Assessing the risks of GB energy networks

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compelling economics

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Executive summary

1.   On behalf of Scottish and Southern Electricity Networks (SSE), Oxera has carried out an assessment of the risk exposure of the GB energy network companies, relative to regulated European energy networks and the water networks in England and Wales (E&W). We focus on systematic (i.e. undiversifiable) risks, which need to be measured to set the regulatory price control allowance for the cost of equity.

2.   The systematic risk of a stock is typically measured by its market beta, which reflects the covariance of a security against the market as a whole. Since most of the GB energy networks are not publicly traded companies, their market betas are not directly observable. To approximate their beta, a representative sample of companies with similar systematic risks needs to be selected. Oxera has assessed which comparator sample of companies would be appropriate for analysing the GB energy networks' beta in the context of the regulated price control allowance for the cost of equity.

3.   To identify an appropriate comparator set for this assessment, three steps are undertaken.

•   Step 1: companies are filtered by sector, geography and liquidity factors;

•   Step 2: the appropriateness of the initial sample is assessed by comparing the systematic risks of the regulatory regimes under which the companies in this initial sample operate;

•   Step 3: the assessment is then cross-checked using the cost of traded debt (data on the traded yield spreads) of the companies in the sample as a measure of relative risk.

More detail on each of these steps is provided below.

Step 1—initial sampling

4.   The sample of ten European water and energy networks identified following the sector, geography and liquidity filtering is as follows.[1]

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[1] The sample also conservatively excludes ADMIE, a Greek electricity transmission system operator (TSO), and Athens Water Supply and Sewerage Company as a result of an additional cross-check. We exclude ADMIE because its returns data is available from June 2017 only, and therefore it is not possible to estimate five-year market betas. We exclude Athens Water Supply and Sewerage Company because its market beta was more volatile than the market betas of other companies, and because it was the highest in the sample after ADMIE's. Excluding these companies from the sample is a conservative approach because their estimated betas are higher than the other companies in the sample. Further investigation would be required to understand whether it is appropriate, in principle, to keep both companies in the sample.

Comparator sample after sector, geography and liquidity filtering, as well as an additional cross-check

Elia Group (energy, Belgium and Germany)	REN (energy, Portugal)
Enagás (energy, Spain)	Severn Trent (water, the UK)
Italgas (energy, Italy)	Snam (energy, Italy)
National Grid (energy, the UK)	Terna (energy, Italy)
Red Eléctrica (energy, Spain)	United Utilities (water, the UK)

Note: Elia and REN are the least liquid of the companies, which implies that their market beta is likely to be underestimated and may require upwards adjustment to reflect their risks appropriately. However, they have been left in the sample at this stage, to be conservative.

Source: Oxera analysis.

Step 2—appropriateness of the initial sample: regulatory regimes review

5. In the case of regulated networks, the regulatory regime is a key driver of systematic risk exposure. While regulation may to some extent mitigate underlying business risks (e.g. by making profits less sensitive to short-term upside and downside deviations in demand), the degree to which these risks are mitigated may vary across different regimes. Furthermore, the risk of changes in regulatory approach is a factor to which regulated utility companies are exposed in varying degrees. Given that Ofgem was particularly concerned about the differences in regulatory regimes of various networks proposed for the comparator sample and that this area is relatively under-researched,[2] our assessment focuses on comparing the systematic risk associated with companies' regulatory frameworks with RIIO-2.

6. The results of our assessment are summarised below.

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[2] For detail, see para. 1.4 of the main body of the report.

Summary of the regulatory regimes risk assessment

Company	Regime[1]	Risk compared to RIIO-2	Comment
National Grid	GB energy	n/a	n/a
REN	Portugal (focused on ET)	Lower	Regulator's consistency over time in applied methodologies and parameters; lower-powered cost-efficiency incentives
Italgas	Italy, GD	Similar (towards lower risk)	Framework similar to GB energy with lower-powered CAPEX incentives
Snam	Italy, GT	Similar (towards lower risk)	
Terna	Italy, ET	Similar (towards lower risk)	
Enagás	Spain, GT	Similar (towards higher risk)	Framework similar to GB energy, with slightly higher risk for GT due to CAPEX incentives being associated with greater regulatory discretion
Red Eléctrica	Spain, ET	Similar	
Elia	Belgium, ET and Germany, ET	Lower	High degree of regulatory consistency over time in applied methodologies and lower risk on financing costs in both regulatory regimes
United Utilities	E&W water	Lower	Lower regulatory discretion due to the redetermination process, albeit with similarities to GB energy in how the individual elements of the regime operate
Severn Trent	E&W water	Lower	

Note: [1] Covering the majority of business activities.
ET—electricity transmission; GD—gas distribution; GT—gas transmission; E&W—England and Wales.
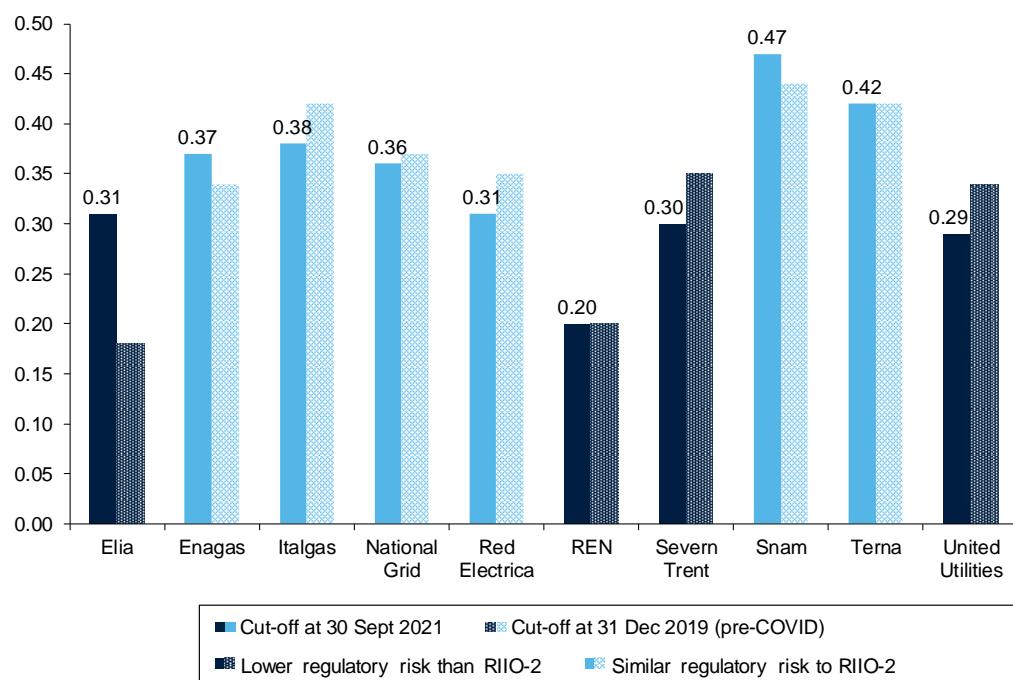
Source: Oxera analysis.

