to exceed US\$3/MBtu early October.

<sup>5</sup> Brent

<sup>6</sup> Liquefied Natural Gas

In continental Europe, in addition to high continental European gas prices, lower electricity prices and low CO<sub>2</sub> emission prices, the increase of renewable energies in the electricity generation mix impacts negatively the gas-fired plants profitability as it reduces their utilization rate.

For example in Spain where renewable energies share in the electricity mix increased significantly over the past nine years (from 12% of the installed capacity in 2003 to 28% in 2011), this utilization rate fell from 66% in 2004 to 23% in 2011<sup>7</sup> while the IEA<sup>8</sup> estimates that these plants need a 57% minimum utilization rate to be profitable.

According to a UBS study, there is a potential closure of up to 10,000 MW of gas-fired power capacity from now to 2014 in Europe.

These closures would pose a real security of supply problem as, thanks to their flexibility, these Combined Cycle Gas Turbines (CCGT) plants are indispensable to the electrical grid balance that has to compensate for the volatility of wind and solar energies and the cold and warm peaks during winter and summer.

One solution resides in capacity markets implementation, as in those new marketplaces, it is not the electricity generation that is paid for but the power plants availability notably during critical periods. These markets exist in the US (PJM, New York ISO or ISO New England) and their creation is under discussion in the UK, Germany and France.

### Electricity wholesale prices

increased in Europe in 2011 compared to 2010 (the average electricity spot price increased by 13% year-on-year) driven by the rise of commodity prices. Similarly, an 8% average decrease is observed in H1 2012 compared to H1 2011, even though spot prices peaked on several power exchanges in early

February 2012 as a consequence of the cold wave that hit Europe: a price of €367/MWh was recorded on French EPEX spot on February 9, €111/MWh on Belgian Belpex or €132/MWh on Italian IPEX.

## Nuclear energy Evolution post- Fukushima

After the terrible Fukushima nuclear accident, political decisions were taken in a number of countries on nuclear energy generation.

Germany was the only country to adopt a federal decision to close immediately its operating reactors. Eight out of its 17 reactors were closed in 2011 and the others are expected to close before 2022. Italy decided to stop its nuclear program which was aiming to build four nuclear plants (they have none). Switzerland decided to phase out its nuclear reactors on the mid-term (2035-2040) but without deciding on a clear threshold date.

On July 4, 2012, the Belgian cabinet voted on a revised nuclear phase-out plan, deciding to close earlier the Doel 1&2 reactors (in 2015) but to prolong Tihange 1 lifespan until 2025. In summary, Doel 3&4 and Tihange 2&3 would close between 2022 and 2025. However, in August 2012, Belgium temporarily shut down Doel 3 and Tihange 2 plants after the country's regulator discovered "several anomalies", including possible cracks, in the reactor pressure. Following Belgium's decision, the OECD's (Organization for Economic Co-operation and Development) Nuclear Energy Agency (NEA) has announced that there will be discussions between plant operators and the safety authorities in eight

countries on specific inspections to show that their reactors are not similarly affected.

The new French government has announced its intention to reduce the nuclear share of electricity generation (75% presently) to 50% by 2025 and to close Fessenheim (the oldest French plant) in 2016. However, many countries have re-affirmed their commitment to nuclear energy including in Europe the UK, Czech Republic and Finland and outside Europe, Russia, Canada, US, Argentina, South Korea and China.

All countries in the world launched safety tests on existing and future reactors and for the first time, there was an international coordination on these safety tests. No plants were stopped after these tests were completed but regulators imposed significant upgrading works. For example in France the upgrading works should amount to more than €10 billion for the 58 reactors. Following the lessons learned from the Fukushima accident, the French ASN<sup>9</sup> (as other Nuclear Safety Regulators bodies in US, China and Japan) imposed new safety features including a nuclear emergency response organization whose job will include responding to incidents at nuclear power stations and monitoring radiation.

Decisions to extend the nuclear plants lifetime were taken in Europe, for example in Spain (Garoña) and in France (Tricastin). Finland announced its decision to build a 6<sup>th</sup> reactor and Russian Rosenergoatom has received a license for building the Kaliningrad plant.

Outside Europe, TVA in the US has decided to complete the Bellefonte 1 reactor and the Southern Company is building two new nuclear plants in Vogtle (Georgia). Argentina has also decided to build a new reactor.

<sup>7</sup> Source: Gas Natural Fenosa

<sup>8</sup> IEA: International Energy Agency

<sup>9</sup> ASN: Autorité de Sécurité Nucléaire, French nuclear safety authority

Asia is a key region for nuclear new build as more than half of the 61 reactors under construction as well as the majority of the new projects are located there. After the Fukushima accident, the Chinese government decided very quickly to launch safety tests on existing and future reactor design. Following the results, it decided to continue building around five to six reactors per year.

In Japan, local authorities have been reluctant to allow plants to re-start after yearly maintenance stops. This resulted in the provisional closure of all the 54 Japanese reactors. After the Prime Minister's green light, the two Ohi reactors operated by Kepco were connected again to the grid in July 2012 to help balance electricity supply and demand during the summer peaks. Japan is also drawing lessons learned from the accident management not only on technical aspects but also on nuclear governance (better defined relationships between Industry, nuclear Utilities and Safety Body) and crisis management. However, Japanese public opinion became anti-nuclear. Under its pressure, the Japanese government has unveiled in September 2012 a plan to restart all operational reactors in the short-term while probably phasing out nuclear power over the next three decades.

