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Reppert, Thorsten

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Thorsten Reppert, M.A. | thorsten.reppert@uni-bamberg.de
Institute of Political Science, University of Bamberg, Bamberg, Germany

III Bamberg Graduate School of Social Sciences
Feldkirchenstraße 21, FG1/00.12
96052 Bamberg, Germany

ORCiD: 0000-0002-4547-1688
Twitter: reppert_polsci

Local-Level Ownership of Electricity Grids:
An Analysis of Germany's Distribution System Operators (DSOs)

Contents

Abstract

Electricity grids are crucial for the energy transition. Despite its importance for renewable energy, the literature on grid ownership at the local level in Germany lacks up-to-date knowledge. Existing research does not state the extent to which municipalities own distribution system operators (DSOs). Based on a novel dataset on grid operators in 10,800 German municipalities, this paper can provide for the first time an overview of the current ownership of electricity distribution companies. Although the electricity infrastructure is decentralised, ownership remains centralised in the hands of Germany's leading energy companies and concentrated in affluent population centres.

Keywords: *Energy Policy, Local Politics, Privatisation*

Word Count: 8,136

1 Introduction

The transition to renewable energy sources is changing how electricity grids work and the role of their operators. As the use of renewable energy (RE) resources increases, there is a greater emphasis on the role of medium- and low-voltage grids. This shift has implications for local communities and raises questions about local decision-making in addition to national and international energy policy (Moss et al., 2015, 2, 13).

New public management reforms have changed how local governments operate and have often been accompanied by the privatisation of publicly owned enterprises. While privatisation is debated internationally, there is an often-overlooked movement towards remunicipalisation. In numerous countries and sectors, political and civil society actors are advocating for the return of formerly privatised companies under municipal ownership. The German electricity market is an example (Petitjean and Kishimoto, 2017, pp. 163–165).

Policy analysts have focused mainly on privatisation at the national level. In contrast, according to Sack (2019, p. 174), ownership at the subnational level has received little attention. Libbe (2021, p. 304) notes that reliable information on the extent of remunicipalisation [and, in turn, privatisation] of electricity supply in Germany is mostly missing. Despite insights from Richter et al. (2006), Bremeier et al. (2006), Richter (2007), and Lormes (2016), there is no comprehensive and up-to-date overview of German distribution grid operators (DSOs).

DSOs are key players in our energy systems. Together with Transmission System Operators (TSOs), they manage the input of electricity and balance supply and demand. This function includes stabilising the grid's voltage to ensure reliable energy delivery to homes, public and commercial buildings, and local factories (Hoicka and MacArthur, 2021, p. 77). DSOs are the last link in this process, operating the power lines reaching most homes and buildings.

Furthermore, distribution grids and their transformation play a central role in the climate-neutral conversion of our energy systems. DSOs are responsible for adapting local-level grid infrastructure in response to the growth of RE generation, making it relevant to know whether municipal actors control local power grids. They are the energy transition’s backbone (BMWi, 2020, p. 1).

Despite this importance, there is little social analysis of DSOs and electricity infrastructure, according to Hoicka and MacArthur (2021, p. 91).

This study aims to provide new insights into public utilities at the local level by identifying local ownership of DSOs. By examining whether municipal or non-municipal companies operate DSOs, the study contributes to our understanding of the current state of local-level electricity grid ownership.

The study uses data from the website *Störungsauskunft* and information from about 900 electricity companies to determine the ownership status of DSOs for around 10,800 individual municipalities in Germany. By combining these two sources of data, the study creates a novel dataset that provides detailed information on the ownership of local electricity grids for all municipalities in Germany. This approach allows for a comprehensive look at DSO ownership based on economic and geographical differences between municipalities.

Analysis shows that while electricity infrastructure is becoming more decentralised, ownership remains centralised. Urban-rural and East-West differences are key factors for local ownership of DSOs in Germany. In urban areas and the industrially strong South, municipal ownership predominates, while in the Northeast and rural areas, privately owned DSOs are the primary operators of most grids.

This study provides new insights into the German electricity market and the privatisation of local services. Thus, it adds to the literature on local-level service provision and helps to understand the dynamics of the German electricity market. As such, the study provides insights into the multitude of DSO contracts that will expire in the early 2030s, a critical point in Germany's energy transformation.

2 Local Power Grids and DSO Ownership

Historically, DSOs have been mostly limited to distributing electricity to consumers. However, this is changing with the increasing expansion of renewable energy. The decentralisation of power generation necessitates a grid transformation (Hoicka and MacArthur, 2021, p. 88).

As shown in Figure 1, with the expansion of renewables, electricity is no longer generated in centralised fossil fuel power plants but increasingly in wind, biogas, or

solar power facilities that are decentralised across the landscape or mounted on rooftops.

TSOs cannot feed in this electricity via their large, high-voltage lines that connect regions. Instead, it is primarily the DSOs that must feed this energy into their local distribution grids. They feed in more than 90 percent of renewable electricity (EU DSO Entity), which is not what the distribution grid was originally designed to do.

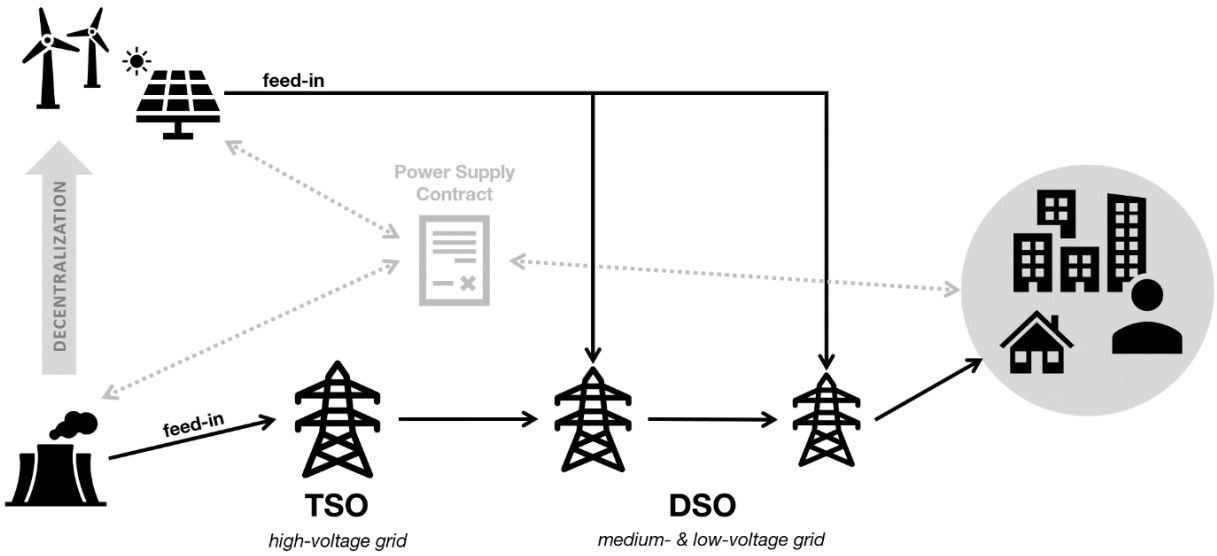

Figure 1: Decentralisation of Energy Market and Grid Operations in Germany

Additionally, there are other challenges that DSOs face as governments move toward a carbon-neutral economy. The expansion of e-mobility means that local grids need to supply power to EV charging stations and wall boxes. The decarbonisation of residential heating is closely linked to the increased installation of heat pumps. Industrial processes are increasingly being electrified to displace fossil fuels in production (Fraunhofer ISI et al., 2021).

The distribution grid must accommodate all these trends. To this end, grid control must become smarter in feeding in and efficiently distributing electricity, including expanding and modifying existing local power lines, rolling out smart meters, and energy storage (Drewello, 2022, pp. 11–12).

However, this also leads to the potential for DSOs to become bottlenecks in the energy transition. Their investments in grids are the basis for a successful expansion of renewable energy and the decarbonisation of the economy.

As expanding and investing in distribution grids are paramount and in the public interest, it is essential to know whether DSOs are majority-owned by non-municipal actors or municipalities. While municipal companies are subject to local control and must act accordingly, for private companies, such a democratic commitment is, at best, voluntary. They are accountable to their shareholders, who expect them to hit return-on-investment quotas or achieve annual revenue goals (Engartner, 2016, pp. 238–239).

Investments and service quality are subject to these corporate strategies, often leaving consumers unsatisfied with the service (Letza et al., 2004, p. 169). Furthermore, critics argue that municipal authorities do not directly influence grid expansion when DSOs are privatised, depriving municipalities of a tool to steer the local energy transition (Berlo and Wagner, 2017, p. 551).

Although corporate and local interests can align, there is no guarantee that they will in all cases. For example, Wagner and Berlo (2015, p. 562) argue that large DSOs tend to prioritise their grid investments on large-scale offshore wind projects, whereas smaller grass-roots projects are left behind. Drewello (2022, p. 6) similarly argues that incumbents support ‘centralized strategies and policies.’ As Petitjean and Kishimoto (2017, p. 160) call it, a ‘public ethos' is only guaranteed under public ownership. Therefore, whether DSOs are public or private is relevant to overall energy policy.