7.   As outlined in the table, we found that the regulatory regimes under which Elia and REN operate are associated with lower risk than RIIO-2. We also find that the regulatory framework for E&W water is lower risk than RIIO-2 due to the appeal regime, which provides a greater degree of protection to investors in water. We give more weight to factors that characterise the regulatory process overall (e.g. the appeals regime) rather than factors that characterise individual elements of the framework (e.g. incentive rates).

8.   The Italian and Spanish regulatory regimes have broadly similar risks to RIIO-2, although:

- Italian networks' regulatory framework is slightly lower risk due to lower-powered CAPEX incentives;

- Spanish GT networks regulatory framework is slightly higher risk due to CAPEX incentives being associated with greater regulatory discretion.

9.   The figure below adds the current estimated asset betas to the summary and shows that REN and Elia have lower asset betas than many other companies in the comparator set. That is even more pronounced when the betas are considered at the date before the impact of the COVID-19 pandemic. The

lower market asset betas of REN and Elia are consistent with our assessment of the regulatory frameworks and the liquidity of their stock.

10. The figure Figure 3.3also shows that the market asset betas of Severn Trent and United Utilities are towards the lower end of the betas range for the rest of the comparators. This is again consistent with our assessment of the regulatory frameworks.

Five-year market asset betas against comparative assessment of systematic risks associated with regulatory regimes

Note: UK company equity betas are estimated relative to the FTSE All-Share index, using daily data. European energy company equity betas are estimated relative to the EuroStoxx TMI index, using daily data. A debt beta of 0.05 is assumed.

Source: Oxera analysis.

11. The regulatory frameworks assessed cover the most significant parts of the companies being considered: for Elia and REN, over 70% and 60% respectively; for Severn Trent and United Utilities, over 65% and 95% respectively.[3] That leaves the risks of smaller parts of these companies (which are mostly represented by activities regulated under other regulatory regimes) unassessed. Although an assessment of these would complement our analysis, we still consider the findings of our analysis presented in this report conclusive. In particular, if the majority of the business is exposed to a regulatory framework with a considerably different risk profile from that of the

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[3] Based on the proportions of revenues of business segments regulated under the assessed regulatory frameworks. See the details and data for other comparators in Figure 3.2 in the main body of the report.

GB energy networks, it is sufficient to conclude that the risk profile of the overall business is unlikely to be comparable either.

12. As a result of Step 2 of the assessment, we consider it appropriate to exclude Elia, REN, Severn Trent and United Utilities from the comparator sample, as being exposed to a different degree of regulatory risk from the networks operating under RIIO-2.

Step 3—cross-check using the traded debt yield spreads

13. As a final step, the results were cross-checked against data on traded debt yield spreads for the utility networks in the initial comparator sample. Wider yield spreads, when controlling for differences in gearing and maturity, indicate a higher asset risk premium and therefore higher asset risk. As such, traded debt yield spreads can be used as a cross-check on the information contained in market asset betas and on the qualitative assessment of risks.

14. Two key findings from the cross-check are as follows.

- We observe that the yield spreads for REN and Elia, when controlling for gearing and maturity, are narrower than those of the rest of the European networks, suggesting a lower asset risk, as explained above. The same pattern can be observed in the market asset betas of these companies and our qualitative assessment—their asset betas and the risks of their regulatory frameworks are lower than those of other European comparator networks.

- National Grid Electricity Transmission (NGET), despite having lower gearing, has yield spreads that are similar to, or wider than, those of Severn Trent and United Utilities (i.e. E&W water networks). This implies that NGET has higher credit risk (when controlling for differences in gearing and maturity) and is likely to have higher asset risk than the water networks. This observation is consistent with our assessment of the regulatory regime for E&W water networks being associated with lower risk than RIIO-2 primarily as a result of the protection afforded to investors by the option to seek a redetermination from the Competition and Markets Authority.

15. Other comparisons among traded debt yield spreads are inconclusive.

16. Overall, our cross-check supports the exclusion of REN, Elia, and E&W water networks from the sample of comparator companies.

Conclusion

17. As a result, we identified six networks that could be considered as having systematic risks comparable to those of the GB energy networks, based on the factors assessed in this report: Enagás, Italgas, National Grid, Red Eléctrica, Snam, and Terna. We find the regulatory frameworks of these networks to be sufficiently comparable to RIIO-2 and see no reason to exclude them from the sample of comparators based on this factor.

- According to our assessment, the regulatory frameworks of the other two energy networks that we considered, REN and Elia, are associated with lower systematic risk than RIIO-2. This is supported by our analysis of the yield spreads on the networks' bonds. Moreover, the stock of these companies is relatively illiquid, which might result in their market beta estimates underestimating their systematic risks. Therefore, we consider it appropriate to exclude REN and Elia from the sample.

- We also find that one of the key elements of the regulatory framework for E&W water networks—i.e. the redetermination process—implies a lower systematic risk than RIIO-2. In addition, the evidence from yield spreads suggests that E&W water networks have lower asset risk than NGET. Therefore, we conclude that E&W water companies should also be excluded from the sample.

