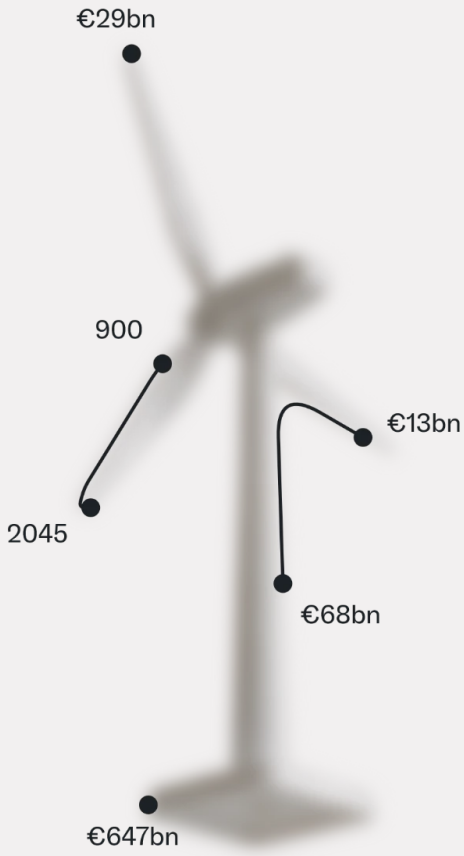
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Climate Neutrality Foundation

Financing Germany's distribution grid build-out



English summary of our studies on DSO financing needs and instruments

05 November 2026

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Table of Contents

1. Introduction **4**

2. DSOs' financing needs and equity gap **5**
Investment and financing needs 5
Equity as a key challenge for public DSOs 8

3. Instruments to finance German DSOs **11**
Debt instruments 11
Equity or equity-like instruments 12

4. Conclusions and outlook **15**

Bibliography **16**

#energytransition #grids #equity

Germany's distribution system operators (DSOs) must invest €647 billion by 2045 to expand and modernise electricity and district heating networks and to maintain and gradually decommission gas distribution networks in line with national climate targets. Most of this investment will be financed through debt and retained earnings. However, DSOs also need €68 billion of new equity by 2035 as lenders only provide debt financing for grid investments if DSOs have a sufficient equity base. We show that an equity gap of roughly €13 billion, concentrated among municipal DSOs, remains even after DSOs use all available levers – higher debt leverage, greater earnings retention, and fresh equity from financially stronger shareholders. To close this gap, we propose equity-like instruments: subordinated shareholder loans from municipalities, mezzanine capital from public promotional banks, and state-backed project financing solutions.

1. Introduction

Distribution system operators (DSOs) are central to the clean electrification of the European economy. Integrating renewable, decentralised energy generation as well as new demand sources, such as heat pumps and electric vehicles, requires increasing grid investments at the distribution level (Eurelectric 2024b): Annual DSO investments of roughly €33 billion between 2019 and 2024 must rise to €50 to 67 billion per year until 2050 (ACER 2026; Eurelectric 2024a). Realising these investments is critical to the European Union's (EU) competitiveness, security, and climate targets.

Despite the regulated nature of energy grids, European DSOs face significant financing challenges that constrain their investment activity. As our analysis shows, internal funding is clearly insufficient to finance the necessary increase in investment. DSO balance sheets need to grow substantially, and expanding debt financing to the level required necessitates additional external equity capital.

National and European policymakers are beginning to address these challenges: In March 2026, the European Commission unveiled its Clean Energy Investment Strategy (CEIS) to unlock grid investment, backed by more than €75 billion of EIB financing over the next three years. To this end, the CEIS includes an EIB-anchored infrastructure investment fund of €500 million to attract private equity; an operator securitisation facility to convert future regulated revenues into instant liquidity; and hybrid bonds that count partly as equity and thus increase DSOs' debt capacity (European Commission 2026).

The CEIS complements existing and planned initiatives at Member State level, such as Germany's "Deutschlandfonds", an umbrella initiative set out in the 2025 coalition agreement and launched in December 2025 that also aims to mobilise more capital for energy infrastructure (KfW 2025). German DSOs can already access new and preferential debt instruments; a mezzanine capital programme has been announced for 2027 (KfW 2026). Germany is a relevant case for European DSO financing both because of its progress in implementing initial financing instruments and because it is home to roughly one third of Europe's 2,674 DSOs (ACER 2026).