Regarding factors connected to DSO shareholding, I expect that urban-rural differences, geographical location, and municipal size are linked to municipal ownership[1]. One reason is the role economies of scale play. Larger (private) companies are assumed to be more efficient than smaller municipal ones (Wassenaar et al., 2010, p. 2). The liberalisation of electricity markets pressures smaller rural municipalities to sell or merge their DSOs. Furthermore, rural infrastructure is typically more expansive (Diermeier, 2020, p. 544). Consequently, larger cities, but also economically strong locations, may counteract pressures to privatise or merge operations, while smaller cities and rural municipalities are more exposed to them (Canzler and Knie, 2009, p. 107).

Likewise, geographical circumstances are essential for renewable electricity. Wind power, for example, can be generated near the coast or in remote mountain regions,

[1] Since this study focuses on status quo, partisan theory or other approaches would not yield meaningful results. With cross-sectional data, as it is used here, it is not possible to conclude whether the status quo is due to the political situation today or 15 years ago.

while hydroelectric power requires proximity to suitable water reservoirs. Solar power requires steady sunshine (Drewello, 2022, pp. 3–4). Since grid expansion and the development of these renewable energies are interrelated, these geographical factors affect the DSO market.

3 German Energy Market and Local Politics

The local level is particularly relevant to public investment and regional development. In Germany, more than half of government spending is administered at the subnational level (Bremer et al., 2021, p. 1). This significance of subnational politics is deeply rooted in German history, with municipal utilities enjoying a rich tradition dating back to the end of the 19th century (Menges and Müller-Kirchenbauer, 2012, p. 59).

Likewise, Germany is an early RE adopter and one of the first countries to introduce a federal feed-in law for solar and wind power at the end of the 20th century. In the 1970s, *Solarförderverein Aachen* pioneered this idea (Jänicke and Quitzow, 2016, p. 58). Local initiatives and citizen participation have played a crucial role in Germany's energy transition, making the local level vital for developing the energy system (Kersting and Roth, 2017, p. 1148).

Germany is not known for widespread privatisation compared to other countries (Garrone and Marzano, 2013, p. 4). Nonetheless, some steps have been taken toward privatisation, particularly in the energy sector (Richter, 2007, p. 60). Market liberalisation and European unbundling, which were intended to create greater competition, led to more centralisation of energy in Germany (Kungl, 2014, pp. 12–14). An example is the so-called "Big Four" companies: E.ON, RWE, EnBW, and Vattenfall. Their dominance was created in the late 1990s and early 2000s due to several mergers and acquisitions of smaller energy companies.

This trend did not continue unabated. After the Fukushima disaster, the "Big Four" faced challenges and had to adapt to the changing energy landscape. They underwent partial sales of the transmission grid and certain subsidiaries (Fuchs et al., 2012, 18 & 23). Nevertheless, the companies remain the prominent players in Germany’s energy industry. In the distribution grid subsector, E.ON took over RWE's business, among others (E.ON, 2019); accordingly, E.ON and EnBW dominate it.

Specific to Germany are the East-West differences in its utility markets. After reunification, the DSO market in the West remained unchanged, while in the East, it was reorganised. In 1994, authorities signed a contract with West Germany's leading energy companies, privatising the major segments of the East German electricity market (Richter, 2007, p. 60). Municipal DSOs have been established only in a few exceptional cases (Lormes, 2016, pp. 58–59). Privatisation of utilities faced fewer obstacles in the former GDR.

At the same time, Germany's geography is significant for its energy transition. The Northeast mainly generates wind energy (Fuchs et al., 2012, p. 28). It has favourable conditions with access to large offshore wind farms, is closer to Germany's coastal lines, and has fewer big-city neighbourhoods (Drewello, 2022, pp. 3–4), making it suitable for large-scale wind power expansion projects. In contrast, the industrially stronger Southwest has higher power demand (BMWi, 2020, p. 1). Accordingly, the regions have different demands on the grid transition and, thus, on DSO companies.

At least every 20 years, municipalities in Germany have to re-tender their power grids. In the early 2010s, this was particularly frequent. In 2013 and 2014 alone, approximately 3,000 power grid contracts expired (Menges and Müller-Kirchenbauer, 2012, p. 52). Although there are other ways in which ownership can change, most municipalities use these re-awarding procedures to privatise or municipalise their grid (Lormes, 2016, p. 115).

Consequently, a new wave of local grid procurements is expected in the early 2030s, meaning most grids will be re-awarded at a critical time for German energy policy. The federal government plans to phase out coal for electricity generation within this timeframe, following the phase-out of nuclear power in 2023. Consequently, most of Germany's power grid will need to be upgraded to replace centrally generated coal-based electricity with decentralised renewable electricity by 2035 (VKU, 2023, p. 2).

Germany aims to have over 20 million electric cars on its roads by 2030, install 6.5 million heat pumps in households, and generate almost 80 percent of the electricity consumed renewably. Investing in local-level distribution grids is essential to achieving this goal (BNetzA, 2020).

The energy association BDEW estimates that investments of more than 50 billion euros will be needed in the high-voltage transmission grid by 2030, with another 50

billion euros needed for local distribution grids (BDEW, 2021). Furthermore, expenditure for grid operations has reached a 10-year peak in 2021 (BNetzA and BKartA, 2021). Annual total costs amount to 8.7 billion euros. In unison, potential revenue is increasing. E.ON expects that the turnover of its grid operations will grow by 3% to 4% annually (Tagesschau, 2021).

4 Previous Research

Despite their importance, the literature on DSO ownership in Germany is limited. Previous studies have mainly relied on data from a few regions or cities. Subsequently, we have no information on DSO ownership for all German municipalities or the factors associated with it.

According to the more general literature, the number of private utility companies increased during the 1990s, with the strongest privatisation trend observed locally (Sack, 2019, p. 172). Richter et al. (2006, pp. 71–72) found that more than 95% of the 124 municipal utility companies they studied had undergone formal privatisation of electricity supply. Bremeier et al. (2006, p. 39) stated that more than half of the municipalities that responded to their questionnaire reported having a private operator take over their grid. According to Sack (2019, p. 172), PwC (2002) also notes a share of more than 60% for material privatisation in its *Kommunalstudie* from the early 2000s.

In contrast, Lormes (2016, p. 115) counted 120 cases of energy utility companies being municipalised between 2005 and 2014. Furthermore, Lormes (2016, p. 105) observed an increase in DSOs in the 1990s and toward the end of the 2000s. This trend may be due to European legislation on unbundling and local politics driving the remunicipalisation of public utilities (Wagner and Berlo, 2017, p. 399).

Additionally, research noted a distinct East-West divide. Richter (2007, pp. 98–99) found that Schleswig-Holstein and Bavaria had a higher percentage of public DSOs than Brandenburg and Saxony-Anhalt, respectively.

Researchers have also noted that recent remunicipalisation initiatives occur mainly in West German states such as North Rhine-Westphalia, Baden-Württemberg, and Lower Saxony (Berlo and Wagner, 2015, p. 43). This pattern suggests a significant

difference in the degree of privatisation between East and West German municipalities.

In the 2010s, E.ON, RWE, and EnBW, three of Germany's leading energy companies, had a strong market position. Together, they operate more than 50% of all local electricity grids in Germany, according to Berlo et al. (2016, p. 115). Moss et al. (2015, p. 9) confirm this in their study of Brandenburg, where subsidiaries of large energy companies operate 'nearly all regional power networks.'

Despite this, Moss et al. (2015, p. 9) claim that DSOs are known for their diverse ownership. Among the nearly 900 local energy companies are small family businesses, cooperatives, public utilities owned by municipalities, subsidiaries of the major energy companies, and various other mixed-form companies. However, whether the market dominance of the incumbents has passed its peak, as Becker (2017, p. 119) suggests, remains to be discussed, as they likely still control significant market share.

Furthermore, research suggests that small municipalities are supplied mainly by private DSOs. Garrone and Marzano (2013, p. 21) and Graf et al. (2013, p. 248) found that smaller municipalities are more likely to privatise their DSOs. As mentioned above, economies of scale can improve administrative efficiency and output capacity.

Bremeier et al. (2006, pp. 38–39) identified two groups of municipalities based on their population size. They found that in municipalities with less than 20,000 residents, E.ON, RWE, and EnBW typically operate most municipal power grids. In larger cities with more than 20,000 residents, municipal DSOs are more prevalent.

Scholars have noted that municipalities with populations between 10,000 and 50,000 are particularly likely to establish their own utility companies. In a study of 72 cases of remunicipalisation, Wagner and Berlo (2017, p. 402) found that 42 of these newly founded utility companies were located in towns with fewer than 25,000 residents. Lormes (2016, p. 117) identified 120 new municipal energy companies, 20 of which were inter-municipal, serving 190 municipalities. In a later study, Berlo et al. (2022, p. 97) found approximately 150 municipal utilities. It should be noted that these figures refer to all energy utilities, not just electricity grids.

