NEP 2.0

A new grid development plan for the future

TENNET

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Background

The German grid development plan for electricity (NEP) sets the frame for future investments in the German transmission grid infrastructure. The plan is a joint plan by all four Transmission System Operators (TSOs) that are legally obliged to submit the NEP. The plan contains a range of scenarios of the future state of the German transmission network, in particular taking into account the strong expansion of renewable energy. Thus, the plan identifies potential areas of stress in the system and defines the investments needed to relieve the stress. It is therefore the tool for assessment and approval of future grid investments.

While the NEP has been a welcome turning point for German grid planning when introduced in 2012, stakeholders are becoming increasingly worried whether the NEP is fit for the future.

On this basis, TenneT has asked Copenhagen Economics to investigate whether the NEP is fit for the future, and how potentially to improve the process.

Executive Summary of the main study

The extensive transformation of the energy system taking place in Germany and surrounding countries has sharply increased the need for grid infrastructure in Germany. The key driver is the growth of intermittent renewable energy sources (wind and solar), in particular with wind power far from consumers in conjunction with the parallel decline of stable baseload production (conventional power plants and nuclear power plants) close to consumers .

The introduction of the common German Grid development plan (NEP), anchored in the Energy Act (*Energiewirtschaftsgesetz*, EnWG) has been a timely and successful turning point in the German grid planning. The NEP successfully fulfilled the first stage of the *Energiewende* by paving the way for an expansion of the annual grid investments from around €600 million before 2010 to about €2.0 billion from 2015 onwards.

The investments listed in the Federal Requirements Plan Act (*Bundesbedarfsplangesetz*, BBPlG) and the Power Grid Expansion Act 2009 (*Energieleitungsausbaugesetz*, EnLAG) reflect the minimum capacity necessary for the transmission grid to take on large amounts of renewable energies. All measures listed in the BBPlG and the EnLAG are therefore no-regret measures; in the future grid planning 2.0, those investments must be the starting point for all further measures in the German transmission grid. However, it becomes more and more clear that the current NEP approach might not be fit for the continued and massive transformation of the German energy

system over the coming decades.[1] In our evaluation, the key weaknesses in the current NEP approach are the following related issues, which is likely to – without a reform of the approach – have a negative effect on the future grid planning:

First, the NEP bases its identification of investment needs on the premise to avoid bottlenecks (nearly completely) in a single year (in the latest NEP, 2030)

Second, costs or benefits associated with potential bottlenecks in years prior to or after 2030 are, except for one scenario looking slightly further ahead into the year 2035, not factored into investment criteria

Third, the assessment is based on scenarios with limited variation in the key drivers for investment needs – such as flexible demand, storage, geographical location and concentration of demand – during the very long lifetime of the grid assets. We would stress risks associated with grid capacity becoming underutilised in the coming decades. This risk is closely linked to a possible rapid maturing of technologies solving bottlenecks and providing flexibility at lower costs than traditional grid investments (the "stranded asset" discussion)

Fourth, too rigid rules determine how TSO can deal with bottlenecks which might both block grid investments with higher expected economic viability than alternatives as well as force grid investments when alternatives are less costly.

Fifth, the current NEP is very resource consuming and recurs every two years. It has arguably too much focus on running very detailed grid models to calculate bottlenecks in a single year despite the fact that the scenarios used to assess investment needs often have limited variation relative to the former round for the same year.

To remedy those issues, we propose a reform package with three key elements. In addition, a smooth transition from the current NEP to the NEP 2.0 is important.

A more robust evaluation of grid investments in a longer-term perspective. Each investment should be based on net-value approach, be compared to alternatives and not be based on the bottleneck-free grid. Costs and benefits are to be measured ideally over the lifetime of the asset, not just a single year.

Explicit treatment of longer term investment risks and opportunities. The scenarios underpinning the evaluation should be based upon a more realistic variation of the key drivers behind investment needs, not the least the increasing economic maturity and scalability of alternatives to grid investments. Grid investment that have high net-value across a large range of plausible scenarios should be prioritised in the NEP.

More flexible and comprehensive approach to grid planning. We suggest changing the frequency of the NEP. Currently, a NEP is produced every second year; we suggest to produce a thorough, formal NEP with thorough analyses and risk assessments every fourth or fifth year, or when significant changes in the main drivers for investments occur. In between those years, we suggest to produce a lighter monitoring report (annually or bi-annually) to assess major changes in the assumptions behind the investment needs. Based on this monitoring report, the TSOs should be allowed to move marginal investment projects up (towards submission for approval) or down (i.e. not prioritised) a the (not yet existing) prioritisation list in the NEP. The NEP will also provide insight into the long term grid investment costs associated with alternative scenarios; this insight can be a very valuable input to the overall energy policy discussion, and can for example help achieving the *Energiewende* at the lowest possible socio-economic costs.

A smooth transition from the current NEP 1.0 to the reformed NEP 2.0. The momentum generated by the current NEP 2030 should be maintained, which is why we suggest finalising the current NEP as planned. The TSOs can on the basis of the current approach calculate and assess the need for new grid investments until the beginning of 2019. Some new elements such as suggestions from this study could potentially already be included. However, on the whole, the assessment of the need for investment will be done as usual in the past, and will be based on current principles. In parallel, preparation for the new NEP 2.0 should start now and eventually lead to principles, legislation and guidelines being re-designed so that they can support a the NEP 2.0 from 2020 onwards.

Our analysis of weaknesses and the practical implementation of our recommendations is mapped out in more detail in the main report (in German only).

[1] Studies by Agora Energiewende (2018) 'Toolbox für die Stromnetze', and Agora Energiewende (2017) 'Optimierung der Stromnetze' for example point out weaknesses in the current grid planning approach.