

**Quick phase-out of nuclear  
power in Germany.  
Short-term options,  
electricity and price effects**

**Short analysis for  
WWF Germany**

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## Summary

The German government announced on 14 March 2011 that in the light of recent events in Japan German nuclear power plants will undergo intensive safety tests and the seven oldest nuclear power plants will, at least temporarily, be shutdown. The challenge is now to analyse more closely how a very quick phase-out of the German nuclear power plants can be realised with a view to guaranteeing security and quality of supply as well as with a view to the effects on electricity and carbon prices.

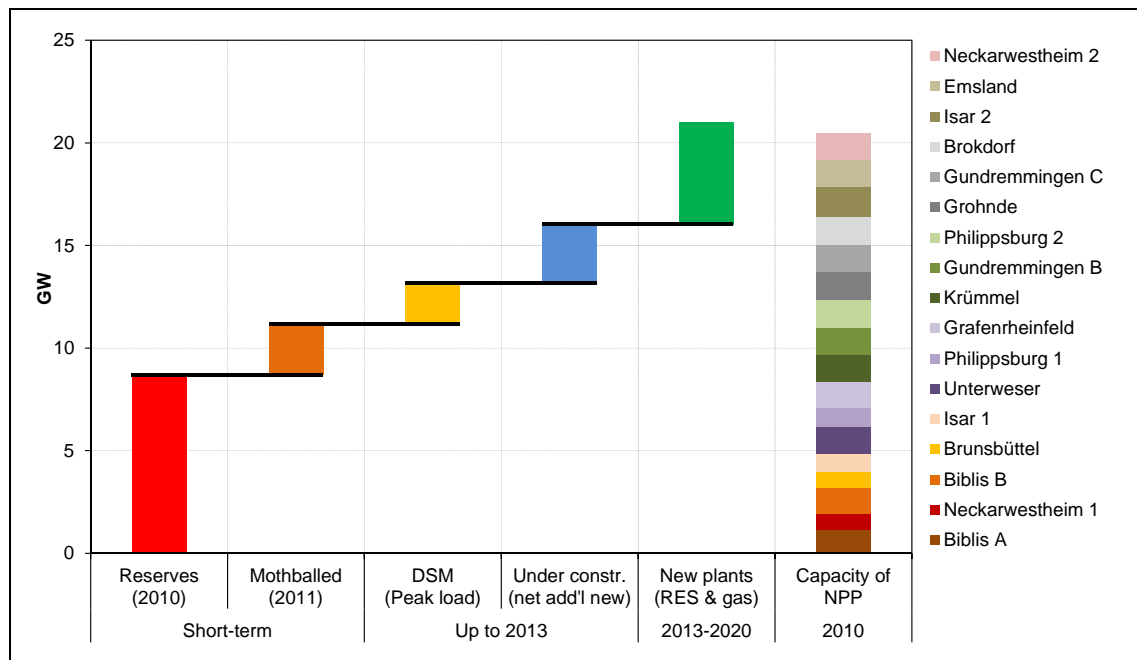
In terms of the decommissioning of the seven oldest nuclear power plants in Germany, it should be noted that the German electricity market was largely prepared for the comparatively quick decommissioning of these power plants in the near future. For this reason alone no significant problems were or are to be expected in terms of security of supply or price distortions on the basis of these plants being shutdown at short notice.

Having provided analyses and estimations, this paper will go on to present different options for alternative load coverage based on conservative assumptions, which can be drawn upon for different time periods:

- In the current power plant mix in Germany – taking into account all non-availabilities and the necessary reserve capacities – at least 8,700 MW of capacity are still available if the nuclear power plants are switched-off.
- In terms of mothballed power plants, approx. 2,500 MW of capacity can be made available for electricity production nationally in the course of a few weeks or months.
- Within the course of one to two years it should be possible to tap demand-side potentials of peak load reduction (in less than 50 hours of the year) amounting in a conservative estimate to at least 2,000 MW.
- Substantial power plant capacities that are currently under construction and whose completion can be regarded as secure will join the grid by 2013. Set against the fossil-fuelled power plant capacities that with high probability will be taken off the grid, at least 2,800 MW of additional production capacities will be available for meeting demand from 2013 onwards.
- For the period up to 2020, and in particular from 2015 to 2020, it is conceivable that up to 5,000 MW of additional power plant capacity will become available (expansion of electricity production from biomass, decentralised combined heat and power plants, other gas-fired power plants).

Overall power plant capacities totalling 21,000 MW could be substituted using the measures analysed in this paper, which corresponds to a little more than the installed net capacity of the German nuclear power plants currently connected to the grid (which total 20,500 MW).

Figure 1 Summary of contributions to the substitution of German nuclear power plants, 2011-2020



Source: Calculations by Öko-Institut

Against this background an accelerated phase-out path for German nuclear power plants can be designed as follows:

- The available system reserves make it possible for the seven oldest nuclear power plants and the Krümmel nuclear power plant in Schleswig-Holstein, which is not currently in operation, to be decommissioned at very short notice.
- Two further blocks of nuclear power plants can be shutdown at very short notice when mothballed power units are reactivated in the German electricity supply system.
- Four additional blocks of nuclear power plants can be decommissioned by 2013 when implemented in combination with load management measures and the additional capacities that are currently being established within the scope of new building projects and which will be connected to the grid with a high level of certainty.
- Three further blocks of nuclear power plants can be shutdown in the second third or, if necessary, the final third of the present decade. Their capacities can be compensated by the secured capacity of new biomass power plants, CHP plants and other natural gas-fired power plants that are to be built.

A short analysis of the effects on the electricity and carbon prices following the German government’s announcement that approx. 40% of the German nuclear power plants were to be removed from the grid at short notice shows that the announcement had clearly recognisable price effects. However, on the second day of trading after the announcement generally decreasing price effects could be observed again. Overall the

order of magnitude of the observed market effects supports the conclusion that the price changes are very small on both the electricity and the carbon markets (0.5 cent per kilowatt hour or 2 Euro per CO<sub>2</sub> allowance at maximum) and ultimately fall within the range of the price fluctuations of recent months and years.

Overall, an accelerated phase-out of nuclear power in Germany whereby the last nuclear power plant could be switched off between 2015 and 2020 can be realised based on the options outlined in this paper while maintaining a very high level of security and quality of supply and with acceptable costs.