18. Although we found the systematic risks of the companies in our final comparator set sufficiently comparable, the range of their market asset betas is still relatively wide. Assessing the factors that may be driving that variance could be complementary to our analysis. That could include an assessment of business risk factors such as long-term demand risks and growth opportunities, and an assessment of the regulatory frameworks of the remaining regulated parts of the businesses (e.g. NG's USA network and Snam's gas storage).

1   Introduction

1.1   On behalf of Scottish & Southern Electricity Networks (SSE), Oxera has carried out an assessment of the risk exposure of the GB energy network companies relative to regulated European energy networks and the water networks in England and Wales (E&W). We focus on systematic (i.e. undiversifiable) risks, which need to be measured to set the regulatory price control allowance for the cost of equity.

1.2   The systematic risk of a stock is typically measured by its market beta, which reflects the covariance of a security with the market as a whole. In the context of the regulatory cost of equity allowance set based on the capital asset pricing model (CAPM), the systematic risk is reflected in the allowed beta.

1.3   A straightforward option would be to set the allowed beta for GB energy networks based on their market betas. However, the stock of only two GB energy networks is traded: National Grid (NG) and SSE. Moreover, neither of these undertakes activities related only to energy networks in Great Britain under Ofgem's regime (i.e. neither is a 'pure-play' network). National Grid has a significant part of its activities in the USA; and SSE has a significant part of its activities in non-regulated businesses. As a result, relying solely on the market betas of these two businesses would not yield a suitable allowed beta for the GB energy networks.

1.4   Ofgem, in its RIIO-2 final determinations for transmission (T) and gas distribution (GD) networks, refers to NG and the E&W water companies in setting the allowed beta.[4] The networks challenged this comparator sample at the Competition and Markets Authority (CMA) in relation to three sets of potential comparators: European energy networks, SSE and the E&W water companies. Ofgem's response was that it:[5]

- did not include European networks because it was concerned about 'the differences in regulatory, political and macro-economic risk';

- did not include SSE because it 'considered that SSE's higher observed betas are likely to be attributable to the relatively higher proportion of non-energy network business';

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[4] Ofgem (2021), 'Decision - RIIO-2 Final Determinations – Finance Annex (REVISED)', 3 February, paras 3.68–3.74.
[5] Gas and Energy Markets Authority (2021), 'RIIO-2 price control: response to appeals on finance issues and TNUOS', 23 April, para. 152.

- did not find sufficient reasons to place no weight on the E&W water networks.

1.5 In response to these considerations, in order to identify an appropriate comparator set, we follow three steps, as detailed in subsequent sections of this report.

- **Step 1—initial sampling (section 2)**: companies are filtered by sector, geography and liquidity, to limit the sample to those with the most comparable systematic risks to GB energy networks and to ensure that only reliable market beta estimates are used.

- **Step 2—assessing the appropriateness of the initial sample (section 3)**: we consider whether the systematic risk of any of the networks included in the initial sample is sufficiently different to that of the GB energy networks. Given that regulatory risk is a significant factor of systematic risk and is relatively under-researched, our assessment focuses on the regulatory risk.

- **Step 3—cross-checking the analysis (section 4)** with evidence from spreads on traded bond yields. Once the differences in leverage and maturity are controlled for, yield spreads are informative of asset risk premia and asset risks, and therefore could either support or contravene our assessment of comparative risks in Step 2.

The conclusions from this analysis are set out in section 5.
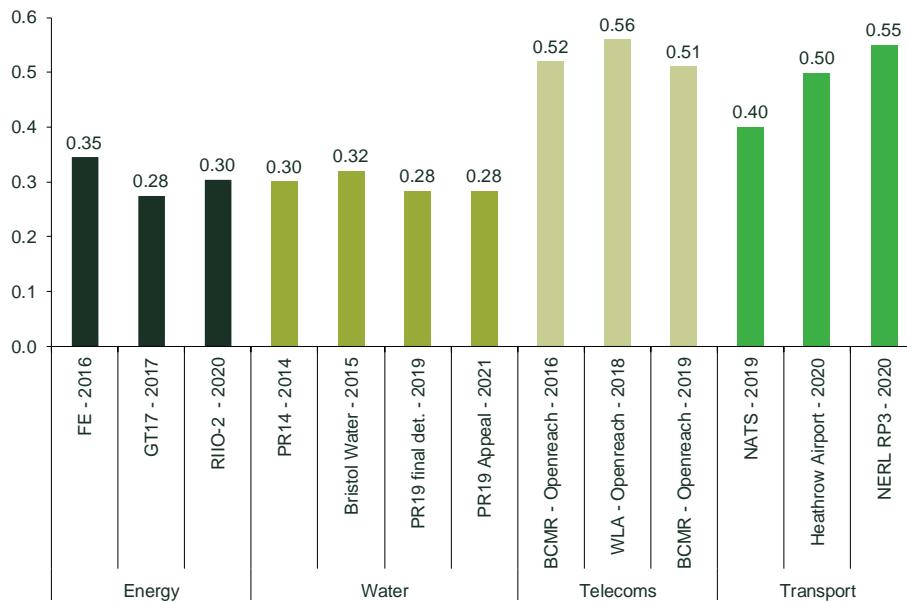
1.6 In this report, we do not look into the differences among the sectors of the GB energy networks, but rather consider the risks of comparator companies relative to GB energy networks regulated under the RIIO-2 framework as a uniform group.

2 Step 1—initial sampling

2.1 We start the assessment of the appropriate sample of comparators by narrowing down a universe of traded companies using sector, geography and liquidity as initial filtering criteria.

- A **sector** is a common indicator of similarity in systematic risks. In section 2A, we discuss which sectors we consider to be the most comparable to the GB energy networks in terms of systematic risk.

- In terms of **geography**, the assessment is limited to Western Europe, the USA, Australia and New Zealand, on the assumption that political risks in these regions are most comparable to those in the UK. It is uncommon for European regulators to consider comparators outside of those regions. In section 2B, we assess whether stock indices in Western Europe, the USA, Australia and New Zealand, against which we estimate betas, are sufficiently comparable to the FTSE All-Share index used for the GB energy networks, for beta estimates to be comparable across the regions.