Despite the potential increase of safety CAPEX and OPEX and back-end costs (decommissioning, final disposal), studies<sup>10</sup> show that existing nuclear plants remain competitive compared to other power plants.

As a conclusion and provided reactors are run safely, the consequences of the Fukushima accident should be less important than viewed just after the accident.

The vast majority of new constructions and existing plants in operation should continue with some delays and more safety focus. The IEA forecasts that nuclear output will rise by more than 70% over the period to 2035.

## Energy transition patterns

The Fukushima accident has triggered many studies and work on energy transition patterns.

As a general conclusion, the energy mix should evolve toward more gas, renewables and coal (in certain countries).

However to design and implement a successful transition, all energy stakeholders would have to overcome many complex issues, among which:

- **Financial and economic issues:** notably cash availability for new generating plants during a deep economic crisis; and an increase in electricity prices linked to the replacement of relatively cheap nuclear electricity by other more costly electricity sources;
- **Grid questions** among which:
  - Grid balance issues (as nuclear energy provides large amounts of schedulable electricity while renewable energies are intermittent);
  - Grid pattern redesign and new lines construction (that often encounter local opposition) in order to connect new and more numerous electricity injection points;
  - More generally smart grids implementation triggered by a higher renewables share in the electricity generation mix.

- **Regulatory issues** as important changes are needed in order to make investment in smart grids profitable, restore profitability for gas-fired plants in Europe (see above), to give the right climate changes signals to the market (ETS system reform);
- **Global temperature** increase threat as nuclear energy does not emit CO<sub>2</sub> while fossil-fueled plants do;
- **Energy dependency increase**, as nuclear energy is domestic and its decrease would lead to more gas imports except in some European countries having shale gas reserves and decided to exploit them quickly;
- **Employment** could be an issue as large employment decreases linked to nuclear plants closures would not be compensated by nuclear plants decommissioning and dismantling (activities that span over decades), more renewable generation and grid construction jobs. For example in the case of France, in the scenario leading to a 50% nuclear energy share in the mix by 2030, there would be a loss of 100,000 to 150,000 jobs on the current 410,000 jobs<sup>11</sup>;
- **Electricity generation costs:** their long-term estimation is complex and depends on:
  - Discount rates especially for high CAPEX technologies such as nuclear, wind farms or solar energy;
  - Commodity (gas or coal) prices projections, greenhouse gas emission rights prices;
  - Plant load factor;
  - Technology improvements and breakthroughs;
  - Other externalities.

<sup>10</sup> French Energies 2050 Commission report published on February 13, 2012 and "The costs of the nuclear power sector", published by French Court of Auditors in January 2012

<sup>11</sup> French Energies 2050 Commission report published on February 13, 2012

According to “Energies 2050 commission”, electricity generation costs in France in 2010 were (in €/MWh): 50 to 60 for nuclear, 80 for onshore wind, 150-200 for offshore wind and 240-400 for solar photovoltaic. Estimates<sup>12</sup> submitted to the British Parliament on July 11, 2012 revealed differing views on the future cost of nuclear and wind, they range (in £/MWh) from 60 to 98 for nuclear (€76 to €124/MWh), 90.2 to 187 (€114 to €237/MWh) for onshore wind and up to 265 (€336/MWh) for offshore wind.

These two studies and others show that, in Europe, existing nuclear electricity is competitive compared to wind and solar sources. However, electricity generation cost differences are mitigated in the final electricity costs as generation is only a part of the total electricity cost (today the French breakdown is: 40% generation, 33% grid, 27% taxes including CSPE<sup>13</sup> that includes the extra costs for renewables).

To conclude this paragraph, we shall look at two cases: the German energy transition and the French “Energies 2050 commission” conclusions:

- *The German energy transition*: in May 2012, Chancellor Angela Merkel expressed her disappointment on the energy transition pace and dismissed her Environmental Minister Norbert Röttgen. In reality the problems are not so simple as there is a need to:
  - *Build more generation capacity* to replace the eight and then 17 nuclear reactors. The plan forecasts a strong increase of renewable share – from 20% to 35% of the generation in 2020. In the shorter-term, German Utilities reopened, for the 2011/2012 winter, 10,000 MW of old lignite and coal plants thanks to which it

was able to become an electricity exporter during the February 2012 exceptional winter peak demand. Germany, having national coal and lignite domestic resources, should be able, if needed, to increase their contribution to electricity generation. So, if climate change issues are put aside, the challenges are more on the grid side than on the generation side;

- *The grid*: in addition to grid balance issues arising from the strong renewables proportion in the electricity mix and technical issues on electrical HVDC (High Voltage Direct Current) links to offshore wind farms, there is a need to redesign the whole grid. The energy injection pattern will change with more and smaller injection points located in new regions while the demand pattern should not change significantly. More generation will come from wind mills in the North of the country while there should still be an important demand in the South.

Local opposition is making these constructions more difficult. Moreover, German regional states (the Länder) tend to have their own energy policy and are not ready to accept controversial high voltage overhead lines for the benefit of other states. While there is a need to build 1,800 km of new lines, only 200 km are already built. These delays create problems on the supply and demand grid balance as was seen during the cold spell in February 2012. Then, because of German grid local congestions, the Austrian and Czech Republic grids were impacted by additional electricity flows coming from Germany and the countries' grid operators had to mobilize their reserve plants;

<sup>12</sup> The economics of wind power, UK's Energy and Climate Change Committee, July 2012

<sup>13</sup> Contribution au Service Public de l'Electricité. Tax contributing to public service of electricity, created by the French government in 2003

- *Impact on electricity prices:* the energy transition investments needed from now to 2020 are forecasted between €350 and 415 billion<sup>14</sup> out of which grid investments amount to about half these estimations. However, end-2011 the Professor Alfred Voss<sup>15</sup> from Stuttgart University, has estimated the energy transition cost for Germans at more than €2,000 billion, an amount comparable to that spent on German re-unification. This will lead to significant electricity price increases for German customers who have already one of the most expensive electricity in Europe. According to a Karlsruhe Technology Institute study from the Baden-Württemberg Chamber of Commerce, large customer prices could increase by as much as 70% by 2025 threatening their competitiveness.