Both studies highlight that the population alone is not a reliable predictor of privatisation. Small municipalities can overcome the disadvantages of scaling and compete

effectively by forming intermunicipal DSOs in cooperation with neighbouring municipalities (Wagner and Berlo, 2017, p. 402).

In summary, researchers have observed that private actors operate most electricity grids in Germany, particularly in East German states and small municipalities. However, these observations are based on limited data, such as figures on newly founded DSOs or small-scale surveys. No comprehensive national analysis of local grid privatisation in Germany has been conducted. This study addresses this gap by providing a complete overview of municipal and private DSOs in Germany using nationwide data, enabling a more reliable assessment of previously theorised trends.

5 Data and Operationalisation

At first glance, the distinction between municipal and private DSO ownership seems straightforward. However, it is essential to differentiate between formal and material privatisation. All companies organised in a private legal form are, formally speaking, private companies. Even then, cities and municipalities can be these enterprises' sole or majority shareholders, meaning that they can be formally privatised but still be under complete municipal control. Material privatisation, on the other hand, focuses on the actual transfer of assets between public and private actors (Schmitt and Obinger, 2011, p. 2).

This study follows the material definition of privatisation, focusing on the ownership of corporate assets and not the legal form of DSOs (Sack, 2019, p. 25). For this analysis, ‘municipal companies’ are defined as municipalities holding an unmediated majority share. In contrast, private ownership is defined as one or more nongovernment investors holding a majority share. Privatisation and remunicipalisation are the transitions of asset majorities between private and municipal investors.

In practice, distinguishing between municipal and private ownership of DSOs can be difficult. DSOs blur the line between purely private and purely municipal ownership. For example, large energy companies and municipal institutions often share the assets of public utility companies (Lormes, 2016, p. 119). Cities may also join forces and establish cooperative ventures (Lormes, 2016, p. 117). Local authorities may be shareholders of private holdings that own shares in utility enterprises elsewhere. There

are many different forms of mixed and nested corporate arrangements, also involving national or state actors.

This complex and sometimes convoluted organisational structure of public service corporations is challenging to capture accurately. Operationalisation must strike a balance between accuracy and simplicity. It should accurately capture different organisational models without becoming overly detailed or impractical to implement. To do so, operationalisation distinguishes between municipal and non-municipal DSOs.

Different studies have used a variety of indicators to measure public ownership in different sectors. For example, Lormes (2016, p. 107) uses data on turnover quotas, capital expenditure, and employment figures to capture the municipalisation of the energy supply. Zohlnhöfer et al. (2015, p. 567) mention similar criteria as possible metrics for measuring the share of state-owned enterprises. Sundell and Lapuente (2012, p. 474), Foged and Aaskoven (2017, p. 142), and Elinder and Jordahl (2013, p. 46) use the municipalities' expenditure on private contract services to measure privatisation. These different indicators can be used individually or combined into indices.

However, these approaches typically focus on the national or regional level and would only be suitable for summarising municipalities into regions. This study uses individual municipalities as units. As a result, the transfer of these tactics is not possible. Andrews et al. (2020, p. 485) and Lormes (2016, p. 133) use operationalisations that allow a clear distinction for individual municipalities, which is suitable for this study.

Andrews et al. (2020, p. 485) use available information on British local authorities' websites to classify companies as public or private based on data on company type and stakeholder statistics. Lormes (2016, p. 133) uses data from the German municipal utility association VKU[2] to identify newly established members as municipalised enterprises. These members are typically majority-owned by local authorities (Richter, 2007, p. 20).

There are disadvantages to both ways of operationalising the classification. Lormes (2016) used only a small database, which excluded municipal utility companies that had not joined the VKU. However, both approaches can be helpful in this study. Using

[2] https://www.vku.de/en/, accessed 13 October 2023

unmediated majority municipal ownership as a criterion allows us to distinguish between municipal and non-municipal enterprises without excluding formally privatised or mixed enterprises. Therefore, examining share ownership can give us a good overview of the extent of municipal DSO ownership.

Although much current attention is on the subject and local electricity grids are relevant to the energy transition, a comprehensive data set is unavailable. Therefore, this study uses a combination of different data sources to provide an overview.

I fill this gap by collecting data on DSOs and their shareholders. First, a list of all DSOs, their names, and some additional information was obtained from the *Marktstammdatenregister*. In the second step, this information was used to conduct primary research on the shareholders of these DSOs. For about 570 companies, information on their websites could be used. About 130 companies are institutions under public law, such as *AöR*, *KöR,* or *Eigenbetriebe*. For another 170 companies, shareholder information was obtained via the *Bundesanzeiger* and the *Handelsregister*. Fifty DSOs provided information by messaging them via phone or email, as other sources did not provide sufficient data.

In a third step, this information was combined with a list of all municipalities and their DSOs. This list was compiled using the *Störungsauskunft* website. Here, the current DSO for each municipality can be looked up using the postal code and the municipality's name.

Together, these data sources allow assigning DSOs and shareholders to each municipality[3]. The result is a dataset that can be used to determine whether a municipal or non-municipal DSO operates the distribution network for each municipality in Germany.

Municipal ownership is divided into three subgroups:

1. Inter-municipal ownership includes companies owned by a majority of shares held cooperatively by two or more municipalities.

[3] In municipalities where more than one DSO operates the grid, the DSO with the highest percentage of public ownership was used.

2. Extra-municipal ownership refers to companies in which one municipality holds a majority stake, but the municipality that holds the shares differs from the municipality where the company operates.
3. Municipal companies include those in which municipal actors are the unmediated majority or sole owners.

Holding companies such as *Thüga Holding GmbH & Co. KGaA*, *TEAG Thüringer Energie AG,* or *EnBW Kommunale Beteiligungen GmbH* are classified as non-municipal. Even if some of these DSOs are majority-owned by municipalities, they are equity holdings that act relatively independently from local politics and administration. Municipalities do not directly hold shares but are indirect shareholders with little capacity to intervene. As mentioned above, such organisational structures can be challenging to capture. Accordingly, this study only covers DSOs with an unmediated municipal shareholder majority as such.

The descriptive analysis offers a general overview based on local and economic differences. It provides a first impression of the factors associated with DSO ownership, where municipal DSOs operate, and their overall share.

In addition to ownership status, the analysis will use variables such as the overall population and the number of unemployed. As mentioned above, these variables are theorised to be connected to ownership and have been used in similar studies by Bremeier et al. (2006), Richter (2007), Lormes (2016), and Wagner and Berlo (2017). The analysis should also help to revisit and re-evaluate their findings based on more elaborate data.

Furthermore, the study uses travel time to medium and larger residential centres to more accurately capture urban-rural differences, introducing another control for the location of municipalities (Diermeier, 2020, pp. 551–552). An East-West dummy variable is included. The data is retrieved from the INKAR database (BBSR, 2021) and *Regionaldatenbank Deutschland* (Statistische Ämter des Bundes und der Länder, 2022).

6 Analysis

About 740 distribution system operators (DSOs) manage local power grids in Germany. Some DSOs are privately owned, some are publicly owned, and some are a mix of both. However, this study only considers one DSO per municipality and only includes DSOs with the highest municipal ownership share. This approach reduces the total number of DSOs to 718. Of these, 120 are non-municipal, and 583 are municipal. Municipal DSOs often operate only within a single municipality, increasing their overall number. Private and larger DSOs, on the other hand, tend to operate in multiple cities and towns.

Westnetz, an E.ON subsidiary, is Germany's largest distribution system operator (DSO). It is the only DSO in 1381 municipalities with around 5.4 million inhabitants. The leading energy companies in Germany, especially E.ON and EnBW, are majority or minority shareholders in 136 DSOs. 55% of municipalities are supplied by a DSO, with one of these companies as the majority shareholder. Thus, 23.7 million residents in 5,999 municipalities receive electricity from a grid operated by one of Germany’s leading energy players. When considering the companies' minority stakes in municipal DSOs, this number increases to 35.2 million residents across an additional 422 municipalities. As a result, E.ON and EnBW have the greatest presence among DSOs in Germany.

When looking at the number of municipal grids operated by DSOs, municipal DSOs are responsible for grid operations in about 20% of German municipalities. Thus, 4 out of 5 municipal power grids are run by the private sector and non-municipal DSOs.

