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Energy, Utilities and Chemicals | the way we see it

European Energy Markets Observatory

2009 and Winter 2009/2010 Data Set
Twelfth Edition, November 2010

In collaboration with

SOCIETE GENERALE
Cross Asset Research

C[M]S Bureau Francis Lefebvre

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Global Energy Think Tank

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A Strategic Overview of the European Energy Markets

Editorial by Colette Lewiner

The economic situation impacted energy trends

As foreseen, 2009 was a crisis year in Europe and in the US. While other regions in the world recovered by mid 2009, it was only at the end of 2009 that green shoots appeared in North America followed by Europe. Hopes were high in early 2010 that the economy would grow, albeit even slowly, however the solvency of certain European countries highlighted the eurozone fragility. Combined with a slower growth in the US and other countries, it has introduced doubts about a sustained recovery. Bumpy recovery scenarios have emerged again in Europe.

In China, India and other developing countries such as Brazil, the crisis, if any, was for a short duration and they are now enjoying a healthy growth.

While we need to acknowledge these regional differences related to economic recovery, let's recognize that many commodity markets including oil are global. Moreover, worldwide energy related resources are limited – around 40 years of consumption in conventional oil reserves; 60 years for conventional gas reserves (with non conventional gas, the technically recoverable gas resources would be worth 250 years of current production[1]); and much more for coal and uranium of around 100 years. Energy markets are, therefore, operating within not so long-term boundaries and what happens in one region of the world impacts the others. While oil and coal are true global markets, gas and electricity markets are not. However, the growing market share of liquefied natural gas (LNG) is allowing increasing global gas exchanges and, with electricity interconnections development, today's national electricity markets are moving regional.

Developing countries, and especially the Asian recovery, have triggered higher oil demand. Consensus now expects oil demand to increase by 1.8mb/d (+2.2%) and by 1.3mb/d (+1.5%) in 2010 and 2011 respectively[2]. With limited production growth from non-OPEC regions, and the expectation that few new fields will be brought on stream in the OPEC countries, one can forecast tighter oil markets. A tighter oil market, with a need for OPEC to increase production, should trigger higher oil prices. Prices have already increased from about US$50 per barrel in the spring of 2009 to about US$80 per barrel at the beginning of September 2010. In addition, the fall of the euro against the US dollar has made European imported energy even more expensive, possibly impacting the fragile economic recovery.

This upward oil prices trend should continue in the future as unconventional supply will be at a high cost. For example, heavy oil extracted from tar sands in Canada will be more costly to exploit (extracting oil from tar sands is economically viable with a barrel at US$80) and in addition the projects are facing opposition linked to their environmental impact. Needless to say that the BP Macondo well accident in the Gulf of Mexico will push regulators to tighten security rules on deepwater exploration and production and to possibly increase liability caps resulting in higher producing costs.

In an opposite movement, the spectacular development of unconventional gas in the US, that today provides around 50% of their production combined with the economic crisis, has led to a sharp gas price decrease. Prices in the US fell to historical lows of US$4/MBtu in September 2009 and have rebounded to US$6/MBtu in January 2010. They are significantly lower in the US than in Europe.

It is interesting to note that gas prices in the US and to a certain extent in the UK are no longer correlated to oil prices. On continental Europe, Gazprom is publicly opposed to gas contracts indexation to spot prices arguing that European trading hubs are not liquid enough and that prices could be manipulated by the large players who are at the same time their clients! However, during the winter of 2009/2010, due to surplus supply in Europe and full storages, Gazprom accepted some concessions to its usual contractual policy (take-or-pay contractual obligations and oil prices indexed contracts) by accepting to cancel some committed quantities and, for limited volumes, to sell at spot prices. Gas spot prices were down in 2009 with little rebound (at €12/MWh on average). On the contrary, and because of increases in oil prices, long-term continental European gas supply prices increased at the end of 2009 and into early 2010 (at €21/MWh on average). In certain countries such as France this wholesale price increase was reflected in retail tariffs that triggered public protests.

At equal energetic content, with these low spot prices, gas is significantly cheaper than oil while being less polluting. This anomaly should be corrected in the long-term. Two things could happen (or a combination of both): either a massive gas substitution to oil happens or gas prices go up as investments in gas exploration and production (onshore, offshore or shale gas) become less attractive, thereby, creating a tense supply situation.

In Europe, electricity wholesale prices went down on average in 2009 compared to 2008 and are stable since the beginning of 2010. Retail prices for all customer segments followed this trend.

1 IEA World Energy Outlook 2009

2 IEA Oil market report, August 2010

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Some retail electricity tariff increases occurred in mid 2010. In France, for example, electricity tariffs were raised by 3.4% on average in order to finance heavy investments needed mainly in generation plants. Electricity tariff increases took place in other European countries (+2% in Germany in H1 2010; +4% in Spain; and +4.2% in Sweden announced on July 1, 2010).

Energy consumption decreased in 2009 and has started to increase again in early 2010

In 2009, we witnessed a historical consumption decrease worldwide for all forms of energy: oil, coal, gas and electricity.

In Europe, 2009 electricity and gas consumption decreased compared to 2008 (-4.7% and -6.1% respectively[3]) triggered by the industrial sector with, at the beginning of 2009, a 10% or more monthly decrease. The residential sector was resilient with, in certain countries, even an increase in demand.

In last year's edition of our Observatory, we predicted a recovery in 2010 which has happened. In H1 2010, electricity consumption increased by 3.4% and gas consumption increased even more by 10.3%[4].This apparent electricity and gas growth was, however, higher than in normal conditions as we experienced a very cold winter of 2009/2010 in Europe with temperatures below the decennial average by 2 to 4°C.

Future energy consumption evolution will be mainly linked to three factors:

- **Economic situation:** For certain sectors such as industry, there is a significant elasticity between the economic situation and energy consumption while elasticity is low for residential usages that are linked to the fundamental needs of heating or cooling for example. Accordingly, the economic crisis has triggered a decrease in the electricity and gas industrial consumption as plants' capacity was only partially needed. With the necessity to replenish low stockpiles, plants have operated, since the beginning of the year, at a higher capacity (the EU-27 industry production index gained more than four points since January 2010). However, this crisis has accelerated the industry production geographical shift to Asia despite governments' pressure to stop or at least slow down these relocations as they destroy European jobs. This trend should continue to bring down energy consumption and CO_2 emissions;
- **Future regulation effects:** In addition to the European Climate-Energy package effects, energy savings regulations recently adopted by the Member States will impact energy consumption in the mid-term. As an example, the French Grenelle de l'Environment[5] comprises various measures to improve building insulation (400,000 homes per year at cruising speed), to reduce the cars gasoline consumption with a "green sticker" (in order to meet the European standard of 120 g/km in 2012) and to encourage the use of rail transportation. The energy savings related to these regulatory effects will take longer to produce results but they will be more sustained than those linked to the economic crisis;
- **Customer behaviors** that are a key element for sustainability:
  - There is a general need for more comprehensive *public information* on energy. Explanations on energy resources boundaries, on energy savings necessity and also on the need to build energy related infrastructure should trigger savvier behaviors;
  - *Price signals*, as time of use rates or energy prices increases, also contribute to virtuous customer behaviors. However, during economic recession times, governments that try to avoid deteriorating their citizens' purchasing power were reluctant to increase electricity and gas prices. However, prices have to increase on a mid-term horizon;
  - *Demand response programs:* New devices – smart meters and intelligent home devices – are a key investment that improves customer energy consumption awareness and energy demand management efficiency. The EU 3rd Legislative Package (adopted in April 2009) recommends that 80% of the European population to be provided with intelligent meters by 2020. Up to now, this recommendation had little impact as the Return on Investment (ROI) for Utilities on smart meters and for individuals on intelligent home devices is not good enough. A key benefit for Utilities comes from the winter or summer demand peak shavings, thus avoiding new plants' or grids' construction. However, following the European market liberalization, the Utilities value chain is now split between regulated (transmission and distribution) and unregulated (generation, trading and sales) activities. As metering is usually part of the distribution regulated business and as a large proportion of savings related to smart metering investments come from the unregulated generation unit (i.e. peak load costs savings), the distribution unit's smart metering ROI is unattractive and investment decisions are difficult to take. In Italy, smart meters are fully implemented. Sweden took the roll out decision in 2003 while France has just decided to implement them

3 Amended geographical perimeter (EU-27 but Malta and Cyprus + Norway and Switzerland), the reference used in this report

4 SG Energy Pulse index tracks the monthly consumption of a focus group comprising, for electricity: France, the UK, Italy, Belgium, Greece Portugal, Denmark, Spain and Poland (i.e. 60% of EU-27 electricity consumption) and for gas: France, Portugal, Spain and the UK (i.e. 36% of EU-27 gas consumption)

5 The "Grenelle de l'Environnement" is a Round Table on environmental issues to define the key points of government policy on ecological and sustainable development issues for the coming five years. More information are available at http://www.legrenelle-environnement.fr

(September 2010[6]). Many other European Member States' governments have been slow to impose smart meters deployment. This is regrettable as smart meters, in conjunction with demand side management Utilities programs, should lead to significant savings in electricity consumption, peak power and CO_2 emissions. A Capgemini study[7] shows that dynamic programs launched in the EU-15[8] countries could save 200 TWh per year by 2020 (which represents the combined residential consumption of Spain and Germany). Remote control programs of electrical appliances that have shown very positive results in the US (for example in Florida and Texas) should also be considered in addition to or replacement of smart meters deployment in Europe.

In the mid-term, all these combined factors should lead to a slower electricity consumption growth.

The European energy mix is slowly becoming greener

According to the EU objectives, and in addition to the energy savings, the energy mix should evolve towards lower CO_2 emitting energy sources. Both energy usages and types of new plants impact this energy mix.

Energy usages

As an example, the transportation sector which is heavily oil dependant, is one of the biggest CO_2 emitters and has to evolve to both low consumption vehicles and other types of fuels (2nd generation biomass and / or electricity). Nearly all of the world's largest car manufacturers now plan plug-in hybrid vehicles or fully electric vehicles within two years. Battery improvement is a bottleneck for the massive deployment of electric vehicles. Manufacturers are developing efforts to increase batteries' autonomy between two loads and to decrease their weight. Commercial innovations such as renting batteries instead of buying them will also help the electric vehicles deployment. Massive electric cars adoption, when it happens, will impact the distribution grid management and, if not carefully thought out, could push up evening electricity peaks. It is worthwhile noting that electric vehicles while contributing to reduce local pollution do not automatically reduce global CO_2 emissions unless the electricity generation is predominantly CO_2 free produced by renewable and nuclear plants. This is the case in France but not in Germany for example.

New generation plants

As predicted in last year's edition of our Observatory, real engagements in new generation plant constructions have slowed down in 2009, while the longer term plans are officially untouched. This is a reflection of the financial crisis, the Utilities sector financial situation, and the short-term consumption decrease.

- *Gas:* Our Observatory also shows that Utilities are investing mainly in gas-fired plants, taking advantage of lower investment costs than for other types of plants, shorter construction duration and hoping that the present low gas prices will remain in the future. In France, for example, these plants are mainly used in peak and semi-peak hours. As in many European countries, winter (and even summer) load peaks are predicted to be sharper and sharper; the related gas consumption should go up unless efficient demand side management projects, helping to "shave" the peaks, are implemented;
- Despite the dominance of gas and other fossil fuels, year-after-year the primary energy mix tends to become "greener". In 2009, regional investments in *renewable energies* were impacted differently by the crisis. Global investments in clean energy only decreased by 7% to US$162 billion according to Bloomberg New Energy Finance with contrasted situations: growth in Asia especially in China (+53%) which offsets falls in North America (-38%) and in Europe (-10%). China is now the biggest wind power market, doubling its installed wind capacity in 2009 by adding over 13,000 MW, and the biggest wind turbines manufacturer. China is also the world's leading solar panel producer, with a 32% market share in 2008, and solar panels exports valued at US$15 billion.

In 2010, worldwide funding is increasing as US$248 billion of the stimulus funding should go on green projects. In Europe, a €4 billion energy infrastructure investment plan was adopted by the EU Member States in May 2009 of which €565 million was dedicated to specific offshore wind projects and €910 millions to smart grids.

However, this improved 2010 investments' situation could be hit again by governmental subsidy decreases linked to the rigorous plans that are being adopted in most European countries. Many countries, including Spain, Italy, France and Germany, have reduced their subsidies to renewables (especially wind and solar energy). Recently, in addition to cuts on subsidies to wind and thermo-solar plants, Spain announced in June 2010 its intention to cut by 45% guaranteed subsidized electricity prices paid to new solar photovoltaic (PV) power plants. In France, on September 1, 2010, the government decreased the solar PV feed-in tariffs by 12% in an attempt to prevent a speculative bubble.

Until green energy becomes profitable, the industry will rely on government incentives to keep it alive. Solar power, for example, is still about three times more expensive than coal and onshore wind is the only green energy source considered a break-even prospect. However, higher and sustained oil prices could improve green energy development.

We are continuing to witness a *nuclear renaissance* in Europe and more countries now have a positive attitude towards nuclear plants. Lifetime extension programs have been launched in Belgium, Spain and are envisaged in France (with an investment spending of around €3 billion). Provided safety is kept at high levels, these programs have a high ROI: in France, around €0.5 billion should be spent per reactor for a ten year – or more – lifetime extension compared to around €5 billion cost of a new EPR plant.

In Germany, the coalition government has taken a position in September 2010 to extend the nuclear power plants lifetime by 12 years on average. To compensate

6 Decree imposing the start of smart meters roll out in 2012 and 95% of clients equipped in 2016 – September 2, 2010

7 "Demand Response: a decisive breakthrough for Europe", a Point of View by Capgemini, Enerdata and VaasaETT, 2008

8 EU-15: original 15 Members of the European Union until May 1, 2004: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the UK

for the windfall profits that they make because of lifetime extensions, nuclear power plant operators will have to pay a "fuel-element tax" totaling €2.3 billion per year for six years. They will also have to pay a supplementary "eco-tax" that amounts to an estimated €15 billion during the remaining lifetime of Germany's nuclear units. They will continue to pay a voluntary contribution of €300 million a year in 2011 and 2012, and €200 million a year from 2014 to 2016 for the construction of renewable energy plants. They will pay more after 2016 when the windfall-profit tax will no longer be payable. Despite all these extra taxes, analysts view these decisions as favorable for the German nuclear operators, E.ON, RWE and EnBW.

Finland, France and the UK were the first European countries to take decisions to build new plants. They were followed by a number of Eastern European countries including Slovakia, the Czech Republic, Bulgaria and Romania. In July 2009, Italy removed its nuclear moratorium and in June 2010 Sweden voted to allow new plants to be built. Other countries will follow (possibly Switzerland and the Netherlands).

However, the first European plant completion (Olkiluoto in Finland and Flamanville in France) are delayed mainly because of EPR's[9] design complexity and construction difficulties.

These EPR delays are also an illustration of the necessity for the industry as a whole to ramp up its facilities, quality insurance and human capabilities as it seems to be more painful than forecasted. On the positive side, as consumption growth is slowing down, the need for these new plants is delayed, thus leaving more time for their completion. On the negative side, the present delays are increasing the final electricity cost as initial investment accounts for 60 to 80% of the generated electricity costs. These construction risks could threaten the nuclear energy competitiveness and render new nuclear plants more difficult to finance.

Many Utilities are focusing on reducing their debts

As a consequence of a bullish acquisition strategy from 2006 to 2008, many large Utilities' war chests have significantly decreased triggering divestments in order to restore the balance sheet. Networks, having long-term recurrent revenues, were seen as easier to sell assets. For example, EDF has agreed to sell its UK distribution networks to a consortium headed by Hong Kong billionaire Li Ka-Shing for UK£5.8 billion.

In addition to cash, Germany's transmission network sales allowed E.ON and Vattenfall Europe to obtain from the EU DG Competition a drop of their charges.

In a similar move, Italian Eni announced that it plans to sell stakes in three major pipelines (valued at €1.5 billion) as part of a potential settlement with the EU regulators over alleged anti-competitive behavior by the company's natural gas pipeline business.

Following the same trend, Enel sold 80% of Endesa's gas pipelines to two Goldman Sachs' infrastructures funds for €800 million.

This cash situation explains that, while we are witnessing many mergers and acquisitions in the Oil and Gas sector, there are fewer in Utilities. However, GDF SUEZ after the time needed to digest their initial merger has announced the first very large acquisition since the crisis. By combining GDF SUEZ Energy International assets (which includes North America, Latin America and the Middle East) with International Power's and adding UK£1.4 billion in cash, GDF SUEZ took a 70% stake in the new International Power Company. This new company, will be a leading global energy producer with strong market positions in America, Europe, the Middle East, Asia and Australia with a total generating capacity of 66 GW. GDF SUEZ is also planning €4 to 5 billion divestments in 2011-2012 and has started this program by selling its 5% stake in Gas Natural.

Finally, austerity plans and a commitment to reduce national debts are pushing governments to consider privatizing their Utilities: ESB and Bord Gáis in Ireland; Galp, EDP and REN in Portugal; Enea in Poland; and PPC in Greece. Others could follow.

Electricity and gas security of supply have generally improved except during the very cold winter in certain regions

Electricity security of supply was threatened during extreme weather conditions

During the observed period, thanks to a consumption slow down and new plants' commissioning, security of supply improved globally (from 9.2% in 2008 to 9.8% in 2009). However, the exceptionally cold weather threatened electricity supply in a few countries. A case in point was the French situation, where in December 2009 and in early January 2010, temperature was 6 to 8°C degrees below normal. Each one degree drop in temperature triggers an extra electricity capacity need of 2,100 MW and the electricity peak went up to a record of 92,400 MW. At the time, the nuclear plants' availability was not good so France had to import up to 8,000 MW from its neighbors for several consecutive days. This import level was near the upper possible limit of 9,000 MW. The situation was even more tense in certain French regions having a fragile transmission grid and messages were sent by the TSO, RTE, to the population asking them to lower their consumption around 7 PM (the peak time). These messages were very well received and the population behavior helped to avoid black-outs.

This demand and supply balance in peak load situations is a real threat to security of supply.

What to do?

- *Peak power plants* investments: In France, in the RTE scenario, peak load demand is estimated at around 30,000 MW at 2025 horizon which represents an investment of €15 to 20 billion to be matched;
- *Network investments:* Let's not forget that the origin of many recent black-outs

9 EPR: European Pressurized Water Reactor

was linked to grids' collapse. There is, thus, a necessity to reinforce both the transmission and distribution grids. Smart grids' investments are also aimed at improving grid reliability. Progress has been made on this front as reflected by the 2009 increase of 15% in the national transmission grids investments;

- As extreme weather events don't always happen at the same time in European countries and as the demand/temperature correlation (often linked to electric heating market share) is not the same in all countries, increasing importation capacity increases security of supply. Investing in European interconnections and decreasing the bottlenecks is, thus, important. While little progress in interconnections investments has been made in 2009 some new large electrical links such as Spain-Portugal, UK-Netherlands or Ireland-UK should be commissioned in 2010 and 2011;
- The importance of *demand response programs* has been demonstrated again during the 2010 exceptionally hot summer in the US. This could have triggered electricity black-outs on the East Coast as transmission capacity was insufficient. These black-outs were avoided thanks to the dynamics demand response programs – as those deployed by PJM[10] – that resulted in peak shavings and increased electrical supply reliability.

In conclusion, European Utilities and regulators need to move quickly on smart metering implementation and other devices deployment in order to boost demand side management and load management programs thus increasing electricity supply reliability.

Gas security of supply is a long-term concern

During the crisis, gas consumption decreased even more significantly than that of electricity as it was hit both by direct consumption decrease and indirectly by the gas-fired electricity plants' consumption decrease. While impacting negatively the Utilities' revenue, this consumption decrease was positive on the European gas security of supply, as shown by the high March 2010 gas level in the European reservoirs despite a cold winter.

Even if in 2009, Gazprom's gas share in Europe's imports fell from 39% to 35%, in the long-term, as much as 50% of EU gas could be imported from this Russian supplier. This could be a threat to the security of supply as demonstrated in the previous years when disputes between Russia and Ukraine (one of the transit countries) deprived the EU of Russian gas during three very cold weeks in early 2009. This year's shorter dispute between Russia and Belarus had a much smaller impact as the crisis was of a shorter duration and gas storages were full.

What to do?

- *Increase storage capacity:* The EU recommends that each country has a storage capacity of 60 days of consumption. The situation is very different from one country to another. Germany, France and Italy having the largest capacity while the UK has one of the smallest. Thanks to the past year's investments, storage capacity in Europe has increased by 15% in 2009 representing 19% of its annual consumption. More than 120 new facilities or extensions projects have been listed but only 23% of these projects benefit from a final investment decision;
- *Increase LNG's share in the total gas supply,* as LNG enables access to 80% of worldwide proven gas reserves thus providing a good supply diversification. 2009 and early 2010 have seen the opening of LNG terminals in Wales and near Venice (an offshore terminal able to supply 10% of Italy's needs) and the partial opening (20%) of Fos Cavaou in France. However, the economic crisis had an impact on the 30 new terminal projects. Several of them (e.g. Brindisi, Rosignano, Civitavecchia and Alpi Adriatico in Italy; Dunkirk and Le Verdon in France) were postponed or cancelled. All together and boosted by cheap international gas prices, LNG imports increased by 27% in 2009;
- Since mid 2008, demand side events, such as the economic recession and the development of US non conventional gas[11] and those on the supply side, such as the commissioning of new liquefaction plants in Yemen and Qatar, have transformed the LNG market. From a 2008 suppliers' market it changed into a buyer's market creating today's LNG bubble. In the long-term, the prediction is that it will take a few years to absorb this LNG "bubble" and that a tense supply market could prevail again. However, this trend could be mitigated by domestic gas production in importing countries such as China or other developing countries. According to Wood Mckenzie studies, Chinese coal gasification, coal bed methane and shale gas are expected to cut from 2020 the country's need for new LNG to 8 million tons a year against 16 million annually during the next decade;
- *Develop unconventional gas production:* Europe has probably lower reserves than the US and they are not yet well known. The IEA estimation amounts to 35 tcm compared to conventional reserves of 3 tcm for the EU and 3 tcm for Norway. Exploration projects are underway in different parts of Europe and unconventional gas production would certainly contribute to security of supply improvement. However, the environmental issues could be more difficult to overcome than in the US;
- *Invest in reverse flows infrastructure:* Gas flows are mainly directed from East to West. The latest Russia-Ukraine crisis highlighted the difficulty in reversing flows and the importance of developing West to East gas flows. The projects (about 40 in total) aim at shipping more easily gas coming from North Europe and LNG terminals to the East and easing gas flows between neighboring countries in case of a supply crisis. These projects cost estimates have reached €1.5 billion, and some of them could benefit from EU subsidies (€80 million for reverse flows);
- *Improving gas market fluidity:* Some progress is being observed. The Balkans is a case in point with plans being implemented to integrate the various pipeline networks into a single system. The Greek pipeline operator, DEFSA, has been improving delivery capacity to neighboring Bulgaria with gas sourced via Greece's LNG import terminal near Athens. In December 2009, the opening of the Central European gas hub (CEGH) at Baumgarten in Austria, close to the Hungarian and Slovakian borders, is already improving the ability of the region to store and distribute gas

10 PJM is a Regional Transmission Operator (RTO), operating 51 million customers on the US East coast. PJM offers several demand response solutions such as economic load response (the customers reduce their consumption when locational marginal prices are high) or emergency load response (customers are compensated during emergency conditions on the PJM system)

11 Non conventional gas (or unconventional gas) designates: shale gas (the most important resource), tight gas and coal bed methane found in former coal mines

to neighboring states in Central and Eastern Europe;

- *Build new pipelines routes:* The EU's strategy is to enable the gas import from Central Asia (mainly Azerbaijan, Turkmenistan and Kazakhstan) through a new pipeline route so as to avoid Gazprom's infrastructure. On the contrary, Gazprom advocates that new pipelines avoiding transit countries (as Ukraine – 80% of transit – and Poland) and thus decreasing conflict situations that have in the past deprived Europe from gas supplies will improve security of supply. The Nabucco pipeline is the EU's flagship project with a forecasted 6% of annual European consumption capacity and a planned start operations date in 2014. However, this project is encountering a lot of difficulties to secure its future gas supply.
  On the contrary, the competing project, South Stream pipeline has made progress, on one hand, through intergovernmental agreements signed between Russia and future transit countries (Bulgaria, Serbia, Hungary, Greece, Slovenia and soon Austria) and, on another hand, in extending its shareholders portfolio with EDF's future entry at 10% in the capital.
  On the Northern side, the Russia/Germany led project, Nord Stream, has extended its shareholders with Gasunie from Netherlands, and GDF SUEZ from France. It is built to transport gas directly from Russia to Germany across the Baltic Sea, avoiding Poland (and Ukraine). Its construction started in April 2010 and the first gas delivery is scheduled for early 2012.
  However, with investments of around €10 billion per pipeline and the slower growth of pipeline gas supplies, the probability of having the three pipelines built before 2020 is slim.

Longer term view: the crisis has negatively impacted investment in energy infrastructures as well as energy consumption trends. It is hard to say if both decreases will match and if security of supply will improve or at least not deteriorate. According to ENTSO-E[12], generation adequacy should be maintained until 2025 in its best estimate scenario[13]. This is good news providing that current planned investments will not be delayed.

While the EU CO_2 reduction objective is likely to be reached, the renewables and the energy efficiency objectives could be more difficult to attain

Let us recall that in June 2009, the EU parliament adopted the so-called 3x20 objectives to be met by 2020: 20% CO_2 emissions reduction compared to 1990 level, sourcing 20% of all final energy consumed from renewable sources and 20% energy consumption reduction. Before looking at Europe's current situation and examining the likelihood of these objectives to be met, let us have a glance at the international situation.

On the international front, very little has been achieved

The results from the December 2009 Copenhagen conference fell short of the EU's goal of achieving maximum progress towards finalizing a legally binding global climate treaty to succeed the Kyoto Protocol in 2013.

The Copenhagen Accord endorses, at a global level, the objective of keeping warming to less than 2°C above the pre-industrial temperature. The Accord also lays the basis for a substantial "fast start" finance package for developing countries, approaching US$30 billion for the period 2010 to 2012, and medium-term financing of US$100 billion annually by 2020. However, this non binding Accord leaves many important details to be worked out in 2010 to make it operational. It seems that the UNFCCC[14] Bonn intermediate conference results were disappointing and that a lot of progress needs to be done before the year-end conference in Mexico.

Outside the EU, no new binding commitment CO_2 emissions reductions and/or on cap and trade system, were adopted at the country level. No legislation will pass in the US before the November 2010 mid-term elections (and even perhaps after) and the Australian law was rejected.

EU CO_2 emissions reduction objective is likely to be reached

Thanks to the economic recession and to national legislations (even if these will have mainly a longer time effect) the EU has basically achieved its Kyoto target as a bloc, although some Member States are still a long way away from their individual targets.

In 2009, a drop of around 7%[15] in the CO_2 emissions under the European Trading Scheme (ETS) system was observed and the 2020 target is less challenging. The EU will have to achieve a reduction of the same absolute magnitude as that expected over the years 1990 to 2010 but in only half the time and without the benefit of favorable one-off factors[16]. However, the probable soft economy and regulatory measures adopted at the EU and Member States levels will help.

Renewables share in final energy consumption is a challenging target

Even if lower than the previous 2008 exceptional growth, renewable energies generation continued to increase in 2009 (15% for wind and 53% in solar PV). However, despite this growth and as reflected in our projection, one can fear that the 20% target will be very difficult to meet. The European Commission's assumptions imply that by 2020 the renewables output will effectively double from around 600 TWh today to around 1,200 TWh by 2020, with about 500 TWh of this increase coming from wind. This could be very difficult to meet as:

- In much of Western Europe the most favorable onshore-wind sites have already been taken, necessitating the development of offshore wind farms that are more expensive and more technically challenging to build and maintain;
- Project finance capital is likely to be more constrained over the next decade than over the last; and
- The subsidies needed to drive the development of offshore wind and solar energy in many EU countries over the next few years will be negatively impacted by their financial situation.

12 ENTSO-E (European Network of Transmission System Operators for Electricity) was created at the end of 2008 and is operational since July 1, 2009. ENTSO-E is the unique association of European electricity TSOs comprising all former regional organizations such as UCTE or ETSO

13 ENTSO-E System Adequacy Forecast 2010-2025

14 UNFCCC: United Nations Framework Convention on Climate Change

15 http://www.eea.europa.eu/highlights/recession-accelerates-the-decline-in

16 Carbon Emission Reports, Deutsche Bank – 2010

Improving energy efficiency by 20% is a difficult but achievable goal

As far as the energy efficiency goal is concerned, this consists in significantly reducing the EU's primary energy consumption from 1,750 Mtoe in 2005 to 1,520 Mtoe by 2020. In 2009, primary energy consumption dropped by 5.6%.

While the Western European industry has already contributed widely to energy savings, improvements in new EU Member States could be expected.

In addition, this crisis has accelerated plant's relocating outside of Europe, resulting in lesser industrial energy consumption. One could believe that the industrial energy future savings are mainly linked to the economy softness level.

More savings should come from other sectors (buildings, transportation) with longer lead times. As already outlined, many national legislations are focusing on building's energy consumption – new isolation regulations and renovation programs – and transportation where huge investments and technology breakthrough are needed.

However, let's not forget that 2020 is a short-term horizon compared to car fleet's renewals or even more so to the renovation of buildings and thus, these new legislations will have only long-term effects.

This is why, unless the economy growth stays flat during the next decade, the EU goal is ambitious and all the more so given that – unlike the emissions and renewables targets – it is not legally binding.

CO_2 prices were too low to trigger switches to lower carbon generation

As a consequence of the above analyzed factors, the spot EUA prices remained stable, in a €13-14/t of carbon range. Because of production slowdown, the industry had an excess of certificates while Utilities were short. Even with the present low gas spot prices, a price of €20/t would be needed (on a short run marginal cost) to trigger switches from coal to gas. This price level should rise to €80/t to economically justify Carbon Capture and Storage (CCS) equipment and this has a low probability to happen in the years coming.

Many factors will impact the ETS future prices including new EU legislation (a 30% CO_2 reduction objective for example), the economic situation and the implementation of auctioning for Utilities starting in 2013.

Some politicians in the UK (and the US) advocate for a carbon price floor in order to give more visibility to investors in CO_2 free generation – mainly in nuclear plants that have a long lead time – and to push for more renewable.

Other politicians want to implement a European carbon tax which would push customers

to buy or use less CO_2 rich products. According to some economists, these carbon taxes have enabled a "green industry" growth, reduced CO_2 emissions and contributed to the economic growth in the countries where they were implemented (Denmark, Sweden and Finland). Their effectiveness is, however, controversial as polluting industrial activities' relocations are partly responsible for the observed CO_2 savings.

Generation mix and customer behaviors changes are calling for smart grids

The above analysis concludes that while overall security of supply increased during the observed period, very tense situations were observed in electricity during the peak periods necessitating either significant peak power generation investment or vigorous demand response programs enabled by devices such as smart metering.

Boosted by the EU Climate-Energy directive, the generation mix is becoming greener implying a high growth of renewable energy share in electricity production.

These new trends related to energy mix and customer behavior, are strongly impacting the electricity grid management, which is a key factor in electricity security of supply.

Today, balancing supply and demand on the grid is a complex exercise requiring already sophisticated equipment, automatisms and data management. With the increase of the renewable energies percentage of generation capacity, the electrical grid's management is facing new challenges as these energies provide unforeseeable and intermittent power generation that is thus not schedulable[17].

Wind and solar power units are generally small providing decentralized type generation and normally they are connected to the distribution networks. Also, with decentralized generation, notably solar PV, customers will become occasional producers. Instead of receiving electricity from the grid they will inject it onto the grid. Today, the distribution network management is not designed to manage these decentralized and sometimes bi-directional flows.

To respond to these new challenges, a new grid concept, smart grids, has emerged. These smart grids will necessitate new equipments and will be more digitally managed. Managing a dramatic increase in data flow, data storage and exchanges both for grid balance and customer relations will become a significant and new challenge.

Thus, communication protocols will need to be standardized in order to manage the information flow on the net and with the customers as well as within buildings. The US Department of Energy took the lead on these crucial standardization points and, unfortunately, Europe is lagging behind which could penalize the European electrical equipment industry.

Smart grids implementation will necessitate new investments. Today, there is funding in Europe and, more so, in the US, for smart grid studies and prototype buildings but not for their real deployment.

As discussed above, with the European Utilities unbundled value chain, separate ROI for the regulated and unregulated entities is not obvious to demonstrate even for smart meters. Massive smart grids' deployment will need a regulatory push and funding through transmission and distribution tariffs increase and by consequence higher electricity prices. These are difficult but needed decisions to take during fragile economic periods.

Paris, October 20, 2010

Colette Lewiner

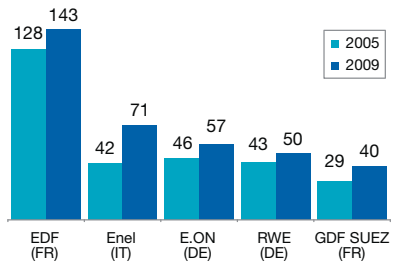
Global Leader of Energy,
Utilities and Chemicals Sector at Capgemini

17 "The Impact of Renewables on the Electric Grid", Point of View by Capgemini – 2009

Competitive Power

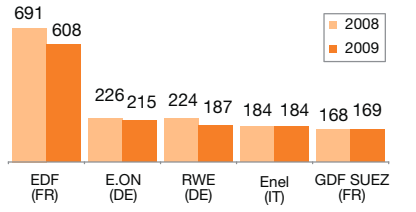
Electricity Generation

Top 5 - European players in terms of total installed capacity in GW



Source: Companies' annual reports – Capgemini analysis, EEMO12

Top 5 - European players in terms of total electricity generation in TWh



Source: Companies' annual reports – Capgemini analysis, EEMO12

In the short-term, the drop in electricity demand due to the economic crisis combined with the continuing momentum in capacities' construction ensured security of supply in most European countries

The economic crisis strongly hit electricity demand in 2009

In 2009, electricity demand was influenced by two conflicting drivers: the economic crisis, which strongly hit industrial power consumption and the cold winter temperatures, which increased electricity demand. The first factor more than offset the second one.

The crisis impact started in Q4 2008 and the effect was confirmed and increased in 2009 with a 4.2% drop in the EU-27's GDP, leading to a 4.7% drop in European electricity consumption[18], the first drop since 1982:

- The highest falls were reported in Eastern European countries like Slovenia (-10.9%), Romania (-8.3%), Slovakia (-8%) and Hungary (-7.9%);
- Western European countries registered significant decreases as well, such as Italy (-6.4%), Belgium (-6.3%), Germany (-5.2%) or Spain (-4.4%). In Germany, extremely low demand on October 4 even led to negative prices in the market at -€11.59/MWh;
- Several countries sustained their domestic electricity demand like France (-1.6%) or Portugal (-1.5%). In France, the economic crisis impact was partially offset by the (electrical) heating consumption during the cold winter.

The European industrial power consumption was the most impacted with for example, a 8.6% drop in France and a 16% fall in Finland and Belgium, when comparing 2009 with 2008.

The colder than normal winter temperatures boosted electricity demand in 2009. Severe winter conditions were reported in most European countries leading to a lower decrease in consumption in the winter (-2%) than in the summer (-6%) in Europe, according to ENTSO-E.

Five countries registered historical peak loads during the cold snaps that hit Europe:

- In France, three new historical peak loads were recorded successively in January 2009. The new historical peak load (92,400 MW) was reached as temperatures were 7.8°C below normal;
- The cold temperatures led to historical peak loads in the UK, Switzerland, Austria and Portugal.

Hopes of recovery arise in Q1 2010

In Q1 2010, the first signs of economic recovery combined with cold weather resulted in an increase in consumption. According to Eurostat, Q1 2010 electricity consumption in the EU-27 was 2.5% higher than in the same period of 2009. And the SG Energy Pulse Index[19] for Q2 2010 shows a 3.3% increase compared to the same period of 2009. Nevertheless, electricity consumption has not reached pre-crisis levels.

The growth of generation capacity was supported by investments in wind plants and gas turbines planned before the crisis

Despite the crisis, the European generation capacity increased by 23.8 GW in 2009, +2.8% compared to 2008 (see Table 1.1). This increase results mainly from projects in Renewable Energy Sources (RES) and gas-fired plants launched before the crisis:

- The highest rise was reported in Portugal (+12.3%) mainly due to the launch of a new 870 MW combined cycle gas turbine (CCGT) and new wind power stations (700 MW);

18 Amended geographical perimeter (EU-27 but Malta and Cyprus + Norway and Switzerland), the reference used in this report

19 SG Energy Pulse index tracks the electricity monthly consumption of a focus group comprising France, the UK, Italy, Belgium, Greece, Portugal, Denmark, Spain and Poland (i.e. 60% of the EU-27 electricity consumption)

C. Lewiner (ed.), *European Energy Markets Observatory*, DOI 10.1007/978-94-007-2753-3_2,
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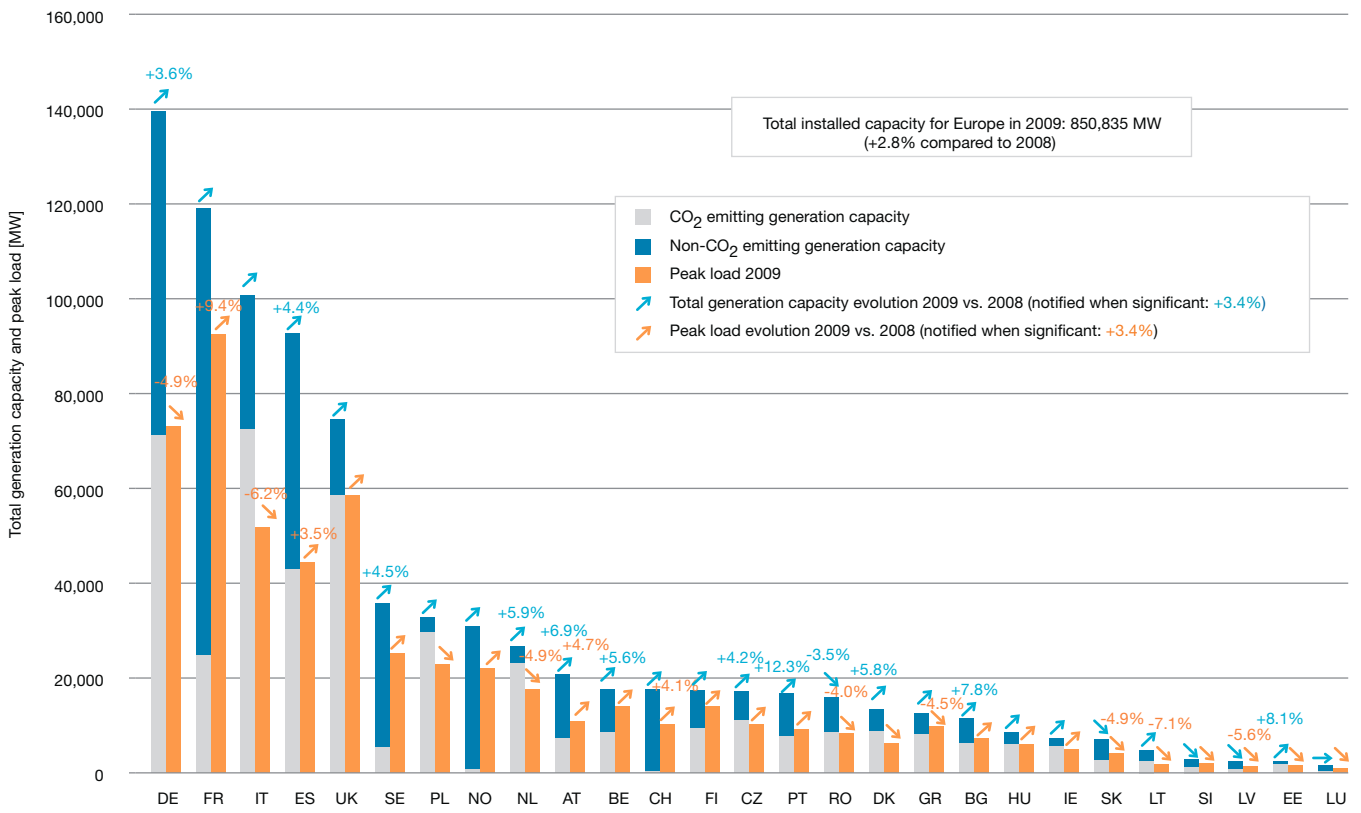
Table 1.1 Peak load, generation capacity and electricity mix (2009)



Source: ENTSO-E, BALTSO, Nordic Energy Regulators – Capgemini analysis, EEMO12

- Other countries also increased their generation capacity such as Austria (+6.9%), the Netherlands (+5.9%), Spain (+4.4%) or Germany (+3.6%);
- In some Eastern European countries, generation capacity slightly decreased as in Romania (-3.5%) Slovakia (-1%) or Slovenia (-0.8%).

Gas-fired capacity represented 18% of the European generation capacity in 2008 and 19% in 2009. The newly-added capacities reached 13.8 GW, which represents a 9% increase from last year. In France, three new CCGT with a combined capacity of 1,300 MW came online. In Spain, several gas-fired plants were added, notably a 441 MW CCGT in Malaga. The CCGT wave is strengthened by a clean spark spread much more favorable than clean dark spread since the end of 2009. Clean dark spread is driven up by the cost of carbon and by high coal prices because of strong Chinese and Indian demand.

The highest increases in generation capacity in Europe are, however, due to RES in 2009:

- In 2009, many European countries kept investing in wind generation like Spain (+ 2.5 GW) or France (+1.0 GW). Wind generation increased by 15% (+9.6 GW)

and now amounts to 8% of the European generation mix (compared to 7% in 2008);

- Eastern Europe countries recorded important new wind capacities like Poland (+260 MW);
- Solar energy is also booming with 5.5 newly-installed GW mostly in Germany and Spain.

Despite RES and gas plants' construction, the European generation mix remained globally similar to the previous years' mix, with fossil fuel (51%) and nuclear (15%) still accounting for two thirds of total generation capacity in Europe.

Demand-Offer equilibrium was secured in 2009 but exceptional factors led to tensions on supply in several countries

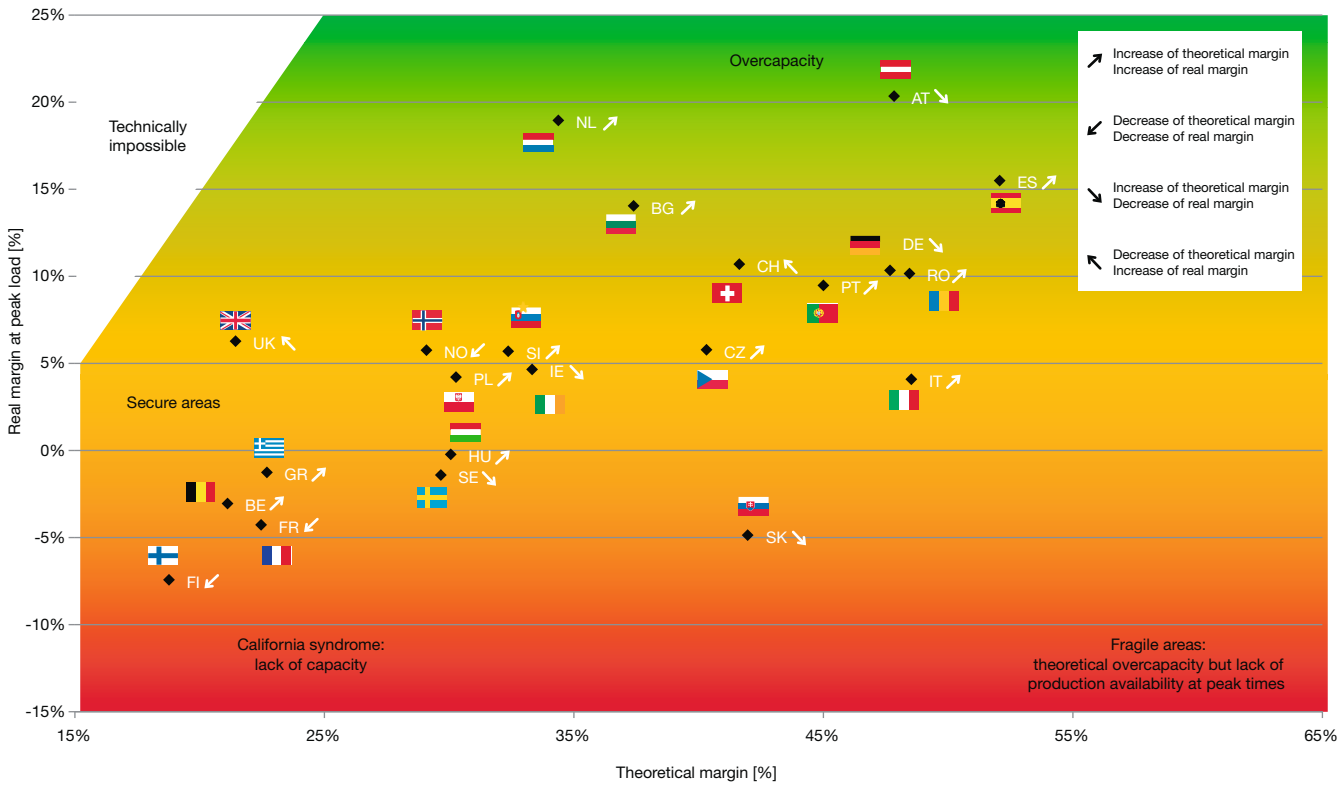
The theoretical margin[20] improved in 2009 to 38% (versus 36% in 2008) in Europe. Increases in theoretical margins were recorded in almost all European countries (see Table 1.2), thanks to additional generation capacities and electricity demand drop which reduced peak loads.

- Nine countries were concerned, with the Netherlands (+7%), Germany (+5%) and Italy (+5%) registering the biggest increase. They had theoretical margins above 45%;
- However, several countries such as France, Norway and Switzerland still had a lower theoretical margin compared to 2008 due to an increase in peak load.

The real margin[21] also improved from 9.2% in 2008 to 9.8% in 2009. However, contrasted situations can be observed (see Table 1.2):

- The Netherlands (19%) and Spain (15%) recorded high margins;
- Austria (20%) and Germany (10%) kept their real margin at a high level (although slightly decreasing compared to 2008);

Table 1.2 Real margin versus theoretical margin (2009)

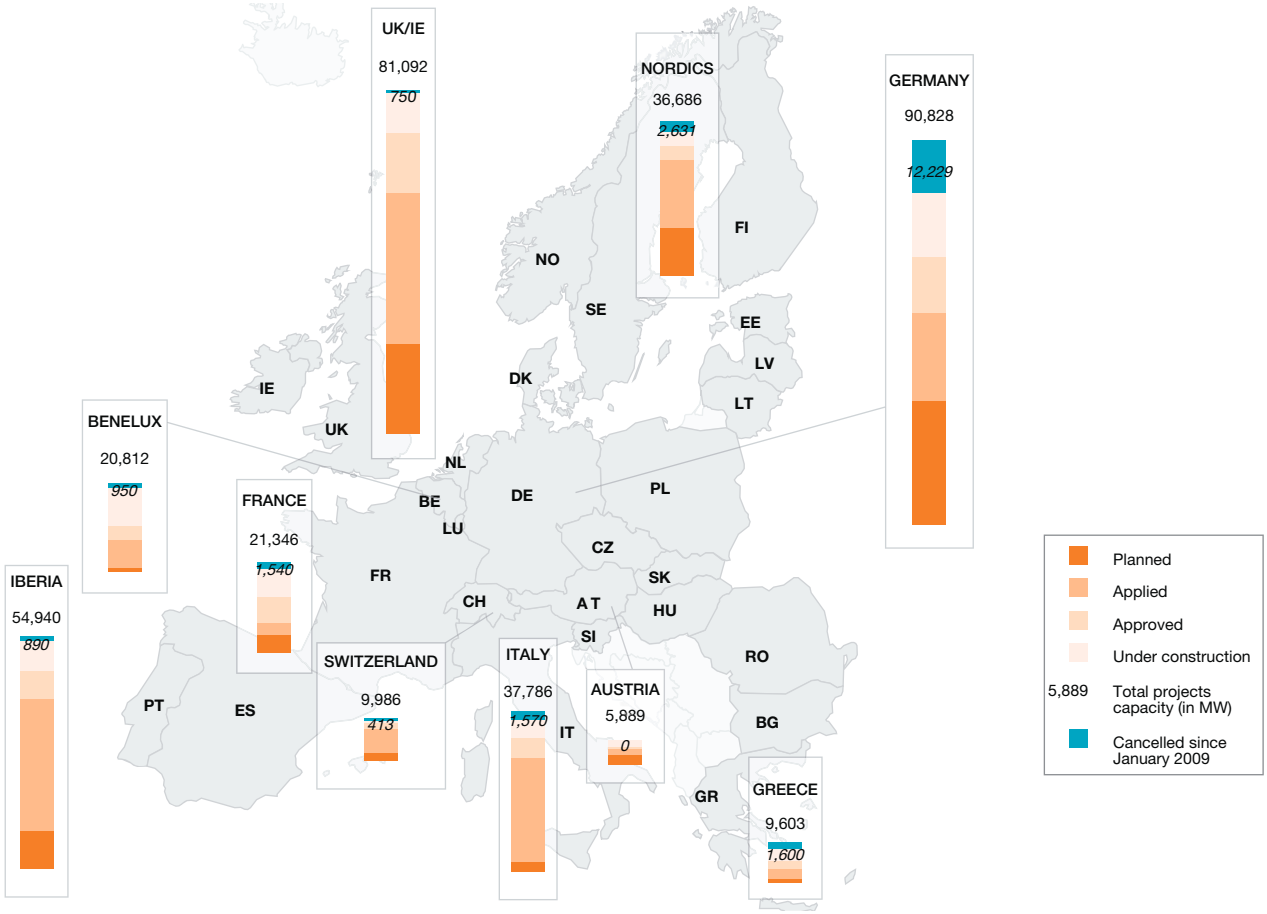


Source: ENTSO-E, BALTSO, Nordic Energy Regulators – Capgemini analysis, EEMO12

20 Percentage of difference between theoretical generation capacity and peak load

21 Percentage of difference between real generation capacity – which integrates non-usable and unavailable generation capacities – and peak load

Table 1.3 Map of generation capacity projects, as of May 2010



Data excludes onshore wind
Note: Planned=announcement of intent; Applied=main permits applied for; Approved=contracts and financial go-ahead pending; Under construction=ground has been broken
Source: Platts – Capgemini analysis, EEMO12

- Belgium increased its real margin from -13% in 2008 to -3% in 2009 mainly due to new capacity and higher plant availability.