This paper summarises the results of a joint research project by Agora Energiewende, Climate Neutrality Foundation, and Dezernat Zukunft on DSO financing needs and solutions in Germany. Chapter 2 covers our studies on the financing needs of German DSOs (Agora Energiewende et al. 2025, 2026). Model details can be found in a technical background paper (Inan et al. 2025). Chapter 3 then sets out our proposed instruments to address German DSOs' financing challenges (Schroeten et al. 2026; Agora Energiewende et al. 2025). Chapter 4 draws conclusions.

2. DSOs' financing needs and equity gap

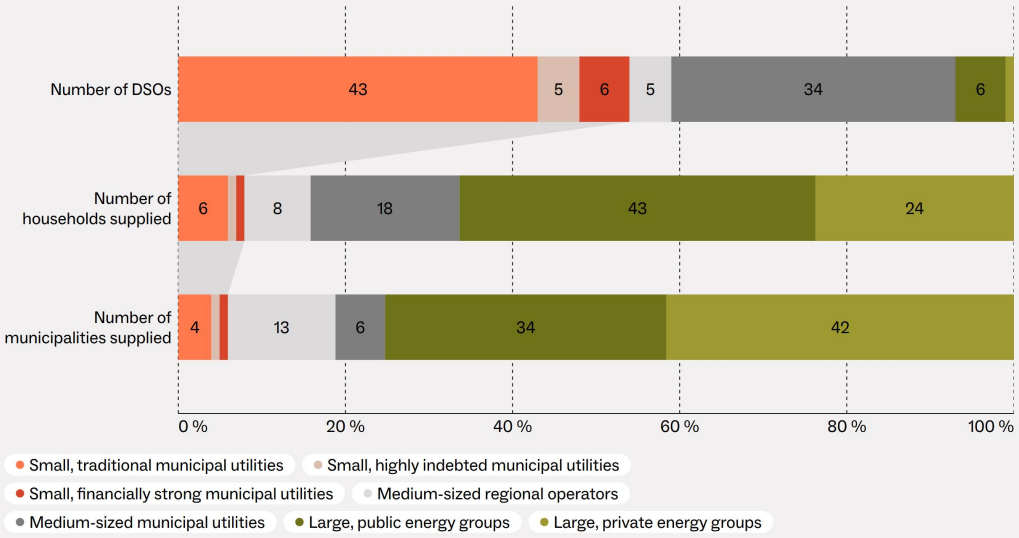
Investment and financing needs

We find that DSOs in Germany will need to invest about €647 billion (nominal) by 2045 to expand and modernise their energy distribution networks. Electricity distribution grids account for 65 percent of the overall investments, while district heating networks account for roughly 31 percent. Gas distribution networks, by contrast, make up only 4 percent, reflecting their planned decommissioning. This large-scale infrastructure build-out will require German DSOs to triple their annual investment compared to the 2015–2025 period.

As German DSOs vary greatly in size and structure, we group them into seven clusters based on balance sheet size, number of supplied municipalities, ownership structure and equity ratio (Figure 1). Small municipal utilities make up 54 percent of all DSOs, but supply only 8 percent of households and 6 percent of municipalities. At the other end of the spectrum, large, private energy groups account for only around 1 percent of all operators, yet supply 24 percent of households and 42 percent of municipalities.

Figure 1

The structure of Germany's DSO landscape



Reading example: Small municipal utilities (traditional, highly indebted, financially strong) make up 54 percent of all DSOs, but supply only 8 percent of households and 6 percent of municipalities.

Note: Supply refers to grid operation.