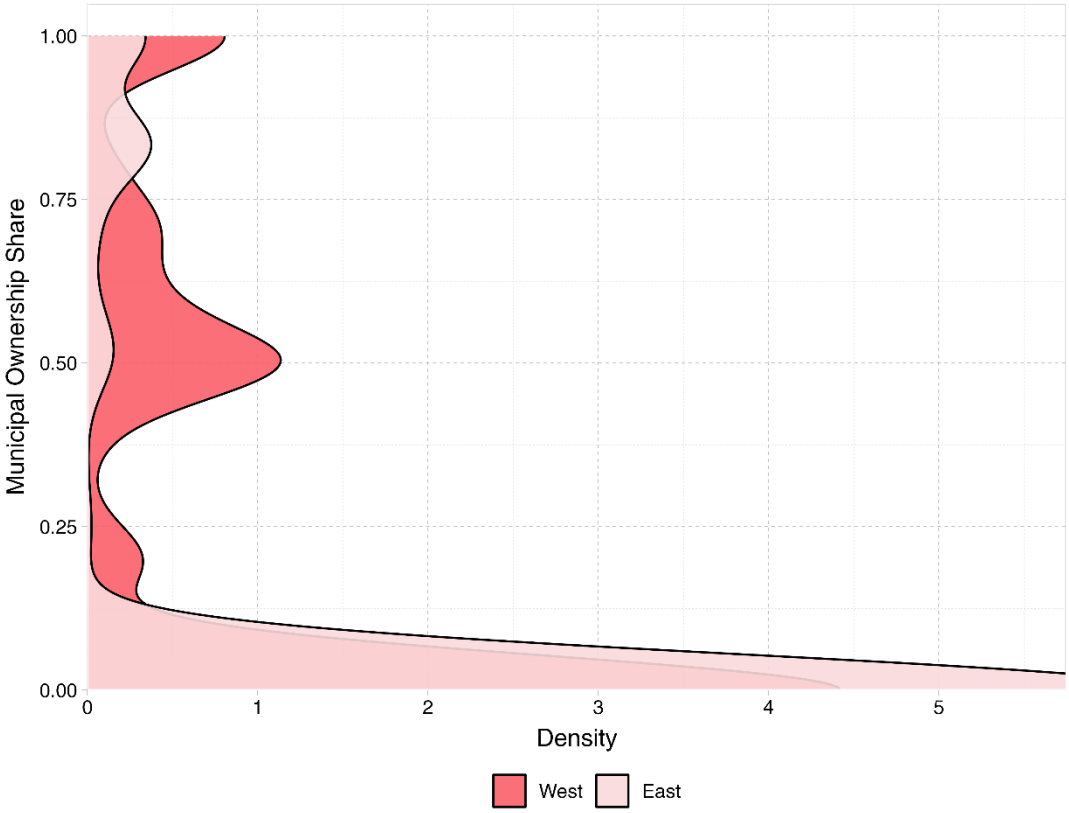

Figure 2: Density Plot for Municipal Ownership Share

Figure 2 illustrates the density of municipal ownership shares for all municipalities in Germany. Municipal ownership is not found at higher densities, indicating that non-municipal DSOs supply most municipalities. Additionally, East Germany has a higher density towards 0% municipal ownership than West Germany. West Germany has a cluster of around 50% municipal ownership, with a slight tilt towards less than 50%[4]. This finding is due to cooperation models such as *Schleswig-Holstein Netz AG*, an E.ON subsidiary, where municipalities hold 49.9% of the shares.

In some cases, the ratio of municipal to non-municipal ownership is 60:40 or 70:30, as shown by the slowly decreasing slopes. For West Germany, there is a final increase towards 100% municipal ownership. In East Germany, the density plot gradually decreases with a final uptick towards 100%.

In terms of population, these proportions change dramatically. Forty-six million people live in municipalities where at least one municipal DSO runs the grid. Non-municipal DSOs, on the other hand, exclusively serve 37 million residents, which is 9

[4] See Table 2, Appendix

million fewer than municipal DSOs. Although they serve only one-fifth of all municipalities, municipal DSOs provide electricity to more than half of Germany's residents.

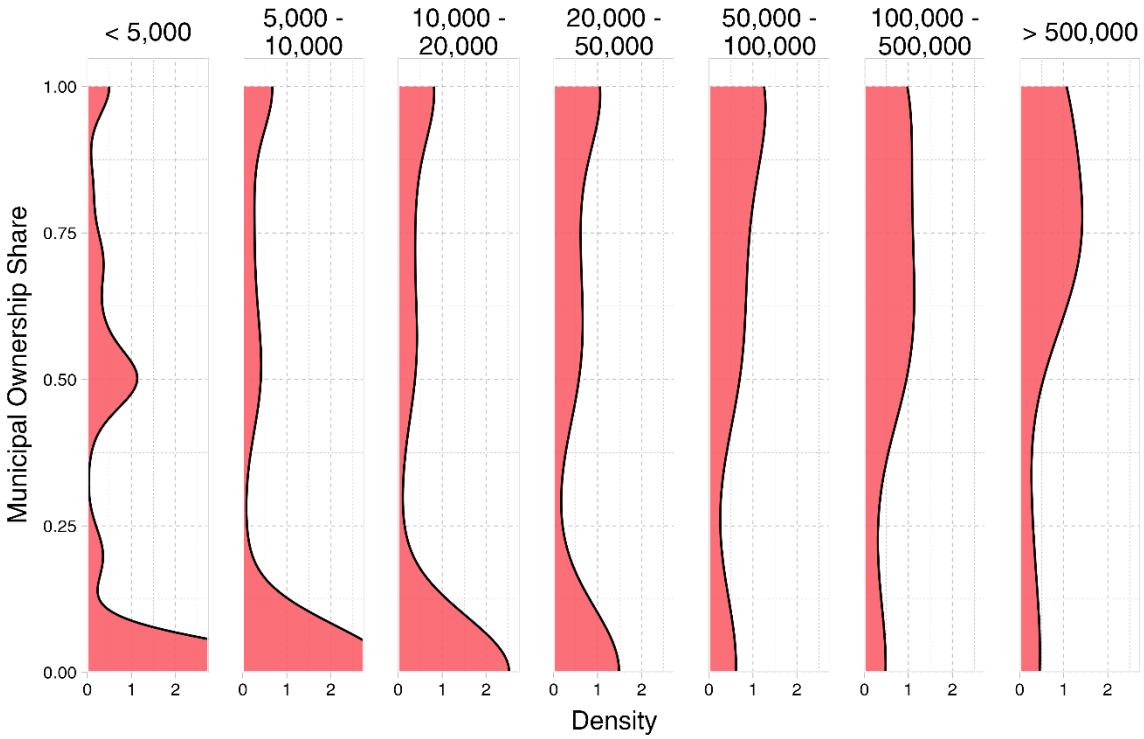

Figure 3: Ridges Plot for Municipal Ownership Share by Number of Inhabitants

Together, both perspectives show the significant impact of population size. The share of non-municipal DSOs decreases sharply as the number of residents increases. More than 75% of cities with at least 100,000 inhabitants have a municipally owned DSO. For small towns with fewer than 5,000 residents, this number is less than 17%. Additionally, Figure 3 indicates a shift toward a lower share of municipal ownership for smaller municipalities. However, the larger the municipality, the more the density curve shifts toward majority municipal ownership. For municipalities with less than 5,000 inhabitants, the density is highest at 0% municipal ownership. For municipalities with more than 50,000 inhabitants, the density is highest at around 100%.

Figures 4 and 5 show that these differences are even more pronounced in East German municipalities. Approximately 25% of West German municipalities have a municipal DSO, compared to around 13% in East Germany. In West Germany, whether Bremen and Hamburg are included or not, most residents live in a municipal-

ity with at least one municipal provider. In East Germany, excluding Berlin, most residents live in non-municipally provided neighbourhoods[5]. However, the gap for the overall population is smaller compared to the overall shares of DSOs.