- In section 2C, we assess whether the stocks of the selected companies are sufficiently **liquid** for their beta estimates to be considered reliable.

2.2 In section 2D, we conclude and show the sample of comparators resulting from the sector, geography and liquidity filtering.

2A Sector filtering

2.3 A natural starting point is to consider firms that are subject to price control regulation. Examples of industries regulated through price controls include energy networks, water networks, telecommunications networks, airports and air traffic control services. Within the set of companies regulated through price controls, significant differences in levels of systematic risk may remain. For instance, the industries mentioned above differ in their degree of exposure to business risks, such as demand risk, as well as regulatory risk.

2.4 Regulators commonly recognise these differences in levels of systematic risks, as evidenced below.

- Figure 2.1 demonstrates how regulators in the UK have set allowed betas in recent determinations. It shows that energy and water networks are typically regarded as having lower levels of risk than telecommunications and transport companies. Indeed, Ofgem, in its RIIO-2 final determination,

considered regulated listed energy and water companies to set the allowed beta and did not expand its set of comparators to telecommunications and transport companies.[6]

Figure 2.1   Adjusted allowed asset betas determined by UK regulators

Note: The adjusted allowed asset betas are calculated by multiplying the allowed equity betas with one minus notional gearing. Adjusted allowed asset betas account for differences in assumed debt betas.
Source: Oxera analysis based on regulatory documents.

- The Australian Energy Regulator (AER) has also noted that the risk characteristics of transport infrastructure firms, which include airports, are different to those of regulated energy networks.[7] Examples of the differences noted by the AER include demand risks and differences in regulatory frameworks. The AER thereby acknowledges that both business risks and regulatory risks should be taken into account. Based on this, it limits its sample to Australian energy infrastructure operators.[8]

- The Dutch regulator, ACM, and the New Zealand Commerce Commission limit their sample to regulated energy network companies.[9]

2.5   Given that the differences in systematic risks between energy and water networks, on the one hand, and other regulated networks, on the other hand,

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[6] Ofgem (2021), 'RIIO-2 Final Determination – Finance Annex (REVISED)', 3 February, p. 42.
[7] Australian Energy Regulator (2018), 'Rate of return instrument: Explanatory statement', December, p. 155.
[8] Unlike other regulators, the Australian regulator includes non-regulated energy infrastructure operators.
[9] ACM (2021), 'Bijlage 3: Uitwerking van de methode van het redelijke rendement (WACC)', 20 September, pp. 17–18; Commerce Commission (2016), 'Input methodologies review decisions: Topic paper 4: Cost of capital issues', 20 December, p. 62.

are widely recognised by regulators, our initial list of comparator firms is limited to regulated energy and water networks.

2.6 While we consider these two types of networks to have distinct systematic risks from other networks, we do not imply that the risks within this group of networks are the same. In terms of differences between energy and water networks, in practice regulators have tended to rely on water companies as comparators for energy companies, and vice versa, only out of necessity due to a lack of suitable comparators in the same industry. Illustrative examples of these are as follows.

- Australian water regulators use domestic energy companies as comparators to set allowed betas for water networks due to there being no listed water networks in Australia.[10]

- ACM relies on European energy network companies in its beta comparator sample for water networks, citing a lack of listed water companies as a rationale.[11] It relies only on energy network companies in its comparator sample for energy networks.[12]

- Ofgem uses domestic water companies as comparators for energy networks due to a lack of pure-play listed energy networks.[13]

2.7 We consider the differences in business risks and regulatory risks between water and energy networks to be an area of research that is not yet well developed. One of the purposes of this report is to provide further insight into these differences.

2B Geography filtering

2.1 As noted above, our assessment is limited to Western Europe, the USA, Australia and New Zealand, on the assumption that political risks in these regions are most comparable to those in the UK. Based on our review of

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[10] ESCOSA (2020), 'SA Water Regulatory Determination 2020: Final Determination: Statement of Reasons', June, p. 222; IPART (2020), 'Review of Prices for Sydney Water: Final Report', June, p. 258.
[11] ACM (2019), 'Bijlage I, behorende bij het advies aan de Minister van Infrastructuur en Milieu over de vaststelling van gewogen gemiddelde vermogenskostenvoet voor drinkwaterbedrijven voor 2020 en 2021', 1 November, p. 13.
[12] ACM (2021), 'Bijlage 3: Uitwerking van de methode van het redelijke rendement (WACC)', 20 September, p. 18
[13] Ofgem (2021), 'RIIO-2 Final Determinations – Finance Annex (REVISED)', 3 February, p. 42.

regulatory precedents considered for this report, we are not aware of any European regulators relying on comparators outside of these regions.[14]

2.2 In this section, we assess whether stock indices in Western Europe, the USA, Australia and New Zealand are sufficiently comparable to the UK FTSE All-Share index. The non-UK indices are used to estimate the betas of non-UK comparators. To ensure that the comparator market betas are appropriate estimates of the betas for the GB energy networks, we assess the similarity of stock indices across regions.

2.3 In particular, the market betas of comparator companies show how sensitive movements in the share price of a utility company are in response to movements in the wider market. However, if the non-UK stock market indices differ structurally from the UK stock market index (e.g. consisting of a different mixture of stocks), their volatility characteristics are likely to be different, and therefore comparators' beta estimates would not be representative of the market betas of the GB energy network companies.

2.4 As such, to consider whether the use of international market beta estimates is appropriate, we assess whether the stock market indices used to calculate comparators' betas are sufficiently similar to the UK stock market index, using the following indices:

- the FTSE All-Share index for the UK;
- the STOXX Europe TMI for Western Europe;
- the S&P 500 for the USA;
- the S&P/ASX 200 for Australia;
- the S&P/NZX 50 for New Zealand.

2.5 The assessment is based on two characteristics of the markets.

- **Sectoral composition**—we consider the sectors in which the constituents of each index operate. For example, share prices of utility companies may have a different sensitivity (and therefore a different beta estimate) to indices that comprise mainly financial companies when compared to indices that predominantly comprise technology companies.

