Germany's grid operators face growing multibillion-euro investment challenge:
Energy transition a boon for green bonds

Germany's electricity grid operators are gearing up for a EUR 19bn increase in capital spending to ensure that the country's energy infrastructure copes with growing reliance on renewable rather than coal and nuclear power supplies. The latest base case estimate for upgrading Germany's grid by 2030 is EUR 52bn, up from an estimated EUR 33bn in 2017, much of it related to connecting and managing extra supplies of wind- and solar-driven electricity and longer distances between generation and consumption.

To fund the bigger-than-expected investment in new long-distance high-voltage cables and other infrastructure, some of the transmission system operators in Germany – TenneT-TSO Germany, 50Hertz, Amprion and TransnetBW – face an extended drain on free cash flows and reliance on external financing.

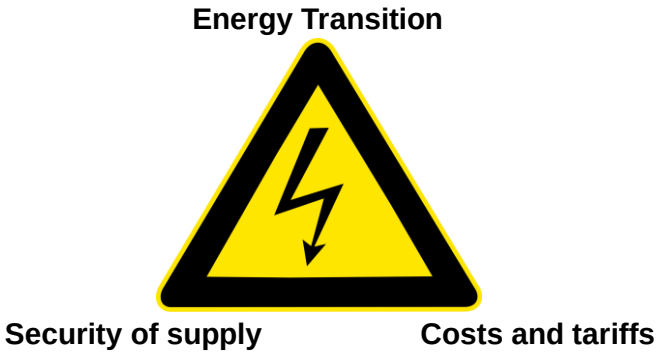
Reassuringly for creditors and investors, Germany's regulatory framework allows grid operators to eventually claw back investment through higher tariffs, despite rules designed to simulate competition and motivate operators to focus on cost efficiency.

German industry and consumers, on the other hand, face a sustained increase in grid charges. Germany already has among the highest end consumer power prices in the EU, a trend which could encourage industrial relocation to other countries.

More encouragingly, the grid operators' funding needs may lead to a further surge in issuance of "green" securities – from public and hybrid bonds to private debt – significantly widening options for investors looking for "sustainable" investments.

The driving force behind this transformation in Germany's energy infrastructure is less the government's desire to catch up with missed targets for reducing CO2 emissions and more the unintended consequences of the ambitious push into volatile renewables.

Figure 1: High-voltage grids caught between climate objectives, costs and grid blackout



Source: Scope illustration

Renewables accounted for an average of 40% of Germany's electricity needs in 2018, an impressive but unrepresentative figure. Daily intermittency of solar and wind is such that they contributed as little as 15% and as much as 70% of Germany's electricity needs according to data from January 2019. Adding more renewable energy capacity helps only at the margin given the constraints of cloudy, windless days and sunless hours.

Such variability strains the overall grid, hence the EUR 52bn estimated investment needed by 2030 to ensure grid stability and integration of onshore renewables, according to the base scenario of the recently published draft Grid Development Plan ('Netzentwicklungsplan' 2019) – an increase of more than 50% from the 2017 plan. And this figure does not even include offshore integration or storage solutions.

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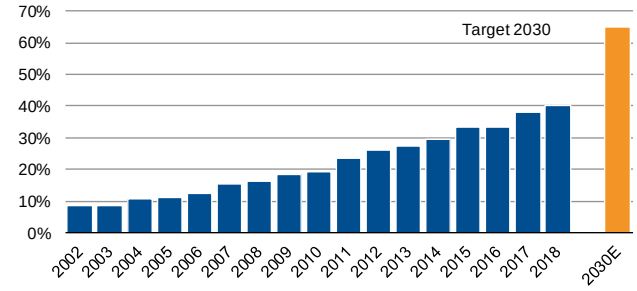
An average is just an average!

Germany targets 65% reliance on renewables by 2030

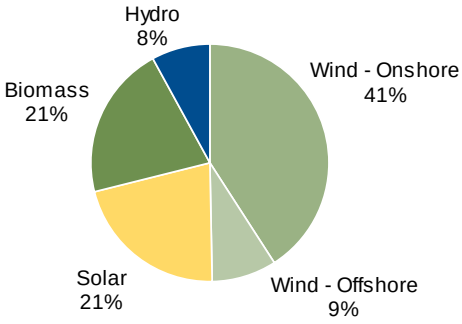
Germany is edging closer to the national target of 65% renewable energy by 2030 (see figure 2), with a contribution of around 40% (roughly 220 TWh) of electricity generated from renewable sources in 2018. While 40% looks impressive and most people support the idea of clean energy, the figure is in reality an average throughout the whole year. In other words, it is misleading to conclude that renewable energy capacities just need to be expanded by factor of X to cover the country's remaining energy needs.