Source: Agora Energiewende et al. (2025) and (2026) based on Agora Energiewende (2024) and IMK (2024)

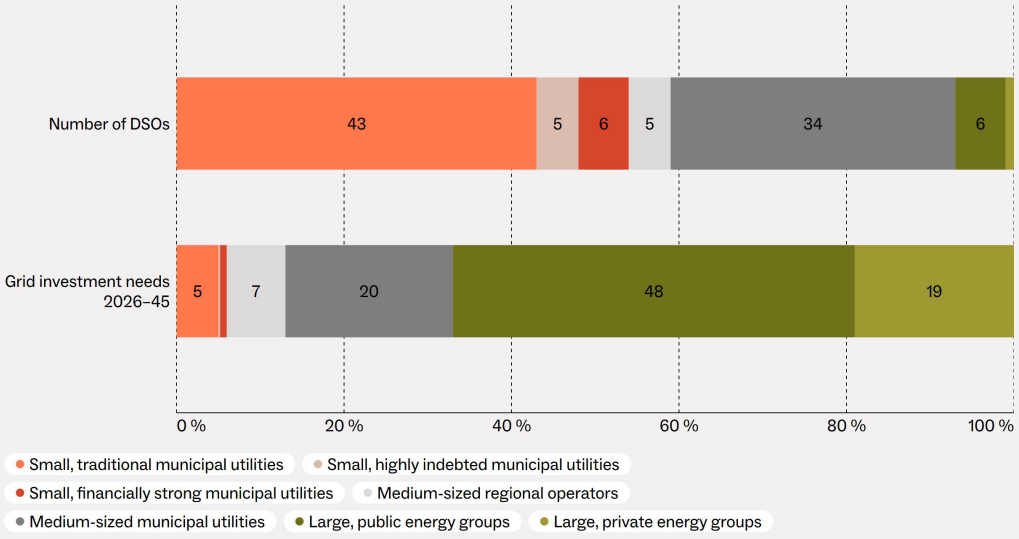
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Figure 2 shows the grid investment needs by cluster. Large, public energy groups account for the largest share of investment needs (€311 billion or 48 percent), followed by medium-sized municipal utilities (€126 billion or 20 percent) and large, private ener-

gy groups (€124 billion or 19 percent). Although these three clusters represent only 41 percent of all DSOs (Figure 2), together they account for 87 percent of total investment needs. Medium-sized regional operators occupy the middle ground with €44 billion (7 percent of investment), while small, traditional municipal utilities (€35 billion, 5 percent) and the two clusters of small, financially strong and small, highly indebted municipal utilities (around €3 billion each, less than 1 percent) together make up only 6 percent of investments. Yet these three clusters make up 54 percent of all operators, reflecting the fragmented nature of Germany's DSO landscape.

Figure 2

DSOs in Germany and their grid investment needs



Reading example: Small municipal utilities (traditional, highly indebted, financially strong) make up 54 percent of all DSOs, but account for only 6 percent of grid investment needs from 2026 to 2045.

Source: Agora Energiewende et al. (2025) and (2026) based on Agora Energiewende (2024) and IMK (2024)

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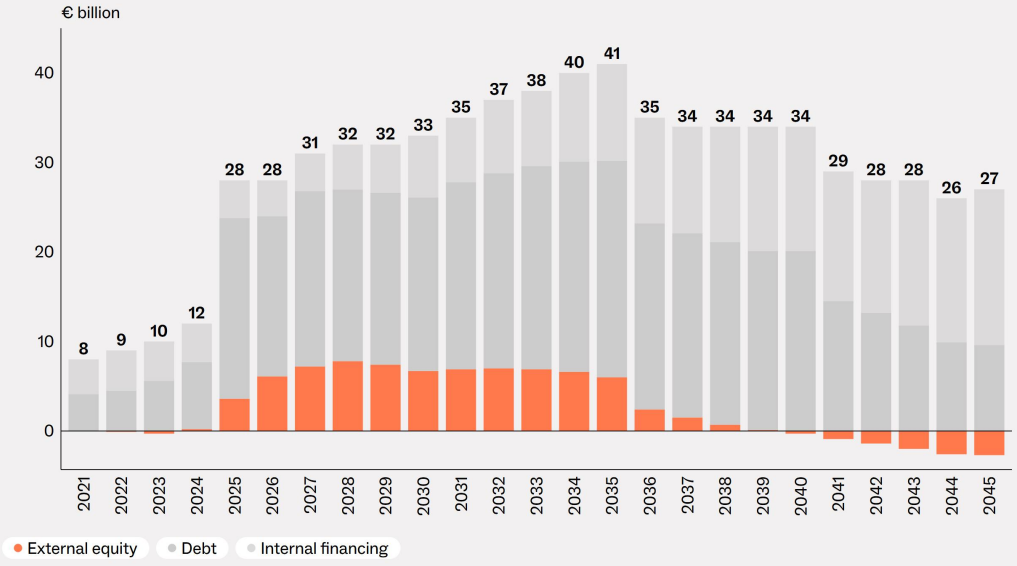
Geographically, investment needs are concentrated in the most populous states: North Rhine-Westphalia (21 percent), Bavaria (14 percent), Baden-Württemberg (12 percent), and Hesse (12 percent). Due to declining populations, the Eastern federal states have the highest investment needs per capita (Agora Energiewende et al. 2026).