The German case shows that energy transitions are complex and can only be envisaged with long run plans.

- *The French Energies 2050 Commission* was established by the former French Minister of Industry to study French energy transition scenarios at the 2050 horizon. It examined the following energy scenarios:
  - Lifespan extension of existing reactors: all existing nuclear reactors lifetime is extended to 60 years providing the nuclear safety authority (ASN) allows it;
  - Replacement of all existing nuclear reactors by 3<sup>rd</sup> generation reactors (EPR) as soon as they reach their 40 years lifetime, which implies building at least two EPR reactors per year over 10 years (from 2020 to 2030);

- Progressive reduction of nuclear energy in the mix: all existing nuclear reactors to be decommissioned upon reaching their 40 years lifetime and only one out of two reactors is replaced by an EPR. This assumption leads to a 40-60% nuclear energy share by 2030;

- Nuclear phase-out: all existing nuclear reactors to be decommissioned when reaching their 40 years lifetime and replaced either by fossil-fueled or renewables plants.

The nuclear phase-out scenarios are the most unfavorable from economic, environmental and social perspectives.

The progressive nuclear phase-out (scenario 4) while less unfavorable, is a costly alternative as EPR cost is still quite high.

Provided that safety and security requisites are met, the Commission recommends extending nuclear reactors lifespan.

Now, the new French government has expressed its determination to phase out progressively nuclear energy to reach 50% of generation share by 2025 (instead of 75% today). According to UFE<sup>16</sup>, this nuclear phase-out would lead to a 16% increase in electricity generation costs and a 12% increase in the final electricity cost (assuming no additional investments in grids).

Additional grid investments have been estimated (in a similar scenario) by the French grid operator RTE<sup>17</sup>. These investments in new interconnection capacity (increasing by 100% the present capacity) are estimated at €350 million per year from now to 2030. In addition to that significant cost, this pace of construction of new lines seems unrealistic regarding the present administrative procedures, which lead to very long construction times for new lines (up to 10 years).

<sup>14</sup> German State Bank KfW

<sup>15</sup> Presentation in Paris "Chaire Energie-Climat" October 11, 2011

<sup>16</sup> UFE: Union Française de l'Electricité, the French association of electricity professionals – Study "Electricity 2030: The choices for France?" published in January 2012

<sup>17</sup> Bilan Prévisionnel 2012, RTE

## Climate Change

It seems that climate change questions are no longer among the top issues on political agendas. In addition to real difficulties in prolonging the Kyoto protocol (linked to fundamental discrepancies in policies on greenhouse gas limitation between developed and developing countries), the economic and financial crisis has shifted the political priorities.

After several disappointing Climate Change summits (including the last one Rio+20) with lack of governmental decisions, there is unfortunately a scenario where no region, other than Europe and Australia, is making quantitative commitments on greenhouse gas limitations. The industry in those isolated regions (Europe-Australia), being penalized puts pressure on their governments to stop their efforts. In this scenario, according to Professor Daniel Kammen of Berkeley University, the resulting long-term warming is 5°C by 2100. Severe climate change impacts will occur with some warning signs expected by 2035. Rising levels of sea water and other natural phenomena would endanger critical assets, disrupt supply chains, decrease access to raw material, mineral resources and water and thus increase cost. It would affect more poor people than rich and could lead to social unrest.

In the shorter-term, within the EU, the market and regulatory signals are inefficient to orient long-term decisions toward low carbon technologies. The carbon emission rights price has decreased from €14/tCO<sub>2</sub> early 2011 to €6-7/tCO<sub>2</sub> in May 2012, reflecting an excess of ETS rights and urgently calling for the reform of the ETS system which is no longer playing its role.

The question is how many excess ETS rights will be withdrawn from the market or more exactly frozen (for legal reasons). DG Climate is apparently proposing to postpone the auction of between 400 and 1,200 million allowances. A decision should be taken within the Climate Change Committee before end-2012. In the longer-term the Commission could propose to include a higher than today, automatic year-on-year auctioned quotas reduction.

The EU 2020 CO<sub>2</sub> objectives should be met knowing that the ETS mechanism related reduction should be small. The main reductions are due to the economic slowdown triggering energy consumption decreases, part of which – linked to plant de-localizations in Asia – are sustained. These reductions result also from the increase in the share of renewable energies in the energy mix.

In December 2011, the EU issued its Energy Roadmap 2050 communication that aims at achieving a reduction of 80-95% in greenhouse gas emissions by 2050 compared to 1990 levels. This implies a shift toward a “decarbonized” energy system with a higher share of renewable and nuclear energy and the development of energy efficiency and carbon capture and storage. Achieving this objective will be costly. It could penalize European businesses and consumers if, as today, large countries (US, China, Russia and India), do not follow similar policies.