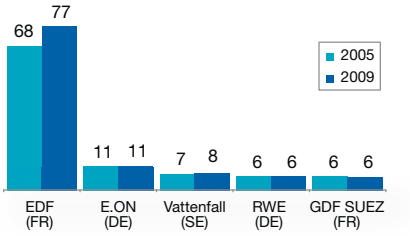
Considering the drop in demand due to the crisis and newly-added capacities, electricity supply was secured in 2009. Nevertheless, exceptional conditions led to tensions on demand-offer equilibrium in several countries:

- In France, low availability of nuclear power plants led to tensions on supply. In Q4 2009, the plants' availability was very low as 19 of the 58 reactors were out for maintenance since the strikes which occurred in spring extended the usual maintenance calendar. France is traditionally an exporter of electricity, however in October, France imported electricity for a full month which had not happened since 1982. On October 17, spot prices reached the maximum authorized price of €3,000/MWh for four hours. France had also to import electricity in the summer of 2009 due to warmer than normal temperatures;
- In Finland, the real margin reached -7.4% on December 17. On this day, tensions on supply led to particularly high prices on the market (€1,400/MWh);
- During the cold snaps at the beginning of 2010, electricity systems were well supplied in most European regions. Only Northern Europe faced major tensions due to the combination of four factors: colder than normal temperatures, low hydro levels, low nuclear generation (two out of four nuclear reactors were in maintenance) and capacity limits on major transmission lines. This situation led to particularly high prices on the market reaching more than €1,000/MWh during three hours on February 22. Export from other European regions was necessary to keep normal operations in the Nordic region.

In the mid-term, plans for plants' construction have been less impacted than expected by the economic crisis

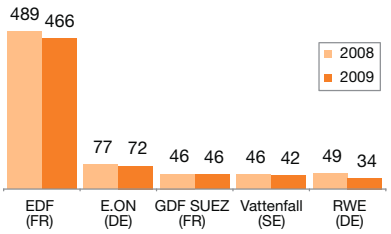
The economic downturn led to a cut in construction projects, but this was not as severe as was initially expected. The volume of projects in the pipeline (status from planned to under construction) across Europe is similar to last year. However, this masks differences at the country level: Germany has 87 GW of projects in the pipeline compared to 78 GW last year; the UK, 78 GW compared to 84 GW; and Italy, 36 GW both in 2009 and 2010 (see Table 1.3).

Top 5 - European players in terms of nuclear installed capacity in GW



Source: Companies' annual reports – Capgemini analysis, EEMO12

Top 5 - European players in terms of nuclear electricity generation in TWh



Source: Companies' annual reports – Capgemini analysis, EEMO12

These investments were made before the crisis and are hard to cancel. Few announcements have been made this year on new investments programs whereas coal plants' cancellations were numerous. The decrease in plants' construction was confirmed by the fall in orders to plants' suppliers like Alstom and Siemens. These cancellations were, however, compensated by a new wave of CCGT projects led by Spain and the UK.

Considering the strong decline of spot electricity prices between 2008 and 2009, recovery might be slower than expected and take up to four years as weak demand nurtures capacity surplus.

The economic slump, however, conveyed positive effects: the decrease in electricity demand relieves the tension on supply and moves capacity shortage predictions a few years in the future: ENTSO-E even anticipates generation adequacy until 2025[22]. Decreasing plants' construction diminishes both prices and waiting lists at turbines' manufacturers, which have been worrying Utilities for several years.

The crisis and the need for flexible and low-carbon energies resulted in a sharp decrease in coal plants' projects and favored gas projects

Gas plants' construction remains strong despite the crisis: 35 GW are in construction and 26 GW under development. This CCGT wave supports overall construction in Europe, in particular in Spain, Germany, the UK and France. According to a 2009 CERA study[23], gas plants' construction represents 61% of new constructions planned (excluding wind) compared to 23% for coal. Investments are ongoing in many countries:

- The UK is moving towards CCGT and nuclear as more than 12 GW capacity, especially oil and coal-fired plants, need to be closed as a consequence of the Industrial Emissions Directives (IED) enforcement, which includes the Large Combustion Plant Directive (LCPD);
- Spain is experiencing a dash-for-gas with 3.6 GW in construction, as does Italy;
- As coal plants are cancelled, a major CCGT plan is emerging in Germany with projects in Premnitz or Wustermark.

  Several coal plants are being dropped and replaced by gas plants as in Kiel.

This dash-for-gas, already observed for several years, has been strengthened by the crisis and the move towards a low-carbon economy.

Contrary to gas, coal plants' construction is sharply hit by the crisis: credit crunch and low electricity demand led to numerous projects' cancellations, especially in Germany with over 12 GW cancelled since January 2009. Constructions have slowed down with only 1 GW built in Q1 2010 compared to 10 GW in Q1 2009. Only the Netherlands is maintaining an ambitious coal development plan.

Coal suffers several disadvantages: higher construction costs than gas (€1,300-1,600/MW versus €750-790/MW), unfavorable spread, and high level of emissions. Coal plants' lifetime could be shortened in the face of emerging low-carbon generation and tightening environmental legislation. In particular, the IED imposes Emissions Limit Values leading to the expected closure of numerous coal and oil plants. Plants can opt out but have to close by 2015, as in the UK where 12 GW capacity will opt out. These difficulties are increased by local populations, environmental and courts' opposition as in Belgium, Germany or Italy.

Moreover, increasing doubts are cast on Carbon Capture and Storage (CCS): the IEA raised doubts on the capacity to finance 20 CCS projects by the end of 2010. If CCS is seen as necessary for coal future, it is also branded as costly, not yet ready and is deteriorating plants' efficiency. High support is already being provided by the European Commission with 300 million EU allowances for CCS projects and €1 billion under the European Energy Recovery Plan but more is needed with an extra €5 to 8 billion. Several projects like Tilbury (UK) by RWE dropped out of CCS funds competition because of tight timelines or objections to projects.

At least, coal plants should benefit from extended duration of States' subsidies to 12 years as discussed at the EU-level.

22 ENTSO-E, System Adequacy Forecast 2010-2025

23 CERA: Economic turmoil puts Utilities under pressure, June 2009

Gas is seen by many players, like Vattenfall, as a "bridge energy" towards a low-carbon economy as gas-fired plants emit less CO_2 and as their lifetime is shorter than coal-fired plants (15 years instead of 40). Under pressure from the EU, the will to decarbonize the economy is indeed accelerating so that low-carbon technologies are given the priority, notably gas. First, gas locks-in emissions for a fewer years, thus leaving time for other technologies like CCS and nuclear to progress. Second, gas brings flexibility to compensate RES' intermittent availability, which is improving for new CCGT plants with ramp up capacities of +/- 38 MW/min[24].

In the long run, gas supply diversification will foster CCGT development since sourcing will be facilitated by increased LNG imports, new zones of supply or unconventional gas future discoveries in Europe.

Nuclear revival is a given in Europe supported by France, Eastern Europe and the UK development plans. However, nuclear construction could be slower than expected. First, it is facing financing difficulties because of the crisis, with additional investors needed, for example, in Lithuania and Poland. Second, it is affected by uncertainty over actual costs, shortage of engineers' resources and re-scheduling encountered on Finland's Olkiluoto and France's Flamanville projects.

Europe's move towards a low-carbon economy is boosting RES

Wind continued its progress despite the crisis. Wind recorded high construction pace in H1 2010 with 2 GW under construction and still 14 GW permitted. The long-term is also bright since Spain, the UK, France and Germany are supposed to add 20 GW each by 2020. Offshore wind planned constructions will increase at +12 GW by 2012, notably in Denmark and the UK.

However, RES considerably alters the market by their intermittent generation and by their impact on prices. German prices even turned negative on October 4, 2009 due to weak demand and high wind generation. Spain experienced many days

Hydroelectric concessions renewal in France: a contribution to the Grenelle de l'Environment's goals but with uncertain profitability

On April 22, 2010, the French Ministry of Environment announced the **renewal of 5.3 GW (i.e. 20% of the total hydro capacities) of French hydroelectric concessions** that will take place between 2011 and 2015. Driven by the European liberalization process, **around 50 concessions should be opened in valley by valley calls for tender.** Between 2020 and 2030, a second round of concession renewals is expected to take place and should concern around 6 GW.

Hydropower is the second source of electricity generation in France, standing at 12% of the total electricity generation and is the first renewable source **with an installed capacity of 25 GW and a yearly generation of about 70 TWh.** The 400 French hydro concessions are mainly operated by EDF (80%) and GDF SUEZ (17%) via its subsidiaries SHEM and CNR. The hydro park consists of run-of-river installations (35 TWh) which supply baseload power, storage (30 TWh) and pumped storage facilities (5 TWh) which produce peakload power.

Many major European Utilities have shown interest in the French hydroelectric concessions. Italian Enel, German E.ON, Spanish Iberdrola, Austrian Verbund (which owns 46% of the French player Poweo), Norwegian Statkraft, Swedish Vattenfall, Swiss Alpiq and Canadian Hydro-Québec have already declared their ambitions. Other smaller players could also be candidates for local power plants.

The three years application procedure is demanding. It is composed of three stages: admission to submit an application, request for proposals and public inquiry. **Applicants demonstrating their technical ability and financial strength are allowed to submit an offer** structured around three criteria:

- **Investment to increase the output and modernize the facilities:** To achieve the national target of 3 TWh/year and 3,000 MW of peak load capacities until 2020[a], an optimization of 20% of installed capacities is expected;
- **Reduction of the environmental impact:** Applicants must provide a better protection of ecosystems while meeting water uses other than energy;
- **Concession fee rate will be set up as a percentage of revenues generated:** It is not defined yet and could be between 25 and 40%.

Beyond the formal criteria, the ability to integrate into the local environment and present a true industrial long-term plan will be essential.

The French government and local authorities intend to take advantage of this change. By implementing various taxes, and asking for better performance and environmental engagements, the profitability of these assets is expected to be very uncertain. The duration of the concession, which is still in discussion, will be another determinant parameter.

a) French multi-year investment program of electricity generation between 2009 and 2020 (PPI 2209), January 19, 2010

24 Source: RWE

Key issues in the United Kingdom

Policy

The UK government changed in May 2010 for the first time in 13 years. Early signs are that **the energy policy will continue to be driven by similar objectives than the ones defined by the old government, but with a greater emphasis on sustainability and security of supply rather than cost.**

There have been a number of developments in each of these objectives.

On **sustainability,** the main developments have been the **introduction of feed in tariffs** (FIT) **for renewables** and the **creation of a UK£500 million, "Low Carbon Network Fund" (LCNF)** for projects that demonstrate how distribution networks can support the move to low carbon energy. The FIT guarantees a payment for electricity produced from certain renewable sources for up to 25 years.

On **security of supply,** Ofgem has highlighted a **need for up to UK£200 billion investment in energy infrastructure by 2020** – to replace the at least 16 GW of generation that is forced to close by 2016 having opted out of the Large Combustion Plant Directive (LCPD) – and acknowledged the need to refine UK energy markets to ensure this investment is forthcoming. **New nuclear generation looks likely to form part of this investment,** with key political opponents to nuclear agreeing not to vote against legislation that would enable it.

On **cost,** there is acknowledgement that **energy prices need to rise to cover the cost of investment.** An early sign of this came in the price control for the 14 UK Distribution Network Operators. This increased the price for using networks by an average of UK£4.30 per household per year; the first price increase for distribution charges since 1995.

Deals

In July, ESB of Ireland agreed to buy the distribution networks of Northern Ireland Electric for €1.25 billion thus valuing the business at close to the regulated value of its assets. In the UK, EDF Energy has selected a consortium led by CKI as the preferred bidder for the UK£5.8 billion sale of its three distribution networks, allowing the EDF Group to reduce its debts.

at zero prices, when high must-take RES and hydro outputs even forced some wind farms to disconnect. This lowers market prices and makes them volatile, thus discouraging investment in other sources or bringing to the forefront the need for more flexibility in other generation assets. To counter this effect, incentives to RES are being cut in Germany and Spain.

Solar energy is recording high progress in 2010. Although solar is also experiencing a reduction in incentives in Germany, France and Spain, it should not hinder its development as an energy of the future according to many observers.

Hydroelectricity is still in development with projects by Enel and Società Elettrica Altotesina in Italy and by Axpo in Switzerland. France has launched a tender for the renewal of its concessions in April 2010 (see Box on the renewal of French hydroelectric concessions).

Major Utilities have managed to adjust to the crisis while independents are struggling

Major Utilities are adjusting their investments and strategy to the crisis, so banks and offtakers are more reluctant to support investments. Utilities freeze, delay investments or divest like Iberdrola which cut its CCGT projects in Spain or Centrica leaving Spain's generation sector. Others modify projects from coal to gas since it mobilizes fewer financial resources: E.ON is developing a CCGT project in Nottinghamshire (the UK) while postponing coal projects in Kingsnorth.

Utilities also invest in gas pipelines projects to ensure gas supply, like GDF SUEZ in Nord Stream and EDF in South Stream, or in new markets with Enel ready to invest €15 billion in Russia. They also continue to swap assets to enter new markets or develop their energy mix. E.ON conducted asset swaps especially on nuclear with GDF SUEZ for 1.7 GW in Benelux (see Table 1.4) and with EDF for 800 MW in France, enabling the company to gain some market shares.

In the long-term, the decarbonization of the economy, an aging fleet and baseload generation issues are leading countries towards nuclear and RES

The 2009 drop in demand has been quite sudden as illustrated by the IEA which reduced its consumption estimates for Western countries in 2030. Beyond the crisis, the pressure put on Member States to reduce CO_2 emissions and improve energy efficiency suggests more than a temporary drop.

According to Eurelectric, 2050 energy mix is projected to be made of 54% RES, 18% fossil fuels, 16% gas and 13% nuclear which has to be compared with the 2009 figures of 28.5% RES, 32% fossil fuels, 19% gas, and 15% nuclear. In order to achieve the 3x20 targets, countries will have to quickly adjust their policy towards reducing CO_2 emissions while securing their supply threatened by the aging generation assets.

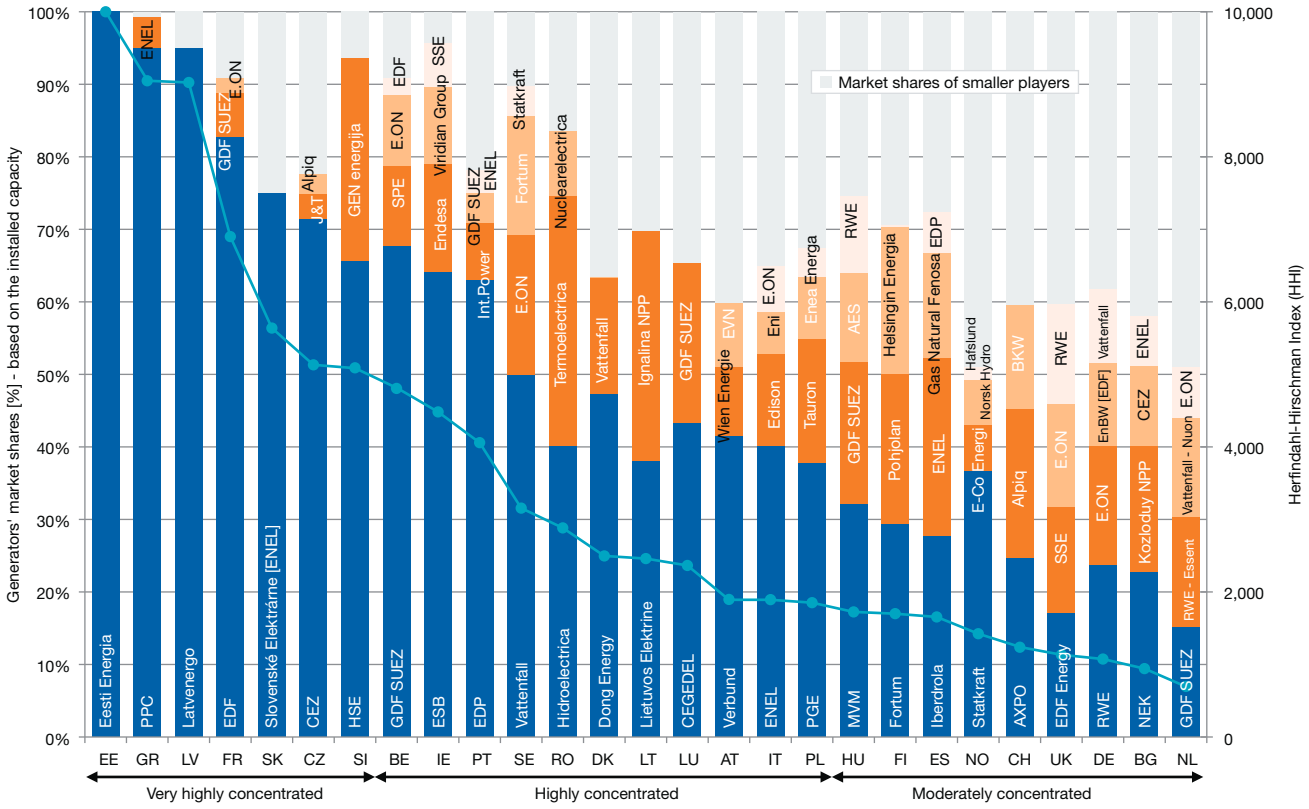
The current aging nuclear fleet remains a significant issue in providing security of supply and is made worse by closures required by the IED. European Member States have been aware of it for a long time, but as the clock is ticking, decisions are being made on leaving coal and oil and developing nuclear, either by new construction or by lifetime extension.

Despite the difficulties faced by the current European nuclear projects and financing issues, nuclear power appears to be the prime low-carbon baseload generation of the future. CCS uncertainties combined with a lack of public support seem to slow down coal's expansion. As hydroelectricity potential appears limited in Western Europe and as RES generation is intermittent, nuclear's future looks bright.

A growing group of countries plan to build new reactors as part of their energy mix target

- The Finnish coalition government continued its nuclear development policy and voted for the construction of two new reactors (Olkiluoto 4 and Fennovoima);
- Sweden decided to cancel its law banning the construction of new reactors

Table 1.4 Generation market concentration (2009)

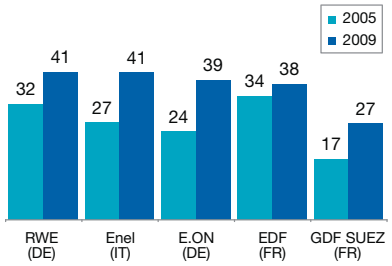


Note: HHI is a commonly accepted measure of market concentration. It is calculated by squaring the market share of each firm competing in a market, and then summing the resulting numbers.
Source: Companies' annual reports – Capgemini analysis, EEMO12

and authorized the construction of new units on existing sites starting in 2011;

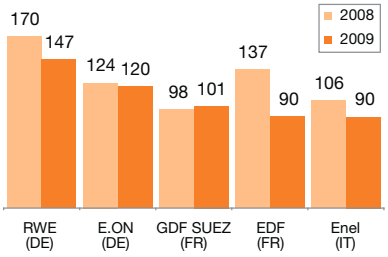
- The UK general election kept the country's path towards new nuclear with 11 nuclear plants to be developed in the next 15 years. Construction of Hinkley's two European Pressurized Reactors (EPRs) could start by 2013 as the tendering process started this year. The UK still needs additional plants' construction to curb a 20 GW-capacity shortage by 2020;
- Switzerland's gloomy medium-term energy security of supply, added to the "No to Coal" general movement and to the CCGT rejection by parliament, finally led the population to overcome its rejection of nuclear power. The Senate adopted a motion to extend the lifetime of the country's four oldest reactors for five years to 2025. It hopes that at least one of the three applications for the new reactors will pass to meet future demand;
- As Italy returns to nuclear power, the government has now to face the critical issue of selecting sites as some regions are against any nuclear sites. Italy justifies the end of phase-out law by a dual benefit: reducing CO_2 emissions and cutting electricity prices. The government hopes it will help meet its 2020 mix targets and reduce energy dependence;
- France is pursuing its nuclear development by extending nuclear lifetime and building new nuclear plants. French reactors are to be submitted to their 30 years inspection aiming at approving lifetime extension. Although EDF's Flamanville EPR has accumulated a two year delay along with budget increase (€5 billion versus €3.3 billion initially forecasted), several new nuclear reactors are planned: Penly EPR is still on the roadmap to 2020 but could be delayed further and discussions on a third EPR allocated to GDF SUEZ

Top 5 - European players in terms of fossil-fueled installed capacity in GW



Source: Companies' annual reports – Capgemini analysis, EEMO12

Top 5 - European players in terms of fossil-fueled electricity generation in TWh



Source: Companies' annual reports – Capgemini analysis, EEMO12

The reactors manufacturers are preparing to fight for a share in the promised nuclear rush

All major reactors manufacturers have expressed their interest in the new construction projects. **While Areva's EPR and Toshiba-Westinghouse's AP 1000 seem to have taken the lead, General Electric Hitachi and Mitsubishi Heavy Industries but also the Russian State company, Rosatom or the Chinese company, CGNPC are trying to come into the game.**

Areva's EPR is clearly a favored design among Europeans with strong political support and alliances with European Utilities such as EDF. Nevertheless, the important costs overruns and delays on the Olkiluoto-3 in Finland (four years delay and above €2.5 billion cost overrun) and the Flamanville site in France are shedding light on EPR's design and construction complexity. This technology has been further questioned in 2010 when the French, British and Finnish nuclear safety authorities have expressed concerns regarding EPR's command control reliability. The high cost of the EPR, mainly due to the addition of extensive safety devices, may be a set back on the global market as shown in the United Arab Emirates tender won by the Korean APR-1400 design, with less safety devices but also two times less expensive than the EPR according to the IEA.

Toshiba-Westinghouse's AP 1000, the other design currently under approval in the UK, is also facing safety issues raised by the UK regulator. Westinghouse has announced the opening of a licensing office in the UK in order to deal with the issue.

General Electric Hitachi is planning a come back in the UK with its ESBWR reactor and its advanced design, the ABWR, being able to show strong arguments: construction projects finished on time and on budget in Japan and a modularization that can shorten the construction cycle according to company officials.

Mitsubishi Heavy Industries has chosen to ally with Iberdrola in order to promote its APWR 1700 MW reactor in Europe, while working in a joint venture with Areva to develop a medium-sized design.

Finally, Rosatom is proposing its VVER-1000 third generation reactor, which has been selected by Enel in Slovakia for the Mochovce plant, to be put online in 2013.

are underway. The country intends to change its energy mix by focusing on low-carbon technologies like nuclear and RES, particularly biomass and offshore wind;

- Eastern European countries continue to largely favor nuclear energy.

Other countries have decided the end of nuclear phase-out but have not secured their long-term energy mix as no decision has been made on nuclear and as coal is being rejected

- In spite of political uncertainties, Belgium has put phase-out in question and decided to extend its three oldest reactors by ten years, pushing the closure year to 2025;
- The German government headed by Angela Merkel argued for ditching the phase-out law and has decided to extend nuclear plants' lifetime despite strong public opposition. Seventeen nuclear plants have obtained on average 12 additional years of lifetime. Angela Merkel confirms that Germany considers nuclear as a technology bridge before complete RES expansion. In the meantime, the series of coal plants' cancellations puts pressure on the construction of new baseload assets. From a competition point of view, the phase-out law was considered a good way to limit the dominance of the German energy cartel (E.ON, RWE, Vattenfall Europe, EnBW);
- Publicly known for its strong opposition to nuclear power, the Spanish government extended the Garoña reactor's lifetime at the minimum duration (until 2013). Faced with the economic crisis and the huge costs of renewable incentives, Spain has postponed any further decision on nuclear and is preparing a deep energy review encompassing RES and nuclear's future. Government decision to subsidize domestic coal and support its coal sector has been widely debated by Utilities and has not led to any major change in low coal plants' investments and utilization as Spain has a generation overcapacity

due to the crisis. Consequently, Spain continues to develop gas and RES.

Only a few countries like Norway and Austria have not set nuclear power on their energy agenda for now.

As Member States are moving towards nuclear, they are organizing to address the related issues raised

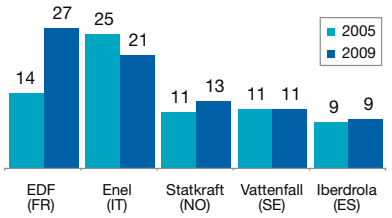
The nuclear revival witnessed during the past few years has raised a number of issues like safety concerns, waste management, competition and financing. While definite answers are still to be found for the financing of new constructions and waste management, concrete steps have been taken on other issues.

The safety of nuclear installations has become a major concern in Western Europe and some incidents on nuclear sites further increased the public awareness. While Italy is in the process of creating a nuclear safety authority to accompany its nuclear come-back, the other countries are organizing at a European level. The first step was taken in June 2009 with the EU directive on nuclear installation safety: EU's first legally binding legislation on the subject. Furthermore, the national authorities represented in the WENRA (Western European Nuclear Regulators' Association) are speaking about the idea of harmonized safety objectives for the nuclear plants in Europe.

The European Commission has pointed out competition issues raised by the lifetime extension of nuclear power plants in Europe chosen by some countries because of the technology's cost advantage. The Commission underlined the need to analyze the market distortion and to find ways to compensate it:

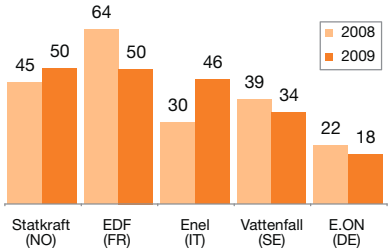
- Belgium has already decided to tax GDF SUEZ for the lifetime extension of their nuclear plants and Germany has extended its €2.3 billion tax from 2014 to 2016. Spain is also assessing a tax system. These nuclear taxes are also a way for governments to reduce their debts;
- France has chosen to address the issue through a market reform. Indeed, the French market is to change significantly with the NOME law (new electricity market organization) encouraging EDF and its competitors to invest in electricity generation capacities or demand curtailment, resulting in 30% of EDF generation to be sold to its competitors at cost. In addition, France is also reforming its whole nuclear sector and repositioning its players to be more competitive on the international markets;
- Italy has to address the different issue of competition on a re-opening market. The small local actors represented by Federutility fear that the Enel-EDF tandem might take a dominant or even monopolistic position. They thus propose that some local players create a consortium and work with another nuclear player like E.ON or GDF SUEZ.

Top 5 - European players in terms of hydro installed capacity in GW



Source: Companies' annual reports – Capgemini analysis, EEMO12

Top 5 - European players in terms of hydro electricity generation in TWh



Source: Companies' annual reports – Capgemini analysis, EEMO12

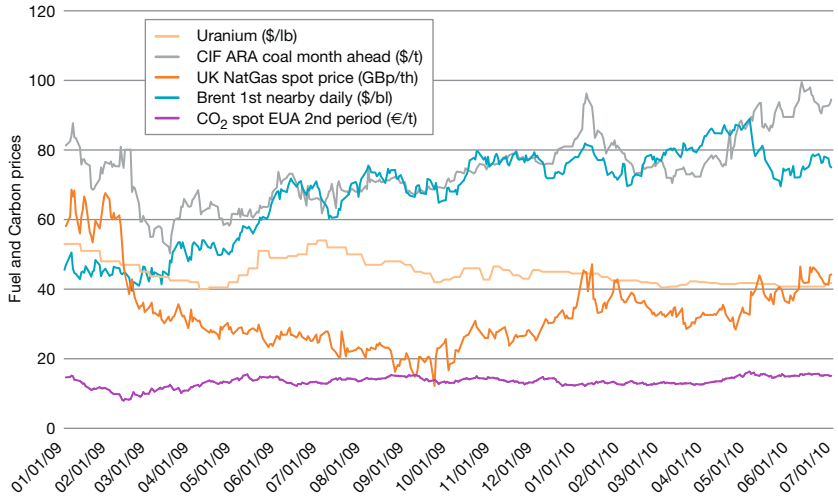
Electricity Wholesale Markets

Electricity demand across Europe was deeply affected by the economic downturn and commodity prices decreased

Power prices are driven by prices of fuels and carbon (see Table 2.1):

- **Oil prices:** the price of oil[25] in Europe recovered from the drops of 2008 and since mid 2009 stabilized in the US$70-85/barrel range. US and the Middle East markers kept relatively close to the European marker within the +/- US$2/barrel range. These price levels seemed to satisfy OPEC, and did not hinder economic recovery. Further price increases had been limited by poor refining margins (lower than US$5/barrel on average in 2009) and high stocks levels. Since 2010, stocks have been decreasing, especially floating storage and this flattened the contango[26] from US$25/barrel to US$10/barrel, showing a balanced short-term market.
  Remarkably, oil prices de-correlated in early 2010 from the EURO/USD exchange rate, but stayed aligned with inflation, showing investors' interests, albeit in cautious mode due to the markets' regulatory reforms in the US conducted by the CFTC[27].
  Worldwide demand decreased by 1.3 million barrels per day. It increased in Q4 2009 in comparison to Q4 2008 for the first time since Q2 2008, pulled by demand from Africa, the Middle East and Asia, in particular China.
  North America and European demands, after having drawn down in 2009 recovered later and Q2 2010 levels were higher than the Q2 2009 ones. OPEC production, after having reached a low at 28 million barrels per day in April 2009, increased steadily to around 29 million barrels per day in Q1 2010;

Table 2.1 Commodity prices (2009 and H1 2010)



Source: SG Commodity Research – Capgemini analysis, EEMO12

- **Gas prices:** see the Gas Wholesale Markets chapter;
- **Coal prices:** yearly average thermal coal spot prices in Europe decreased by 50% in 2009 compared to 2008 to US$69.9/t, thanks to a demand drop of 35 million of tons (-20%) – a third of this drop coming from the UK. The economic crisis impacted the demand and led to high stocks. In addition, the three international benchmarks for coal prices (Europe, South Africa and Australia) stayed quite close in H1 2009, putting pressure on freight prices, which averaged below US$5/t[28].
  From Q4 2009 onwards, thanks to an increasing Asian demand, and rising logistic issues in Australia, an unconventional price pattern developed, with European coal prices being the cheapest. Demand kept growing in China and India which attracted some South African coal. Even some Colombian spot cargoes went to Asia. This phenomenon stopped in the summer of 2010, when European power generators started preparing next winter. European price reached the US$90/t range in the late spring of 2010.
  Volatility decreased during 2009 coming back to usual level, showing a trend to business as usual. Term markets stayed in contango and had similar movements compared to spot, but much attenuated and without inversion between Europe and South Africa;
- **Carbon valuation:** see the Sustainable Energy and Climate Change chapter.

25 Brent, first nearby monthly product, is the usual marker of the European zone for oil

26 Contango means that term prices are higher than spot prices

27 CFTC: Commodities Futures Trading Commission, a US regulatory body

28 Freight route from South Africa to Europe

C. Lewiner (ed.), *European Energy Markets Observatory*, DOI 10.1007/978-94-007-2753-3_3,
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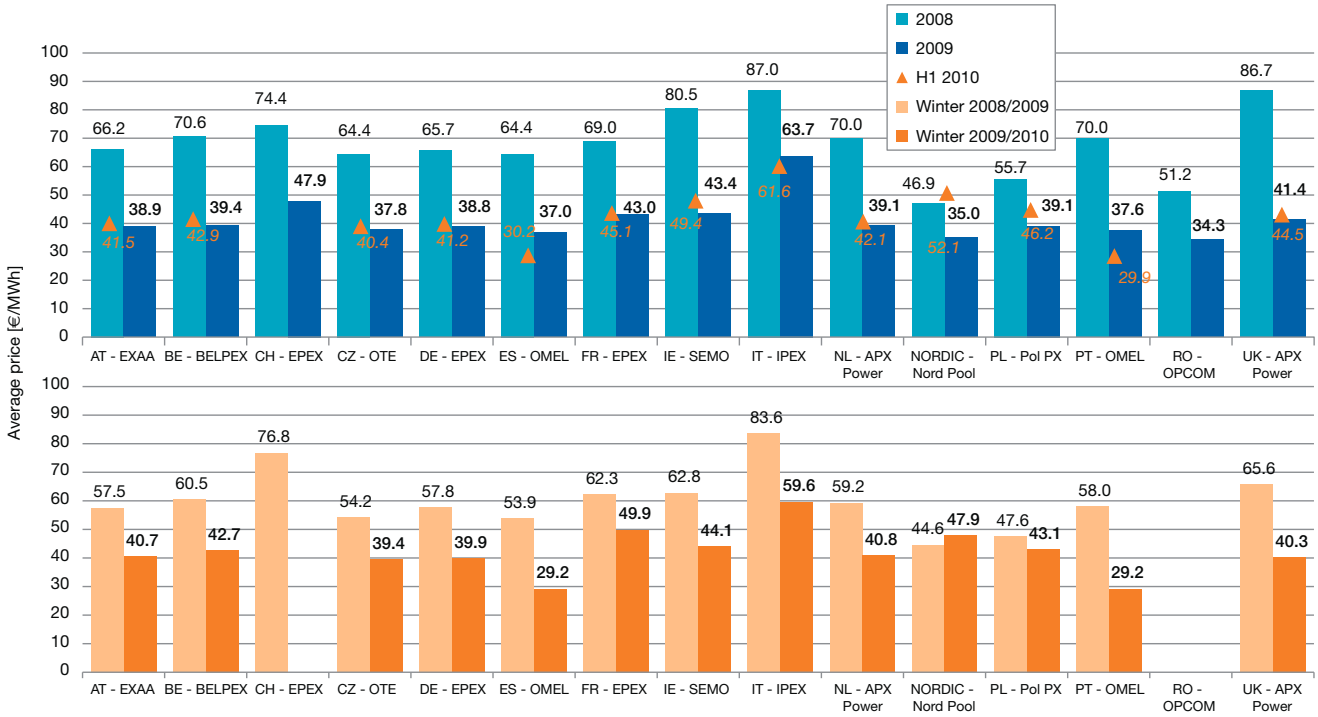
Table 2.2 Yearly (2008 and 2009) and winter (2008/2009 and 2009/2010) average electricity spot prices



Source: Power Exchanges web sites, SG Commodity research – Capgemini analysis, EEMO12

As a consequence, European average spot prices for 2009 decreased significantly by about 40% compared to 2008. Q1 2010 spot prices increased by 10% compared to Q1 2009 prices due to the cold weather and an increasing demand

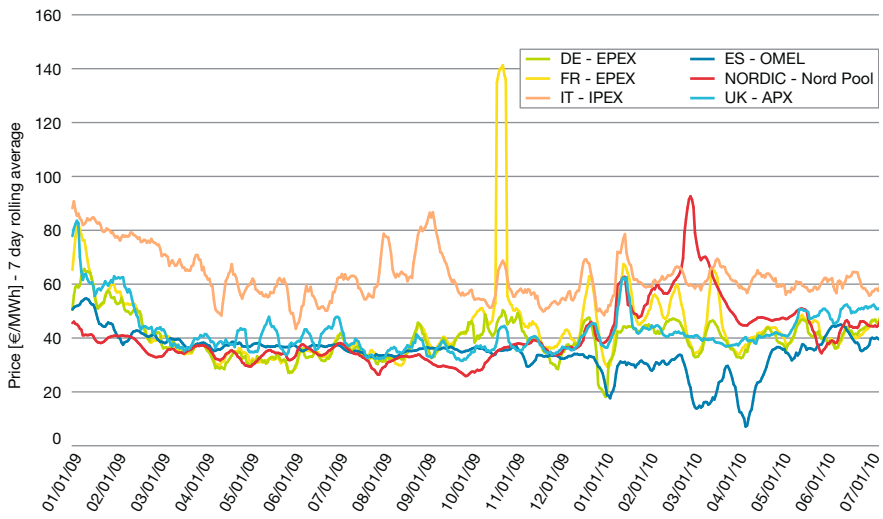
Average spot prices for 2009 were 40% lower than for 2008 in Europe with the UK recording the highest decrease at 52%, from €86.7/MWh in 2008 to €41.4/MWh in 2009 (see Table 2.2). The Nordic countries' prices decreased the least by 25%, ending at €35/MWh in 2009 versus €46.9/MWh in 2008. This lighter decrease was supported by low hydro levels and low Swedish nuclear power availability.

The Nordic countries remained in the cheapest range, only beaten by Romania at €34.3/MWh with a 33% decrease compared to 2008 average prices. Similar to the Nordic countries, Italy recorded a low spot prices decrease with a 26% reduction, staying the most expensive with €63.7/MWh versus €87/MWh in 2008, almost €23 for a MWh more than the European average (€41.1/MWh).

France, Germany and Spain, with respectively 37% (€43/MWh), 41% (€38.8/MWh) and 43% (€37/MWh) prices reduction were representative of the average European spot prices decrease.

Spot prices of the winter of 2009/2010 were 30% lower than those of the winter of 2008/2009. Portugal and Spain showed the largest decrease with the same price of €29.2/MWh for both countries, and respectively a decrease of 50% and 46% compared to the winter of 2008/2009. Along with Iberian Peninsula, the UK spot prices lost 39% at €40.3/MWh. Conversely to the rest of Europe, the Nordic countries ended the winter of 2009/2010 with a spot price increase of 7% at €47.9/MWh mainly due to low hydro levels and the unavailability of some Swedish nuclear power plants.

Table 2.3 Electricity spot prices on the main European markets (2009 and H1 2010)



Source: Power Exchanges web sites, SG Commodity research – Capgemini analysis, EEMO12

European spot prices in 2009 showed an unusual flat pattern all year long (for example, Nord Pool spot prices remained most of the time in the €30-40/MWh range in 2009). And in Q1 2010, the UK, Spain, and Portugal spot prices continued to decrease.

By the end of 2009 and the beginning of 2010, low gas prices compared to increasing coal prices have inverted clean spreads[29].

Due to less efficient interconnections, European spot prices were less convergent in 2009 and H1 2010 than in 2008 and H1 2009.

Spot power prices are also impacted by the demand/supply balance:

- Availability of generating units has impact on the marginal plant, and thus on price;
- Hydro precipitations and levels have more or less impact depending on the share of hydro in the countries' energy mix as well as consequences on coal logistics (transportation on river) and the cooling of some power plants;
- Weather impacts use of air conditioning and energy requirements for cooling of some power plants in the summer, and impacts heating energy in winter;
- Industrial output in a global crisis, with factories on temporary shut-down, leads to a lower demand and thus lower spot prices;
- Renewable or subsidized power has some impact on spot prices, in particular in Germany and Spain where the installed capacity is significant in the power generation mix;
- Interconnection when not saturated gives a country access to neighboring countries.

Continental power

Because of high wind energy outputs combined with mild temperatures (+1.5°C above normal on the average) and low demand during 2009, Germany was in a good supply situation and was able to export to France.

France was in 2009 dependent on German imports, and suffered from a tight supply from nuclear power plants. Nuclear availability stood at record low (-4,000 MW year-on-year in September). In October, one third of the French nuclear reactors were out of operation. The strikes which took place in the spring have prolonged the maintenance period at plants, which resulted in price rises. 458 GWh was imported by France in October. This situation eased at the end of 2009. But due to peak demand, France was again a net importer in January 2010 with a record level of 7.7 GW of instantaneous power being imported on January 6.

Few prices differences were noted in the TLC[30] zone, with French prices remaining on the average higher than those in Benelux and the Netherlands.

Exceptional events in France and Germany were recorded in 2009:

Because of a peak demand of 3,000 MW higher than predicted and the unavailability of 4,100 MW of nuclear power and of the peak hydro plant of Grand-Maison, on October 19 from 8 to 12 AM, France broke the news with spot price at €3,000/MWh on the exchange (see Table 2.3);

29 Cost of power produced by gas or coal, with carbon cost taken into account

30 Trilateral Market Coupling: market coupling mechanism to allocate daily capacities on the France-Belgium and Belgium-Netherlands interconnections by simultaneous use of the three countries' market order books

In Germany, several episodes of negative prices were recorded, in particular on October 4, for the first time, the baseload price for a day reached -€11.59/MWh, with an all-time low of -€500.02/MWh registered from 2 to 3 AM. All these episodes were due to very strong wind energy outputs, low demand, lack of grid capacity to absorb this electricity and lack of power assets flexibility. Those negative prices episodes may continue to happen, as under a new version of the German Renewable Energy Law (EEG) in January 2010, TSOs are now obliged to offer all renewables' output at the exchange.

Nordic countries

Prices in Scandinavia were supported by supply trouble. Incidents at Oskarshamn 1 and 3 and at Forsmark 1 resulted in a low availability of Swedish nuclear power all year long. In August 2009, 73% of total nuclear capacity in Sweden was offline. Nordic countries experienced a tense hydro situation all year long because of reserves below normal in 2009 and in the beginning of 2010 (for example, -58% of rainfall and -56% of inflow in December 2009 compared to November 2009). The price spikes in January and February 2010 were mainly due to icy temperatures, 24% below normal in January. Furthermore, from February 7 to 23, 2010, the 700 MW NordNed cable bringing power from the Netherlands to Norway failed (from December 2009 to March 2010, 70% of the cable flow was from the Netherlands to Norway).

Spain and Portugal

The economic crisis deeply impacted demand in the Iberian Peninsula in 2009, resulting in low prices all year long. At the beginning of 2010, prices were remarkably low, under €20/MWh due to mild temperatures, good hydro levels (23% above the last 10 years average) and high wind energy outputs.

For the first time, from December 28, 2009 to January 15, 2010 the Spanish market recorded 74 hours of thermal power sales for free, due to low demand and overflow of renewable energy.

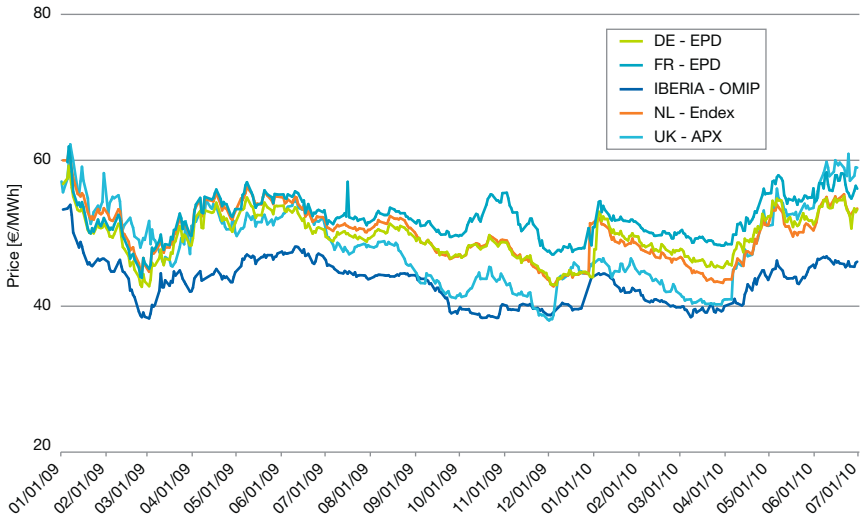
Forward prices – as spot prices – were affected by the economic recession (-30% on average compared to 2008), converging in a €45-50/MWh range with the exception of Spain which stayed lower as an isolated price peninsula

Forward power prices are driven by fuels and carbon prices and market behaviors. The Calendar 2010 Baseload products remarkably moved parallel between the main European countries (see Table 2.4), the Iberian zone being the cheapest, with the Netherlands forward prices at the same level as the German ones, and the French prices above the German prices.

In H1 2010, the UK forward prices were higher than the other European forward prices because of the increase of the UK gas prices.

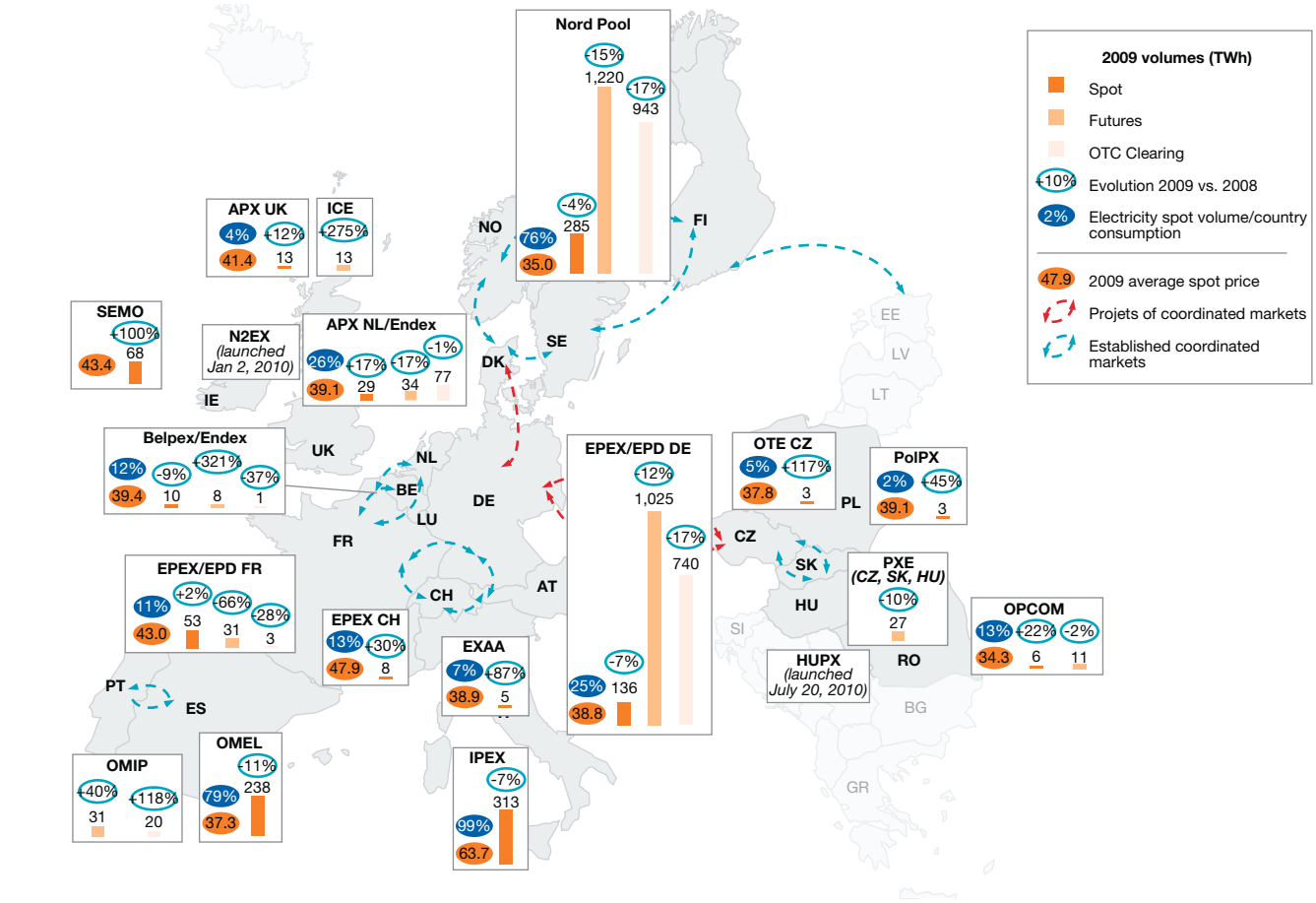
The economic downturn caused over capacities and thus price drops for oil, coal and gas, with CO_2 remaining stable

Table 2.4 Electricity futures prices (year ahead) on the main European markets (2009 and H1 2010)



Source: SG Commodity Research – Capgemini analysis, EEMO12

Table 2.5 Map of electricity trading (2009)



Source: Power Exchanges web sites, SG Commodity research – Capgemini analysis, EEMO12

in comparison to 2008 average level. European forward power prices moved accordingly to commodity prices. For example, German Calendar Baseload registered its low point at €43/MWh in February 2009, losing 40% in five months. It ended 2009 only marginally above its lowest level of February at €44/MWh, only €5/MWh above the average spot price in 2009.