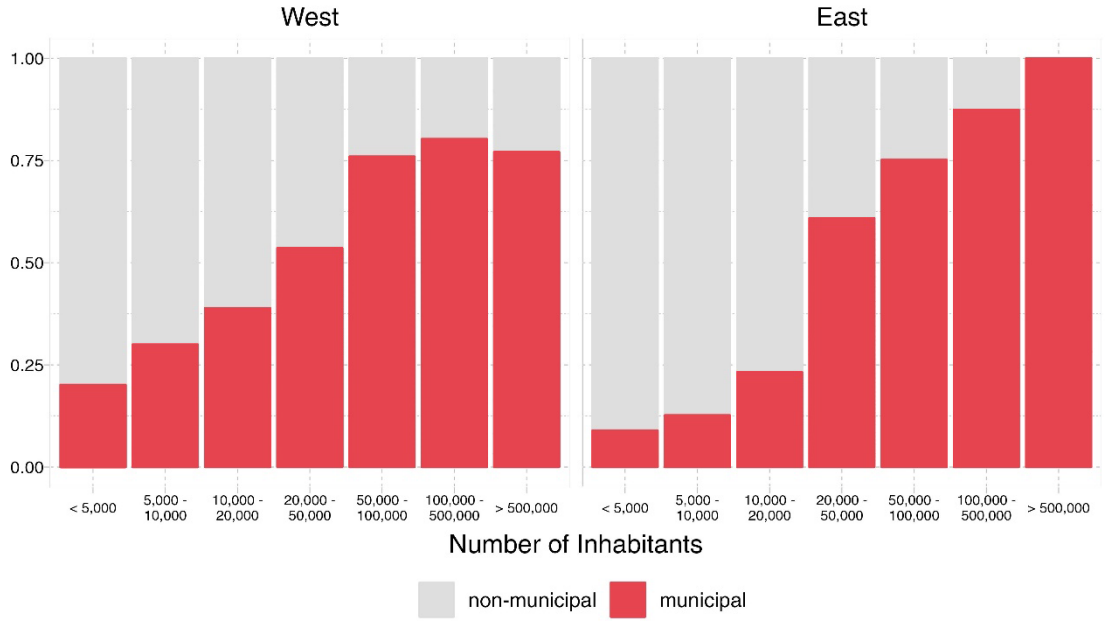

Figure 4: Share of Municipal DSOs by Number of Inhabitants, by East and West

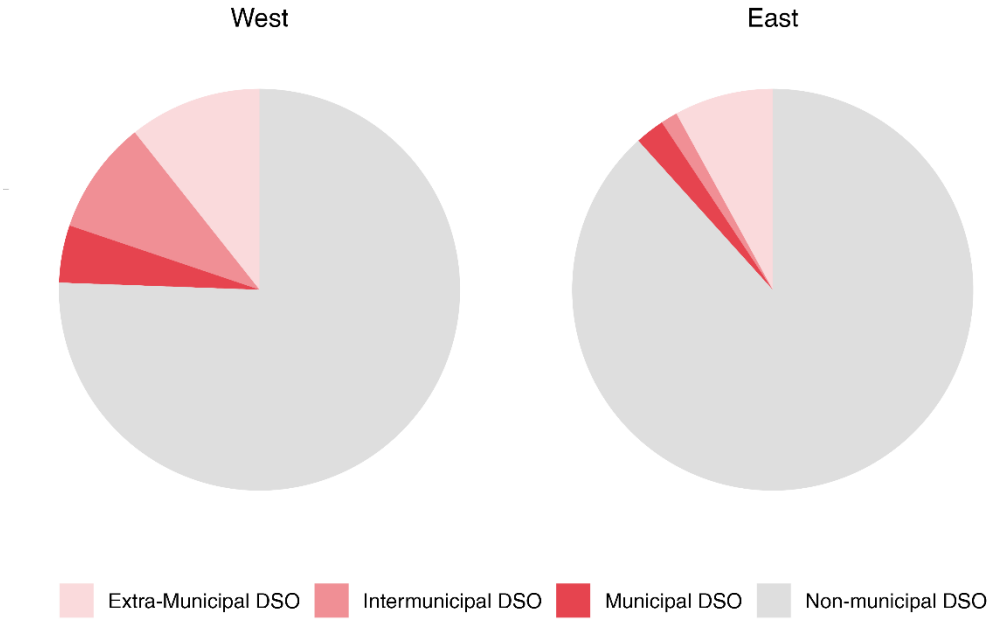

Figure 5: Pie Chart for Overall Number, by East and West

[5] See Table 3, Appendix

Saxony is a unique case. When considered together, its share of non-municipally supplied towns and cities is lower than in Bavaria or Baden-Württemberg. This finding is mainly due to Dresden's DSO, which operates power grids in 116 municipalities. It operates in the surrounding region, drastically improving the overall share of municipal DSOs. In total, it supplies electricity to approximately 1.2 million people, more than double the population of Dresden.

Similar business models can be found near many major urban centres, particularly around Nürnberg, Hannover, and the Rhein-Ruhr region. Excluding these cases, the percentage of solely municipal DSOs in Saxony falls notably behind Saarland, Bavaria, Baden-Württemberg, and Hesse (see Table 1). These findings illustrate the influence that large cities have on public utility ownership.

Intermunicipal DSOs are almost exclusive to West Germany and are particularly common in Hesse (Table 1). One reason might be the high number of small municipalities (Bogumil and Holtkamp, 2013, pp. 24–29). Additionally, two local districts own two of the main DSOs in Hesse.

North Rhine-Westphalia, with its metropolitan Rhein-Ruhr region, has the highest share of places with municipal DSOs. In contrast, Lower Saxony, which is mainly rural, has the smallest municipal ownership share in West Germany. Mecklenburg-Western Pomerania has the lowest share for East Germany. With its booming cities of Dresden and Leipzig, Saxony has the highest share in East Germany. Brandenburg, Saxony-Anhalt, and Mecklenburg-Western Pomerania have the lowest proportion of municipalities with at least one municipal DSO. Saxony has a higher proportion than Saarland, Bavaria, Baden-Württemberg, Hesse, and Rhineland-Palatinate. Apart from some exceptions, this order is also reflected in the population figures[6].

[6] see Table 4, Appendix

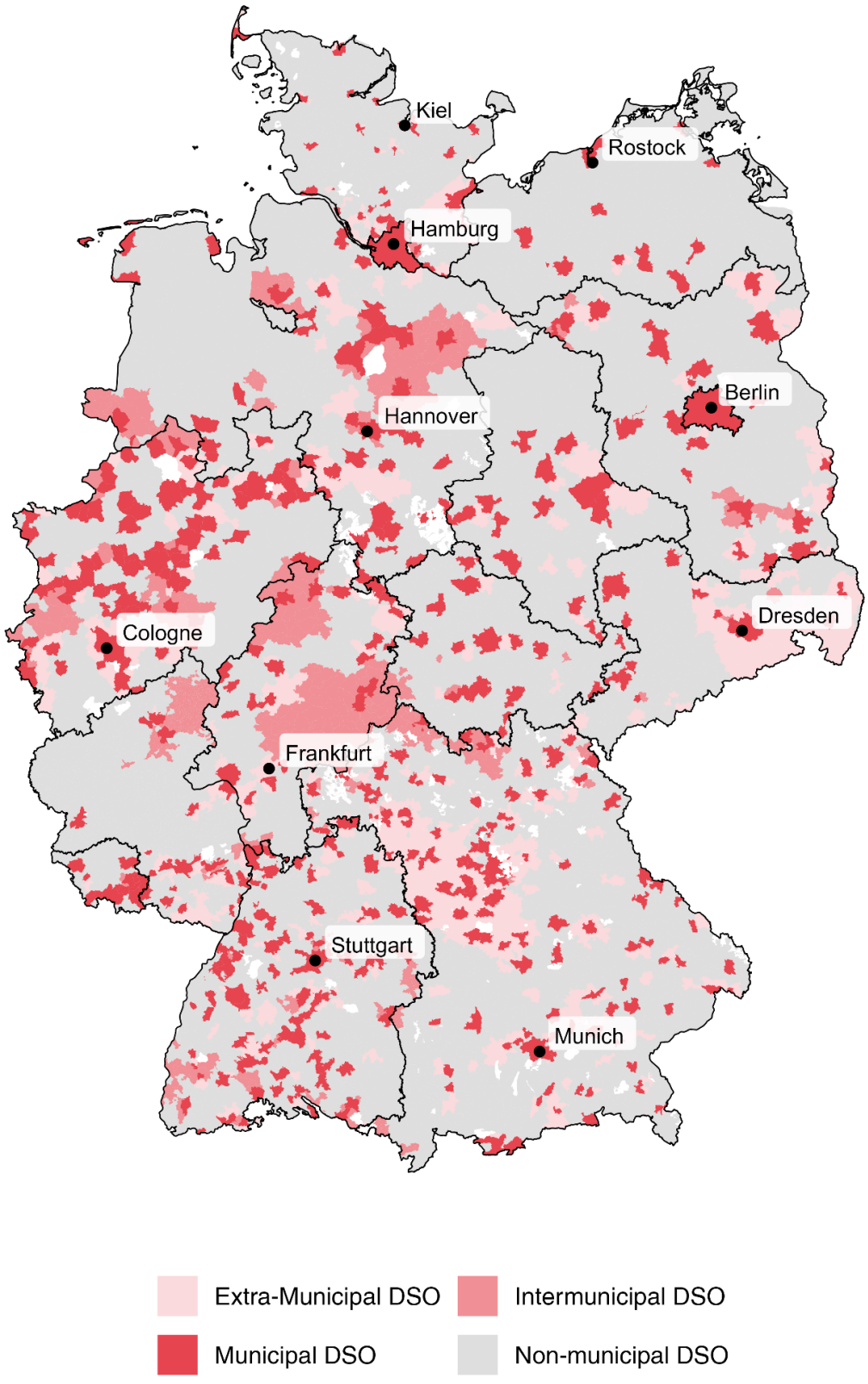

Figure 6: Map of DSOs by Ownership Categories

On the map (Figure 6), differences between East and West Germany and urban and rural areas are evident. Red spots, representing municipal DSOs, are more common in the Southwest. In addition, extra-municipal DSOs can be seen next to major cities, which are coloured pink. Finally, the light-red areas in the West show a surplus of intermunicipal DSOs. Once again, this is mainly due to their prevalence in Hesse and North Rhine-Westphalia. The grey areas, which represent non-municipal DSOs, also reflect urban-rural differences. Here, northern Lower Saxony, large parts of Schleswig-Holstein, and Mecklenburg-Western Pomerania stand out. The map provides visual confirmation of previous observations.