Figure 2: Contribution of renewable energy sources in Germany's power generation mix



Source: Fraunhofer, Scope

Figure 3: Split of renewable energy by source 2018



Source: Fraunhofer, Scope

An average does not help at times when the sun is not shining, or the wind is still

Data from winter and summer months (January 2019 and July 2018) demonstrate the significant variability of renewable energy's contribution to Germany's power needs. The examples illustrate why average renewable-energy availability is not a very helpful measure considering there are times when renewable energy sources are simply not available (see figures 4–7). This particularly relates to the more volatile generation from on- and offshore wind farms.

Electricity generation mix and share of renewables in Germany

Figure 4: Daily generation in January 2019

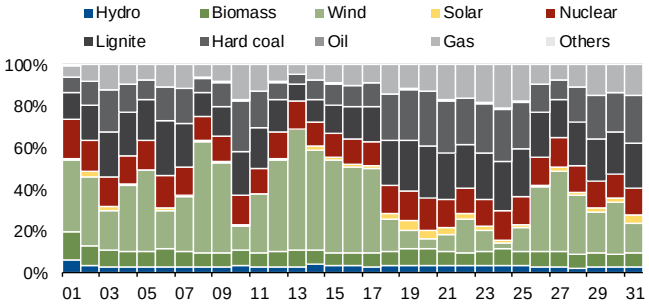


Figure 5: Daily share of renewables in January 2019

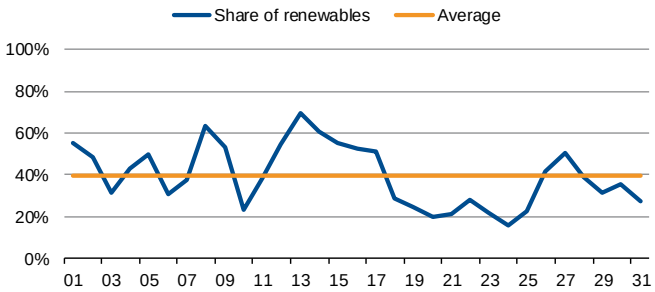


Figure 6: Daily generation mix in July 2018

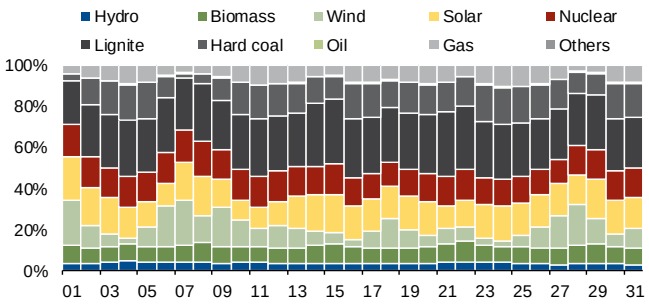
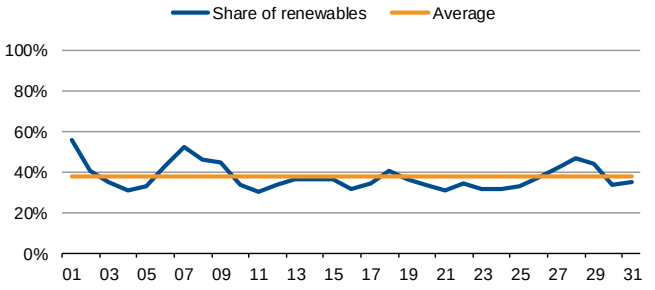


Figure 7: Daily share of renewables in July 2018



Source: Fraunhofer, Scope

Keeping the lights on

Germany has to call often on electricity imports from neighbouring-country coal and nuclear power plants.

While on some days, generation from renewables already reached 60% and more, on others, the contribution from renewables stands at less than 20%, thereby requiring large contributions from thermal generation capacities and even significant imports from neighbouring markets, which could be "clean" hydro power from Scandinavia or Austria, but could also be "dirty" power from French/Swiss/Czech nuclear or Polish coal power plants. Moreover, the higher volatility of wind power and longer distances of power transmission from the location of power generation to the location of power consumption requires considerable effort of the grid operators, regarding balancing of the more volatile load profile and deploying reserve and emergency capacity.