With the increase of coal prices, margins of coal-fired plants have declined sharply: the German baseload clean dark spreads went down by 40% in two months, as clean spark spreads gained 10% in the first three months of 2010.

Volumes traded on European power exchanges were stable in 2009. Since 2005, they have increased by 21%

Total volumes traded in France, Germany, the UK, the Netherlands, Spain, Italy and Scandinavia stayed stable (+0.1%) from 9,929 TWh in 2008 to 9,944 TWh in 2009 (see Table 2.5).

Spot volumes remained stable in France (+2%), rose in the Netherlands (+17%) and in Switzerland (+30%), which shows an increasing interest for electricity exchange in Switzerland. In August 2009, Belpex posted a record year-on-year day-ahead volume at 1.16 TWh, an increase driven by strong exports to the Netherlands and France.

The Nordic countries recorded their first drop in volumes since 2003 (-4%), and German spot volumes also decreased by 7%.

EPEX announced a rise of the intraday market liquidity, especially at the end of 2009 with 11,483 contracts exchanged in Q4 compared to 7,793 in Q3.

The downward movement in the Nordic countries impacted Futures and OTC[31] transactions: -15% in Futures and -17% in OTC. The reduction of transactions on derivative market in Europe impacted the volume of Futures traded on EPEX: -12% in Germany and -66% in France were recorded.

Conversely to Nordic countries and EPEX, Futures volumes traded in the UK increased by 19%, equivalent to 3.3 times the British demand for power, compared with 2.7 times the annual demand in 2008. Spain recorded an increase of 40%, albeit from a low level.

OTC transactions in Europe accounted for 82% of trades compared to 71% in 2008.

The trend towards European markets integration continued in 2009

As part of the Baltic Energy Market Interconnection Plan (BEMIP) launched in February 2009, Nord Pool Spot has opened for trade the Estlink bidding area connecting Estonia to Scandinavia on April 1, 2009. BEMIP is a European Commission initiative aiming to optimize cross-border capacity between the Baltic countries.

In 2009, the last step of cooperation between Powernext and EEX was passed: Powernext Spot and Futures markets were transferred to EPEX Spot SE. France and Germany market coupling is expected in Q4 2010. Moreover, a joint test between EPEX, Nord Pool and OMEL was launched in June 2009 for Price Coupling of Regions (PCR initiative). This area composed of Portugal, Spain, France, Germany, Austria, Switzerland, Denmark, Norway, Sweden and Finland accounts for two thirds of the European power market volume.

In Hungary, HUPX (first Hungarian organized power market) was launched on June 18, 2009. And less than 15 days after the launch the number of the applied market participants has doubled to 15 participants.

In the UK, a market traditionally dominated by OTC transactions, N2EX, a new marketplace for physical UK power contracts exchange was launched on January 12, 2010. N2EX is operated jointly by NASDAQ OMX Commodities (US) and Nord Pool Spot. The average price since the launch is €43.4/MWh, in a €40-50/MWh range.

The impact of exceptional prices spikes in Germany and France was taken into account by EPEX

Several episodes of negative prices in 2009 in Germany in addition to day-ahead price spikes of €3,000/MWh on October 19, 2009 in the French market has prompted the exchange council at EPEX Spot to improve its procedures: the exchange would be able to run a second auction if the hourly prices are below -€150/MWh or over €500/MWh or significantly differ from the OTC price.

31 Over-The-Counter: trading operation outside organized exchanges

Electricity Retail Markets

In 2009/2010, the European electricity retail markets went through a period of unprecedented drop in demand and price conditions. While the beginning of 2009 was heavily affected by the economic crisis, starting from the last quarter of 2009, in 2010 the markets started to recover

Five consecutive quarters of electricity consumption decrease until Q1 2010

The development of electricity demand can be explained with the development of GDP. In the EU-27, the GDP showed a decrease of 4.2% in 2009 and electricity consumption dropped by 4.7%. This is true for several countries like Germany, France, Italy or the UK with a decrease of GDP of 4.7%, 2.6%, 5.0% and 4.9%[32] respectively, while the electricity consumption dropped by 5.2%, 1.6%, 6.4% and 6.1% respectively, in the same period.

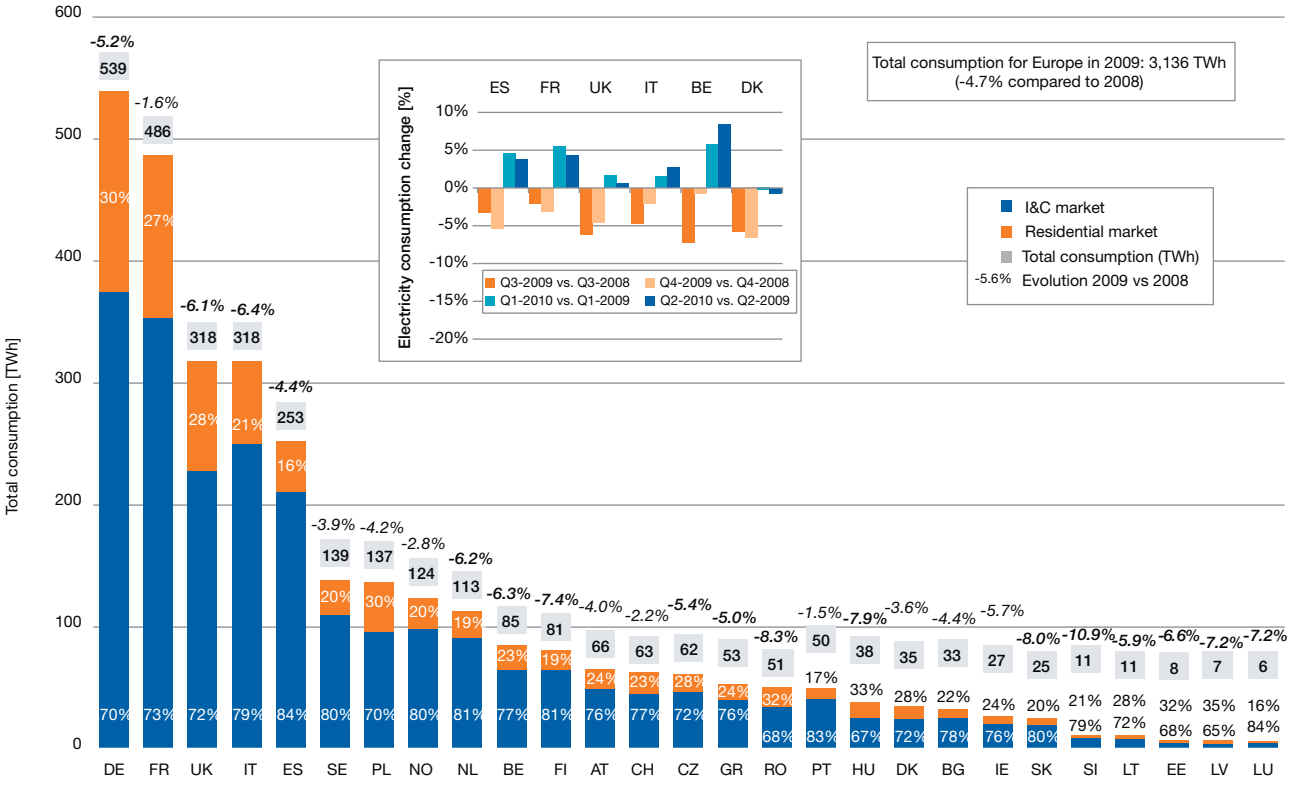
However, the reality in European countries is quite complex (see Table 3.1):

- In 2009, two groups of developments can be differentiated:
  - Germany, the UK, Italy or Spain show a significant decrease of between 5 and 10%;
  - Countries like France, Sweden or Norway have a slight decrease of between 1 and 5%.

The peak of industry downturn in Europe was reached in March and April 2009[33]. The negative effect for the energy industry was time-delayed to the middle of the year.

- In most of the countries, the decrease of consumption in H2 2009 was absorbed by an equal increase of consumption in H1 2010. For example in Spain, it was -5% in Q4 2009 which was offset by +5% in Q1 2010, or in Belgium, it was -7% in Q3 2009 which was offset by +8% in Q2 2010;
- When differentiating customer segments, the consumption decrease for industrial clients (-6%) has been more significant than that of the household segment (-2.1%);

Table 3.1 Total electricity consumption and size of I&C and residential markets (2009)



Source: ENTSO-E, SG Smart Energy Index – Capgemini analysis, EEMO12

32 Eurostat

33 Eurostat

C. Lewiner (ed.), *European Energy Markets Observatory*, DOI 10.1007/978-94-007-2753-3_4,
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- In newly joined European Union countries like Romania (-8.3%) or Slovenia (-10.9%), the decrease is higher than in the former EU-15 (-4.7% overall and France at -1.6%, Portugal at -1.5%, and Germany at -5.2%).

The relationship between the GDP and electricity consumption is changing in some countries after the crisis. This potentially indicates an improvement in energy efficiency (see the Sustainable Energy and Climate Change chapter) while in the past, European electricity consumption had been increasing continuously.

The beginning of 2010 was marked by an increased electricity consumption across Europe month-on-month. This accelerating growth pattern was common for most of the countries with the exception of the UK, the Baltic and the Nordic regions. In Q1 2010, electricity consumption increased by 2.5% compared to the same period of 2009[34]. Among the factors that influenced the evolution of the European electricity consumption in Q1 2010 were the state of the economy, the weather conditions and the modest levels of wholesale prices for electricity.

Retail electricity prices were stable in 2009 and are starting to rise again in 2010

Despite the efforts of the European Commission to improve market integration, there is still a huge difference in retail prices within the Member States (up to 220%), showing that there is not yet one European market for retail electricity. Residential clients in Denmark paid, for example, c€28.02/kWh in March 2010 while in Finland the kWh cost c€11.81[35] for the same customer segment.

Electricity prices exhibited the same stability but heterogeneity over all customer segments in Europe (see Tables 3.2). While the segments of Small to Medium Industries and Residentials kept

Tables 3.2 I&C electricity prices - VAT excluded (H2 2009 and % change with H2 2008)

Source: Eurostat – Capgemini analysis, EEMO12

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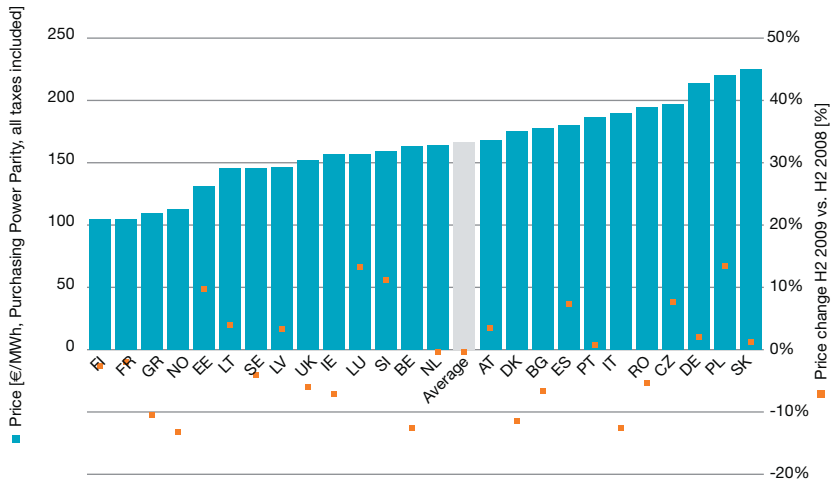
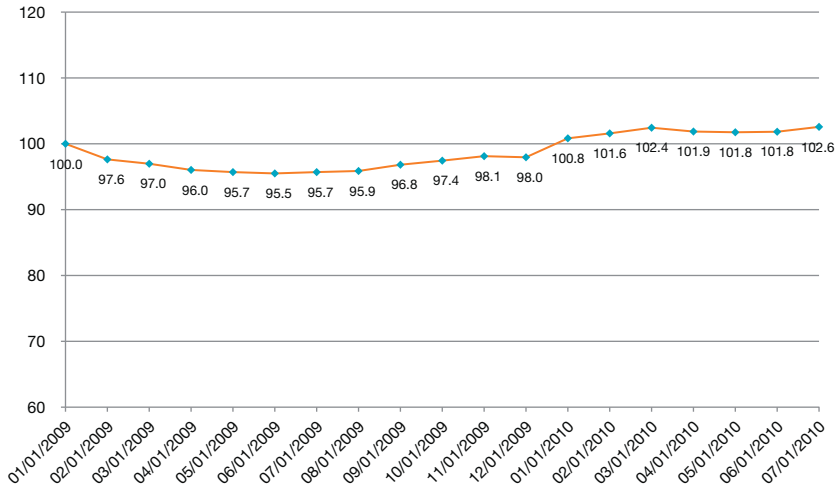
35 E-Control, VaasaETT, Households Electricity Price Index (HEPI), July 2010

Table 3.3 Residential electricity prices - all taxes included and with PPP (H2 2009 and % change with H2 2008)



Source: Eurostat – Capgemini analysis, EEMO12

Table 3.4 Households Energy Price Index (HEPI) in the EU-15 capitals - electricity without taxes (2009 and H1 2010)



Source: E-Control, VaasaETT – Capgemini analysis, EEMO12

the same levels in H2 2009 compared to H2 2008; prices for Very Small Industries were increasing at about 4%; and prices for Medium to Large Industries were falling in the same time (-2%).

Spanish retail prices for Very Small Industries increased significantly by 29% despite the fall of wholesale prices. In Ireland prices were cut by about 17% due to falling wholesale prices and the regulation of State Utility prices. This development created an opportunity for new entrants to aggressively compete for market shares in Ireland.

In the Medium to Large Industries segment, the price fluctuation throughout the Member States is less obvious, but countries like Norway, Denmark, the UK and Italy have reduced their prices by more than 10% in 2009 compared to 2008. This decrease is mainly driven by the prices drop for all commodities in 2009. Only Slovenia and Lithuania have increased their prices by more than 10% as tariffs are no longer regulated in that customer segment.

In the households segment, the persistence of regulated tariffs in many Members States still leads to flat price increase in average. Fifteen out of 27 countries are still offering regulated tariffs (see Table 3.5). Because of the stability of wholesale prices, this segment has not shown a significant price reduction in 2009 (see Table 3.3), only a few countries (Estonia, Belgium, Norway, Denmark or Italy) have forced price reductions because of the economic crisis.

Globally, in 2010 residential retail prices started to increase again (see Table 3.4). Lithuanian household prices rose dramatically by around 33%. Several retail companies announced price increases at around 3 to 4%, as did, for example, EDF with an average 3.4% increase for household customers starting from mid August 2010; CEZ in the Czech Republic in Q1 2010; or Vattenfall in Sweden in July 2010.

In 2010, price increases are mainly justified by the rising wholesale prices (e.g. the UK and Ireland). In some countries, extreme price movements are caused by the changes in taxation that exerted a significant influence on wholesale prices.[36]

36 Quarterly Report on European Electricity Market of Directorate-General for Energy, 2010, Volume 3, Issue 1

Contrary to 2008 and 2009, the discussion about rising energy prices does not seems to have been as intensive as it was before. Until now the governmental pressure against rising prices has been not perceptible.

Competition and churn have been favored by the economic crisis

Figures on market shares need to be considered carefully as retailers do not tend to disclose them. Nevertheless, even if the overall situation did not seem to change a lot and, in most of the cases, oligopolies replaced the old monopolies, competition progressed in 2009 and 2010, both in terms of switching behaviors and in terms of the number of market players.

Several countries have switching rates of above 10% (Ireland, Great Britain, the Netherlands, Sweden and the Walloon region in Belgium) while others kept stable rates in 2009 at around 5% (Germany and France). Still, hardly 50% of the EU-27 can be described as dormant markets (Poland, Portugal or Greece) when showing switching rates of below 1% (see Box on switching).

The retail market concentration in 2009 is still high (see Table 3.6), but should not hide a certain dynamism in some countries with new entrants like FlexStrom in Germany, E.ON in Italy or Bord Gáis Energy or Airtricity in Ireland, which have gained significant market shares. Still, the incumbents are leading the national markets and expanding cross borders as well as offering dual fuel contracts in several countries. And they are fighting against competitors in order to keep a high market share.

Market liberalization is still a general concern for the European Commission as it sent warnings in July 2010 to 20 out of the 27 Member States to finally implement the rules of liberalization for electricity and gas.

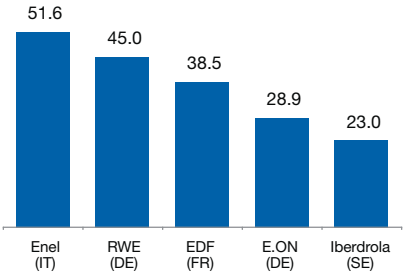
As an exception some municipalities in Germany decided to buy back concessions from the four incumbents and to build up a local energy retail company as well as owning the concessions. Cities like Hamburg and Stuttgart were the first ones to buy back concessions from e.g. Vattenfall. Many other municipalities will follow this example as the time when they earned a lot of money by just selling the concessions is over, and as the quality of supply and service is being impaired.

Cost cutting has been identified as an answer on price discussion and increasing switching rates

As the margin in retail business has been under pressure for some years (see Box on Cost to Serve and Cost to Acquire), the identification of cost savings potential gets into focus for the retail business. Based on the analysis of Cost to Serve and Cost to Acquire indicators, retail companies identified the following room for improvement:

- **Credit and debt management:** The credit defaults of customers increased drastically due to the economic crisis and this is true for all customer segments. For that reason, retail companies, for example, in Italy or Slovakia adapted their credit management strategy, especially with regards to the bad debt management;
- **Customer retention:** Because of rising switching rates, retail companies are starting to focus on customer retention such as Mainova in Germany. They follow mainly already known models that can be found in the telecommunication or insurance sectors: on the one hand, tariffs with a binding period and, therefore, a fixed price are getting more popular; on the other hand, energy related services are combined with pure electricity tariffs, for example, discount on home electricity work. Retail companies offer these kinds of services not only to maximize the profit, but rather to intensify customer stickiness: firsthand services are very much appreciated;
- **IT efficiency:** In the context of customer retention, retail companies increase their IT investments for data management and process streamlining purposes. Tools like customer relationship management (CRM) and/or data mining are implemented in order to reduce customer switching and, therefore, raise customer retention. In Germany, some retailers have updated or linked their IT systems to pure billing data in order to simplify customer contact through all the channels (phone, Internet or e-mail).

Top 5 - European electricity retailers in terms of million customers (2009)



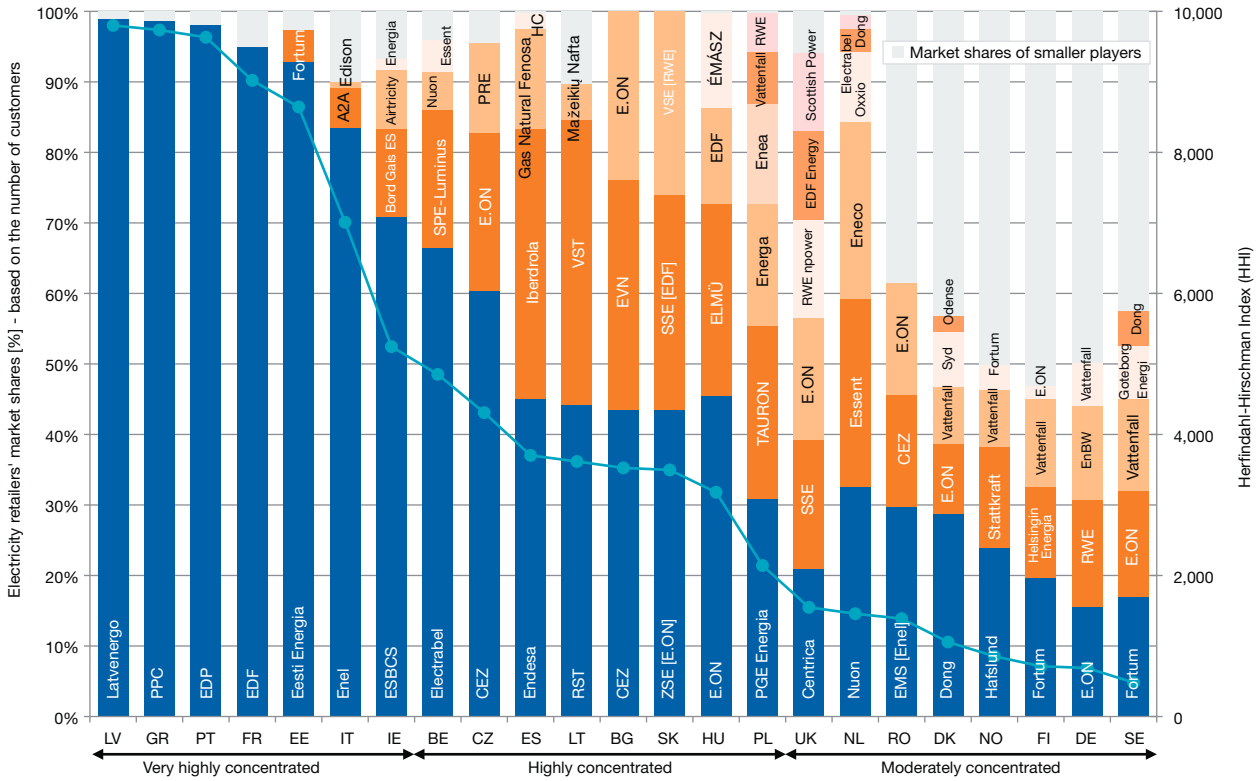
Source: Companies' web sites and annual reports – Capgemini analysis, EEMO12

Table 3.5 Status of electricity price regimes (as of July 2010)

Country	Existence of regulated tariffs (date of price control removal when available)
AT	N *(2001)*
BE	N *(2007)*
BG	Y
CZ	N *(2006)*
DE	N *(2007)*
DK	Y
EE	Y
ES	N *(July 1 2009)*
FI	N
FR	Y
GR	Y
HU	Y
IE	Y
IT	Y
LT	Y
LU	N *(2007)*
LV	Y
NL	Y
NO	N
PL	Y
PT	Y
RO	Y
SE	N
SI	N
SK	Y
UK	N

Source: European Commission, Platts – Capgemini analysis, EEMO12

Table 3.6 Electricity retail market concentration (2009)



Note: HHI is a commonly accepted measure of market concentration. It is calculated by squaring the market share of each firm competing in a market, and then summing the resulting numbers.
Source: Companies' web sites and annual reports, National Regulators – Capgemini estimation, EEMO12

Retailers need to challenge their business model

Enforced by the economic crisis and rising churn rates, retailers need to consider how they want to make business in the future. But still the change of established business model is very slow.

Right now, the following developments all over Europe are observed:

- Optimization on processes and quality in customer service while offering more services on self-service channels as e.g. interactive voice recognition (IVR) call centers or the Internet, for example Web 2.0 for EDF in France;
- Multi-brand strategy by placing apart from the incumbent brand a discount brand only using online sales instrument in order to attract price-sensitive clients like, for example, eprimo as the discount brand of RWE in Germany;
- Enhancement of the retail value chain by not offering only energy supply but technical services such as the installation of photovoltaic panels or boiler maintenance services as does, for example, Enel in Italy or GDF SUEZ in France;
- Design of energy efficiency services supporting the national implementation of the EU Energy-Climate Package, e.g. consulting services on how to save energy within private households[37]. For example, in the UK, within its energy savings program, household clients have the possibility to receive subvention for the replacement of their old heating systems.

Whatever trend they will follow, European retail companies need to define their new business model in a world where people will consume less energy than during the past 30 years, making the sale of additional services vital for future growth.

37 Institute for Marketing Research: more than 22% are willing to buy energy saving electronic at their retail company

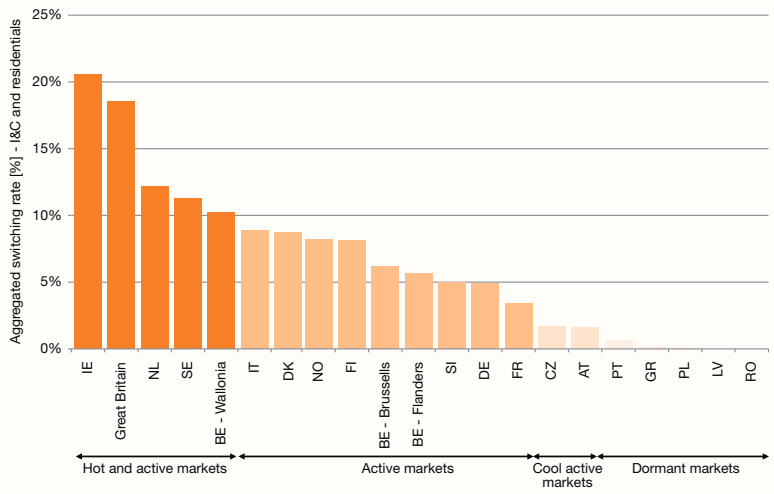
2009 has been a record year for European switching

vaasa ett
Global Energy Think Tank

2009 was a year whereby switching activity extended to new boundaries. As a whole, Europe was more active than ever before, continuing its growth in the switching momentum.

For the first time since the start of the European electricity market liberalization, Great Britain was knocked off the top spot for customer switching. **In 2009, nearly 21% of all electricity customers in Ireland switched supplier, 2% more than in Great Britain.** In fact between February 2009 and February 2010, Bord Gáis Energy won nearly 21% of the residential electricity market in Ireland, thanks to the world's most successful marketing campaign ever for an electricity retailer, if measured in terms of the percentage of residential customers in the market that were won during a 12 month period.

Annual European electricity switching rates (2009)



1. *A "switch" is essentially seen as the free (by choice) movement of a customer from one supplier to another. Switching activity is defined as the number of switches in a given period of time and includes re-switch (when a customer switches for the second or subsequent time, even within the same measured period of time), switch back (when a customer switches back to his/her former or previous supplier). A change of tariff with the same retailer is not equivalent to a switch.*
2. *UK data excludes I&C switching but includes switches due to moving home and registering with the local incumbent. These two errors are estimated to approximately equal each other out.*

Source: VaasaETT – Capgemini analysis, EEMO12

The Irish electricity market had been open to competition for larger businesses since February 2000 and was fully open to competition **in all market segments since 2005, but it was only in 2009, with the arrival of two key new entrants, Bord Gáis Energy and Airtricity, that the residential market became active.** The main reasons for this high level of customer switching were the new competitors offering significant price savings (although these only ranged from approximately 5 to 14%); the economic downturn in Ireland; and the outstanding marketing, especially relating to the extensive and highly effective use of online and social media marketing. Price savings were achieved through a combination of regulatory price controls placed on the incumbent ESBCS preventing them from reducing their prices (until it lost 40% of its customers), as well as timely and opportunistic energy purchasing strategies by Bord Gáis Energy.

The Irish experience should not be underestimated. Markets that are uncompetitive now, can become active very quickly if the conditions are right, a fact that indicates that during the coming few years, dramatic increases in switching activity will take place in other, as yet inactive, markets around Europe.

Great Britain was Europe's second most active market in 2009, supported once again, for example, by aggressive and effective marketing, significant retail margins, high levels of customer awareness, powerful online switching and comparison services on active media, and retail price volatility. The element of recession also appears to have played a substantial role.

Denmark was another surprising market. In 2009, approximately 200,000 customers switched their electricity supplier, corresponding to over 6% of all electricity customers. This may not be a high rate compared to the most active markets, but it is twice the rate of 2008 and it brings Denmark into the active markets category. The main reasons for this activity was the increased marketing activity of new entrants combined with increased customer elasticity resulting from the effects of the recession.

Switching also increased in other medium activity markets, such as Finland and Sweden as well as lower activity markets such as Italy, the Czech Republic, France, Greece, Portugal and Slovenia. In Slovenia it was due to the increased marketing activity from one player GEN-I, whereas in Greece it was largely due to high end user prices for smaller consumption segments combined with wholesale opportunities for new entrants. In the case of the Czech Republic, an increase in marketing and new supplier activity was significant, along with the collapse of a major electricity trader (Moravia Energo a.s.) and the subsequent application (for the first time) of the concept of supplier of last resort. In France, an increase in marketing activity for electricity, and a favorable wholesale market for gas, meant that non-incumbent players temporarily prospered, especially in the residential segment. Portugal benefited from an influx of Spanish Utilities in a climate of saving potentials driven by wholesale opportunities.

However, in Austria, Germany, Belgium (Flanders, Wallonia and Brussels), Norway and the Netherlands, switching trends were at similar levels to 2008, due, in the case of Belgium, to a mixture of factors including market concentration, insufficient savings opportunities, and switching process and rule inefficiencies. In the case of the Netherlands, there seems to be some consumer fatigue with direct marketing along with "Don't call me" registers. In the case of Norway and Germany, there was a reduced price volatility and a generally uneventful market.

Most other markets remained dormant, for now, but the evidence shows a general increase in the momentum of switching activity in Europe. The trend is typically upward.

Competitive Gas

Upstream

After a slight increase in 2008, gas production of the EU-27 Member States dropped significantly in 2009 by 9.3% to 171.2 bcm

The main factors explaining this pattern are the collapsing gas demand (due to the economic recession) together with the large availability of cheap liquefied natural gas (LNG) and the development of unconventional gas in the US (which currently accounts for around 50% of the US gas production).

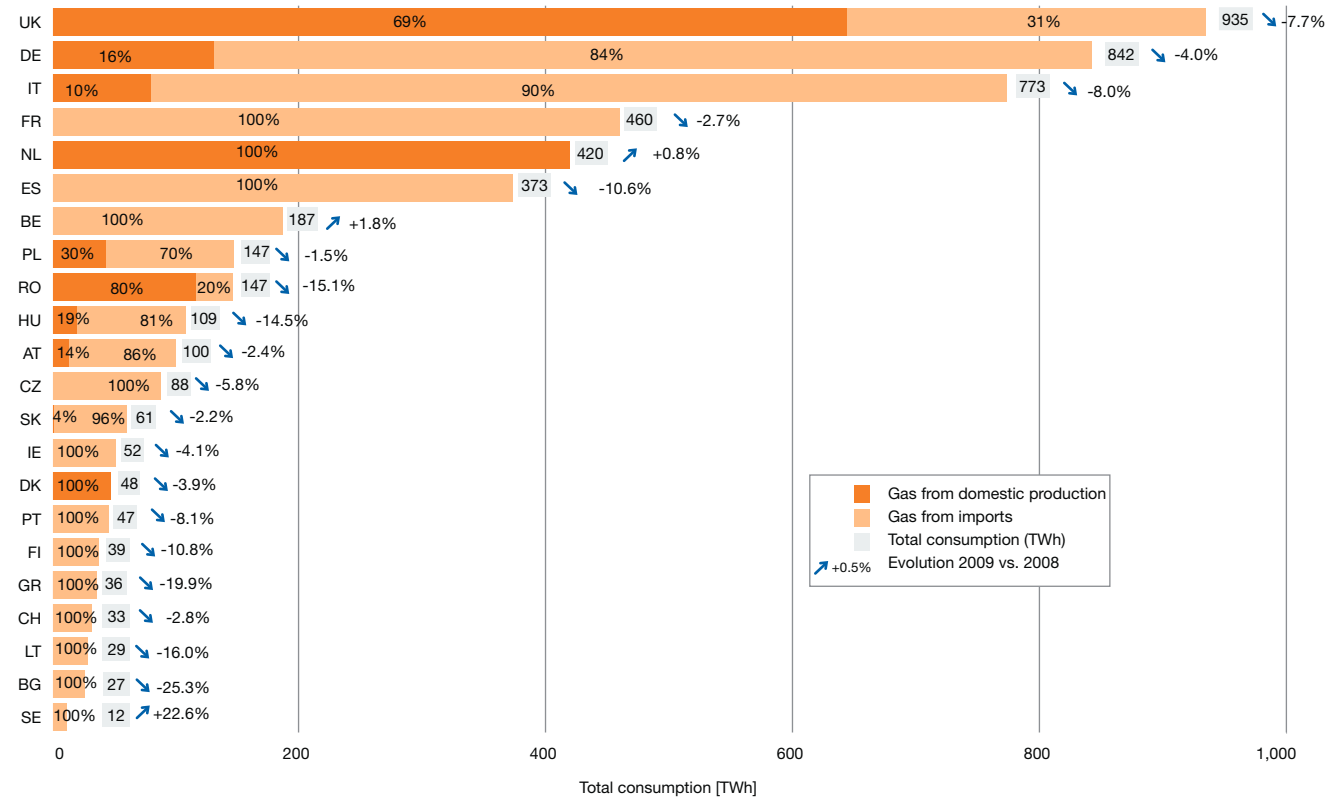
In most European producing countries, 2009 was a year with double-digit decreases in production (see Table 4.1). Danish gas production dropped by 16.3% (after a 9.4% increase in 2008), bringing its production back to its 2002 level. In the UK (accounting for 35% of the EU-27 gas production), the 14.1% decrease of natural gas production represents twice as much as the average yearly decrease of 7.8% in the five previous years, taking UK production back to its 1993 level. Regarding the new production in the UK, only eight new fields started production, which was the lowest number since 2000. In the Netherlands, the largest European gas producer, the decline was limited to 5.6%.

In other European gas producing countries, the decline in production continued or accelerated such as in Germany (-6.3% in 2009 after -8.9% in 2008), in Italy (-12.0%) or in Romania (-4.2%).

These six countries together accounted for 94% of the EU-27 gas production.

According to Cedigaz, natural gas production should recover in 2010 from the low level of 2009 as demand starts to rise again in Europe. Indeed, according to Eurogas, the EU-27 natural gas consumption increased by 12% in H1 2010 (compared to H1 2009) boosted by a Europe-wide cold weather from late December 2009 into January 2010. An increase of between 6 to 8% is anticipated for 2010.

Table 4.1 Domestic gas production versus imports (2009)



Source: BP statistical review of world energy 2010, Eurogas – Capgemini analysis, EEMO12

C. Lewiner (ed.), *European Energy Markets Observatory*, DOI 10.1007/978-94-007-2753-3_5,
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European gas companies decreased significantly their production in 2009, as a consequence of a demand reduction and a price drop

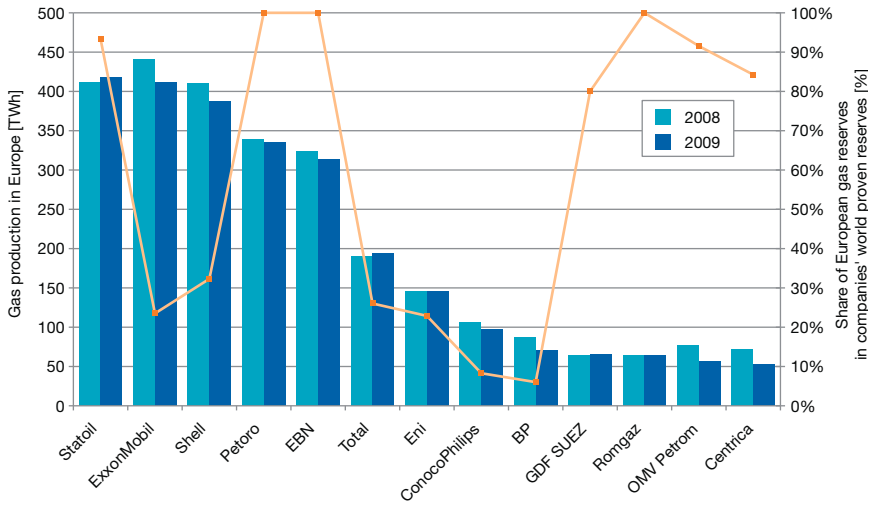
Most of the top 15 European gas producing players representing over 90% of European production (EU-27 + Norway) decreased their gas production in Europe in 2009 (see Table 4.2). This 4.5% decrease, coming after a 3.5% growth in 2008, can be largely attributed to ExxonMobil, Shell, BP, OMV Petrom and Centrica. Together, they reduced their natural gas production in Europe by 10.1 bcm out of a 11.9 bcm total reduction for the top 15 European gas producers. Only four players increased their production: Statoil (+1.4%) which is now the largest European gas producer; Total (+1.8%); GDF SUEZ (+1.4%) which jumped from 14th to 10th place in the ranking; and Romgaz (+1.7%). The production from the other players remained stable.

In 2009, the decline in European natural gas reserves slowed down

As shown in Table 4.3, the proven gas reserves of the EU-27 were 2.42 tcm at the end of 2009, compared with 2.49 tcm at the end of 2008. The reserves decreased by only 2.8% while the average rate for the past five years was -5.0%. The reserve-to-production ratio (R/P) reached 14 years of reserves at the end of 2009, while it was 13 at the end of 2008.

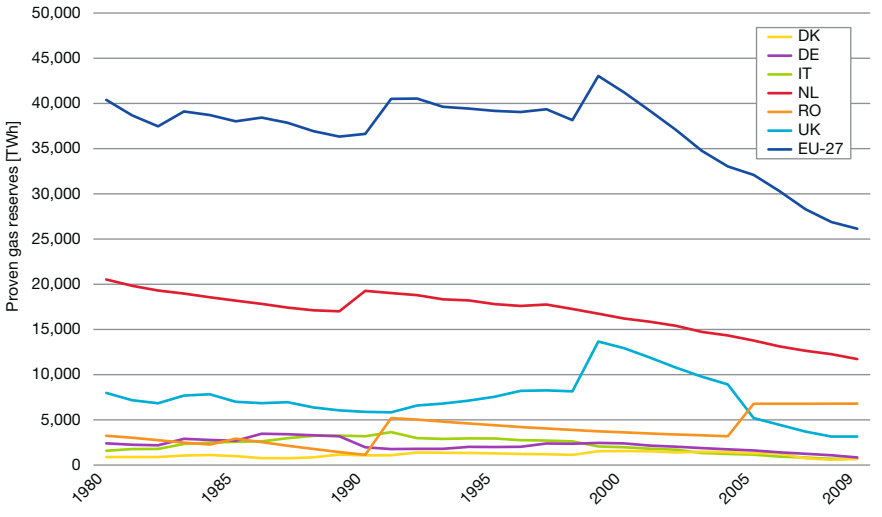
The UK, Romania, Poland and Italy managed to maintain their reserves at the same level as in 2008. In order to increase reserves renewal, the UK is trying to stimulate investments by providing tax incentives for the development of remote deepwater gas fields such as the Laggan-Tormore led by Total in the West Shetlands.

Table 4.2 Gas production and share of European proven reserves by company (2008 and 2009)



Source: Companies' annual reports – Capgemini analysis, EEMO12

Table 4.3 Proven gas reserves (2009)



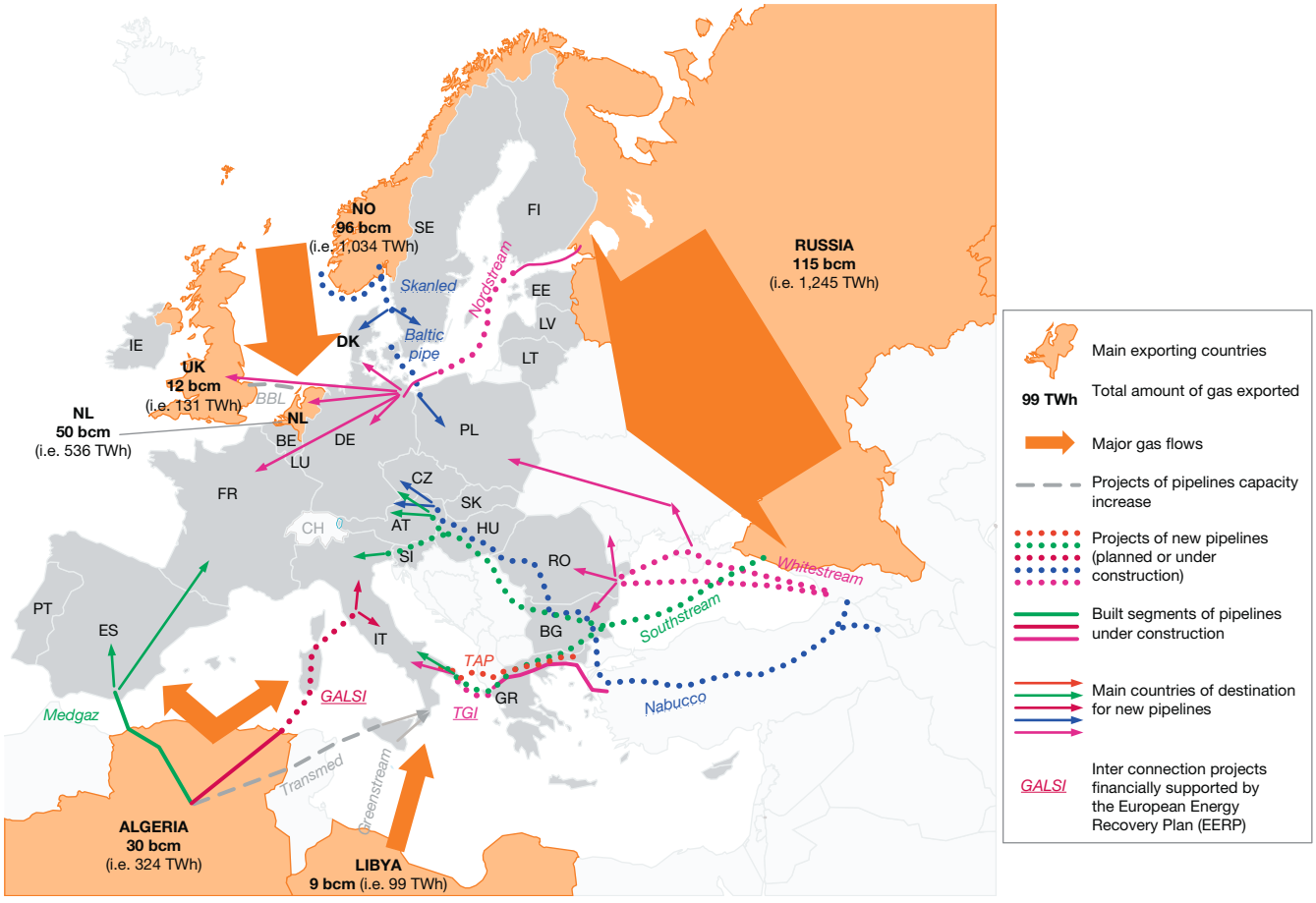
Source: BP statistical review of world energy 2010 – Capgemini analysis, EEMO12

Germany continued to face a dramatic reduction of its reserves with a decline of 22.6%, which is double that of the average annual decline rate of 11.1% since 2004. In the Netherlands, the natural gas reserves also continued to decrease by 4.4%. Denmark was the only country where gas reserves increased in 2009 (+16.4%).

Exploration activity remained flat in 2009 in North West Europe. The presence of many large oil and gas companies across North West Europe (North Sea) prevented a sharp decline of exploration and appraisal drilling activity levels. In Central & Eastern Europe, the economic crisis reduced capital expenditure on exploration and development projects, except for some unconventional gas exploration projects.

The Macondo incident in the Gulf of Mexico may impact the exploration activity in Europe as people are asking for a moratorium and a reinforcement of regulations which could consequently increase finding and development costs. Norway imposed a six months deepwater drilling restriction. There will probably be new regulations and requirements that will take into account the lessons from the BP disaster. Other European countries might not make significant changes to their drilling regulations as the North Sea already has stricter safety norms than in other parts of the world. The UK government refused a moratorium arguing that it would increase its inspection of drilling rigs and monitoring of offshore compliance. Furthermore, security of supply and the revenues provided by oil and gas activity are too important for the EU to ban offshore exploration. The European Commission is expected to release a directive in the autumn of 2010 which might reinforce safety norms and controls to avoid blowouts.

Table 4.4 Map of gas imports through pipelines and pipeline projects (2009)



Source: BP statistical review of world energy 2010 – Capgemini analysis, EEMO12

In 2009, even though the import dependency towards extra-European sources, mainly Russia, continued to grow, security of supply improved due to diversification over the past years

In 2009, imports covered 62.8% of the EU-27 gas consumption, up from 61.3% in 2008. But this hides large differences among Member States. Indeed, the European supply gas market can be split into three main areas:

- Western Europe (the UK, the Netherlands, Romania, France and Germany), which has a large domestic production (except for France), gets its supply from Norway and the North Sea, from pipelines (mainly Russia) and from LNG;
- Southern Europe (Portugal, Spain and Italy) is supplied by a pipeline from Algeria and Libya, and also by the LNG markets. Italy has contracted volumes with Gazprom and receives 30% of its imports from Russia;
- Central & Eastern Europe is mainly supplied with piped gas from Russia.

It is of no surprise that gas imports dropped by 3.9% in 2009 (see Table 4.4). In Q1 2010, the import level, however, increased by 18% compared to the same period in 2009.

Russia represented 35% of the total EU imports in 2009 followed by Norway (32%), Algeria (15%), Qatar (6%), Libya (3%), Nigeria (4%), Trinidad & Tobago (2%) and Egypt (2%).

Dependence on Russian gas is reducing over the years (from 65% in 1990 to 35% in 2009) as Europe has no problem accessing non-Russian gas. The situations are different among the Member States. Italy and Germany represent almost 50% of all contracted Russian gas in the EU, while seven countries (Austria, Bulgaria, the Czech Republic, Greece, Hungary, Lithuania, Poland and Slovakia) rely on Russian gas for over half of their consumption. In the future, the EU-27 will need more Russian gas as the indigenous production is set to decline and be largely insufficient to meet demand.

As a consequence of the EU-27 consumption reduction, Russian production fell by 12.1% in 2009.

Furthermore, as the oil-indexation formulae incorporated into Russian contracts made Russian gas prices higher than other suppliers during a period of time in 2009, buyers had a strong incentive to reduce Russian off take. A recovery is anticipated in 2010, but the changes in the gas market have pushed Russian gas companies to revise their investment strategies for future development. For example, Gazprom announced in February 2010 that the production start-up of the giant Schtokman gas field was pushed back to 2016 instead of 2013.

Algeria, which holds important potential gas reserves especially in remote southwest zones of the country, also saw its exports to Europe drop slightly from 16% of total EU-27 imports in 2008 to 15% in 2009 as a consequence of the economic recession.

Imports from Norway continued to rise in 2009 (+4.0%) while those of all other main suppliers declined. This trend is explained by the strong increase of Norwegian LNG imports to the EU-27 (+62.7%) from 1.38 bcm in 2008 to 2.25 bcm in 2009 (one of the reasons being that Snøhvit is back to full production after repairs), whereas pipeline exports increased only by 3.2% from 92.7 bcm to 95.6 bcm. Norway is very well placed to take advantage of spot markets as the pipelines used for the import of Norwegian gas are well connected to most liquid trading hubs. Seven developments projects are scheduled to come on stream in 2010 in Norway. The largest one is Gjøa which is located in the Northern North Sea and operated by Statoil and GDF SUEZ. Gjøa is the first of new hub developments in Norway that is expected to stimulate exploration and development of smaller discoveries in the least explored parts of the maturing North Sea.

2009 saw a major evolution in the natural gas supply mix of the EU-27 countries with a boom of LNG trade movements. LNG deliveries rose by 26.7% from 50.2 bcm in 2008 to 63.2 bcm in 2009 (see the LNG chapter).

Gas traded by pipeline decreased by 9.5% from 270 bcm in 2008 to 245 bcm in 2009. Following the decline in demand

for European imports of piped gas, signs of flexibility have emerged in contract agreements negotiations. Some European buyers have renegotiated the penalties or have given extra time for deliveries within the framework of a firm purchase commitment. In Q1 2010, Gazprom and Statoil announced their intention to index gas purchase on the spot prices rather than on the oil price, for all purchases higher than the minimum volumes of fixed terms contracts. These kinds of measures are expected by gas exporters to minimize the drop out of their exports due to a more competitive spot market as seen in 2009.

While news flow has been positive on Nord Stream in 2009/2010, little concrete progress was made on the Nabucco and South Stream projects

Diversification of routes and the implementation of projects to construct new pipelines are critical for European energy security. The EU sponsors pipeline projects that will increase gas supply from countries such as Algeria (Galsi, Medgaz, Transmed) or from the Caspian region (Nabucco, Turkey-Greece-Italy pipeline). Russian initiatives, on the other hand, tend to build up gas supplies and eliminate transit risks.

The three major projects that rely on natural gas reserves potentially available from Russia, other Commonwealth of Independent States (CIS) countries and the Middle East are Nord Stream, South Stream and Nabucco.

The Nord Stream project is a strategic investment that could enable Gazprom (which owns 51% of the project) to mitigate current transit risks associated with Ukraine and Belarus. Its total capacity is expected to be 55 bcm/year. The main progress in this project is that Nord Stream AG has started up the construction work in April 2010. The first leg of the pipeline is to be built in 2010/2011 and the second one in 2011/2012. The first gas delivery is scheduled for early 2012.