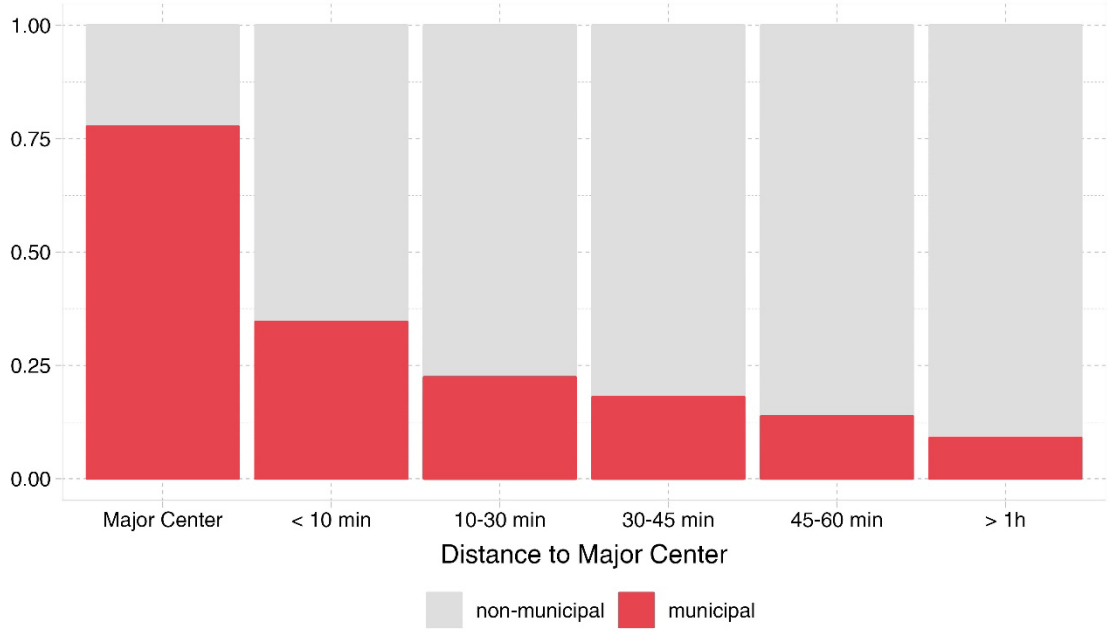

Figure 7: Share of Municipal DSOs by Distance to Major Residential Centres

Other indicators further reflect these findings. The distance to large and medium-sized residential centres seemingly influences whether municipalities have a municipal DSO, as shown in Figure 7. More than three-quarters of major population centres have a city-owned DSO. As distance increases, this share decreases. Suburban municipalities with a travel distance of less than 10 minutes have a municipal DSO in less than 35% of cases. Municipalities 45 minutes or farther away from a large residential centre have a municipal DSO in less than 10% of cases.

7 Discussion

Two patterns emerge: it matters whether municipalities are urban or rural and whether they are in the East or West. In urban regions, municipal DSOs are in the majority. In rural regions, on the other hand, private actors and large non-municipal DSOs are more active. There is a distinct contrast between the South, where municipal DSOs are relatively more common, and the Northeast, where municipal DSOs are less common. These patterns, which can be seen in Figure 6, are further supported by additional observations.

Hoicka and MacArthur (2021, p. 69) argue that an analysis of electricity infrastructure should understand the word power 'with a double meaning: political and economic power, and electrons that power our lives.' The analysis results show that political and economic power remains centralised, whereas the power of electricity is becoming decentralised. DSO ownership is concentrated, while renewable energy and grid development expansion is dispersed.

Municipal utility companies often extend their economic activities beyond their administrative borders and supply the surrounding area. The same is true for private DSOs, which often serve entire regions. Approximately 120 non-municipal DSOs supply almost 4/5 of all German municipalities, while more than 580 municipal DSOs serve the remaining fifth. *Westnetz*, *Bayernwerk*, *Avacon*, *Netze BW*, and other subsidiaries of E.ON, EnBW, and Co. alone supply more than 20 million people.

Overall, the data analysis essentially confirms previous findings in the literature. The outcomes provide evidence for the assumed differences between East and West Germany. The share of power grids held by incumbent energy companies has been accurately assessed. Urban-rural differences are also confirmed. Although it could be debated whether the 20,000 population cut-off point suggested by Bremeier et al. (2006, pp. 38–39) should be higher, all in all, the previous observations are correct despite the lack of data that would have allowed for a more precise picture, as provided in this paper.

Centralisation of ownership and power structures further accentuates the urban-rural conflict in relation to grid expansion. Due to the decentralisation of energy generation, rural areas are increasingly important in securing energy supplies. Cities and industrial centres cannot produce enough green electricity to meet their demand, so

they will need to import it from less populous but more spacious municipalities in the countryside, where green energy production, transmission, and distribution grids will be expanded (Czada and Radtke, 2018, p. 66). Urban grid expansion will be mainly driven by demand, while rural grid expansion will be primarily driven by supply.

However, private DSOs or larger cities' utility companies running the grids there are not directly accountable to rural populations but to private shareholders and urban societies. Hall et al. (2016, p. 10) argue that municipalities running their grids are more willing to forgo profits to provide higher-quality electricity infrastructure. As a result, establishing the 'public ethos' described by Petitjean and Kishimoto (2017, p. 160) may be challenging in rural areas.

At the same time, disparities between East and West Germany persist, illustrating how deep the divide remains more than 30 years after reunification, even in the electricity market. Policy decisions made during the 1990s, such as the 1994 privatisation contract, continue to impact current DSO ownership. Thus, path dependence appears to have a significant effect on the overall energy market as well as on DSOs.

Once again, decentralised RE expansion, which has gained significant traction in north-eastern Germany, is at odds with the power and ownership structure. West German energy companies and DSOs from metropolitan regions dominate the East German market.

Ownership differences between urban and rural areas, as well as between East and West Germany, exacerbate existing trends in infrastructure inequality. These inequalities could lead to political conflict. However, there are also opportunities for regional development. For example, RE expansion could reconfigure the energy market to benefit rural areas and East Germany. The industrial South and metropolitan regions are likely to become more dependent on rural areas in the North for energy, which have access to offshore wind and more wind farms.

Consequently, a crucial factor will be how different regions are involved and respond to grid and energy transformation. Citizen participation is crucial (Kersting and Roth, 2017, p. 1148). Corporations need to find ways to include civil actors as essential pillars of grid extension.

Political and economic structures will need to adapt to infrastructural changes, allowing rural areas and eastern Germany to benefit from renewable energy and grid

expansion. Otherwise, distributional and procedural justice concerns may arise from the mismatch between centralised power and decentralised infrastructure, which could hinder the progress of Germany's grid transition.

8 Conclusion

In this study, the ownership structure of German DSOs and the local energy transition were examined. A new data set made it possible to provide a comprehensive overview of where municipal and non-municipal DSOs are active.

Two patterns emerged:

1. Urban and prosperous communities are more likely to be served by municipal DSOs than rural communities with weaker local and economic development.
2. This pattern coincides with a southwest-northeast divide in the overall share of municipal DSOs. Few municipal DSOs operate in rural areas, particularly in former East German states and Lower Saxony.

Additionally, the DSO market remains largely centralised despite the decentralisation of energy infrastructure. Municipal and non-municipal DSO ownership distribution reflects differences between urban centres and rural peripheries. Based on this study, it is unclear whether this mismatch will lead to more communities municipalising their DSOs.

Although there may be some errors in this study due to human error and deviations in the application of criteria, the study still provides an up-to-date overview of German electricity grid ownership. This new data allows for an analysis of the distribution of municipal DSOs based on local-level differences. The study offers a more comprehensive overview of distribution grid ownership than previous research by presenting trends that were previously only theorised based on smaller data sets or indirect measurements. This information is vital for understanding the energy transition and its governance structures.

Finally, this study contributes to a view of energy infrastructure and its owners beyond purely technocratic analyses. The parallels to political conflict between urban

population centres and rural regions and continued East-West differences show the need for social science analysis of the energy transition and grid expansion.

DSO ownership could be used as a potential intervening variable to investigate possible links to the progress of local RE expansion. Furthermore, this study only briefly discussed explanatory factors for ownership change. A longitudinal analysis with additional data could allow us to examine whether and how local political and economic actors influence the decision to sign DSO contracts with private or municipal enterprises. Research into these questions would provide additional explanations for the current results and may be relevant for understanding privatisation and remunicipalisation decisions in the future. As DSO markets will gradually need to adapt to the energy transition and invest more in grid infrastructure, this could be of particular interest in advance of the re-procurement of many German distribution grids in the early 2030s.