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[14] For example, the Dutch regulator, ACM, refers to European and US companies, while the German regulator, BNetzA, uses Australia, UK, Western Europe and the USA. See ACM (2017), 'Bijlage 2: Uitwerking van de methode voor de WACC', 23 February, p. 17 and BNetzA (2016), 'BK4-16-160', 5 October, p. 26.

- **The average gearing of the composite companies**—we assess the average level of gearing of the constituents of each index. Share prices of utility companies may have different exposures (and therefore a different beta estimate) to indices that mainly comprise companies that are highly leveraged when compared to indices that comprise companies with lower levels of gearing.

2.6   As the purpose of the comparator sample is to attain an appropriate representation of the betas of the GB energy networks, we aim to identify geographies outside the UK where the main stock indices are sufficiently similar to the UK index.

2B.1   Sectoral composition

2.7   We assess the sectoral composition of the indices to check whether these differ structurally from the UK index in terms of the industry classification of their constituents. If this were the case, the betas of comparators estimated while using their respective market indices would not be sufficiently representative of the betas of the GB energy networks.

2.8   For all indices, we have broken down each sector into their component parts, and by their exposure to economic cycles.[15]

Detailed sector breakdown

2.9   The sector breakdown reveals structural differences between the FTSE All-Share index (UK), on the one hand, and the S&P 500 (the USA) and S&P/NZX 50 (New Zealand), on the other hand. These differences include the following.

- More than 50% of the S&P/NZX 50 market capitalisation is accounted for by financial companies. The equivalent percentage of the FTSE All-Share market capitalisation accounted for by financial companies is only 17%.

- Around 26% of the S&P 500 market capitalisation is accounted for by technology companies. In the FTSE All-Share, technology companies make up less than 5% of the market capitalisation.

2.10   Having 50% of the index being formed of financial companies or 26% of the index being formed of technology companies significantly affects the volatility

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[15] Each of the constituents of an index was assigned to a sector based on its classification in level 1 of the Bloomberg Industry Classification System (BICS).
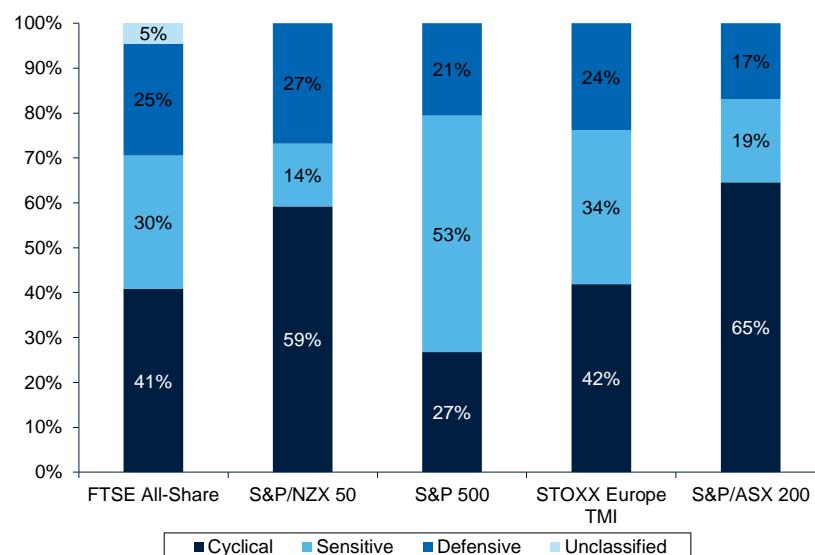
characteristics of the corresponding indices, which, by extension, affects the betas of the utility networks in those markets.

2.11 In contrast to the S&P 500 (the USA) and S&P/NZX 50 (New Zealand), we do not observe significant proportions of either the FTSE All-Share (UK) or the STOXX Europe TMI being represented by a specific sector that is not pronounced in the other index.

Breakdown by exposure to economic cycles

2.12 To assess the average exposure of the indices to economic cycles, three categories of sectors are used: cyclical, defensive and sensitive. Sensitive sectors are affected by the wider economy to a greater extent than defensive sectors, but to a lesser extent than cyclical sectors. Constituents of the indices are allocated to one of the categories based on their industry classification—see Figure 2.2.[16]

Figure 2.2   Breakdown of the market capitalisation of the indices based on exposure to the economic cycle

Note: The FTSE All-Share is the relevant index for the UK. The S&P/NZX 50, S&P 500, STOXX Europe TMI and S&P/ASX 200 are the indices for potential comparators from New Zealand, the USA, Western Europe and Australia respectively.

Cyclical sectors capture sectors that are significantly affected by the economic cycle, and include materials, 'consumer cyclical', financial services and real estate. Defensive sectors are relatively unsusceptible to economic shifts, and include healthcare, utilities and 'consumer defensive'. Sensitive sectors are affected by the wider economy, but to a lesser extent than cyclical sectors, and include communications services, energy, industrials and technology.

Source: Oxera analysis based on Bloomberg data.

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[16] This classification is created by mapping the BICS classifications to the Morningstar Global Equity Classification Structure. See Morningstar (2021), 'Morningstar Global Equity Classification Structure', 26 April.

2.13   Figure 2.2 shows that the evidence on the exposure of the constituents to economic cycles is consistent with the more granular sectoral analysis described above. In particular:

- a significantly greater proportion of the S&P/NZX 50 (New Zealand) and S&P/ASX 200 (Australia) market capitalisation is accounted for by 'cyclical' constituents, when compared to the FTSE All-Share index;

- more of the S&P 500 market capitalisation is accounted for by companies that are 'sensitive' to the economic cycle, when compared to the FTSE All-Share index.

2.14   The results also reveal a strong similarity between the FTSE All-Share and STOXX Europe TMI. This shows comparability between the European and UK stock market indices in terms of sectoral compositions.

