Conclusion of the GDP 2013, second draft

July 26, 2013

The four German transmission system operators (TSOs) are making a major contribution to the implementation of the "Energiewende" in Germany and, with this draft of the 2013 grid development plan, they are identifying the necessary grid expansion in the next ten years.

The grid development plan (GDP) relates to the need for expansion in the German onshore power transmission system and is based on the statutory requirements in the Energy Industry Act (EnWG § 12a-d). With this plan, the TSOs are laying the foundations for stable grid operation in the next ten years, taking into account the integration of renewable energies and the development of a European electricity market under the defined energy management frame conditions. As with the first GDP in 2012, grid optimisation and reinforcement measures have been given priority over expansion measures. The NOVA principle on which the GDP is based is already oriented towards the optimum use of existing routes.

As a result of the input variables which have changed in comparison with the 2012 GDP, additional measures are necessary in the 2013 GDP compared with the previous year in order to satisfy the required expansion for the calculated transmission requirements in accordance with applicable law. The focus continues to be on high-power north-south connections. Grid enhancements and optimisation on existing routes over a length of 4,900 km are required, of which 3,400 km are new developments on existing routes. The requirements for new construction include 1,500 km of AC transmission lines and 2,100 km of corridors for high-voltage DC transmission lines. The four DC transmission corridors in the north-south direction have a total transmission capacity of 12 GW. Changeover from AC to DC operation is planned over a distance of around 300 km.
The total investment for the expansion of the transport grid in the next ten years is approx. 22 billion euros.

On completion of the grid expansion, this will be reflected by an increase of less than 0.5 cents/kWh in the final customer price.

A comparison of the 2013 GDP with the 2012 GDP shows three significant factors which have an effect on the transmission requirements and therefore on the grid expansion requirement.

1. The power generated by offshore wind is increased by 1.1 GW,
2. The power generated by onshore wind in the north of Germany is increased by 1.8 GW,
3. The unwanted power flows (ring flows) in Poland, the Czech Republic and Austria are reduced by 2 GW.

As a result of these shifts, a total additional power of around 5 GW needs to be transmitted within Germany in the north-south direction.

As assumptions relating to the generation and consumption structure, the calculation method used and the resulting grid expansion requirements are openly presented, the network development planning process is transparent. The TSOs have no influence on the real development of the generation structure. The 2013 GDP follows the methodology already applied in the 2012 GDP and confirmed by the Federal Network Agency (BNetzA). The scenario framework confirmed by the BNetzA on 30.11.2012 therefore forms the starting point for the production of the grid development plan and the offshore grid development plan (according to § 12b EnWG and § 17b EnWG) with regard to future assumed generation capacities and the consumption situation.

The fundamental characteristics of the individual scenarios are also retained in the 2013 GDP. The nuclear power capacity is excluded from all scenarios due to the planned shutdown of power stations by the end of 2022. However, the lead scenario B 2023 clearly shows higher installed capacities for renewable energies compared with the previous year.

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In addition, some improvements have been achieved in the production of the scenario framework. The conventional power station base from the reference year 2011 has been recorded on a wider basis and increased as a result of this detail. Power station shutdowns reported by the operators have also been taken into account for the first time.

In addition, a large number of lower-power CHP plants have been added and accurately recorded in detail. Additionally planned pump storage power stations with a total capacity of approx. 2 GW have been notified to the BNetzA and taken into account in the scenario framework. With regard to the spatial distribution of the regenerative power generators in all categories, their installed capacities have been given for all scenarios for each Federal state. This process improvement with regard to regionalisation is a real step towards resilient regional data. More far-reaching steps towards further improved robust regionalisation have already been taken together with the distribution network operators and the Federal states for the 2014 scenario framework.

The market simulation shows higher export quantities compared with 2012. In all scenarios, Germany is a net exporter of power from renewable and conventional sources. The fact that in the lead scenario B 2023 transits occur in approx. 87% of hours shows the significance of Germany for the internal European energy market.

As a result of the approval of the scenario framework on 30.11.2012, three months are available for producing the 2013 GDP. The 2012 GDP has identified specific grid expansion measures for all four scenarios. In the 2013 GDP, the focus in the first step is on further developing the additional grid expansion measures of lead scenario B 2023. The analyses confirm the results of the 2012 GDP, scenario B 2022, and identify further measures which are necessary as a result of the increase in the expansion of regenerative energy arising from the update of the scenario framework.