Appendix

Table 1: Number of Municipalities by Ownership Category

States	Extra-Municipal DSOs	Intermunicipal DSOs	Municipal DSOs	Non-municipal DSOs	***Total***
Schleswig-Holstein (SH)	137 12.6%	4 0.4%	31 2.8%	919 84.2%	1091 100%
Hamburg (HH)	0 0%	0 0%	1 100%	0 0%	1 100%
Lower Saxony (NI)	43 4.6%	101 10.7%	43 4.6%	753 80.1%	940 100%
Bremen (HB)	0 0%	0 0%	0 0%	2 100%	2 100%
North Rhine-Westphalia (NW)	63 16.3%	46 11.9%	76 19.6%	202 52.2%	387 100%
Hesse (HE)	43 10.2%	120 28.4%	25 5.9%	234 55.5%	422 100%
Rhineland-Palatinate (RP)	124 5.4%	296 12.9%	26 1.1%	1841 80.5%	2287 100%
Baden-Württemberg (BW)	85 7.8%	60 5.5%	83 7.6%	868 79.2%	1096 100%
Bavaria (BY)	410 20%	79 3.9%	124 6.1%	1433 70%	2046 100%
Saarland (SL)	1 1.9%	2 3.8%	13 25%	36 69.2%	52 100%
Berlin (BE)	0 0%	0 0%	1 100%	0 0%	1 100%
Brandenburg (BB)	50 12.2%	19 4.6%	20 4.9%	322 78.3%	411 100%
Mecklenburg-Western Pomerania (MV)	3 0.4%	0 0%	10 1.4%	713 98.2%	726 100%
Saxony (SN)	136 32.5%	3 0.7%	13 3.1%	267 63.7%	419 100%
Saxony-Anhalt (ST)	9 4.1%	0 0%	12 5.5%	196 90.3%	217 100%
Thuringia (TH)	7 1.1%	14 2.2%	14 2.2%	595 94.4%	630 100%
Total	**1111 10.4%**	**744 6.9%**	**492 4.6%**	**8381 78.1%**	**10728 100%**

Table 2: Number of Municipalities by Categorized Ownership Share differentiated by East and West

Municipal Ownership Share	West	East	***Total***
0%	4806 57.7 %	2083 86.6 %	6889 64.2 %
less equal 10%	50 0.6 %	1 0 %	51 0.5 %
less equal 20%	344 4.1 %	0 0 %	344 3.2 %
less equal 30%	14 0.2 %	8 0.3 %	22 0.2 %
less equal 40%	55 0.7 %	0 0 %	55 0.5 %
less equal 50%	1090 13.1 %	9 0.4 %	1099 10.2 %
less equal 60%	249 3 %	47 2 %	296 2.8 %
less equal 70%	597 7.2 %	9 0.4 %	606 5.6 %
less equal 80%	171 2.1 %	21 0.9 %	192 1.8 %
less equal 90%	62 0.7 %	116 4.8 %	178 1.7 %
less equal 100%	888 10.7 %	110 4.6 %	998 9.3 %
Total	**8326** **100 %**	**2404** **100 %**	**10730** **100 %**

Table 3: Population Share by Ownership Category and differentiated by East and West (without Berlin, Hamburg, and Bremen)

	Extra-Municipal DSOs	Intermunicipal DSOs	Municipal DSOs	Non-municipal DSOs	***Total***
East Germany	11.3 %	1.2 %	29.4 %	58.1 %	**100 %**
West Germany	11.6 %	8.2 %	34.2 %	46.0 %	**100 %**

Table 4: Population Share by Ownership Category and differentiated by States (without Berlin, Hamburg, and Bremen)

States	Extra-Municipal DSOs	Intermunicipal DSOs	Municipal DSOs	Non-municipal DSOs	***Total***
Schleswig-Holstein (SH)	7.5%	1.8%	30.5%	60.2%	**100 %**
Lower Saxony (NI)	4.8%	8.0%	23.2%	64.0%	**100 %**
North Rhine-Westphalia (NW)	12.2%	8.5%	40.3%	39.0%	**100 %**
Hesse (HE)	20.8%	16.8%	17.9%	44.5%	**100 %**
Rhineland-Palatinate (RP)	11.2%	11.9%	16.6%	60.3%	**100 %**
Baden-Württemberg (BW)	8.2%	11.8%	54.9%	25.1%	**100 %**
Bavaria (BY)	13.7%	2.4%	35.0%	48.9%	**100 %**
Saarland (SL)	3.7%	3.0%	48.3%	45.0%	**100 %**
Brandenburg (BB)	7.2%	1.6%	23.7%	67.5%	**100 %**
Mecklenburg-Western Pomerania (MV)	0.1%	0.0%	30.4%	69.5%	**100 %**
Saxony (SN)	18.1%	1.4%	35.4%	45.1%	**100 %**
Saxony-Anhalt (ST)	21.3%	0.0%	17.6%	61.1%	**100 %**
Thuringia (TH)	1.3%	2.3%	33.9%	62.5%	**100 %**

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References

Andrews, R., Ferry, L., Skelcher, C., Wegorowski, P., 2020. Corporatization in the Public Sector: Explaining the Growth of Local Government Companies. Public Admin Rev 80, 482–493. https://doi.org/10.1111/puar.13052.

BBSR - Bundesinstitut für Bau-, Stadt- und Raumforschung, 2021. INKAR - Indikatoren und Karten zur Raum- und Stadtentwicklung, Bonn. https://www.inkar.de.

BDEW - Bundesverband der Energie- und Wasserwirtschaft, 2021. Zahl der Woche / Netzausbau: Mehr als 100 Milliarden Euro … https://www.bdew.de/presse/presseinformationen/zahl-der-woche-netzausbau-mehr-als-100-milliarden-euro/.

Becker, S., 2017. Our City, Our Grid: The energy remunicipalisation trend in Germany, in: Kishimoto, S., Petitjean, O., Steinfort, L. (Eds.), Reclaiming Public Services: How cities and citizens are turning back privatisation. Amsterdam, Paris, pp. 117–129.

Berlo, K., Schäfer, D., Wagner, O., 2022. Mitmischen is possible: Neugegründete Stadtwerke nutzen die Chancen der Energiewende 12. et-energie-online.de (accessed 14 February 2022).

Berlo, K., Templin, W., Wagner, O., 2016. Remunicipalisation as an Instrument for Local Climate Strategies in Germany: The Conditions of the Legal Energy Framework as an Obstacle for the Local Energy Transition. Renewable energy law and policy review 7, 113–121.

Berlo, K., Wagner, O., 2015. Widerstände und Chancen von Rekommunalisierungen. Solarzeitalter 27, 41–45.

Berlo, K., Wagner, O., 2017. Energiewende als Untersuchungsobjekt der Transitionsforschung: Eine Analyse der örtlichen Verteilnetzebene für Strom und Gas, in: Holstenkamp, L., Radtke, J. (Eds.), Handbuch Energiewende und Partizipation. Springer Fachmedien Wiesbaden, Wiesbaden, pp. 545–561.

BMWi - Bundesministerium für Wirtschaft und Energie, 2020. Der Netzausbau schreitet voran. https://www.bmwk.de/Redaktion/DE/Downloads/M-O/netzausbau-schreitet-voran.pdf?__blob=publicationFile&v=8 (accessed 13 September 2022).

BNetzA - Bundesnetzagentur, 2020. Bericht zum Zustand und Ausbau der Verteilernetze 2020, Bonn. https://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Sachgebiete/Energie/Unternehmen_Institutionen/NetzentwicklungUndSmartGrid/ZustandAusbauVerteilernetze2020.pdf?__blob=publicationFile&v=3 (accessed 17 June 2022).

BNetzA - Bundesnetzagentur, BKartA - Bundeskartellamt, 2021. Investitionen und Aufwendungen für die Netzinfrastruktur* der Verteilnetzbetreiber in Deutschland in den Jahren 2011 bis 2021 (in Millionen Euro). Chart. Statista GmbH. https://de.statista.com/statistik/daten/studie/168148/umfrage/investitionen-in-die-stromnetze-der-verteilnetzbetreiber-seit-2007/ (accessed 17 June 2022).

Bogumil, J., Holtkamp, L., 2013. Kommunalpolitik und Kommunalverwaltung: Eine praxisorientierte Einführung. BpB, Bonn, 263 pp.

Bremeier, W., Brinckmann, H., Killian, W., 2006. Kommunale Unternehmen in kleinen und mittelgroßen Kommunen sowie Landkreisen, in: Killian, W., Richter, P., Trapp, J.H. (Eds.), Ausgliederung und Privatisierung in Kommunen: Empirische Befunde zur Struktur kommunaler Aufgabenwahrnehmung. Ed. Sigma, Berlin, pp. 25–54.

Bremer, B., Di Carlo, D., Wansleben, L., 2021. The constrained politics of local public investments under cooperative federalism. MPIfG Discussion Paper, Cologne, Online-Ressource.

Canzler, W., Knie, A., 2009. Auf dem Weg zum Gewährleistungsstaat: Netzvermarktung und Infrastrukturpolitik für die schrumpfende Gesellschaft, in: Neu, C. (Ed.), Daseinsvorsorge. VS Verlag für Sozialwissenschaften, Wiesbaden, pp. 97–111.

Czada, R., Radtke, J., 2018. Governance langfristiger Transformationsprozesse. Der Sonderfall „Energiewende“, in: Radtke, J., Kersting, N. (Eds.), Energiewende. Springer Fachmedien Wiesbaden, Wiesbaden, pp. 45–75.

