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Carbon Emissions

Keeping an Eye on Germany's Nuclear-Energy Policy

The election in Nordrhein-Westfalen brings nuclear policy back into spotlight. Our ETS emissions forecasts over 2010-20 have always assumed that Germany's nuclear phase-out would not proceed as planned, a view reinforced by the federal election last September resulting in a CDU/FDP coalition government committed to revoking the nuclear phase-out. However, the outcome of yesterday's regional election in Nordrhein-Westfalen (NRW) could call this assumption into question, and should the nuclear phase-out ultimately remain in place we would expect to raise our ETS-emissions forecasts by 15Mt for 2013 and by up to 40Mt by 2020.

The current government wants to revoke the existing nuclear phase-out ... As explained in our in-depth analysis of Germany's nuclear-energy policy published ahead of Germany's federal elections last year (*Which Way Blows the Wind?*, 15 July 2009), the amended Atomic Energy Act (AEA) of 2002 mandates the closure of all Germany's nuclear power plants by 2022. However, the federal coalition Government of CDU/FDP parties that was elected in the general election of September 2009 committed itself to revoking the AEA and to giving lifetime extensions to Germany's nuclear power plants.

... but the election in NRW could make this more difficult. In the election held in Nordrhein-Westfalen on Sunday 9 May, the CDU/FDP coalition that had been in power since 2005 lost its majority, with its combined number of seats in the NRW legislature falling from 101 to 80. By contrast, the combined number of seats for the SPD and Green party rose to 90 from 86, leaving the SPD and Greens one seat short of an overall majority in the new state parliament. At this stage a number of permutations for governing NRW are possible, but at the federal level it seems clear that the NRW result will deprive the CDU/FDP central government of its majority in the upper chamber of parliament (the *Bundesrat*). In turn, this could make it more difficult for the federal government to revoke the existing legislation to phase out nuclear power.

If the nuclear phase-out continues, the main replacement fuel will be coal. In our report *Which Way Blows the Wind?*, we calculated that of 21.4GW of planned new German generation capacity by 2013 (11.1GW already under construction, 9.5GW approved, and 800MW pending approval), 10.3GW was coal based (7.5GW of hard coal, and 2.8GW of lignite), 4.7GW CCGT, and 6GW offshore wind. However, our analysis assumes that only 2.1GW of offshore-wind capacity will in fact be onstream by 2013, which means that we expect coal or lignite capacity to account for two thirds of all new firm capacity by 2013.

This would mean higher CO₂ emissions by 2013 and 2020. If the nuclear phase-out in Germany were ultimately to continue, we calculate that Germany's power sector would likely emit 15Mt of CO₂ more by 2013 than it does today, and c.40Mt more by 2020 compared with today's level.

No change to our forecasts at this stage, but we maintain a watching brief. It is unclear to us whether the revocation of the existing legislation to phase out nuclear power in Germany by 2020 would require the approval of the *Bundesrat* or not, and at this stage our base-case assumption remains that the current federal government will be able to enact legislation that extends the operating lifetime of most if not all of Germany's nuclear power stations. However, the result in NRW undoubtedly makes the political situation more complicated at the federal level, so although we are not making any changes to our ETS emissions forecasts at this stage we will continue to monitor events closely over coming months and watch for any signs that might lead us to re-consider our assumption that the nuclear phase-out will be revoked.

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A watching brief on German nuclear-energy policy

The election in Nordrhein-Westfalen brings nuclear policy back into spotlight

Our ETS emissions forecasts over 2010-20 have always assumed that Germany's nuclear phase-out would not proceed as planned, a view reinforced by the federal election last September resulting in a CDU/FDP coalition government committed to revoking the nuclear phase-out.

However, the outcome of yesterday's regional election in Nordrhein-Westfalen (NRW) could call this assumption into question, and should the nuclear phase-out ultimately remain in place we would expect to raise our ETS-emissions forecasts by 15Mt for 2013 and by up to 40Mt by 2020.

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As explained in our in-depth analysis of Germany's nuclear-energy policy published ahead of Germany's federal elections last year (*Which Way Blows the Wind?*, 15 July 2009), the amended Atomic Energy Act (AEA) of 2002 mandates the closure of all Germany's nuclear power plants by 2022. However, the federal coalition Government of CDU/FDP parties that was elected in the general election of September 2009 committed itself to revoking the AEA and to giving lifetime extensions to Germany's nuclear power plants.