## Renewable Energies

Renewables have continued their worldwide expansion (8% growth in 2011 over 2010) mainly in Asia. China added 90 GW of new renewable capacities in 2011 and is now the top renewables leading country with an estimated 282 GW installed capacity for 2011. After hydro power, wind has the largest share of renewables capacities (18% worldwide) with a 3% growth in 2011 over 2010. Solar with a smaller share (5% worldwide) is growing faster (75% growth in 2011 over 2010). In Europe, the EU objectives are favoring renewables power installations (they amounted to more than 70% of capacity additions in 2011).

At the beginning of September 2012, the installed capacity of wind power in the UK was 6,858 MW out of which a 1,858 MW capacity is offshore farms. Through the Renewables Obligation, British electricity suppliers are now required by law to provide a proportion of their sales from renewables sources such as wind power or pay a penalty fee.

In April 2012, French government awarded permissions for around 2,000 MW offshore wind farms located at four different sites for a total investment estimated at €7 billion. However, the sovereign debt problems combined with the economic and financial crisis have pushed governments to decrease their subsidies, especially for solar energy, thus creating oversupply situations.

For a few years now, helped by a dynamic Chinese renewables program and nationalistic purchasing policies favoring Chinese companies, wind turbine and solar photovoltaic panels manufacturers have boomed, and are facing today (like their Western peers) an oversupply situation. They have

been very active low cost exporters on the European and American markets that are also oversupplied.

This competition, combined with reductions in subsidies, resulted in difficulties for many western manufacturers; for example the Danish wind turbine leader, Vestas, which announced (end August 2012) its plan to eliminate another 1,400 jobs this year, in addition to the more than 2,300 positions it has already said it would shed.

Solar panel prices have plummeted over the past two years partly because of new low cost manufacturing facilities in China and other Asian countries. The competition coming from these low cost panel importations, combined with cuts in governmental subsidies, has pushed many European manufacturers into the red. Four German actors (as Q-Cells) and other European and American companies went bankrupt. Others were acquired by Chinese firms (Sunways acquisition by LDK Solar Company).

This situation is resulting in an economic war between the US and China; the former accusing the latter of dumping cost practices. In May 2012, the United States Commerce Department decided to impose a 31% antidumping tariff on 250 Chinese solar panels manufacturers.

This imposition has raised the hackles of the Chinese Government which considers the solar industry to be strategic to its future growth and plans to bring this issue to the WTO<sup>18</sup>. Similarly, in September 2012, the EU announced a trade investigation of Chinese solar panels manufacturers noting that it was its biggest in terms of import value affected (€21 billion in 2011).

While the 2020 EU objectives of 20% renewable in the energy mix will be difficult to reach, one can question

the relevance of those objectives. By setting relative short-term stringent objectives needing subsidies and feed-in tariffs to be met, EU has encouraged massive importation from low cost manufacturing countries as China, hence the present problems. It could have been wiser to set longer-term objectives and to give incentives (that would have been much smaller) to Research & Development (R&D) in order to design new and more performing products, giving a real advantage to European companies and decreasing in a sustained way the renewable energy costs.

This situation in renewable energies, added to China's ambition in nuclear plants exportation, demonstrates that in energy, as in other manufacturing sectors, China is becoming a dominant worldwide lower cost supplier.

On June 6, 2012, the European Commission presented a Communication on its renewable energy policy, confirming the need for their growth after 2020. Lessons learned from the present situation should encourage some prudence before taking final decisions on new quantitative objectives. It is indispensable to assess these additional renewables installations costs and their impact on the European industry as well as on equipment importations.

<sup>18</sup> World Trade Organization

## Smart Grids

With the increase in the share of renewable energies in generation, the electrical grid's management is facing new challenges as these energies provide intermittent power generation that is thus not schedulable. Large scale energy storage at competitive cost is critical for penetration of renewables, grid stability and reliability. While a lot of fundamental and applied research on modeling, simulation and materials is being undertaken, there are not yet available technologies that meet the technical and economic requirements. Without large scale electricity storage, balancing demand and supply on the transmission and distribution grids becomes more complex. Moreover, as discussed earlier, high gas prices in Europe and lack of capacity markets are threatening the needed flexible gas-fired plants competitiveness.

On the transmission grids, to which large wind farms are connected, there is a need to improve wind generation forecasting, strengthen interconnections and improve High Voltage Direct Current (HVDC) cables technology. Decentralized smaller renewables generation (typically solar cells on a homeowner roof or smaller wind mills) impacts distribution grids. Today the latter are not designed to manage those decentralized, non schedulable and sometimes bi-directional flows that request more active distribution system operators and new regulation.

Those smarter Transmission and Distribution grids necessitate new equipment and will be more digitally operated calling for standardized

communication protocols and the management of much larger information flows.

There are numerous experiments in smart grids in Europe that should, hopefully, enable the emergence of new market models and standards. Between 2002 and 2006, €190 million were invested in more than 60 smart grid EU-sponsored R&D projects. In addition, 14 system operators grouped in the European Electricity Grid Initiative (EEGI) launched 31 research and small scale implementation projects. Their total 2010-2018 investment is forecasted at €2 billion.

In addition numerous smart cities experiments are aimed at demonstrating that local supply and demand balance is a better economic optimum than national balance. This is certainly easier to prove when there is no access to a centralized grid or when the grid expansion is under strong constraints.

Each European grid operator will have a different electricity mix to manage in the future; hence their future needs will involve different levels of sophistication, and sometimes specific criteria of choice will determine that level and the speed of investments.

Moreover all stakeholders (Utilities, customers, regulators, equipment manufacturers and information services providers) need to work together to define which type of benefits, for whom and who pays for them?

