Beta and ERP for the Heating Companies in the Netherlands

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8 MAY 2025

Brattle

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I. Introduction and Summary

1. Since 2014, the Dutch Authority for Consumers and Markets (ACM) is responsible for setting the maximum prices that heat suppliers in the Netherlands can charge to consumers and small and medium companies with a connection up to 100 kW for the supply of heat.[1] The ACM sets the maximum heating tariffs nationally, so there is no differentiation based on the heating companies' varying characteristics.[2] As of the time of preparing this report, the ACM sets five different tariffs components for: (i) supply, (ii) metering, (iii) connection, (iv) disconnection, and (v) the rental of heat exchangers. The tariffs for supply and metering are based on the "no more than usual" principle, which entails that consumers who rely on a heating company for their heat demand shall pay no more than if they had used natural gas for heating with a domestic boiler. The ACM sets the supply and metering tariffs annually using the most recent gas prices as reference prices. The tariffs for the connection and disconnection to the heating network and for the rental of heat exchangers are instead based on the actual costs of about 20 of the largest heating companies.

2. The ACM started calculating a nominal pre-tax WACC in 2019, to be used as an estimate for the maximum return heating companies are allowed to earn on the rental of heat interface units. In 2019, the ACM determined the WACC for the rental of heat interface units for the period 2020-2022 based on the general ACM method. However, a ruling by the Trade and Industry Appeals Tribunal (CBB) determined that the cost of debt should be based on the actual debt costs of the Dutch heating companies. Accordingly, in 2022 the ACM calculated the WACC for the regulatory period 2023-2025 and recalculated the WACC for 2020-2022 using the general ACM method for calculating the cost of equity and using the actual debt costs of a sample of relatively large heating companies to calculate the cost of debt.

3. Since October 2021, the ACM must also calculate a weighted average cost of capital (WACC) for the heating sector in general, to determine whether the actual returns of individual

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1 Unlike energy networks, heating companies are required by law to be integrated, so that production, transport and delivery are all performed by one single company, due to the very local nature of heat supply.

2 Some of the differences between heating companies reflect non-systematic risks, which would not affect the companies' cost of capital or WACC. Nevertheless, there could also be different mixes of fixed and variable costs between heating companies (operating leverage) that would affect the cost of capital. However, it would be difficult to accurately measure this (likely small) difference based on listed companies. We note that even absent differences in operating leverage between companies, estimating a beta for heating is subject to some judgement and potential error. Trying to further differentiate between different types of heating companies would not be practical. Any differences in betas that result are more likely to be driven by the statistical error for the 'comparable' companies' chosen for the analysis, rather than representing a true difference in systematic risk and beta.

heating companies exceed an allowed reasonable return (the so-called rate of return test). In 2023, the ACM calculated the WACC for the heating companies for the regulatory period 2023-2025 using the same methodology applied for the rental of heat interface units.

4. The ACM is now seeking advice on the calculation of the WACC for heating companies for the next regulatory period, 2026-2028. Within this context, the ACM has commissioned The Brattle Group (Brattle) to:

   a. Select a peer group of comparable companies that are sufficiently liquid to allow a reliable beta estimate.

   b. Estimate the asset beta for heating companies in the Netherlands.

   c. Estimate the equity risk premium (ERP).

5. The ACM has instructed us to apply the general ACM method for estimating the asset beta and the ERP, and to apply the method already applied in the last method decision and in the 2023 Brattle report commissioned by the ACM for the selection of peers.[3]

6. The ACM has further asked us to analyse the relationship between firm size and the cost of equity in the Dutch heating sector. This request relates to the ongoing appeal by the association of energy firms in the Netherlands (VEN) against ACM's decision on the WACC for heating companies for 2018-2025. During the recent court proceedings, an expert jointly appointed by VEN and ACM on invitation of the Court (the "Expert Report") has argued that the cost of equity for smaller Dutch heating companies based on CAPM is too low for two main reasons:

   a. First, Dutch heating companies should face more risks (both idiosyncratic and systematic risks) compared to the publicly listed peer group, which are relatively large companies.

   b. Second, the Capital Asset Pricing Model (CAPM) used by the ACM is less applicable to Dutch heating companies because these companies are private and equity is less liquid compared to the group of peers.

7. The ACM wishes to investigate this issue further in view of the 2026-2028 method decision, because it believes that the argument that smaller heating companies face a higher cost of equity is insufficiently substantiated. Accordingly, the ACM has asked us to assess the reasoning of the expert and hence evaluate the impact of firm size on the cost of equity within

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[3] See ACM, "[Besluit WACC warmteleveranciers rendementstoets warmte](https://www.acm.nl) 2018-2025" (WACC decision heating companies), ACM/UIT/600827, 22 augustus 2023; Dan Harris, Lucrezio Figurelli, Filippo Nezzo and Elena Cannone, "The WACC for Heating Companies in the Netherlands", August 2023 (available at: https://www.acm.nl/system/files/documents/bijlage-wacc-adviesrapport-brattle_0.pdf).

the context of the Dutch heating sector. The ACM has requested that we address three questions:

a. Does economic theory suggest that firm size affects the cost of equity in the context of the Dutch heating sector?

b. Does the empirical literature provide evidence of a relationship between firm size and the cost of equity that is relevant for the Dutch heating sector?

c. If smaller heating companies indeed have a higher cost of equity, is it economically justifiable to apply a premium equal to that used for the cost of debt?

8. In preparing this report, we use data up to and including 28 February 2025, being the most recent date available at the time of our analysis.

A. Selection of the Peer Groups

9. Understanding the operations and the systematic risks of heating companies is essential to estimate a reasonable rate of return for these activities. In particular, because the Dutch heating companies are not listed, we need to estimate beta by reference to a group of comparable companies engaged in similar activities and facing similar systematic risks as the regulated companies.

10. In our 2023 report commissioned by the ACM[4] we analysed the activities and risks of heating companies and concluded that four comparable sectors could be used to estimate the beta of heating companies:

a. Similar to **power generation companies**, heating companies' profits are sensitive to changes in the price of the inputs used in heat generation. Heating companies also face demand risks, but at a much lower level, because the turnover of homes connected to the heat network is limited.

b. Similar to energy **networks**, heating companies develop and operate a monopolistic network at regulated prices with limited customer turnover. Operation of the heat network is thus comparable to the operation of an energy network.

c. **Utilities** are also good comparators for the heating companies, as they provide essential services to consumers, generally facing similar risk exposure as the heating companies.

[4] See Dan Harris, Lucrezio Figurelli, Filippo Nezzo and Elena Cannone, "The WACC for Heating Companies in the Netherlands", August 2023 (available at: https://www.acm.nl/system/files/documents/bijlage-wacc-adviesrapport-brattle_0.pdf).

d. Finally, ‘**alternative’ telecom operators** – defined as telecom operators that own a new-generation fixed access network competing with the incumbent former state monopolists owning the legacy copper network – make significant investments in new generation fiber networks, and experience similar risks as the heating companies, particularly with respect to buildout and take-up risks.

11. In our 2023 report we recommended to take a simple average of the median asset betas across the four sectors, arguing that the alternative approach of using a weighted average across sectors, using data about the relative contribution of different activities and risks to the profitability of heating companies was infeasible in practice. We recommend using a similar approach in this report.

12. We note, however, that the risk of deploying new-generation, fiber telecom networks has gradually declined, as penetration and take up of these services has increased. Accordingly, the current beta of alternative telecom operators may no longer reflect the significant buildout and take-up risks that the heating companies continue to face. In this report we test this hypothesis empirically, by comparing the median asset beta of alternative telecom operators to the median asset beta of incumbent telecom operators – defined as telecom operators who own the legacy copper network in at least one country in which they operate.

13. To select our peer groups of comparable companies, we start with the same candidate peers we considered in the 2023 Brattle Report[5] and in a recent ACM’s decision for the gas and electricity networks.[6] We then exclude companies that are no longer listed and check that the shares of the candidate peers are sufficiently liquid to provide a reliable beta estimate.

14. We consider two additional screening tests to ensure a reliable beta estimate. Specifically, we check that the credit rating of the candidate peers is not below investment grade and that the companies were not involved in substantial mergers and acquisitions (M&A) activity. The credit rating of three out of the 104 potential peers is below investment grade, while all of the candidate peers considered were not recently involved in M&A activity having a noticeable effect on the daily returns of the stock price.

15. Finally, we check the candidate peers within the energy network sector earn a majority of their revenues from regulated energy transmission and distribution. We find that all candidate peers derive a majority of their revenues from regulated energy transmission and distribution activities, with the exception of National Grid.

[5] See Dan Harris, Lucrezio Figurelli, Filippo Nezzo and Elena Cannone, “The WACC for Heating Companies in the Netherlands”, August 2023 (available at: https://www.acm.nl/system/files/documents/bijlage-wacc-adviesrapport-brattle_0.pdf).

[6] See Dan Harris and Lucrezio Figurelli, “The WACC for the Dutch Electricity TSO and Electricity and Gas DSOs”, April 2021 (available at: https://www.acm.nl/sites/default/files/documents/the-wacc-for-the-dutch-electricity-tso-and-electricity-and-gas-dsos.pdf).

16. After application of the screening criteria, we end up with 21 power generation companies, 7 energy networks, 20 utilities and 6 alternative telecom operators. In addition to the four comparable groups, we also consider 13 incumbent telecom operators.

B. Equity and Asset Beta

17. In line with the ACM methodology, we estimate equity betas for the peer groups by regressing the daily returns of individual stocks on market returns over sample periods of three years as of the relevant measurement date. We calculate market returns using a broad Eurozone index for companies operating in the Eurozone and a broad national index for UK companies. We calculate the gearing of each comparator as of the measurement date as the three-year average of quarterly gearing ratios obtained by dividing quarterly net debt over quarterly market capitalization. We then un-lever the equity betas using the Modigliani and Miller formula.

18. Table 1 below reports the median asset betas for the four comparable groups and for incumbent telecom operators. Overall, the results are broadly consistent with our expectations, with the median asset beta for power generation and renewables (0.61) higher than the median asset beta for utilities (0.42) and energy networks (0.36).[7] As regards alternative telecom operators, we find a median asset beta of 0.33, which is significantly lower than the value of 0.38 we estimated in our 2023 report, close to the median asset beta of incumbents (0.32). The comparison between the beta of alternative telecom operators and incumbents supports the hypothesis that the risk of deploying fiber networks has gradually declined and that the current beta of alternative telecom operators may no longer reflect the additional buildout and take-up risks of new investments.

TABLE 1: MEDIAN ASSET BETAS FOR THE PEER GROUPS

Asset Beta		
Power generation	[1]	0.61
Networks	[2]	0.36
Utilities	[3]	0.42
Alternative telecom operators	[4]	0.33
Incumbent telecom operators	[5]	0.32
Average		

7 Overall, the estimated median asset betas for the four comparable sectors are both in line (power generation), higher (networks) and lower (utilities and telecom operators) than our June 2023 estimates. For power generation companies we find a median asset beta of 0.61, consistent with the value estimated in our 2023 report. For networks, we find a median asset beta of 0.36, which is higher than the median asset beta of 0.28 estimated as of June 2023. In contrast, the median asset betas for utilities (0.42) and alternative telecom operators (0.32) are lower than the values estimated as of June 2023 (0.48 and 0.38, respectively).

Power, networks, utilities & alternative telecom	[6]	Average([1]:[4])	0.43
Power, networks & utilities	[7]	Average([1]:[3])	0.46

19. Table 1 further shows that the average of the median asset betas calculated including alternative telecom operators is equal to 0.43 (row [6]), whereas the average excluding alternative telecom operators is equal to 0.46 (row 7]).

20. We previously recommended the ACM should adopt the average including the alternative telecom operators to capture the build-out and take-up risk of heating companies. Since the asset beta of alternative telecom operators appears no longer to reflect these risks, we now recommend using the average of the median asset beta for power generation companies, networks and utilities, equal to of 0.46. Since the asset beta of alternative telecom operators no longer appears to reflect these risks, and there is no obvious alternative regulated sector, other than telecommunications, with a similar build-out and take-up risk as for heating companies, we now recommend using the average of the median asset betas for power generation companies, networks and utilities, equal to of 0.46.

21. Our proposed approach strikes a reasonable balance. On the one hand, our average beta does not include a sector that captures the potential build-out and take-up risk of heating companies. On the other hand, our average beta now places a higher weight on power generation companies and utilities, which both have a median asset beta higher than the median asset beta of alternative telecom operators in both our original and updated analyses. We have further considered an alternative approach to compensate the heating companies for build-out and take-up risks based on the fiber premium identified in 2020 in our report for the ACM on the WACC for KPN and VodafoneZiggo.[8] This approach would also result in a beta of 0.46, providing further support on the reasonableness of the beta we recommend.

C. Equity Risk Premium

22. We calculate the Equity Risk Premium (ERP) using long-term historical data on the excess return of shares over long-term bonds, using data from European markets. Specifically, the methodology requires that the projected ERP should be based on the average of the arithmetic and geometric realized ERP for the Eurozone, using the market capitalization of each country's stock market as weights. The methodology also requires considering whether adjustments to the final ERP need to be made based on considerations of the historical average ERP, and ERP estimates based on dividend-growth models.

8 See Dan Harris and Lucrezio Figurelli, “The WACC for KPN and VodafoneZiggo”, February 2020 (available at: https://www.acm.nl/sites/default/files/documents/2020-03/onderzoek-naar-de-vermogenskostenvoet-van-kpn-en-vodafoneziggo_1.pdf).

23. In our 2023 report for the ACM, we selected an ERP of 5.0%. This was in line with the average ERP over the 2018-2022 period, and consistent with ACM's contemporaneous WACC decisions for the gas and electricity networks. More recently, in our 2024 report for the ACM on the WACC for the Dutch drinking water companies (the 2024 Brattle Drinking Water Report),[9] we recommended the ACM to increase the ERP to 5.10%, to reflect the higher estimates of the realized ERP in 2022 (5.20%) and 2023 (5.23%). 2025 DMS data on the realized ERP based on data from 1900 up to and including 2024 now indicates that the weighted average ERP for the Eurozone has increased further to 5.27%. The question is then whether the further increase in the realized ERP warrants a further increase in the ERP for regulated companies in the Netherlands.

24. Based on the available evidence, we now recommend the ACM to apply a further increase in the ERP and to select a value of 5.20% to reflect the higher economic uncertainty driven by the continued military conflict in Ukraine and in the Middle East and the increased uncertainty about the direction of global trade policy after the 2024 US elections.

D. Relationship Between Firm Size and Cost of Equity

25. The Capital Asset Pricing Model (CAPM) is based on the assumption that firm specific risk, idiosyncratic risk can be diversified away. As a result, under the standard CAPM methodology, the cost of equity of an investor depends only on its exposure to market risk, also called "asset beta".

26. The Expert Report does not consider the standard CAPM methodology to be appropriate for Dutch heating companies because larger companies can more easily 'absorb' idiosyncratic risk. For example, the Expert Report indicates that small companies can "*get into trouble more easily*", due to factors such as liquidity constraints, key personnel risk and greater concentration risk among customers.

27. The Expert Report arrives at these conclusions by drawing an overly narrow focus on the small companies themselves, ignoring the underlying investors. While a specific small company may be exposed to a higher degree of idiosyncratic risks than a relatively large company, the investors in the small company can diversify away the idiosyncratic risks by investing in several small companies. As a result, an investor in a small company may have the same exposure to idiosyncratic risks as larger companies, and therefore, should not receive any premium to the standard reasonable return.