... but the election in NRW could make this more difficult

In the election held in Nordrhein-Westfalen on Sunday 9 May, the CDU/FDP coalition that had been in power since 2005 lost its majority, with its combined number of seats in the NRW legislature falling from 101 to 80. By contrast, the combined number of seats for the SPD and Green party rose to 90 from 86, leaving the SPD and Greens one seat short of an overall majority in the new state parliament.

At this stage a number of permutations for governing in NRW are possible, but at the federal level it is already clear that the NRW result will deprive the CDU/FDP central government of its majority in the upper chamber of the federal parliament (the *Bundesrat*). In turn, this could make it more difficult for the federal government to revoke the existing legislation to phase out nuclear power.

If the nuclear phase-out continues, the main replacement fuel will be coal

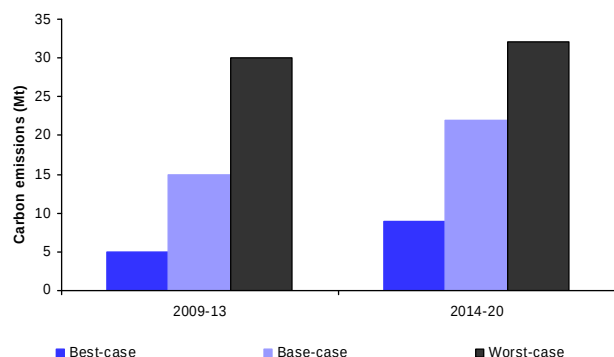
In our report *Which Way Blows the Wind?*, we calculated that of 21.4GW of planned new German generation capacity by 2013 (11.1GW already under construction, 9.5GW approved, and 800MW pending approval), 10.3GW was coal based (7.5GW of hard coal, and 2.8GW of lignite), 4.7GW CCGT, and 6GW offshore wind.

However, our analysis assumes that only 2.1GW of offshore-wind capacity will in fact be onstream by 2013, which means that we expect coal or lignite capacity to account for two thirds of all new firm capacity by 2013.

This would mean higher CO2 emissions by 2013 and 2020

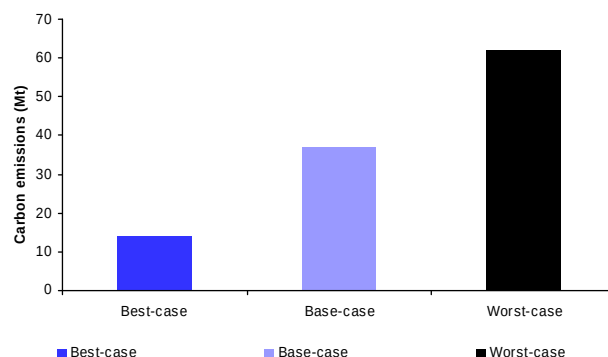
As shown in Figures 1 and 2 below, if the nuclear phase-out in Germany were ultimately to continue, then based on our analysis as first set out in *Which Way Blows the Wind?* we calculate that Germany's power sector would likely emit 15Mt of CO2 more by 2013 than it does today, and c.40Mt more by 2020 compared with today's level (please see our report *Which Way Blows the Wind?* for full details on the assumptions behind our analysis).

Figure 1: DB estimate of increase in ETS emissions from changing German capacity mix under nuclear phase-out, 2009-13 and 2014-20



Source: Deutsche Bank

Figure 2: DB estimate of increase in ETS emissions from changing German capacity mix under nuclear phase-out, 2009-20



Source: Deutsche Bank

Running two sensitivities against this base case, we find that on a worst-case scenario emissions could rise by as much as 30Mt by 2013 relative to today's levels, while on a best-case scenario the increase might be only 6Mt (Figure 1).

Looking beyond 2013, our worst-case scenario suggests that by 2020 emissions could be up to 62Mt higher than they are today, while in our best case they would be only 14Mt higher (Figure 2).

Significantly, in order for the mix of new capacity to be built that we have assumed in all our scenarios, both power and carbon prices would have to be higher than current levels.

No change to our forecasts at this stage, but we maintain a watching brief

It is unclear to us whether the revocation of the existing legislation to phase out nuclear power in Germany by 2020 would require the approval of the *Bundesrat* or not, and at this stage our base-case assumption remains that the current federal government will be able to enact legislation that extends the operating lifetime of most if not all of Germany's nuclear power stations.

However, the result in NRW undoubtedly makes the political situation more complicated at the federal level, so although we are not making any changes to our ETS emissions forecasts at this stage we will continue to monitor events closely over coming months and watch for any signs that might lead us to re-consider our assumption that the nuclear phase-out will be revoked.