## Gas golden age?

In the new IEA GAS<sup>19</sup> scenario, thanks to unconventional gas production, the gas reserves would reach 250 years of consumption (instead of 60 years previously estimated), with the gas share of primary energy consumption reaching 25% in 2035 at a global level (more than coal, slightly less than oil).

However, the present situation in Europe does not give a foretaste of this rosy future (see Table 6.3 in the report). Gas prices are high, gas-fired plants stopped (see above) and some countries such as France (having around 108 consumption years reserves according to US Energy Information Administration<sup>20</sup>) are banning or imposing a moratorium (Romania, Bulgaria) on hydraulic fracturing technologies. In reality there are many pre-requisites to this scenario:

- Infrastructure availability: the pipeline investment needs in Europe together with the re-gas facilities (enabling LNG imports) investments are estimated at €70 billion by 2020;
- Lower gas prices, made possible by a progressive market globalization, enabling Europe to benefit from low US gas prices. LNG exchanges level increase is key to render this possible;
- ETS reform leading to higher CO<sub>2</sub> emission prices in order to make gas power generation more advantageous than coal.

There are many rules to be established and followed to make the development of shale gas outside the US, and especially in Europe, socially acceptable. They have been listed by IEA, among which:

- Ensuring a consistently high-level environmental performance by treating water responsibly,

preventing well leaks, eliminating venting flaring and other emissions;

- Improving operator's transparency, public and governmental information.

The benefits of developing shale gas are important as by lowering gas prices it allows repatriation of some gas-consuming industries (fertilizers, chemicals for example) and improves employment. Recent US estimation is as high as 600,000 new jobs created. Shale gas is also domestic supply: in an optimistic scenario<sup>21</sup> it could even replace conventional declining EU gas production so that import dependence would be maintained at the present level (around 60%).

However the GAS scenario leads to a +3.5°C global temperature increase in 2035 (compared to the +2°C objective). This highlights the importance of developing the greenhouse gas Capture and Storage industry.

## Infrastructures development is key

As pointed out earlier, infrastructure investments are the bottleneck for improving energy security of supply and for a successful energy transition toward a less carbon-intensive energy mix. These increases in investment needs result from:

- Construction of generation plants to replace old plants (during 2011, almost 9.5 GW generation capacity was decommissioned); the potential phase-out of nuclear reactors; and safety and environmental improvements;
- Reinforcement of electricity and gas grids to improve security of supply, accommodate decentralized and renewables generation, transform present grids into smarter ones, and face the increase in electricity usage (for example electric cars);

<sup>19</sup> IEA GAS: International Energy Agency Golden Age of Gas report

<sup>20</sup> World shale gas resources: an initial assessment of 14 regions outside the United States, US EIA, April 2011

<sup>21</sup> EC studies, September 12: [http://ec.europa.eu/clima/policies/eccp/studies\\_en.htm](http://ec.europa.eu/clima/policies/eccp/studies_en.htm)

- Gas transportation infrastructure including large importation pipelines and LNG facilities.

Total EU investment requests until 2020 (before the Fukushima accident) are estimated to the considerable amount of €1.1 trillion. It is split nearly equally between power generation (€500 billion) and gas and electricity transmission and distribution (€600 billion). This estimation does not include:

- €350 billion (or more) of German investments linked to nuclear phase-out;
- Other investment needs linked to nuclear reactors safety improvements resulting from lessons learned from the Fukushima accident ;
- The cost of smart grid rollout that varies from €120/user for smart meters only (French Linky project) and more than €450/user (EEGI<sup>22</sup>) including the cost of additional functionalities (e.g. grid instruments and IT development).

Some electrical interconnections were commissioned during the observation period (Sweden-Finland, UK-Ireland) and more are forecasted for the next two years (mainly France-Spain, France-Italy and the Netherlands-Denmark). This should improve the European electricity market fluidity.

On the gas importation side, Nord Stream (€7.4 billion investment), allowing gas to flow from Russia to Germany by bypassing countries like Poland and Ukraine, was inaugurated at the end of 2011 (27.5 bcm<sup>23</sup>/year capacity, to double by end-2012). Multiple southern pipelines, including the most advanced one South Stream (€15 billion investment) due to open in 2016 and many other projects including Nabucco (€8 to 15 billion investment) are in competition. Their future will

depend on substituting gas for nuclear generation, on the pace of development for unconventional gas and LNG, and on the economic situation.

However, during 2011/2012, and despite the large investment needs, the CAPEX over revenue ratio at the largest Utilities decreased, showing that this upward move in investment has not yet started.

In reality some key pre-requisites are not fulfilled:

- Adequate return on investments:
  - Grids: the “RPI-X” formula was built in the UK many years ago and has now been imposed by numerous European regulators to push grid operators toward a more rigorous management approach. But it does not provide enough incentives for investors (Utilities or Funds having acquired recently those infrastructures). Only the UK has taken (in 2011) a holistic view on this question and launched the new RIIO<sup>24</sup> system;
  - Generation: in some countries, prices especially for domestic customers are regulated (they are called tariffs). Despite the real need for more investment and, in the case of gas, the necessity to pass through the supply cost increases, national governments are, for social reasons, limiting tariff increases. This is a short-term view as it does not provide operators with enough investment capacity and does not give the right signals for energy savings.

- Public acceptance: the assets acceptance procedures that involve, in the case of aerial lines, many stakeholders, are the major obstacle in building overhead lines. This is why all European TSOs<sup>25</sup> are urging the European Commission and Parliament to move ahead with the draft regulation “Guidelines for trans-European Energy Infrastructure” and, in particular, its provisions on streamlining permit-granting procedures through a three-year time limit and the so-called one-stop-shops. The EC has designated 416 energy infrastructure projects as Projects of Common Interest, with a view to requiring national governments to fast-track them through a designated permitting process;
- A holistic view is necessary in certain cases (as in peak load shaving case), since soft measures such as public information and time-of-use tariffs could alleviate the need to invest in peak load capacity used only a few hours a year.