Conclusion of the sectoral composition analysis of the indices

2.15   From the results presented above, we conclude that there are evident dissimilarities between the UK index, on the one hand, and the USA, New Zealand and Australian indices, on the other hand. The sectoral composition of the UK and European indices (the FTSE All-Share and STOXX Europe TMI) is relatively similar.

2B.2   Gearing
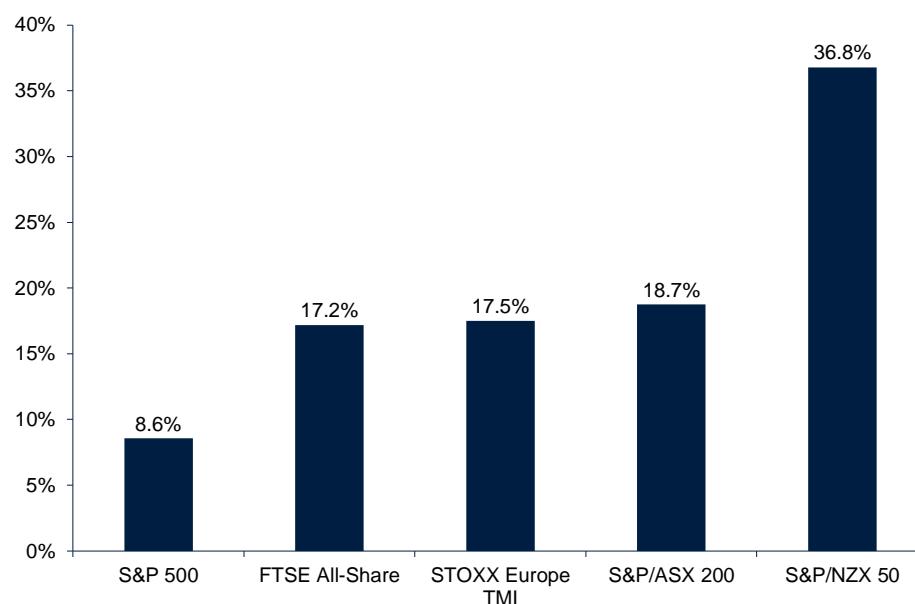
2.16   In addition to the sectoral composition of stock indices, we have assessed the average gearing level of the constituents,[17] as this affects returns to equity holders, including the volatility of returns on the stock market as a whole, and, in turn, any betas estimated using that market's index. Therefore, the use of market betas of comparators that are traded in stock markets with a significantly different average gearing level to that of the UK index would be inappropriate when approximating the beta of a GB energy networks.

2.17   As Figure 2.3 below shows, the results reveal structural differences in gearing between stock markets. In particular:

- S&P 500 constituents have relatively low levels of gearing compared to the FTSE All-Share comparators;

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[17] The numerator in our gearing ratio is the book value of the net debt of a company, while the denominator is the sum of net debt and its market capitalisation. The average gearing ratio is a weighted average of the gearing ratios of individual companies, with weights derived from their market capitalisation.

- S&P/NZX 50 (New Zealand) constituents have relatively high levels of gearing when compared to the FTSE All-Share comparators.

2.18   On the contrary, the European and Australian stock market indices (STOXX Europe TMI and S&P/ASX 200) have gearing levels broadly similar to the FTSE All-Share index.

Figure 2.3   Average levels of gearing of the stock market indices

Note: The FTSE All-Share is the relevant index for the UK. The S&P/NZX 50, S&P 500, STOXX Europe TMI and S&P/ASX 200 are the indices for New Zealand, the USA, Europe and Australia respectively.

Source: Oxera analysis.

2.19   Based on our conclusion that the USA, New Zealand and Australian indices are evidently dissimilar to the UK index in terms of sectoral composition, as well as the USA and New Zealand indices having widely different levels of average gearing, our geographic scope is limited to firms within the UK and Western Europe, as suitable comparators for GB energy networks.

2B.3   The comparator sample following sector and geography filtering

2.20   Among a universe of Western European regulated water and energy networks, including firms based in the UK, considered, 15 firms are identified that satisfy our filtering criteria. Box 2.1 describes the filtering process.

Box 2.1   The process of obtaining a sample of 15 Western European energy and water networks

Using Bloomberg, we obtained a long list of companies classified as gas utilities, water utilities, and electric transmission & distribution businesses, traded in Western Europe.[1] This resulted in a sample of 47 companies.

Subsequently, based on our review of the companies' activities, we removed any that were significantly different from a pure-play utility network. In particular, we excluded companies with a high proportion of revenue from:

- energy retail activities;

- energy generation;

- other activities, such as telecommunications.

Note: [1] In particular, we included companies with BICS level 4 'Gas utilities', 'Water utilities' and 'Electric Transmission & Distribution'.

Source: Oxera.

2.21   Box 2.2 lists the 15 Western European energy and water networks identified for further assessment.

Box 2.2   Comparator sample after sector and geography filtering

ADMIE (energy, Greece)	Red Eléctrica (energy, Spain)
Athens Water Supply & Sewage (water, Greece)	REN (energy, Portugal)
Elia Group (energy, Belgium and Germany)	Severn Trent (water, the UK)
Enagás (energy, Spain)	Snam (energy, Italy)
Eaux de Royan (water, France)	Terna (energy, Italy)
Fluxys (energy, Belgium)	Thessaloniki Water & Sewage (water, Greece)
Italgas (energy, Italy)	United Utilities (water, the UK)
National Grid (energy, the UK)	

Source: Oxera analysis.