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[9] See Dan Harris, Lucrezio Figurelli and Gleb Kolotvin, "The WACC for Drinking Water Companies in the Netherlands", October 2024 (available at: https://www.acm.nl/system/files/documents/bijlage-1-brattle-drinking-water-report.pdf).

28. The Expert Report argues that a premium to compensate small companies for idiosyncratic risk "*has been recognized in both the academic literature and in practice*". The Expert Report does not cite any supporting evidence for this statement, but we suspect it is referring to the notion of "total beta" or to a similar concept that rewards investors for bearing idiosyncratic risks. We note, however, that the underlying literature has received significant criticisms from academics. Moreover, one of the proponents of the total beta, Professor Damodaran, indicated that "the idea of total beta is something I mentioned in passing a number of years ago, but it seems to have taken on a life of its own and is being used in ways I never intended".

29. In any case, we take the proposal in the Expert Report at face value and compare two scenarios:

    a. In **scenario A**, the regulator applies the standard CAPM return for both small and large companies.

    b. In **scenario B**, the regulator applies the standard CAPM return for large firms and the standard CAPM return supplemented by a small company premium for small firms.

30. Our analysis shows that in both scenarios, diversified investors would have incentives to acquire all the assets in the market either through M&A activity, or by private investors diversifying their own assets. Moreover, **Scenario A** leads to an appropriate level of compensation for all investors by matching the present value of prospective cash flows with the cost of an asset. In contrast, **Scenario B** leads to overcompensation, as diversified and undiversified investors will receive a compensation that is higher than the present value of their investments. Our conclusions are consistent with corporate finance best practice and a lecture from Professor Damodaran. [10]

31. We further highlight a potential problem with asymmetric information. If the regulator assumes that private companies belong to undiversified investors and are entitled to a higher return, diversified investors will have incentives to conceal their ownership over regulated assets and pretend to be undiversified investors.

32. We have also analysed in more detail the arguments about liquidity in the Expert Report. While we recognise that the lack of liquidity may impose costs on investors, we find that the discussion in the Expert Report is one-sided, focusing on the argument that being private has advantages. In the non-regulated sector, however, listed companies and private companies compete with one another. If there was a structural disadvantage to being private, there would be no private companies.

[10] Aswath Damodaran, "Diversification, Control & Liquidity: The Discount Trifecta", last accessed 3 March 2025.

33. We thus present a more balanced analysis that considers both the benefits and the costs of being private. We find that a heating company would need to be worth at least €253 million to find it more advantageous to be public. A company with such a valuation would generally meet the EU's definition of a large company. In any case, we do not see the reason why customers should pay for any of the costs of being private, like lower liquidity, by paying a premium on the WACC, while the owners enjoy the benefit of being private.

34. Finally, we examined the argument that the ACM should incorporate a premium on the cost of equity equal to at least the average premium on the cost of debt of small and large companies in the Netherlands ("SMEs Interest Premium"). The SMEs Interest Premium is not specific to the heating sector and reflects a wider macroeconomic phenomenon. In any case, the available literature attributes the SMEs Interest Premium to:

    a. High market concentration in the Dutch banking sector;

    b. The relatively lower risks for banks in the Dutch mortgage market than for loans to SMEs; and

    c. Information asymmetries regarding SMEs' financial health.

35. None of these factors would justify a higher cost of equity. A regulator should not reward a group of investors with a WACC premium to match the monopoly rents earned by another group of investors. Instead, the existing literature highlights that risk characteristics explain a negligible portion of the SMEs Interest Premium. This finding suggests that Dutch investors, the banks, can successfully diversify the idiosyncratic risks of small companies, which is consistent with the standard CAPM methodology.

II. Selection of the Peer Groups and Screening Tests

A. The Systematic Risks of Heating Companies

36. Understanding the operations and the systematic risks of heating companies is essential to estimate a reasonable rate of return for these companies. More specifically, because the Dutch heating companies are not listed, we need to estimate beta by reference to a group of comparable companies engaged in similar activities and facing similar systematic risks as the

regulated companies. In this Section we analyse the activities and risks of heating companies in order to identify a set of comparable sectors that can be used to estimate beta.

37. Heating companies are vertically integrated companies, responsible for the production, transport and delivery of heat to consumers. Heat is obtained from several sources – often a generation plant burning fossil fuels – and is transported as steam or hot water through a system of pipes. Steam and hot water are first delivered to a substation, before being delivered to end-consumers through the distribution heating network. Because demand fluctuates considerably over time, back-up boilers are also used at the substation to ensure stability of supply. Finally, in order to transfer heat from the heat network to their indoor system, consumers must rent a heat exchanger. The delivery of heat thus requires four main components: (i) a source of heat, (ii) a system of pipes, (iii) a substation with back up boilers, and (iv) heat exchangers.

38. As regards to the sources used to generate heat, the most commonly used sources in the Netherlands are drain water and residual heat – where the heat is obtained from electricity or waste incineration plants or from the heat released in industrial activity. Other sources include biomass and aquifer thermal energy.[11]

39. Risks of the heating companies can be broadly classified into one of four categories: demand risks, supply risks, buildout and take-up risks and regulatory risks.

40. **Demand risks from existing customers**. Heating companies face the risk of revenue fluctuations related to fluctuations in demand. These risks relate to changes in number of consumers and in the quantity of heat demanded by connected consumers. Demand risks from existing customers, however, are relatively low, because customers connected to a heat network have limited capacity to switch to an alternative source without incurring significant costs. As a result, the turnover of existing customers is low.

41. **Buildout and take-up risks**. Similar to investments into a new fiber telecommunications network, the development of a heating network involves a certain degree of demand risks related to buildout and take-up of the heat network. Take-up risk relates to the risk that the rate at which homes connect to the heating networks differs from what is foreseen when the investment is made. Similarly, construction risks relate to the risk of higher costs or longer lead time during the construction period.

42. **Supply risks**. Heating companies face supply risks because they are fully responsible for the generation and supply of heat. The nature and extent of these risks varies by company based on the source(s) used to generate heat and on the degree of vertical integration. In general, supply risks relate to the availability of the sources used to produce heat, which cannot be

[11] See Europe Economics, "WACC calculation for heat exchangers in The Netherlands", December 2019, p.4.

changed (easily) in the short run, and to their price relative to the price of gas. Unlike regulated transport and distribution networks, the profitability of heat networks is highly sensitive to changes in the supply and relative price of the inputs used in the generation of heat.

43. **Regulatory risk**. In addition to general regulatory risks, heating companies also face potential asymmetric regulatory risk due to the combination of the "no more than usual" clause applied to the supply and metering tariffs,[12] and the "rate of return test", which ensures that realized returns of the heating companies do not exceed a reasonable level. Unlike demand, supply, buildout and take-up risks, which are mostly systematic risks, regulatory risks, including asymmetric risk, are mostly non-systematic. Therefore, it should not affect the beta of heating companies.[13]

44. Based on the above description of the activities and risks of heating companies, in our 2023 report commissioned by the ACM[14] we identified four comparable sectors that can be used to estimate the beta of heating companies: power generation, networks, utilities and telecom companies.

45. **Power generation companies** derive much of their revenues from sales in liberalized power markets. Power generation companies thus face competition from other power plants, including renewable power sources, and have significant demand and supply risks. Similar to power generation companies, heating companies are highly sensitive to changes in the supply of the inputs used in heat generation and in particular to changes in price. Heating companies also face demand risks, but at a much lower level, because the turnover of homes connected to the heat network is limited.

46. Similar to energy **networks**, heating companies develop and operate a monopolistic network at regulated prices with limited customer turnover. Operation of the heat network is thus comparable to the operation of an energy network. **Utilities** are also good comparators. Similar to heating companies, utilities provide essential services to consumers at regulated prices, generally operating as natural monopolies and facing similar risk exposure. Finally, **alternative telecom operators** – defined as telecom operators that own a new-generation fixed access network competing with the incumbent, former state monopolists owning the

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[12] As explained above, the "no more than usual" principle entails that consumers who rely on a heating company for their heat demand shall pay no more than consumers using gas.

[13] Companies, however, make investment decisions taking non-systematic asymmetric risk into account in developing expected cash flows. In practice, however, adjusting expected cash flows for non-systematic asymmetric risk may be challenging. Determining whether there should be compensation in the WACC for asymmetric risk is outside the scope of this report.

[14] See Dan Harris, Lucrezio Figurelli, Filippo Nezzo and Elena Cannone, "The WACC for Heating Companies in the Netherlands", August 2023 (available at: https://www.acm.nl/system/files/documents/bijlage-wacc-adviesrapport-brattle_0.pdf).

legacy copper network – make significant investments in new generation fiber networks, and experience similar risks buildout and take-up risks as the heating companies.

47. Based on the above considerations, in our 2023 report we estimated the beta for the heating sector based on the asset betas of four comparator groups:

    a. Power generation companies;

    b. Networks;

    c. Utilities; and

    d. Alternative telecom operators.

48. In our 2023 report we recommended to take a simple average of the median asset betas across the four sectors, arguing that the alternative approach of using a weighted average across sectors, using data about the relative contribution of different activities and risks to the profitability of heating companies, was infeasible in practice. We recommend using a similar approach in this report.

49. We note, however, that the risk of deploying new-generation fiber networks has gradually declined, as penetration and take up of these services has increased. Accordingly, the current beta of alternative telecom operators may no longer reflect the significant buildout and take-up risks that the heating companies continue to face. In this report we test this hypothesis empirically, by comparing the median asset beta of alternative telecom operators to the median asset beta of incumbent telecom operators – defined as telecom operators who own the legacy copper network in at least one country in which they operate.

B. Potential Peers

50. In this report, we start considering the same candidate peers we considered in the 2023 Brattle Report,[15] which were selected by reference to prior ACM determinations in the utilities, telecoms, and energy sectors, [16] and in a recent ACM's decision for the gas and electricity

[15] See Dan Harris, Lucrezio Figurelli, Filippo Nezzo and Elena Cannone "The WACC for Heating Companies in the Netherlands", August 2023 (available at: https://www.acm.nl/system/files/documents/bijlage-wacc-adviesrapport-brattle_0.pdf).

[16] See Dan Harris and Lucrezio Figurelli, "The WACC for Heating Companies and Heat Exchangers in the Netherlands", July 2022, Section V (available at: https://www.acm.nl/nl/publicaties/consultatie-adviesrapport-wacc-rendementstoets-en-afleversets). See also, Europe Economics, "WACC calculation for heat exchangers in The Netherlands", December 2019; Dan Harris, Lucrezio Figurelli and Massimiliano Cologgi, "The WACC for KPN and VodafoneZiggo", February 2020 (available at: https://www.acm.nl/sites/default/files/documents/2020-03/onderzoek-naar-de-vermogenskostenvoet-

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networks.[17] From this broad list, we exclude companies that are no longer listed. To further assess whether the buildout and take up risk of alternative telecom operators has effectively declined, we further consider a group of incumbent telecom operators – defined as telecom operators who are the former state monopolists that own the legacy copper network in at least one of the countries in which they operate. After applying these criteria, we end up with a list of 104 candidate peers of which 35 power generation companies, 9 are energy networks, 39 are utilities companies, 7 are alternative telecom operators and 14 incumbent telecom operators.

van-kpn-en-vodafoneziggo_1.pdf); Dan Harris, Lucrezio Figurelli, Federico Guatri and Filippo Nezzo, "The WACC for Drinking Water Companies in the Netherlands", August 2021 (available at: https://www.acm.nl/sites/default/files/documents/the-wacc-for-drinking-water-companies-in-the-netherlands-2022-2023-2024.pdf); Dan Harris, Lucrezio Figurelli, Federico Guatri and Filippo Nezzo, "The WACC for Electricity and Water Companies in the Caribbean Netherlands for the years 2023-2025", 10 May 2022 (available at: https://www.acm.nl/sites/default/files/documents/rapport-brattle-the-wacc-for-electricity-and-water-companies-in-the-caribbean-netherlands-for-the-years-2023-2025.pdf).

[17] See Dan Harris and Lucrezio Figurelli, "The WACC for the Dutch Electricity TSO and Electricity and Gas DSOs", April 2021 (available at: https://www.acm.nl/sites/default/files/documents/the-wacc-for-the-dutch-electricity-tso-and-electricity-and-gas-dsos.pdf). This 2021 report included Transgaz SA Medias in its sample of peers. We consider Transgaz SA Medias a relevant candidate peer for this report as well, so we include it in our sample of potential peers.

TABLE 2. THE CANDIDATE PEERS

Power generation	Utilities	Networks
A2A SpA	Societe Electrique de l'Our SA	Elia Group SA/NV
Clearvise AG	Acsm - Agam SpA	Enagas
Arise AB	Holding Co ADMIE IPTO SA	Fluxys Belgium
Alerion Cleanpower SpA	Audax Renovables SA	National Grid PLC
Aventron AG	Ascopiave SpA	Redeia Corp SA
ADEV Wasserkraftwerk AG	Burgenland Holding AG	REN - Redes Energeticas Nacionais
Drax Group PLC	BKW AG	Snam SpA
EAM Solar ASA	Clean Invest Africa PLC	Transgaz SA Medias
EnBW Energie Baden-Wuerttember	Centrica PLC	Terna-Rete Elettrica Nazionale
Encavis AG	Carpevigo Holding AG	
Edison SpA	DGB GROUP NV	**Alternative telecom operators**
EDP Renovaveis SA	Naturenergie Holding AG	Liberty Global PLC
Energiekontor AG	Elmera Group ASA	NOS SGPS SA
Endesa Sa	Enel SpA	Telefonica Deutschland Holding
Electricite de Strasbourg SA	Selected Energy SA	Orange Belgium SA
Engie SA	Envitec Biogas AG	Tele2 AB
ERG SpA	EVN AG	United Internet AG
Edisun Power Europe AG	Fernheizwerk Neukoelln AG	Vodafone Group PLC
Etrion Corp	Greencoat Renewables PLC	
Frendy Energy SpA	Hera SpA	**Incumbent telecom operators**
Good Energy Group PLC	Italgas SpA	BT Group PLC
Romande Energie Holding SA	Iren SpA	Deutsche Telekom AG
7C Solarparken AG	Jersey Electricity PLC	Elisa Oyj
Iberdrola SA	Lechwerke AG	Hellenic Telecommunications Organisation SA
MVV Energie AG	Minesto AB	Koninklijke KPN NV
OMV AG	Finaxo Environnement	Orange Polska SA
Orsted AS	Hydro-Exploitations SA	Orange SA
RWE AG	Mainova AG	Proximus SADP
Scatec ASA	New Sources Energy NV	Swisscom AG
Solaria Energia y Medio Ambien	Photon Energy NV	Telefonica SA
SSE PLC	Gelsenwasser AG	Telenor ASA
Uniper SE	Acea SpA	Telia Co AB
Verbund AG	Public Power Corporation SA	Telecom Italia
Velcan Holdings SA	Thessaloniki Water and Sewerage Company SA	Telekom Austria AG
Voltalia SA	Athens Water Supply & Sewage	
	Eaux de Royan SA	
	Pennon Group PLC	
	Severn Trent PLC	
	United Utilities Group	

C. Liquidity Tests

51. Illiquid stocks tend to underestimate the true industry beta.[18] Hence, for each of the potential peers in the initial sample, we test to see if the firms' shares are sufficiently liquid.

