EUROPEAN pathways

jointly with

NEPP north european power perspectives

Results

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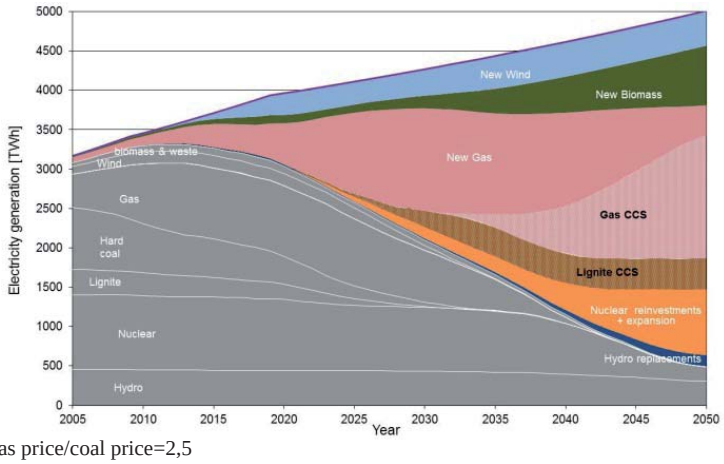
Abundance of natural gas
- increased supply of shale gas

The market for natural gas has recently seen a significant price reduction, most explained by additional supply of unconventionally extracted natural gas (shale gas). An example of this is that the USA no longer needs to import natural gas. A de-coupling from the oil price has also been seen. This can contribute in a positive direction with respect to meeting European CO_2-emission targets for 2020 and onwards. Assuming a ratio between gas price and coal price of 2,5 or lower, the analyses indicate a massive European expansion of gas power with CCS, instead of coal power with CCS which is seen at higher price ratios. However, this development is also linked to several other macro economic factors. An expansion of gas based power generation would result in a doubling of natural gas import. For utilities, lower gas prices will probably, in the short time range, result in an ambition to keep existing power plants, "low risk investments" in gas power and renewable power supported by subsidies. The question is to what extent the system can rely on gas as a major player in the power supply when proposed European (EU) climate targets more or less prescribes a carbon neutral power system by mid-century. This question is closely linked to the development of CCS - technologies, storage infrastructure and public acceptance.

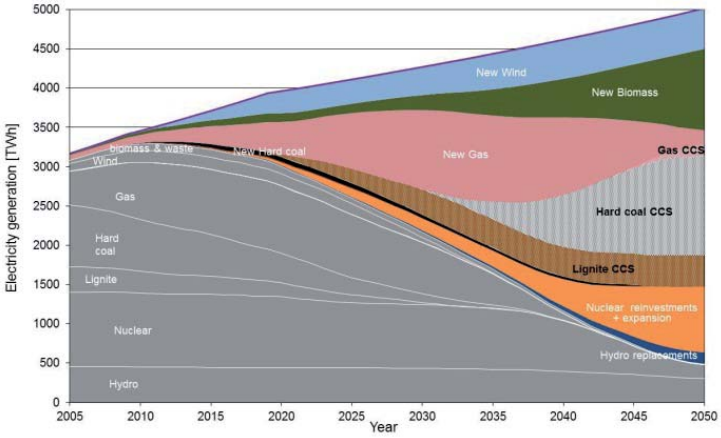
This work reflects a "Storyline" exploring the development of the European electricity generation system over the next decades characterized by good prospects for future supply of natural gas. The origin of the investigation lies in the topical issue of shale gas as a new and substantial contributor to the gas market. At the same time initial cost for CCS (or other barriers) has increased, which obviously puts more pressure on the power sector when it comes to meeting emission reduction targets for 2020 and onwards. This study relates to the Policy and Market scenarios as described in the Pathways report (Part 1), yet here with the change applying a fixed gas to coal price ratio of 2, 2.5 and 3.

Implications of shale gas – CCGT vs CCS

The analysis shows that in the eventuality of a decreased gas price relative coal during a long period of time, naturally drives the competitiveness of gas in a positive direction (see Figure 1). This is especially prominent in a carbon constrained world where a price on carbon acts with leverage advantageous for gas technologies (higher efficiency and lower carbon intensity in gas than in coal). Thus, considering the midterm perspective, a low natural gas price could provide a cost efficient bridge to meet targets by 2020 with the aid of fuel shifting from coal to low cost gas. In addition, the updated costs for CCS amplify the role of such fuel shift. In the longer perspective it is noteworthy from the analyses that under these conditions also gas CCS should play an important role, i.e., with a gas to coal price ratio below about 2.5 gas CCS outcompetes coal CCS.



Gas price/coal price=2,5



Gas price/coal price=3

Figure 1. Development of the European electricity generation system as given in the original Pathways project, here used as reference scenarios. The Figure shows the Market scenario under influence of a reduced gas price by fixing the gas price relative the coal price by the factors 2.5 and 3.