In terms of financing mix, German DSOs will finance most of their investments until 2045 through new debt (€379 billion, 59 percent) and retained earnings (€203 billion, 32 percent). Annual debt financing rises until investments peak in 2035 and falls thereafter (Figure 3). Retained earnings grow throughout the entire period as the asset base expands; their share rises from 14 percent in 2026 to 64 percent in 2045. At €68 billion, DSOs' external equity need through 2035 is small relative to total financing, but critical to ensuring that additional debt can be raised. This need declines after 2035, as annual investments fall and growing retained earnings contribute more. From the 2040s onwards, the equity need turns negative in many clusters, allowing DSOs to return capital to their shareholders.

Figure 3

Distribution grid investment needs in Germany, 2021–2045

Financing mix, nominal



Reading example: In 2028, investment needs amount to €32 billion — about 25 percent external equity, 61 percent debt, and 14 percent internal financing. From 2040 onward, external equity turns negative: as investment needs decline and internal financing rises, the negative equity requirement corresponds to a repayment of capital.

Note: From 2025 onward, the figures are based on our estimates of investment needs, which assume higher investment for electrification; the years before reflect historic investments.

Source: Agora Energiewende et al. (2025) and (2026) based on Agora Energiewende (2024) and IMK (2024)

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Our findings are in line with other studies on the financing needs of German DSOs (PwC 2025). Box 1 summarises our methodology.

Box 1: Methodology to assess German DSOs' financing needs

Our model to calculate the financing needs of German DSOs determines annual profits or losses, cash flows and balance sheet figures by considering regulatory requirements and other assumptions, such as the future financing structure and dividend payout ratio. We derive the financing needs at the DSO cluster level and break them down by year and sector, providing high temporal granularity and showing when debt and equity funding is needed.

The key inputs to the model are the annual, sector-specific historical and planned distribution grid investment volumes up to 2045 for each cluster, based on Agora Energiewende (2024) and IMK (2024). The model accounts only for

capital expenditures, costs of capital, and regulated returns on capital. Operating costs and other aspects of the German Incentive Regulation (ARegV) are not considered.

The model works as follows: investments are financed first through retained earnings wherever possible, then through additional debt. The annual amount of debt raised is limited by the annual target debt ratio and the resulting debt capacity. Equity is the residual source of funding: if internal funds and debt alone cannot cover the investment without exceeding plausible debt-to-equity ratios, equity closes the remaining gap. The annual equity need can also turn negative if internal financing exceeds investment needs; this corresponds to a repayment of capital.

The model distinguishes between three sectors – electricity, gas, and district heating. The calculations are carried out separately for each cluster and sector and aggregated in the overall analysis. Differentiating by sector also captures regulatory differences: electricity and gas are far more tightly regulated than district heating.

Our model and methodological approach are explained in more detail in Inan et al. (2025).

Equity as a key challenge for public DSOs

Equity forms the basis of DSOs' financing structures and thus enables their grid investments. As the capital that absorbs losses first in the event of insolvency, equity strongly influences a DSO's rating and, therefore, its ability to raise debt capital. The more equity a DSO has, the more easily it can borrow from banks or the bond market. Most DSOs need additional equity because retained earnings alone cannot build an equity base large enough to support the debt needed to finance the sharp rise in grid investment, particularly over the next ten years.