[18] To understand why this is true, for example, consider a firm with a true beta of 1.0, so that the firm's true value moves exactly in line with the market. Now suppose that the firm's shares are traded only every other day. In this case, the firm's actual share price will only react to news the day after the market reacts. This will give the impression that the firm's value is not well correlated with the market, and the beta will appear to be less than one. Using weekly returns to calculate beta mitigates this problem, since it is more likely that the firm's shares will be traded in the week. However, using weekly returns has other disadvantages, such as providing 80% less data points over any given period.

52. Since 2021, the ACM methodology requires to apply a bid-ask spread threshold of 1% as the primary liquidity criterion.[19] Accordingly, we calculate the average bid-ask spread as a percentage of the stock price over the reference period 1 March 2022-28 February 2025.[20]

53. We consider two additional screening tests to ensure a reliable beta estimate. Specifically, we check that the credit rating of the candidate peers is not below investment grade and that the companies were not involved in substantial M&A activity. Share prices of firms with lower credit ratings tend to be more reactive to company-specific news. This will lower the measured beta, in a way that may not be representative of the Dutch heating companies. Similarly, substantial M&A activity will tend to affect a firm's share price in a way that is unrelated to the systematic risk of the business. Hence, the observed beta for a firm with substantial M&A activity will tend to underestimate the true beta for a firm with the same business activity absent M&A activity. Accordingly, we would exclude firms that have been involved in 'substantial' mergers and acquisitions (M&A) during the period for which data is used to calculate the beta.[21]

54. Finally, we check whether the candidate peers within the energy network sector earn a majority of their revenues from regulated energy transmission and distribution. All candidate peers pass this test with the exception of National Grid. On average, between 2022 and 2024 National Grid earned about 60% of its revenues from activities in the US and from businesses grouped under National Grid Ventures.[22] However, for such activities we cannot distinguish between revenues related to energy transmission and distribution and revenues related to the sale of energy. Accordingly, we exclude National Grid from the final sample.

55. Table 12 Appendix A summarizes the results of the screening tests.

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[19] Historically, the ACM methodology applied two criteria to test for liquidity. First, the shares of the candidate peers had to be traded on at least 90% of the days in which the relevant market index traded over the reference period (the number of trading days test). Second, the ACM methodology required that the candidate peers had annual revenues of at least € 100 million (the annual revenue requirement), on the basis that firms with larger revenues are likely to have shares that are liquidly traded. Later, in response to a court ruling, the ACM commissioned a study to provide a recommendation on the appropriate criteria to select peers for efficient beta estimation. The study determined that a bid-ask spread threshold of 1% should be applied as the primary liquidity criterion. We have applied this criterion in all recent reports for the ACM.

[20] More specifically, we calculate the daily value of the bid-ask spread as the difference between bid price and ask price at closing divided by the average between the bid price and the ask price. We then calculate the simple average of the daily bid ask spreads over the relevant period.

[21] We define a 'substantial' M&A activity as a transaction involving more than 30% of the average market capitalization of the firm in the thirty days preceding the transaction and having a noticeable effect on the daily returns of the stock price.

[22] National Grid Annual Report and Accounts 2023/2024, p.137.

D. The Final Peer Groups

56. Table 3, below, provides a summary of the final peer groups. Overall, the final sample of peers includes 21 power generation companies, 7 energy networks, 20 utilities and 6 alternative telecom operators. The table further lists 13 incumbent operators.

TABLE 3. THE FINAL SAMPLE OF PEERS

Power generation	BKW AG	**Alternative telecom operators**
A2A SpA	Centrica PLC	NOS SGPS SA
Arise AB	Energiedienst Holding AG	Telefonica Deutschland Holding
Alerion Cleanpower SpA	Elmera Group ASA	Orange Belgium SA
Drax Group PLC	Enel SpA	Tele2 AB
Edison SpA	EVN AG	United Internet AG
EDP Renovaveis SA	Greencoat Renewables PLC	Vodafone Group PLC
Energiekontor AG	Hera SpA	
Endesa SA	Italgas SpA	**Incumbent telecom operators**
Engie SA	Iren SpA	BT Group PLC
ERG SpA	Minesto AB	Deutsche Telekom AG
7C Solarparken AG	Acea SpA	Elisa Oyj
Iberdrola SA	Thessaloniki Water and Sewerage Company SA	Hellenic Telecommunications Organisation SA
OMV AG	Athens Water Supply & Sewage	Koninklijke KPN NV
Orsted AS	Pennon Group PLC	Orange Polska SA
RWE AG	Severn Trent PLC	Orange SA
Scatec ASA	United Utilities Group	Proximus SADP
Solaria Energia y Medio Ambien		Swisscom AG
SSE PLC	**Networks**	Telefonica SA
Uniper SE	Elia Group SA/NV	Telenor ASA
Verbund AG	Enagas	Telia Co AB
Voltalia SA	Red Electrica Corporacion SA	Telekom Austria AG
	REN - Redes Energeticas Nacionais	
Utilities	Snam SpA	
Holding Co ADMIE IPTO SA	Transgaz SA Medias	
Audax Renovables SA	Terna-Rete Elettrica Nazionale	
Ascopiave SpA		

III. Beta

A. Peer Groups Equity Betas

57. ACM's methodology specifies a three-year daily sampling period for the beta. Accordingly, we estimate equity betas for the peer group of firms by regressing the daily returns of individual stocks on market returns over the three-year period 1 March 2022-28 February 2025.[23]

58. The systematic risk of each peer, as summarised in its beta parameter, must be measured against an index representing the overall market. A hypothetical investor in a Dutch heating company would likely diversify its portfolio within a single currency zone so as to avoid exchange rate risk. Using indices from the relevant country or currency zone avoids exchange rate movements depressing the betas, and should result in a higher beta estimate than if we estimated betas against an index derived in a different currency. Accordingly, to calculate market returns we use a broad Eurozone index for companies operating in the Eurozone (the Stoxx Europe 600 (SXXP)) and the FTSE All-Share index (ASX Index) for UK companies Drax Group PLC, Centrica PLC, SSE PLC, Pennon Group PLC, Severn Trent PLC, United Utilities Group PLC, Vodafone Group PLC and BT Group PLC.

59. We perform a series of diagnostic tests to assess if the beta estimates satisfy the standard conditions underlying ordinary least squares regression. We test for autocorrelation using the Breusch-Godfrey test, but rely on the OLS estimate of the beta parameter even in the presence of autocorrelation.[24] We test for the presence of heteroscedasticity using the White's test and use White's-Huber robust standard errors.

60. In addition to the above diagnostic tools and adjustment procedures, we apply a test for market imperfections. This test requires us to use a weekly beta instead of the daily beta, if it appears that share prices react to news the day before or the day after the market index reacts. This could occur because of differences in market opening times and trading hours, or differences in the liquidity of the firm's shares relative to the average liquidity of the market. If such an effect is present, a beta estimated using daily returns on the firm's share and on the market index may be biased. Similarly, financial market frictions caused by information

[23] We measure daily returns based on dividend adjusted prices using Bloomberg's "TOT_RETURN_INDEX_GROSS_DVDS" function. This function returns stock prices adjusted to account for the issuance of dividends, gross of any applicable withholding tax.

[24] We test for autocorrelation up to three lags. Note that the OLS estimator of the beta is unbiased (not systematically too high or too low) and consistent (converges to the correct value) even in the presence of autocorrelation.

asymmetries, transaction costs, limit orders, and overreaction to news may also affect the way information is incorporated in the share price. In contrast, weekly betas are less sensitive to the speed at which share prices assimilate information, because they use returns over five trading days.

61. If the market is perfectly efficient, all information should be dealt with on the same day. The test for market imperfections requires to regress a company's daily returns using the market index returns one day before and one day after as additional regressors. If the lag or the lead coefficients are either significantly different from zero or jointly significantly different from zero, this suggests that information about the true beta may be lost by considering only the simple regression. This problem is addressed using weekly data to estimate the equity beta.

62. We have performed this test for the firms in our peer groups. The test is significant for 24. Hence for these firms we take the weekly beta.[25] For the remaining firms we take the daily beta.

63. Table 4 reports the equity betas of the peers. Overall, the equity betas range between 0.56 (Edison SpA) and 1.87 (Scatec ASA) for power generation, between 0.21 (REN – Redes Energeticas Nacionais) and 0.94 (Elia Group SA/NV) for networks, between 0.06 (Naturenergie Holding AG) and 1.21 (Hera SpA) for utilities, between 0.04 (Orange Belgium SA) and 1.11 (United Internet AG) for alternative telecom operators, between 0.26 (Orange SA) and 0.99 (Orange Polska SA) for incumbent telecom operators.

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[25] The weekly beta was higher than the daily beta for most of the companies. In particular: the weekly beta of Drax Group PLC (1.12) compares to a daily beta of 0.77; the weekly beta of EDP Renovaveis SA (1.00) compares to a daily beta of 0.78; the weekly beta of ERG SpA (0.80) compares to a daily beta of 0.77; the weekly beta of Iberdrola SA (0.69) compares to a daily beta of 0.57; the weekly beta of OMV AG (0.78) compares to a daily beta of 0.99; the weekly beta of Scatec ASA (1.87) compares to a daily beta of 1.43; the weekly beta of Elia Group SA/NV (0.94) compares to a daily beta of 0.58; the weekly beta of Transgaz SA Medias (0.51) compares to a daily beta of 0.32. the weekly beta of Holding Co ADMIE IPTO SA (0.64) compares to a daily beta of 0.66; the weekly beta of Hera SpA (1.21) compares to a daily beta of 0.94; the weekly beta of Italgas (0.69) compares to a daily beta of 0.76; the weekly beta of Iren SpA (1.17) compares to a daily beta of 0.94; the weekly beta of NOS SGPS SA (0.54) compares to a daily beta of 0.38; the weekly beta of Orange Belgium (0.04) compares to a daily beta of 0.07; the weekly beta of BT Group PLC (0.97) compares to a daily beta of 0.90; the weekly beta of Deutsche Telekom AG (0.56) compares to a daily beta of 0.40; the weekly beta of Elisa Oyj (0.54) compares to a daily beta of 0.27; the weekly beta of Koninklijke KPN NV (0.30) compares to a daily beta of 0.21; the weekly beta of Orange Polska SA (0.99) compares to a daily beta of 0.72; the weekly beta of Orange SA (0.26) compares to a daily beta of 0.14; the weekly beta of Swisscom AG (0.35) compares to a daily beta of 0.13; the weekly beta of Telefonica SA (0.66) compares to a daily beta of 0.46; the weekly beta of Telenor ASA (0.50) compares to a daily beta of 0.44; the weekly beta of Telekom Austria AG (0.45) compares to a daily beta of 0.31.

TABLE 4: EQUITY BETAS

	Beta [A]	Robust Standard Error [B]	Beta chosen [C]
Power generation			
A2A SpA	0.95	0.06	Daily
Arise AB	0.91	0.12	Daily
Alerion Cleanpower SpA	0.88	0.09	Daily
Drax Group PLC	1.12	0.24	Weekly
Edison SpA	0.56	0.05	Daily
EDP Renovaveis SA	1.00	0.18	Weekly
Energiekontor AG	0.95	0.09	Daily
Endesa Sa	0.57	0.05	Daily
Engie SA	0.65	0.05	Daily
ERG SpA	0.80	0.14	Weekly
7C Solarparken AG	0.57	0.07	Daily
Iberdrola SA	0.69	0.10	Weekly
OMV AG	0.78	0.15	Weekly
Orsted AS	0.84	0.12	Daily
RWE AG	0.68	0.07	Daily
Scatec ASA	1.87	0.25	Weekly
Solaria Energia y Medio Ambien	0.93	0.10	Daily
SSE PLC	0.74	0.06	Daily
Uniper SE	1.20	0.22	Daily
Verbund Ag	0.65	0.09	Daily
Voltalia SA	0.90	0.13	Daily
Networks			
Elia Group SA/NV	0.94	0.17	Weekly
Enagas	0.46	0.05	Daily
Redeia Corp SA	0.40	0.05	Daily
REN - Redes Energeticas Nacionais	0.21	0.04	Daily
Snam SpA	0.64	0.04	Daily
Transgaz Sa Medias	0.51	0.15	Weekly
Terna-Rete Elettrica Nazionale	0.56	0.05	Daily
Utilities			
Holding Co ADMIE IPTO SA	0.64	0.13	Weekly
Audax Renovables SA	0.68	0.10	Daily
Ascopiave SpA	0.64	0.06	Daily
BKW AG	0.45	0.06	Daily
Centrica PLC	0.77	0.08	Daily

Naturenergie Holding AG	0.06	0.07	Daily
Elmera Group ASA	0.89	0.13	Daily
Enel SpA	1.00	0.04	Daily
EVN AG	0.84	0.06	Daily
Greencoat Renewables PLC	0.31	0.05	Daily
Hera Spa	1.21	0.12	Weekly
Italgas SpA	0.69	0.10	Weekly
Iren SpA	1.17	0.14	Weekly
Minesto AB	0.79	0.21	Daily
Acea Spa	0.67	0.06	Daily
Thessaloniki Water and Sewerage Company SA	0.37	0.06	Daily
Athens Water Supply & Sewage	0.42	0.06	Daily
Pennon Group PLC	0.83	0.09	Daily
Severn Trent PLC	0.62	0.06	Daily
United Utilities Group	0.62	0.06	Daily
Alternative telecom operators			
NOS SGPS SA	0.54	0.10	Weekly
Telefonica Deutschland Holding	0.39	0.08	Daily
Orange Belgium SA	0.04	0.11	Weekly
Tele2 AB	0.58	0.06	Daily
United Internet AG	1.11	0.09	Daily
Vodafone Group PLC	0.79	0.07	Daily
Incumbent telecom operators			
BT Group PLC	0.97	0.19	Weekly
Deutsche Telekom AG	0.56	0.09	Weekly
Elisa Oyj	0.54	0.09	Weekly
Hellenic Telecommunications Organisation SA	0.55	0.06	Daily
Koninklijke KPN NV	0.30	0.07	Weekly
Orange Polska SA	0.99	0.14	Weekly
Orange SA	0.26	0.11	Weekly
Proximus SADP	0.65	0.07	Daily
Swisscom AG	0.35	0.09	Weekly
Telefonica SA	0.66	0.12	Weekly
Telenor ASA	0.50	0.11	Weekly
Telia Co AB	0.54	0.06	Daily
Telekom Austria AG	0.45	0.09	Weekly

Source: Brattle analysis of Bloomberg data.

B. Peer Groups Gearing and Asset Betas

64. As well as reflecting the systematic risk of the underlying business, equity betas also reflect the risk of debt or financial leverage. As debt is added to the company, the equity will become

riskier as more cash from profits goes towards paying debt in each year before dividends can be distributed to equity. With more debt, increases or decreases in a firm's profit will have a larger effect on the value of equity. Hence if two firms engage in exactly the same activity, but one firm has more debt, that firm will have a higher equity beta than the firm with less debt.

65. To measure the relative risk of the underlying asset on a like-for-like basis it is necessary to 'unlever' the betas, imagining that the firm is funded entirely by equity. The resulting beta is referred to as an asset beta or an unlevered beta. To accomplish the un-levering, the methodology specifies the use of the Modigliani and Miller formula.[26]

66. Consistent with the three-year reference period used to estimate the beta, we calculate the gearing of each comparator as of each measurement date as the three-year average of quarterly gearing ratios obtained dividing quarterly net debt over quarterly market capitalization.