Gas consumption potentially rising from 130 bcm in 2009 to 445 bcm in 2050

Figure 1 shows resulting gas consumption up to 2050 in six modeled scenarios, Market (blue) and Policy (red) with a gas-to-coal price ratio (GCR) of 2.0, 2.5 and 3.0 along with four projections up to 2030 from IEA WEO 2010 and 2011 (green), namely the 2010 New and Current Policy scenarios (NPS and CPS respectively) and 450 ppm scenario as well as the 2011 Gas scenario. Also shown is past consumption and the projection up to 2030 in the EE&TT 2009 study (black).

As can be seen from Figure 2, only the Market 2.0 and 2.5 scenarios lead to a substantial increase in gas consumption. The Market 2.0 scenario implies more than a doubling from current levels by 2021 and more than a tripling by 2050. Between 2020 and 2027 when the growth is most intense consumption increases at an average annual rate of almost 9%. Six countries account for almost 80% of total gas consumption in the power sector in 2050; Italy, Germany, UK, Luxembourg, Hungary and the Netherlands. Most remarkable is the consumption level reached in Luxembourg, up from less than 1 bcm in 2008 to a peak of almost 48 bcm in 2050 requiring almost 40 GWe gas based capacity (as opposed to 0.4 GWe being on-line in 2008). Between 2009 and 2027, gas based capacity in EU (plus Norway) increases from 219 GWe to 470 GWe indicating an average annual net addition of 14 GWe. This should not however represent a problem, for instance 15 GWe gas based capacity was installed in 2005 while some 13 GWe was installed both in 2004 and 2010. The Market 2.5 scenario ends up with a consumption level in 2030 relatively equal to IEA's projections in the CPS although consumption level up to 2030 is considerably higher than IEA's projections in the CPS.

Analyzing the results with respect to natural gas

The analysis of the results with respect to natural gas will concentrate on the results obtained in the Market 2.0 scenario with main focus on the supply side. Obviously, it is important to investigate whether the increased demand envisioned in the Market 2.0 scenario will affect natural gas prices so that demand will be dampened. Europe's own conventional gas resources are being depleted and the second largest exporter to EU, namely Norway, will have to prove up new reserves in order to maintain current export levels. At the same time, search for unconventional gas is ramping up on every continent including in Europe, for instance IEA estimates some 14 Tcm (Trillion m^3) recoverable gas throughout Europe (current production in EU is around 0.2 Tcm while consumption is 0.5 Tcm) although these figures are highly uncertain and there is also considerable local opposition to production of unconventional gas on several places in Europe. On the other hand, several significant discoveries of conventional gas worldwide over the last few years together with production of unconventional gas in other parts of the world may still lead to an abundance of gas on world markets and thus, very competitive natural gas prices. The analysis will also investigate import infrastructure, both on EU and single member state level. In several member states, natural gas consumption is swinging considerably over the year so it will therefore be important to investigate total supply ability (indigenous production, storage withdrawal rates and import capacity) versus peak demand including demand management options such as interruptible sales. Finally, results in the Market 2.0 scenario will also be analyzed with regard to gas power plant site requirements, i.e. how can and should the large amount of gas based power coming on-line between 2009 and 2050 be located.

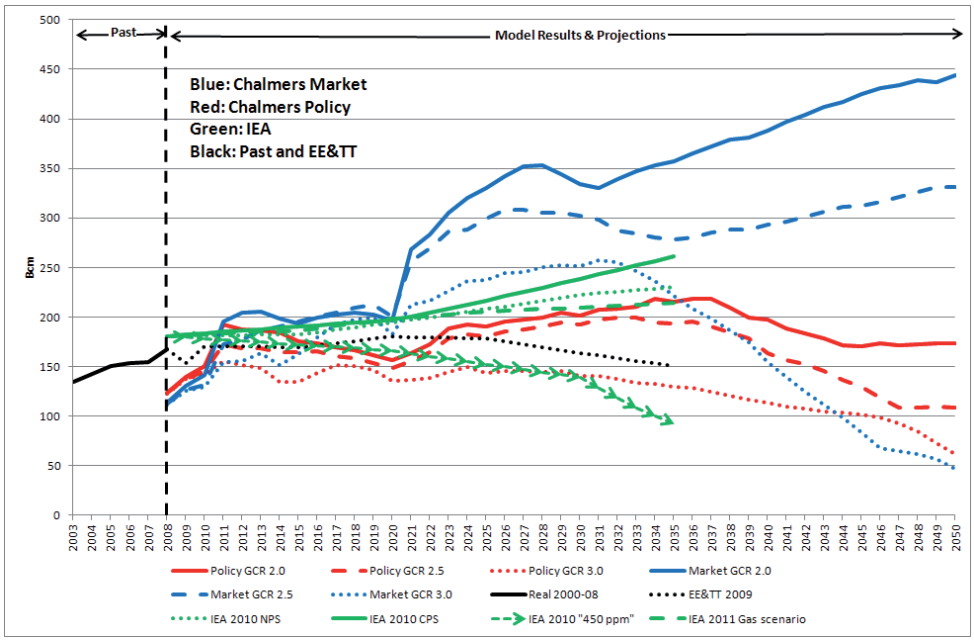


Figure 2: Chalmers modeled gas consumption up to 2050 in six scenarios assuming abundance of gas and delayed CCS along with projections up to 2030 from IEA and EE&TT.

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