Valuation and risks

The theory behind our valuation

In theory, and in keeping with the methodology we first set out in our report *It Takes CO₂ to Contango* (30 May 2008), we think that the Phase-3 ETS cap agreed at the EU Heads of Government Summit in December 2008 is tight enough to imply an EUA price of around €30/t already in 2010 (Figure 3 below).

This is because expectations about a much tighter cap in Phase 3 will make Phase-2 allowances more valuable given that they can be carried over into Phase 3. In effect, the bankability of Phase-2 EUAs means that the shortage of EUAs foreseen by the market in Phase 3 should already be anticipated in Phase 2 (assuming the market is efficient).

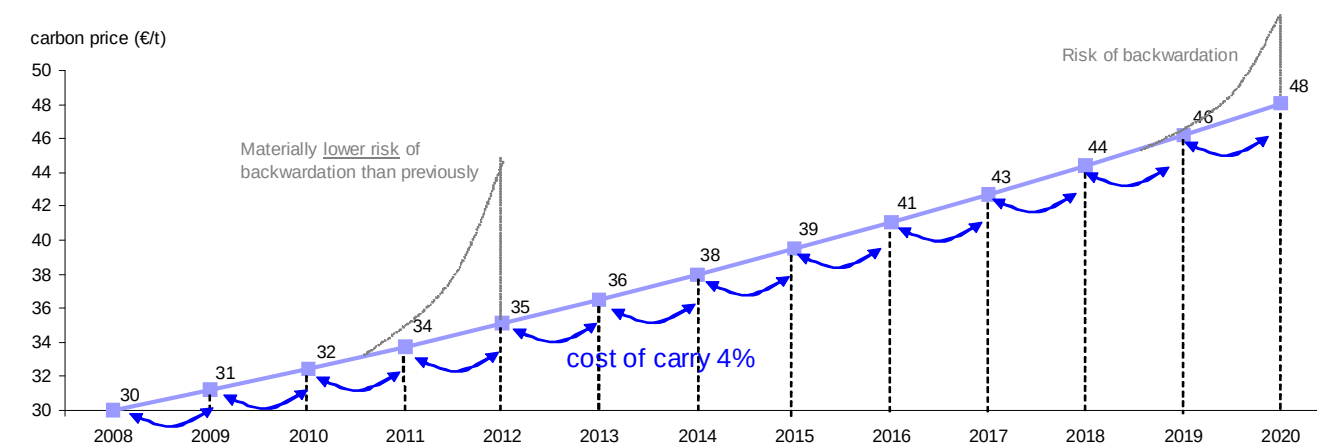
In other words, bankability means we have to consider the expected residual abatement requirement in Phases 2 and 3 together rather than separately. Now that our model is explicitly assuming an extra 90Mt of abatement will be achieved by the power sector over 2010-12, the average residual abatement requirement in the ETS over and beyond this amount over 2008-20 is 20Mt per year.

If there is insufficient fuel-switching capacity in the EU to meet the required level of abatement in the ETS then today's EUA price should reflect the long-run marginal cost (LRMC) of carbon, this being the carbon price required to ensure that CCGT gas-fired plant gets built ahead of coal-fired plant.

On our estimates, however, the full ETS shortfall of 20Mt per year could in theory be met via existing plant across the EU, and if this were to happen the price of EUAs would be set by the short-run marginal cost (SRMC) of fuel switching rather than the LRMC, unless the SRMC of abating 20Mt per year were greater than the LRMC of building new capacity.

Given the volatility of commodity prices over the last 18-24 months, estimating both the LRMC and the SRMC of fuel switching is a complicated task. At this time, however, we see no reason to change our long-run commodity-price forecasts as set out in our report of 15 October 2008, *Emissions in Remission*.

Figure 3: DB fundamental theoretical EUA forward curve over 2008-20E (€/t)



Source: Deutsche Bank

As shown in Figure 3, our LRMC analysis would therefore still indicate a fundamental value for EUAs of €32/t already in 2010, rising thereafter at the cost of carry (we use 4% to derive a 2020 EUA fair value of €48/t), should the building of new capacity be necessary to meet the cap.

The SRMC changes constantly in response to the prompt prices of oil, gas, and coal, but we estimate that to abate 20Mt of CO₂ fuel switching would be required in both Spain and the UK. Given that the UK's CCGT fleet is on average older and less efficient than Spain's, then we calculate that a price in the range of €25/t-€30/t would be necessary to achieve this in the short run (assuming coal prices of \$90/t, and an oil price of \$60/bbl or higher).