67. Table 5 reports the equity beta, the gearing and the resulting asset betas for each firm. Overall, we find that:

   a. **Power generation:** the asset betas range between 0.38 (7C Solarparken AG) and 0.85 (Energiekontor AG), with a median asset beta of 0.61.

   b. **Networks:** the asset betas range between 0.11 (REN - Redes Energeticas Nacionais) and 0.56 (Elia Group SA/NV), with a median asset beta of 0.36.

   c. **Utilities:** the asset betas range between 0.05 (Naturenergie Holding AG) and 0.79 (Minesto AB), with a median asset beta of 0.42.

   d. **Alternative telecom operators:** the asset betas range between 0.02 (Orange Belgium SA) and 0.76 (United Internet AG), with a median asset beta of 0.33.

   e. **Incumbent telecom operators**: the asset betas range between 0.14 (Orange SA) and 0.63 (Orange Polska SA), with a median asset beta of 0.32.

TABLE 5: EQUITY AND ASSET BETAS

	Equity beta [A]	Gearing (D/E) [B]	Tax Rate [C]	Asset beta [D]
Power generation				

[26] The specific construction of this equation was suggested by Hamada (1972) and has three underlying assumptions: A constant value of debt; a debt beta of zero; that the tax shield has the same risk as the debt.

A2A SpA	Italy		0.95	87%	28%	0.58
Arise AB	Sweden		0.91	14%	21%	0.82
Alerion Cleanpower SpA	Italy		0.88	38%	28%	0.69
Drax Group PLC	Britain		1.12	55%	23%	0.79
Edison SpA	Italy		0.56	2%	28%	0.55
Edp Renovaveis SA	Spain		1.00	46%	25%	0.75
Energiekontor AG	Germany		0.95	18%	30%	0.85
Endesa SA	Spain		0.57	48%	25%	0.42
Engie SA	France		0.65	74%	26%	0.42
ERG SpA	Italy		0.80	44%	28%	0.60
7C Solarparken AG	Germany		0.57	70%	30%	0.38
Iberdrola SA	Spain		0.69	70%	25%	0.45
OMV AG	Austria		0.78	20%	24%	0.68
Orsted AS	Denmark		0.84	25%	22%	0.70
RWE AG	Germany		0.68	24%	30%	0.58
Scatec ASA	Norway		1.87	157%	22%	0.84
Solaria Energia y Medio Ambien	Spain		0.93	55%	25%	0.66
SSE PLC	Britain		0.74	44%	23%	0.56
Uniper SE	Germany		1.20	86%	30%	0.75
Verbund Ag	Austria		0.65	9%	24%	0.61
Voltalia SA	France		0.90	101%	26%	0.51
	Median	[1]	0.84	46%		0.61
Networks						
Elia Group SA/NV	Belgium		0.94	92%	25%	0.56
Enagas	Spain		0.46	86%	25%	0.28
Redeia Corp SA	Spain		0.40	66%	25%	0.27
REN - Redes Energeticas Nacionais	Portugal		0.21	139%	32%	0.11
Snam SpA	Italy		0.64	92%	28%	0.39
Transgaz SA Medias	Romania		0.51	51%	16%	0.36
Terna-Rete Elettrica Nazionale	Italy		0.56	63%	28%	0.38
	Median	[2]	0.51	86%		0.36
Utilities						
Holding Co ADMIE IPTO SA	Greece		0.64	0%	22%	0.64
Audax Renovables SA	Spain		0.68	66%	25%	0.45
Ascopiave SpA	Italy		0.64	76%	28%	0.41
BKW AG	Switzerland		0.45	16%	20%	0.40
Centrica PLC	Britain		0.77	0%	23%	0.77
Naturenergie Holding AG	Switzerland		0.06	32%	20%	0.05
Elmera Group ASA	Norway		0.89	38%	22%	0.69
Enel SpA	Italy		1.00	110%	28%	0.56
EVN AG	Austria		0.84	28%	24%	0.69
Greencoat Renewables PLC	Ireland		0.31	88%	13%	0.18
Hera SpA	Italy		1.21	94%	28%	0.72

Italgas SpA	Italy		0.69	145%	28%	0.34
Iren SpA	Italy		1.17	163%	28%	0.54
Minesto AB	Sweden		0.79	0%	21%	0.79
Acea SpA	Italy		0.67	153%	28%	0.32
Thessaloniki Water and Sewerage Company SA	Greece		0.37	0%	22%	0.37
Athens Water Supply & Sewage	Greece		0.42	0%	22%	0.42
Pennon Group PLC	Britain		0.83	167%	23%	0.37
Severn Trent PLC	Britain		0.62	99%	23%	0.35
United Utilities Group	Britain		0.62	116%	23%	0.33
Median		[3]	0.67	71%		0.42
Alternative telecom operators						
NOS SGPS SA	Portugal		0.54	86%	32%	0.34
Telefonica Deutschland Holding	Germany		0.39	64%	30%	0.27
Orange Belgium SA	Belgium		0.04	164%	25%	0.02
Tele2 AB	Sweden		0.58	42%	21%	0.43
United Internet AG	Germany		1.11	66%	30%	0.76
Vodafone Group PLC	Britain		0.79	199%	23%	0.31
Median		[4]	0.56	76%		0.33
Incumbent telecom operators						
BT Group PLC	Britain		0.97	152%	23%	0.45
Deutsche Telekom AG	Germany		0.56	125%	30%	0.30
Elisa Oyj	Finland		0.54	17%	20%	0.48
Hellenic Telecommunications Organisation SA	Greece		0.55	9%	22%	0.52
Koninklijke KPN NV	Netherlands		0.30	48%	26%	0.22
Orange Polska SA	Poland		0.99	69%	19%	0.63
Orange SA	France		0.26	112%	26%	0.14
Proximus SADP	Belgium		0.65	141%	25%	0.32
Swisscom AG	Switzerland		0.35	28%	20%	0.28
Telefonica SA	Spain		0.66	167%	25%	0.29
Telenor ASA	Norway		0.50	58%	22%	0.34
Telia Co AB	Sweden		0.54	78%	21%	0.34
Telekom Austria AG	Austria		0.45	51%	24%	0.32
Median		[5]	0.54	69%		0.32

Notes:
[A]: Table 4.
[B]: Brattle analysis of Bloomberg data.
[C]: Damodaran, Corporate Marginal Tax Rates - By country, January 2025 Update.
[D]: [A]/(1+(1-[C])x[B]).

68. Table 6 below reports the median asset betas for the four comparable groups and for incumbent operators. Overall, the results are broadly consistent with our expectations, with the median asset beta for power generation and renewables (0.61) higher that the median asset beta for utilities (0.42) and energy networks (0.36). As regards alternative telecom

operators, we find a median asset beta of 0.33, which is significantly lower the value of 0.38 we estimated in our 2023 report, and close to the median asset beta of incumbents (0.32).

69. The comparison between the beta of alternative telecom operators and incumbents supports the hypothesis that the risk of deploying fiber networks has gradually declined and that the current beta of alternative telecom operators may no longer reflect the significant buildout and take-up risks that the heating companies continue to face.

TABLE 6: ASSET BETAS FOR THE HEATING COMPANIES

Asset Beta			
Power generation	[1]		0.61
Networks	[2]		0.36
Utilities	[3]		0.42
Alternative telecom operators	[4]		0.33
Incumbent telecom operators	[5]		0.32
Average			
Power, networks, utilities & alternative telecom	[6]	Average([1]:[4])	0.43
Power, networks & utilities	[7]	Average([1]:[3])	0.46

Notes: Weights for the heating sector are assumed to be equal across all groups.

70. We previously recommended the ACM should adopt the average including the alternative telecom operators to capture the build-out and take-up risk of heating companies. Since the asset beta of alternative telecom operators no longer appears to reflect these risks, and there is no obvious alternative regulated sector, other than telecommunications, with a similar build-out and take-up risk as for heating companies, we now recommend using the average of the median asset betas for power generation companies, networks and utilities, equal to of 0.46. Our proposed approach strikes a reasonable balance. On one hand side, our average beta does not include a sector that captures the potential build-out and take-up risk of heating companies. On the other hand, our average beta now places a higher weight on power generation companies and utilities which both have a median asset beta higher than the median asset beta of alternative telecom operators in both our original (0.38) and updated (0.33) analyses.

71. Had we selected the average beta for power generation companies, networks and utilities in our 2023 report, we would have calculated an asset beta of 0.46, which is very close to, albeit higher than, the 0.44 asset beta we selected in 2023 taking the four-sector average. This suggests that the impact of taking the three-sector average, placing a higher weight on power generation and utilities, may more than compensate the Dutch heating companies for the build-out and take-up risks they take.

72. We have further considered an alternative approach to compensate the heating companies for build-out and take-up risks based on the fiber premium identified in our 2020 report for the ACM on the WACC for KPN and VodafoneZiggo.[27] The rationale for using the value of the premium selected in 2020 is that the build-out and take-up risks that heating companies face today is more comparable to the build-out and take-up risk alternative telecom operators faced in 2020. At the time, we estimated a beta differential between incumbents and alternative telecoms operators of 0.14.[28] If we calculate a four-sector average taking the median asset beta for power generation (0.61), networks (0.36) and utilities (0.42) and increasing the beta of incumbents by the 0.14 fiber premium (0.46=0.32+0.14), the resulting four-sector average would be equal to 0.46. This result is in line with the three-sector average, providing further support on the reasonableness of the beta we recommend.

IV. The Equity Risk Premium

73. ACM's methodology specifies that the ERP should be based on a historical time-series of the excess return of stocks over long-term bonds for the Eurozone economies. Specifically, ACM has determined to use the simple average of the long-term arithmetic and geometric ERP for the Eurozone as the anchor for the ERP estimate. The ERP for individual countries in the Eurozone should be weighted using the 2024 value of each country's stock market.[29] The methodology reflects an estimate of the ERP in the very long run, and notably excludes countries outside of the Eurozone. This is reasonable, because a Dutch investor is more likely to be diversified over the same currency zone, rather than to incur additional currency risks by diversifying within Europe but outside of the Eurozone.

74. In our 2023 report for ACM on the WACC for the Dutch heating companies, we selected an ERP of 5.0%. This was in line with the average ERP over the 2018-2022 period, and consistent with ACM's contemporaneous WACC decisions for the gas and electricity networks.[30] More

[27] See Dan Harris and Lucrezio Figurelli, "The WACC for KPN and VodafoneZiggo", February 2020 (available at: https://www.acm.nl/sites/default/files/documents/2020-03/onderzoek-naar-de-vermogenskostenvoet-van-kpn-en-vodafoneziggo_1.pdf).

[28] *Ibid.*, Table 9.

[29] Weighting based on the current market-capitalization reflects the idea that a typical investor would invest a larger share of his portfolio in countries with more investment opportunities.

[30] See Dan Harris and Lucrezio Figurelli, "The WACC for the Dutch Gas TSO", July 2020 (available at: https://www.acm.nl/sites/default/files/documents/rapport-the-brattle-group-the-wacc-for-the-dutch-gas-tso_0.pdf) and "The WACC for the Dutch Electricity TSO and Electricity and Gas DSOs", April 2021 (available at:https://www.acm.nl/sites/default/files/documents/the-wacc-for-the-dutch-electricity-tso-and-electricity-and-gas-dsos.pdf).

recently, in the 2024 Brattle Drinking Water Report,[31] which used historical ERP data up to and including 2023, we recommended the ACM to increase the ERP to 5.10%, to reflect the higher estimates of the realized ERP. The question that we address in this section is whether new data from 2024 warrants a further change in the ERP.

75. Table 7 shows the historical long-run ERP derived from one of the most widely used sources, the data published by Dimson, Marsh and Staunton (the "2025 DMS report").[32] The 2025 DMS report contains ERP estimates for different countries based on data from 1900 up to and including 2024. Columns [A] and [B] show the geometric and arithmetic means of the ERP for the Eurozone countries considered in the 2025 DMS report, while column [C] reports the simple average of the two. We find that the Eurozone simple average ERP is 5.84% (see cell [11][C]), while the average ERP weighted by each country's stock market capitalization is 5.27% (see cell [12][C]).[33]

TABLE 7: HISTORIC EQUITY RISK PREMIUM RELATIVE TO BONDS (1900 – 2024)

		Risk premiums relative to bonds, 1900 - 2024			
		Geometric mean	Arithmetic mean	Average	Country Market Cap (2024)
		%	%	%	USD mln
		[A]	[B]	[C]	[D]
Austria	[1]	3.30	21.20	12.25	142,485
Belgium	[2]	2.60	4.60	3.60	372,061
Finland	[3]	5.50	9.00	7.25	259,757
France	[4]	3.50	5.70	4.60	2,927,979
Germany	[5]	5.20	8.30	6.75	2,400,751
Ireland	[6]	3.00	5.00	4.00	81,690
Italy	[7]	3.30	6.60	4.95	721,221
Netherlands	[8]	3.70	5.90	4.80	959,196
Portugal	[9]	5.20	9.20	7.20	71,896
Spain	[10]	2.00	3.90	2.95	788,853
Average Eurozone	[11]	3.73	7.94	5.84	
Value-weighted average Eurozone	[12]	3.86	6.68	5.27	

Notes and sources:

[31] See Dan Harris, Lucrezio Figurelli and Gleb Kolotvin, "The WACC for Drinking Water Companies in the Netherlands", October 2024 (available at: https://www.acm.nl/system/files/documents/bijlage-1-brattle-drinking-water-report.pdf).

[32] UBS Global Investment Returns Sourcebook 2025, Table 12.

[33] Note that in calculating the Eurozone averages, at the request of ACM, we include Austria, for which DMS reports an arithmetic average ERP of 21.2%. Excluding Austria would reduce the value of the weighted Eurozone average of the arithmetic mean from 6.68% to 6.43%, and the average between the values of the weighted arithmetic and geometric means from 5.27% to 5.15%.

[A][1]- [B][10]: Elroy Dimson, Paul Marsh, and Mike Staunton, Credit Suisse Global Investment Returns Sourcebook 2025, Table 12.
[C]: Average [A]:[B].
[D]: Bloomberg.
[11]: Average [1]:[10].
[12]: Average [1]:[10], weighted by [D].

76. Table 8 further illustrates the recent evolution of the ERP estimates for the Eurozone based on data published by DMS in previous years. Columns [A] and [B] show the weighted average of the geometric and arithmetic means of the realized ERPs for Eurozone countries, while column [C] reports the simple average of the two. All three columns rely on the ERP data for the Eurozone countries in the DMS studies weighted by their stock market value. The average of the geometric and arithmetic means for the Eurozone has steadily increased from 4.85% in 2020 to 5.27% in 2024. We note that the true ERP is unobservable, as it reflects the expected return required by investors as a compensation for market risk. The question is then whether the increase over time represents an increase in the true long-term ERP or is simply a short-lived phenomenon.

TABLE 8: DMS ERP, WEIGHTED AVERAGE OF THE ARITHMETIC AND GEOMETRIC MEANS FOR THE EUROZONE, 2020 – 2024

%	Geometric Mean [A]	Arithmetic Mean [B]	Average [C] Average([A]:[B])
2020	3.38	6.31	4.85
2021	3.60	6.51	5.06
2022	3.79	6.62	5.20
2023	3.82	6.65	5.23
2024	3.86	6.68	5.27
Average	3.69	6.55	5.12

Notes and sources:
Brattle calculation using data from Credit Suisse Global Investment Returns Sourcebook, 2021-2023, and UBS Global Investment Returns Sourcebook, 2024-2025.
[A], [B]: Value-weighted average for the Eurozone.