Another key point to be noted is that GDF SUEZ took a 9% interest stake in Nord Stream AG after E.ON and Wintershall each sold 4.5%.

On the South Stream project, which Gazprom is building together with Italy's Eni to transport gas from Russia across the Black Sea to Bulgaria, Italy and Austria, little concrete progress has been made. Total capacity is expected to be 63 bcm/year making the potential co-existence of the South Stream and Nabucco projects questionable. Eventually Eni's CEO proposed in March 2010 to merge the two projects to reduce the investments and costs, but this proposition was rejected by Russia. It is scheduled to be finalized in 2015.

In 2009/2010, South Stream received governmental approval from several transit countries, most notably Turkey. However, significant challenges remain such as ensuring that the supply is secured and available, and managing the construction costs which are estimated at between €19 and 24 billion. The preparatory phase is expected to be completed in the fall of 2010. Construction work could start shortly afterwards. In June 2010, Gazprom, Eni and EDF published a joint press release confirming that EDF will join the project.

The Nabucco project is motivated by the EU countries to reduce over dependence on Russian gas imports and by the repeated threats of supply interruption due to the Russia-Ukraine gas disputes. The capacity of the future pipeline is expected to reach 31 bcm/year in 2020. Nabucco has yet to secure gas supply which represents a significant hurdle to its development as some potential suppliers (Kazakhstan, Uzbekistan and Turkmenistan or Azerbaijan) have still not firmly committed their supplies to Nabucco. Construction costs are also an unsolved issue as the project sponsors and the EU have only committed a fraction of the €7.9 billion construction costs.

In 2010, Romania and Turkey were the two last countries to ratify the intergovernmental agreement. Construction of the pipeline is scheduled to begin at the end of 2011 after the final investment decision was taken by the project partners (OMV, MOL, Transgaz, Bulgargaz, Botas and RWE).

Unconventional gas could be a potential good surprise to increase Europe's gas reserves and reduce dependency but is not yet a game changer

Unconventional gas is not new in the oil and gas industry. It simply refers to gas found in formations where the permeability of the reservoir rock is so low that it requires stimulation to achieve sustained gas flow: deep natural gas (4,500 meters or deeper underground), tight gas (gas trapped in unusually impermeable, hard rock, or in a sandstone or limestone formation that is unusually impermeable and non-porous), shale gas or coalbed methane (natural gas contained in coal seams). Unconventional gas resources have traditionally been considered too complex or expensive to produce, but it is getting more accessible due to technological and geological knowledge progress. Key technologies are horizontal drilling and modern fracturing techniques.

In the US, unconventional gas is seen as a game changer because roughly 50% of the country's production is met by unconventional gas. Tight gas has the highest share, accounting for about 30% of the total US natural gas production, but shale gas (around 9% of the US gas production) and coalbed methane (around 10% of the US gas production) are gaining momentum.

In Europe, the International Energy Agency (IEA) estimates that unconventional gas resources could amount to 35 tcm, six times higher than the continent's conventional gas resources and sufficient to potentially weaken external suppliers' grip on Europe's energy supply. Although no production of unconventional gas is established yet.

Europe has numerous sites of potential interest which include Germany, Poland, Sweden, France, Austria, the Netherlands, Hungary and the UK.

Shale gas licensing has grown strongly during the last two or three years. However, it is now over as there is limited prospective acreage left. This rush to land grab has been led largely by majors who were late on the scene in North America such as ConocoPhillips, ExxonMobil and Shell. Other companies such as Total, OMV, MOL, GDF SUEZ or niche players are also engaged in shale gas resources evaluation projects.

One of the main issues is to find the right rocks, as there is limited data available in Europe due to the scarcity of wells. It is not the case in the US. Hence, an increase in seismic and drilling activity is expected in the coming years. Experts from the US Geological Survey say that in an area the size of the Benelux countries, there would have to be up to 6,000 wells to develop shale gas in Europe, an impact that would probably attract environmental opposition.

Furthermore, several other challenges remain such as:

- Gaining a better understanding of potential geological reservoirs to refine reserves estimates;
- Overcoming the access barrier as acreage and land access is more difficult than in the US due to a higher population density;
- Finding solutions to reduce the environmental impact and public acceptance as large amounts of water, sands and chemical products are needed for fracturing, recycling or disposing produced fluids;
- Optimizing economics since European well costs – drilling and stimulation – are up to four times the North America levels.

Unconventional gas may not be a game changer now since production will be later and more expensive than in the US. However, it will contribute to replacing some of the declining North Sea production and, thereby, reduce forecasted imports in the mid- to long-term.

Key issues in Switzerland

Since the beginning of 2009, the Swiss electricity market has been open for large-scale customers (> 100 MWh per year). **The deregulation**, however, **did not meet the expectations of the sector and of customers in 2010. The customer churn remained low.** The full market opening (including households) is planned for 2014. Until then a comprehensive revision of the legal framework and the regulatory environment is expected.

Due to an increase in energy consumption and the age-related shut-down of plants, **Switzerland will face a rising discrepancy between supply and demand.** Closing the gap is essential for a reliable and cost efficient electricity supply throughout the country. **It will not be possible to close the gap by renewable energy only. Progress in developing wind energy is slow.** The approval process takes up to seven years and the Swiss wind potential is small compared to other European countries. In Switzerland, 55% of electricity is generated by hydro power and around 40% comes from nuclear power.

To expand generation capacities, Alpiq, Axpo and BKW plan to build new nuclear power plants in Mühlenberg, Beznau and Niederamt, for which they have filed applications for obtaining preliminary approval for the construction. **Nevertheless, Swiss citizens will vote on the construction of new nuclear power plants no earlier than the end of 2013.** A further large investment is being done by Axpo with 2 billion CHF for constructing the largest hydro power plant (1,450 MW) in Switzerland. Axpo plans to launch commercial operations in 2015.

In addition to increasing generation capacities, **grid capacities have also increased.** To ensure efficient improvement of the grid, Swissgrid was founded in 2007 by eight Swiss electricity companies. The operator of the high voltage grid was established on the basis of the Electricity Supply Act (StromVG) and requested by the EU in 2008. **The Swiss high-tension transmission network (220/380 kV) will be fully assigned to Swissgrid, starting from the end of 2012 onwards.**

LNG

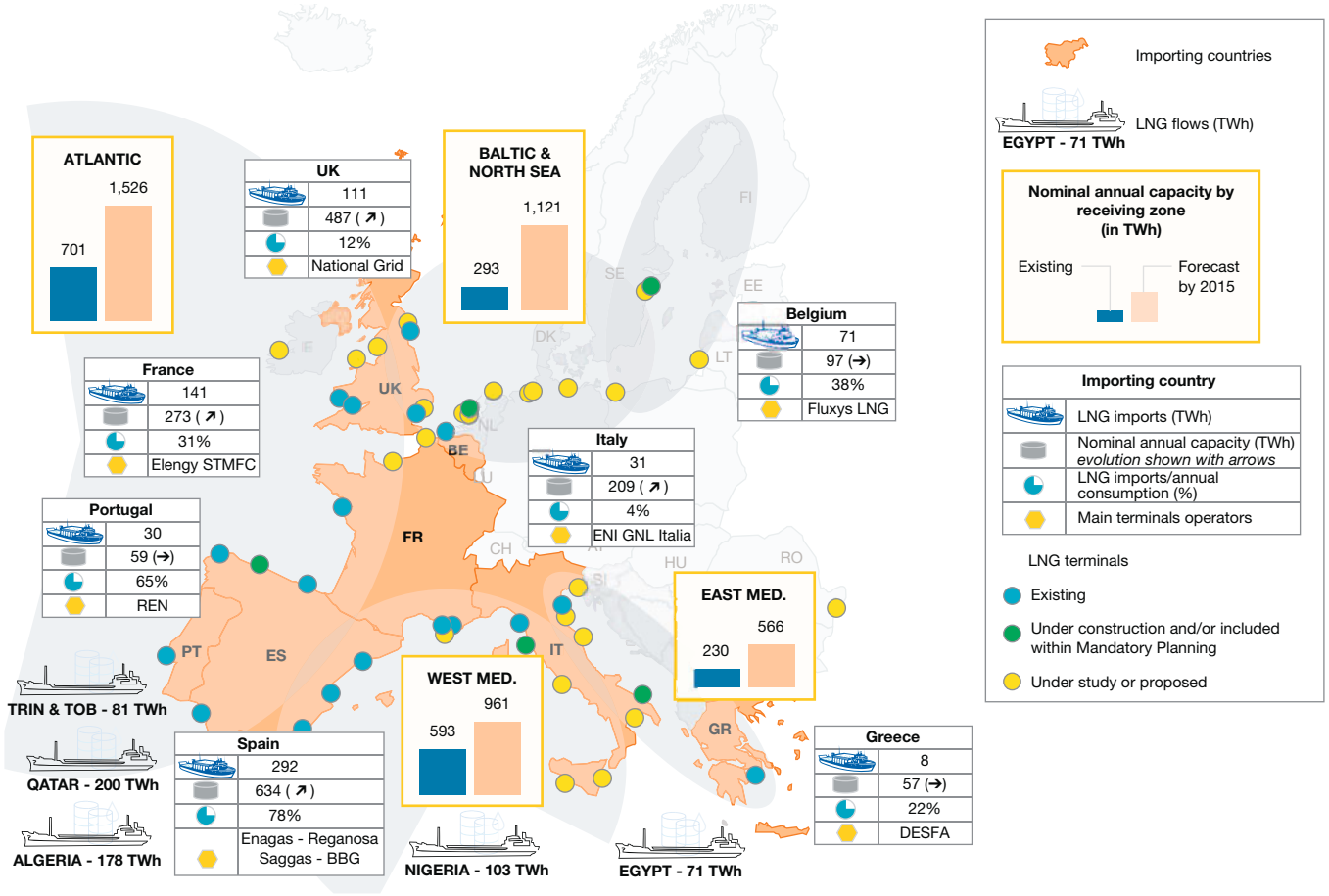
2009 sees a resurgence in European LNG demand

The LNG consumption in Europe grew strongly by 26.7% in 2009 (from 540 to 684 TWh). The role of LNG in terms of supply diversification has become of greater importance for the EU-27 where LNG represented 20.5% of the total gas trade (LNG + piped gas) in 2009 versus 15.7% in 2008. The increase in LNG flows towards Europe can be attributed to the following factors:

- US shale gas production in the five year period 2004 to 2008 has seen a 300% increase from 19.4 bcm/year to 57 bcm/year. And the global recession, which has resulted in a lower overall gas demand, has led to a depressed Henry Hub gas price. As a consequence, LNG producers had no option but to direct their cargoes towards Europe where the spot gas price was relatively more attractive;
- Asian buyers, in particular Japan and Korea, continued to feel the impact of the recession leading to a smaller premium of Asian spot prices over Europe;
- The main driver for European growth has been the increased LNG terminal capacity in the UK with two terminals coming online at the same time in Milford Haven in Wales (South Hook LNG: a joint venture between Qatar Petroleum, ExxonMobil and Total; and Dragon LNG operated by BG Group). Significant uncommitted cargoes of Qatar Petroleum have made the UK an ideal destination since demand was depressed in the US and Asia.

While Europe provided a destination for cargoes, overall there are excess volumes of LNG in the global market and lower prices are expected to continue until

Table 5.1. Map of LNG terminals and flows (2009)



Source: GIE gle, BP statistical review of world energy 2010 – Capgemini analysis, EEMO12

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at least the end of 2010 as long-term supply/demand issues, investment options and energy security take center stage. In the long-term LNG market, supply/demand conditions may arise again if economies start to recover from 2011, as there is little new LNG supply anticipated between 2013 and 2016. Recovery of short-term LNG demand in the Asia Pacific region remains uncertain and is still sensitive to the duration and depth of the economic recession, but it is anticipated to recover in 2011.

Spain continues to be the leading importer of LNG with the UK entering the market

Spain continues to be the leading importer of LNG in Europe and the third largest globally (see Table 5.1), however volumes have been impacted by the financial crisis resulting in a 6% decrease in demand in 2009 (from 310.3 to 291.7 TWh). France occupied second position with a 3.8% increase in 2009 (from 136 to 141.2 TWh).

However, the biggest contributor to Europe's increased intake in 2009 compared to 2008 has been the UK. The addition of the two new terminals in Milford Haven in Wales has changed the UK's import situation and hence its security of supply position. The UK has seen a 885% growth in LNG imports (from 11.2 to 110.6 TWh) between 2008 and 2009. It should be noted that the increase is from a very low base. Qatar's mega-trains have been the main provider of LNG at South Hook LNG. Dragon LNG has also seen increased volumes from its LNG liquefaction assets in Trinidad & Tobago.

Belgium is another notable importer which has witnessed a rise of 162.3% in 2009 (from 26.9 to 70.5 TWh) with supply coming primarily from Qatar's LNG trains. Zeebrugge was the first terminal in Europe to install a facility to re-liquefy the gas for export allowing its customers to exploit commercial opportunities. This reconfiguration has continued to attract cargoes to Zeebrugge in 2009 and allowed them to re-export LNG when market conditions were right.

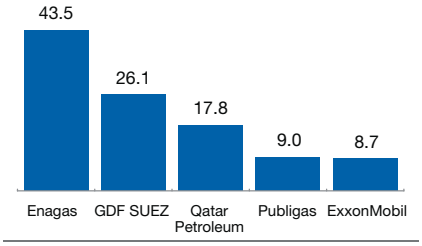
Italy's 86% LNG import increase in 2009 (from 16.8 to 31.3 TWh) is mainly attributable to the commissioning of a new offshore terminal in the North of the Adriatic Sea. Finally, the expansion of the Revithoussa import terminal, envisaged in 2009, was reported due to severity of the financial crisis. Greece had a significant decline of 21% from 2008 to 2009 (from 10.2 to 8 TWh).

From the supply side (see Table 5.2), there have been major changes in 2009 with the drop of Nigerian deliveries (-30% to 103.2 TWh) and the increase of deliveries from several countries such as Qatar (+134% to 199.6 TWh), Norway (+62.7% to 24.3 TWh), Trinidad & Tobago (+48.4% to 80.6 TWh), Libya (+35.8% to 7.8 TWh) or even Oman (+664.7% to 14 TWh) and Equatorial Guinea (+116.4% to 1.9 TWh). There were also deliveries to the EU-27 market for the first time in 2009 from Australia (0.9 TWh) and Yemen (1 TWh).

The global recession has had a marked impact on the regasification investment in the Mediterranean basin

In last year's edition of our Observatory, it was reported that a number of regasification terminal final investment decisions, particularly in Italy, were on the agenda for approval. However, continued regulatory hurdles, and then the economic crisis have made a big impact on the go-ahead for the Brindisi, Rosignano, Civitavecchia and Alpi Adriatico terminals in Italy. The delays in approval show that if planned investment went ahead, LNG receiving capacity in the West Mediterranean basin would be 961 TWh in 2015 compared to 1,301 TWh as reported last year. Similarly, if planned investment in the East Mediterranean basin went ahead then a receiving capacity of 566 TWh in 2015 is expected compared to the 869 TWh reported last year.

Top 5 - European LNG operators in terms of ownership in LNG terminals in bcm (2009)



Source: Companies' web sites and annual reports – Capgemini analysis, EEMO12

In addition, the UK's Canvey Island, France's Le Verdon and Dunkirk, Sweden's Oxelösund, and the Netherlands' Liongas Rotterdam have all had delays and no final investment decision has been taken.

LNG players covering the full value chain are having a greater say

In last year's edition of our Observatory, there was an argument that in the longer term it would be players in the industry that cover the whole value chain from liquefaction, shipping/trading as well as import terminals that would truly be able to exploit the opportunities. This is true for Qatar Petroleum and ExxonMobil, that have made regasification investments in Europe, and which rank 3rd and 5th respectively in the Top 5 European LNG operators. 2009 saw the introduction of South Hook LNG with Qatar Petroleum having a 67.5% interest, ExxonMobil with 24.2% and Total with 8.4%. In addition, Adriatic LNG saw Qatar Petroleum and ExxonMobil each take a 45% stake with Edison taking the remaining 10%.

With market conditions continuing to be volatile, players with both liquefaction and regasification assets strategically located around the world will be able to exploit market opportunities when they arise.

The market dynamics continue to change for liquefaction and regasification

In 2008, LNG demand outstripped supply, and liquefaction producers geared towards the spot market benefited greatly by diverting cargoes to Asian buyers. However, 2009 has seen the complete reversal due to the recession with excess supply feeding the market which has no buyers. The slower than expected liquefaction ramp-up capacity and project delays have helped to mitigate the oversupply situation. Without these delays, global short-term market prices would have been even further depressed causing problems for liquefaction producers.

One of the key issues facing liquefaction producers is the inflexibility in turning down LNG output due to high operating leverage and the technological challenges in ramping down production. The effect of this is that during a depressed demand, output cannot be reduced significantly either from a commercial or a technical perspective.

In addition, for the majority of long-term contracts, buyers can have a 10% flexibility built in so as to not have cargoes that they don't want. In normal circumstances producers can manage this. However, in 2009 a high proportion of buyers wanted to exercise this option. This

Table 5.2 LNG imports to Europe (2009)

In TWh	From															
To	Trinidad & Tobago	Belgium	Norway	Oman	Qatar	UAE	Yemen	Algeria	Egypt	Equatorial Guinea	Libya	Australia	Nigeria	Total imports	% of total Europe	% change 2009 vs. 2008
Belgium	1.7	-	1.9	-	65.1	-	-	-	1.0	-	-	-	0.9	**70.5**	10.3%	162.3%
France	7.8	-	4.7	-	1.9	-	-	82.9	17.6	0.9	-	-	25.4	**141.2**	20.6%	3.8%
Greece	0.4	-	-	-	-	-	-	5.7	1.8	-	-	-	-	**8.0**	1.2%	-21.1%
Italy	-	-	-	-	16.7	-	-	13.7	0.9	-	-	-	-	**31.3**	4.6%	85.9%
Portugal	4.3	-	-	-	-	0.9	-	1.1	-	1.0	-	-	23.1	**30.4**	4.5%	7.2%
Spain	45.1	0.9	14.9	14.0	53.8	-	1.0	56.1	44.3	-	7.8	-	53.9	**291.7**	42.7%	-6.0%
United Kingdom	21.3	-	2.8	-	62.1	-	-	18.1	5.5	-	-	0.9	-	**110.6**	16.2%	885.0%
Europe	**80.6**	**0.9**	**24.3**	**14.0**	**199.6**	**0.9**	**1.0**	**177.7**	**71.1**	**1.9**	**7.8**	**0.9**	**103.2**	683.8	100%	26.7%
% of total Europe	11.8%	0.1%	3.5%	2.1%	29.2%	0.1%	0.1%	26.0%	10.4%	0.3%	1.1%	0.1%	15.1%			
% change 2009 vs. 2008	48.4%	276.8	62.7%	664.7%	134.3%	n.a.	n.a.	8.8%	4.6%	116.4%	35.8%	n.a.	-30.0%			

Source: BP statistical review of world energy 2010 – Capgemini analysis, EEMO12

has meant that there were higher volumes but no markets.

An additional 80+ bcm of LNG is expected to come onto the market by 2011 and half of that volume has already been sold into fixed, long-term contracts in Asia Pacific. The remaining uncommitted volumes will flow into the Atlantic Basin if they are unable to find Asian Pacific buyers. The effect of these additional uncommitted cargoes, in addition to the 10% clause opened by buyers in long-term contracts, is forcing downward pressure on short-term and spot prices, thereby directing further cargoes towards Europe.

Are long-term contracts linked to oil-parity about to end?

The countries represented in the Gas Exporting Countries Forum (GECF)[38] want to get export gas prices back to oil-parity. However, long-term LNG contracts linked to current oil prices are multiples of depressed local gas spot prices. Major LNG buyers such as Japan, Korea, China and Taiwan want lower prices and are encouraging competition by supporting new projects in Australia where 11 projects are under construction or in the planning stage.

Even with the current depressed demand, GECF is insisting on oil-linked contracts but unlike most members whose current production is linked to long-term contracts, Qatar has large uncommitted volumes of LNG with no attractive market. With increased seller competition for limited LNG demand as well as large disparity between oil-linked and spot prices, it might just provide the impetus for Asian and European players to sign a competitive long-term contract price linked with gas-to-gas price and break the oil price link.

The next few years will continue to pose uncertainty for liquefaction and regasification players

2009 has seen a reversal from 2008 where increased supply coupled with decreased US and Asia demand has provided Europe with greater access to cargoes. However, it must be noted that it is not only the right market conditions that is driving up demand, but EU regulations to diversify its energy supply. The increasing use of LNG in 2009 strengthens the case for continued LNG regasification investment as it is starting to play a more critical role in Europe.

In summary, Europe has enjoyed a resurgence of LNG imports in 2009 but the outlook remains uncertain due to issues existing both in liquefaction and regasification. While gas demand can dropped temporarily in developed countries, it is expected to grow in emerging countries such as China and India. This leads to long-term contracts being signed with both Qatar and Australia and creates more competition for the European LNG buyers.

From the suppliers end, the current recession and high capital investment required has resulted in Russia and Qatar freezing further investment in LNG for the short-term. In addition, there is a growing focus on nationalizing gas resources which may only further restrict LNG supply.

Key issues in Portugal

At the beginning of 2010, Portugal presented its National Energy Strategy (ENE 2020), renewing its belief in renewables. Targets were set at 31% of its gross final energy consumption and 60% of its electricity generation by 2020. In 2009, Portugal became the world's second largest wind power market with EDP Renováveis ranking third worldwide.

Energy efficiency is also key to this strategy, with the aim to reduce final energy consumption by 20% in 2020. A national platform for electric mobility (Mobi-e) is being implemented with the objective to serve 750,000 electric vehicles by 2020. Additionally, the smart grid national consortium (InovGrid) led by EDP, launched in April 2010 a pilot for the first smart city in Portugal and plans to install about 30,000 smart meters.

After the full opening of the electricity market in 2006, consumers have alternated between regulated and liberalized markets, but in April 2010, the latter reached an unprecedentedly high volume of 50.2% of the total market consumption. **To avoid a liberalization set-back, all regulated electricity tariffs, excluding low power residential clients, are set to disappear by January 2011.** The same will happen for gas by March 2011.

The Iberian retail gas market continued to develop, with Galp Energia becoming the second largest gas company (1.3 million clients), after Gas Natural and before EDP (1.1 million clients). In addition, the wholesale gas market became more competitive with, for the first time, another company than Galp (EDP) being able to use the Sines LNG terminal to import gas (July 2010).

In response to the economic crisis, Portugal launched a three year Stability & Growth Plan (PEC) in March 2010, designed to build trust into the economy and to reduce the public debt. It included privatizing operations estimated at €6 billion until 2013, through the State's current stakes in the energy sector (51.08% of REN, 25.73% of EDP and 8% of Galp). Already in 2010, the government is expected to raise more than €1 billion by selling 5% of EDP and 7% of Galp.

38 Primarily Russia, Qatar, Egypt, Equatorial Guinea, Nigeria, Libya and Trinidad

Gas Wholesale Markets

The de-correlation between European wholesale gas spot prices and gas long-term contracts prices, initiated during the winter of 2008/2009 continued into 2009 in an oversupplied international market, flooded with LNG, depressed demand and rising US unconventional gas production. Oil-gas parity seems to have come back since the summer of 2010 thanks to the maintenance period in the North Sea and the booming Asian gas demand that is attracting LNG

The wholesale gas spot prices on the three historical trading European hubs (the UK, Zeebrugge and the Netherlands) followed the same trend during 2009 and the winter of 2009/2010, reaching a monthly low in September 2009 at €7.7/MWh (in the UK). The UK spot prices averaged €11.5/MWh in 2009, a 52% drop compared to the 2008 level. The winter of 2009/2010 price decreased by around 40% to reach €12/MWh, leaving the summer of 2009 prices at €10/MWh (see Table 6.1).

The new trading areas in Europe averaged €13.3/MWh in 2009 for Gaspool in North Germany and €12.6/MWh both for NCG in South Germany and for PEG Nord in France. The winter of 2009/2010 prices were set at €12.3/MWh in France and Germany (NCG).

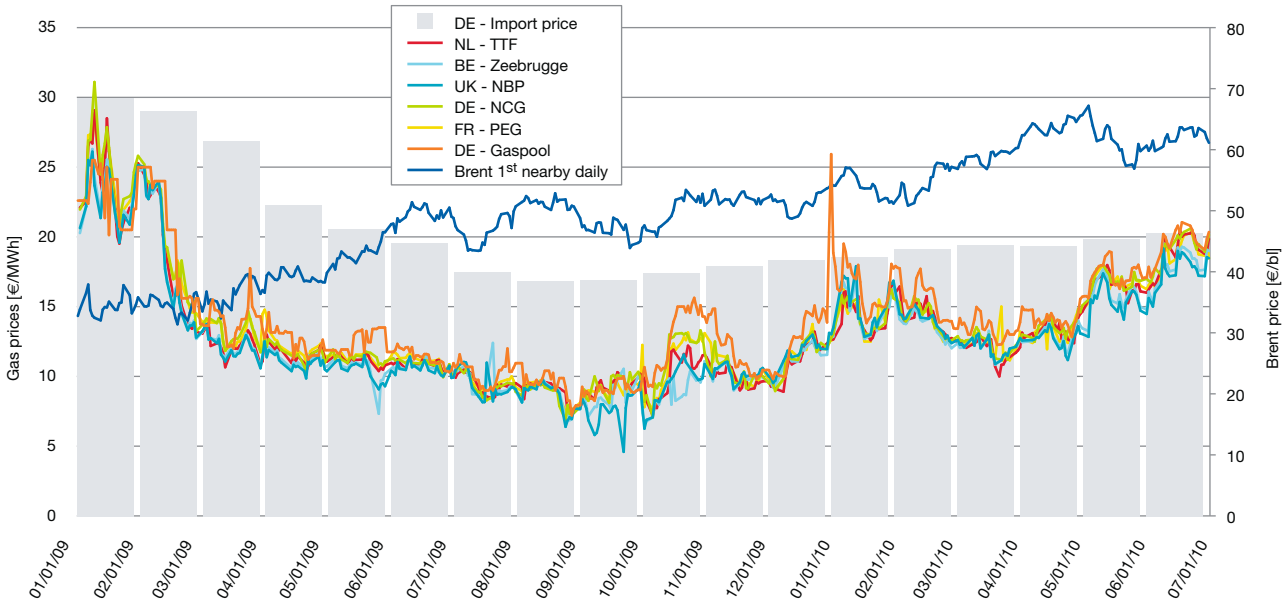
2009 began with the Russia-Ukraine crisis and a period of cold temperatures that pushed prices to their highest yearly range: the UK NBP (National Balancing Point) peaked at €26.1/MWh on January 8, and the Dutch price went even higher at €29.1/MWh on January 9. Prices moved in the €20-25/MWh range until mid-February supported by the cold weather and the falling storage levels across Europe.

Then, due to a falling demand and a good supply in particular from Norway and the LNG market, prices fell to below €15/MWh from March onwards and below €10/MWh in June. Continental stock levels rose rapidly from their lows of 15-20% and the UK stocks, which bottomed at 27%, were full at the beginning of August. Only the Baumgarten area did not reach its full capacity.

The summer of 2009 (€10.2/MWh on average in the Netherlands) was characterized by:

- A usual pattern of market prices well below gas long-term contracts realized prices, which hit their low in July 2009 at around €17.5/MWh;
- Some maintenance periods entailing short-term price movements and thus creating volatility;
- Shut-down in September of the Interconnector between the UK and the continent for maintenance purposes, and associated price de-correlation leading UK prices to reach their daily lowest at €4.6/MWh.

Table 6.1 Gas spot prices (2009 and H1 2010)



Source: Gas Exchanges web sites, BMWI, SG Commodity Research – Capgemini analysis, EEMO12

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Remarkably, during the summer of 2009, worldwide depressed prices were observed in all three main gas zones: the US, Asia and Europe. The US benchmark Henry Hub spread with the UK NBP stayed within the €2.5/MWh (~US$1/Mbtu) range from March until December. Usually this correlation is held from June until August and is fitted with trans-Atlantic transportation costs of around €0.5/MWh. In May 2009, for example, an Australian LNG cargo delivered its gas to the UK rather than to Japan or Korea which are the usual destinations for Australian LNG, since cargoes prefer the shorter route.

The winter of 2009/2010 started smoothly with prices of only between €1 to 2/MWh higher than those of Q4 2009. However, the October cold weather in Eastern Europe combined with some arbitrage between day-ahead and month-ahead products with available storage capacity in Germany, led the German and French prices to be between €1 and 2/MWh higher than the UK prices. It showed the congestions at the Dutch-German borders and the limited ability of Norwegian gas, which can flow to UK or the continent, to level off prices in Europe.

The end of December 2009-January 2010 cold snap moved the price to a high of around €18/MWh and generated system alerts from the UK gas system operator. On January 8, the UK and the continent de-correlated. The interconnector was at its maximum capacity (40 mcm/day) as the UK demand had reached an all-time record level of 450 mcm/day. A second price spike occurred in late January, as the cold snap as well as the main UK storage center of Rough created concerns within the market. The UK returned to an export mode towards the continent at the end of February, thanks to the volumes of LNG arriving at its increased terminal capacity. Nevertheless, gas spot prices never reached their traditional ceiling of European gas long-term contracts realized prices, which continuously increased from €17/MWh in October 2009 to €19/MWh in March 2010, because of the increasing oil price in US$ per barrel and a decreasing value of the euro (-7.6%) from December 2009 onwards.

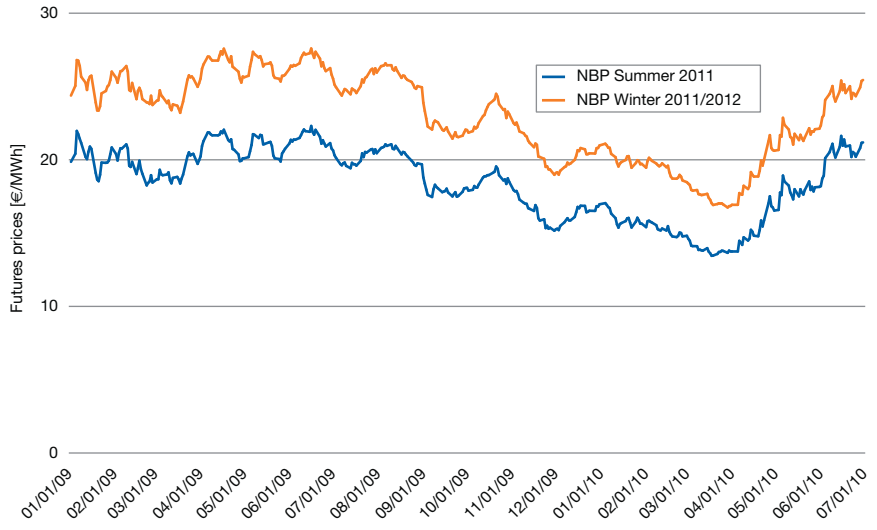
The most striking pattern of the winter of 2009/2010 gas spot prices development was the unusual difference with gas long-term contracts continental realized prices, which led:

- Importers such as E.ON, GDF SUEZ and Eni to open negotiations with producers such as Gazprom, Statoil and GasTerra to remove partly oil-indexation or reduce the take-or-pay volume on a temporary basis. Little information is available on the commercial terms;
- The opening of a debate that forced gas exporting countries, meeting in Oran on April 19, 2010 within the framework of the GECF, to confirm the oil-indexation of gas long-term contracts prices in the long run, albeit different national interests.

During the winter of 2009/2010, stocks in Germany and Austria were little used in comparison to the previous year and their levels were higher by 45% than during the winter of 2008/2009. Stocks from Western Europe (the UK, France, the Netherlands) ended below the 15% threshold, although they were a little drawn down at the beginning of the winter period. Players have different strategies on the various European market places, that take into account the characteristics of the market places (e.g. contractual flexibility, LNG capacity).

After the winter of 2009/2010, prices during Q2 2010 showed some unusual patterns, as they reached highs of as much as €19.2/MWh. On average, the prices were higher than in Q1 2010, which was not anticipated by the market. The reasons behind this move were:

Table 6.2 Gas futures prices (summer 2011 and winter 2011/2012)



Source: SG Commodity Research – Capgemini analysis, EEMO12

- Production issues on the giant North Sea field Ormen Lange and on the Norwegian system (Kollsnes plant);
- Larger than expected demand, due to the injection into depleted stocks and competitive gas power generation in the UK and the continent. The interconnector between the UK and the continent reached a record high in May 2010 with almost steady flows towards Belgium.

Since the summer of 2009, gas costs for power generation in the UK and the continent were lower than or equivalent to coal costs, which helped to sustain gas demand whereas coal demand for power generation dropped. In the UK, gas demand for power generation increased year-on-year of more than 10% thanks to the low prices, whereas coal-fired power generation fell by 30% in Q4 2009 affected by higher generation costs.

On the forward market, the all year long bearish European gas prices did not follow the oil prices and disconnected from European gas long-term contracts levels. As a consequence and thanks to higher coal prices denominated in euros, power generation from coal and gas competed

The yearly contract in the gas wholesale market is referred to as a "Gas Year contract", with delivery starting on October 1 and ending the following September 30. The Gas Year 2010 started on October 2010 and will end in September 2011, thus including Winter 2010/2011 and Summer 2011 contracts.

The Gas Year 2010 decreased its price during 2009, moving from €22/MWh in January 2009 to €17/MWh in December 2009 (see Table 6.2). The contract did not follow the expected gas long-term contracts value, calculated on the term prices of oil, which were assessed between €23 and 26/MWh at the end of 2009 for delivery in 2010 and kept increasing in H2 2009 and in H1 2010. The fall of the euro against the US dollar in conjunction with the strong oil price denominated in US dollar pulled gas long-term contracts prices higher. Although this de-correlation was well accepted by the market for shorter-term maturities products such as Summer 2010 thanks to the high level of stocks and LNG oversupply, for longer-term maturities the indexation was deemed to stay at the right signal, as re-affirmed by GECF. But the development of the spot LNG might alter over a longer period the link between gas and oil, by taking market share in a price war. The question remains: how long will this situation continue and will it happen from time to time or will there be a fundamental change?

The spread between the seasons decreased to a record low,as the market, with its short memory, took into account the realized spread between the Winter 2009/2010 and the Summer 2010 products. The forward spread between the Winter 2010/2011 and the Summer 2011 products moved within the €1 to 3/MWh range. As a consequence, storage auctions, such as the ones held by the UK operator of Rough storage, saw their prices decrease. Fundamentally, LNG arbitrage may impact the usual seasonal pattern on European wholesale markets.

From their highs of November 2008 to their lows of July 2009 at €17.5/MWh, European gas long-term contracts were bullish thanks to rising oil prices and a weakening euro and increased their premium to gas wholesale market prices

The prices of European gas long-term contracts usually show a three to nine months delay compared to oil prices. They settled on an average of €21.6/MWh in 2009, which was a 30% decrease compared to 2008. They dropped in H1 2009 to €17.5/MWh, and have risen steadily since then towards €20/MWh.

Although the European gas long-term contracts during the winter of 2008/2009 partly de-correlated from gas wholesale prices, the importers were able to manage this change within their contractual flexibility. Nevertheless, the de-correlation during the winter of 2009/2010 was much more pronounced in price level and duration. The European holders of gas long-term contracts (E.ON, GDF SUEZ, Eni) managed to re-negotiate with gas producers (Gazprom, GasTerra, Statoil, Sonatrach) some clauses in order to manage the gas slump. Both parties gained flexibilities on a temporary basis (three years): for volumes and prices, and for procurement location, ability to trade in Europe and storage rights.

Thanks to over capacity, LNG gained market share in 2009 and early 2010 and changed the price pattern that are usually encountered in the gas markets

A significant amount of new LNG facilities were brought online all over the world, for both liquefaction and regasification as part of completion of investments that were decided years earlier. In Europe, Fos Cavaou (France), Dragon LNG and South Hook LNG (UK), and Rovigo (Italy) were the main commissioned regasification units.

As opposed to 2008, where LNG trade came to a halt, 2009 saw a 5.6% growth in the volume of LNG traded in the world. Europe gained LNG market share (spot and long-term contracts) from 22 to 26%, in particular due to a lower demand in Asia which attracted less spot LNG. Spot LNG trade towards Europe doubled at the expense of Asia which decreased by 25%.

The exporters spot LNG market share also changed compared to 2008, with the Middle East and Africa losing share, but maintaining their leadership at 50%. Australia/Malaysia and Trinidad & Tobago entered the market.

The development of LNG facilities coincided with a worldwide gas demand drop and the glut of LNG volumes changed price patterns: the prices in the three zones (US, Europe and Asia) converged during certain periods. Nevertheless, the question remains whether this equilibrium is cyclical – LNG is providing a temporary connection – or could be representative of a future unified worldwide gas market place where LNG arbitrages the three zones.

The LNG market also gained transparency as more brokers began to offer services in this market and news agencies started reporting on prices.

New trading places in Germany and Austria gained momentum which supported the development of wholesale markets in continental Europe

While NBP still dwarfed European continental markets in terms of traded volume with approximately 25 to 40 TWh traded on a daily basis, some new continental markets (Virtual Trading Points) showed a significant increase of volumes:

- NCG, the South & North East zone of Germany, after some extension in 2009, reached 3 TWh/day;
- Gaspool, the North West zone of Germany, saw its volume increase to 2 TWh/day in Q4 2009.

They competed with the Dutch market (around 3 TWh/day traded), which benefited from a surge of volume in Germany, whereas the Zeebrugge market fell below 2 TWh/day. Volumes traded in Germany exceeded the volumes traded in the Netherlands (see Table 6.3).

Traded volumes on the French (PEG) and Italian (PSV) markets also benefited from this momentum and their volumes increased year-on-year to reach around 1 TWh/day. Nevertheless, the PSV market took only 25% of the volume auctioned

Key issues in Sweden

The electricity consumption declined by 3.9% and was driven by the recession and the reduced demand from the electricity-intensive industry, which also strongly impacted the price levels. The electricity production declined as well and can be explained by the extensive modernization work of the nuclear power plants.

In February 2009, the Swedish government presented a new energy policy based on the EU's climate and energy directive. The main goals of the policy are to have 50% of renewable energy; 10% of renewable energy in the transportation sector; 20% energy efficiency improvement and 40% reduction of GHGs emissions by 2020.
The Swedish energy sector plans to invest €30 billion between 2009 and 2018. Half of the investments should go for new electricity generation capacity, primarily wind power, and the other half in distribution, district heating and gas.

In June 2010, the Swedish government decided that nuclear power should be a component of the energy mix and, therefore, removed the old law prohibiting new nuclear reactors from being built.

The number of electricity supplier switches increased in 2009 compared to 2008. For households it was the highest measurements since 2004[a]. The increase could be explained by:

- The public information campaign led by Swedish consumers agency and the energy market inspection to persuade customers to switch;
- The high prices at the end of 2009 which pushed many households to switch to cheaper alternatives;
- Aggressive telemarketing campaigns from retailers.

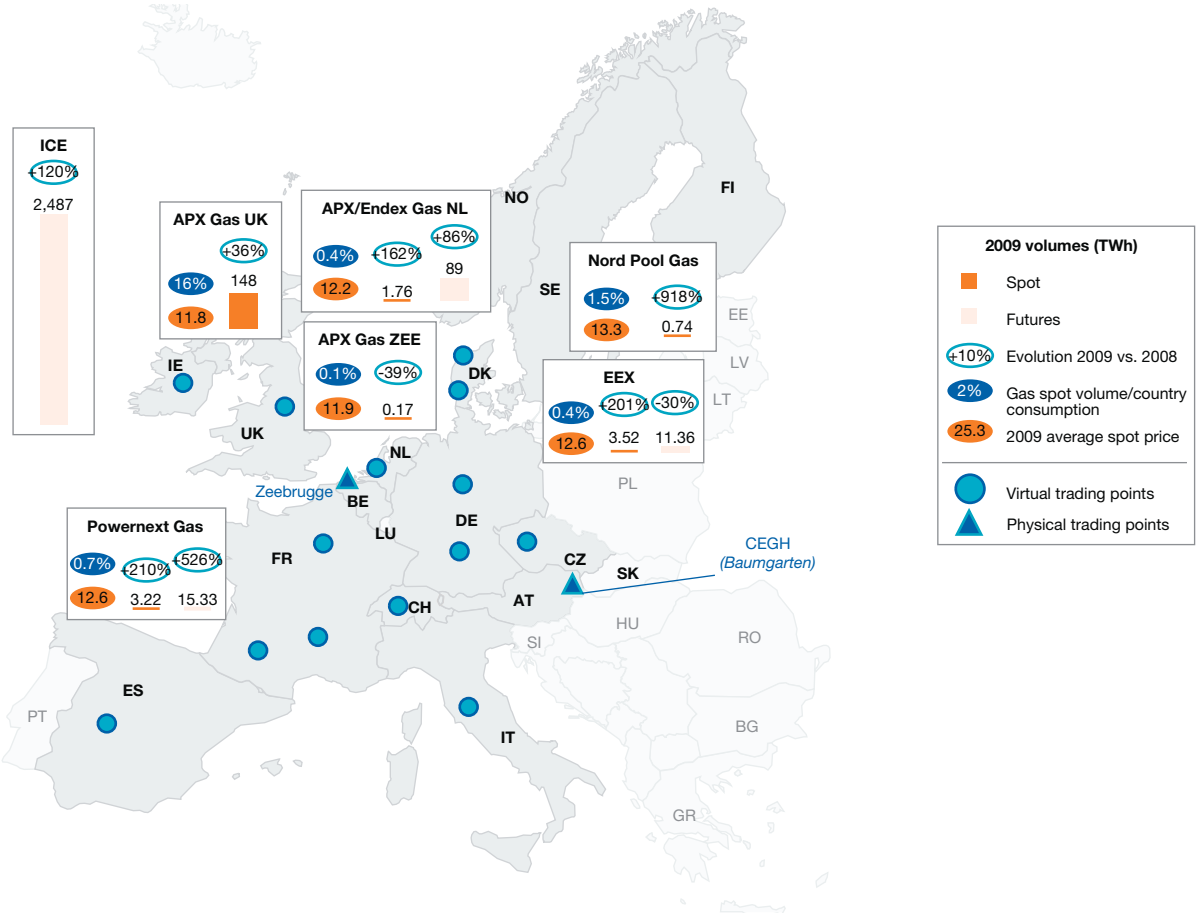
Additionally, **in April 2009, EMIX,** the electricity industry information exchange went live and in July 2009 monthly meter readings were introduced for all household customers.

There is a strong political ambition to further develop the electricity and gas retail markets. High on the agenda and under investigation are:

- **The establishment of a common Nordic end customer market by 2015;**
- **How to leverage smart meters and smart grids** to facilitate customer activity and create incentives to improve energy efficiency;
- **Harmonization of the natural gas law and electricity regulation.**

a) Statistiska centralbyrån, www.scb.se

Table 6.3 Map of gas trading (2009)



Source: Gas Exchanges web sites, SG Commodity Research – Capgemini analysis, EEMO12

by Eni, while carrying out regulatory requirements.

The market players developed confidence in the spot price signal of these various markets and learnt about each physical situation. For example, Gaspool is supposed to be cheaper than NCG, thanks to its higher density of storage facility. Moreover, NCG is more influenced by TTF and the North Sea gas production area, whereas Gaspool is closer to CEGH, from where a large amount of Russian gas lands in Baumgarten, although there are some congestion issues in the summer. PEG seems to be more linked to NCG than to TTF as experienced from late October to early November 2009.

The Austrian (CEGH) hub market launched an exchange in December 2009 in collaboration with the stock exchange of Vienna. Spot products are offered and term products are planned before the end of 2010. The Austrian hub has about 100 members.

In Italy, May 2010 saw the set-up of the first gas trading place organized by GME[39], paving the way for a future gas exchange. This first trading place was defined by regulations and is linked to quotas that importers of gas have to sell to the market.

Although gas is usually traded through OTC, the volumes on the spot exchange increased in line with the overall volume. This increase was due to the merging of gas zones, offering of capacities on pipelines, or LNG terminals and simplified operations.

The extent and pace at which market places developed in terms of volume, products and exchanges, could play a significant role in the current debate of oil-indexed long-term contracts.

39 Gestore Mercati Energitici, an energy exchange in Italy

Gas Retail Markets

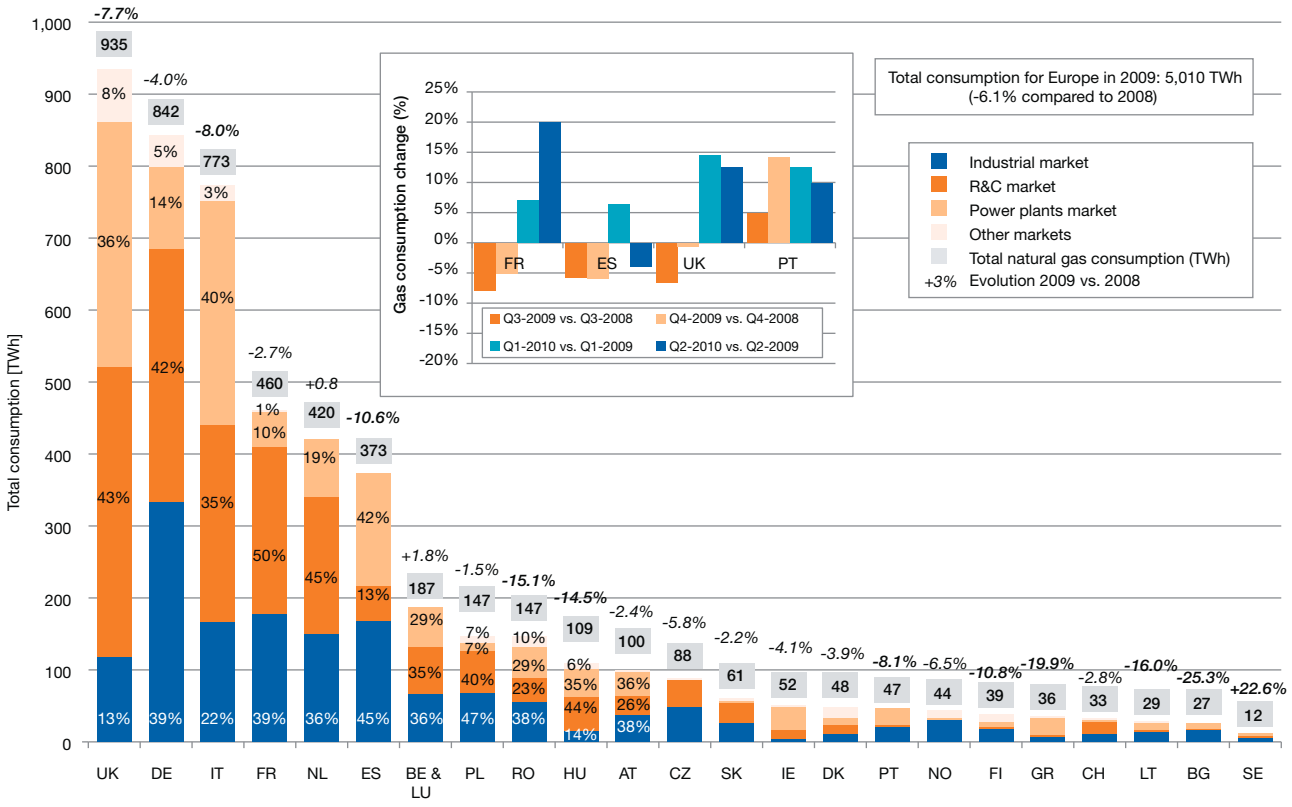
European gas consumption decreased dramatically in 2009 as a consequence of the economic downturn with a 11% drop in industrial clients demand, but there are signs of recovery

In 2009, Europe consumed 5,010 TWh of natural gas. That represents a 6.1% decrease over the 2008 figures and is the direct result of the economic downturn (see Table 7.1). According to Eurostat, the GDP in the EU-27 zone fell by 4.2% during the same period.

The European countries with the greatest gas consumption are the UK, Germany, Italy, France, the Netherlands and Spain. Their cumulated 2009 gas consumption (3,804 TWh) represents 76% of the total European demand. In 2009, most of the top six countries registered a negative trend except the Netherlands (+0.8%), which regained fifth position from Spain. Some countries like the UK, Italy and Spain recorded sharp drops, in the range of 8 to 10%. France and Germany, instead, limited the decrease of between 3 to 4%. The differentiated consumption pattern is partly explained by the various trends of the GDP, the climate conditions, and the new CCGT plants installation and use.

With a 37% share, the Residential and Commercial (R&C) segment has the greatest gas consumption, followed by industry (32%) and the thermoelectric clients (27%). As expected, the share of the industrial market consumption is lower in 2009 than in 2008, when it was 33%,

Table 7.1 Total gas consumption and size of I&C and residential gas markets (2009)



Source: BP statistical review of world energy 2010, Eurogas, SG Smart Energy Index – Capgemini analysis, EEMO12

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Key issues in Belgium

Smart metering/smart grid are on the forefront
Distributors, suppliers and regulators are continuing their evaluations of smart metering/ smart grid projects in the different regions. However, **the regional organizations have different approaches and calendars. The first mass roll out is planned for 2014 in the Flanders.** The introduction of a new clearing house, that could centralize and process all the smart meters data, has been postponed for several years in order to formalize and obtain the agreement of all stakeholders.