2C   Liquidity filtering

2.2   If a stock is not sufficiently liquid, the estimated beta tends to be unusually low and statistically less reliable.[18] For the 15 companies that passed the sector and geography filtering, we assessed their stock liquidity based on four widely used liquidity metrics.
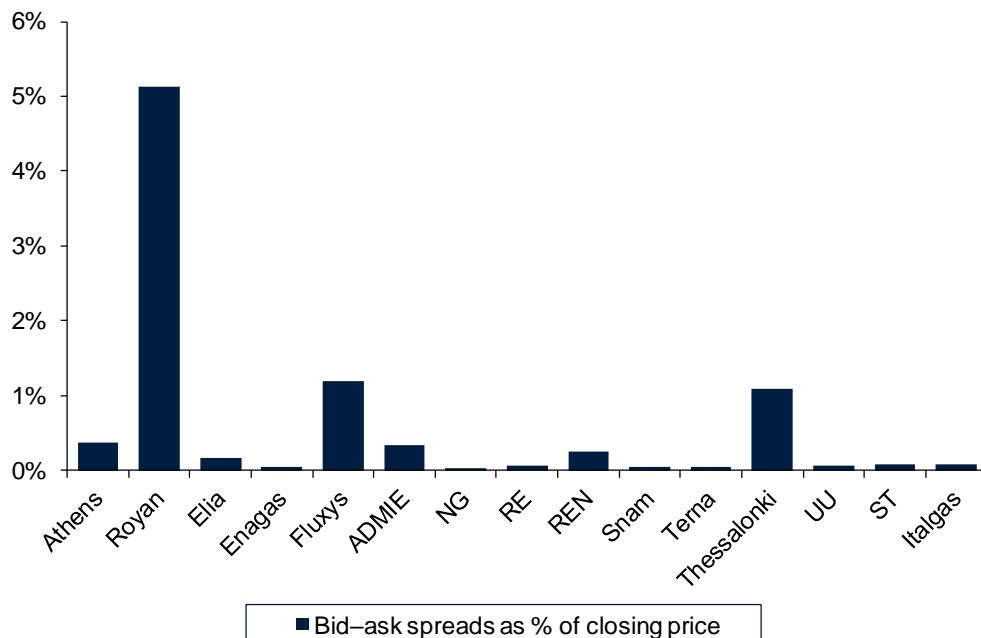
- **The bid–ask spread** measures the difference between the buy and the sell price of a stock. The less liquid the stock is, the wider the spread.

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[18] The bias in market betas for stocks that are infrequently traded is well documented in academic literature. This bias is thought to have been first identified by Fischer but has been widely recognised by other academics. See Fischer, L (1966), 'Some New Stock-Market Indexes', *The Journal of Business*, **39**:1, pp. 191–225; and McClelland, D.E., Auret, C.J. and Wright, T.K. (2014), 'Thin-Trading and Beta Estimation: Results From a Simulated Environment', *Journal for Studies in Economics and Econometrics*, **38**:2, pp. 19–32.

- **Share turnover** measures the traded volume of a stock relative to the market capitalisation. The less the stock is traded, the lower its liquidity is.

- **Free float** measures the percentage of a firm's shares that are freely tradable on market exchanges. This excludes shares that are held over a long term and are therefore not frequently traded. The lower the free float percentage, the lower the liquidity.

- **Zero return days** measures the percentage of trading days on which a firm's share price did not change from the previous day. The higher the percentage of zero return days, the lower the liquidity.

2.3   Figure 2.4 shows that Eaux de Royan, Fluxys and Thessaloniki Water & Sewage have significantly higher bid–ask spreads than the other companies, and, based on this criterion, should be regarded as illiquid. The bid–ask spreads of Athens Water Supply & Sewage, ADMIE and REN are also noticeably higher than the spreads of other companies, although at this stage we keep them in the sample.

Figure 2.4   Average bid–ask spread
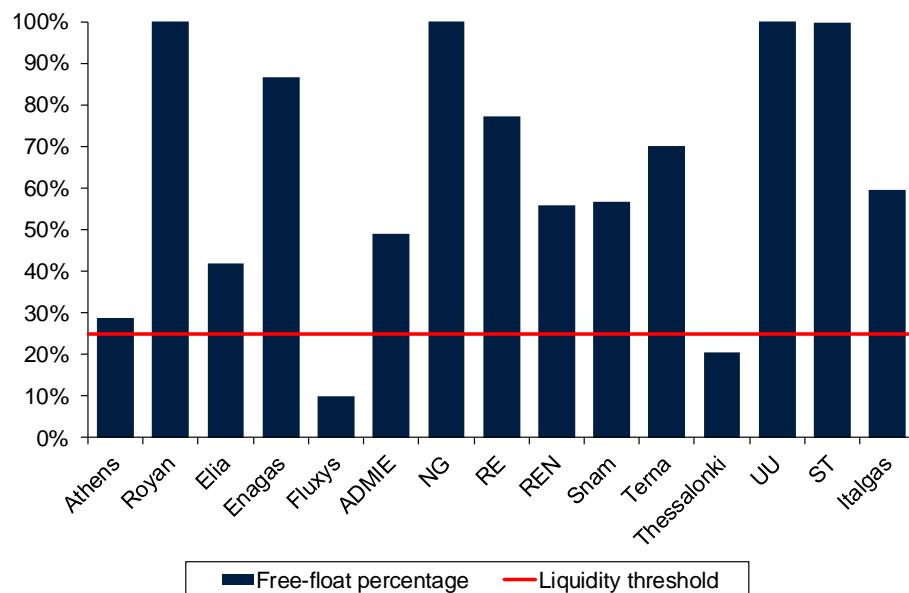
Note: NG—National Grid Group, RE—Red Eléctrica, UU—United Utilities, ST—Severn Trent, Based on 2021 data. The results are similar for all years from 2016 to 2021.

Source: Oxera analysis based on Bloomberg data.

2.4   Figure 2.5 shows the average free-float percentage for each of the companies. A minimum threshold of 25% of the shares being freely traded is applied, which

is the threshold used for the FTSE UK indices, for example.[19] Fluxys and Thessaloniki Water & Sewage do not meet this threshold, while the next least-liquid stocks are those of Athens Water Supply & Sewage, Elia and AMDIE.