Significant new electricity transmission infrastructure needed

In the context of the missing generation volumes of around 70 TWh (13% of annual power generation in Germany) from the nuclear exit by 2022 and the gradual reduction of power generation from coal-fired power plants (see also Scope's comment on Germany's coal exit: Mixed medium to long-term implications, Jan 2019), Germany will require significant investments in transmission cables, but also interconnectors such as Nord.Link and NorGer, gas-fired power plants and related infrastructure such as such as Russia-Germany NordStream gas pipelines, gas storage capacities and power-to-gas infrastructure.

Stability of supply comes at a price

Planned nuclear, coal exits come at a price for Germany's electricity network

Creditors and end-consumers need to be aware that preparing the transmission sector for the deepening of Germany's energy transition will not be cheap. Germany's determination to further expand renewable energy and reduce conventional power production raises the challenge of the investment required in the national electricity grid to safeguard the security of energy supply. Heavy investment is needed to avoid power outages or even blackouts as Germany relies increasingly on intermittent solar and wind power for which backup supplies from fossil-fuel and nuclear sources will remain crucial.

Estimated cost of new SüdLink cable is EUR 10bn

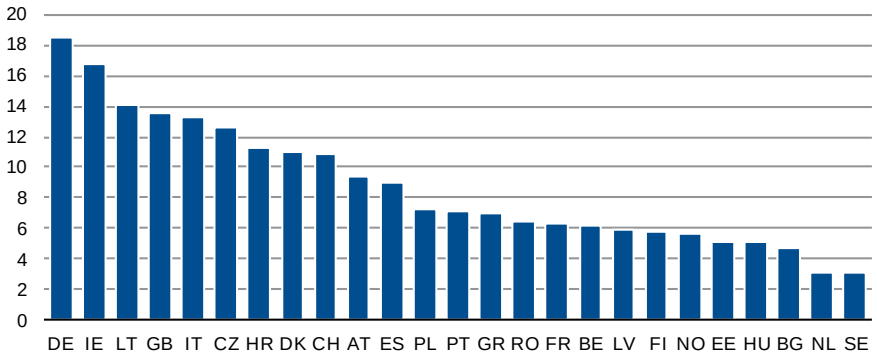
The envisaged investment costs of around EUR 10bn for the 2x2 GW SüdLink cable – a 750km long high-voltage power line in areas serviced by TenneT-TSO Germany and TransnetBW – gives an indication of how this transition comes at a price. According to recently published draft of the Grid Development Plan ('Netzentwicklungsplan'), investment of around EUR 52bn is needed by 2030 in the so-called scenario B2030 to ensure grid stability and adequate integration of renewables into the country's grid. And an extra of EUR 18bn is earmarked for the integration of new offshore wind capacities under the 'Flächenentwicklungsplan'. Such investments will initially drain cash flow from the four German TSOs – Amprion, TenneT-TSO Germany, 50Hertz and TransnetBW and their parent companies – though ultimately they will be covered by all end customers.

Steadily increasing grid charges are the natural consequence

It will require heavy external financing and will naturally be followed by increased transmission tariffs as a result of increased operational costs and a steadily growing regulated asset base. We note that Germany already has some of the highest unit transmission tariffs[1] in comparison with other European countries (see figure 8).

[1] The calculation of the unit transmission tariffs for a pre-defined voltage level covers charges invoiced to base case grid users (generation and load) for the purpose of covering both TSO costs (infrastructure, system services and losses) and, where applicable, non-TSO costs (renewable energy support, regulatory levies, stranded costs, etc).