Mergers and acquisitions continue
After the merger of Suez with Gaz de France, the acquisition of SPE by EDF makes **Paris even more involved in the Belgian Utilities sector.** The capacity swap between Electrabel (two plants in Belgium) and E.ON (four plants in Germany), is another initiative in the context of the European Utilities landscape transformation. At the same time, GDF SUEZ decided in March 2010 to step out of the capital of Elia and Fluxys. Publigas (municipal holding company) now owns almost 90% of Fluxys but could decide to sell part of its shares to a private investor.

Also, Elia took over one of the German TSOs, 50Hertz Transmission (a former part of Vattenfall Europe), with a 40% share investment from IFM, an Australian infrastructure investor. This transaction represents **a major step towards the construction of the European electricity grid.**

At the DNOs level, **two publicly owned companies:** PBE (DNO for the Brabant region) and Infrax (DNO for a part of the Flanders regrouping Interelectra, Iveg en WVEM) **decided to merge their operations.** Both are pure distribution companies. **The merger will allow a better coordination of large investments e.g. for connecting renewables and for smart metering.**

Belpex, the power exchange for Belgium, has become a part of APX-ENDEX, which now covers the UK and Benelux territory for gas and electricity markets.

Production tax
Meanwhile, **the issue of a tax on the nuclear production** (€250 million per year) **is not settled.** Although it has been paid in 2009, **it remains heavily contested** especially by Electrabel and SPE.

Tables 7.2 I&C gas prices - VAT excluded (H2 2009 and % change with H2 2008)

Source: Eurostat – Capgemini analysis, EEMO12

because the industry consumption was hit harder than any other segment.

The industrial market actually saw a substantial drop in consumption (-11%), as happened also for the other markets (-39%), but which share of the overall demand is, however, much smaller. Power plant gas consumption slightly decreased (-1%) whereas the R&C markets registered a little increase (+1%). In fact, the consumption of the residential market is driven more by meteorological conditions than by economic conditions and gas-fired power plants tend to be cheaper to run than the other fossil fuels technologies that also emit more CO_2.

Demand from gas-fired power plants was lower when compared with that of 2008, in sharp contrast with the positive trend registered since 2006, which was sustained by the massive installation of new CCGT plants in Europe. There are, however, countries like France, Germany and Spain where new gas-fired generation units that were put online triggered a greater demand for gas.

The countries with the highest share of thermoelectric consumption are Greece (72%), Ireland (64%) and Latvia (60%). They all recorded a slight decrease of gas consumption in this segment. Among the top six countries, the greatest thermoelectric consumptions are reported in Spain (42%), Italy (40%) and the UK (37%). In 2008, Spain was third but climbed to be first thanks to the recent gas-fired capacity developments.

Spain, with 45%, is leading the league of the greatest share of industrial consumption, among the top six countries. This explains why the Spanish gas market was particularly hit by the economic downturn, which impacted especially the productive activities. Other countries with a high share are France, Germany (both 39%) and Poland (47%). A combination of the increase of gas-fired plants demand and a colder winter than normal explain why these countries, even if with a high share of industry demand, were hit less by the financial crisis.

The industrial clients are becoming more and more energy efficient and, hence, consume less gas even in a period of economic growth. If the difficult access to credit could limit the investments in efficiency technologies, efficiency remains a way to lower energy costs and, hence, should contribute to limit gas consumption.

France (50%), the Netherlands (45%) and the UK (43%) are countries with a high share of R&C consumption. This kind of consumption is also high in Poland. All these nations registered a decrease in gas consumption for heating purposes except for the Netherlands. The decrement is driven by the winter conditions and only in some cases, by the choice of consumers that renounce to some heating in the context of the economic crisis.

The first half of 2010 has shown signs of recovery. According to Eurogas, gas consumption in Europe increased by 12% in H1 2010 compared to H1 2009. French gas consumption went up by almost 20%, when comparing Q2 2010 to Q2 2009. Also the UK and Portugal have increased their demand from 10 to 15%, both in Q1 and Q2 2010, although less in Q2. Of the analyzed countries, only Spain is still struggling to get the gas consumption back to normal.

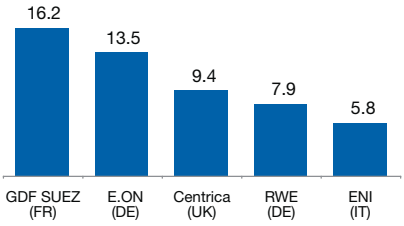
Gas prices in Europe dropped sharply, because of the oil price drop and partially because of bearish gas trading markets

After the spikes of the summer of 2007, the oil price went down, at the beginning of 2009, to levels in the range of US$40/barrel. Since then, the prices started growing and settled at what is considered to be the industry fair and long-term value, i.e. some US$75/barrel.

The 2008 and 2009 drops produced a beneficial effect on gas prices that are linked to that of oil, with a lag time effect. Long-term supply contracts are the commercial core of the gas supply business. They contain formulae whereby the price of gas is determined on the basis of the average prices of oil with a three to nine months delay.

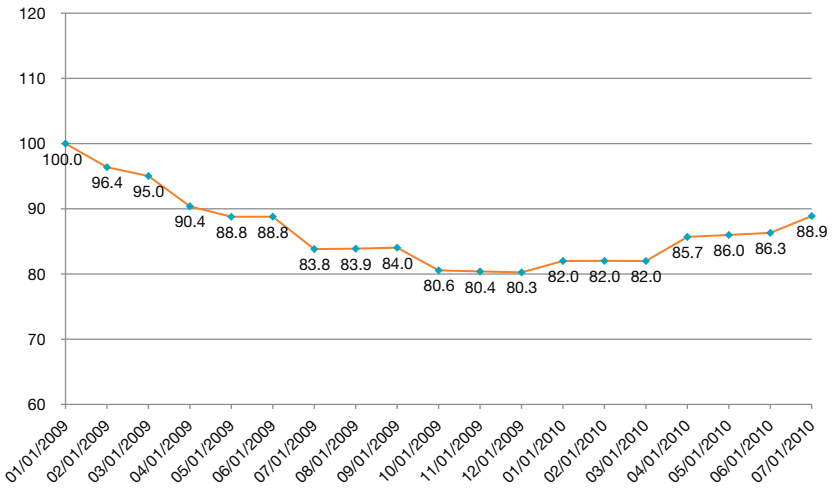
In general, 2009 gas prices in all European countries and for all consuming segments fell (see Tables 7.2), in some cases down by 52%. The customers that benefited more from the prices drop are the Medium

Top 5 - European gas retailers in terms of million customers (2009)



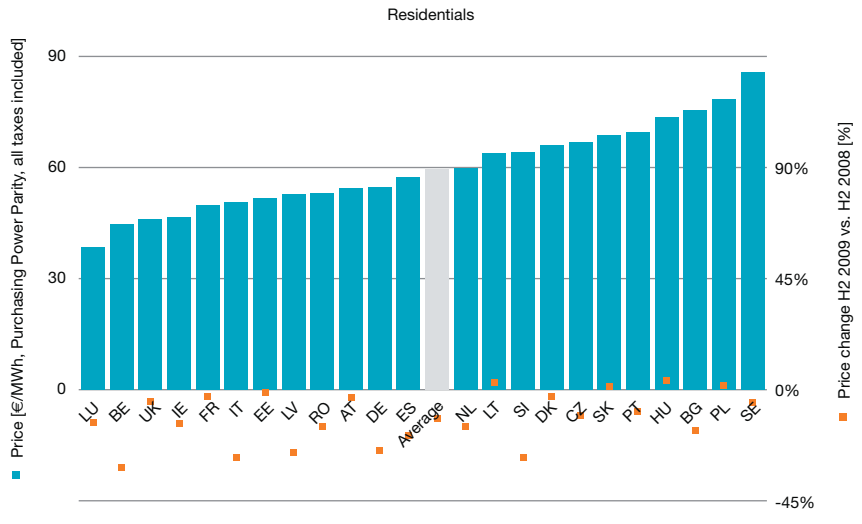
Source: Companies' web sites and annual reports – Capgemini analysis, EEMO12

Table 7.3 Households Energy Price Index (HEPI) in the EU-15 capitals - gas without taxes (2009 and H1 2010)



Source: E-Control, VaasaETT – Capgemini analysis, EEMO12

Table 7.4 Residential gas prices - all taxes included and with PPP (H2 2009 and % change with H2 2008)



Source: Eurostat – Capgemini analysis, EEMO12

to Large Industries, with an average decrease of 27% for the EU-27, when comparing H2 2009 with H2 2008. On average in Europe, prices for the Small to Medium Industries went down by 23%; those for the Very Small Industries by 14%; and, finally, the prices for the Residential customers fell "only" by 11%.

The price drop was more pronounced for the final consumers with the greater consumption because prices for the large customers contain a component of the prices realized on the secondary trading markets that have been in 2009 consistently lower than the oil linked ones (see the Gas Wholesale Markets chapter). Supply contracts for the small clients are based almost entirely on the oil formulae, with some exceptions, like in France, where CRE, the regulator, announced that a gas spot price component of some 10% has been included in the gas regulated price formulae.

It is in the UK that the Medium to Large Industries enjoyed the major price cut (-52%). Other price drops were also recorded for this segment, in the Czech Republic (-37%), Slovakia (-37%) and Romania (-35%).

Residential consumers have seen price decreases smaller than those of industrial clients. Countries with the greatest drops for Residentials are Belgium (-32%), Italy (-28%) and Slovenia (-28%). After the drop of 2009, residential gas prices have started to increase since the beginning of 2010, as represented by the HEPI index (see Table 7.3).

The scattered trend of price changes is repeated in the pattern of European absolute price levels. Medium to Large Industries energy spending is below average in the UK (€13/MWh) and Romania (€17/MWh), with European average being at €23/MWh. In the UK, more than in any continental European country, gas prices are associated with the outcome of the gas trading sessions that were lower than the oil linked prices. Romanian low prices for the industrial clients might come from the high share of national production and from the sourcing negotiations with Russia.

Prices for Medium to Large Industries are above the European average in Italy (€24/MWh), France (€25/MWh) and Germany (€27/MWh).

Gas prices for Very Small Industries are reported below the European average in Romania (€22/MWh), the UK (€37/MWh) and Germany (€41/MWh) whereas they are above it in France (€43/MWh), Spain (€43/MWh) and Italy (€53/MWh). The panel averages at €43/MWh.

In the Residential segment, favourable prices can be found in the major European gas countries (see Table 7.4). Residential consumers of the UK (€46/MWh), France (€50/MWh) and Italy (€51/MWh) enjoy below average price, which is €59/MWh. Only the Dutch clients (€60/MWh) are slightly above it, followed by the countries of Central Europe.

Table 7.5 Status of gas price regimes (as of July 2010)

Country	Existence of regulated tariffs (date of price control removal when available)
AT	N *(2002)*
BE	N *(2003)*
BG	Y
CZ	N *(2007)*
DE	N
DK	Y
EE	Y
ES	N *(2009)*
FI	/
FR	Y
GR	Y
HU	Y
IE	Y
IT	Y
LT	Y
LU	N *(2007)*
LV	Y
NL	Y
NO	/
PL	Y
PT	Y
RO	Y
SE	N *(2007)*
SI	N *(2007)*
SK	Y
UK	N

Source: European Commission, Platts – Capgemini analysis, EEMO12

The deviations of gas prices are meaningful within Europe. The minimum price for Medium to Large Industries is €22/MWh (in Romania); the maximum is €77/MWh (in Denmark); and they are 47% below the average and 81% above it, respectively. The minimum price for Residentials is €38/MWh (in Luxembourg); the maximum is €86/MWh (in Sweden); and they are 36% below the average and 44% above it, respectively.

This fragmented price image shows that gas prices in Europe are not converging. Price convergence is not happening because of the different pricing strategies of the European gas suppliers that might transfer margins from the wholesale to the retail businesses. Also, tariffs for the use of gas infrastructures, that are included in the final price, are not homogeneous.

In addition, the wholesale price of all European countries should be similar, for the final price to converge. But consolidation of the wholesale markets is ongoing and, most of all, wholesale prices are determined mainly with oil formulae that are different for each gas supplier.

Price regulation might represent a further obstacle to the formation of a single European gas price. Still, price control measures might be needed to protect the weakest part of the market, i.e. the residential clients, especially within the context of a non competitive market.

Examples of regulated tariffs can be found in the major European gas countries like France, Italy and the Netherlands. Spain abolished them in 2009 whereas Germany and the UK have no form of price regulation (see Table 7.5).

Gas retail markets are still very concentrated, with the former incumbents dominating both domestic and non domestic markets

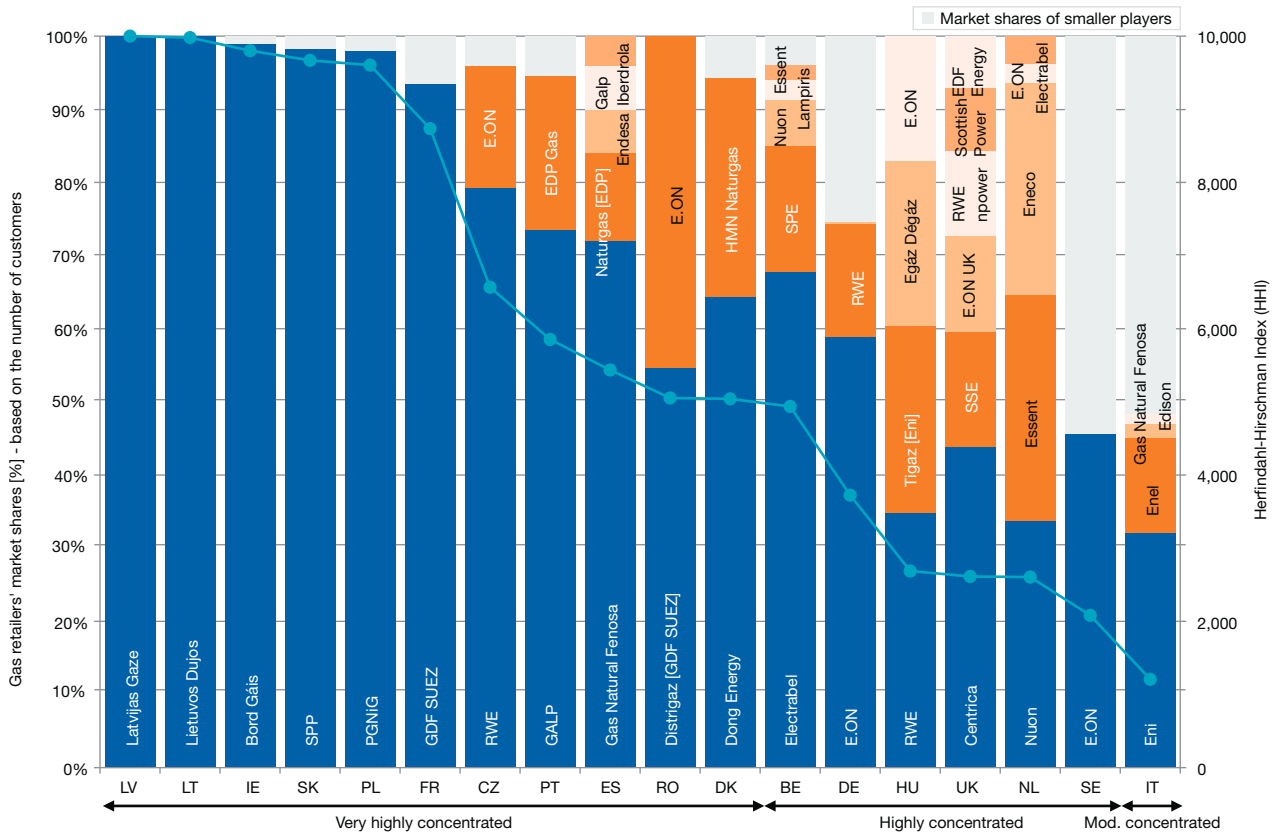
Italy, with a Herfindahl Hirschman Index (HHI) below 1,800, is the only country with a moderately concentrated gas retail market, with Eni enjoying the greatest market share (see Table 7.6). The markets in the Netherlands, the UK and Germany are highly concentrated, with Nuon (a Vattenfall company), Centrica and E.ON as the dominant suppliers, respectively. Gas Natural Fenosa controls 72% of the Spanish market and GDF SUEZ controls 93% of the French market.

This concentration was calculated on the basis of the number of clients. When using the volumes sold, the competitive picture changes. GasTerra in the Netherlands and Distrigas in Belgium become the dominant players, and the Italian market becomes concentrated again.

Interestingly, the major former incumbents also dominate some non domestic markets. GDF SUEZ, through Distrigaz (not to be confused with the Belgian company Distrigas, acquired by Eni), controls 55% of the Romanian market with the other 45% being supplied by the German E.ON. E.ON dominates the Swedish market and the other German supplier, RWE, which ranks second in its domestic market, is the first supplier in the Czech Republic and in Hungary.

Clearly, the incumbents of France and Germany could leverage their domestic market dominant positions to make important acquisitions abroad. The challenge for them is to effectively integrate the operating models of the acquired companies and hence actuate all synergies and be competitive in the supply market. As the 2009/2010 Capgemini Retail benchmark study[40] shows, for generating economies of scale, a critical

Table 7.6 Gas retail market concentration (2009)



Note: HHI is a commonly accepted measure of market concentration. It is calculated by squaring the market share of each firm competing in a market, and then summing the resulting numbers.
Source: Companies' web site and annual reports, National Regulators – Capgemini estimation, EEMO12

40 European multi-client retail mass market benchmark, Key findings from 2009/2010 edition – November 2010

Retail energy providers still have to face low net margin levels. Therefore, Cost to Serve and Cost to Acquire control remains key to ensuring profitability

The average Cost to Serve in the Capgemini 2009/2010 European Retail benchmarking study[a] stands at €36.7 per contract per year. Cost to Serve has increased compared to last year's study. This is partly due to **the increasing weight of bad debts (between +10% and +15%)** due to the economic context.

The main parts of the Cost to Serve are still workforce costs which represent on average 50% of the total and IT costs, generally induced by the liberalization process and which are, therefore, more sensitive in countries where liberalization is on the way.

The companies' panel, larger and including very big players, has allowed to draw new conclusions and to refine the thresholds:

- It is now possible, this year, to show economies of scale. A threshold seems to appear at around one million customers. **Participants with less than one million customers show an average Cost to Serve of €41 per contract per year whereas participants above one million customers show an average Cost to Serve of €31.7 per contract per year;**
- Some countries trends also appear and show **better performance of Italian participants with a median of €25.2 per contract per year, partly due to automatic meter reading, and partly due to the use of deposits which limits bad debts.**

Cost to Acquire is very dispersed, as it depends on the acquisition strategy. It stands between €34 and 202 per contract with an average of €90.4 per contract.

As in last year's study, **most of the best performers in terms of Cost to Serve are also the best performers in terms of Cost to Acquire.** This is partly due to the fact that in both cases, channel mix is a key cost driver, and **companies which use a proper mix efficiently generally apply it both to service and acquisition.**

a) European multi-client retail mass market benchmark, Key findings from 2009/2010 edition – November 2010

mass of one million residential customers seems to be required. It is important that all clients, captive or not, are administered with the same business systems.

Table 7.6 gives the picture of a generally highly concentrated market but this should not mislead about the commercial activity dynamism and the change in the retail business model.

In Europe, many retail companies started offering side services, like boilers maintenance or energy data management, as a means to retain their customer base. Some of them started implementing customer intelligence systems to evaluate the profile of their client base and be more effective in their marketing activity.

But the majority of the retail companies have been focusing on cost cutting and cash management. The level of bad debts have increased dramatically in 2009, impacting the Cost to Serve (CtS) that, according to the Capgemini retail benchmark of 2010, went up from €26.3 per client in 2008 to €36.7 per client in 2009. Accordingly, Utilities are now starting to adopt cash management tools, adapting the models from other more mature industries, like the banking and telecom sectors, to the specific needs of the energy business.

Infrastructures and Regulated Activities

Electricity Transmission

In 2009, the European TSOs have continued to work towards greater harmonization and integration of electricity grids

There has been a long standing drive to harmonize standards across the European TSOs. However, the focus on this area has increased under the 3rd Electricity Market Directive. This has led to a number of developments since last year's edition of our Observatory, specifically:

- New TSOs are emerging both through Vertically Integrated Utilities (VIU) divesting their TSOs and through cross-border mergers to create transnational TSOs;
- There is evidence of tighter coordination across the TSOs;
- Regional power markets are becoming operational.

New TSOs are emerging

The 3rd Electricity Market Directive has further reduced the synergies of a VIU of owning a TSO. This in turn has accelerated activity in the unbundling of the TSOs (see Table 8.1). For instance in Germany, this has started a wave of setting up separate companies (Transpower, Amprion, 50Hertz Transmission). In Belgium, this has triggered the sale of the remaining shares of GDF SUEZ in Elia.

Table 8.1 Ownership unbundling status of electricity TSOs (as of July 2010)

Ownership Unbundling of Electricity TSOs	
YES	NO
Belgium (2009), Czech Republic (2003), Denmark (2005), Finland (2000), *Germany (2009)*, Ireland (2005), Italy (2003), Spain (2003), Netherlands (2002), Poland (2007), Portugal (2000), Romania (2000), Sweden (1998), United Kingdom (1997)	**Austria, Bulgaria, Estonia, France, Greece, Hungary, Latvia, Lithuania, Luxembourg, Slovakia, Slovenia**

Source: European Commission, Platts – Capgemini analysis, EEMO12

In addition, the greater harmonization of TSOs across Europe is contributing to some international consolidation. Transpower, the transmission part of the E.ON Group, which recently became independent, has been taken over by Tennet, the Dutch TSO, at the end of 2009. And during the spring of 2010, Elia, the Belgian TSO, has taken over 50Hertz Transmission, which was the transmission part of the Vattenfall Group in Germany, and which also recently became independent.

There is evidence of tighter coordination across the TSOs

New organizations have been established to support the harmonization of electricity grids

The new organization of TSOs, ENTSO-E has become fully operational since July 2009 taking over from the previous organizations – ETSO, UCTE, Nordel, ATSOI, BALTSO, and UKTSOA – which have been fully integrated into the new organization. ENTSO-E now has 42 members from 34 countries.

The organization has been given a mission for network and market development by having a much greater influence on decisions than before. It has two main tasks:

- The development of the network codes;
- A European wide Ten Year Network Development Plan (TYNDP) which increases transparency on the investments needed in the electricity grid.

The Agency for the Cooperation of Energy Regulators (ACER) will be established in Ljubljana. It is set to take up its role by the beginning of 2011. ACER will be able to coordinate or take decisions on international rules for which the approval of several regulators would be needed.

The new associations together with the existing network user associations (like

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IFIEC, EFET and Eurelectric) will be able to move forward on the harmonization of the internal EU market.

The development of the network codes on a European level has kicked off with a first (pilot) code concerning the rules for connection of generation units to the electricity grid with a specific focus on the connection of renewable energy (and particularly wind generation).

On a European level, all stakeholders continued to increase efforts to work together in building a common view of the future of the electricity markets in Europe. A group consisting of delegates from the regulators (ERGEG), the traders (EFET), the producers (Eurelectric), the transmission operators (ENTSO-E), the power exchanges (Europex), and the European Commission developed a target model for the market. The day-ahead and intraday market models are being further detailed in order to achieve harmonization of markets across Europe and to facilitate the access to the markets for smaller traders, suppliers and even large industrial consumers.

Desertec and Transgreen: two complementary projects following the same objective

Launched in 2009, **Desertec** is a program that aims to design the technical, economical, political, social and environmental framework for the **large scaled generation of renewable energy in Middle Eastern and North Africa (MENA) deserts** to supply both the region and European countries. **The objective is to produce 15% of Europe's electricity demand by 2050.**

This initiative is based mostly on concentrating solar power (see Box on CSP), and on wind power along the coasts of Morocco. The advantage is that this project could also provide energy and desalinated sea water to the MENA region.

In parallel, the **Transgreen** project was created in July 2010. This complementary project is an **"industrial initiative for Mediterranean electric grids",** that aims at designing a grid framework to transport electricity from MENA to Europe via underwater high voltage direct current (HVDC) lines. **The goal is to allow 5 GW of grid connections between the South and the North of the Mediterranean basin.**

Both initiatives are private, and surprisingly, very few companies from the MENA region have decided to take part in these projects: Desertec is a German initiative, and most companies involved are indeed German (only two participants are from the MENA region), whereas Transgreen is initially a French project, led by French companies, EDF and RTE together with the Saudi company, Taqa, as the only representative from the MENA region at the moment.

Still, for such initiatives to prevail, cooperation is necessary between countries which have the required solar resource; countries which need clean energy; and countries and companies which provide the technology. Therefore, the involvement of MENA companies or organizations will in time be necessary for the success of both projects.

Increased cooperation aims to develop the electricity grid in a coherent and targeted manner

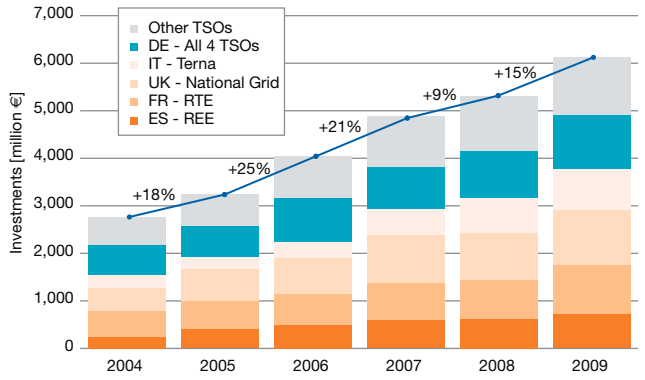
The Ten Year Network Development Plan (TYNDP) is, even if it is a non binding plan, a major step forward for the European TSOs showing that network development needs to be addressed on a European wide scale and not by individual national development plans. The increase of wind generation and the expected rise of solar power change fundamentally the network operation on an international scale.

The TYNDP focuses a lot on the impact of the increasing installation of renewable energy sources on the transmission grid. It is estimated that 20,000 km of new lines needs to be built in the coming ten years for connecting and transporting renewable energy. The other main drivers for network development are the security of supply (avoiding a black-out) which requires 26,000 km of new lines and the facilitation of cross-border exchanges on the European electricity market which requires more than 28,000 km of new lines. There is, of course, a certain overlap between the drivers.

Moreover, in May 2010, the EU launched a new project 'Twenties', a three year project with 26 partners for research and development in order to facilitate the further introduction of wind power into the electrical system.

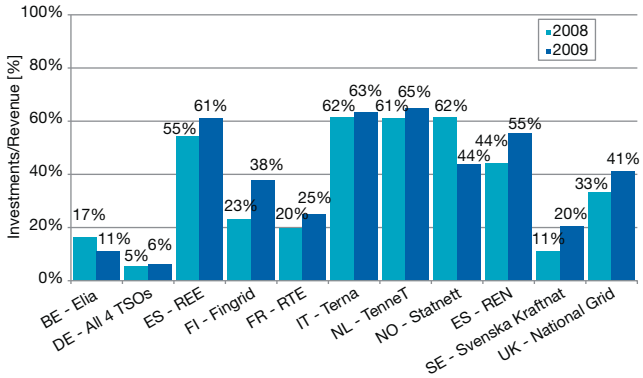
TSOs are looking to expand the network beyond the European boundaries, reaching out towards the North of Africa, where trials are being run to expand the part

Table 8.2 Investments from selected electricity TSOs in their national grid (2004 to 2009)



Note: 2009 data for German TSOs is based on planned investments and may vary
Source: TSOs Annual Reports, National Regulators – Capgemini analysis, EEMO12

Table 8.3 Electricity TSOs investments in the national grid as a % of their revenues (2008 and 2009)



Note: 2009 data for German TSOs is based on planned investments and may vary
Source: TSOs Annual Reports, National Regulators – Capgemini analysis, EEMO12

of Africa already connected to Europe (northern parts of Morocco, Algeria and Tunisia) and towards Turkey with concrete connection plans (see Box on Desertec and Transgreen).

International Grid Security initiatives are growing and leading to a better coordination between network operations, reducing risk of black-outs

Coreso, a company jointly owned by RTE (France), National Grid (the UK) and Elia (Belgium) has become fully operational in its responsibility for controlling the international flows of electricity, which has added an extra layer on the network security of the European grid above the national control centers.

The TSC initiative (TSO Security Cooperation), is grouping 11 TSOs from six countries (Germany, Austria, Poland, the Czech Republic, the Netherlands and Switzerland), and is also creating a common platform for data exchange and security assessment. The security cooperation aims to improve the overall system security of the European electricity grid. In July 2010, the common platform for TSO security cooperation became operational.

During 2009, no major disturbances were reported which shows the improved cooperation and coordination between the TSOs.

The transparency platform of ENTSO-E (Entso-e.net, formerly known as etsovista) is expected to continue taking a leading role in centralizing European market information in one web-based platform. Next to this, ENTSO-E is also continuing the development of a system giving a real-time view of the European grid. This awareness system will help the TSOs to improve further the security of the system and control the cross-border congestions.

The European electricity market is continuing its integration as regional markets have become or are in the process of becoming operational

Regulators are continuing to play their role in facilitating the development of regional markets as the working groups around the regional initiatives follow the action plans for each region intensively.

TSOs and power exchanges have been working on the system implementation and by the end of 2010 a day-ahead market for the Central West Europe (CWE) area should be fully operational, thereby linking two of the largest markets of France and Germany together. TSOs have already started a new project which aims to link this market with the Nordic market operated by Nord Pool, creating one North West Europe (NWE) region spanning more than 50% of the EU market.

TSOs of Central-East Europe (CEE) continued working on an explicit flow based auction of capacity. This entails having a maximum of cross-border capacity, on all borders in the region, auctioned to the market in line with what

the network can manage as electricity flows over all borders. The first dry runs of the systems have been programed during the summer of 2010.

In the Iberian-French region, progress is being made in the intraday and balancing markets. Also, discussions are continuing between TSOs and power exchanges for linking the Iberian day-ahead market to the NWE market coupling.

The largest inter-regional project seems to be the NWE intraday project, which spans the CWE, Northern Europe (NE) and the UK regions, which would allow the linking together of about 60% of the EU electricity market for close to real-time energy exchanges. This project formally started in 2010 with 13 TSOs participating from Sweden, Norway, Finland, Denmark, the UK, the Netherlands, Belgium, Germany, Luxembourg and France.

Investments into the network have systematically increased over the past years and are expected to continue to rise

Tables 8.2 and 8.3 show that investments are steadily rising year-on-year. The main reasons for this are:

- The electricity consumption continues to rise in Europe which structurally means that the size of the transmission capacity needs to follow this increase;
- The opening of the electricity markets all over Europe is putting increasing needs for cross borders exchanges of electricity;
- The introduction of renewable energy reshapes the flows through the grid requiring additional infrastructure, mostly to allow the wind generation to be dispatched towards the consumers;
- Increasing replacement of old equipment: the high voltage network is aging.

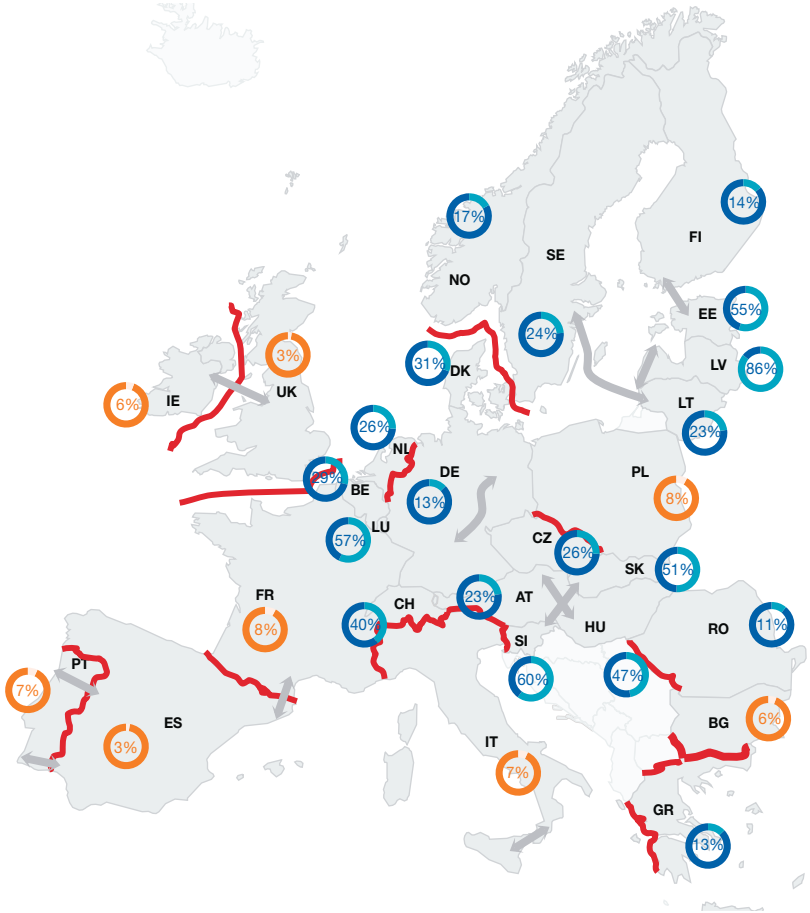
But bottlenecks still exist and not all countries of the EU have already achieved sufficient international connection

The current state of play is that interconnection capacity, mainly between the regions in Europe, is still insufficient to be able to talk about a real EU single market. Table 8.4 shows the main bottlenecks in Europe and the current state of interconnection levels based on published indicative Net Transfer Capacity (NTC) values for the summer of 2010.

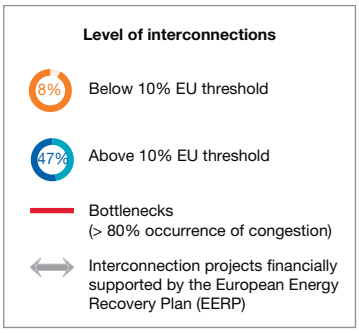
These NTC values represent what TSOs expect to be the minimum energy transmission capacity available to the market for international trading during the summer, with the provision that these capacities are not guaranteed.

The network in the North Sea is continuing to be developed. One example

Table 8.4. Map of interconnections levels, bottlenecks and priority interconnections (2009)



Countries	Projects of interconnections	Expected date	Capacity increase
ES - PT	Aldeadávila - Lagoaça 400kV	2010	>1,000 MW
UK - NL	BritNed HVDC link	2010	>1,000 MW
IT - AT	Prati di Vizze - Steinach	Short term	n.c.
FR-BE	Moulaine - Aubange	2010	300 MW
SL-HU /HR	Cirkovce - Heviz (HU) Zerjavenec(HR)	Short term	n.c.
AT - HU	Tie-line Wien SO - HU Border	2011	n.c.
FI - SE	Fennoscan submarine cable	2011	550 MW
IE - UK	Woodland - Deeside	2011	500 MW
ES - PT	Guillena/Puebla de Guzman - Tavira/Portimão	2011	n.c.
DE – PL	Vierraden - Krajnik	2012	n.c.
IE - UK	Moyhill - Turleenan	2012	> 550 MW
FR - IT	Cornier - Piossasco	2012	600 MW
DK - DE	Kassö - Ensted	Mid term	500 MW



Source: ENTSO-E, European Commission – Capgemini analysis, EEMO12

Key issues in Spain

Within the context of the economic recession that led to a strong energy demand downturn (-5.5% in electricity consumption and -10.6% in gas consumption in 2009), **the Spanish energy market has been questioned during 2009 and the beginning of 2010 by politicians and the industry. Discussions were around the energy mix strategy and market fundamentals efficiency.**

First, the government ruled that the Garoña's nuclear plant will have to close in 2013, in line with its program to **avoid nuclear energy sources in the future.**

Second, **subsidies to national coal production were maintained** under the framework of the EU-27 directive that enables the incentive of power generation facilities consuming indigenous primary sources through a preferred dispatching in the spot market, up to 15% of the total demand.

Finally, but most relevant, **the new regulation regarding renewable energy incentives** – to be launched before the end of 2010 – **plans to cut feed in-tariffs** by 35% for wind and up to 45% **for solar photovoltaic (PV).** These subsidies accounted for €6 billion in 2009 (around 50% of this was for PV installations) due to the huge increase in installed capacity during the last few years (32,416 MW of installed capacity in 2009 benefiting from the RES incentive scheme, amongst which 22,595 MW of wind and solar).

Demand reduction and RES increase have dramatically reduced the thermal gap available for coal and CCGT producers, resulting in an excessive overcapacity in the system (especially affecting CCGT players who need to manage take or pay clauses with gas suppliers). Although prices reached all time lows in the power spot market, **the tariff deficit still accounted for €4.6 billion,** with no additional governmental plans to further reduce it.

Gas Natural continued its divestment process after its merger with Unión Fenosa. After having sold a part of its gas distribution network in Madrid to Morgan Stanley and the related customers to Galp, Gas Natural has recently sold 400 MW CCGT (plus an option for another 400 MW) to Alpiq. Other new entrants are expecting further opportunities.

is that during the summer of 2010, the 260 km long BritNed cable in the North Sea was finalized.

In June 2010, a new interconnection between France and Belgium was put online, which increased capacity for the market between these countries and further decreased price divergence on the wholesale market. Another interconnector is scheduled to come into operation before the end of 2010 that will increase the capacity between Spain and Portugal to an average of 2,000 MW.

The EU decided in a second batch of investments to support the construction of interconnections between Sweden, Finland and the Baltic States, between Wales and Ireland, between Spain and Portugal, between Spain and France, and between mainland Italy and Sicily.

European TSOs need to face new challenges arising from smart grids and intermittent generation while retaining a focus on business as usual

EWIS, integrating wind generation

The European Wind Integration Study (EWIS) aims to propose common solutions for the integration of wind energy on a large scale. Detailed results have been delivered for the 2015 time horizon. They show the additional grid investments that are necessary to ensure the connection of all wind initiatives in order to realize the 3x20 objectives of the European Commission. These investments need sufficient priority approvals from relevant authorities in line with the wind energy installation progress. Next to this, TSOs will further improve a coordinated management of the European grid and also improve the efficient use of the existing infrastructure.

The study is an example of how the TSOs have successfully worked together with the European Commission in delivering concrete proposals for the development of the electricity grid and the market.

Smart grids and smart metering are a main topic for regulators and TSOs

TSOs play an active role in the smart grids initiatives. They mainly focus on studies of demand response, balancing needs which might change due to the installation of smart meters, and organizing fair third-party access.

ERGEG has issued draft guidelines for good regulatory practices in smart metering, saying that it is essential that smart meters provides services in an obvious and easy way that benefits the customer. According to ERGEG the minimal services that should be provided by smart meters are:

- Information based on actual and not estimated consumption, which should be communicated on a monthly basis enabling more accurate bills. In addition, offers should reflect actual consumption patterns;
- Access to information on consumption data as per customer request;
- Accurate information for the consumer and all other players involved when switching supplier or move-in/out;
- Activation and de-activation of supply in line with other (social) regulations;
- Possibility for power capacity reduction/ increase;
- Single meter for the customers both generating and consuming electricity.

Investigating the future of the network

ENTSO-E is also working on the long-term needs for the electricity grid in a "Supergrid 2050" project. It is estimated that the total network will have to increase in size by 30% in order to be able to cope with the expected increase in renewable energy sources. Basically the network was built to route large concentrated volumes of electricity towards the consumers, relatively homogenously spread on the territory. With renewables, generation is becoming, on the one hand, more dispersed over the territory, but on the other hand, concentrated in areas where there is a lot of wind (like the offshore wind farms) or lots of sunshine.

Such a significant need for new infrastructure also calls for significant investments. It is a question today of how TSOs are going to attract investors to be able to finance this entire new infrastructure.

Smart metering implementation across Europe is slow

The 3rd Energy Package adopted in April 2009, requires **all Member States to adopt a timetable for rolling out electric smart meters,** with a recommendation that **at least 80% of customers (versus 10% to date) should be equipped with smart meters by 2020,** pending a cost assessment study.

So far, only Italy and Sweden have fully implemented smart meters. Italy's experience presents its first feedback:

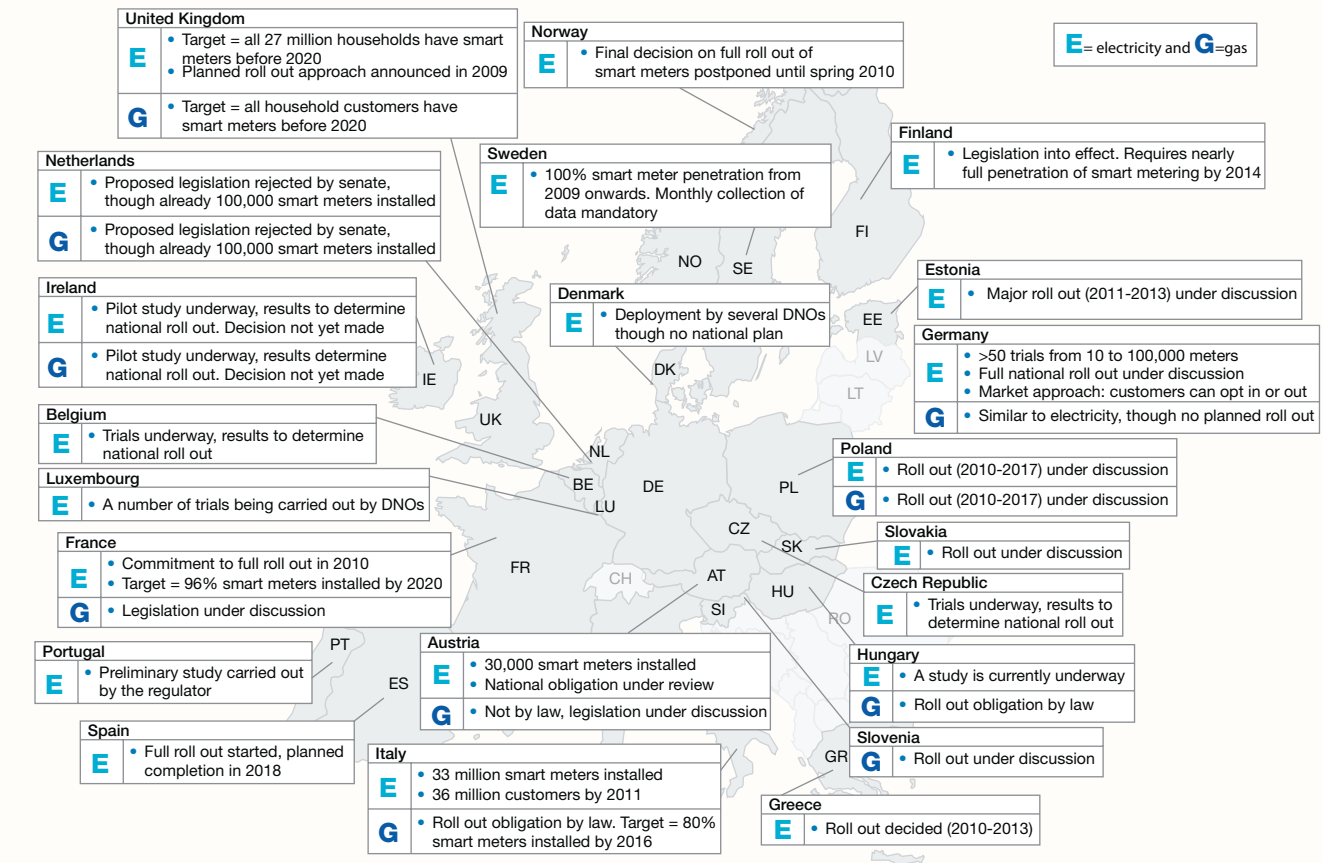
- Energy distributors have benefited from a 5% reduction in their yearly meter management costs;
- Periods of service interruption per customer have more than halved from 128 to 49 minutes per year bringing down the related annual costs for DNOs from €80 to 49 per customer;
- Enel estimates that consumption peaks have been reduced by 5%.

Profitability of smart metering is the main challenge

As national roll out depends on a cost assessment study, **investors are keen to recover their investments. Smart meters will not come free for consumers as companies will eventually transfer the cost onto their electricity and gas bills. However, the political rationale is that, in the long run, they will pay themselves back in energy savings.**

In the UK, for example, the government estimated that equipping 26 million homes with smart meters by 2020 would cost over UK£8 billion. But the cost would be more than compensated by the UK£14.5 billion of savings in the operational costs of power companies and lower bills for customers.

Smart Metering initiatives in Europe



Source: ESMA, GEODE - Capgemini analysis, EEMO12

Will smart grid technologies compete with telecom technologies?

Smart grids are traditional grids whereby electricity circulates always from generators to consumers with the addition of sensors and communication devices. **"Smart" functionalities are enabled by capturing and transmitting pertinent data about the grid.** Will power grids become a new media competing with coaxial cables, wireless/radio and telephone lines/DSL?

Communication technologies are crucial for the success of smart grids.

Basic Power Line Communication techniques (PLC) which use a carrier to transmit data over wires in addition to 50/60 Hz flows are not new but they suffered from high level of noise and electrical disturbances present on LV and MV wires. PLC carriers, especially low frequencies, are very sensitive to noise present on wires and higher frequencies do not go through transformers. Wireless (radio) communications may be preferred.

However, much progress has been made quite recently with PLC that enables more robust bandwidth for the data transmission over power grids. During the last few years, mainly in the US, broadband over power lines (BPL) has developed. Frequency is often around 10 MHz that allows for a wider bandwidth for data. The applications may range from Voice over IP to television.

Standardization bodies are reluctant to extend transmission frequency, mainly because of electromagnetic compatibility (EMC). Interferences may occur with other radio applications because electric wires act as antenna at high frequency. However, they should quickly react to impose standards over proprietary solutions.

The convergence between US and EU standards is far away. However, since 2009, many efforts are ongoing, both in the US (IEEE guide for smart grid interoperability) and in Europe (Prime Alliance with Iberdrola, PLC 3G with ERDF). **EU standards for smart meters and communications are expected for 2011.** At the same time the telecom industry (HomeGrid Forum) is trying to extend protocols to electrical wires.

Smart grids rely on the convergence and the interoperability of these standards (or extensions). Are technologies mature enough for smart grids? Are we close to the massive roll out of IP for every device on the grid? Will there be "plug and play" components on the grid? Last but not least, **are the power Utilities and telecom companies willing to cooperate to speed up the emergence of smart grids?**

Smart Energy Services deployment requires all stakeholders to organize if they want to reap all the benefits

According to a Capgemini research[a], the EU-15 could make annual energy savings of up to 200 TWh by 2020 with the hypothesis of smart meters mass deployment. This equals to the annual residential consumption in Germany and Spain. In addition, 100 million tons of CO_2 could be avoided per year.

But this requires the implications of all stakeholders:

- **European politicians need to dedicate funds for research efforts,** e.g. on the storage of electricity or on the economic and technological innovations to clear the peak demand. It would consequently demonstrate courage to accept an increase in electricity prices. This is inevitable so as to ensure the return on investment in the deployment of intelligent networks;
- **European administrations need to organize the standardization of communication protocols,** allowing many devices on the network to exchange data, such as enabling home appliances fitted intelligent dialogue between them. The emergence of new technologies and products will reinforce the need for international standards; and Iberdrola and ERDF are pushing for extending existing standards.
  Security is also a critical concern. Communication infrastructures for grid operators cannot be as permissive as the Internet; appropriate regulatory environments have to be defined;
- **Energy market players need to adapt their industrial model.** All players should adapt their value proposition, their business processes and their skills. Some distribution companies could move from a cost based to a service based business model and develop new services for their client (e.g. data management). As far as industry integration is concerned, two simultaneous moves are anticipated:
  - Vertically: large Utilities may directly supply metering equipments while equipment manufacturers will add "intelligence" to their meters;
  - Horizontally: shared infrastructures initiatives may emerge from consortium involving new players (gas or water Utilities, telecom service providers) in order to drive cost down.

Standardization of smart meters is a major issue if different metering systems are to become interoperable in the future. The correct scale for all these actions, including standardization, is the EU level. **Europe must take action to avoid being overtaken by the US which would then gain a double competitive advantage: the availability of proven technologies and the power to impose their standards.**

The development of "smart" services will have to face key questions: Could consumers reduce or adapt their consumption through better information and interaction with their suppliers? Will consumers really adapt their behaviors? Will confidentiality of consumers be ensured?

a) Demand Response: a decisive breakthrough for Europe, Capgemini, VaasaETT, Enerdata, 2008

Smart Energy Services - Experience Reduces Risk

Capgemini's Smart Energy Services supports Utilities and their customers by delivering sustainable energy efficiency and environmental solutions, and transforming Utility operations and customer fulfillment. We offer not just pilots, but practical working solutions. Capgemini collaborates with its clients to design and implement solutions that address today's requirements and enable tomorrow's business transformation.