In the scenarios A 2023 and C 2023, the analyses are based on selected grid usage cases and therefore give only a guide to the required grid development. They show that the resulting grid B 2023 is not sufficient by itself to cope with the transmission tasks. However, the indicative analyses that have been carried out have enabled important measures to be identified for the scenarios A 2023 and C 2023.

An analysis has been carried out for the scenario B 2033 based on representative grid situations. The results of these confirm that the grid expansion measures in the 2012 GDP are still up-to-date. The grid concept proposed in the 2013 GDP is consistent with the grid expansion proposed last year.

All the grid measures which have been determined for a particular scenario will lead to a fully functioning grid which satisfies the requirements for the target year in accordance with applicable law. As a result of the regular updating of the grid development plan, new knowledge relating to the production scenarios (as decisive input variables), the technical and the legal developments can be included in the future grid development plans in good time.

Based on the calculations and experience of the TSOs, it has been possible to identify a key raft of measures as early as 2013 which in any event are to be implemented by 2023. These urgent measures are described in the 2013 GDP. Further measures ("under consideration") which have been determined for transmission requirements in the target year must continue to be considered in detail in subsequent grid development plans in the light of energy management and political developments, and re-evaluated in each case. If the development of renewable generation should continue to progress as assumed in the generation scenarios, the urgent need for these measures would also be quickly substantiated and then they too should be considered in a Federal requirement plan.

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The 2013 GDP shows transmission requirements between start and end points. As a rule, start points lie in regions with excess generation capacity and end points in those with a high consumption or at the locations of nuclear power stations which will be shut down by 2022. In the southern Federal states (Bavaria, Baden-Württemberg, Hesse), approx. 30% of the annual consumption will have to be imported in 2023.

Like its predecessor, the present 2013 grid development plan does not specify specific routes for new transmission lines but documents the necessary transmission requirements between grid nodes. Future line connections from one transformer station to another transformer station are calculated. Place names for designating start and end points are purely technical statements which serve to identify existing grid connection points.

Specific route corridors will only be defined as part of the Federal planning by the BNetzA or the regional planning by the Federal states. The GDP does not specify locations for future power stations, EE plants or a future market design, nor does it give recommendations or optimisation proposals.

As well as the expansion of the 380 kV AC grid, high-voltage direct current connections (HVDC) are also provided for the high transmission requirements from north to south. They enable low-loss transmission over long distances and, with the use of modern technology, stabilise the AC power network. This avoids a considerably larger AC expansion which would otherwise be necessary. Complex converter systems, which significantly restrict the number of possible substations along the route, are required for inputting and outputting power. The electronics required for these is usually installed in separate buildings. There is currently little experience with VSC HVDC systems in interconnected transmission networks, as these have not previously been installed onshore in Germany in these power ranges.

A decision relating to the (sectional) cabling of high-voltage direct current lines is not part of the 2013 GDP and will be made as part of the further route planning or Federal planning or in the approval process.

As well as the use of DC technology, the additional optimisation and extension of the 380 kV AC network is necessary for wide-area transmission. In order to minimise the requirement for new routes, attempts will be made to accommodate this expansion within the corridors of today's 220 kV grid. The combined use of DC and AC technology proposed in the GDP enables an overall optimisation of the transmission network for the historical growth in supply requirements and the future transmission requirements with regard to grid stability, economy and space utilisation.

An expansion of the grid is elementary to the success of the "Energiewende". The speed of the grid expansion will determine the speed of the "Energiewende". If the grid expansion continues to lag behind the speed at which renewable generation systems expand, this will endanger the objectives of the "Energiewende" and the security of supply. In addition, a failure to optimise, enhance and expand the transmission network would incur high costs in other areas, for example due to the collapse of the common market area in Germany and the formation of zones with different electricity wholesale prices, increasing regional shut-downs of regenerative producers and consumers (supply management) and ever increasing costs for re-dispatch. In addition to the transmission network, network expansion is also necessary at the distribution grid level and for offshore connections.

This grid development plan is the second draft. It is the result of a constructive public debate based on the first draft of the GDP as part of the public consultation. The results of this are included in the second draft. The consultation was accompanied by numerous dialogue events with the TSOs in the Federal states. The transparent and dialogue-oriented process ensures that all interests affecting the GDP are discussed in the public domain and that the GDP is the result of a mutual awareness and development process. In parallel with the

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GDP, first approaches are being made regarding sensitivities which highlight additional knowledge concerning the relationship between input variables and grid expansion. However, these considerations are taking place outside the statutory scope of the grid development plan.

Together with the offshore grid development plan, the electrical supply grid development plan is an essential prerequisite for achieving the "Energiewende" objectives.