77. From a theoretical standpoint, an increase in the historical ERP may reflect a short-term impact due to a *decrease* in the true ERP or a medium-term impact due to an *increase* in the true ERP:

a. In the short term, a decrease in the true ERP will drive stock returns up, as investors re-evaluate existing investment, thus leading to an increase of historical averages.[34]

b. In the medium term, an increase in the true ERP will gradually lead to an increase in the historical averages as investors will only undertake new investments with higher returns.

78. However, because changes in the true ERP are unobservable, it is generally difficult to determine whether observed changes in the historical ERP reflect a short-term or a medium-term effect.

79. In the 2024 Brattle Drinking Water Report, we attributed the increase in historical ERPs for the Eurozone to an increase in the underlying "market" ERP due to higher market volatility and a temporary increase in the realized historical ERP due to higher inflation.

80. As regards market volatility, both the Covid-19 pandemic and the war in Ukraine triggered a significant increase in the volatility of stock markets.[35] In general, higher market volatility implies higher risk and, therefore, the need for a higher risk premium. It is important to stress that what is relevant here is not necessarily an ex-post measure of realized volatility of stock prices. Rather, it is the volatility of stock prices expected by investors, which is likely linked to the degree of uncertainty about future economic conditions. Arguably, economic uncertainty has increased since the drafting of the 2024 Brattle Drinking Water Report, as a result of continued military conflict in Ukraine and in the Middle East and increased uncertainty about the direction of global trade policy after the 2024 US elections.

81. As regards inflation, the significant and unexpected increase in inflation in the past few years likely resulted in a temporary increase in the measured ERP. In general, real returns on investments tend to have some negative correlation with the rate of inflation, meaning that real returns will decrease when inflation increases. However, the correlation of real equity returns with inflation tends to be smaller in absolute terms than the correlation between real bond returns and inflation.[36] This implies that when inflation increases, real returns to equity will decrease less than real returns to bonds, causing an increase in the difference between the return on equity and the return on bonds. In other words, when inflation increases the realized ERP tends to increase. Since the drafting of the 2024 Brattle Drinking Water Report,

[34] The increase in the historical averages will be relatively small when the realized ERP is measured using a long-term average.

[35] The volatility index for the S&P 500 (VIX), for example, increased from values of about 100 at the end of 2019 to values exceeding 600 in March 2020 and then remained relatively high until the beginning of 2023. The volatility index for the Euro Stoxx 50 (VSTOXX Index) followed a similar pattern.

[36] The relation between the ERP and the inflation rate has been clearly identified as one of the drivers of the recent increase in the historical ERP by the Body of European Regulators of electronic Communications (BEREC). BEREC cites DMS' finding of a correlation of -0.21 between real equity returns and inflation and a correlation of -0.42 between real bond returns and inflation. See BEREC, WACC parameters Report 2024, BoR (24) 102, p. 60.

inflation has continued to decrease compared to the 2022-23 levels, and the ECB currently expects European inflation to settle at its 2% target by 2026-27, which suggests that the difference between real returns on equity and real returns on bonds is no longer driven by higher inflation rates.[37]

82. In our recommendation in the 2024 Brattle Drinking Water Report we explained that increasing the ERP from 5.0% to 5.10% was reasonable, to account for a more uncertain economic environment. However, increasing it to as much as 5.23%, equal to the weighted average ERP for the Eurozone as of 2023, would have been too high, because the effect of inflation on the realized ERP was likely temporary. But new data now seems to support a further increase to the ERP.

83. ACM's methodology further requires us to look at evidence on the ERP from the dividend-growth model ("DGM") as a "sanity check" to determine whether other market data suggests an increase or decrease in the "market" ERP.[38] In the 2024 Brattle Drinking Water Report we noted that the evidence from the DGMs was highly mixed – with the ERP estimates from KPMG and Bloomberg going in opposite directions – and did not provide us any indication as to whether the market ERP had actually increased.

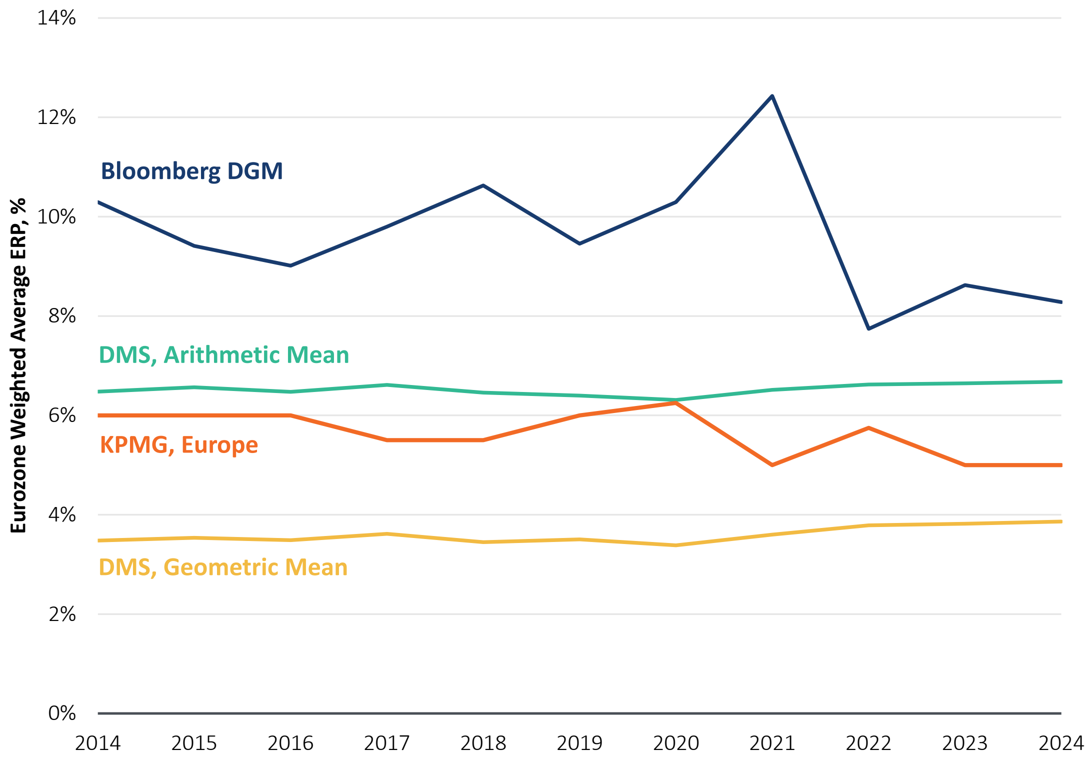
84. Figure 1 updates Figure 3 from the 2024 Brattle Drinking Water Report to include Bloomberg's and KPMG's DGM-based ERP estimates for 2024. The figure compares the DMS estimates of the arithmetic and geometric means of the historical ERP for the Eurozone to the forward looking DGM estimates from Bloomberg and KPMG since 2014.[39] The DGM estimates for 2024 continue showing mixed results on the market ERP. KPMG's estimate for 2024 remained stable at its 2023 value of 5% and Bloomberg's estimate decreased from 8.62% in 2023 to 8.28% in 2024. On balance, the DGM estimates do not provide a clear conclusion on the direction of the unobservable market ERP.

[37] ECB, Monetary policy decisions, Press release dated 5 March 2025.

[38] For example, after the 2009 financial crisis, historical data indicated a decrease in the ERP, because realized returns of stocks over bonds were very low. But the DGM indicated that the ERP had if anything increased after the crisis. The DGM result made sense, since investors would likely have perceived more risk and demanded higher returns immediately after the crisis. Hence, the results of the DGM indicated that, for this period, a downward reduction in the ERP was not justified, even though this is what the unadjusted historical data indicated.

[39] KPMG provides a DGM-based estimate of the ERP for Europe based on the implied equity returns of European indices. See "Equity Market Risk Premium - Research Summary", KPMG, 31 December 2024. Bloomberg provides daily DGM-based estimates of the ERP for individual European countries under the 'Country Risk Premium' function. We use Bloomberg's DGM-based ERP estimates for individual Eurozone countries as of 31 December of each year to calculate a weighted average DGM-based ERP for the Eurozone.

FIGURE 1: EUROZONE EQUITY RISK PREMIUMS, BY YEAR



Source: Bloomberg, various DMS reports, KPMG Netherlands and Brattle calculations.

85. Based on the available evidence, we now recommend the ACM to apply a further increase in the ERP and to select a value of 5.20%. Several reasons support this recommendation. First, economic uncertainty has likely increased. Second, the further increase in the DMS ERP as of 2024 can no longer be attributed to extraordinary inflation levels, as inflation levels in 2024 were significantly lower than in prior years. Finally, the DGM estimates of the ERP do not provide any conclusive evidence of a decline or increase in the ERP. The proposed value of 5.2% is slightly lower than the 5.27% ERP based on the 2025 DMS report, reflecting higher market uncertainty, lower inflation and the lack of conclusive evidence from the DGM.

V. Relationship Between Firm Size and Cost of Equity

86. The association of Dutch energy firms (VEN) appealed against the ACM's WACC decision for heating companies for 2018-2025 (VEN's Appeal). During VEN's Appeal, VEN and ACM jointly commissioned a report on invitation by the Court to assess whether the size of a firm affects its cost of capital (the "Expert Report").[40] The Expert Report concluded that:

    a. The ACM should include a size premium in the cost of equity of small Dutch companies because these companies (1) face idiosyncratic risks that are not captured in the beta of publicly traded peers[41] and (2) are generally private, which implies that their equity is less liquid than that of publicly traded peers.[42]

    b. The size premium for the cost of equity should be equal to at least the difference in the borrowing costs of small and medium sized enterprise (SMEs) and larger companies in the Netherlands (SMEs Interest Premium).[43]

87. The ACM has requested Brattle to critically assess the impact of firm size on the cost of equity of Dutch heating company. Our assessment is structured as follows:

    a. First, we consider whether the size of Dutch heating companies would affect their cost of equity. Our assessment considers in detail the two risk premia highlighted in the Expert Report: (1) idiosyncratic risks (Section V.A); and (2) lack of liquidity (Section V.B).

    b. Section V.C performs a review of existing literature explaining the SMEs Interest Premium to determine whether the observed premium can be applied to the cost of equity.

A. Idiosyncratic Risks

88. Corporate finance textbooks recognise that over any given period, the risk of holding a stock will reflect:

    a. **Firm specific risk,** including events specific to a company, such as increases in market shares within an industry.

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[40] "Expert report pursuant to VEN and ACM research assignment", October 2024.

[41] The Expert Report, p. 8.

[42] The Expert Report, p. 8.

[43] The Expert Report, pp. 9-10.

b. **Market risk,** including events that effect the economy, and thus all companies, such as changes in interest rates.[44]

89. The Capital Asset Pricing Model (CAPM) assumes that firm specific risk (idiosyncratic risk) can be diversified away.[45] Drawing on the example above, a diversified investor holding a portfolio of companies could diversify the risk of changes in market shares by holding multiple positions across different firms. Increases for one company in such portfolio would be offset by decreases for other companies. As a result, under the standard CAPM methodology, the cost of equity of an investor depends only on its exposure to market risk, also called "asset beta".

90. The Expert Report indicates that the standard CAPM methodology is not appropriate for Dutch heating companies[46] because larger companies can more easily "absorb" idiosyncratic risk.[47] For example, the Expert Report indicates that small companies can "*get into trouble more easily*" due to factors such as "*additional liquidity constraints, key personnel risk, greater concentration risk among customers, etc.*"[48]

91. It is not clear why the factors mentioned in the Expert Report would result in a higher cost of equity. For example, consider the risk of greater customer concentration highlighted in the Expert Report. Figure 2 shows a hypothetical example, with a small heating company that only has one customer (top of the figure), and a publicly listed heating company with 100 customers (bottom of the figure).

[44] Brealey, Richard A, Myers, Stewart C, and Allen, Franklin, "Principles of Corporate Finance", Tenth Edition, New York McGraw-Hill, (2011), pp. 168-170 and Berk, Jonathan and DeMarzo Peter, Corporate Finance, Third Edition, Pearson, (2014), pp. 332-333.

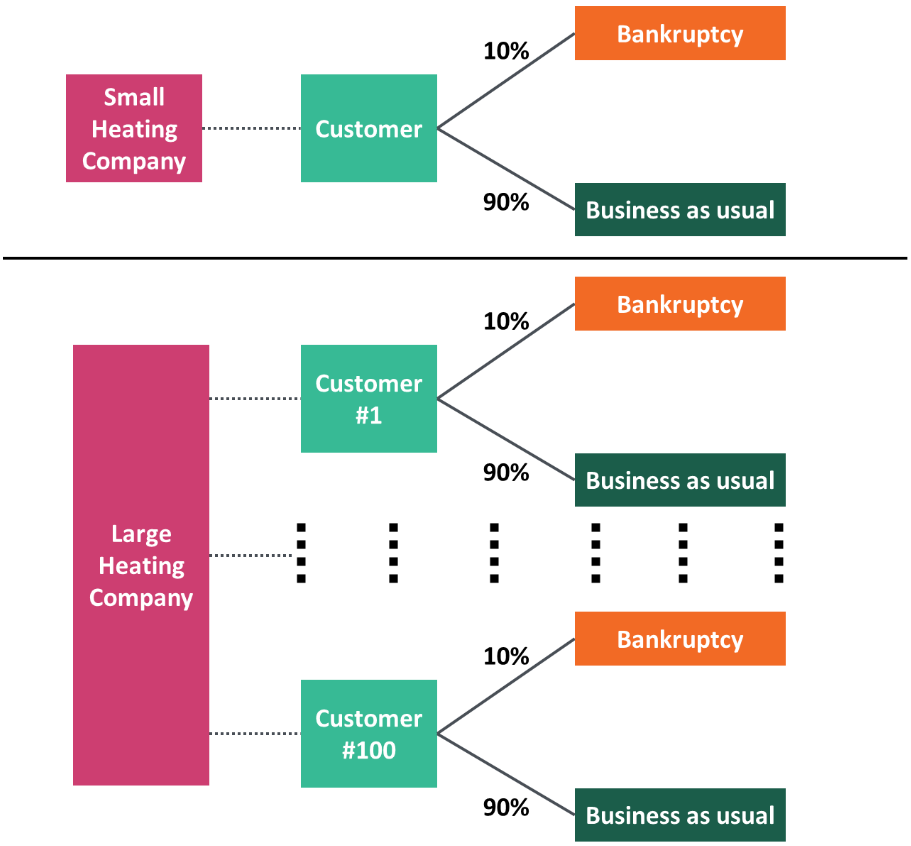
[45] Brealey, Richard A, Myers, Stewart C, and Allen, Franklin, "Principles of Corporate Finance", Tenth Edition, New York McGraw-Hill, (2011), pp. 192-193 and Berk, Jonathan and DeMarzo Peter, Corporate Finance, Third Edition, Pearson, (2014), pp. 379-380.

[46] The Expert Report, p. 1. Note that the Expert Report often refers to the "WACC methodology". However, fn. 1 in the Expert Report clarifies that "*by WACC methodology, we refer to the use of the CAPM to determine the reasonable rate of return (with beta as the risk parameter).*"

[47] The Expert Report, p. 8.

[48] The Expert Report, p. 8.

FIGURE 2: CUSTOMER CONCENTRATION RISK



92. Figure 2 assumes that in the event of an economic downturn (market risk), each customer has a 10% chance of going bankrupt. Hence, each heating company in our example has a 10% chance its revenues will decrease. The key difference is that for the small heating company the actual outcome will either be 100% revenues or 0% revenues. For the publicly listed heating company with 100 customers the likely outcome will be closer to 90%.