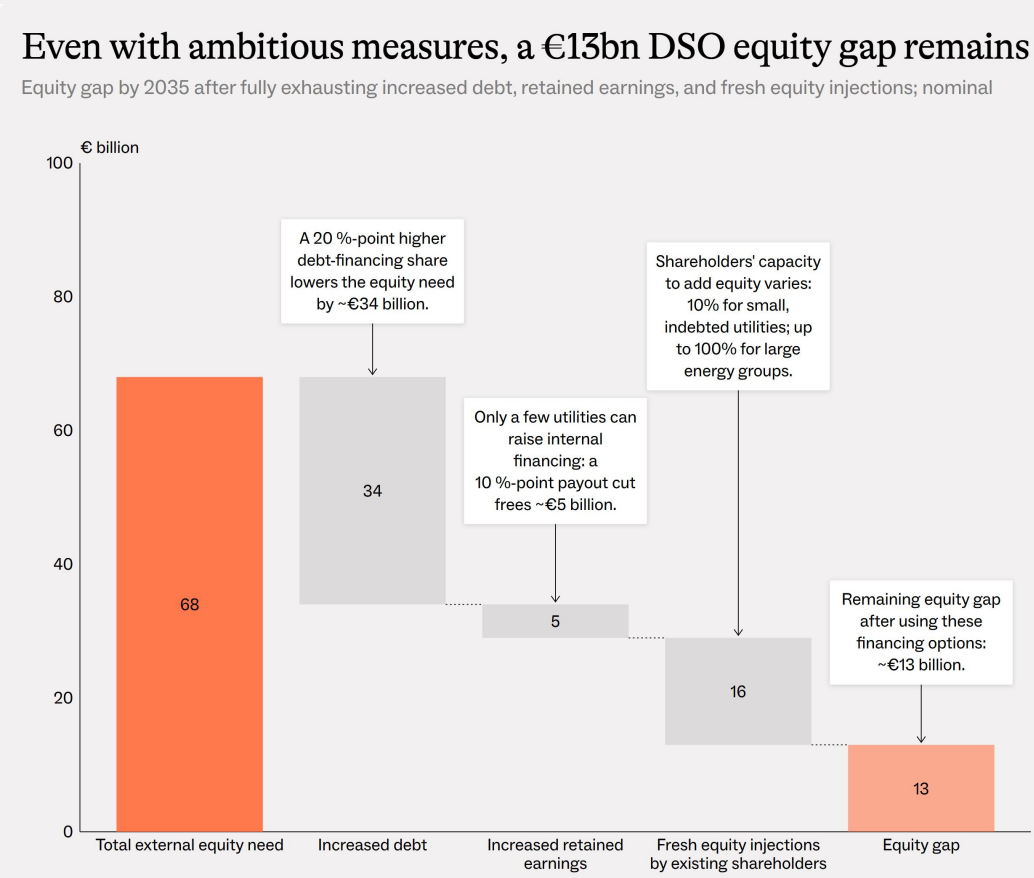
That said, the resulting external equity requirement of €68 billion need not be covered entirely by new equity injections (Figure 4). Incentives to expand debt and internal financing for a given level of equity can partly reduce this requirement: if DSOs can raise more debt per unit of equity, the need for fresh equity capital decreases. If they retain more profits rather than distributing them, they strengthen their equity base from within and need to raise less external equity.

A 20-percentage-point expansion of debt financing can reduce the external equity requirements of all DSOs by up to €34 billion by 2035. Prerequisites are financial expertise within operators and targeted debt instruments, as outlined in the following chapter.

In contrast to debt financing, we expect internal financing to contribute very little. Many municipal shareholders – particularly in the case of small, highly indebted municipal utilities – rely on profit distributions from the local DSO. Historical payout ratios of large, private energy groups also suggest that distributions can only be reduced moderately, as owners expect regular returns. Assuming that the average payout ratio across all DSO

clusters is reduced by ten percentage points, the equity requirement falls by a further €5 billion.