In reality, in a poor economic situation, as in 2012, where one could expect energy consumption stagnation, Utilities are more inclined to withdraw generation capacity than to invest. Moreover the lack of credible projections on the euro zone future economic situation and on the related energy consumption, is discouraging many Utilities from starting to build the needed new infrastructures.

<sup>22</sup> European Electricity Grid Initiative

<sup>23</sup> bcm: billion cubic meters

<sup>24</sup> Revenue using Incentives to deliver Innovation and Outputs

<sup>25</sup> TSOs: Transmission Systems Operators

## Energy Efficiency

The best energy is the energy that is not consumed.

However, at Member States levels as well as EU level, 2020 objectives (20% energy consumption decrease) are far from being met.

On June 13, 2012, in reaction to that situation, the European Parliament and Council adopted a compromise text for the Energy Efficiency Directive. This compromise now aims to achieve a 17% decrease in Europe's primary energy consumption by 2020. The heart of this new legislation is a requirement for Utilities to make energy savings, equivalent to 1.5% of their annual sales, each year from 2014 to 2020.

For many reasons, crisis times are not the best suited for energy savings: consumption is anyhow down, prices and overall costs are weaker deteriorating the ROI (Return on Investment), making it more difficult to find the needed funds and to mobilize the stakeholders.

Large energy intensive industries have already done a lot, and industrial energy efficiency in Europe is in the upper global benchmark range. There is more to do in decentralized medium energy consuming industries that have not usually put this issue on their priority list. Buildings remain the main source of savings as, worldwide, the energy savings in this area are equivalent to worldwide consumption by the transportation sector. The multiplicity of stakeholders (construction companies, owners and users being usually different) renders this problem complex. There is however some progress through new standards (regarding insulation, lighting, white goods consumption labeling) and regulations (for example the obligation in France

for a house or apartment seller to indicate its energy consumption). More automation and remote control would allow large achievements; however, communication standards are still a blockage.

**Capgemini** has carried out studies<sup>26</sup> to evaluate the potential for energy savings in Europe. These studies show that it is easier to shift peak electricity consumption to non-peak periods (30% potential savings) than to decrease it. Large-scale pilots show that energy savings in the 2-6% range are achievable while more focused programs – based on customer segmentation – can reach 18% energy savings.

Generally speaking new devices (such as smart meters) can help – but customer segmentation, focused tariffs, information and customer behavior as well as automation are key.

**The Japanese example:** The Great East Japan earthquake on March 11, 2011, and subsequent accident at the nuclear power plant in Fukushima resulted in a severe decline in the available supply of electricity, triggering country-wide energy conservation plans<sup>27</sup>. During 2011 summertime, when power demand increased sharply due to the higher use of air conditioning, all Japanese electricity users had targets set to reduce their electricity consumption by 15% compared to the same period of the previous year (2010). These reductions were compulsory for large customers in Eastern Japan. Large electricity users were required to voluntarily formulate and implement plans for reducing their power consumption during peak times, for example by shifting their operations or business hours. For small electricity users, METI<sup>28</sup> presented examples of

electricity-savings measures related to lighting, air conditioning or office equipment use, and encouraged them to formulate and implement voluntary energy-savings action plans to achieve the target. Electricity-savings supporters visited 150,000 offices and held explanatory meetings about 10,000 times in the targeted areas and METI launched the “electricity savings hotline”.

METI provided ideas to save electricity to households through newspapers, television, and various other means. It also distributed educational materials on electricity-savings measures to about 4,300 elementary and junior high schools in Eastern Japan areas, and promoted a participatory program for households called the “declaration of household electricity saving” which had about 150,000 participants. In addition to those targeted approaches, integrated approaches were also carried out. For example, an intensive campaign encouraged customers to visualize electricity demand and supply status by connecting to TEPCO's “electricity forecast” service.

In the event of possible tight supply or rolling blackouts, the government prepared emergency alert messages to call for prompt electricity-savings practices, and planned to release electricity shortage alerts via TV and radio broadcasts, mobile phones and community wireless systems. Fortunately, this was not necessary in the summer of 2011 as the conservation measures results, helped by temperatures lower than an average year, enabled Japan to avoid planned outages.

<sup>26</sup> Demand Response: a decisive breakthrough, How Europe could save Gigawatts, Billions of Euros and Millions of tons of CO<sub>2</sub> – a study in collaboration with VaasaETT and Enerdata, published in 2008 and its update in 2012

<sup>27</sup> Follow-up Results of Electricity Supply-Demand Measures for this Summer, released by the Japanese Ministry of Economy, Trade and Industry (METI) in October 2011

<sup>28</sup> METI: Japan Ministry of Economy, Trade and Industry

## Utilities situation

During the observation period, many Utilities-related indicators evolved negatively, notably:

- Their stock performance compared to MSCI Europe decreased;
- Their Price Earnings ratio decreased.

However thanks to a dynamic divestment policy, their debt decreased in 2011.

Regulated infrastructures were the main assets sold during the observation period. The buyers were predominantly infrastructure funds. For example in May 2012, E.ON sold Open Grid Europe, its German gas distribution network, to a consortium led by Australia's Macquarie Group for €3.2 billion (see Table 12.1 in the report).