Figure 8: Comparable TSO-specific Unit Transmission Tariffs 2018 at the voltage level of 220-150 kV in EUR/MWh (constant Euros of 2017), excluding non-TSO costs (renewable energy support, regulatory levies, stranded costs, etc)



Source: ENTSO-E 'ENTSO-E Overview of Transmission Tariffs in Europe: Synthesis 2018', Scope

Grid transition leaves TSOs with constrained free cash flows

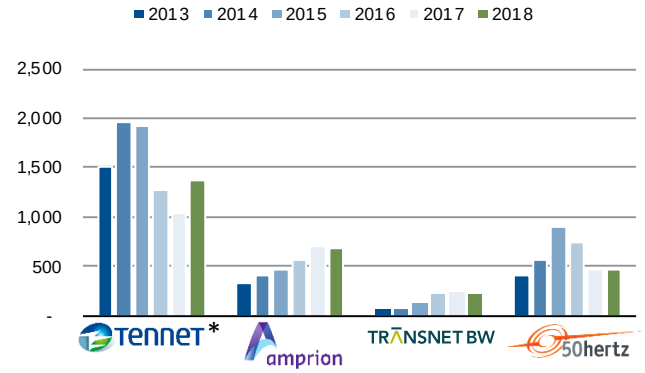
TenneT-TSO Germany to shoulder most of capital expenditure

The significant capex of German TSOs over the past few years (see figure 9) has squeezed free operating cash flow (see figure 10), which translates into frequent reliance on external financing - and no room for deleveraging. Looking at the dedicated medium-to-long term investment plans of the four TSOs, this situation will worsen over the next few years.

Publicly announced investment plans:

- TenneT-TSO Germany — EUR 23bn for a 10-year period between 2019-2028
- Amprion — EUR 6.8bn for a 10-year period between 2018-2027
- 50Hertz — EUR 3.4bn for a 5-year period between 2019-2023
- EnBW Grids segment[2] — EUR 3.3bn for a 3-year period between 2018-2020

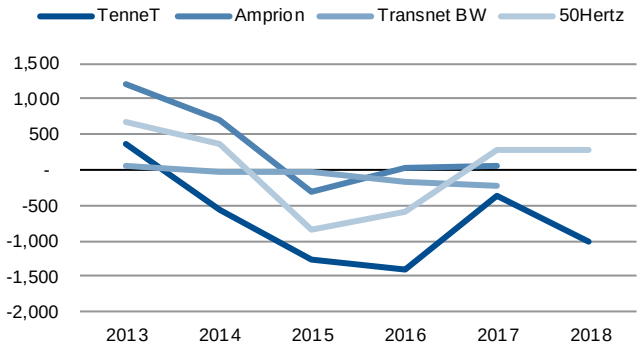
Figure 9: Capex of German TSOs (in EURm)



* Relates to TenneT–TSO Germany

Source: companies, Bundesanzeiger, Scope

Figure 10: Free operating cash flows of TSOs[3],[4]



Source: companies, Bundesanzeiger, Scope

[2] EnBW's grids segment comprises TransnetBW GmbH but also encompasses the distribution of electricity and gas, the provision of grid-related services, e.g. the operation of grids for third parties, and the supply of water.

[3] Free operating cash flows of TenneT relate to TenneT Holding BV which includes TenneT–TSO Netherland and TenneT–TSO Germany

[4] TransnetBW GmbH is part of EnBW where separated cash flows for the grid business are not available. Cash flows have been estimated based on TransnetBW GmbH's reports on Bundesanzeiger.

Boon for "green bonds"

Boon for Europe's "green bond" market

While such extended periods of constrained or even negative free operating cash flows and dependence on external financing would be tricky in other industries, Scope is not overly concerned about the cash flow profile of grid operators because of the following:

- First, the existing incentive regulation on transmission tariffs provides coverage of grid-related costs and an 'adequate' return on investment, with some delay, despite a harmonisation of tariffs among the four German TSOs in the current regulatory period from 2019-2023.
- Secondly, external financing for such regulated grid operators is largely available and TSOs increasingly benefit from the issuance of "green" financing instruments. TenneT is using a full range of green instruments such as green bonds, green Schuldschein and green US-PPs as well as a green hybrid (summing up to EUR 6bn). EnBW – the parent of TransnetBW – has recently issued a EUR 500m green bond in relation to investments in wind, solar and e-mobility but could likely do the same relating to the grid business. Amprion and 50Hertz/Eurogrid are likely to follow, from Scope's perspective.

Natural monopoly underpins investment grade credit ratings

Even highly leveraged TSOs with persisting negative FOCF, such as TenneT Holding BV – the parent company of TenneT – TSO Germany – or Elia System Operator NV – the parent company of 50Hertz/Eurogrid – can achieve a credit rating in the higher investment grade categories because of their very strong competitive profiles as natural monopolies with a secured cost coverage, strong interest coverage ratios and sound liquidity profiles. That is despite the utilities having leverage of above 5x, which could rise further over the next few years.

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