Risks to our valuation

In practice, we think market inefficiencies could keep EUA prices significantly below our theoretical fair-value estimate throughout 2010 and the first half of 2011. In particular, with our revised forecasts showing Phase 2 viewed in isolation to be long of EUAs by an average of 82Mt per year, we think the EUA price will remain volatile and potentially vulnerable to any further deterioration in the EU economy beyond that already indicated in our forecasts.

Indeed, since our model assumes that the ongoing but still very modest EU economic recovery will continue over the rest of this year and into 2011 and 2012, any change to this assumption would force us to revise our EUA price expectations over 2010-12 downwards (in this respect we would highlight in particular the risk of a more widespread financial crisis in the Eurozone caused by the very difficult situation in Greece).

Moreover, the outcome of the COP-15 conference in Copenhagen in December 2009 has in our view heightened the uncertainty over the continuation of the CDM and JI mechanisms beyond 2012, at least in their current forms. This could lead to increased volatility in CER/ERU pricing over 2010, and, indirectly, to greater volatility in EUA pricing as well.

Appendix A: Glossary

Figure 4 defines the technical terms used throughout this report.

Figure 4: Glossary of terms

Abatement	In the carbon context, GHG-emissions reduction
AEA	Atomic Energy Act, the amended legislation on nuclear power passed by the SPD/Green coalition government which came into force in 2002 and which mandates the closure of all of Germany's nuclear power plants by 2022.
Bankability/banking/to bank	In the EU ETS context, the carrying over of carbon credits from one phase to the next
Baseload	The continuous minimum level of electricity demand
Baseload plant	A power plant that generates electricity to meet continuous minimum demand
BAU	Business as usual
boe	Barrel-of-oil equivalent
Bundesrat	The upper house of Germany's federal parliament (the lower house is the <i>Bundestag</i>).
CER	Certified Emissions Reduction, a carbon credit generated by Clean Development Mechanism (CDM) projects.
CCGT	Combined Cycle Gas Turbine
CDM	Clean Development Mechanism. Defined in article 12 of the Kyoto Protocol, CDM projects undertaken in developing countries are intended to meet two objectives: (i) to address the sustainable development needs of the host country, and (ii) to reduce/limit GHG emissions to generate emission credits that can be used to satisfy commitments of Annex-I Parties and thus increase their compliance options. Projects that limit or reduce GHG emissions generate CERs if approved by the CDM Executive Board.
CDU	Germany's Christian Democratic Union. The CDU is currently one of the two main parties that make up the federal German Government (note that the CSU, the CDU's sister party in the state of Bavaria, is also in the federal government).
CSU	Germany's Christian Social Union, the CDU's sister party in the state of Bavaria (see CDU above).
CO ₂	Carbon-dioxide
DB	Deutsche Bank
E	Estimated
ERU	Emissions Reduction Unit, a carbon credit generated by Joint Implementation (JI) projects.
EU	European Union
EUA	European Union Allowance being a type of carbon credit solely for use within the EU-ETS
ETS	European Union Emissions Trading Scheme
FDP	The Free Democratic Party of Germany, currently one of the two parties that make up the federal German Government.
GHG(s)	Greenhouse gas(es)
GW	Gigawatt, a measure of the capacity of a power station (one billion watts)
GWh	Gigawatt-hour, a measure of the output of a power station (one billion watts of power generated for an hour)
JI	Joint Implementation, a flexible mechanism defined in article 6 of the Kyoto Protocol. It allows developed countries, or companies from those countries, to cooperate on projects to reduce GHG emissions and share the emissions-reduction units (ERUs). As JI occurs between Annex-B countries that have caps under the KP, no new emissions units are generated (unlike the case with CDM projects)
LRMC	Long-Run Marginal Cost
M or m	Million
Mt	Million tonnes or Mega-tonnes
MW	Megawatt, a measure of the capacity of a power station (one million watts)
MWh	Megawatt-hour, a measure of the output of a power station (one million watts of power generated for an hour)
NRW	Nordrhein-Westfalen, the largest state in Germany with 18m inhabitants.
Phase 1, Phase 2, Phase 3	Trading periods of the EU ETS running from 2005 to 2007, 2008 to 2012, and 2013 to 2020 respectively
SPD	The Social Democratic Party of Germany
SRMC	Short-Run Marginal Cost
t	Tonne
TWh	Terawatt-hour, a measure of the output of a power station (one million megawatts of power generated for an hour)

Source: Deutsche Bank, UNEP

Appendix 1

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