Those funds are now becoming strong actors in Utilities networks.

Utilities were negatively impacted by:

- A weak economy: due to the crisis and in some cases stringent social laws and new taxes, some Utilities clients such as industrial manufacturers, have continued to decrease their European footprint (bankruptcy, delocalization to low-cost countries, etc). Combined with lower energy prices and tariff ceilings in certain countries, this resulted in EBITDA decrease;
- Regulatory future decisions: for example the new EU energy efficiency compromise, requiring Utilities to ensure their own clients achieve energy savings from 2014 on. These aggregated savings should reach, year after year 1.5% of the Utilities annual sales, if not they would incur penalties;

- Political decisions such as:
  - Accelerated nuclear phase-out in Germany: this is very costly for Utilities as they had to close reactors well before the end of their lifespan. For example E.ON and RWE are to seek €8 billion in damages from the German government;
  - Renewable energy: a costly policy with part of the financial burden remaining on the Utilities accounts. For example, in France, these renewable-related extra costs are reflected through the CSPE tax and account for half of it (in 2012). CSPE should increase by 60% in 2012 to reach €4.2 billion and could reach €8 billion in 2020. However EDF is not allowed to pass onto the end customers the whole CSPE and the resulting cost for the Utility should be €1.2 billion in 2012;
  - Nuclear taxes: in 2011 the Belgium government decided to impose an annual €550 million tax on nuclear power generation. In Germany the nuclear-fuel tax was introduced at the beginning of 2011. It was understood to be linked to the nuclear lifetime extension which was announced at the same time. This tax remained despite the new nuclear phase-out policy decided after the Fukushima accident. Some German Utilities, as RWE, have filed litigation against this tax. Similarly in September 2012, the Spanish government has proposed two new taxes on the nuclear industry related to production and storage of radioactive waste.

As a consequence many large Utilities decided to divest some of their European assets and to increase their presence outside of Europe, notably in fast-growing countries. In order to implement this strategy, GDF SUEZ agreed in June 2012 to buy the minority interests (30%) in International Power for €8.3 billion, thus taking full control of this independent power generation company present in 30 countries worldwide.

The German Utility E.ON also has similar international ambitions and “plans for its outside Europe business to deliver 25% of its EBITDA by 2015”.

As seen above, Utilities have very important investment needs. They thus have to increase their competitiveness. In order to help its clients to reduce their operational costs, Capgemini carried out two benchmark studies: the “Multi-client B2C retail benchmark” focusing on “Cost to Serve” and the “European Power Distribution Networks Operators (DNOs) benchmark” focusing on operational costs.

According to the first study, the highest cost to serve<sup>29</sup> at €62.3 per client contract is more than twice the sample average (€27.8 per contract) showing

room for improvement. The latter is possible when taking a broad view embracing:

- Customer satisfaction improvement leading to a higher customer lifetime value;
- End-to-end process efficiency: marketing, acquisition, digital meter-to-cash value chain and energy services.

Structural factors such as consumers’ density, network structure and level of consumption have an impact on full DNOs costs level.

Taking these structural factors into consideration, Capgemini’s third benchmark study shows a 40% performance gap between the most efficient and the least efficient DNO on full costs.

On average, full costs can be decreased by nearly 7% to reach top performers’ full costs level through improvement of controllable costs<sup>30</sup>. Two thirds of this decrease arises from network operations and one third from customers’ services.

In summary, to be a winner in this difficult environment, European Utilities companies have to increase competitiveness, develop synergies along the value chain and cross countries and manage the assets portfolio while becoming more innovative.

<sup>29</sup> Cost to serve is a process-driven accountancy tool to calculate the profitability of a customer account, based on the actual business activities and overhead costs incurred to service that customer

<sup>30</sup> Controllable costs are costs related to activities on which the DNOs’ management can have a direct impact for cost reduction purposes. Examples include: maintenance, metering, contract management or network monitoring costs. At the opposite, non-controllable costs include network losses, transmission fees and distribution-specific taxes

## Conclusions

As it is well known, “it is easier to predict the past than the future”, especially in this period where we observe contradictory signals:

- Future infrastructure investments are huge but a slow economy and lower consumption could affect these needs;
- Energy efficiency objectives are difficult to meet but with the consumption slowdown they could happen naturally;
- The ETS system aimed at reducing greenhouse gas emissions has become inefficient, but the emissions reduction objective should be met thanks to the reduction in energy consumption linked to the economic crisis.

If one assumes that the crisis could last for long, a lot of the urgent reform and investment needs will be pushed further into the future — but the post-crisis wake-up call promises to be tough. The Utilities sector has proven to be much less resilient than previously thought, as companies are impacted by their own customer difficulties, European regulation policies lacking holistic global views, and governments still believing that they can continue to milk this cash cow. They should be careful not to kill the goose that lays the golden egg, especially as large Utilities are divesting from Europe.

As summarized by RWE’s CEO Peter Terium: *“The present framework conditions are anything but favorable; mounting state intervention in the energy sector, shrinking power plant margins and fierce competition in electricity and gas supply are all challenges we are facing”.*

Also Europe or Member States political inconsistencies are generating financial or strategic losses. For example:

- Relatively short-term renewables objectives are, as seen above, costing money to highly indebted governments while helping the development of foreign (Chinese essentially) companies;
- Early nuclear phase-out in Germany will have a high cost – paid for by domestic and industrial German customers;
- Refusing shale gas exploration and exploitation in France will deprive the country of low-cost gas, industrial revival (and the associated jobs) and greater energy independence;
- The forced unbundling of regulated activities has decreased the ROI on smart metering (that has to come only from the distribution part of the value chain) and made their deployment more difficult to decide. Europe is losing ground to the US;
- While the effects of unbundling on interconnections investments are unclear, national measures to accelerate local acceptance of aerial lines are not being taken.