Figure 4

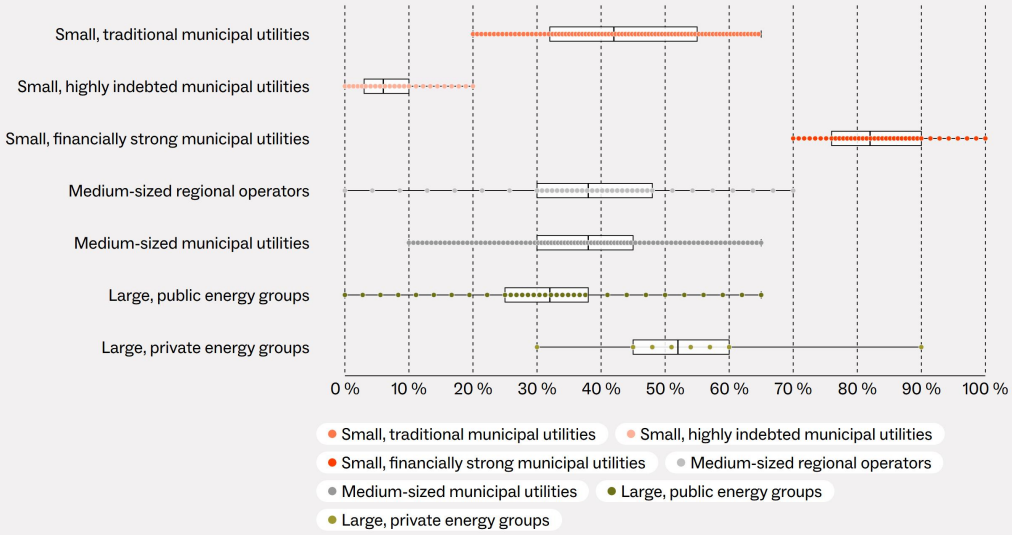


Once increased debt financing and internal financing are fully exhausted, a residual external equity requirement of around €29 billion remains. We assume that around 55 percent of this amount, approximately €16 billion, can be provided by existing shareholders. To this end, we apply cluster-specific factors that reflect how much additional equity current shareholders can inject. These factors take into account the historical equity ratios of German DSOs (Figure 5) and the €32 billion deficit of German municipalities (Raffer et al. 2025). For small, highly indebted municipal utilities, this factor is only 10 percent; for large, private energy groups it is 100 percent.

Ultimately, an equity gap of around €13 billion persists. It mainly affects municipal DSOs and cannot be closed without additional equity and hybrid capital instruments from public institutions. Measured against total investment needs, the equity gap is small. However, if it is not closed, many DSOs will be unable to raise enough debt capital to expand and upgrade their grids in line with climate targets.

Figure 5

Equity ratio of German DSOs, 2021



Note: The box itself represents the middle 50 percent of the data; the line inside the box shows the median. The whiskers cover the remaining 50 percent, and outliers are shown as individual points.

Sources: Agora Energiewende et al. (2025) and (2026), based on annual financial and activity reports filed under the German Energy Industry Act (EnWG) and 2021 group financial statements.

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3. Instruments to finance German DSOs

To close the DSO equity gap, we propose a combination of targeted debt and equity financing instruments that take into account the diverse capital requirements across German DSO segments (Agora Energiewende et al. 2025; Schroeten et al. 2026).

Debt instruments

DSOs' capacity to take on more debt is constrained by, among other things, limited corporate financing know-how among smaller DSOs, sector- and operator-specific credit risks, and already stretched bank balance sheets. Our recommendations target these barriers:

Especially for smaller DSOs with little corporate finance know-how and limited access to capital markets, we propose **capacity-building programmes to improve financial expertise and access to debt**. Such programmes could be executed in collaboration with Germany's promotional bank KfW, supporting either DSOs directly or their municipal shareholders. For the latter, one option is to enable municipalities to issue green bonds to raise capital for their DSOs. So far, only a handful of municipalities – Cologne, Offenbach, Hanover, Münster, and Munich – have gained initial experience with green bonds, so their potential remains largely untapped (Brilon and Raffer 2025).

To incentivise more debt financing in the face of sector-specific risks, we propose public **concessional loans** with de-risking elements. They could be designed as co-financing loans, accessible only if matched by additional bank financing, to leverage private capital. Such an instrument is now available through KfW's "Konsortialkredit Energieversorgung" (KfW 2026) – a joint loan facility in which KfW and local banks co-finance a DSO loan, sharing credit volume and associated risks.

To the same end, we propose **public credit guarantee programmes**, particularly in the context of higher-risk investments such as geothermal or certain district heating projects. In Germany, the "Förderkredit Geothermie", introduced in December 2025, provides loans for drilling projects to tap geothermal heat and covers up to 100 percent of the discovery risk through a combination of private insurance (Munich Re) and a federal guarantee. The loan only needs to be repaid if drilling is successful (Inan and Steitz 2026; KfW 2025). At EU level, an EIB guarantee lets the EIB take on up to 50 percent of the credit risk on loans Commerzbank AG extends to German DSOs (European Investment Bank 2025a).