93. Figure 2 provides an illustration of customer concentration risk. The small heating firm would lose all customers with a probability of 10%, whereas the larger heating firm would lose all customers with a probability closer to zero.[49] In practice, the difference in default risk for the two heating companies will depend on the degree of correlation in the outcomes for its customers. For example, the academic literature often attributes the Global Financial Crisis to a "*lack of understanding of the appropriate correlation between [and] across the categories of mortgages*."[50] In our example, as the default correlation increases to 1, the probability that the large company loses all its customers would increase to 10%.[51]

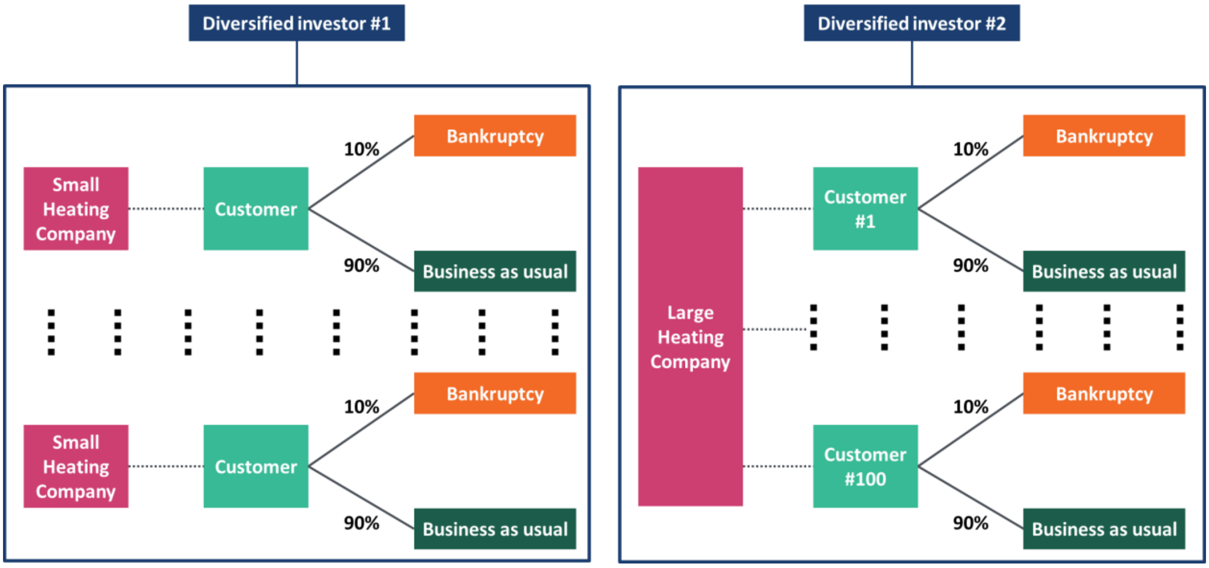
[49] Assuming no correlation in the probability of bankruptcy, the large company would lose all its customers with a probability of 10%^100.

[50] John M. Griffin and Jordan Nickerson, "Debt Correlations in the Wake of the Financial Crisis: What are Appropriate Default Correlations for Structured Products?", 2016, p.1.

[51] Tobias Neumann, Staff Working Paper No. 708, "Mortgages: estimating default correlation and forecasting default risk", 2018, Bank of England, p.2.

94. Clearly, for the small heating company, the loss of its one customer would be a disaster. But a diversified investor would be indifferent between the risks of the publicly listed heating company with 100 customers and the risk of the small heating company with a single client. This is because the investor could – in theory at least – hold a portfolio with 100 small heating companies each with a single client. This would be equivalent to holding shares in the publicly listed heating company with 100 customers. Figure 3 illustrates this concept. On the left-hand side of the figure Diversified Investor #1 holds a portfolio of 100 small heating companies. On the right-hand side, Diversified Investor #2 invests in a single large heating company with 100 customers. The risk for both investors is the same.

FIGURE 3: DIVERSIFIED INVESTORS WITH TWO PORTFOLIOS



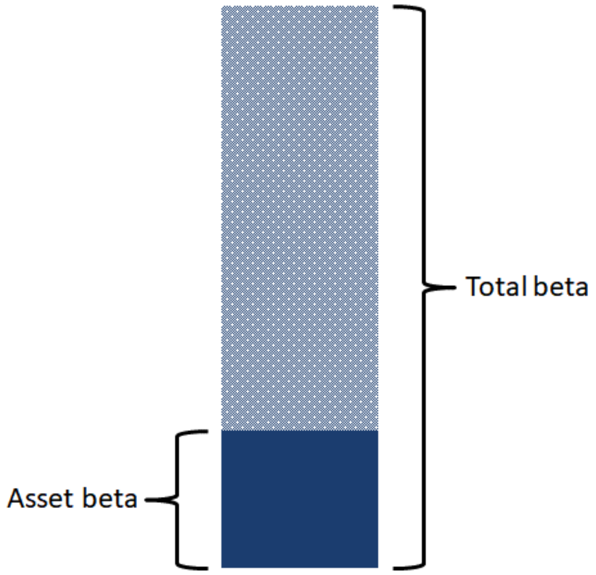
95. Allowing smaller heating companies to charge more for the perceived risk of customer concentration could result in inefficient outcomes and customers paying more. To see why, imagine the regulator allows large heating companies to charge €100 to each customer, and small companies to charge €101 to compensate them for the perceived risk of customer concentration. If that is the case, "Diversified Investor #1", on the left-hand side, would clearly be better off than "Diversified Investor #2". Both investors would bear a similar amount of risk by diversifying away most of customer concentration risk. However, "Diversified Investor #1" would obtain €100 more than "Diversified Investor #2".[52] "Diversified Investor #2" would have economic incentives to break up the large heating company and charge each customer €101. As a result, customers previously paying €100 would be worse off.

96. The logic outlined above would apply to other idiosyncratic risks such as key personnel risk and liquidity constraints. We discuss the lack of liquidity in more detail in Section V.B.

[52] €101 x 100 customers - €100 x 100 customers.

97. The Expert Report argues that the proposed premium for idiosyncratic risk "*has been recognized in both the academic literature and in practice*".[53] However, the Expert Report does not cite any supporting evidence. We suspect the Expert Report is referring to the "total beta", a concept used by some professors such as Professor Damodaran, see Figure 4.[54]

FIGURE 4: ASSET BETA AND TOTAL BETA



98. According to Professor Damodaran, total beta reflects an asset's total exposure to market and idiosyncratic risks.[55] To calculate the total beta, Professor Damodaran suggests dividing the asset beta by the proportion of total risk explained by market risk.[56] For example, for an asset beta of 0.5, which explains 60% of the observed risk, Professor Damodaran would calculate a total beta of 0.83.[57] By applying a "*total beta*" in the CAPM formula, small undiversified investors would receive a higher cost of equity, including compensation for idiosyncratic risk.

99. The total beta concept has attracted significant criticisms from academics.[58] In response, Professor Damodaran indicated that "*the idea of total beta is something I mentioned in passing a number of years ago, but it seems to have taken on a life of its own and is being*

53 The Expert Report, p. 8-9.

54 Aswath Damodaran, "Diversification, Control & Liquidity: The Discount Trifecta", last accessed 3 March 2025, p. 9.

55 Aswath Damodaran, "Diversification, Control & Liquidity: The Discount Trifecta", last accessed 3 March 2025, p. 9.

56 The proportion of risk explained by the asset beta can be inferred from the R-square of the regression analysis used to derive the asset beta. See Aswath Damodaran, "Diversification, Control & Liquidity: The Discount Trifecta", last accessed 3 March 2025, p. 9.

57 0.5 / 0.60 = 0.83.

58 See for example, Sarah Von Helfenstein, "Revisiting Total Beta", 2009, Business Valuation Review; L. Kasper, "The Butler Pinkerton Model for Company-Specific Risk Premium—A Critique", 2008, Business Valuation Review 27, pp. 233–243; and D. Canefield, L. Kruschwitz, A. Löffler, "Why Total Beta Produces Arbitrary Valuations: A Violation of the "No-Arbitrage" Principle", 2014, Business Valuation Review.

used in ways I never intended”.[59] According to Professor Damodaran, the total beta “*theoretically applies if you have an investor who is completely undiversified, but you never have that kind of buyer in the real world. At the other end of the spectrum* [asset] *beta applies for totally diversified investors. Investors in private companies are somewhere in between*”.[60]

100. Table 9 provides a numerical example showing that from a regulatory perspective, compensating investors for idiosyncratic risks would lead to overcompensation and consumers paying more than they should for heating. For simplicity, Table 9 assumes a regulated asset that costs a €100 and receives regulated revenues over a 10-year period under a regulated asset base framework (RAB). For ease of calculations, we use an unlevered cost of capital and assume operating costs are zero.

TABLE 9: VALUE OF A REGULATED ASSET UNDER DIFFERENT RATES OF RETURN

Risk Free Rate	%	[1]	Assumed	2%										
MRP	%	[2]	Assumed	5.50%										
Asset beta	#	[3]	Assumed	0.50										
R Square	%	[4]	Assumed	60%										
Total beta	#	[5]	[3]/[4]	0.83										
Cost of capital														
Diversified investor	%	[7]	[1]+[2]x[3]	4.75%										
Undiversified investor	%	[8]	[1]+[2]x[5]	6.58%										
Year					1	2	3	4	5	6	7	8	9	10
Capex	€	[9]	Assumed	-100										
Regulated asset base														
BoP	€	[10]	See note		100	90	80	70	60	50	40	30	20	10
Depreciation	€	[11]	[9]/10		10	10	10	10	10	10	10	10	10	10
EoP	€	[12]	[10]-[11]		90	80	70	60	50	40	30	20	10	0
Return at Cost of Capital of undiversified investor														
Reasonable return	€	[14]	[8]x[10]		7	6	5	5	4	3	3	2	1	1
Regulated revenues	€	[15]	[11]+[14]		17	16	15	15	14	13	13	12	11	11
Net present value of investment														
Diversified investor	€	[16]	NPV of [15] at [7]	108										
Undiversified investor	€	[17]	NPV of [15] at [8]	100										
Return at Cost of Capital of diversified investor														
Reasonable return	€	[18]	[7]x[10]		5	4	4	3	3	2	2	1	1	0
Regulated revenues	€	[19]	[11]+[18]		15	14	14	13	13	12	12	11	11	10
Net present value of investment														
Diversified investor	€	[20]	NPV of [19] at [7]	100										
Undiversified investor	€	[21]	NPV of [19] at [8]	92										

Notes and sources:
[10]: Equal to -[9] in the first year, then [12]{t-1}.

101. Rows [1] to [8] calculate a standard unlevered cost of equity for a diversified investor and the equivalent rate for an undiversified investor based on the “total beta”. The cost of capital in row [8] would compensate small investors for the idiosyncratic risks identified in the Expert

[59] Damodaran: ‘Total beta’ has taken on a life of its own | Business Valuation Resources.

[60] Damodaran: ‘Total beta’ has taken on a life of its own | Business Valuation Resources.

Report. Row [9] shows the cost of building the heating asset, while rows [10] to [12] show the evolution of the RAB.

102. We now assume the regulator sets the reasonable return at the cost of equity of an undiversified investor, row [14]. We then discount the total regulated revenues in row [15] at the two potential costs of capital, see rows [16] and row [17]. We observe that the diversified investor is overcompensated as the present value of the regulated revenues, €108 in row [16], exceeds the cost of the heating asset, €100 in row [9]. In contrast, the undiversified investor earns a zero NPV, as the present value of its regulated revenues, row [17], matches the cost of the asset, row [9].

103. In this situation, diversified investors would be willing to purchase heating assets for up to €108 from undiversified investors.[61] Undiversified investors would then have an incentive to sell their investment for €108 or diversify their holdings to become diversified investors. Through diversification or asset sales, the undiversified investors would ultimately achieve an NPV premium of €8, calculated as the difference between €108 and the cost of the asset, €100.

104. Rows [18] to [21] present an alternative scenario, where the regulator sets the reasonable rate of return based on the cost of equity of a diversified investor. Row [18] shows the reasonable return, while row [19] shows the total regulated revenues. Discounting at the two costs of capital, we find that the diversified investor would achieve an NPV zero, while the undiversified would expect a loss of €8.

105. Once again, diversified investors would compete to purchase heating assets for up to €100 from undiversified investors. Undiversified investors would have an incentive to sell their investment at €100 or would try to diversify their assets to become a diversified investor themselves. Through diversification or asset sales, the undiversified investors would achieve an NPV of €0.

106. Note that undiversified investors could diversify their holdings in several ways. For example, within the structure of a small heating company, the undiversified investor could use the company's free cash flows to acquire new customers to remove customer concentration risk, hire additional personnel to limit key personnel risk, or eventually pursue an IPO to limit the impact of illiquidity. The undiversified investor could also diversify its holdings outside of the structure of a small heating company. For example, the undiversified investor could use the company's free cash flows to issue dividends to fund acquisitions of other small heating companies. Alternatively, if the small company does not generate free cash flows, the undiversified investor could merge its stake with other small heating companies.

[61] Any purchase at €108 would be NPV zero as the present value of prospective regulated revenues matches the purchase price of the asset.

107. In both scenarios in Table 9, we would expect diversified investors to acquire all the assets in the market either through M&A activity, or by private investors diversifying their own assets. However, the first scenario leads to overcompensation as diversified and undiversified will receive up to €108 in present value terms for an investment only worth €100. In contrast, the second scenario leads to a reasonable return for both diversified and undiversified investors as both investors receive €100 in present value terms for an investment worth €100.

108. Regulation that matches the present value of prospective cash flows with the cost of an asset to ensure an NPV of zero is consistent with best practice. For example, one corporate finance textbook explains that "*if the NPV of buying a security were positive, then buying the security would be equivalent to receiving cash today—that is, it would present an arbitrage opportunity. Because arbitrage opportunities do not exist in normal markets, the NPV of all security trades must be zero.*"[62]

109. Our results are also consistent with a lecture from Professor Damodaran, which recognises that the total beta is "*not the appropriate measure of risk*" [63] in a market where an asset might be purchased by partially or mostly diversified buyers. In such markets, competition ensures that both diversified and undiversified investors realise the same market value.