Diermeier, M., 2020. Ist mehr besser? Politische Implikationen der disparaten Daseinsvorsorge in Deutschland. Z Politikwiss 30, 539–568. https://doi.org/10.1007/s41358-020-00239-y.

Drewello, H., 2022. Towards a Theory of Local Energy Transition. Sustainability 14, 1–20. https://doi.org/10.3390/su141811119.

E.ON, 2019. E.ON closes purchase of innogy shares from RWE. https://www.eon.com/en/about-us/media/press-release/2019/2019-09-18-eon-closes-purchase-of-innogy-shares-from-rwe.html (accessed 4 June 2023).

Elinder, M., Jordahl, H., 2013. Political preferences and public sector outsourcing. European Journal of Political Economy 30, 43–57. https://doi.org/10.1016/j.ejpoleco.2013.01.003.

Engartner, T., 2016. Staat im Ausverkauf: Privatisierung in Deutschland. Campus Verlag, Frankfurt, New York, 268 pp.

EU DSO Entity. The EU DSO entity: My entity! Why? https://www.eudsoentity.eu/media/53eh22ss/brochure_final-version-adopted-by-jtf.pdf (accessed 4 June 2023).

Foged, S.K., Aaskoven, L., 2017. Public Sector Unions and Privatization: Evidence From the Eldercare Sector in Danish Municipalities. JOPART 27, 135–149. https://doi.org/10.1093/jopart/muw040.

Fraunhofer ISI, Öko-Institut e.V., Prognos AG, 2021. Entwicklung des Bruttostromverbrauchs bis 2030: Berechnungsergebnisse aus dem Szenario 1. Kurzpapier.

Fuchs, G., Hinderer, N., Kungl, G., Neukirch, M., 2012. Adaptive Capacities, Path Creation and Variants of Sectoral Change: The Case of the Transformation of the German Energy Supply System. SOI Discussion Paper 2012-02. Research Contributions to Organizational Sociology and Innovation Studies. University of Stuttgart - Institute for Social Sciences, Stuttgart, 46 pp. http://www.uni-stuttgart.de/soz/oi/publikationen/soi_2012_2_fuchs_hinderer_kungl_neukirch_adaptive_capacities.pdf.

Garrone, P., Marzano, R., 2013. Why Do Local Governments Resist Contracting Out? SSRN Journal. https://doi.org/10.2139/ssrn.2357944.

Graf, S., Dirnberger, F., Gass, A., 2013. Gemeinden in der Energiewende: Örtliche Energiepolitik - Vertreter örtlicher Interessen - Energieverbraucher - Energiewirtschaftliche Betätigung. Darstellung. Kommunal- und Schul-Verlag Wiesbaden, Wiesbaden, 500 pp.

Hall, S., Foxon, T.J., Bolton, R., 2016. Financing the civic energy sector: How financial institutions affect ownership models in Germany and the United Kingdom. Energy Research & Social Science 12, 5–15. https://doi.org/10.1016/j.erss.2015.11.004.

Hoicka, C.E., MacArthur, J., 2021. The Infrastructure for Electricity: A Technical Overview, in: Hancock, K.J., Allison, J.E. (Eds.), The Oxford handbook of energy politics. Oxford University Press, New York, NY, pp. 69–98.

Jänicke, M., Quitzow, R., 2016. Wirtschaftliche Interessen in der europäischen Klima- und Energiepolitik. Entwicklungstendenzen unterhalb der nationalen Ebene, in: Kemmerzell, J., Knodt, M., Tews, A. (Eds.), Städte und Energiepolitik im europäischen Mehrebenensystem. Nomos Verlagsgesellschaft mbH & Co. KG, pp. 45–70.

Kersting, N., Roth, R., 2017. Bürgerbeteiligung und Energiewende, in: Holstenkamp, L., Radtke, J. (Eds.), Handbuch Energiewende und Partizipation. Springer Fachmedien Wiesbaden, Wiesbaden, pp. 1147–1164.

Kungl, G., 2014. The incumbent German power companies in a changing environment: A comparison of E.ON, RWE, EnBW and Vattenfall from 1998 to 2013. Inst. für Sozialwissenschaften, Stuttgart, 35 pp.

Letza, S.R., Smallman, C., Sun, X., 2004. Reframing privatisation: Deconstructing the myth of efficiency. Policy Sciences 37, 159–183. https://doi.org/10.1023/B:OLIC.0000048530.30139.98.

Libbe, J., 2021. Rekommunalisierung– Bewusstsein für eine an kommunalen Zielen ausgerichtete Daseinsvorsorge –, in: Junkernheinrich, M., Lorig, W.H., Masser, K. (Eds.), Brennpunkte der Kommunalpolitik in Deutschland. Nomos Verlagsgesellschaft mbH & Co. KG, pp. 295–310.

Lormes, I., 2016. Kommunalisierung der Energieversorgung: Eine explorative Untersuchung von Stadtwerke-Gründungen. Springer Fachmedien Wiesbaden, Wiesbaden, 378 pp.

Menges, R., Müller-Kirchenbauer, J., 2012. Rekommunalisierung versus Neukonzessionierung der Energieversorgung. Z Energiewirtsch 36, 51–67. https://doi.org/10.1007/s12398-012-0074-4.

Moss, T., Becker, S., Naumann, M., 2015. Whose energy transition is it, anyway?: Organisation and ownership of the Energiewende in villages, cities and regions. Accessed via edoc-Server of Humboldt-Universität Berlin. Local Environment 20:12. https://edoc.hu-berlin.de/handle/18452/22568.

Petitjean, O., Kishimoto, S., 2017. Cities and citizens are writing the future of public services, in: Kishimoto, S., Petitjean, O., Steinfort, L. (Eds.), Reclaiming Public Services: How cities and citizens are turning back privatisation. Amsterdam, Paris, pp. 157–177.

PwC - PricewaterhouseCoopers, 2002. Deutsche Städte auf dem Weg zum modernen Dienstleister. Kommunalstudie, Frankfurt am Main.

Richter, P., 2007. Die Bedeutung der kommunalen Wirtschaft : eine vergleichende Ost-West-Analyse.

Richter, P., Edeling, T., Reichard, C., 2006. Kommunale Betriebe in größeren Städten: Ergebnisse einer empirischen Analyse der Beteiligungen deutscher Städte über 50.000 Einwohner, in: Killian, W., Richter, P., Trapp, J.H. (Eds.), Ausgliederung und Privatisierung in Kommunen: Empirische Befunde zur Struktur kommunaler Aufgabenwahrnehmung. Ed. Sigma, Berlin.

Sack, D., 2019. Vom Staat zum Markt: Privatisierung aus politikwissenschaftlicher Perspektive, 1st ed. Springer Fachmedien Wiesbaden; Imprint: Springer VS, Wiesbaden, 379).

Schmitt, C., Obinger, H., 2011. Constitutional Barriers and the Privatization of Public Utilities in Rich Democracies. World Political Science 7. https://doi.org/10.2202/1935-6226.1100.

Statistische Ämter des Bundes und der Länder, 2022. Regionaldatenbank Deutschland. GENESIS Online, Düsseldorf. https://www.regionalstatistik.de/genesis/online.

Sundell, A., Lapuente, V., 2012. Adam Smith or Machiavelli? Political incentives for contracting out local public services. Public Choice 153, 469–485. https://doi.org/10.1007/s11127-011-9803-1.

Tagesschau, 2021. e.on steckt Milliarden in Netzausbau. https://www.tagesschau.de/wirtschaft/unternehmen/eon-energiewende-milliarden-investitionen-birnbaum-101.html (accessed 17 June 2022).

VKU - Verband kommunaler Unternehmen e.V., 2023. Anforderungen an den vorausschauenden Netzausbau zum Gelingen der Energiewende - Hemmnisse und Lösungsvorschläge, Berlin. https://www.vku.de/fileadmin/user_upload/Energiewirtschaft/230216_VKU-Positionspapier_Vorausschauender_Netzausbau.pdf (accessed 4 June 2023).

Wagner, O., Berlo, K., 2015. The wave of remunicipalisation of energy networks and supply in Germany: the establishment of 72 new municipal power utilities, in: First fuel now: ECEEE 2015 Summer Study. Proceedings. 1-6 June 2015, Toulon/Hyères, France. European Council for an Energy Efficient Economy, Stockholm, Stockholm, pp. 559–569.

Wagner, O., Berlo, K., 2017. Remunicipalisation and Foundation of Municipal Utilities in the German Energy Sector: Details about Newly Established Enterprises. J. sustain. dev. energy water environ. syst. 5, 396–407. https://doi.org/10.13044/j.sdewes.d5.0152.

Wassenaar, T., Groot, T., Gradus, R.H.J.M., 2010. Contracting Out, an Empirical Study on Motives. SSRN Journal. https://doi.org/10.2139/ssrn.1722547.

Zohlnhöfer, R., Schmitt, C., Obinger, H., 2015. Wirtschaftspolitik, in: Wenzelburger, G., Zohlnhöfer, R. (Eds.), Handbuch Policy-Forschung. Springer VS, Wiesbaden, pp. 565–590.