To increase banks' capacity to provide loans for energy grid projects, we also suggest **public loan-purchase programmes** that buy existing energy-related loans off banks' balance sheets. By selling existing energy-related loan books, banks lower their concentration risks and can extend more loans. Pooling and securitising such loan books can also make them investable for institutional investors (Agora Energiewende et al. 2025). The EIB is well placed to run such a programme, since existing EIB programmes already follow similar approaches for SMEs and mid-caps (European Investment Bank 2022, 2025b). In the CEIS, the Commission commits to "explore with the EIB how to better support access to finance for grid operators by freeing up banks' lending capacity" (European Commission 2026).

Equity or equity-like instruments

The key challenge lies in closing the equity gap for municipal DSOs, whose shareholders face tight budgets. Private operators, most of which are large, will find it easier to source the required equity from existing shareholders.

To this end, we propose a layered approach that involves all levels of government: the municipalities as DSOs' shareholders, the federal states as the supervisory authorities for municipalities, and the federal government as the framework-setting actor, risk-sharer, and investor. We also discuss when and how private investors could be involved. The following sections outline the role that each level of government can play in closing the equity gap.

Municipalities

We recommend that municipalities provide their DSOs with hybrid capital in the form of debt-financed **shareholder loans**: the municipality takes out a loan (or issues bonds) and passes the proceeds on to its DSO as a subordinated shareholder loan, i.e. one that ranks behind other creditors in the event of insolvency. Banks recognise a shareholder loan fully or partially as equity if specific conditions are met, such as deep subordination to other creditors, repayment at maturity, and the option to defer interest payments. Compared with direct equity injections, shareholder loans can be structured to avoid burdening the municipality's cash flow: their repayment and interest schedules can mirror those of the municipality's own debt or bond financing. As a result, even municipalities with tight budgets can use the instrument.

Two cities show that the instrument works. Hanover on-lent €700 million to its utility enercity AG as a subordinated shareholder loan. Lower Saxony had amended its municipal code beforehand, so that such loans only need to be notified to the supervisory authority rather than approved (§ 121a NKomVG). Halle provides its utility with €9–10 million a year over ten years as a subordinated shareholder loan, subject to annual approval by the city council. We consider shareholder loans particularly well suited to utilities with simple ownership structures. However, municipalities are likely to face lengthy approval processes and restrictive municipal supervisory practices in most federal states. To enable a broad roll-out of municipal shareholder loans, we recommend streamlining the approval processes at state level (Schroeten et al. 2026).

Federal states

Federal states can support municipalities and DSOs through four instruments of their own:

First, we recommend that states adjust the legal framework within which municipalities can lend to their utilities. The example of Lower Saxony was already mentioned (Niedersächsisches Ministerium für Inneres, Sport und Digitalisierung 2025; Schröten et al. 2026). Schleswig-Holstein is another good example and went even further. It treats group loans as municipal investments and explicitly includes subordinated loans with equity character. If the utility's equity ratio remains at least 25 percent after the investment, no supervisory approval is required (§ 85 GO SH). We recommend that all states adopt comparable rules.

Second, we recommend that states further strengthen municipalities' capacity to provide shareholder loans by establishing **guarantee schemes** that partially secure interest and

principal repayments to the municipality in the (unlikely) event that DSOs experience liquidity issues. To date, no such programme exists. Nonetheless, given tight municipal budgets and cautious financing practices, we believe such an instrument could significantly boost the uptake of shareholder loans while posing only a limited risk to state budgets.

Third, we recommend states use their promotional banks to provide DSOs with **mezzanine capital**, a form of subordinated capital, by borrowing on the capital market and on-lending the proceeds on terms similar to those of the shareholder loan described above. In Hesse, the first such programme offers local DSOs a total of €1 billion and also carries a state guarantee – a feature we argue should become standard across federal states (WiBank 2025).