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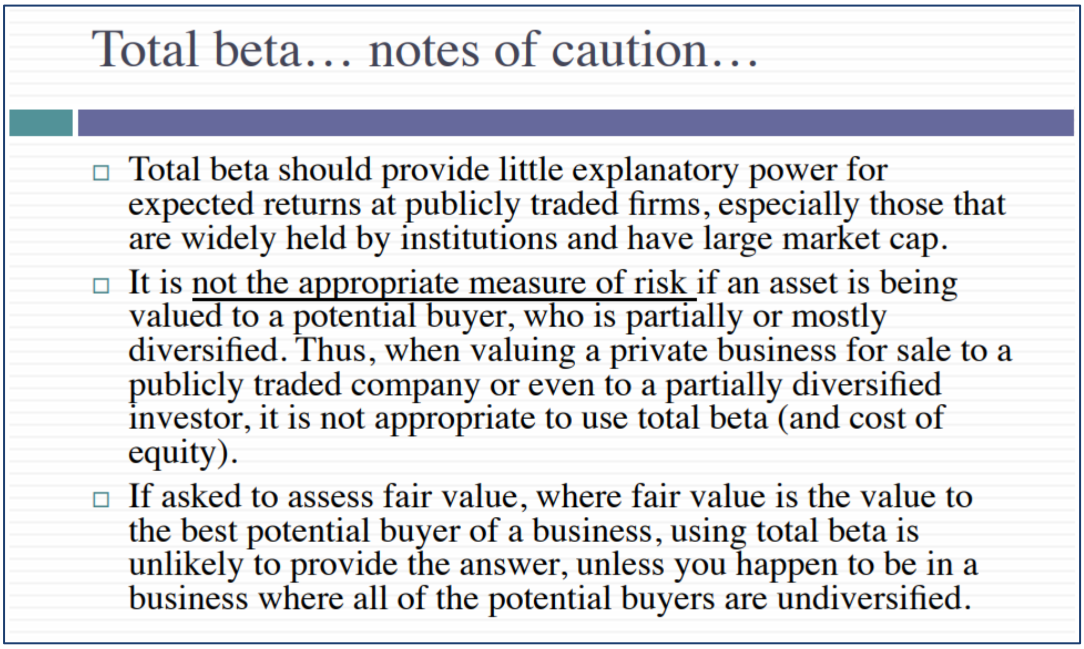
[62] Jonathan Berk and Peter DeMarzo, "Corporate Finance", 2014, Third Edition, Pearson, pp. 75-76: "*Another way to understand this result is to remember that every trade has both a buyer and a seller. In a competitive market, if a trade offers a positive NPV to one party, it must give a negative NPV to the other party. But then one of the two parties would not agree to the trade. Because all trades are voluntary, they must occur at prices at which neither party is losing value, and therefore for which the trade is zero NPV. The insight that security trading in a normal market is a zero-NPV transaction is a critical building block in our study of corporate finance. Trading securities in a normal market neither creates nor destroys value: Instead, value is created by the real investment projects in which the firm engages, such as developing new products, opening new stores, or creating more efficient production methods. Financial transactions are not sources of value but instead serve to adjust the timing and risk of the cash flows to best suit the needs of the firm or its investors.*"

[63] Aswath Damodaran, "Diversification, Control & Liquidity: The Discount Trifecta", last accessed 3 March 2025, p. 15.

FIGURE 5: LECTURE FROM PROFESSOR DAMODARAN[64]



110. We further highlight potential information asymmetries between the regulator and the investor. If the regulator assumes private companies belong to undiversified investors, diversified investors will have incentives to conceal their ownership over regulated assets. For example, diversified investors could set-up subsidiaries that own regulated assets as local private companies. Alternatively, the owners of private companies could use their personal assets to become diversified investors without alerting the regulator. The owners would receive compensation for the risk of being 'small' and undiversified, when they are in fact neither.

111. As a more general policy point, it is not clear why consumers should pay higher tariffs to compensate networks for inefficient ownership structures. Regulation that incentivises diversification is consistent with best practice. It minimises costs to consumers and encourages investors to avoid holding undiversified portfolios, which corporate finance textbook label as a "stupid" decision.[65]

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64 Aswath Damodaran, "Diversification, Control & Liquidity: The Discount Trifecta", last accessed 3 March 2025, p. 15.

65 Richard A. Brealey, Stewart C. Myers, and Franklin Allen, "Principles of Corporate Finance", 2011, Tenth Edition, New York McGraw-Hill, fn. 12: "*Investing in A or B only would be stupid; you would hold an undiversified portfolio*".

B. Lack of Liquidity

112. The Expert Report also posits that the owners of smaller companies often find it more difficult to divest (part of) their stake in the company.[66] We partially agree with the Expert Report. An investor in a publicly traded company can sell a portion of their shareholding relatively quickly and at a low cost by selling their shares on public markets. In contrast, to sell a stake in a private company, investors will often incur additional transaction costs such as accountants' and lawyers' fees, and the costs of identifying potential buyers. Moreover, the entire sale process might take time, during which the seller faces the risk of a decline in the asset's value.

113. However, on the other hand, selling a significant stake in a listed company can also involve costs, because the liquidity of the traded shares may be limited. Typically, an investor would not be able to sell a very large block of shares on the market without at best causing a significant decrease in the share price, and at worst a panic that there is a problem with the company. Investors would typically market a large block of share through a private placement, using an investment bank that charges significant fees. Hence, the liquidity difference between publicly traded and privately held companies is not as large as it may first appear, especially when large ownership blocks are bought and sold.

114. We also note that a discussion of the costs of being privately held, including increased difficultly in selling ownership shares, is incomplete without also discussing the benefits of private ownership relatively to being publicly traded. Clearly, being private has advantages. In the non-regulated sector, listed companies and private companies compete with one another. If there was a structural disadvantage to being private, there would be no private companies.

115. The benefits of being private include lower transparency and reporting standards. Conversely, becoming a publicly listed firm has costs. For example, a study from PWC indicates that during an initial public offering to become a listed firm, pre-existing investors "*incur an underwriter fee equal to 4% - 7% of gross proceeds*".[67] Moreover, two thirds of the CFOs surveyed by PWC "*estimated spending between $1 million and $1.9 million annually on the costs of being public*".[68]

116. Hence, the relevant question is whether, for small firms, the costs of being privately held outweigh the benefits. Our analysis suggests that, even if we only consider the annual avoided

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[66] The Expert Report, p. 8.

[67] PWC, "Considering an IPO to fuel your company's future? Insight into the costs of going public and being public", November 2017, p.13.

[68] PWC, "Considering an IPO to fuel your company's future? Insight into the costs of going public and being public", November 2017, p.14.

costs of being private from the PwC study, a heating company would need to be worth *at least* €253 million to find it more advantageous to be public.[69]

117. To make this estimate, we compare the costs to public ownership to the costs of reduced liquidity from being private. Several academic studies describe how to calculate liquidity discounts.[70] We are aware of one technique that allows calculating asset specific liquidity discounts: an option-related technique proposed by Professor Longstaff of the UCLA Anderson School of Management.[71] Professor Longstaff recognises his methodology produces an "*upper bound*" estimate for the liquidity discount.[72] Another option-based model developed by Professor Finnerty from Fordham University[73] is similar to Professor Longstaff's, but the underlying assumptions produce a lower bound estimate for the applicable liquidity discount.[74]

118. The application of both option models requires an estimate of the expected volatility of a Dutch heating company.[75] In Section III, we calculated the asset beta of Dutch heating companies based on a sample of publicly traded companies. We use the same sample to derive an estimate of the stock volatility of a typical heating company, around 21%. Professors Longstaff's and Finnerty's models also require an assumption on the typical time to sell an asset. We assume a sale period of 6-months for a regulated heating company. Table 10 indicates that a privately held heating company would trade at a 3.5% to 6.0% discount to a publicly traded company based on Finnerty's and Longstaff's option-based models.

TABLE 10: ILLIQUIDITY DISCOUNT APPLICABLE TO DUTCH HEATING COMPANIES

Marketing Period, years	[1]	Assumed	0.50

69 Table 11.

70 Mukesh Bajaj, David J. Denis, Stephen P. Ferris and Atulya Sarin, "Firm Value and Marketability Discounts", Working Paper Series at Social Science Research Network, dated 26 February 2001; Michael Hertzel and Richard Smith, "Market Discounts and Shareholder Gains from Placing Equity Privately", The Journal of Finance, Vol. 48(2), pp. 459-85, dated June 1993; Francis A. Longstaff, "How Much Can Marketability Affect Security Value?", The Journal of Finance, dated December 1995 and, Francis A. Longstaff, "Valuing Thinly Traded Assets", Management Sciences, dated 24 May 2017.

71 Francis A. Longstaff, "How Much Can Marketability Affect Security Value?", The Journal of Finance, dated December 1995; Francis A. Longstaff, "Valuing Thinly Traded Assets", Management Sciences, dated 24 May 2017.

72 Francis A. Longstaff, "Valuing Thinly Traded Assets", Management Sciences, dated 24 May 2017, p. 1.

73 Finnerty, J. D., "An Average-Strike Put Option Model of the Marketability Discount", The Journal of Derivatives, Vol. 19(4), 2012.

74 Finnerty, J. D., "An Average-Strike Put Option Model of the Marketability Discount", The Journal of Derivatives, Vol. 19(4), 2012. Professor Finnerty implicitly assumes that a seller would be equally likely to sell on any day during the marketing period, and could do so if the asset had liquidity, but must wait to the end of the period if the asset is illiquid.

75 Generally, the appropriate liquidity discount depends on numerous factors, including the liquidity of the relevant assets, the volatility of their market value, and the precise nature of the financial interests in question. Hence, any liquidity premium for Dutch heating companies should be derived from similar assets.

Volatility, %			
Comparables average	[2]	See note	21.3%
Liquidity Discount, %			
Finnerty	[3]	See note	3.5%
Longstaff	[4]	See note	6.0%
Average	[5]	Average([3]:[4])	4.7%

See note:
[2]: Three-year average volatility of stock returns for the power generation companies, networks and utilities in the peer group as of the measurement date.
[3]: Values calculated using the equation from John D. Finnerty, "An Average-Strike Put Option Model of the Marketability Discount", The Journal of Derivatives, Vol. 19 - 4, 2012.
[4]: Values calculated using equation 3 from Francis A. Longstaff, "Valuing Thinly Traded Assets", Management Science, May 2017.

119. Assuming being public has an additional cost of €1.5 million, consistent with the PwC study, a private company would need to earn around €32 million[76] in free cash flows per year for the impact of illiquidity to offset the cost savings from not being public. Table 11 shows that with a regulated WACC of 6.0%, a company earning €32 million in free cash flows would be worth between €253 million and €490 million depending on the useful life of the asset.[77] A company with a value in this range would generally meet the EU's definition of a large company: *"over €50M annual turnover or over €43M in assets on the balance sheet."*[78]

TABLE 11: VALUE OF ASSET TO PUBLIC AND PRIVATE COMPANY

Liquidity haircut	%	[1]	Table 10	4.7%			
Additional cost	€ mln	[2]	Assumed	1.5			
Breakeven cash flows	€ mln	[3]	[2]/[1]	32			
WACC	%	[4]	Assumed	6.0%			
Growth rate	%	[5]	Assumed	2.0%			
				Useful life, years			
				10	15	20	25
Annuity factor	#	[6]	See note	8	11	13	15
Asset value	€ mln	[7]	[3]x[6]	253	348	426	490

76 €1.5 million / 4.7%.

77 We use a standard annuity formula with a fixed term and growth equal to the inflation target of the European Central Bank.

78 Companies with more than 250 employees, over €50M annual turnover or over €43M in assets on the balance sheet are considered large. See What is an SME / MKB in the Netherlands? | Business.gov.nl.

Notes and sources:
[6]: (1-((1+[5])^T) x ((1+[4])^(-T)))/([4]-[5]), where T is the useful life.

a. It is not clear why customers should pay for any costs of being private, like lower liquidity, by paying a premium on the WACC, while the owners enjoy the benefit of being private. When the companies are worth less than €253 million, the benefits of being private outweigh the costs, so any additional premium on the WACC would lead to overcompensation. When the value of the company increases above the breakeven point, private companies could still receive fair compensation by selling their assets to public companies or entering initial public offerings ("IPOs").

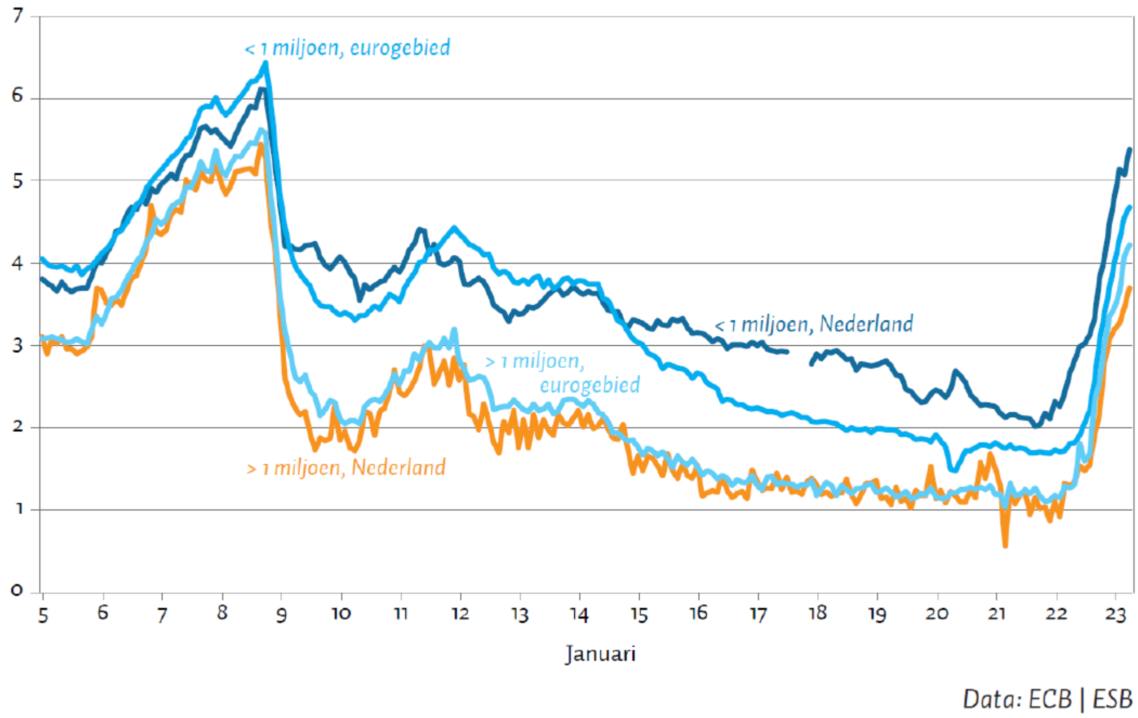
C. SMEs Interest Premium

120. The last part of the question relates to whether small firms have a systematically higher cost of debt than large firms. We understand that market data shows that since mid-2015:

a. The SMEs in the Netherlands pay higher interest rates than larger firms; and,

b. The SMEs Interest Premium is larger than the one observed in the rest of Europe, see Figure 6.

FIGURE 6: INTEREST RATE OF BANK LOANS TO SMES IN THE NETHERLANDS FROM 2005 TO 2023, BY CONTRACT SIZE[79]



121. According to the Expert Report, "*it is (almost) impossible that equity is not subject to at least the same mark-up [as the cost of debt]*".[80] Presumably, the reasoning is that equity is riskier than debt, and so the premium on equity must be at least as higher as the premium on debt. However, the factors that drive any premium on the debt of SMEs are likely to be unrelated to the cost of equity of a Dutch heating company.

122. For example, if banks in the Netherlands have a degree of market power and charge above market interest rates, small companies may be subject to higher borrowing costs because they do not have access to alternative sources of funding. In contrast, large companies might be able to substitute financing from Dutch banks with financing from banks in other EU

[79] Gus Brouwer, "Midden- en kleinbedrijf betaalt een hogere rente en dit duidt op marktfalen".

[80] The Expert Report, p.10.

countries or private bond placements.[81] In these circumstances, we would observe an SMEs Interest Premium, which does not justify a higher cost of equity. A regulator should not reward a group of investors with a WACC premium to match the monopoly rents earned by another group of investors.