The energy sector is strategic for Europe. More holistic analyses, longer-term views, more pragmatic approaches, more sustained regulations and better governance are needed.

Could it happen?

Paris, October 15, 2012



**Colette Lewiner**

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### About Exane BNP Paribas

Founded in 1990, Exane is an investment company specializing in 3 businesses:

- **Cash Equities:** Under the brand name Exane BNP Paribas, Exane provides institutional investors with research, sale and execution on European equities.
- **Equity Derivatives:** Exane Derivatives has built a robust structured products franchise, based on its longstanding leadership in European convertible bonds and options.
- **Asset Management:** Exane Asset Management is the leading long/short equity fund manager in France.

As a top-ten broker for European Equities, bolstered by the expansion of a strong platform in London, Exane BNP Paribas counts 110 analysts covering about 610 European stocks and work closely with an 90-strong sales and sales-trading team. Exane BNP Paribas serves more than 1,200 institutional investors worldwide from a base of ten offices (Paris, London, Brussels, Frankfurt, Geneva, Madrid, Milan, Stockholm, New York and Singapore).

Exane BNP Paribas's sound and balanced model is based on:

- Quality research reputed for rigorous analysis and sector expertise.
- A sales force close to our institutional clients and recognized for its stock-picking expertise.
- A comprehensive range of execution services (high-touch sales trading, facilitation, electronic trading, program trading and ETF).

More information can be found on [www.exane.com](http://www.exane.com)

### About CMS Bureau Francis Lefebvre

CMS Bureau Francis Lefebvre is one of the leading business law firms in France. Its organisation based on the active assistance by specialist lawyers and its recognised know-how for over 85 years ensure that companies are provided with reliable and sound advice relating to their strategic and tactical decisions at national and international level.

CMS Bureau Francis Lefebvre is a member of CMS, the organisation of 10 major independent European law firms providing businesses with legal and tax services across Europe and beyond. Operating in 46 business centres around the world, CMS has over 750 partners, more than 2,800 legal and tax advisers and a total complement of over 5,000 staff.

CMS main member firms' offices and associated offices worldwide: Amsterdam, Berlin, Brussels, Lisbon, London, Madrid, Paris, Rome, Vienna, Zurich.

More information at [info@cms-bfl.com](mailto:info@cms-bfl.com) and [www.cms-bfl.com](http://www.cms-bfl.com)

### About VaasaETT Global Energy Think-Tank

**The VaasaETT Global Energy Think-Tank** shares, develops and envisions best practice for the global Utilities industry through a network of thousands of senior executives, officials, researchers and other experts who are for the most part known and trusted personally. Value is provided to partners through the synergy of Interactive Forums and Collaborative Projects. The Think-Tank focuses broadly on strategic business, market, innovation and regulatory issues, and is world renowned for its expertise in fields such as Customer Psychology & Behaviour, Smart Metering and Demand Response.

More information at [www.vaasaett.com](http://www.vaasaett.com)

## About the European Energy Markets Observatory

Initiated in 2002, Capgemini's European Energy Markets Observatory (EEMO) is an annual report that tracks progress in establishing an open and competitive electricity and gas market in EU-27 (plus Norway and Switzerland) and the progress in reaching the EU's 3x20 climate change objectives. The report looks at all segments of the value chain and analyzes leading-edge energy themes to identify key trends in the electricity and gas industries.

The analysis is made by a team of consultants and regional experts of **Capgemini Consulting**, the global strategy and transformation consulting organization of the Capgemini Group. Their in-depth knowledge combined with sector news crunching provide an insightful analysis which is enriched by the expertise from our selected partners: Exane BNP Paribas, VaasaETT and CMS Bureau Francis Lefebvre.

## About Capgemini Consulting

**Capgemini Consulting** is the global strategy and transformation consulting organization of the Capgemini Group, specializing in advising and supporting enterprises in significant transformation, from innovative strategy to execution and with an unstinting focus on results. With the new digital economy creating significant disruptions and opportunities, our global team of over 3,600 talented individuals work with leading companies and governments to master Digital Transformation, drawing on our understanding of the digital economy and our leadership in business transformation and organizational change.

### Our Expertise and Unique Approach in the Utilities and Energy Sector

Capgemini Consulting helps clients formulate operational strategies, implement wide business transformations and optimize organizations and processes through dedicated operational management initiatives.

Our areas of expertise in the Utilities and energy sector include:

- Digital Utilities Transformation
- Smart Energy (including implementation of smart infrastructures)
- Power generation
- Power & gas infrastructures and regulated activities
- Energy retail including energy services
- Clean technologies
- Water distribution, collection and treatment
- Upstream and downstream Oil & Gas
- Operational excellence

Our 800+ professionals operating in 12 major geographies include consulting professionals and experts in specific value chain segments and industry issues. We deliver consulting services to 60% of the leading Utilities companies, and to 50% of the leading Oil and Gas companies worldwide.

We are recognized for our professional commitment and leadership, our intellectual curiosity, and our ability to innovate.

Find out more at:

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## About Capgemini

With more than 120,000 people in 40 countries, Capgemini is one of the world's foremost providers of consulting, technology and outsourcing services.

The Group reported 2011 global revenues of EUR 9.7 billion.

Together with its clients, Capgemini creates and delivers business and technology solutions that fit their needs and drive the results they want.

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