Solutions are real, in the market now, and already making a difference for Utilities around the world.

Smart Metering is the foundation of Smart Grid and provides:
- Enhanced tariff capabilities enabling consumers to make choices, change behavior and lower consumption;
- Reduced operational costs associated with meter reading and maintenance;
- Enablement of grid monitoring and control processes to improve reliability, power quality and security.

Smart Grid enables operational efficiency and distributed generation and provides:
- Asset optimization with two-way communications and advanced applications management;
- Energy efficiency and CO_2 reduction with line loss reduction;
- Improved reliability with enhanced situational awareness and outage management services.

Demand response is about reducing electricity consumption at critical times or in response to market prices which in turn, helps Utilities to manage supply and demand, realize operational savings and reduce the carbon impact.

Smart Home gives the customers the ability to monitor and control energy usage and provides:
- Customer controlled appliance and energy management;
- Flexible, efficient and cost effective Utility demand response programs;
- Distributed and alternative generation management and dispatching programs.

How we can help:
- Strategy and planning
- Business / regulatory rate case development
- Systems architecture and integration
- System and vendor evaluations
- Business process re-engineering
- Program management office
- Delivery network re-engineering
- Communications infrastructure
- Physical and cyber security assessment
- Operational / training change management
- Consumer education and enrollment
- System development, configuration, and testing
- Supply chain management
- System deployment / customer migration
- Design-Build-Run (outsourcing)

Key issues in Norway

The Nordic energy regulating authority (NordREG) has presented a plan for a new common Nordic retail market. The objective is to **increase competition, increase industry efficiency,** and **make the market more transparent for end users.** This will have impacts on the Norwegian power market.

A "supplier centric" model is proposed, whereby the retailer will be the primary contact for end users. It will thus be under its responsibility to manage the billing of grid costs on behalf of the DNO.

NVE, the Norwegian regulator, has decided that **smart meters will be rolled out by 2018.** The original roll out date has been postponed to wait for new technology and standardization and to reduce the risk for grid companies. Final regulation is expected to be presented in H1 2011.

A new and revised energy law was introduced and became effective on January 1, 2010. DNOs are now obliged to connect small power plants and are, thereby, forced to make investments in the grid to enable distributed generation.

To secure the supply of power in dry years (hydroelectricity stands for 99% of the total generation), **a 31 km long DC power connection to Denmark is being built (700 MW).** The import of power has never been as high as in H1 2010, when 6.6 TWh was imported, due to the highest consumption ever recorded in combination with low water reserves.

Nord Pool, the single financial energy market for the Nordics, is today the largest power derivatives exchange and the second largest exchange for EU emission allowances (EUAs) and global certified emission reductions (CERs). In March 2010, NASDAQ OMX announced it will acquire all shares of Nord Pool ASA. The deal, that does not include Nord Pool Spot AS, was approved by market regulators in May 2010.

Churn for households increased by 15% in Q1 2010 compared to Q1 2009. This is higher than in the past and indicates that the market is getting more competitive. The tendency for customers to switch from standard variable contract to spot price contract continues.

Electricity Distribution

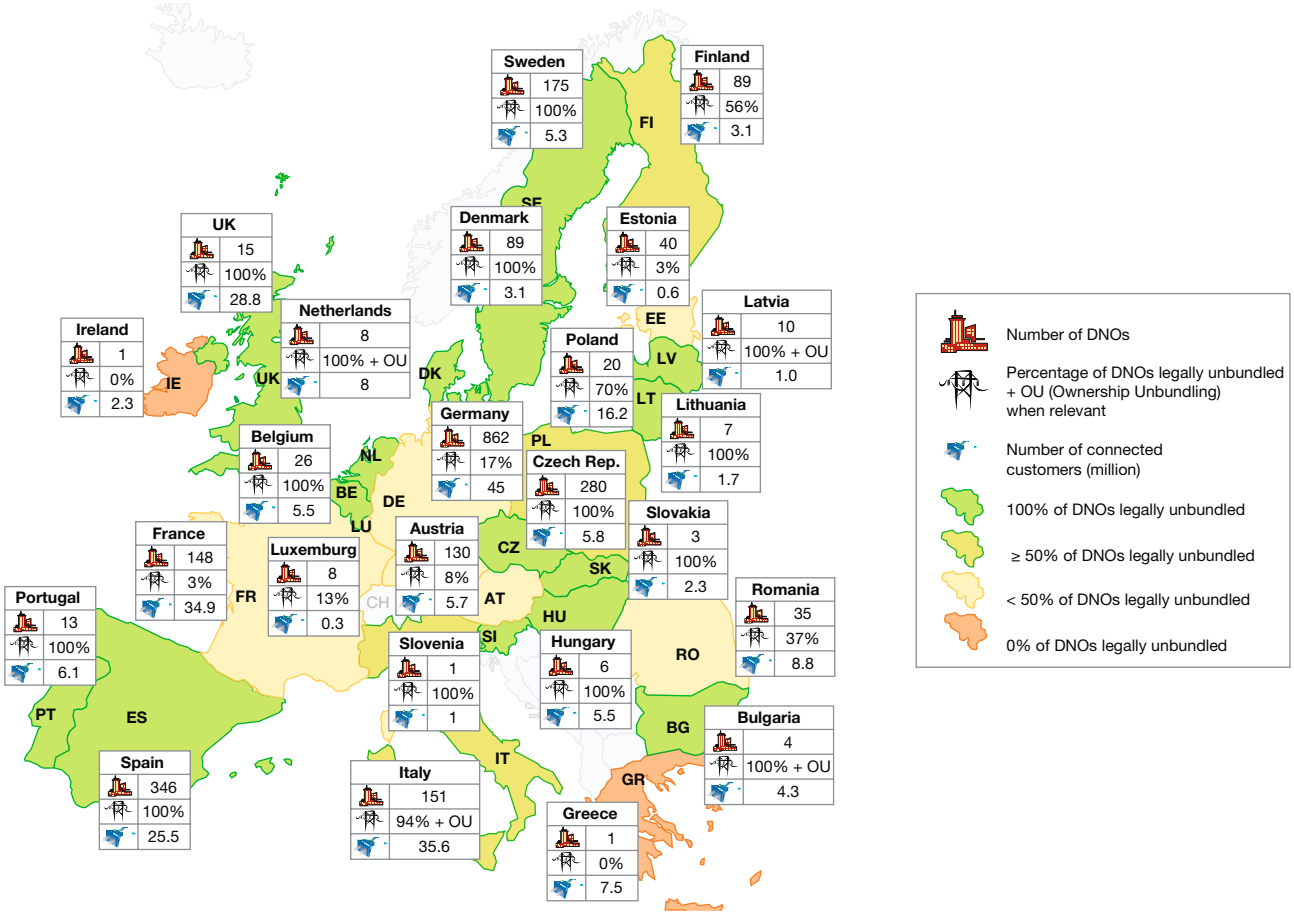
Distribution Network Operators (DNOs) companies have the responsibility to maintain and develop the physical distribution networks that deliver electricity to end consumers. DNOs often have responsibilities such as metering, settlement, public lighting and supply of last resort. There are thousands of distribution companies in Europe (see Table 9.1). Some are active on a national level, some in large regions within a country, but most of them operate purely at the municipality level.

A new step towards unbundling

European policy over the last 14 years has progressively driven the greater separation between DNOs activities and the generation, trading and retail activities of Vertically Integrated Utilities (VIUs), specifically:

- Accounting unbundling: The 1st Electricity Market Directive (96/92/EC) required VIUs to maintain separate accounts for their generation, transmission and distribution activities;

Table 9.1. Map of electricity DNOs and their unbundling status (2009)



Source: European Commission, National Regulators – Capgemini analysis, EEMO12

C. Lewiner (ed.), *European Energy Markets Observatory*, DOI 10.1007/978-94-007-2753-3_10,
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- Information, managerial and legal unbundling: The 2nd Electricity Market Directive (2003/53/EC) required stronger measures to prevent VIUs using their monopoly activities in transmission and distribution to benefit their competitive generation, trading and retail activities. Specifically this Directive brought strict constraints on the flow of information between those monopoly businesses and other areas of the VIUs, as well as requiring complete managerial separation and legal unbundling;
- Customers' awareness of unbundling: The recently adopted 3rd Electricity Market Directive asks separate branding for monopoly activities and that their customer communications are separate to those of the VIUs' retail or generation business.

This policy has eroded the benefits to a VIU of owning a DNO. This has contributed to a number of VIUs selling their DNOs – including the 2010 sale of three DNOs by EDF Energy in the UK.

Smart meters projects are on the way

EU legislation calls for the development of more sophisticated retail markets, including the roll out of smart meters. Smart meters are seen as having benefits in managing end user consumption as well as in supporting improved management of distribution networks (e.g. reducing energy losses). The installation of smart meters is a big challenge both technically and financially that explains the long delays needed to be properly rolled out[41] (see Box on the status of smart meters deployment in Europe).

From the EU new sustainability targets to technological breakthrough, DNOs face broad investments that could led to a new regulatory framework

European electricity DNOs have a role to play in delivering the ambitious sustainability targets set by the EU policymakers. These add new items to the DNOs mission beyond the traditional tasks of securing network reliability and quality.

Smart grids: Smart grids are seen as having benefits in terms of lower network costs as well as supporting the drive to reduce carbon emissions. A smart grid involves a combination of emerging software and hardware allowing networks to accommodate small scale renewable generation, enables consumers to manage their demand and supports more efficient investments and operational decisions in managing the network[42];

Electric vehicles: The drive towards the electrification of road transport is also seen as an important subject for DNOs since the charging stations for electric vehicles will have to be properly integrated into the electricity distribution system, again with associated investment needs;

Renewable generation: The grid integration of renewable energy such as distributed generation.

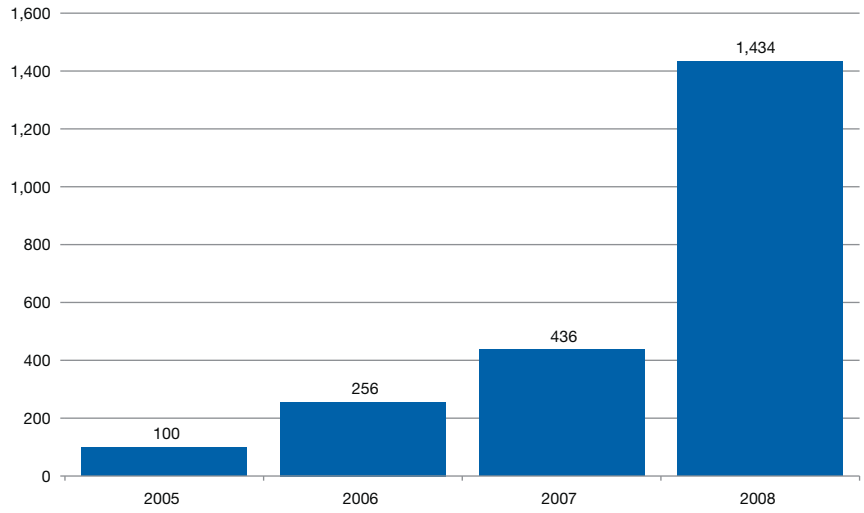
The DNOs need to take into account these challenges within their current operational or financing models but this supposes increasing investments. Introducing smart investments policies could be a way to limit the expected increase of costs for DNOs. But an appropriate regulation to encourage the development of these policies could be needed. It can be observed[43] in recent years that European DNOs have made increasing capital

41 The 2010 European DNO Benchmarking study, performed by Capgemini among 16 major European DNOs in 10 countries, shows that only three DNOs have developed other practices other than manual reading is a significant share in 2009

42 The European Commission recognized the role of 'smart grids' in reaching the goals of the energy-climate package in its recent Green Paper on Energy Networks

43 2010 European DNO Benchmarking Study, Capgemini

Table 9.2 Number of new generation connections (basis 100 = 2005)



Source: Capgemini 2010 European DNO benchmark – Capgemini analysis, EEMO12

expenditure, mainly due to the quality of supply improvement and to the need for replacing aging distribution networks. The same tendency is very likely to be observed in the coming years since an increasing number of subjects (presented above) will drive investments upwards. These new investment drivers questioned the need for a revision of the remuneration of electricity distribution investments.

In its position paper regarding Smart Grids[44], ERGEG considers that new regulatory schemes could solve these issues. With a regulatory scheme integrating inputs (technical details) and outputs (benefits of the investment), the regulatory means would have been more balanced between economic and technical perspectives and will certainly better integrate the customers' expectations.

While wanting DNOs to progress on smart grids implementation, regulation continues to put pressure on the costs of DNOs. For example, the UK regulator asserts that after 20 years of cost reduction, UK DNOs can still reduce their operating costs by 1% each year[45].

Delivering these savings through IT solutions are no longer being considered, as many DNOs are now focusing on approaches such as Lean and Six Sigma to find incremental improvements.

The quality of supply remains at the top of the DNOs agenda and commercial quality expectations are on the way

While the transmission networks need to ensure the functioning of the market and the electrical system on a wide scale, distribution networks are particularly important in ensuring faultless delivery of electrical power to the end users. Quality of service is consequently an issue of primary importance for distribution companies.

In the 4th benchmarking report on the electricity quality of supply issued in December 2008, CEER established that the continuity of electricity supply is improving, with customer minutes lost per year decreasing almost continuously since 2002, and the number of unplanned interruptions (excluding exceptional events) stabilizing. Regarding commercial quality (i.e. customer service) many standards exist in several countries for connection, customer care, technical service, metering and billing but three main types of commercial standards appear:

- Guaranteed Standards whereby the DNO has to pay compensation to the customer

44 June 2010- E10-EQS-38-05

45 OFGEM: Final proposal for GB electricity distribution price control – December 2009

if it does not meet the customer service standard set by the regulator;

- Overall Standards referring to a given set of cases (e.g. percentage of bills based on estimated meter readings);
- Other Available Requests in order to achieve a certain quality level.

The 3rd Electricity Market Directive, once implemented, will ensure that all regulators will have a role in monitoring compliance, reviewing performance of the network security and reliability rules as well as setting or approving standards and requirements for quality of service and supply and for commercial quality.

The impact of distributed generation on the networks has to be managed

Distributed generation (e.g. generation from renewable sources) is becoming an increasingly important technical challenge for the distribution sector. A large scale increase in small, dispersed generating units has a significant impact on the distribution networks in both technical and economic terms. Capgemini's 2010 European DNO Benchmarking study, performed among 16 major European DNOs, shows that as the number of load customers remained nearly stable (+1% per year), the number of generation customers exploded in the last four years. For seven DNOs, more than one customer out of 100 is now a generation customer.

As an example, CEZ Distribution and E.ON Distribution said on February 16, 2010 that they have suspended the authorization of new grid connections for wind and solar projects in the Czech Republic, in line with a recent request from the national grid operator, CEPS.

The distribution business remains attractive for investors even in the context of a global financial crisis

The sale by EDF of its UK distribution network to the Cheung Kong Infrastructure consortium at an unexpected price level (€6.8 billion) according to the financial analysts, proves the resilience of the distribution business and its interest for financial investors. The aim of EDF is to improve its balance sheet. It is also worth noting the emergence of non pure player owning distribution companies like Macquarie, an investment fund, that has realized many acquisitions in the regulated networks field in Europe and overseas.

With very predictable financial results and non risky business, the distribution companies remain a safe haven in an uncertain time.

Key issues in the Netherlands

Competition has increased in the Dutch energy market **with an average churn at an all time high of 12%,** customers being conscious of offers based on price and sustainability. Incumbents like Essent-RWE, Eneco and Nuon-Vattenfall still have a combined market share of around 70%, but are struggling to increase retention rate and diminish churn. In addition, incumbents are occupied with extensive changes caused by acquisitions and unbundling issues. **Being competitive on cost and acquisition is imperative.**

The Dutch energy regulator (NMa) wants the wholesale gas and electricity markets to be more effective. The gas market is still impeded by the limited availability of cross-border capacity and access to flexibility.

Under a Dutch government decision, **distribution companies have focused on full unbundling** which entails operating as standalone organizations. But in June 2010, the court in The Hague ruled that **this is inconsistent with European law.** Utilities could now seek compensation from the government. The government will appeal the decision.

In November 2009, an important step towards electricity market integration was made. The Dutch TSO TenneT bought the German TSO Transpower stromübertragungs GmbH, (a former part of E.ON), for €885 million.

On sustainability, **municipalities initiated sustainable and small scale local facilities to generate and sell energy.** The central government is seeking to encourage renewable energy as it currently accounts for a small portion of generation (3.8%). This led to several wind power projects as well as activity and discussion about nuclear power. Delta Energy has formalized its plans to install a second nuclear power plant. **And more political parties are becoming pro nuclear.**

At the beginning of 2009, the Dutch Senate did not ratify part of the adapted energy legislation regarding smart metering due to security and privacy issues. Currently, the House of Representatives is reviewing an update of the changes in this legislative period for approval. These changes consist of a more voluntary nature of smart meters installation, which could have enormous influence on the business case and possible delay of the roll out of smart meters in the Netherlands.

Gas Transmission

Guidelines and network codes are on the European gas transmission agenda

With the Directive 2009/73/EC of July 13, 2009, that entered into force on September 3, 2009, the European Commission has adopted new measures for the internal market in natural gas, including a set of rules for the unbundling of gas transmission operations. Accordingly, Member States are free to opt for one of three models:

- The ownership unbundling, whereby it is not permitted to exercise control over a transmission system operator (TSO) and at the same time perform any of the generation or sales functions;
- The independent system operator (ISO), whereby a Vertically Integrated Utility (VIU) owning the gas transmission system, designates an ISO that acts independently as a TSO. The VIU finances the investment plan decided by the ISO and approved by the regulatory authority or give its agreement to financing by any interested party;
- The independent transmission operator (ITO), whereby a VIU designates an ITO that owns and operates the gas transmission system. The ITO has to be autonomous and must have the power to raise money in the capital markets. Subsidiaries of the VIU performing the generation or sales functions cannot have any direct or indirect shareholding in the ITO.

Member States should transpose the new unbundling rules into their national legislation by March 3, 2011 and apply them by March 3, 2012. The status of the unbundling regime in the European countries (see Table 10.1) has not changed much since 2008, as reported in the European Commission report[46].

Spain, the Netherlands and the UK have adopted the ownership unbundling model in advance of the European resolution, whereas the model for the other major gas countries, i.e. France, Germany and Italy, resemble that of the ITO but with less autonomy.

A lot of effort and debate has been spent on gas transmission unbundling but, as mentioned in last year's edition of our Observatory[47], unbundling is not the only step towards the European internal market in natural gas, nor the major one. The equalization of gas transmission rules, specifically at the cross-border, is just as important.

The European Gas Regulatory Forum met in Madrid, on January 14 and 15, 2010, to discuss guidelines and network codes. Network codes contain the common rules for access to the transmission service at the cross-borders and are supposed to increase the cooperation and coordination among the TSOs, both in their development and application phases.

The network codes are developed by the ENTSO-G[48] on the basis of the guidelines prepared by the ACER[49], and are adopted by the European Commission, after the recommendations from the ACER.

The main topic of the next Forum is the framework guidelines for the balancing regime that should be market based and harmonized at the cross-borders. Possible mismatches between balancing relevant periods at the interconnection, i.e. hour and day, should be solved.

The guidelines and network codes initiative represents an important step towards the harmonization process that is instrumental to the proper functioning of the market.

There have not been congestions at the European interconnections as gas flows decreased, but gas reverse flow projects are progressing

The GTE+, before assuming the name and the tasks of the ENTSO-G, published a winter outlook where it forecasted the short-term capacity utilization and any possible interconnection bottleneck. Not surprisingly, given the decreased gas consumption and flows, all countries and interconnections were not expected to experience capacity constraints (see Table 10.2), as actually happened during the winter of 2009/2010.

Interestingly, on June 16, 2010, the ENTSO-G published its first Summer Supply Outlook. The outlook is a short-

Table 10.1 Ownership unbundling status of gas TSOs (as of July 2010)

Ownership Unbundling of Gas TSOs	
YES	**NO**
Denmark (2004), Netherlands (2005), Portugal (2006), Romania (2004), Spain (2003), United Kingdom (1997)	**Austria, Belgium, Bulgaria, Czech Republic, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Latvia, Luxembourg, Poland, Slovenia, Slovakia, Sweden**

Source: European Commission, Platts – Capgemini analysis, EEMO12

46 Report on progress in creating the internal gas and electricity market, COM(2010)84

47 European Energy Market Observatory, Eleventh Edition, November 2009, page 64

48 European Network of Transmission System Operators for Gas. See glossary for definition

49 Agency for the Cooperation of Energy Regulators. See glossary for definition

C. Lewiner (ed.), *European Energy Markets Observatory*, DOI 10.1007/978-94-007-2753-3_11,
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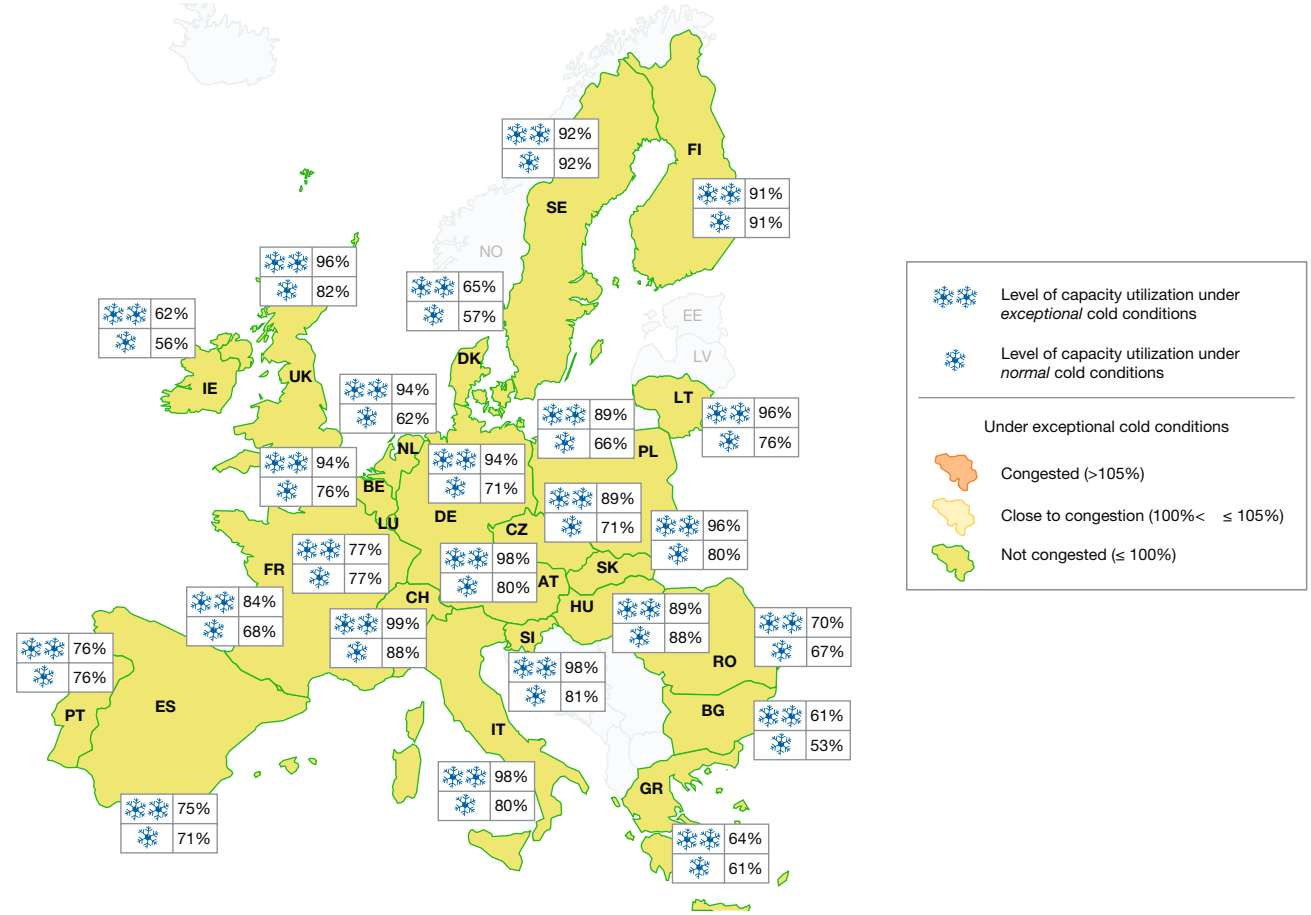
Table 10.2 Map of physical congestions on gas infrastructures (2009)



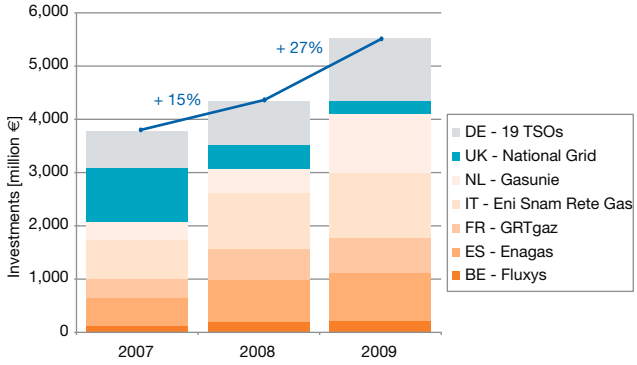
Source: GIE gte – Capgemini analysis, EEMO12

term forecast of the transmission network ability to cope with the demand and, most of all, with the summer injection program into storage.

The flow patterns resulting from the ENTSO-G simulations display considerable flexibility, i.e. spare capacity, in most of the European countries, with load factors at the interconnection generally below 90%.

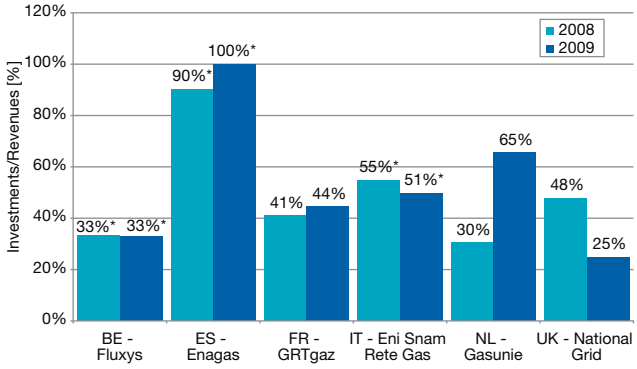
Accordingly, European shippers showed little interest for the interconnection capacity extension. During the open season launched by the French and Spanish TSOs, no shippers committed to the development of the MidCat pipeline, connecting France to Catalonia, and the line connecting with the Basque Country. The CRE and the CNE, the respective national energy regulators, acknowledged

Table 10.3 Investments from selected gas TSOs in their national grid (2007 to 2009)



Source: TSOs Annual Reports, National Regulators – Capgemini analysis, EEMO12

Table 10.4 Gas TSOs investments in the national grid as a % of their revenues (2008 and 2009)



** Investments given for pipelines, LNG and storage activities*
Source: TSOs Annual Reports, National Regulators – Capgemini analysis, EEMO12

the failure of the open season and cancelled the projects. Only the extension of the existing interconnection at Larrau has received enough interest and will be implemented, with a total cost of €1.7 billion.

Interconnection capacity is not an issue but reverse flow could be. In the first half of 2010, the European Commission has awarded, within the framework of the European Energy Program for Recovery, grants of €80 million to gas reverse flow projects, located mainly in Central Europe.

The major European TSOs are still investing in capacity development, as shown in their 2009 plans

All major European gas TSOs are maintaining a positive trend for their capacity development spending, but mainly for national system extension, and not, as seen before, for expanding interconnections.

The investments of the TSOs in the countries of Belgium, Germany, France, Italy, Spain, the Netherlands and the UK reached more than €5.5 billion in 2009. This represents a 27% increase compared to 2008 (see Table 10.3).

The Italian Snam Rete Gas, the Dutch Gasunie and the Spanish Enagas lead the ranking of investments and have consistently increased their spending from 2007 to 2009:

- The Snam Rete Gas CAPEX plan has been directed towards the internal expansion of the national network in Calabria and Sicily regions, and the construction of new entry points, e.g. at the new Livorno LNG terminal, but also towards the development of other infrastructure activities like gas storage and distribution, which needs the substitution of cast iron mains;
- Gasunie investments relate to the expansion of the internal system; for the construction of the national North-South route; the extension of the BBL line; the Nord Stream pipeline taking gas from Russia through the Baltic sea; but also to the developments of the Zuidwending natural gas storage and the GATE LNG project;
- Enagas has invested in the expansion of the network, connecting the new entry point of Almeria, where the Medgaz pipeline lands, to the rest of the South-East Spanish system, in the extension of the existing LNG terminal capacity at Barcelona, Cartagena and Huelva sites, and in the development of the underground storage plants of Castor, Gaviota and Yela.

The ratio of TSOs' investments versus revenues displays a stable trend (see Table 10.4). Only Gasunie has invested more, relatively to its revenues, than in 2008, whereas National Grid has invested less.

The consistency over the years 2007 to 2009 of the investments (and revenues) trends provides an indication of the nature of the gas transmission business that is based on long-term plans, only partially affected by the economic cycles. This explains why there is no apparent correlation between the financial downturn and the cash flow to develop the transmission capacity.

Also the profitability drivers of the gas transmission business explain this positive investment trend. The regulatory authority defines a tariff scheme whereby TSOs are remunerated, at a regulated cost of capital (WACC), for all the assets reported in the balance sheet, regardless of their load factors and regardless of the actual capacity sold. In some countries, new investments approved by the regulator, are granted a premium WACC.

To complete the picture, it is worth mentioning the ENTSO-G first development plan, the Ten Year Network Development Plan 2010-2019 delivered on December 23, 2009. In this report, ENTSO-G reported on development areas that it had identified through a peak day analysis of demand and capacity:

- When only the capacity projects for which a final investment decision (FID) have been taken into account, a need for additional entry capacity, including interconnections, was found in all the major European gas countries, for 2018 and 2019. The necessary increments are a 1.9% increase over the total expected capacity;
- When the mature projects without a FID were accounted for, a need for additional entry capacity was found only in Denmark and Sweden in the time range from 2014 to 2018. This corresponds to the new import capacity necessary to replace the declining Danish domestic production.

Antitrust probes have initiated the major market consolidation deals

In early February 2010, the EU DG Competition reached an agreement with Eni, the Italian energy company, over the sales of its European gas transmission assets. The pipelines Tenp, in Germany, Transitgas in Switzerland and TAG in Austria will be spun off to end the antitrust probe.

Eni will renounce its ownership and management rights of the pipelines, but will maintain the rights of use. The buyers are not known yet, although E.ON, which jointly owned the German asset since its development, is one of the natural candidates. The TAG pipeline will be sold either to the Cassa Depositi e Prestiti, the Italian government owned bank that owns shares in Eni or to another Italian state owned financial organization.

In order to settle an antitrust dispute, RWE offered to sell its network in the German state of North Rhine Westphalia, which borders the Netherlands. The network is 4,100 km long and is valued at €1 billion. Bayerngas, which runs Germany's largest natural gas hub with E.ON, is one of the candidate bidders.

Only Gasunie, the Dutch TSO, has made an acquisition outside the European competition disputes. It acquired 20% of the Nel project, one of the two pipelines taking to West Germany the gas delivered by the Nord Stream. The Nel pipeline will be 440 km long.

Transposition of the EU 3rd Energy Package is heterogeneous across Member States

CMS Bureau Francis Lefebvre

The 3rd energy package was enacted on July 13, 2009. It mainly aims at:

- Ensuring fair competition between EU companies and third country companies;
- Strengthening the powers of national regulation authorities (NRAs);
- Creating an Agency for the Cooperation of Energy Regulators (ACER);
- Fostering the development of smart meters: the package includes a binding aim for the deployment of smart meters in 80% of European homes by 2020 and 100% by 2022;
- Improving consumers rights;
- Setting up a better unbundling between energy retail and generation, on the one hand, and network operations, on the other hand.

Member States are currently transposing, or are supposed to transpose, the package in their jurisdictions: the deadline is March 3, 2011 for the majority of the provisions, but it is March 3, 2012 for the unbundling matters, and March 3, 2013 for the certification of operators controlled by non EU persons.

The UK has not transposed the directive yet, but a consultation on the implementation of the EU 3rd Internal Energy Package has been published on July 2010. However, the transposition will not involve a significant amount of additional primary legislation, nor new policies, since the necessary measures have already been anticipated by various acts. **The Netherlands has not transposed the package, but a bill has been introduced in the second half of 2010.** Furthermore, certain provisions have already been transposed, like some unbundling requirements, pursuant to the Act of November 23, 2006 on independent network management. **In Poland, preliminary consultations between the government, the national regulation authority and other protagonists of the Polish energy market are currently being carried out, but the package is not transposed either.**

In France, a bill is currently being debated in Parliament that initially allows the government to issue an ordinance to quickly transpose the 3rd package; however, the Parliament deleted those provisions. **Likewise, there is no draft available concerning the third package implementation in Austria, the Czech Republic, Italy, Luxembourg and Germany.**

On the other hand, **in Bulgaria, the new government considers the matter as a priority and the country should be in line with the timetable set out in the package.** And **Hungary has already transposed the third package;** the Parliament has adopted a national Electricity Act and Gas Act in December 2009, and the new provisions will enter into force in their entirety as of March 2011.

Finally, since several Member States have not yet fully or correctly transposed the former Directives of June 23, 2003, it is likely that some Member States will also miss the major milestone of March 3, 2011.

Gas Storage

Despite a short-term gas oversupplied situation encountered in 2009, adding security of supply and flexibility in the European natural gas market remains a long-term priority

The sharp fall of the gas demand due to the economic crisis (-6.1% in 2009), combined with the increased LNG trade movements (+26.7% compared with 2008) and the rise of US unconventional gas production (50% of US gas production) has led to an exceptional gas oversupply across Europe in 2009. As a consequence, gas spot prices were below long-term oil indexed prices and the seasonal spread was squeezed, giving a false impression of cheap available supply and flexibility, thus discouraging new storage investments.

In 2009, the EU-27 storage capacity accounted for 19% of the total European natural gas consumption with 85 bcm (130 underground facilities), representing a 15% increase compared to the 2008 figures, with the same level of imports compared to consumption (see Table 11.1). Even during the January 2009 Russia-Ukraine gas transit crisis, not one of the European major gas markets came close to being cut off which was due to good levels of storage. Withdrawals from the EU-27 storage facilities during January 2009 reached 15 bcm, representing an increase of about 45% compared to the 2008 figures.

However in the longer term, gas storage investment drivers remain valid. The decrease of European indigenous production (proven reserves decreased by 5% per year between 2003 and 2008) has weakened security of supply in Europe. As distance from sources and import dependency increase, the risks linked to regular supply become increasingly evident. Storage facilities close to the market and connected to import pipelines will be able to tackle this problem.

The question of flexibility remains critical as Europe is suffering from the consequences of two diverging effects: a less flexible supply and a more variable gas demand. The decrease of indigenous

Table 11.1 Gas storage capacities (2009)

Source: GIE gse, BP statistical review of world energy 2010 – Capgemini analysis, EEMO12

C. Lewiner (ed.), *European Energy Markets Observatory*, DOI 10.1007/978-94-007-2753-3_12,
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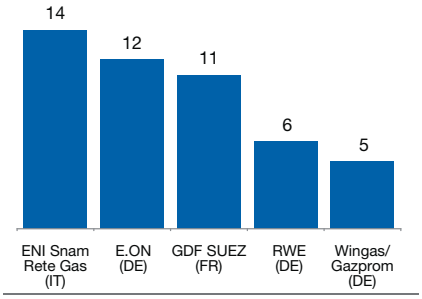
Table 11.2 Map of gas storage (2009)

Source: GIE gse, BP statistical review of world energy 2010 – Capgemini analysis, EEMO12

production which provides most of the European supply swing, combined with the increase of long distance base load gas imports with little flexibility, is likely to lead to an increase in demand for regional and local flexibility to meet seasonal consumption patterns. In addition, the use of gas-fired plants to back-up wind power and the commodity arbitrage (electricity versus gas) has led to an increased gas consumption variability. Furthermore, storage has become a practical arbitrage tool to optimize price variations occurring on European natural gas markets. Flexibility is a matter of short-term demand requiring high daily deliverability rates from storage rather than an important working gas capacity.

Top 5 - European gas storage operators in terms storage capacities in bcm (2009)



Source: Companies' web sites and annual reports – Capgemini analysis, EEMO12

Despite the economic downturn, Europe is the most dynamic region in the world for the development of gas storage with more than 120 projects representing around 70 bcm of new working capacity by 2015

At the beginning of 2010, Germany, Italy and France owned 56 % (i.e. 48 bcm) of the EU-27 total underground gas storage capacity. These countries historically rely on gas imports secured by take-or-pay long-term contracts that have little flexibility. Hence, in order to balance their high seasonal gas consumption, gas storage was developed. Furthermore, building storage facilities is cheaper than building new pipelines. Another 20% of the EU-27 storage capacity is located in Central Eastern Europe. Austria, Hungary, Slovakia and the Czech Republic held at the beginning of 2010 around 17 bcm (see Table 11.2).

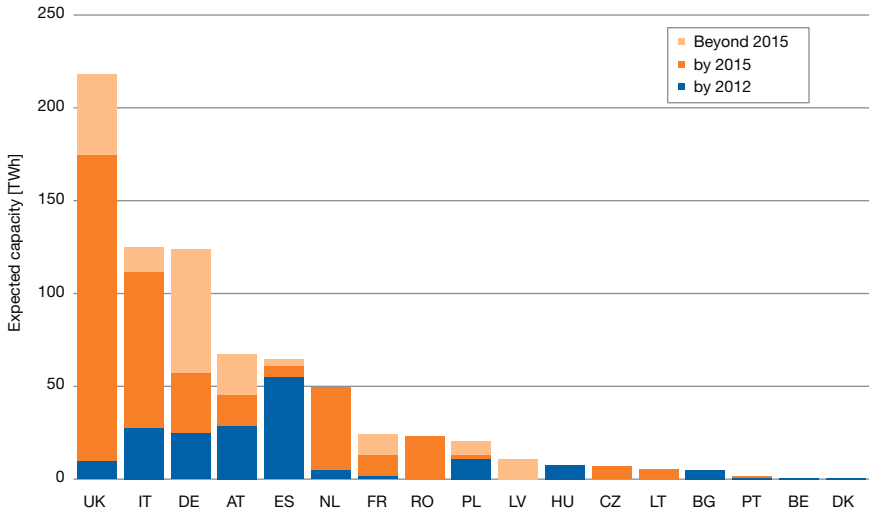
In 2009, the EU-27 increased its overall storage capacity by 6% mainly through the construction of new facilities in Hungary and Italy and extensions of existing facilities in Germany and France:

- Hungary has increased its storage capacity by 65% to around 6 bcm due to two major projects:
  - E.ON Földgáz completed the 600 mcm expansion at the Zsana facility in November 2009;
  - MOL converted the mostly depleted Szöreg 1 gas reservoir in a 1.9 bcm strategic storage facility in Algyö. The project was mandated by Hungary's government in the wake of the successive Russia-Ukraine gas supply crises.
- Italy, through Stogit, had new builds and extensions that increased storage capacity by 4% up to around 15 bcm. This was achieved thanks to the 200 mcm and the 300 mcm expansions in the Ripalta and Sergnamo storage facilities respectively and the construction of a 350 mcm new facility in Fiume Treste;
- Germany and France increased their storage capacity by 4% and 3% respectively up to 20.6 bcm and 12.4 bcm resulting from the several extensions of existing facilities.

At the beginning of 2010, Gas Storage Europe (GSE) listed more than 120 projects representing around 70 bcm (+8% compared to 2008). With an average growth rate of 10% per year, the European gas storage capacity should reach about 155 bcm by 2015. However, only 23% of these projects benefit from a final investment decision. Examples of active countries are the following (see Table 11.3):

- The UK, with more than 20 projects representing around 20 bcm of additional capacities, is by far the most dynamic country in terms of investment although half of the projects do not benefit from final investment decisions. During recent years, investment in storage has been neglected as companies underestimated the fall of North Sea output. North Sea depleted fields represent a huge potential of development for offshore gas storage. Onshore and offshore depleted fields represent 70% of gas storage projects (30% being salt caverns). Centrica has taken a controlling stake in Perenco's Baird depleted gas field storage project which potentially could be the UK's second largest facility, half the size of Rough with a 1.7 bcm capacity operated by Centrica Storage Limited;
- Germany, with more than 11 bcm of additional capacities, is strengthening its European network hub role and increasing its security of supply. With its ideal location, the 2 bcm Jemgum gas storage project is the perfect illustration. Wingas (50% owned by Gazprom) plans to connect Jemgum to the Wingas Transport market area which is planned to merge with a number of other German zones into a new single zone called Gaspool. Furthermore, the company is also planning to build a link to the market area of the Dutch grid operator GTS. Jemgum is also a part of Gazprom's Ukraine bypass strategy as it will be connected to the future Nord Stream pipeline;
- The Netherlands wants to maintain its key position of swing supplier in

Table 11.3 Gas storage facilities projects (2009)



Source: GIE gse – Capgemini analysis, EEMO12

Northern Europe despite the decrease of its indigenous production. The 4.1 bcm Bergermeer gas storage developed by TAQA should reinforce the strategic position of the Dutch gas market. Moreover, Bergermeer Gas Storage benefits from an initial CAPEX reduction, with Gazprom providing the cushion gas[50] in return for gas storage capacity. The cushion gas represents roughly 50% of capital costs of the underground storage facilities;

- Spain, with the move to wind energy backed-up by CCGT, is looking for gas flexibility. Projects could lead to an additional storage capacity of about 6 bcm by 2015, 1.3 bcm being LNG peak shaving. The main projects under development are the 1.5 bcm Castor offshore gas storage of Escal, and the 1.3 bcm aquifer gas storage in Yela, built by Spain's domestic gas grid operator, Enagas.

According to GSE and Société Générale, EU storage volumes need to be expanded by 50 bcm (+60%) by 2025, representing a €60 billion investment in order to keep the same level of security of supply and to meet gas flexibility requirements. Despite the economic downturn, investors have not been discouraged, and Europe appears to be on the right path to meet these recommendations.

The 3rd Directive concerning common rules for the internal market in natural gas enacted in July 2009, should pave the way to storage access conditions improvement

Since 2003, the 2nd Directive concerning common rules for the internal market in natural gas (2003/55/EC) imposed non-discriminatory Third Party Access (TPA) and allowed Members States to choose between negotiated TPA (tariff set by the operators) and regulated TPA (tariff set by the regulator). Several surveys (DG Competition sector inquiry, ERGEG survey on CAM[51] and CMP[52] 2008 and 2009) pointed out the weaknesses of storage access such as:

- Lack of transparency;
- Discriminatory behaviors;

50 The cushion gas is the volume of gas intended as permanent inventory in a storage reservoir to maintain adequate pressure and deliverability rates throughout the withdrawal season.

51 Capacity Allocation Management. See glossary for definition

52 Congestion Management Procedure. See glossary for definition

Key issues in France

Following the Champsaur Commission recommendations in April 2009, **the NOME[a] law should be implemented by January 1, 2011** so as to:

- **Organize a regulated access to historic nuclear power** for end customers suppliers, with a maximum volume of 100 TWh/year and with a price to be determined later;
- **Require suppliers to secure peak load capacity for their end customers,** thus creating a capacity market. Implementation will not be immediate.

Other legal changes included:

- **Abandonment of the carbon tax;**
- **Amended law** with respect to renewable production (Grenelle II) which **decreased feed in tariffs for solar power plants** and **toughened conditions for building wind power plants;**
- **New power network tariffs,** with a formulae that takes into account inflation, technical performance and network losses costs. As a consequence, tariffs increased in August 2009 and 2010;
- **Increased regulated tariffs** in August 2009 and 2010.

Gas end customers tariffs decreased in April 2009 following the drop of oil prices. The government did not authorize any increase in July and October 2009, but it did so in April and July 2010 (+4.7% on average) to take into account the oil prices rise as well as increasing network costs.

After the rules of **opening of hydraulic concessions** had been clarified in 2008, **the first procedures began with more than 5 GW being at stake before 2014.** In addition to French players, some leading European companies such as Verbund, Statkraft, Vattenfall and E.ON announced their interest.

Moreover, E.ON increased its presence in France through the:

- Acquisition of 800 MW of drawing rights on French nuclear power plants through a swap with EDF;
- Completion of the acquisition of SNET (2.5 GW of thermal capacity); and
- Participation of 8% in the new nuclear reactor of Penly.

EDF finally signed in March 2010, the Exeltium agreement with some industrials, which will give access to power at the equivalent nuclear cost. The State started a debate to re-organize the French nuclear industry and in particular the roles of the two main State companies: EDF and Areva.

a) NOME : Nouvelle Organisation des Marchés de l'Electricité i.e. New Organisation of the Electricity Markets

Key issues in Slovakia

In 2009, Slokavia's power generation dropped by 11%, going back to the figures of 1998 while the consumption dropped by 4%, in absolute numbers close to the level of 1995.

The gap between production and consumption has been traded off by slightly increased importation of energy: +3.5% on a yearly basis. From this, the biggest importation was natural gas at +28%.

Unfortunately, **even after the new gas crisis of 2009, Slovakian security of supply did not improve.** According to Eurostat, total energy dependence increased from 64.3 to 70% on a yearly basis. The biggest supplier of energy to Slovakia is still the Russian Federation.

In order to avoid a new gas crisis, **Slovakia signed diversification contracts** with E.ON Ruhrgas and GDF SUEZ in order to supply 850 mcm/year from Western sources.

In 2009, competition increased in the electricity market with alternative players (like Ukrenergo, Magna EA, Lumius, Slovakia Energy and CEZ Slovensko) **and in the gas market with international players** (RWE Gas and Vemex Energy/Gazprom) **entering the markets,** serving mainly the Small and Medium Enterprises and the household segments.

Regarding market integration, an important milestone has been achieved in 2009: the market coupling between the Czech Republic and Slovakia on a daily basis which has put more liquidity on both electricity markets.

From a regulation point of view, **the government continued to exercise the political power and control of the Energy Authority (URSO) in order to keep the retail prices down and to limit the amount of RES projects,** mainly after the boom of solar photovoltaic power plants (only 36 projects representing an installed capacity of 120 MW were approved out of a total of 1,500 MW presented by different investors).

Table 11.4 Gas storage regulation regimes (2009)

Negotiated TPA (nTPA)	Regulated TPA (rTPA)	Hybrid
Austria, Czech Republic, Denmark, France, Germany, Netherlands, Portugal and Slovakia	Bulgaria, Hungary, Italy, Latvia, Romania and Spain	UK

Source: National Regulators – Capgemini analysis, EEMO12

- Lack of available capacities;
- High price;
- Inadequacy of storage services;
- Weak position of National Regulatory Agencies.

European countries can be divided into three groups according to their regulatory regime (see Table 11.4).

Within these categories, EU storage markets face various issues according to the CAM and CMP mechanism chosen:

- nTPA:
  - In France, the capacity allocation mechanism applied is the "Capacity Goes With the Customer" (CGWC) which means that the majority of the capacities are reserved for shippers supplying end customers (residential customers and public services) and is allocated pro-rata based on the portfolio size of the shipper at a negotiated price. By decree application, active suppliers must have in stock 85% of capacities dedicated to domestic customers by November 1 each year. The rest of the capacities are allocated via auctions with a reserve price. The two main issues of the French market are the lack of available capacities for shippers with no domestic customers due to the CGWC mechanism and the high price of capacities;
  - In Germany, more than 24 SSOs operate and no particular requirement on CAM is set by Bundesnetzagentur, the German regulator. As a consequence, most of the allocation results from bilateral negotiations known as "First Committed First Served" (FCFS) principle. The FCFS principle is strongly criticized as it gives a wide range of discrimination. Capacities are allocated via long-term contracts largely to affiliated companies. Moreover, FCFS is not a market base mechanism since capacities are not allocated according to willingness to pay which impedes economic signals for new investment.
- rTPA:
  - In Italy, Stogit owns most of the capacities. As the TPA for gas storage is completely regulated, AEEG, the regulator, determines the tariffs as well as the services which have to be offered. Services include strategic storage, storage for balancing of the national network, storage for domestic producers and modulation storage (major part of the capacities). In case of congestion, capacities are allocated following the previous order. In practice, congestion only occurs for modulation storage and in this case capacities are allocated with priority for domestic customers. In recent years, Italy has experienced capacities' shortage that mainly affected industrial and thermoelectric customers who have to look for other flexibility means.

In order to improve gas storage access, the EU enacted in July 2009, the 3rd Directive concerning common rules for the internal market in natural gas. The main objectives concerning the CAM and CMP are:

- Reinforcing unbundling of storage system operators;
- Defining precise criteria for choosing regulated or negotiated TPA;
- Redefining and reinforcing of NRA's responsibilities

Member States will have to transpose these measures by March 2011[53] in order to comply with this new Directive.