123. Several other factors could contribute to the SMEs Interest Premium, without justifying a higher cost of equity. The European Commission ("EC") recognised the existence of a SMEs Interest Premium in the Netherlands.[82] Based on academic evidence and analysis from the Dutch Bureau for Economic Policy Analysis, the EC attributed the SMEs Interest Premium to:

   a. High market concentration in the Dutch banking sector;

   b. The relatively lower risks for banks in the Dutch mortgage market than for loans to SMEs; and

   c. Information asymmetries regarding SMEs' financial health.[83]

124. The academic paper cited by the EC is particularly relevant as it examined 37,000 loans across almost 18,000 companies in the Netherlands.[84] The paper found that risk characteristics – so probability of default or expected losses – are a determining factor for interest rates, but "*they explain only a small part of the interest rate differential (about 0.05 percentage points) between the median micro and large companies, partly because the median risk characteristics do not differ greatly by company size.*"[85] Instead, the paper finds that the difference in the loan size explains most of the SMEs Interest Premium. The paper then provides two potential explanations for its findings: "*firstly, more market power of banks compared to SMEs and secondly, higher screening costs due to more prevalent information asymmetries among SMEs than among large companies.*"[86]

125. The explanations above do not justify a higher cost of equity for a small Dutch heating company. First, the evidence is not specific to small Dutch heating companies, which may borrow at the same terms as larger heating companies. A definitive assessment would require sector-specific empirical data on Dutch heating companies. Moreover, while the academic evidence acknowledges that the average Dutch SME is "*riskier than the large company*", it

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81 Often these forms of financing will have relatively high fixed costs, that make them too expensive for smaller companies.

82 European Commission, "In-Depth Review 2024: The Netherlands", March 2024, p. 13.

83 European Commission, "In-Depth Review 2024: The Netherlands", March 2024, p.15 and Bureau for Economic Policy Analysis, "Dutch SME bank financing, from a European perspective", July 2019.

84 Gus Brouwer, "Midden- en kleinbedrijf betaalt een hogere rente en dit duidt op marktfalen", p. 4.

85 Gus Brouwer, "Midden- en kleinbedrijf betaalt een hogere rente en dit duidt op marktfalen", p. 7.

86 Gus Brouwer, "Midden- en kleinbedrijf betaalt een hogere rente en dit duidt op marktfalen", p. 8.

highlights the risk characteristics explain a negligible portion of the interest differential.[87] This finding suggests that Dutch investors, the banks, can successfully diversify the idiosyncratic risks of small companies. This finding is consistent with the standard CAPM methodology.[88] The remaining reasons for a higher cost of debt for smaller companies are specific to debt, and do not apply to equity investors.

D. Conclusions on the Relationship Between Firm Size and Cost of Equity

126. Overall, we recommend the ACM should maintain the standard CAPM approach and continue assessing the cost of equity of an investor in the heating sector based on their exposure to systematic risks.

127. The Expert Report suggests adding a size or idiosyncratic risk premium to the cost of equity by drawing an overly narrow focus on the small companies itself and ignoring the underlying investors. While a specific small company may be exposed to a higher degree of idiosyncratic risks than a relatively large company, investors in the small company can diversify away the idiosyncratic risks by investing in several small companies. As a result, an investor in a small company may have the same exposure to idiosyncratic risks as larger companies, and therefore, should not receive any premium to the standard reasonable return.

128. Moreover, our analysis shows that adding a small company premium for idiosyncratic risk or illiquidity could lead to overcompensation as diversified and undiversified would receive a compensation that is higher than the present value of their investments. As a more general policy point, it is not clear why consumers should pay higher tariffs to compensate networks for inefficient choices, including the lack of diversification and ownership that are allegedly sub-optimal (i.e. less liquid). In line with best practice, ACM's existing approach incentivises diversification and encourages competition between firms with different ownership structures to determine the most efficient outcome for customers. The SMEs Interest Premium referenced in the Expert Report is not specific to the heating sector and reflects a wider macroeconomic phenomenon that according to the existing literature would not justify a higher cost of equity for investors in the heating segment.

[87] Gus Brouwer, "Midden- en kleinbedrijf betaalt een hogere rente en dit duidt op marktfalen", p. 4.

[88] See Section V.A above.

Appendix A

TABLE 12: RESULTS OF LIQUIDITY AND M&A TESTS

		Liquidity tests					
	Country	Actively trading	Bid-ask spread	Investment grade	M&A	Regulated revenue test	Final peers
Power generation							
A2A SpA	Italy	✓	✓	✓	✓	n.a.	✓
Albioma SA	France	✗	✓	✓	✓	n.a.	✗
Clearvise AG	Germany	✓	✗	✓	✓	n.a.	✗
Arise AB	Sweden	✓	✓	✓	✓	n.a.	✓
Alerion Cleanpower SpA	Italy	✓	✓	✓	✓	n.a.	✓
Athena Investments A/S	Denmark	✗	✗	✓	✓	n.a.	✗
Aventron AG	Switzerland	✓	✗	✓	✓	n.a.	✗
ADEV Wasserkraftwerk AG	Switzerland	✓	✗	✓	✓	n.a.	✗
Drax Group PLC	Britain	✓	✓	✓	✓	n.a.	✓
EAM Solar ASA	Norway	✓	✗	✓	✓	n.a.	✗
EnBW Energie Baden-Wuerttember	Germany	✓	✗	✓	✓	n.a.	✗
Encavis AG	Germany	✓	✗	✓	✓	n.a.	✗
Electricite de France SA	France	✗	✓	✓	✓	n.a.	✗
Edison SpA	Italy	✓	✓	✓	✓	n.a.	✓
Edp Renovaveis Sa	Spain	✓	✓	✓	✓	n.a.	✓
Energiekontor AG	Germany	✓	✓	✓	✓	n.a.	✓
Endesa Sa	Spain	✓	✓	✓	✓	n.a.	✓
Electricite de Strasbourg SA	France	✓	✗	✓	✓	n.a.	✗
Engie SA	France	✓	✓	✓	✓	n.a.	✓
ERG SpA	Italy	✓	✓	✓	✓	n.a.	✓
Edisun Power Europe AG	Switzerland	✓	✗	✓	✓	n.a.	✗
Etrion Corp	Switzerland	✓	✗	✓	✓	n.a.	✗
Frendy Energy SpA	Italy	✓	✗	✓	✓	n.a.	✗
Falck Renewables Spa	Italy	✗	✓	✓	✓	n.a.	✗
Futuren SA	France	✗	✗	✓	✓	n.a.	✗
ContourGlobal PLC	Britain	✗	✓	✗	✓	n.a.	✗
Good Energy Group PLC	Britain	✓	✗	✓	✓	n.a.	✗
Romande Energie Holding SA	Switzerland	✓	✗	✓	✓	n.a.	✗
7C Solarparken AG	Germany	✓	✓	✓	✓	n.a.	✓
Iberdrola Sa	Spain	✓	✓	✓	✓	n.a.	✓

MVV Energie AG	Germany	✓	✗	✓	✓	n.a.	✗
OMV AG	Austria	✓	✓	✓	✓	n.a.	✓
Orsted AS	Denmark	✓	✓	✓	✓	n.a.	✓
Rurelec PLC	Britain	✗	✗	✓	✓	n.a.	✗
RWE AG	Germany	✓	✓	✓	✓	n.a.	✓
Scatec ASA	Norway	✓	✓	✓	✓	n.a.	✓
Solaria Energia y Medio Ambien	Spain	✓	✓	✓	✓	n.a.	✓
SSE PLC	United Kingdom	✓	✓	✓	✓	n.a.	✓
Uniper SE	Germany	✓	✓	✓	✓	n.a.	✓
Verbund AG	Austria	✓	✓	✓	✓	n.a.	✓
Velcan Holdings SA	France	✓	✗	✓	✓	n.a.	✗
Voltalia SA	France	✓	✓	✓	✓	n.a.	✓
Utilities							
Skanska Energi AB	Sweden	✗	✗	✓	✓	n.a.	✗
Societe Electrique de l'Our SA	Luxembourg	✓	✗	✓	✓	n.a.	✗
ItN Nanovation AG	Germany	✗	✗	✓	✓	n.a.	✗
Alpiq Holding AG	Switzerland	✗	✗	✓	✓	n.a.	✗
Acsm - Agam SpA	Italy	✓	✗	✓	✓	n.a.	✗
Holding Co ADMIE IPTO SA	Greece	✓	✓	✓	✓	n.a.	✓
Audax Renovables SA	Spain	✓	✓	✓	✓	n.a.	✓
Agatos SpA	Italy	✗	✗	✓	✓	n.a.	✗
Aggregated Micro Power Holding	Britain	✗	✗	✓	✓	n.a.	✗
Eltech Anemos SA	Greece	✗	✗	✓	✓	n.a.	✗
Ascopiave SpA	Italy	✓	✓	✓	✓	n.a.	✓
Atlantica Sustainable Infrastructure Ltd	Britain	✗	✓	✗	✓	n.a.	✗
Bettwork Industries Inc	Switzerland	✗	✗	✓	✓	n.a.	✗
Burgenland Holding AG	Austria	✓	✗	✓	✓	n.a.	✗
BKW AG	Switzerland	✓	✓	✓	✓	n.a.	✓
Clean Invest Africa PLC	Britain	✓	✗	✓	✓	n.a.	✗
Centrica PLC	Britain	✓	✓	✓	✓	n.a.	✓
Carpevigo Holding AG	Germany	✓	✗	✓	✓	n.a.	✗
DGB GROUP NV	Netherlands	✓	✗	✓	✓	n.a.	✗
Naturenergie Holding AG	Switzerland	✓	✓	✓	✓	n.a.	✓
Elektrische Licht & Kraftanlag	Germany	✗	✗	✓	✓	n.a.	✗
Elmera Group ASA	Norway	✓	✓	✓	✓	n.a.	✓
Enel SpA	Italy	✓	✓	✓	✓	n.a.	✓
EnergyO Solutions Invest AB	Sweden	✗	✗	✓	✓	n.a.	✗
Selected Energy SA	Greece	✓	✗	✓	✓	n.a.	✗
Envitec Biogas AG	Germany	✓	✗	✓	✓	n.a.	✗
EVN AG	Austria	✓	✓	✓	✓	n.a.	✓

Fandango Holdings PLC	Britain	✗	✗	✓	✓	n.a.	✗
Fernheizwerk Neukoelln AG	Germany	✓	✗	✓	✓	n.a.	✗
Fintel Energia Group SpA	Italy	✗	✗	✓	✓	n.a.	✗
Greencoat Renewables PLC	Ireland	✓	✓	✓	✓	n.a.	✓
Hera Spa	Italy	✓	✓	✓	✓	n.a.	✓
Italgas SpA	Italy	✓	✓	✓	✓	n.a.	✓
Innogy SE/DE	Germany	✗	✗	✓	✓	n.a.	✗
Iren SpA	Italy	✓	✓	✓	✓	n.a.	✓
Jersey Electricity PLC	Britain	✓	✗	✓	✓	n.a.	✗
Lechwerke AG	Germany	✓	✗	✓	✓	n.a.	✗
Minesto AB	Sweden	✓	✓	✓	✓	n.a.	✓
Galatia Energie	France	✗	✓	✓	✓	n.a.	✗
Finaxo Environnement	France	✓	✗	✓	✓	n.a.	✗
Hydro-Exploitations SA	France	✓	✗	✓	✓	n.a.	✗
Mainova AG	Germany	✓	✗	✓	✓	n.a.	✗
New Sources Energy NV	Netherlands	✓	✗	✓	✓	n.a.	✗
Photon Energy NV	Netherlands	✓	✗	✓	✓	n.a.	✗
R Energy One	Cyprus	✗	✗	✓	✓	n.a.	✗
Solarpack Corp Tecnologica SA	Spain	✗	✗	✓	✓	n.a.	✗
Enercity AG	Germany	✗	✗	✓	✓	n.a.	✗
Trention AB	Sweden	✗	✗	✓	✓	n.a.	✗
Gelsenwasser AG	Germany	✓	✗	✓	✓	n.a.	✗
Acea SpA	Italy	✓	✓	✓	✓	n.a.	✓
Public Power Corporation SA	Greece	✓	✓	✗	✓	n.a.	✗
Thessaloniki Water and Sewerage Company SA	Greece	✓	✓	✓	✓	n.a.	✓
Athens Water Supply & Sewage	Greece	✓	✓	✓	✓	n.a.	✓
Eaux de Royan SA	France	✓	✗	✓	✓	n.a.	✗
Pennon Group PLC	United Kingdom	✓	✓	✓	✓	n.a.	✓
Severn Trent PLC	United Kingdom	✓	✓	✓	✓	n.a.	✓
United Utilities Group	United Kingdom	✓	✓	✓	✓	n.a.	✓
Networks							
Elia Group SA/NV	Belgium	✓	✓	✓	✓	✓	✓
Enagas	Spain	✓	✓	✓	✓	✓	✓
Fluxys Belgium	Belgium	✓	✗	✓	✓	n.a.	✗
National Grid PLC	United Kingdom	✓	✓	✓	✓	✗	✗
Redeia Corp SA	Spain	✓	✓	✓	✓	✓	✓
REN - Redes Energeticas Nacionais	Portugal	✓	✓	✓	✓	✓	✓

Snam SpA	Italy	✓	✓	✓	✓	✓	✓
Transgaz SA Medias	Romania	✓	✓	✓	✓	✓	✓
Terna-Rete Elettrica Nazionale	Italy	✓	✓	✓	✓	✓	✓
Telecom - Alternative operators							
iliad SA	France	✗	✗	✗	✓	n.a.	✗
Liberty Global PLC	Britain	✓	✓	✗	✓	n.a.	✗
Masmovil Ibercom SA	Spain	✗	✗	✓	✓	n.a.	✗
NOS SGPS SA	Portugal	✓	✓	✓	✓	n.a.	✓
Telefonica Deutschland Holding	Germany	✓	✓	✓	✓	n.a.	✓
Orange Belgium SA	Belgium	✓	✓	✓	✓	n.a.	✓
Sunrise Communications Group A	Switzerland	✗	✗	✓	✓	n.a.	✗
TalkTalk Telecom Group Ltd	Britain	✗	✗	✗	✓	n.a.	✗
Tele2 AB	Sweden	✓	✓	✓	✓	n.a.	✓
Telenet Group Holding NV	Belgium	✗	✓	✗	✓	n.a.	✗
United Internet AG	Germany	✓	✓	✓	✓	n.a.	✓
Vodafone Group PLC	Britain	✓	✓	✓	✓	n.a.	✓
Telecom - Incumbent							
BT Group PLC	Britain	✓	✓	✓	✓	n.a.	✓
Deutsche Telekom AG	Germany	✓	✓	✓	✓	n.a.	✓
Elisa Oyj	Finland	✓	✓	✓	✓	n.a.	✓
Hellenic Telecommunications Organisation SA	Greece	✓	✓	✓	✓	n.a.	✓
Koninklijke KPN NV	Netherlands	✓	✓	✓	✓	n.a.	✓
Orange Polska SA	Poland	✓	✓	✓	✓	n.a.	✓
Orange SA	France	✓	✓	✓	✓	n.a.	✓
Proximus SADP	Belgium	✓	✓	✓	✓	n.a.	✓
Swisscom AG	Switzerland	✓	✓	✓	✓	n.a.	✓
Telefonica SA	Spain	✓	✓	✓	✓	n.a.	✓
Telenor ASA	Norway	✓	✓	✓	✓	n.a.	✓
Telia Co AB	Sweden	✓	✓	✓	✓	n.a.	✓
Telecom Italia	Italy	✓	✓	✗	✓	n.a.	✗
Telekom Austria AG	Austria	✓	✓	✓	✓	n.a.	✓