Bundesnetzagentur

Report on the impact of the nuclear power exit on transmission networks and on security of supply

and

Report on the need for a back-up nuclear power plant under the amended Atomic Energy Act

31 August 2011

Executive summary[1]

1 The Bundesnetzagentur (BNetzA) has been empowered by the German Parliament (Bundestag and Bundesrat) by means of the 13th Act amending the Atomic Energy Act (AtG) of 31 July 2011 (Federal Law Gazette I, p. 1704), in the interest of avoiding danger to or disturbances of the security or reliability of the electricity supply system, to mandate the back-up operation of a nuclear power plant (section 7(1e) sentence 1 AtG). BNetzA can only make use of these powers until 1 September 2011. It has no authority to do so after this date.

2 The authorisation to mandate back-up operation of a nuclear power plant represents a discretionary decision. The legislator does not require BNetzA to take such a decision in any event, but has instructed it to weigh up the improvements to security of supply that can be achieved by back-up operation on the one hand and the remaining risks, costs and consequences associated with back-up operation or the default situation on the other. In doing so, BNetzA must assess the facts with care and seek to exhaust every possibility.

3 The statutory provisions do not make mandating back-up operation the preferred solution. On the contrary, mandating back-up operation represents an ultima ratio instrument in case network stability and security of supply cannot otherwise be safeguarded.

4 Technical and time constraints make it neither feasible nor reasonable to calculate all the theoretically conceivable load conditions of the electricity transmission networks. With good reason, the TSOs therefore restricted their risk assessments to two main scenarios and a parallel examination to identify suitable indicators for extreme load situations. BNetzA considers this approach appropriate and has aligned its own inquiry accordingly.

5 The scenarios can be characterised as follows. They are based on a cold winter day in the early evening hours, i.e. a time when high to very high load occurs in the network. Due to darkness, no photovoltaic plant feed-in is available. In this situation, the so-called (n–1) case occurs, i.e. failure of one essential operating facility in the transmission network. The following cases then have to be considered separately:

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[1] The complete report is available (in German) at http://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/BNetzA/Presse/Berichte/2011/BerichtNotwResKKW31August2011pdf.pdf?__blob=publicationFile

a) very low wind energy feed-in;

b) very high wind energy feed-in;

c) unplanned outage of the Brokdorf NPP (one of the largest generators in the north);

d) unplanned outage of Philippsburg NPP block 2 (one of the largest generators in the south).

Failure of an essential operating facility combined with a simultaneous outage of a large generator is a rare event, but not so rare that it can be disregarded. Such considerations are part and parcel of a diligent approach to network planning.

6 While not obligatory under the principles of diligent network planning, an examination of exceptional contingency is advisable, however, in the light of security concerns due to the stressed network situation following the permanent shutdown of 8.4 GW of nuclear generating capacity. This includes so-called common-mode faults and busbar faults. The effects of such faults are not restricted to a specific operating facility but extend to a number of these.

7 A number of the scenarios specified above could lead to major voltage maintenance issues in the greater Hamburg area. In the scenarios, the transmission lines of the TSO Amprion in the direction of Frankfurt am Main experience extremely high load and major voltage maintenance issues arise in south-west Germany.

8 Amprion has carried out a parallel investigation into these scenarios. Its investigation assumes that south-west Germany would have to be supplied domestically, i.e. without any imports, in a winter situation with, simultaneously, annual peak load, an (n–2)-case, i.e. failure of two operating facilities, and no renewable energy feed-in. Amprion considers that, under these circumstances, an additional generation capacity of around 2,000 MW will be required in the south.

9 The TSOs have added a safety margin to the network load underpinning the calculations, in order to cater even for loads that are significantly above historic maximum levels.

10 BNetzA first verified the generation capacity data that form the basis for the TSOs' and their consultants' calculations and has established, for the first time, a reliable overview of all generation capacities above 20 MW in Germany.

11 BNetzA has also reviewed the generation capacity maintenance schedule to March 2012 and the expected new build and decommissioning of facilities in the coming years.

12 On the European level, BNetzA has contacted all the neighbouring countries concerned, their National Regulatory Authorities and TSOs as well as the European Commission, and invited them to voice any concerns regarding security of the network and security of supply. BNetzA organised, jointly with the Commission, a conference in which high-level representatives of Member States and National Regulatory Authorities participated. No specific concerns have been voiced.

13 In its Report of 26 May 2011, BNetzA had suggested looking into so-called phase-shift operation for the idled nuclear plants. Meanwhile, Amprion and RWE Power have run through phase-shift operation for the generator of Biblis A. The phase shifter will contribute significantly to network stability. BNetzA has therefore called on Amprion and RWE Power to introduce this straightaway; this could be done by January 2012. The costs incurred can be refinanced via the use of system charges.