53 ERGEG – Status Review 2009 On Capacity Allocation Management and Congestion Management Procedures for Storage, EC – The 3rd Directive concerning common rules for the internal market in natural gas

Gas Distribution

Gas distribution activities are influenced by various factors, arising from both within and outside the industry:

- Regulatory bodies which provide rules affecting business;
- Market liberalization that entails new activities and competencies;
- Improved economic performance needs;
- Increasing requests from customers;
- New stakeholders with different expectations and influence.

There are different distribution network operators (DNOs) structures throughout the EU. This is because natural gas markets have developed differently in individual countries, and because of heterogeneous local political or economic factors. DNOs can be owned by integrated gas or energy companies, local authorities or by service companies. DNOs are now facing the challenges of legal unbundling requirements.

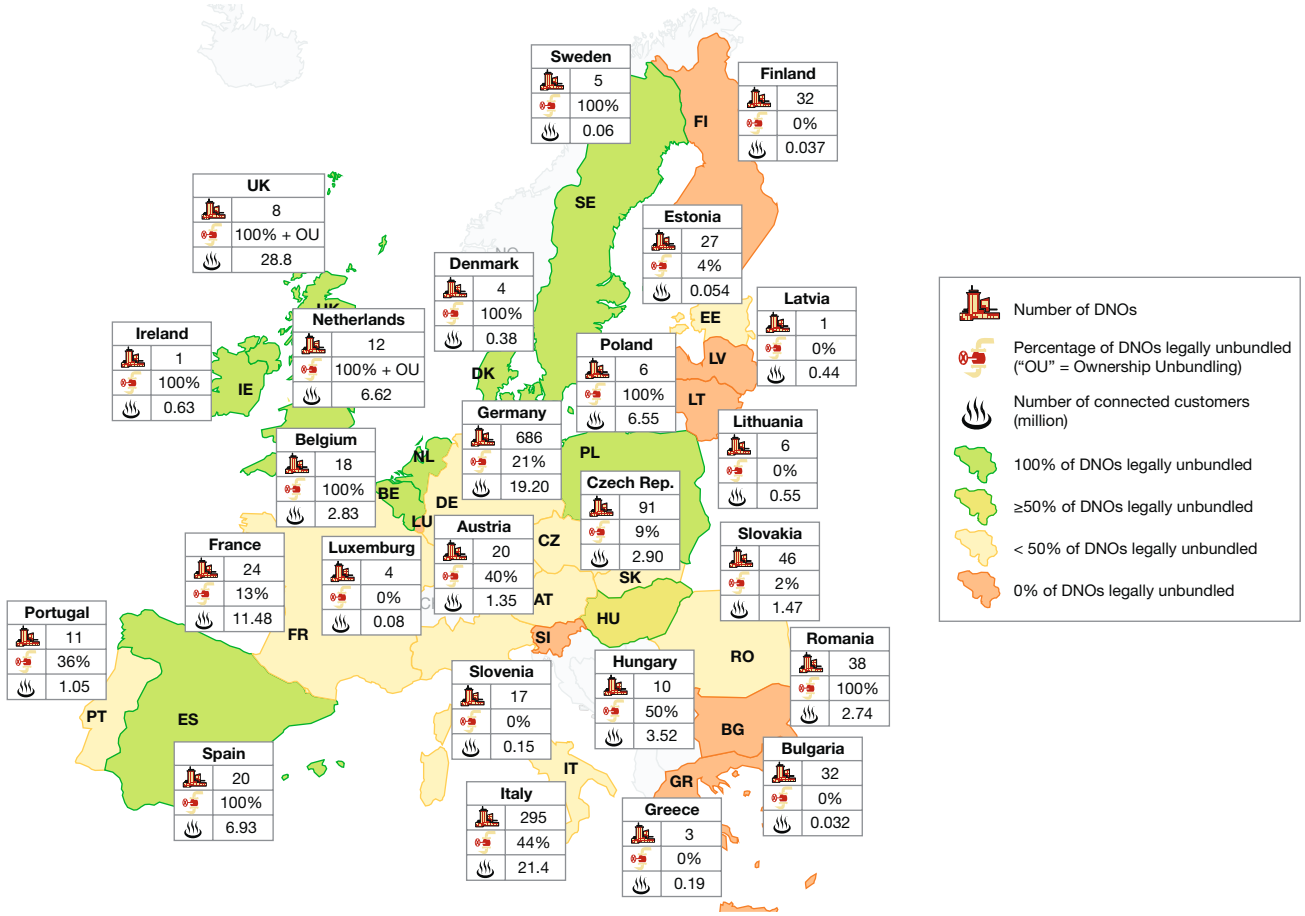
A new step to unbundling

The European Gas Directive 2003/55/EC which required network and sales activities to be separated has been followed by the 3rd Directive in which issues such as metering, implications of sustainable development policies and regulatory prerogatives have to be taken into account by the DNOs (see Table 12.1).

Within the gas market liberalization context, DNOs have retained their core technical roles. The EU and national regulations and standards have confirmed their roles:

- Design and construction of modern gas distribution systems;
- Safe operation and preventive maintenance of old and new complex gas grids;

Table 12.1 Map of gas DNOs and their unbundling status (2009)



Source: European Commission, Eurogas – Capgemini analysis, EEMO12

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- Organization of emergency response;
- Quality of service towards end customers;
- Environmental protection within the framework of sustainable development.

Every investment, and especially the expansion of the gas grid, needs careful economic evaluation. This is because of the price of competing energies (coal, oil and electricity), technological alternatives (heat pumps, biomass) and global heating systems (district heating).

These roles, nevertheless, need to be performed in a cost effective manner in order to preserve the gas energy competitiveness.

A new regulatory framework that better takes into account the market trends is about to emerge

DNOs invest in the extension of gas networks to enable customers to benefit from gas access. It is, therefore, fundamental that they are confident about their future return on investment (ROI). This ROI depends mainly on the third party access tariffs, which are determined by the regulators. These tariffs should give incentives for the investments in the network that need to be carried out to ensure the viability of the distribution grid. The regulatory authorities should establish a stable and predictable framework, including an appropriate ROI, when setting or approving the tariffs or the means for calculating them.

But today, as the natural gas market in Europe has been hit by a declining demand and an over supply, it can be expected to have low utilization and asset redundancy for some part of the network. In such conditions, DNOs have to be careful regarding redundant or unnecessary investment and thus have to consider alternatives to network investment such as interruptible contracts.

The British energy regulator, OFGEM, proposed in July 2010 a new model for regulating the gas distribution network. The model puts much more emphasis than before, on incentives to drive the innovation needed to deliver required outputs in terms of improved customer service and smarter grids.

From smart meter to smart pipes?

Smart meters for gas will result in many of the same benefits for consumers and suppliers as set out for electricity meters in terms of choice, energy savings, quality of service and increased efficiency. Four main benefits appear for gas DNOs:

- Gather information for both suppliers and distributors to better understand consumption patterns and network operations through data analysis. The increase in data flow will allow a more detailed modeling of networks which will lead to better offers, more efficient investment and a greater security of supply;
- Configure remotely gas smart metering system: There is a basic requirement that DNOs will be able to change meter configurations remotely over the life of the meter;
- Display messages from DNOs to consumers through the smart metering system to notify them of issues or progress updates on specific incidents;
- Disable gas supply: assuming that security questions are solved and that the gas smart meter incorporates a valve, DNOs will have the ability to quickly restore gas supply in case of emergency, adding thus further customer protection. This functionality has an important impact on the gas smart metering business case.

The natural gas grid has not received the same attention as the electric grid. As the gas grid has been extremely reliable, safe and efficient throughout its tenure, the current demand to update the gas grid is more about reducing OPEX, increasing energy conservation, and meeting global climate initiatives and mandates. Many reflections are on the way particularly in research and development to transform the existing gas network into a smart one, focusing on two main industry needs:

- Giving real-time information on damage to the natural gas pipelines;
- Providing information on the performance of the pipeline. Significant resources are devoted annually to inspect leaks in distribution pipelines. Gas DNOs are actively seeking remote detection technology to improve the efficiency and reduce maintenance costs of leak detection.

A way to diversification

In a more prospective point of view, the distribution networks could contribute to the evolution of the European energy mix by distributing other gases than natural gas.

Biomethane can partly replace natural gas in the gas grid. Source materials for biogas include household refuse, sewage sludge and agricultural waste. Using biomethane to produce heat or other forms of energy has clear benefits as most material used to produce biogas would normally go to a landfill.

However, before being injected into the distribution grid, the biogas quality needs to be upgraded to reach natural gas quality. Today, the cost of biogas upgrading is high and upgrading facilities together with biomethane filling stations have to be built together with the biogas plants. Should injected volumes of biogas become significant, DNOs could face balancing issues, similar to the ones raised in electricity with intermittent generation capacities. Legislative frameworks need also to be implemented to allow natural gas substitution.

CO_2 captured by Carbon Capture and Storage (CCS) technologies in coal-fired power plants is another type of molecule which could transit through gas pipelines.

Finally, it is also becoming apparent that LPG and other gases may provide a basis for further gas network development in areas remote from the natural gas system.

Sustainable Energy and Climate Change

The economic crisis had a positive impact on carbon emissions and primary energy consumption but it did not help to improve the energy efficiency of the economy

In Europe, official state level energy statistics are published with a one year delay so the 2009 comprehensive figures are not yet available. The global analysis refers to 2008 figures but whenever possible, a partial analysis of 2009, based on alternative or provisional data, is included.

European greenhouse gases emissions were reduced in unforeseen proportions

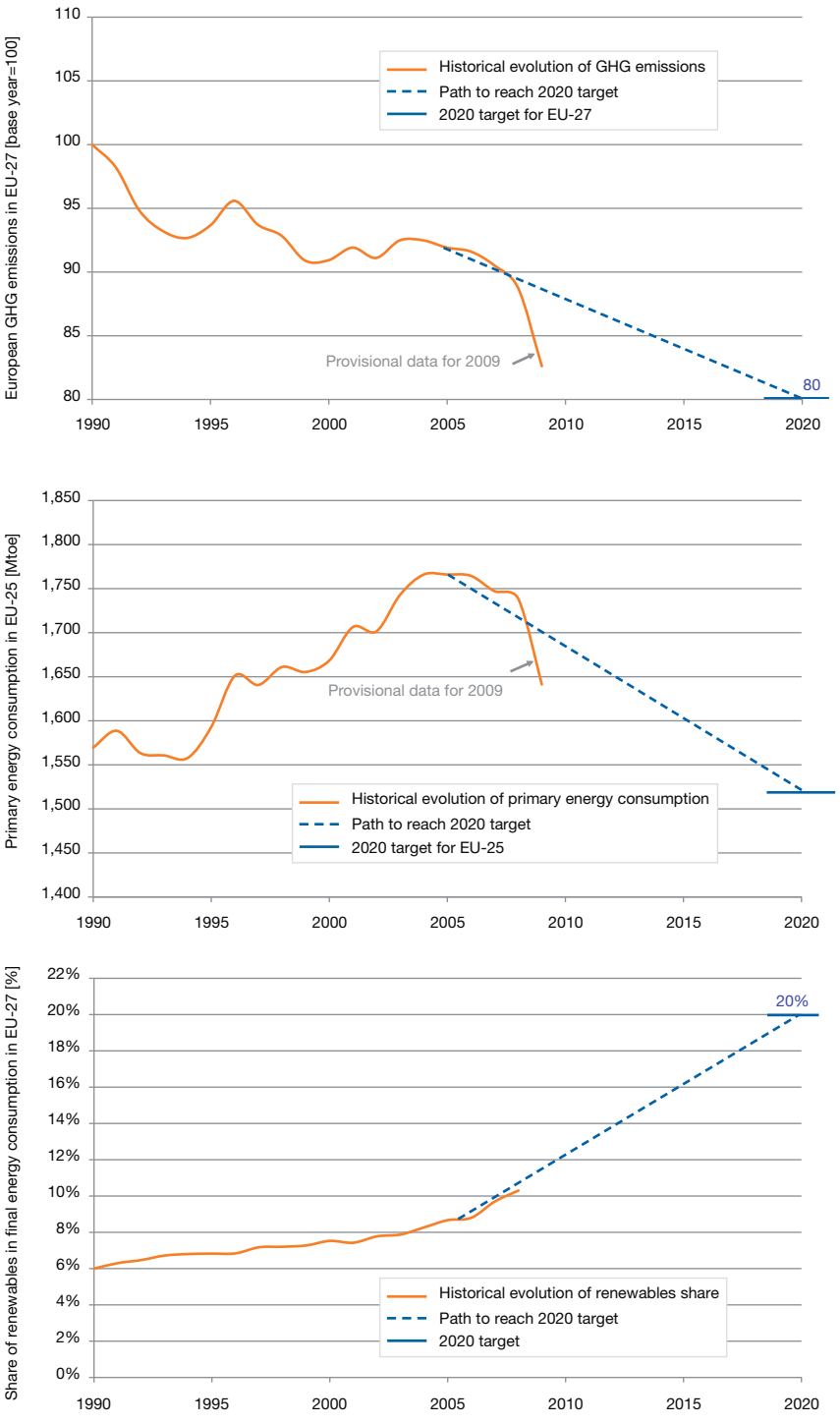
In 2008, greenhouse gases (GHG) emissions decreased by 2% in the EU-27. This followed an average annual decrease of 0.5% over the previous decade (see Tables 13.1). Almost all countries contributed to this decrease, especially Spain (-7.5%) and Finland (-10.2%). This brought the 2008 GHG emissions level to 11.3% below the 1990 reference year. This decrease was amplified in 2009, for which the European Environment Agency (EEA) reports provisional data of a 6.9% decrease for the EU-27 (i.e. 17.3% below the 1990 level), making the EU objective almost already achieved.

The economic crisis is the main reason for GHG emissions reductions in 2009 where there was a 4.2% European GDP decrease, after a slight increase (+0.7%) in 2008.

The Emissions Trading Scheme (ETS) sectors contributed the most, with an emissions drop by 11% in 2009, following a 3.7% decrease in 2008, while a 5.9% cut in quotas was observed, compared to the previous ETS phase.

For sure, the economic recession and the national legislations make the EU objective easier to reach. This is the reason why some countries, notably the UK, Germany and France, have called for a 30% emissions reduction objective. Due to the economic crisis, the financial increment to achieve such an objective is more affordable now than when the 20% target was set.

Tables 13.1 3x20 European Union climate change objectives (status as of 2009 with provisional data)



Source: Eurostat, EEA, BP statistical review of world energy 2010, European Commission – Capgemini analysis, EEMO12

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Key issues in Italy

In H1 2010, the government issued a law to increase competition in the gas sector, containing measures for:

- **The development of new gas storage infrastructures,** with up to 4 bcm of working gas; and
- **The possible implementation of new gas release programs** by Eni, comprising 4 bcm over two years.

Industrial customers and power plants operators are allowed to finance and make use of the development of this new storage capacity.

The electricity production from RES is growing (up to 69.3 TWh in 2009, a 19% increase compared to 2008) but the incentive system needs be reviewed. The level of Italian incentives is very high and increases significantly end consumers' energy bills. The regulator estimates that this increase will reach 20% by 2020.

In Italy, the renewable incentive scheme, except for photovoltaic (PV), is based on a market system of tradable certificates that represent additional revenues to those obtained from the sales of electricity on the wholesale market. The price level of the certificates has remained very high, at some €80/MWh, by virtue of an obligation of the GSE, the state owned body in charge, to buy back their excess at a regulated price. The government has proposed some corrective measures, like the cancellation of the GSE obligation.
In H1 2010, the government has started a process to cut by 10% the incentives for the PV technologies.

On July 1, 2010, two listed multi-utility companies, Iride and Enìa, completed their merger process to form IREN. This new multi-utility group, with revenues of €3.2 billion, is listed on the Italian stock exchange and is active in the Piedmont and Emilia regions. It sells more than 4.1 bcm of natural gas and more than 12 TWh of electricity.

As an opportunity to raise capital and restructure its debt, Enel started the IPO process for the listing of Enel Green Power (EGP), its renewable energy business (estimated value of between €3 and 4 billion). In 2009, EGP has produced 20.7 TWh of electricity from renewable plants, with an installed capacity of 5,700 MW.

Primary energy consumption dropped in similar proportions

In 2008, primary energy consumption decreased by 0.5% in the EU-27 and provisional data shows a 5.6% decrease in 2009[54] (see Tables 13.1).

Yet the crisis deteriorated the energy efficiency of the economy. The primary energy intensity is the amount of energy needed to generate €1,000 of GDP. It reflects the energy efficiency of the economy at a global level. This indicator improved slowly in 2008 and 2009: +1.6% in 2009[55], after a 1.2%[56] improvement in 2008. It is much less than what was observed between 2005 and 2007 (more than 3% annual improvement).

The share of renewable energy continued to grow

In 2008, the share of renewables in the final energy consumption reached 10.3% compared to 9.7% in 2007 (see Tables 13.1). This increase is mainly due to the greater biomass and biofuel consumption (+7%) as well as hydroelectricity (+5%) and wind (+16%). The share of renewable electricity produced in the EU-27 increased by 7.7% in 2008 (compared to 6.1% in 2007) to reach 16.7%. At this rate the EU is unlikely to reach its 2020 target on time.

Meanwhile, climate change continues as 2009 was one of the 10 warmest years globally since 1850[57].

The Copenhagen, Bonn and Tianjin failures give negotiators little hope for Cancun in December 2010

The economic crisis emphasized the difficulties in globally aligning countries' policies and ambitions on climate change. The climate negotiations meetings which took place in Bonn in August 2010 and in Tianjin early October 2010 did not succeed in overcoming the disappointing outcome of the Copenhagen meeting in 2009.

Indeed, the lack of a political drive during the 15th Conference of the Parties (COP-15) in Copenhagen and in particular the EU's failure to ascertain itself as a major political force led to a disappointing outcome. The Conference resulted in the so-called "Copenhagen agreement", a three-page political document that neither provides binding commitment for countries nor gives much visibility on the post-2012 context.

Some decisions have been made involving all major emitters but many uncertainties remain.

First, the level of allowed emissions by 2020 and 2050 is still unknown. The Parties agreed on the necessity to limit the increase in global temperature by at least 2°C compared to pre-industrial levels. This means that the 2050 worldwide emissions should be 80% below the 1990 levels. However, the Annex I[58] countries' cumulated propositions after Copenhagen will lead to a minimum reduction of only 13%[59] by 2020, which is far below the scientific expectations. Europe is keeping its 20% emissions reduction target by 2020 even if several Member States ask for higher commitments.

Second, the use of emission reduction credits (CERs / ERUs / other offsets[60]) is still uncertain after 2013. Participants to the COP-15 called for more simplified and transparent standard procedures for project mechanisms (CDM / JI projects[61]). But their future, and especially their value, is highly dependent on the countries' quantified commitments and on rules for the use of credits for compliance.

The Bonn negotiations began as the US had just delayed in July 2010 its energy and climate legislative process. After this meeting, experts remain pessimistic at having a conclusive result at the Cancun meeting in December 2010.

54 BP statistical report of world energy 2010

55 BP statistical report of world energy 2010

56 Eurostat

57 Climate Research Unit HadCRU3 and NASA GISS, through European Commission

58 Annex I countries include the industrialized countries that were members of the OECD (Organisation for Economic Co-operation and Development) in 1992, plus countries with economies in transition (the EIT Parties), including the Russian Federation, the Baltic States, and several Central and Eastern European States

59 Estimation made by CDC Climat Recherche

60 CER: Certified Emission Reduction; ERU: Emission Reduction Unit; See glossary for definitions

61 CDM: Clean Development Mechanism; JI: Joint Initiative; See glossary for definitions

Copenhagen: what's next?

C M S Bureau Francis Lefebvre

The Copenhagen Climate Conference should have led to the first new binding agreement since the Kyoto Protocol. Certainly, the heralded revolution did not occur in Copenhagen: **the Conference did neither provide such outcome, nor clearly pave the way for it.** Nevertheless, it was the first time that 128 Heads of State negotiated directly on climate issues. And **most countries have now published national commitments,** even if not always based upon figures: the US and Canada are committed to reducing their emissions by 17% in 2020 compared to 2005 (i.e. 4% compared to 1990), while China and India agree to decouple emissions of greenhouse gases in their growth curve.

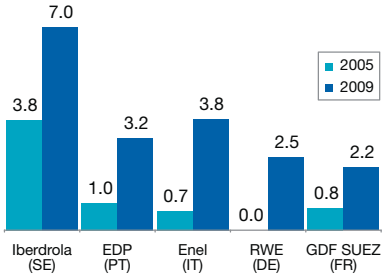
The Cancun summit may lead to more or even less significant advances, if not a form of conclusion. With the exception of deforestation, observers deem that, due to their global rivalry, the major protagonists (US, China, India, Brazil, EU) will not succeed in overcoming their differences and signing a more ambitious protocol than the Kyoto one, but that the Cancun summit could lead to a pragmatic extension of the Kyoto Protocol, maybe for one or two years provided that the debate upon the taxation of imports from "non-virtuous countries" is avoided.

The European Commission seems keen to propose a gradual approach: adopting an overall framework in Cancun, and a legally binding agreement at the next COP in South Africa (2011).

One of the major issues relates to the most vulnerable countries. **Developed countries agreed in Copenhagen on a promise of US$30 billion over three years** (2010, 2011 and 2012); **this assistance should be increased up to US$100 billion between 2010 and 2020.** The most vulnerable countries could have to face huge challenges, like the consequences of the elevation of the seas, whereas they are the least prepared and able to adapt to such a dramatic change. However, so far, only six EU countries – Denmark (€165 million), France and Germany (€1.26 billion each), the Netherlands (€310 million), Norway (€279 million) and the UK (€1.8 billion) – have detailed their pledges. A reiteration of this commitment in Cancun is not acquired yet. At most, there is no set calendar, and no defined framework. There is also the risk that donors will recycle portions of the already allocated aid.

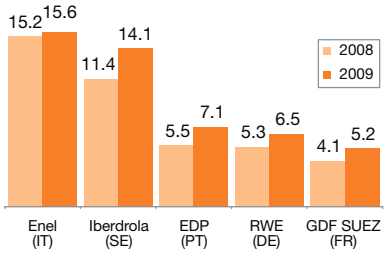
So, despite the European goodwill, the Cancun conference promises to be complex and its outcome remains unpredictable.

Top 5 - European players in terms of total RES installed capacity in GW



Source: Companies' annual reports – Capgemini analysis, EEMO12

Top 5 - European players in terms of total RES electricity generation in TWh



Source: Companies' annual reports – Capgemini analysis, EEMO12

The countdown has started as a legal international framework following the Kyoto Protocol is needed before the end of 2012.

The Parties of the Kyoto Protocol do not seem inclined to extend it post-2012 as they would prefer one general agreement encompassing all countries instead of three agreements (Kyoto Parties, Developing Countries, US).

It seems likely that one general agreement for all countries will not be reached by 2011 (UNFCCC[62] meeting in South Africa).

These next UNFCCC meetings will be decisive: climate, but also the future of carbon emissions trading, currently valued at US$143 billion[63], are at stake.

European leaders showed limited ambition on climate policies even if step-by-step technical progress has been made

Following the adoption of the Energy and Climate Package, the European Commission launched many consultations during two years to prepare its implementation.

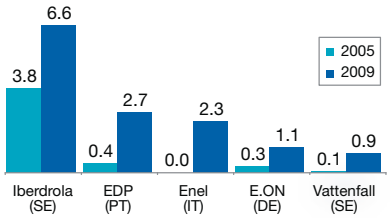
In this transition period, some important new decisions have been made:

- The total amount of allowances for Phase 3 (2013-2020) of the European Trading Scheme (ETS) has been set at 1,927 billion tCO_2eq for the original scope (sectors and gases), which is about 5% below the average annual cap compared to Phase 2 (2008-2012). This amount will be adjusted to take into account the changes in the ETS scope (i.e. inclusion of new sectors and other GHG after 2013 according to the 2009/29/EC Directive). As a result,

62 United Nations Framework Convention on Climate Change

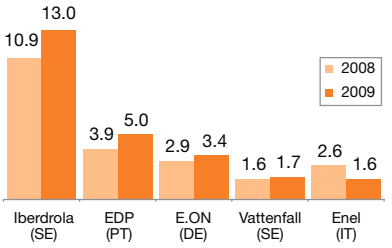
63 World Bank 2009 valuation

Top 5 - European players in terms of wind installed capacity in GW



Source: Companies' annual reports – Capgemini analysis, EEMO12

Top 5 - European players in terms of wind electricity generation in TWh



Source: Companies' annual reports – Capgemini analysis, EEMO12

the emissions cap is becoming more constraining for ETS sectors: it will reduce annually by 1.74% of the average annual total amount of allowances allocated during Phase 2, i.e. about 35 million tCO_2eq/year[64];

- 164 sectors have been identified at risk for carbon leakage of which steel, cement, chemicals and plastics. They represent 77% of emissions covered in the EU-ETS[65]. There is now a great deal of debates on defining the benchmark principles that will determine the amount of free allowances for these sectors;
- A draft regulation on emissions allowances auctioning was published in March 2010. The main issue relates to the creation of a single or multiple auction platforms. The text should be adopted before the end of 2010.

…while others have been delayed:

- On the renewables side, most countries missed the first milestone set by the Directive. To ensure that the goals are reached, each country had to draw up a national renewable energy action plan by June 2010. Only the Netherlands and Denmark produced it on time.

But the main concern is that the economic downturn has reinforced the EU's internal divisions on climate policies and future actions. It is one of the reasons why discussions on the introduction of a European carbon tax have been postponed.

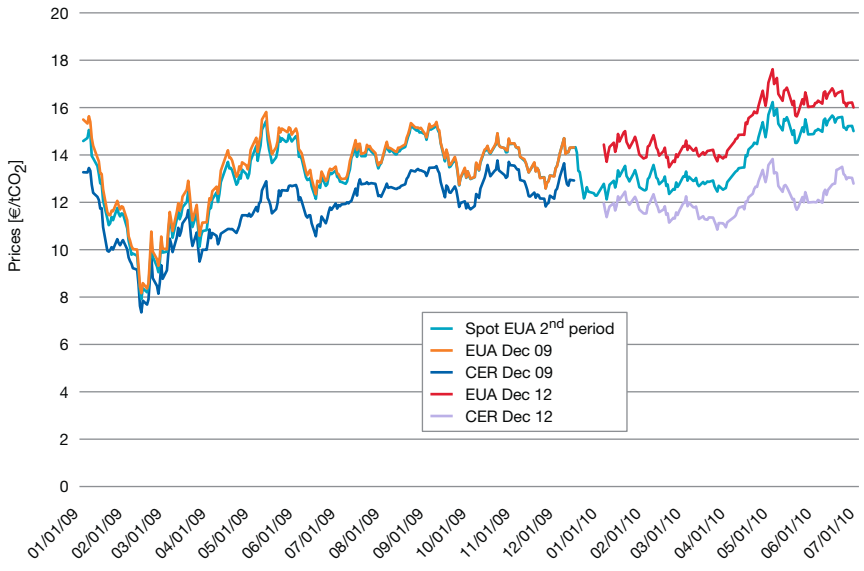
Negotiations are also stalled on the 30% emissions reduction target even if everyone agrees that it would now be cheaper to achieve than two years ago. Indeed, the absolute costs of meeting the 20% target have fallen from €70 to 48 billion per year by 2020[66] because of the accelerated drop in EU emissions in 2009.

The economic crisis and the lack of visibility on the post-2012 context also affected CO_2 markets by increasing exchanges and prices volatility

Lower emissions and need for liquidity led to record sales of CO_2 allowances on the ETS, resulting in a low average price of €13-14/EUA[67] in 2009 and 2010 (see Table 13.2).

The amount of allowances exceeded actual emissions of ETS sectors by 170 Mt in 2009. While 2008 ended with a shortage of about 163 Mt CO_2eq, all countries

Table 13.2 CO_2 prices (2009 and H1 2010)



Source: European Climate Exchange, BlueNext – Capgemini analysis, EEMO12

64 European Union press release, July 2010

65 Euractiv, July 2010

66 Communication from the EC on carbon leakage risks beyond 20%, May 2010

67 EUA: European Union Allowance. See Glossary for definition

were in a long position in 2009, except Denmark, Greece and Norway. The economic downturn brought a large drop in CO_2 emissions, which fell by 11% to 1,870 Mt compared to 2008. And 94% of the EUA demand came from thermal power plants that were relatively less sensitive to the crisis.

Most companies needed to raise cash to cope with the sudden decline in demand. The sale of CO_2 allowances appeared as a good opportunity. This is the main reason why EUA prices fell in February 2009, down to €8/t compared to €30/t nine months earlier. Since then, prices have stabilized around an average of €13-14/t.

Another consequence is that CO_2 volumes increased strongly in European markets in 2009. From February to July 2009, they exceeded 480 Mt per month, compared to 200 Mt on average the previous year.

Renewable markets showed a good resistance in 2009

The good resistance of cleantechs in 2008 compared to 2007 was pointed out in last year's edition of our Observatory, but with a warning for 2009/2010. The story repeats itself this year.

On the positive side, the 2010 report from UNEP RISO Bloomberg New Energy Finance[68] notes that in 2009 the investments in renewable and cleantech energy was US$162 billion worldwide, decreasing by only 7% compared to 2008, with a good resistance from Europe (-10%), a strong growth in Asia, especially in China (+53%) and lows in North America (-38%).

The first trends in H1 2010 confirms the clean energy sector resilience at global level, with US$65 billion investments worldwide, which is 25% up on H1 2009 and at the same level as H2 2009. Yet the growth comes from Asia and North America, while Europe sees a decrease due to less offshore wind deals.

Conversely to what was expected in last year's edition of our Observatory, merger and acquisitions activity remained at about the same level in 2009 compared to 2008 (-5 to -7%). This was due to fair resistance of the sector and the difficulties in raising money on the financial markets.

Renewables are surpassing other new power capacities

As a result of these strong figures, more capacities were developed in renewable energies than in any other classic power technology. They represented 62% of new capacities installed, up from 57% in 2008[69]. Wind power came first, with 9.6 GW installed in 2009, more than half of new renewable capacities, and a 15% increase in Europe. Amongst renewables, solar photovoltaic (PV) came second, with 5.5 GW (see Table 13.3). Among fossil fuels, it is interesting to mention that gas-fired capacities built were about three times as much as coal-fired ones, leading to a decarbonization trend of the electricity mix (see the Electricity Generation chapter).

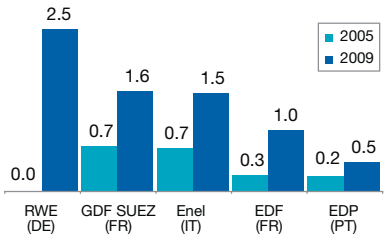
Wind keeps steady

The crisis has had little impact on the global wind energy market in 2009. Political support helped the industry grow. Long-term incentive systems have led investors to consider wind power to be a safe haven, therefore remaining unaffected by the global economic downturn. As a result, 37 GW of wind power were installed in the world in 2009 which is 10 GW more than in 2008.

Even though Europe remains in first place in terms of cumulated wind power capacity (almost 50% of the world's capacity), Asia has become the first market worldwide, with record numbers in China (13 GW installed in 2009, i.e. over a third of the global market).

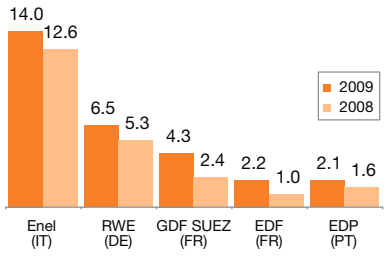
Europe defended its place thanks to new markets in Central Europe (Poland: 254 MW installed in one year, +56% in capacity). The offshore wind market increased: six new offshore farms were connected in 2009, leading to a total offshore capacity of almost 2 GW. Horns Rev 2-210 MW was inaugurated in Denmark by Dong Energy in September 2009 and was at that time the world's

Top 5 - European players in terms of other RES (than hydro and wind) installed capacity in GW



Source: Companies' annual reports – Capgemini analysis, EEMO12

Top 5 - European players in terms of other RES (than hydro and wind) electricity generation in TWh

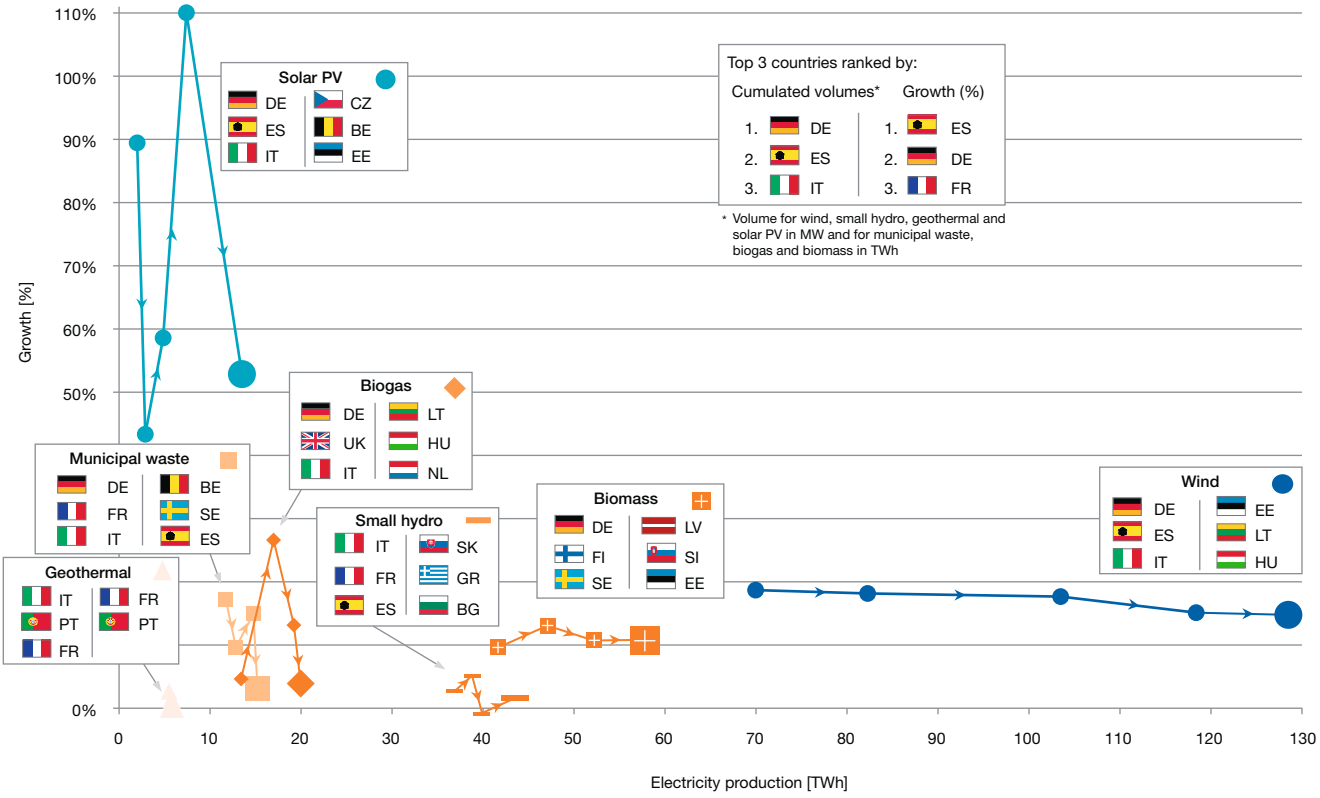


Source: Companies' annual reports – Capgemini analysis, EEMO12

68 "Global trends in sustainable energy investments 2010", UNEP, RISO, Bloomberg New Energy Finance, July 2010

69 "Renewable Energy Snapshot", European Commission, June 2010

Table 13.3 Growth rate of renewable energy sources (2005 to 2008 or 2009)



** From 2005 to 2008 for Waste, Biogas, Geothermal, Small hydro and Biomass and from 2005 to 2009 for Wind and Solar PV -- the latest year is represented by the biggest symbol*
Source: Eur'Observer barometers – Capgemini analysis, EEMO12

largest offshore wind farm. However, in September 2010, Vattenfall inaugurated Thanet, a 300 MW farm located on the coast of Kent, thus becoming the world's biggest offshore wind farm ever built.

Eurobserv'ER predicts a market growth of 15% in 2010 thanks to support policies, new markets in Poland and Romania, and their assessment of a continued boom of the offshore market. Offshore wind is developing especially in Denmark, which pursue high installation levels, and Germany where the capacity was multiplied by six in 2009 (from 12 MW to 72 MW) and new projects are due for 2010. The UK showed great offshore wind ambitions – Scotland alone represents one fourth of the total European offshore wind potential – but in October 2010, there was a rumor that the government would reduce its support to renewable energy sources.

Offshore wind plants are expensive to build so the sector could suffer from the current economic situation which prevents governments and investors to launch projects.

Solar photovoltaic (PV) grew again in 2009 despite the crisis, thanks to low prices and adjustments in supporting policies

The global PV market underwent a rollercoaster movement over the past five years and managed to grow significantly in 2009, with "only" a 17% increase worldwide (+7 GWp installed capacities, of which 5.5 GWp in the EU-27 i.e. a 53% increase) when it had nearly doubled in 2008.

Spain, which represented half of the world market in 2008, cut its feed-in tariffs in 2009, leading to a drastic slowdown of the global installation market (from 2,688 MWp in 2008 to 99 MWp in 2009)

and to a situation of overproduction of solar panels.

In parallel, new silicon production capacities were launched worldwide, which resulted in an 80% drop in the price of silicon in one year. Both situations had a positive impact on panel prices which dropped by 40% in 2009, thus allowing the market to mechanically rebound, resulting in a 7.5% increase in Europe, compared to 178% in 2008.

Europe is still the primary market for solar PV, with 3.8 GWp installed in Germany, i.e. +63% growth on 2008, 574 MWp in Italy (+125%), 411 MWp in the Czech Republic (+752%) or 292 MWp in Belgium (+412%).

In 2010, overproduction continues resulting in further cost reductions. A race for the connection of systems before July 1 took place in Germany as players were influenced by a rumor in the market in early 2010 of feed-in tariffs reductions (measures finally announced officially in May). New records are predicted in the Czech Republic (+1,150 MWp)[70], Italy (+1,000 MWp)[71] and France (+500 MWp)[72]. It is very likely that 2010 will be a very good year for the PV market.

In parallel, concentrated solar power capacity (CSP) tripled in Europe in 2009 (see Box on CSP).

All other renewables grew in 2008, but at much slower paces

The markets for solar thermal and biofuels slowed down because of the economic downturn. Solid biomass continues its regular growth (+2.3% primary energy production in 2008), mostly for electricity generation (+10.8%), as well as biogas (+4.4%) despite a stagnation of the main biogas market: Germany reached almost 50% of the primary biogas produced in Europe in 2008 thanks to feed-in tariffs which helped the development of small farm methanization plants.

The comeback of concentrating solar power (CSP)

CSP technology consists of using the heat from the sun as the primary energy to power a thermal power plant. A CSP plant is made of thousands of mirrors that concentrate the irradiation to vaporize a fluid which is then used to produce electricity in a classic turbine.

First developed in the 1970's, **the technology saw its first commercial plants in California in the 1980's.** However, its development slowed as a result of the bankruptcy in 1991 of its main developer, Luz Industries. **It then rebounded in the 2000's with feed-in tariffs being created in several European countries with Spain leading the way (2004), but also Italy more recently (2008).**

Still, CSP exhibits many advantages compared to its direct competitor, photovoltaic (PV) electricity:

- There is more stable output due to the inertia of the heated fluid and the control of its flow into the turbine;
- The possibility to store the thermal energy in order to offer greater flexibility and increase the number of operating hours of the plant, even during night time;
- The possibility to combine the plant with a fossil fuel such as gas in order to extend the working hours of the plant;
- The opportunity to use sea water as a cooling fluid, which produces desalinated water as a byproduct.

These arguments, together with current developments in storage technologies, make CSP an interesting choice for new solar electricity developments. According to both ESTELA and the IEA[a], **it could become cost competitive by 2020-2025.**

As a result, numerous projects have emerged: Spain has, after the US, the most important projects pipeline with 2.5 GW planned by 2015, due to an attractive incentive policy that has been in place since 2004, and appropriate weather conditions. Also, important projects are planned in desert areas such as California/Nevada (8 GW planned by 2015 in the US), or the Middle East North Africa region (0.8 GW). The latter are included in the Desertec Initiative (see Box on Desertec and Transgreen).

However, **the technology exhibits some key drawbacks** such as the need for large water quantities for cooling (but there are ongoing developments in dry-cooling technologies), the required high direct irradiance (DNI), high operation and maintenance costs, or the impossible integration to buildings.

Therefore, CSP and PV are and will remain complementary and with comparative cost levels. They will co-exist in the future to provide, according to the IEA, around 20% of the global electricity demand by 2050.

a) Thermal Electricity Association, "Solar Thermal Electricity 2025", June 2010
International Energy Agency, "CSP Technology roadmap", May 2010

70 Czech Republic Industry and Trade Administration

71 ENEA - Italian National agency for new technologies, Energy and sustainable economic development

72 EurObserv'ER

For 2010/2011 the threat of a "double-dip" crisis scenario remains, because of a possible credit crunch and potential governmental cuts on renewable incentive policies to reduce fiscal deficits

The sector faces fresh challenges in Europe, because governments are under pressure to cut deficits. What will be the impact on supporting policies such as feed-in tariffs or green certificates? New PV tariffs are in place in Germany since July 1, 2010. Spain announced in August 2010 that incentives for PV installations would be further slashed by up to 45%. The new UK government is looking for financial cuts. The French government reduced tariffs twice in 2010 and may be planning to apply a cap to 500 MW per year for large solar PV projects. The Spanish wind market may face a possible contraction due to more constraining registration procedures. European governments are squeezed between their need to reduce their fiscal deficit and their will to support the development of their "green industry".

Renewables are increasingly impacting the market mechanisms. Will it start a wave of opposition or a step of maturation?

Wind should increase spot prices for a short number of hours in the year but should bring them down during most of the time as a result of low marginal costs.

But the market mechanisms are starting to break down. Negative market prices were observed in Germany for the first time in 2009: during the weekend of October 3-4, a price of -€500/MWh was observed on EEX, the German power exchange. Too much electricity was generated, and large, poorly flexible plants (such as coal-fired ones) were still more expensive to stop and restart than to pay consumers to absorb the excess energy injected. This situation happened again several times in 2010.

Consequently, investors are starting to claim that such low spot prices threaten investments for the replacement of old fossil fuel plants with new ones, as financial returns are more uncertain. They have called for a re-examination of the renewables' policies.

Another impact of renewables is the intermittency of the load, which can lead to balancing difficulties and grid congestions due to the lack of proper grid management. In Italy, 10% of the wind energy produced in 2009 was not used due to grid congestions. These events call for clear rules to manage the markets and the grids. It also calls for increased demand response programs, which could answer both the lack and excess of peaking generation.

These barriers will have to be faced in order to progress towards the 20% European objective.

Demand response made only small progress in 2009 and 2010: existing tariffs do not provide the right signals, smart metering saw contrasted evolutions in Europe with only smart grid demonstrators gaining momentum

Demand response is necessary both through tariffs design and through smart metering

It is commonly agreed that price signals and/or technology (smart meters, smart homes) should help change consumption behaviors, even to a small extend:

- Consuming less at extreme peaks to save useless thermal capacities and grid developments;
- Adapting consumption patterns to match renewable intermittency;
- Consuming less all year long to reduce carbon emissions and energy imports.

In June 2010, a communication from Eurelectric[73] estimated that the error gaps between forecasts and wind actual availability would call for a flexibility need of about 10-15% one day ahead and 5% five hours ahead. On the European scale 200 GW of intermittent capacities by 2020-2030 would therefore require 20-30 GW of flexibility one day ahead and 10 GW of flexibility five hours ahead.

Demand response is one of the answers to such flexibility. Capgemini has estimated that the potential for demand flexibility could level up to 30 GW in a medium scenario and to 50 GW in a high scenario[74] in the EU-15.

73 "Integrating intermittent renewable sources into the EU electricity system", Gunnar Lundberg, Chairman of Eurelectric Markets Committee, VIII Florence Forum, June 11, 2010

74 "Demand Response, a decisive breakthrough for Europe", Capgemini, VaasaETT, Enerdata, 2008

2011/2012 will also see the first significant steps in electric mobility, with an industrial scale commercialization of electric cars in all regions and especially in Europe. Smart grids are also being implemented.

Yet, tariffs and smart technologies are making contrasted progress.

French regulated tariffs evolutions send wrong signals

Standard tariffs can provide good or bad signals with respect to sustainability. In France, the tariffs increases implemented in July 2009 and August 2010 are higher for clients choosing a low power subscription rather than a high one, and for clients consuming large amounts of electricity rather than small ones. This does not incentivize clients to use less peaking capacity. These tariffs were validated by the French regulator, although the regulator's advice[75] explicitly requires that future tariffs take more into account customer "virtuous behaviors" incentives.

However, France decided to launch capacity auctions, thus opening the way to flexibility aggregation, demand response, and electricity storage.

Smart metering: has Europe moved forward or backward?

Smart metering will give a boost to seasonal and hourly dynamic pricing. The EU is officially moving towards smart metering generalization, through a measure mentioned in the third legislative package, adopted in April 2009. This measure requires Member States to submit clear milestones and deadlines for smart metering introductions, with the aim of an 80% penetration by 2020 ***"pending a cost-assessment study"***. Contrasted situations are observed (see Box on the status of smart meters deployment) with some countries delaying their decision process while others are accelerating.

No decision concerning smart metering has been taken in Austria, Belgium (pilot results will determine national roll out), Germany and Portugal. In France, the project may be more substantially adapted than expected after the results of the pilot in 2010/2011. The Netherlands took a step back due to concerns raised among the population on the confidentiality of metering data. On the other hand, the UK, Spain and Greece now have objectives for the full implementation in 2020, 2019, 2013 respectively, although it is not clear how it will happen, especially in the UK.

Smart grids are increasingly getting out of the labs: significant budgets are devoted to live demonstrations

Smart grids (see Box on Smart Energy Services) are needed to integrate large amount of renewable sources and to provide further developments to demand response programs.

The development of smart grids is becoming a key priority that should be highlighted in the European Commission's new energy infrastructure package in November 2010.

Smart grids are a priority of the European 7th Framework Program (2007-2013), with almost €400 million budget, of which €126 million is to develop large scale demonstration projects.

Some of the most significant and recent demonstrator projects including renewable integration and/or demand response include:

The European Electricity Grid Initiative (EEGI), a nine-year research, development and demonstration program launched in June 2010 by the electricity TSOs, dedicating €1.4 billion of its total €2 billion budget to large scale demonstrations[76];

The EPRI[77] Smart Grid Demonstration Initiative, involving EDF and ESB Networks together with 19 other North-American participants. They are working to roll out 11 demonstration projects in the US, Canada, France and Ireland (as of August 2010)[78].

Key issues in Germany

In 2009/2010, the German energy market continued its development towards a more competitive and greener structure.

In order to reach the goals of the European directive on renewable energy in 2010, the discussion about the runtime of power plants as replacement for coal-fired plants reached its peak. Expertise from the German government gave its conclusions in September 2010 announcing the **extension of nuclear power plant runtimes of 12 years on average** while at the same time additional nuclear fuel taxation was announced. **A new Energy Concept for the period until 2050 has been adopted at the end of September 2010. The Concept encompasses all commodities as well as goals for renewables, energy efficiency and CO_2 emissions reduction.**

To comply with the European Commission directive to separate transmission from generation and in order to stop investigations by the EC DG Competition, **E.ON sold,** in November 2009, **its electricity grid to Tennet (Transpower). Vattenfall Europe** also **sold its grid** (50Hertz Transmission) **to a consortium of Elia and Industry Funds Management** in March 2010.

Transmission and distribution companies in Germany will face significant investments requirements (up to €40 billion until 2020) to build the required infrastructures **for bringing electricity produced by offshore wind plants to densely populated areas.**

With regards to regulation of gas sector, the government announced the ease of access to the gas distribution network by introducing additional regulation; it started by reducing the number of market areas from ten to six in 2009.

German retail companies are struggling with increased churn rates. The market share of incumbents remains above 90% mainly due to their "second brand strategy" (e.g. Yello of EnBW). The increasing roll-out of smart meters in pilot projects in 2009 still has not led to profitable energy tariffs for household clients.

The market environment is still driven by cost reductions through restructuring (e.g. RWE, E.ON) or by cooperation (e.g. Thüga) which remain key for Utilities.

75 Deliberation giving advice on new electricity regulated tariffs, CRE, August 11, 2010

76 "EEGI Roadmap 2010-18 and Detailed Implementation Plan 2010-12", ENTSOE and EDSO, May 2010

77 Electric Power Research Institute

78 "Smart grid demonstration initiative – Two year update", EPRI, August 2010

Energy efficiency is making inroads in the regulation and commercial space

National Energy Efficiency Action plans vary significantly from one Member State to another in terms of nature, level and depth of actions

The European 2006 action plan for energy efficiency[79] requires Member States to draw up National Energy Efficiency Action Plans (NEEAPs). At the end of 2007, all 27 countries had submitted their reports.