Several other federal states are currently developing programmes similar to Hesse's. Federal and state ministries have also announced plans to launch a joint nationwide mezzanine capital programme in 2027 to support these state efforts. Under this scheme, KfW would provide capital alongside the state promotional banks and share in the risk (KfW 2026; Energieministerkonferenz et al. 2026; NRW.BANK 2026).

Fourth, we recommend exploring **public equity investment companies** as a last-resort source of financing for infrastructure projects that cannot otherwise be financed, for example if poor DSO credit ratings hinder the implementation of municipal shareholder loans, hybrid state loans, or private financing solutions (see below). To avoid diluting DSO ownership structures, equity could be provided at project level rather than company level.

Federal government

Overall, the federal government, together with the national development bank KfW, plays an important role in **coordinating and streamlining** the various initiatives underway at state and municipal level.

Regarding specific instruments, as discussed above, we see a role for the federal government in standardising and supporting financing across states. We recommend that the federal government support states' mezzanine capital programmes through a joint **co-financing programme**, as KfW now intends to do (see previous section).

Furthermore, the federal government should explore a **counter-guarantee programme** for states' guarantee schemes for municipal shareholder loans, which would incentivise states to introduce their own guarantee schemes. Finally, the federal government could act as an intermediary between DSOs and private investors (see next section).

Private investors

Most municipal DSOs are reluctant to bring private equity into their capital structure, as this would dilute public ownership. At the same time, private DSOs and some municipal DSOs, especially those with more diverse ownership structures, are open to working with private investors, in particular via project financing vehicles that leave existing ownership structures unchanged. One challenge is the high fragmentation of the sector: many operators are too small for private investors with suitable time horizons, such as pension funds, so some aggregation is needed.

In Schroeten et al. (2026) we discuss a **private investor pool** – a publicly supported fund through which private investors can finance energy infrastructure projects. Such a fund

need not be managed by the government itself; a professional asset manager could run it under a specific mandate. For private investors, the benefit would be access to a single structure that bundles many infrastructure projects too small to invest in on a standalone basis. Public involvement could take the form of an anchor investment. The large and underutilised pension provisions of states and the federal government are a potential source of funds, as Climate Neutrality Foundation recently pointed out (Digulla and Schroeten 2026). The newly announced capital-funded pension scheme – a central part of the government's pension reform – could also provide funding (Gottschalk et al. 2026).

Momentum for mobilising private capital is growing. The government is currently considering a relatively passive approach: a public platform that selects and endorses project aggregators able to bundle municipal infrastructure projects and connect them with private investors (Bundestag 2026).

4. Conclusions and outlook

Our research on Germany highlights the importance of designing grid financing instruments based on a deep understanding of DSOs' underlying corporate ownership structures, financial conditions, and transition pressures – there is no one-size-fits-all solution.

In Germany, policymakers must ensure that close to 900 diverse operators can realise the investments needed for clean electrification in line with energy and climate targets. We see the largest challenges among municipally owned operators: small municipal utilities, many of which face tight financing conditions, and large, publicly owned energy groups, which account for roughly half of the total equity need.

The federal government and federal states have recognised this acute challenge and are taking measures to support DSOs. Several debt instruments have recently been introduced. In terms of equity and equity-like instruments, the federal government and federal states are working on a mezzanine capital programme run by public promotional banks, for which the federal government would guarantee 60 percent of the financing volume. Regarding shareholder loans, they are examining how the legal framework in the individual federal states could be amended to simplify their use (Energieministerkonferenz et al. 2026). The platform for private investors is the least developed of these measures so far; its design has yet to be specified.

Closing the equity gap is not a permanent subsidy. The need arises from the investment surge and declines once the new assets generate returns. It is bridge financing, and the critical period runs until 2035.

EU policymakers are navigating an even more complex landscape, as operator structures and grid investment needs differ not only within Member States but also between them. Our analysis shows that a granular picture of national circumstances is essential for designing effective instruments.

Against this backdrop, research on DSOs' financing needs across EU Member States should inform the implementation of the CEIS instruments and grid-related instruments in the next Multiannual Financial Framework (MFF) 2028–2034. A key question is how EU-level instruments can best complement national measures.

An upcoming study by Dezernat Zukunft and the European Macro Policy Network will provide first high-level estimates of financing needs across EU Member States, applying the methodology of our study on Germany (Vivier et al. Forthcoming).

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