14 BNetzA has made sure that power plant Ensdorf Block 3, power plant 2 in Mainz-Wiesbaden, power plant 3 in Mannheim (GKM3), power plant Ensdorf Block C and Mineraloelraffinerie Oberrhein with a combined additional thermal capacity of 849 MW, facilities that are so important for maintaining voltage in the Rhine-Main-Neckar area, are available in reserve, if need be. In future, TSOs will be able to call upon the reserve plant Freimann in Munich with an additional 160 MW of redispatch potential, providing a total of 1,009 MW additional reserve capacity in southern Germany.

15 BNetzA has identified reserve capacity of 1,075 MW in Austria which can be contracted. TenneT TSO GmbH has supported BNetzA in creating the prerequisites for inviting binding offers, and will ensure implementation. The costs needed for this can be refinanced via the use of system charges.

16 These binding offers for reserve capacities in Austria, together with the reserve capacities in southern Germany, mean that an additional 2,084 MW of reserve capacity is available, compared to the status on 26 May 2011. The entry into service in January 2012 of new additional capacity of 832 MW in Austria will impact positively on network security. There are sufficient interconnections between the Austrian and German networks in the expected scenarios. As no congestion has occurred so far, the Austrian and German markets form a single price zone at wholesale market level.

17 When these new circumstances are taken into account, the extreme load situations cited in para 5 above and the resulting problems as cited in para 7 above, are manageable. However, it will require a major effort on the part of TSOs, a significant correction of the power plant schedules that result from market outcomes, and the use of nearly all available safety margins. The calculations of the TSOs and the consultants find an operationally acceptable voltage level and responsible line loads, even in the case of exceptional contingency. BNetzA explicitly recognises the tremendous efforts made by the TSOs and the commitment of their staff.

18 BNetzA urges approval of continued operation of the power plant blocks Datteln 1 to 3 (hard coal, 303 MW), pending completion of Datteln 4 (hard coal, 1,055 MW). Delay to Datteln 4 going live may mean that Deutsche Bahn AG's electricity requirements in winter 2012/2013 will have to be met from southern Germany, adding to the strain on the transmission networks. BNetzA expressly welcomes the willingness of the government of federal state North Rhine-Westphalia to enter into a dialogue and its announcement to tolerate an operation of blocks 1 to 3 that could be approved under immission control legislation.

19 In light of the difficult situation regarding generation in southern Germany in winter 2012/2013 as well, BNetzA would also advise using the experience gained in the coming winter to see whether reserve operation of the Staudinger 3 plant beyond the given closure date of 31 December 2012 until 31 March 2013 at least is necessary and possible.

20 Completing the 380 kV extra high voltage line from Hamburg/Krümmel to Schwerin must be given top priority. The legislator identified an urgent demand for this line already in the Power Grid Expansion Act (EnLAG) of 2009. Hamburg, Lower Saxony and Schleswig-Holstein would experience a very low voltage level particularly in the “strong load / no wind energy feed-in” scenario. The measures agreed for the coming winter, network topology and special measures for high-voltage direct current links, can only represent an interim solution which will not be available for winter 2012/2013 without restrictions being created elsewhere.

21 Ramping up a nuclear power plant from the "cold, sub-critical" state envisaged for back-up operation would take between 36 and 72 hours. While this process is safe, minor faults have sometimes occurred in the past, leading to delays in the start-up procedure. Following the initial call up by the TSO, back-up operation of an NPP would require continuous operation, at least at a lower level.

22 There will always be risks for security of supply, with or without giving orders for back-up operation. Guarding against every possible risk was impossible even before the nuclear moratorium. The difference is, as always, only gradual, even if the difference before and after the moratorium has been quite significant. However, with current levels of knowledge, the main extreme situations for the transmission networks are just about manageable, thanks to the TSOs' intervention instruments, and thus there is no need to order operation of a back-up nuclear power plant.

23 The weighing of risks and legally protected interests that is required does not mean that the risk of local, regional or widespread power outages can be disregarded. On the contrary, this risk has increased considerably with the simultaneous and permanent shutdown of 8.4 GW generation capacity. However, it can now be better managed, according to the findings from the inquiry into conventional alternatives, than BNetzA had assessed in its earlier report of 26 May 2011. The customary principles of medium-term planning by TSOs that were valid before the moratorium still form the basis for these evaluations. BNetzA recognises that these planning principles have been underpinned in the past by a network and generation structure which provided reserves and safety margins. These additional margins will be exhausted as a result of the permanent shutdown of eight German NPPs. They would be recovered only partly, however, but not fully, by restarting a back-up nuclear plant.

24 BNetzA assumes that all the parties concerned will endeavour to take the necessary steps to ensure security of supply. Such steps include, for instance, rapid contracting by TSOs of reserve capacities, and planning approval for transmission projects, especially from Hamburg/Krümmel to Schwerin, without delay.

After weighing all the circumstances, especially the more recent ones, BNetzA has concluded that it is not necessary to order back-up operation of a nuclear plant using the discretionary scope granted to BNetzA by the legislator under section 7(1e) sentence 1 AtG.

Ultimately, BNetzA considers that it is neither legally authorised, nor empowered for urgent technical reasons, to seek a higher safety level than is usually applied in network planning.