In June 2009, the European Commission published a synthesis[80] of its plans. It showed a wide range of measures adapted to the context of each single country. For example, Denmark concentrated on the residential sector (41-44% of the total) and transport (32-33%). In Germany, efforts were focused on improving the efficiency of coal-fired powers plants (40% of energy savings). Greece ("EXOIKONOMO" program) and the Netherlands have chosen to promote improvements with public awareness campaigns and various initiatives that target energy savings in municipal buildings and public areas. In Finland, the energy efficiency plan calls for major investments in buildings efficiency and could constitute more than 75% of all energy savings by 2016[81].

To further embed the energy saving policies, the European Commission is expected to present a new Energy Efficiency Action Plan by early 2011.

EU policy on energy efficiency is progressing for buildings standards and electrical appliances

On May 18, 2010 a rewriting of the directive on energy performance of buildings (2002/91/EC) was adopted. It requires that all new buildings must be nearly zero energy by 2021 and by 2019 for new buildings owned or leased by public authorities.

In May 2010, the European Parliament voted[82] to extend to all electrical appliances the 1992 directive on product labelling and information on energy consumption. The new Directive requires that regular reviews of product classification be conducted, and that tax credits are offered to industries manufacturing highly energy-efficient products.

In September 2009, the Eco-design requirements were also extended to all electrical appliances.

The white certificates schemes are progressively being confirmed in the European Utilities landscape

White certificates are schemes aiming at energy savings through obligations set on energy suppliers' or energy distributors.

In France, the first phase of white certificates ended in 2009 with a 65 TWh achievement for a target of 54 TWh. Public authorities decided to extend the mechanisms to retail, oil suppliers, public or tertiary private large energy consumers and transportation. The French government would like to multiply the objectives by five, to 345 TWh in three years and allow €2 billion of penalties. As of May 2010, 2,495 certificates were delivered to 540 grantees for 117 TWh, in line with the objectives.

In Italy, a new decree was issued in February 2009 confirming the scheme's extension until 2012. The Ministry of Environment said in January 2009 that the program had prevented approximately 2 Mt of carbon emissions per year.

Started in 2002, the UK initiative for energy efficiency[83] is now entering its third period. The Carbon Emissions Reduction Target (CERT) has just been extended to December 2012 with a higher target of 293 Mt of lifetime CO_2 savings (an additional 108 Mt CO_2 over the former target). It is expected that suppliers will need to invest around UK£5.6 billion on energy efficiency to meet this target.

In Poland, on November 10, 2009, the Council of Ministers adopted the Energy Policy until 2030. As a result, a white certificates system should be prepared by the Ministry of Economy.

79 Directive 2006/32/EC of the European Parliament and of the Council of April 5, 2006 on energy end-use efficiency and energy services and repealing Council Directive 93/76/EEC.

80 http://ec.europa.eu/energy/efficiency/doc/sec_2009_0889.pdf

81 Motiva Oy, 2007, Finland National Energy Efficiency Action Plan (NEEAP), July 13, 2008

82 Directive 2010/30/EU of the European Parliament and of the Council of May 19, 2010

83 UK Department of Energy and Climate Change - http://www.decc.gov.uk/

Finance and Valuation*

In this 12th edition of the European Energy Markets Observatory, a sample of 41 companies has been examined (see Table 14.1), which is down from 43 covered in last year's report, as two of the companies were acquired in 2009: Dutch Essent was bought by German RWE, and Nuon (also Dutch) was acquired by Swedish Vattenfall. The time period considered for this analysis is the full year of 2009.

For historical and regulatory reasons, the number and size of the players in the list differs substantially from one country to another. Some countries such as France, Belgium, Sweden, Finland and Italy have national champions, while in other countries such as Spain, Germany and the UK, the market is shared between several players. And in other countries the market is highly fragmented as is the case for Switzerland, the Netherlands, certain Nordic countries and most Eastern European countries.

Together the companies in this sample generated revenues of €610 billion in 2009, down 2.1% versus 2008. This was the first time revenues had dropped since this report was published seven years ago.

While all the companies in the sample belong to the Utilities sector, their business models are different and are categorized as follows:

- Electricity companies which accounted for approximately 55% of the market in terms of revenues;
- Gas companies which represented about 10% of the sample;
- Companies operating in both the gas and electricity markets (E.ON/Ruhrgas, GDF SUEZ and Gas Natural Fenosa) which accounted for 30% of our sample;
- Grid/network companies (electricity or gas) which accounted for 5% of the companies.

The electricity sector has seen its revenues increase slightly while revenues in the gas and network sectors have declined considerably

In 2009, gas companies' revenues were erratic, mainly because gas prices are indexed to oil prices in general. Gas companies' revenues were down 13% versus 2008 and the revenues of companies operating in both the gas and the electricity market fell by 4%.

Network companies offer better visibility, as their revenues are mostly a function of local regulators. Their 2009 revenues fell by more than 10% due to lower demand.

The 2009 revenues of pure electricity companies rose 2% in 2009, bolstered by the forward sales generated in previous years. This growth was underpinned by an increase in the average realized price (including forward sales) of about 5 to 7% (SG estimate), which was offset by a decrease in electricity demand.

Over the years 2004 to 2009 electricity companies saw their revenues increase significantly (see Table 14.2), rising 11% per year on average, while volumes rose by just 4% per year over the same period.

The stabilization of electricity companies' revenues versus volumes growth came from:

- The companies' ability to forward sell 2009 volumes. These forward sales led average realized sales prices to stabilize in 2009 despite price declines over the period (electricity base prices in the German EEX fell 41% on average in 2009 versus 2008 to reach €38.8/MWh). As a reminder, the EEX base price rose considerably in 2008, by 73% versus 2007.
- Sector consolidation, with the acquisition of small players and/or assets in an effort to mutualize resources over a larger region and to reach more customers.

* This chapter was written in collaboration with Société Générale Global Research

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Table 14.1 Companies on the panel and their main characteristics (2009)

€m	Country	Type	Sales 2009	Sales 2008	% ch. 09/08	EBITDA 09	EBITDA 08	% ch. 09/08
E.ON	DE	Elec/gas	81,817	86,753	-5.69%	13,526	13,385	1.05%
GDF SUEZ	FR	Elec/gas	79,908	83,053	-3.79%	14,012	13,886	0.91%
EDF	FR	Elec	66,336	64,279	3.20%	17,466	14,240	22.65%
Enel	IT	Elec	64,035	61,184	4.66%	16,044	14,318	12.05%
RWE	DE	Elec	47,741	47,500	0.51%	9,165	8,773	4.47%
Endesa	ES	Elec	25,692	22,836	12.51%	7,228	6,895	4.83%
Centrica	UK	Gas	24,772	29,106	-14.89%	2,360	3,504	-32.65%
Iberdrola	ES	Elec	24,559	25,196	-2.53%	6,815	6,412	6.29%
Scottish & Southern Energy	UK	Elec	24,307	20,804	16.84%	2,084	1,931	7.92%
Vattenfall	SE	Elec	19,840	17,589	12.80%	5,003	4,913	1.83%
GasTerra	NL	Gas	18,310	23,953	-23.56%	62	54	14.95%
National Grid	UK	Network	15,777	21,305	-25.95%	5,054	5,505	-8.19%
EnBW	DE	Elec	15,564	16,305	-4.55%	2,748	2,540	8.19%
Gas Natural Fenosa	ES	Elec/gas	14,879	13,544	9.86%	3,937	2,564	53.55%
EDP	PT	Elec	12,198	13,894	-12.21%	3,363	3,155	6.59%
Alpiq	CH	Elec	9,989	10,392	-3.88%	1,041	947	9.93%
Distrigas	BE	Gas	8,362	5,936	40.87%	602	399	50.85%
Dong	DK	Elec/gas	6,621	8,151	-18.77%	1,188	1,827	-34.98%
Fortum	FI	Elec	5,435	5,636	-3.57%	2,292	2,478	-7.51%
Eneco	BE	Elec/gas	5,245	4,943	6.11%	564	695	-18.85%
CEZ	CZ	Elec	4,518	7,275	-37.90%	2,498	3,493	-28.49%
RTE	FR	Network	4,130	4,221	-2.16%	1,211	1,349	-10.20%
Verbund	AT	Elec	3,843	3,745	2.63%	1,275	1,322	-3.56%
MVV Energie AG	DE	Elec	3,161	2,636	19.92%	385	486	-20.78%
Statkraft	NO	Elec	2,983	3,149	-5.27%	1,179	1,745	-32.44%
EVN	AT	Elec/gas	2,727	2,397	13.77%	373	362	3.06%
Eni Snam Rete Gas	IT	Network	2,438	1,902	28.18%	1,887	1,511	24.88%
Gasunie	NL	Network	1,669	1,506	10.82%	510	807	-36.85%
Drax Power	UK	Elec	1,665	2,390	-30.33%	254	619	-58.97%
GRTgaz	FR	Network	1,478	1,464	0.96%	727	733	-0.82%
Bord Gais	IE	Elec	1,349	1,379	-2.15%	320	299	7.13%
Terna	IT	Network	1,295	1,395	-7.15%	951	853	11.51%
Hafslund	NO	Elec	1,288	1,389	-7.27%	272	275	-1.09%
Energinet.dk	DK	Elec	1,233	1,118	10.29%	236	167	41.32%
Red Electrica	ES	Network	1,200	1,126	6.59%	810	780	3.82%
Enagas	ES	Network	882	846	4.29%	701	636	10.23%
Elia	BE	Network	771	724	6.53%	328	334	-1.86%
Fluxys	BE	Network	688	592	16.22%	382	312	22.56%
TenneT	NL	Network	547	460	18.75%	238	140	69.77%
Fingrid	FI	Network	359	382	-6.12%	115	127	-9.14%
Statnett	NO	Network	345	535	-35.51%	31	216	-85.65%
Total			**609,957**	**622,991**	**-2.09%**	**129,237**	**124,986**	**3.40%**

Source: SG Global Research, company data – Capgemini analysis, EEMO12

The average profitability of the companies' sample has increased at a greater pace than revenues, though to a far lesser degree than in 2008

The EBITDA rose 3.4% in 2009 versus 2008 (to be compared with +8.5% in 2008 versus 2007).

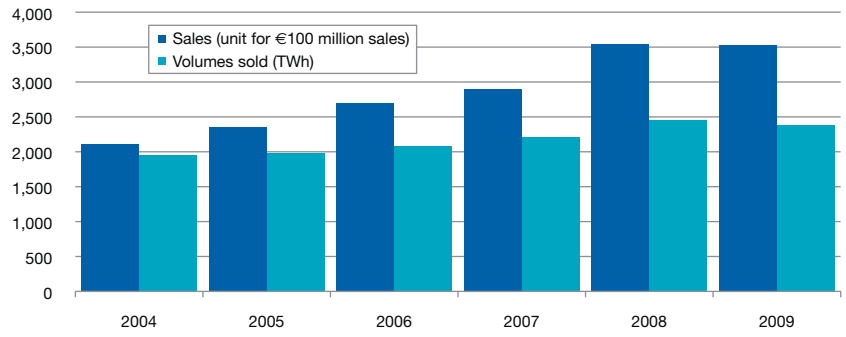
This slowdown was attributable to the economic crisis, although the companies in the sample experienced weaker margin erosion, with margins even rising by 1.7% to 20.8% (versus 19.1% last year, see Table 14.3). This is explained by:

- A stable cost structure (excluding commodities price fluctuation);
- Ongoing cost cutting plans, even though some of the gains generated enabled the companies to offer price reductions to customers in an attempt to increase customer loyalty.

The following is a list of the main companies that have implemented cost cutting plans which are likely to keep them resilient throughout the economic crisis:

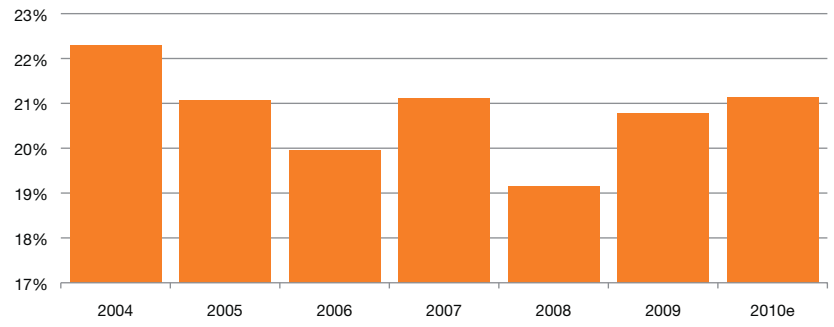
- RWE implemented a €1.2 billion plan called "Top Fit" with an end date of 2012 (so as to shave 3.5% off operating costs incurred in 2006, when the plan was announced);
- E.ON implemented a €1.5 billion plan called "Perform to Win" with an end date of 2011 (so as to shave 2% off 2008 operating costs);
- EDF implemented a €1 billion plan called "Operational Excellence" with an end date of 2010 (the aim is to shave 2.3% off 2007 operating costs);
- GDF SUEZ implemented a €1.8 billion plan called "Efficio" with an end date of 2011 (so as to shave 2.6% off 2008 operating costs);
- Enel implemented a €1.4 billion plan called "Zenith" with an end date of 2011 (the aim is to shave 3% off 2008 operating costs). Enel also plans to lower its Working Capital Requirements (WCR) by €1.3 billion by 2011 in addition to the €1.4 billion of cost reductions made through the Zenith plan;

Table 14.2 Evolution of electricity Utilities' revenues and volumes sold



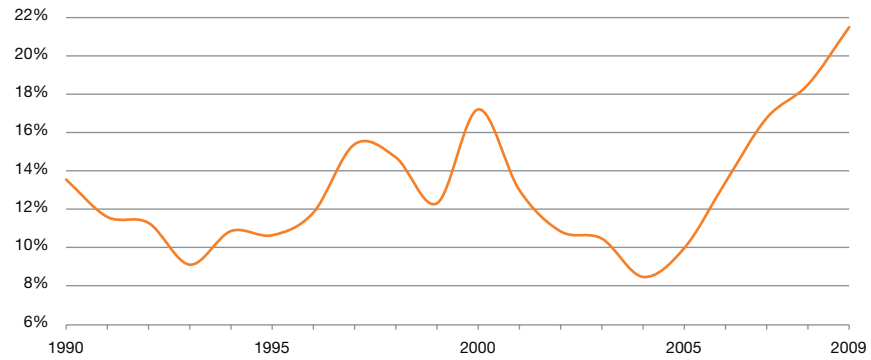
Source: SG Global Research, company data – Capgemini analysis, EEMO12

Table 14.3 EBITDA margin evolution (2004 to 2010e)



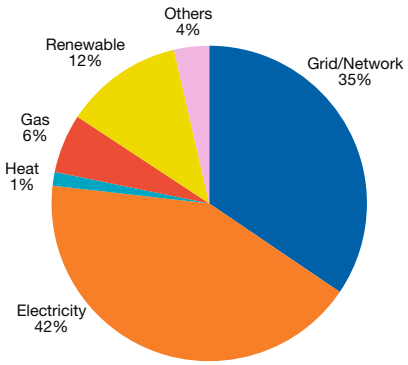
Source: SG Global Research, company data – Capgemini analysis, EEMO12

Table 14.4 CAPEX to revenues ratio (1990 to 2009)



Source: SG Global Research, company data – Capgemini analysis, EEMO12

Table 14.5 Breakdown of investments by segment (2009)



Source: SG Global Research, company data – Capgemini analysis, EEMO12

- Vattenfall announced in September 2010, a €650 million cost cutting plan over the next five years and a 18% cut in its investments plan over the same period.

Some cost cutting plans could be stepped up in the face of a greater than expected decrease in volumes in 2010.

Companies continued to invest massively in 2009 despite the crisis and these investments still primarily involve the electricity sector

In value terms, these investments represented approximately €132 billion versus €116 billion in 2008, or an increase of around 14%. A peak might have been reached in 2009 (see Table 14.4).

The investment programs that were launched in 2007 and 2008 continued in 2009 and seem hard to stop.

As with 2008, the power generation segment absorbed a significant share of the investments (43%), although the network segment absorbed a larger share in 2009 (35%) than in 2008 (24%) (see Table 14.5).

Mergers and Acquisitions activity slowed sharply in 2009

After the 2005 to mid-2008 period, mergers and acquisitions activity slowed down considerably in 2009, which for the most part, saw the finalization of transactions initiated in 2008:

- RWE acquired Essent for €7.3 billion;
- Snam Rete Gas acquired Stogit and Italgas for €4.5 billion;
- BG Group acquired Queensland Gas for €2.2 billion;
- Centrica acquired Venture and various North American assets for over €1.5 billion;
- EDF acquired British Energy for €13.5 billion;
- Enel acquired Endesa for €11.1 billion.

Companies have also managed their balance sheets by selling non-strategic assets:

- E.ON sold for over €12 billion in 2009 and early 2010 (LG&E in North America for €6.1 billion, Thüga for €2.9 billion, generation assets for about €2 billion, German network assets for €1.1 billion, and various stakes in German municipal companies);
- Gas Natural sold assets worth approximately €3.6 billion (Mexican electricity generation assets, points of contact on the distribution network in Spain and non-strategic assets which emerged during the new entity's refocusing);
- The sale by Vattenfall of German high-voltage networks in June 2010 to Elia;
- EDF, with the disposal of network assets in the UK for €6.8 billion;
- Planned disposal of RWE's gas network.

Last, some governments could sell a portion of their assets in order to get them through their financial difficulties:

- The Irish government is considering selling Bord Gáis and ESB so as to reduce the budget deficit;
- Portugal announced a program aimed to sell a portion of its stakes in various industries, including energy. The companies involved are Galp Energia, Energias de Portugal (EDP) and REN;
- The Polish government will sell 51% share of Enea in Q4 2010, for which it expects €1.5 billion. The deal has raised interest from EDF and GDF SUEZ as it represents an opportunity for future nuclear developments in the country;
- Greece currently intends to retain its stake in Hellenic Public Power Corporation (HPPC) but has expressed a desire to sell some of its holdings in the following sectors: railroads, real estate and water. In terms of the energy sector, the European Commission has asked Greece to sell about 40% of its stake in HPPC in a bid to open up the market.

Elsewhere, other mergers and acquisitions transactions could take place as opportunities arise, like the acquisition/merger of International Power by GDF SUEZ. The strategy is to consolidate the groups' global positions in power generation. Without ruling out these types of deals, there has not been much of a pick-up in mergers and acquisitions activity at this point of 2010 in Europe. While new transactions could take place, the real question is, will European companies be buyers or targets?

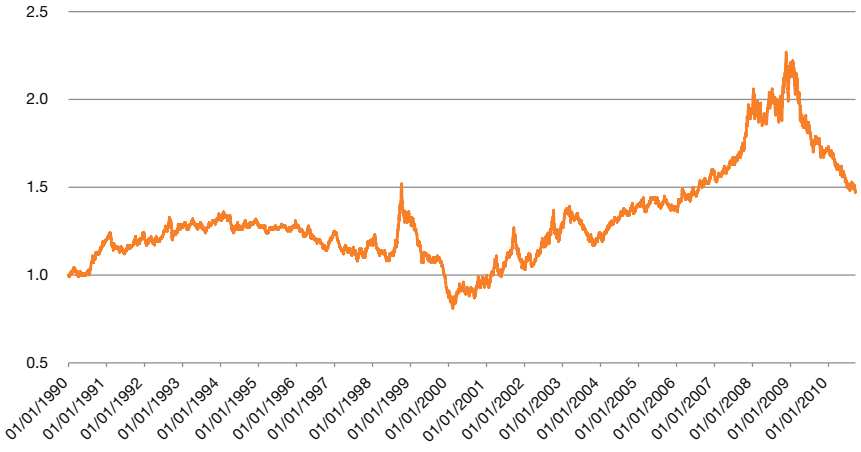
This is the second turbulent year for sector stocks

The Utilities sector's poor performance between January and August 2010 (-13%) erased all the gains made between 2005 and mid-2008 (see Table 14.6).

The sector has underperformed the rest of the market since early 2009 (see Tables 14.7 and 14.8).

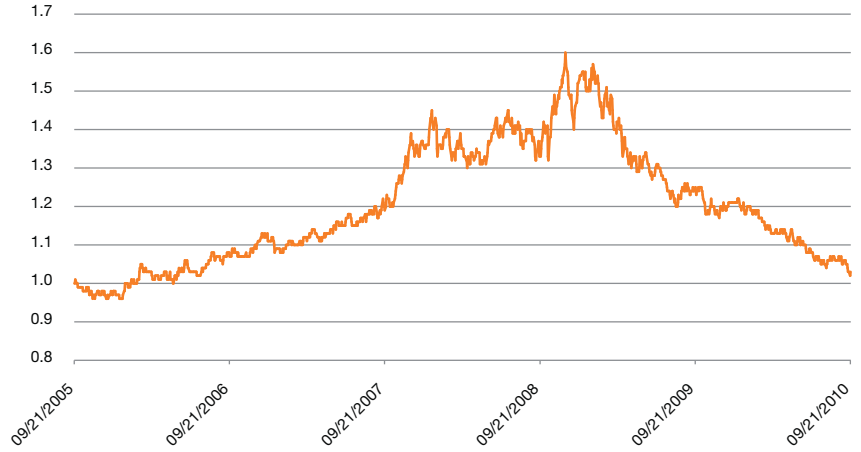
In looking more closely at the performance of companies operating mostly in the electricity sector (Enel, RWE, EDF, EDP, Iberdrola and Scottish & Southern Energy) and comparing them to those operating

Table 14.6 Utilities sector performance versus DJ Eurostoxx 50 (base 1 on January 1, 1990)



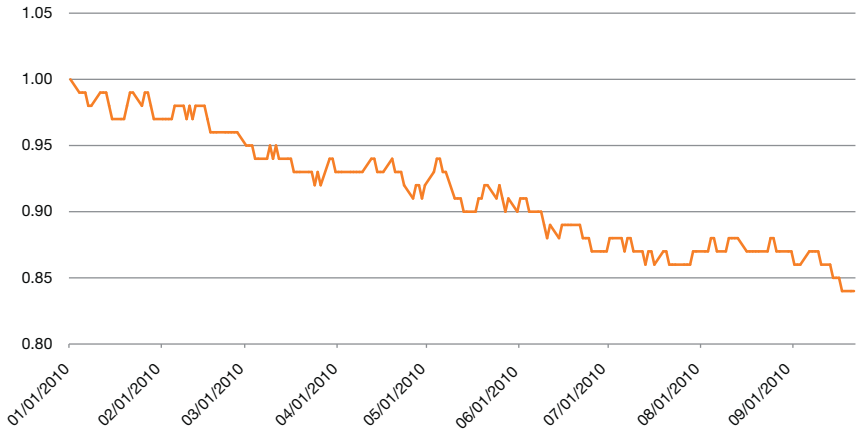
Source: SG Global Research, Datastream – Capgemini analysis, EEMO12

Table 14.7 5-year Utilities sector performance versus DJ Eurostoxx 50 (base 1 on September 1, 2005)



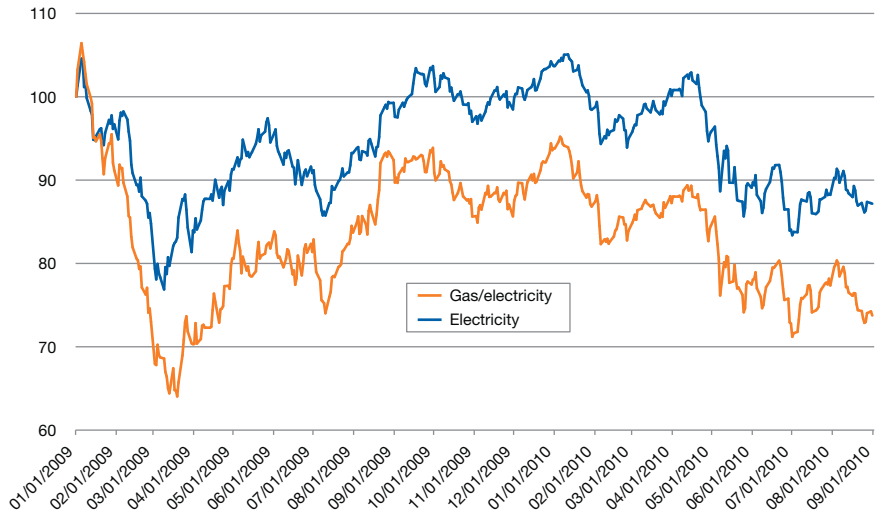
Source: SG Global Research, Datastream – Capgemini analysis, EEMO12

Table 14.8 Utilities sector performance versus DJ Eurostoxx 50, as of September 21, 2010 (base 1 on January 1, 2010)



Source: SG Global Research, Datastream – Capgemini analysis, EEMO12

Table 14.9 "Electricity" versus "gas" stocks, share performance (base 100 on January 1, 2009)



Source: SG Global Research, Datastream – Capgemini analysis, EEMO12

primarily in the gas sector (E.ON, GDF SUEZ and Gas Natural Fenosa), electricity companies appear to have performed better than gas companies since early 2009 (see Table 14.9).

The stronger decline in gas-dominated stocks is certainly due to the collapse of natural gas prices in early 2009, whereas electricity prices remained stable.

So, investors are wondering whether they should reinvest in the sector. But after the sharp growth experienced by the sector between 2000-2002 and mid-2008, investors appear to have lost their enthusiasm and are more skeptical for the following reasons:

- Concerns that new taxes will be imposed to finance budget deficits with a tax imposed on nuclear income in Germany and Belgium and the possibility of taxes on generation in the Nordic countries and/or Spain;
- Low electricity selling prices associated with weak electricity demand which made it hard to anticipate sales growth in certain countries in 2009;
- Commodity (coal and gas) prices remain relatively high;
- Uncertainty over trends in the price to pay for CO_2 emissions;
- Energy savings policies ('Grenelle II' being one such example), with lower subsidies allocated to renewable energy sources (especially wind and solar).

Investors' fears were replaced by the euphoric mergers and acquisitions mood of the 2005-2007 period, and then by the surge in the oil prices in 2008. Current market conditions no longer point to a return to such favorable conditions.

Elsewhere, challenges to energy legislation can bring instability and do not encourage investment in the sector. One noteworthy example of this is the Spanish government's decision in 2010 to restructure its regulatory energy framework.

Sector valuation holding steady

The sector's 12m P/E stands at about 10x, which is slightly lower than for US companies (see Table 14.10). The valuation of large Utilities is, therefore, relatively uniform.

The sector is not particularly attractive relative to the rest of the market (see Table 14.11). The sector's relative P/E (sector P/E / market P/E) is in line with the historical relative sector P/E (i.e. over 20 years) of 0.9x for Europe and 0.8x for the US.

The decrease in the sector valuation levels concerned all companies including lower valuation levels for network companies (Enagas, Snam Rete Gas, Red Electrica de Espana, Terna, Elia, REN and National Grid). The P/E of these stocks is 12x, while it was over 17x at the beginning of 2009 (see Table 14.12).

In conclusion, 2010 is experiencing a post-crisis stabilization ahead of 2011 when performance will depend on whether or not investors regain confidence

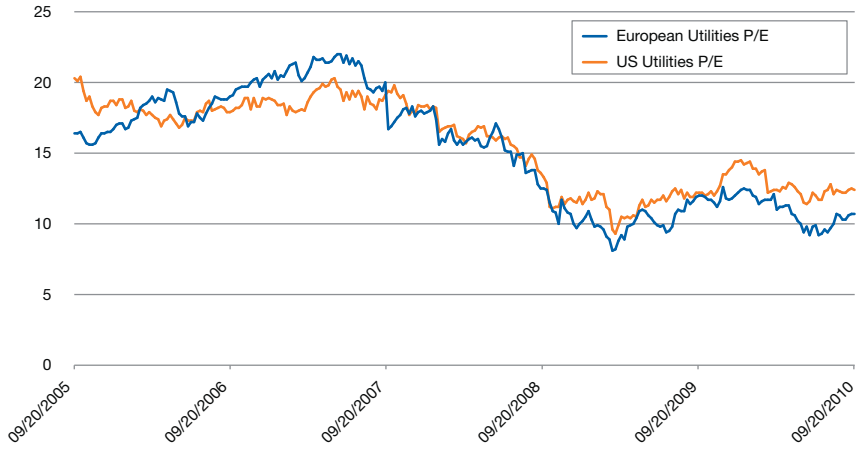
2010 appears to be a lackluster year with few positive concrete developments justifying higher valuation levels for the sector.

However, the beginning of the year saw a return to normal financing levels after the financial crisis (when 10-year yields were high, as were the risk premiums associated with them in 2009).

Utilities companies should see their debt levels stabilize in 2011. This happened in 2009, when net debt rose by only an estimated 5% (after doubling between 2005 and 2009).

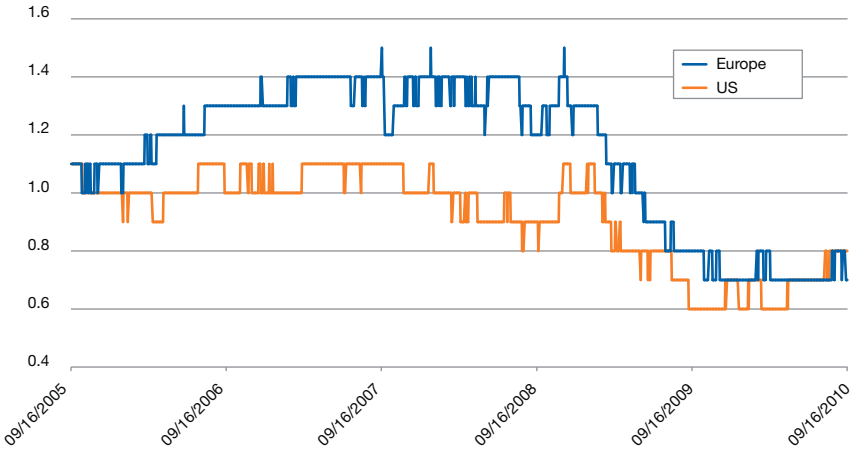
2011 could be a year of transition as long as investors do not let fear – justified or not, of new taxes and a liquidity crisis – take over. Investors could regain confidence but it remains to be seen when this might happen.

Table 14.10 Utilities sector P/E, Europe and US (5 years)



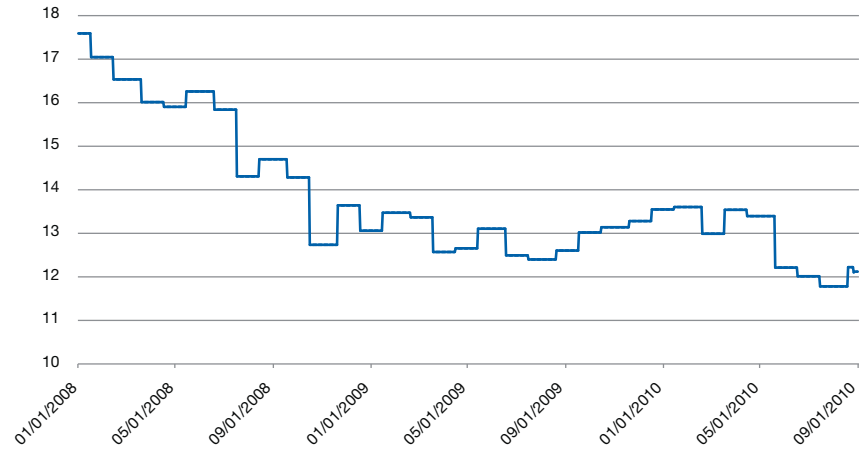
Source: SG Global Research, Datastream – Capgemini analysis, EEMO12

Table 14.11 Relative sector P/E, Europe and US (5 years)



Source: SG Global Research, Datastream – Capgemini analysis, EEMO12

Table 14.12 Average P/E for network companies



Source: SG Global Research, Datastream – Capgemini analysis, EEMO12

Glossary

ACER
Agency for the Cooperation of Energy Regulators, created under the EU Third Legislative Package, adopted in April 2009

AMI
Advanced Meter Infrastructure. AMI designates the set of advanced metering components and technical architecture that allow AMM operation

AMR
Automated Meter Reading. AMR is automated remote metering data collection. The device allows the uploading of information from the meter to the operator of the metering solution

AMM
Automated Meter Management. AMM is AMR plus complementary automated meter related services such as activation, change of authorised power, etc. The device allows two-way communication between the meter and the operator of the metering solution

Backwardation
See Contango

Base load
The minimum amount of electricity delivered or required over a given period, at a constant rate

Bilateral contracts
A contractual system between a buyer and a seller agreed directly without using a third party (exchanges, etc.)

Black Certificates
Exchangeable or tradable CO_2 allowances or quotas within the European Trading Scheme and Kyoto protocol (see EUA)

CAM
Capacity Allocation Mechanisms. Procedures or mechanisms to be applied for assigning gas storage capacity to requesting parties, as long as there is no congestion

CAPEX
Capital Expenditure, funds used by a company to acquire or upgrade physical assets

CCGT
Combined Cycle Gas Turbine (see Combined cycle power plant)

CCS
Carbon Capture and Storage. Technologies used for isolating carbon dioxide from flue gas (at combustion plants) and storing it. This means that a significantly lower amount of CO_2 is emitted into the atmosphere

CDM
Clean Development Mechanisms, a mechanism under the Kyoto Protocol through which developed countries may finance greenhouse-gas emission reduction or removal projects in developing countries, and receive credits for doing so which they may apply towards meeting mandatory limits on their own emissions

CEER
Council of the European Energy Regulators

CER
Certified Emission Reduction. Quotas issued for emission reductions from Clean Development Mechanism (CDM) project activities

Churn
See Switching

CHP
Combined Heat and Power (see Cogeneration)

Clean Coal
New technologies and processes allowing electricity generation from coal while lowering CO_2 emissions

Clean Dark Spread
The difference between electricity's spot market price and the cost of electricity produced with coal plus the price of related carbon dioxide allowances

Clean Spark Spread
The difference between electricity's spot market price and the cost of electricity produced with gas plus the price of related carbon dioxide allowances

Clearing
Administrative and financial settlement of a contract

Clearing house
Organisation in charge of clearing contracts on behalf of contractual parties. Generally a service offered by exchanges or banks

CMP
Congestion Management Procedures. In the event that demands exceeds capacity offers, congestion management procedures are needed to resolve the congestion and, in some cases, to make unused gas storage capacities available or (re-)allocate gas storage capacity to requesting parties.

Cogeneration
System of simultaneous generation of electricity and heat. The output from cogeneration plants is substantially better than it would be if they produced only electricity

Combined cycle power plant
Thermal power plant, usually running on gas-fired turbines, where electricity is generated at two consecutive levels: firstly by gas combustion in the turbines, and secondly by using energy from the product of the gas combustion process in boilers, which supply heat to steam turbo-generators.

This process provides high levels of thermal output (55 to 60%, compared with only 33 to 35% for conventional thermal power plants)

Contango
"Contango" means that long-term prices are more expensive than short-term prices, depicting a relaxed short-term market, whereas "backwardation" reveals more tension in the short-term reflected in higher short-term prices than in the long-term

Decentralised generation
Production of electricity near the point of use, irrespective of size and technology, capacity and energy sources

Demand response
Any program which communicates with the end-users regarding price changes in

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the energy market and encourages them to reduce or shift their consumption

DG Competition
European Union's Directorate General for Competition which role is to enforce the competition rules of the Community Treaties

DG TREN
European Union's Directorate General for Transport & Energy that develops EU policies in the energy and transport sectors

Distributed generation
Any technology that provides electricity closer to an end-user's site. It may involve a small on-site generating plant or fuel cell technology

DNO
Distribution Network Operator

EBIT
Earnings Before Interest and Taxes. EBIT may also be called operating income; i.e. the product of the company's industrial and commercial activities before its financing operations are taken into account. EBIT is a key ratio for gauging the financial performance of companies

EBITDA
Earnings Before Interest, Taxes, Depreciation and Amortization. EBITDA is a key ratio for gauging the cash flow of companies

EFET
European Federation of Energy Traders

Eligible customer
Electricity or gas consumer authorised to turn to one or more electricity or gas suppliers of his choice

ENTSO-E
European Network of Transmission System Operators for Electricity. ENTSO-E, the unique association of all European TSOs, was created at the end of 2008 and is operational since July 1, 2009. All former TSOs associations such as UCTE or ETSO are now part of ENTSO-E

ENTSO-G
European Network of Transmission System Operators for Gas. ENTSO-G was created at the end of 2009 and comprises 32 gas TSOs from 22 European countries

EPR
European Pressurized Reactor. Third generation of nuclear plant technology using advanced Pressurized Water Reactor (PWR)

ERGEG
European Regulators Group for Electricity and Gas

ERU
European Reduction Unit. A unit referring to the reduction of greenhouse gases, particularly under the Joint Implementation where it represents one ton of CO_2 reduced

ETS
Emissions Trading Scheme. An administrative approach used to control pollution by providing economic incentives for achieving reductions in the emissions of pollutants. The European Union Emissions Trading Scheme has been in operation since January 1, 2005

EUA
European Union Allowances. Quotas allocated by the National Allocation Plans in compliance with the European Trading Scheme

Eurelectric
Professional association which represents the common interests of the Electricity industry at pan-European level

European Commission (EC)
A governing body of the European Union that oversees the organization's treaties, recommends actions under the treaties, and issues independent decisions on EU matters

European Council
A body formed when the heads of state or government of European Union member states meet. Held at least twice a year, these meetings determine the major guidelines for the EU's future development

European Parliament (EP)
The assembly of the representatives of the Union citizens

EWEA
European Wind Energy Association

Forwards
A standard contract agreement for delivery of a given quantity at a given price, for a given maturity (OTC markets)

Futures
A standard contract agreement for delivery of a given quantity at a given price, for a given maturity (organized exchanges).

The maturities may differ across power exchanges (weekly, half-yearly, quarterly, monthly, annually).

Maturity Y+1 corresponds to the calendar year after the current year.

Gas release
A program to introduce competition on the market. Players release on the market a certain amount of gas for other players through call for tenders or bilateral negotiations

GECF
Gas Exporting Countries Forum. GECF is a gathering some of the world's leading gas producers

GIE
Gas Infrastructure Europe. GIE is the association representing gas transmission companies (GTE), storage system operators (GSE) and LNG terminal operators (GLE) in Europe

Green Certificates
A Guarantee of Origin certificate associated with renewable targets fixed by national governments. Green Certificates are often tradable

Greenhouse effect
The warming of the atmosphere caused by the build up of 'greenhouse' gases, which allow sunlight to heat the earth while absorbing the infrared radiation returning to space, preventing the heat from escaping. Excessive human emissions including

carbon dioxide, methane and other gases contribute to climate change

GSOO
Europe's Gas Storage Operators' Organisation

Guarantee of Origin
A certificate stating a volume of electricity that was generated from renewable sources. In this way the quality of the electricity is decoupled from the actual physical volume. It can be used within feed in tariffs or Green Certificate systems

HHI
Herfindahl-Hirschman Index, a commonly accepted measure of market concentration. It is calculated by squaring the market share of each firm competing in a market, and then summing the resulting numbers. The HHI number can range from close to zero to 10,000

Hub (gas)
Physical or virtual entry/exit points for natural Gas

Hub (retail)
Inter Company Data Exchange platform primarily enabling Suppliers and Distribution companies to exchange client related data and making supplier's switching more reliable

IFIEC
International Federation of Industrial Energy Consumers

Installed capacity
The installed capacity represents the maximum potential net generating capacity of electric utility companies and auto-producers in the countries concerned

IPCC
Intergovernmental Panel on Climate Change, the leading body for the assessment of climate change, established by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) to provide a clear scientific view on the current state of climate change and its potential environmental and socio-economic consequences

JI
Joint Implementation, a mechanism under the Kyoto Protocol allowing industrialised countries with a greenhouse gas reduction commitment to invest in emission reducing projects in another industrialised country as an alternative to emission reductions in their own countries

Kyoto Protocol
The United Nations regulatory frame for greenhouse gases management, adopted in December 1997. It entered into force in February 2005 and ends in 2012. It encompasses 6 greenhouse gases: CO_2, CH_4, N_2O, HFC, PFC, SF_6

LNG
Liquefied Natural Gas. Natural gas that has been subjected to high pressure and very low temperatures and stored in a liquid state. It is returned to a gaseous state by the reverse process and is mainly used as a peaking fuel.

Load balancing
Maintaining system integrity through measures which equalize pipeline (shipper) receipt volumes with delivery volumes during periods of high system usage. Withdrawal and injection operations into underground storage facilities are often used to balance load on a short term basis

Load factor
Ratio of average daily deliveries to peak-day deliveries over a given time period

Market coupling/Market splitting
Market coupling links together separate markets in a region, whereas market splitting divides a regional market into prices zones. Market coupling minimises prices differences and makes them converging wherever transmission capacity is sufficient. Cross-border market coupling also drives better use of interconnection capacity

Metering
Measurement of the various characteristics of electricity or gas in order to determine the amount of energy produced or consumed

NAP
National Allocation Plan. List of selected industrial and power installations with their specific emissions allowance

Nomination
A request for a physical quantity of gas under a specific purchase or transportation agreement

NTC
Net Transfer Capacity. NTC is the expected maximal electrical generation power that can be transported through the tie lines of two systems without any bottlenecks appearing in any system

Off-peak
Off-peak energy is the electric energy supplied during periods of relatively low system demands as specified by the supplier

On-peak
On-peak energy is electric energy supplied during periods of relatively high system demand as specified by the supplier

OPEC
Organization of the Petroleum Exporting Countries

Open season
A period (often 1 month) when a pipeline operator accepts offering bids from shippers and others for potential new transportation capacity. Bidders may or may not have to provide "earnest" money, depending upon the type of open season. If enough interest is shown in the announced new capacity, the pipeline operator will refine the proposal and prepare an application for construction before the appropriate regulatory body for approval

OPEX
Operational Expenditure, expenditures that a business incurs as a result of performing its normal business operations

OTC
Over The Counter (see bilateral contracts)

Oxyfuel combustion
Process to eliminate nitrogen from the flue gas by combusting the fuel in a mixture of oxygen and recycled flue gases. After combustion, the flue gas is cleaned. The cleaned flue gas primarily consists of CO_2 and water vapour. By cooling the flue gas, the water vapour condenses thereby creating an almost pure CO_2 stream. The CO_2 can be compressed, dried and further purified before being transported to a storage site

P/E
Price / Earning ratio. The ratio of the share price to the Earning per share (EPS). P/E ratio is one of the tools most commonly used for valuing a company share

Peak load
The highest electrical level of demand within a particular period of time

Peak shaving
Reduction of peak demand for natural gas or electricity

Post combustion
In post combustion capture, CO_2 is captured from the flue gases in a «scrubber» using an absorption process based on chemical solvents, like amines. On leaving the «scrubber» the solvent can be reused. The captured CO_2 can be transported to a storage site

Pre combustion
Pre combustion CO_2 capture involves removing all or part of the carbon content of a fuel before burning it. The fuel is processed to produce a gas stream that primarily consists of CO_2 and hydrogen. The CO_2 is then captured for storage and the hydrogen is combusted

Real margin at peak load
This value is obtained by deducting the system services reserve, outages, overhauls and non usable capacity from the installed capacity and is compared with the peak load. Yearly values are an average of monthly real margin at peak load

RES
Renewable Energy Sources. Energy (electricity or heat) produced using wind, sun, wood, biomass, hydro and geothermal. Their exploitation generates little or no waste or pollutant emissions

RPI-X
An approach to regulating prices under which the regulated company is allowed to adjust its own prices subject to the weighted average of prices not exceeding a cap. In the RPI-X price cap system this cap is allowed to increase at the rate of inflation (RPI) less some «X factor» to account for productivity gains or to reduce the regulated firm's rents

Shippers
The party who contracts with a pipeline operator for transportation service. A shipper has the obligation to confirm that the volume of gas delivered to the transporter is consistent with nominations. The shipper is obligated to confirm that differences between the volume delivered in the pipeline and the volume delivered by the pipeline back to the shipper is brought into balance as quickly as possible

Spot contract
Short-term contract, generally a day ahead

SSO
Storage System Operator

Switching
Free (by choice) movement of a customer from one supplier to another

Take-or-pay contract
Contract whereby the agreed consumption has to be paid for, irrespective of whether the consumption has actually taken place

Theoretical capacity margin
This value is obtained by deducting the peak load from the installed capacity

TPA
Third Party Access. Recognised right of each user (eligible customer, distributor, and producer) to access in a non-discriminatory and efficient manner transmission or distribution systems in exchange for payment of access rights

TPSA
Third Party Storage Access

TSO
Transmission System Operator (High Voltage transmission network)

UCTE
Union for the Co-ordination of Transmission of Electricity. Former European organisation of network coordination gathering network operators, now part of ENTSO-E

UGS
Underground Gas Storage

Unbundling
Separation of roles according to the value chain segment (generation, transmission, distribution, retail) required by European Directives for enabling fair competition rules

UNEP
United Nations Environment Program

VPP
Virtual Power Plant, fictional production capacity, non-designated, sold to an operator through auctions and used to withdraw on demand energy at a previously set price from a generator

White Certificate
A certificate stating a volume of engaged energy savings (electricity, gas, fuel, …) at end-users' site, like a home or a business. They are tradable or not

Country Abbreviations and Energy Authorities

Countries	Abbreviation	Regulators	Ministries or authorities for energy-related topics
Austria	AT	E-Control	Ministry of Economic Affairs: www.bmwa.gv.at/ Environment Agency: www.umweltbundesamt.at/ Competition Authority: http://www.bwb.gv.at/
Belgium	BE	CREG (national) BRUGEL (Brussels) CWAPE (Walloon) VREG (Flanders)	Ministry of Economic Affairs: http://economie.fgov.be/en/
Bulgaria	BG	DKER	Ministry of Economy and Energy: www.mi.government.bg/
Czech Republic	CZ	ERU	Ministry of Industry and Trade: www.mpo.cz/ Competition Office: www.compet.cz/
Denmark	DK	DERA NordREG	Energy Agency: www.ens.dk/ Ministry of Economic and Business Affairs: www.oem.dk/ Ministry of Environment: www.mim.dk/
Estonia	EE	ETI	Ministry of Economic Affairs: www.mkm.ee/ Competition Authority: www.konkurentsiamet.ee/
Finland	FI	EMV NordREG	Ministry of Employment and the Economy: www.tem.fi/ Ministry of Environment: www.ymparisto.fi/ Competition Authority: www.kilpailuvirasto.fi/
France	FR	CRE	Ministry of Energy: www.developpement-durable.gouv.fr/ Ministry of Economics, Finance and Employment: www.minefe.gouv.fr/
Germany	DE	BNetzA	Federal Environment Ministry: www.bmu.de/ Energy Agency: www.dena.de/ Competition Authority: www.bundeskartellamt.de/
Greece	GR	RAE	Ministry of Development: www.ypan.gr/ Ministry of Environment: www.minenv.gr/ Competition Commission: www.epant.gr/
Hungary	HU	MEH	Ministry of Transport, Telecommunication and Energy: www.khem.gov.hu/
Ireland	IE	CER (Republic of Ireland) NIAUR (Northern Ireland)	Department of Communications, Energy & Natural Resources: www.dcenr.gov.ie/Energy/
Italy	IT	AEEG	Ministry of Environment: www.minambiente.it/ Ministry of Economic Development: www.sviluppoeconomico.gov.it/ Competition Authority: www.agcm.it/
Latvia	LV	VEI	Ministry of Economy: www.em.gov.lv/ Competition Council: www.kp.gov.lv/
Lithuania	LT	REGULA	Ministry of Economy: www.ukmin.lt/
Luxemburg	LU	ILR	Ministry of Economic Affairs: www.eco.public.lu/ State's energy service: www.ilnas.public.lu/
Netherlands	NL	DTe	Ministry of Economic Affairs: www.rijksoverheid.nl/ Energy Council: www.algemene-energieraad.nl/ Competition Authority: www.nmanet.nl/
Norway	NO	NVE NordREG	Oil and Energy Ministry: www.regjeringen.no/ Competition Authority: www.konkurransetilsynet.no/
Poland	PL	URE	Ministry of Economy: www.mg.gov.pl/
Portugal	PT	ERSE	Ministry of Economics: www.min-economia.pt/ Directorate General for Energy and Geology: www.dgge.pt/
Romania	RO	ANRE	Ministry of Energy and Resources: www.minind.ro/
Slovakia	SK	URSO	Ministry of Economy: www.economy.gov.sk/ Ministry of Environment: www.enviro.gov.sk/
Slovenia	SI	AGEN	Ministry of Environment and Energy: www.mop.gov.si/
Spain	ES	CNE	Ministry of Industry: www.mityc.es/ Ministry of Environment: www.marm.es/ Competition Authority: www.cncompetencia.es/
Sweden	SE	EMI NordREG	Ministry of Energy: www.regeringen.se/ Competition Authority: www.kkv.se/
Switzerland	CH	BFE	Federal Department of Environment, Transport, Energy and Communications: www.uvek.admin.ch/ Competition Authority: www.weko.admin.ch/
United Kingdom	UK	OFGEM	Department of Energy and Climate Change: www.decc.gov.uk/ Competition Authority: www.competition-commission.gov.uk/

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