Figure 2.5   Free-float percentage
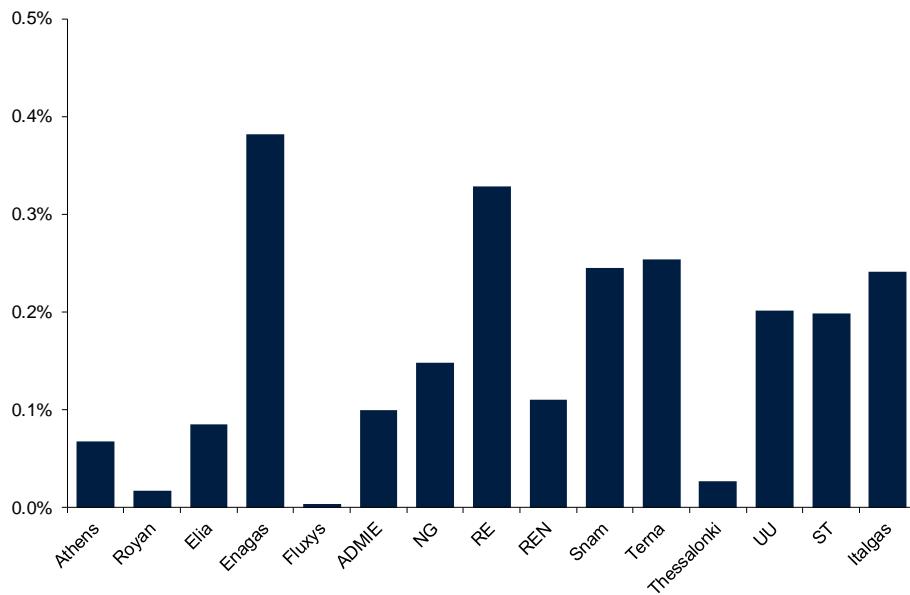
Note: Based on 2021 data. The results are similar for all years from 2016 to 2021.

Source: Oxera analysis based on Bloomberg data.

2.5   Figure 2.6 shows the share turnover for each of the companies in the sample. The same companies as for the bid–ask spread show the lowest liquidity—Eaux de Royan, Fluxys and Thessaloniki Water & Sewage—followed by Athens Water Supply & Sewage, Elia, REN and ADMIE.

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[19] If an issuing company is located in the UK, the FTSE Russell index requires a minimum free float of 25% for the stock to be eligible for inclusion in the FTSE UK index series. See FTSE Russell (2021), 'FTSE UK Index Series v15.1', June, p. 14.

Figure 2.6   Share turnover percentage
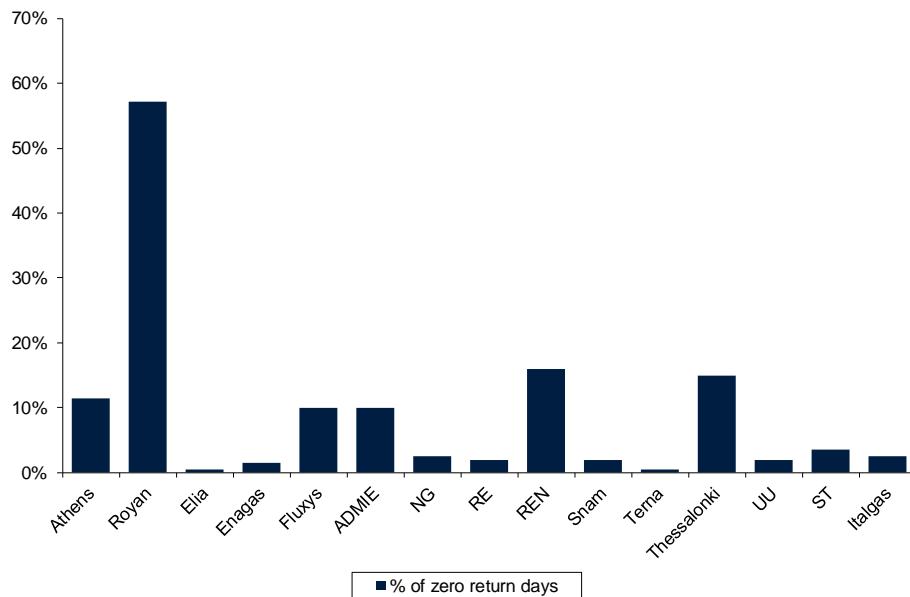
Note: Based on 2021 data. The results are similar for all years from 2016 to 2021.

Source: Oxera analysis based on Bloomberg data.

2.6   Figure 2.7 shows the percentage of zero return days for each of the
        companies. Eaux de Royan is the most illiquid company, followed by REN and
        Thessaloniki Water & Sewage and then Athens, Fluxys, and ADMIE.

Figure 2.7   Percentage of zero return days

Note: Based on 2021 data. The results are similar for all years from 2016 to 2021, with Elia, Fluxys
and Thessaloniki having a higher percentage of zero return days in 2019 and 2018 than in 2021,
i.e. higher than is shown in this figure.
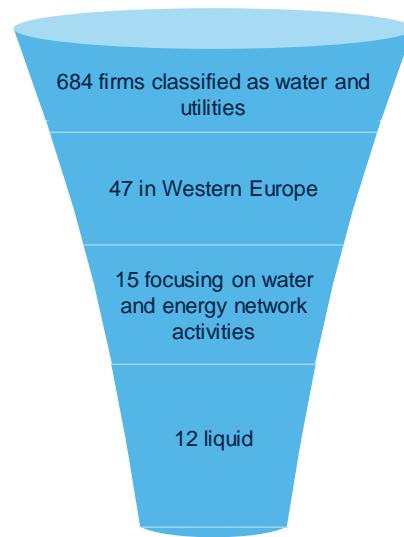
Source: Oxera analysis based on Bloomberg data.

2.7 On the basis of our review of the four liquidity metrics described above, we exclude Eaux de Royan, Fluxys and Thessaloniki Water & Sewage from the sample, while noting that the stocks of Athens Water Supply & Sewage, Elia, REN and ADMIE are also significantly less liquid than those of the other companies. That leaves 12 companies in the sample of comparators.

2D Conclusion on the initial sample

2.8 Figure 2.8 summarises the steps undertaken during the sector, geography and liquidity filtering process, leaving 12 comparator companies in the initial sample.

Figure 2.8 Filtering process

684 firms classified as water and utilities

47 in Western Europe

15 focusing on water and energy network activities

12 liquid

Source: Oxera.

2.9 Of the 12 comparators, two started trading relatively recently:
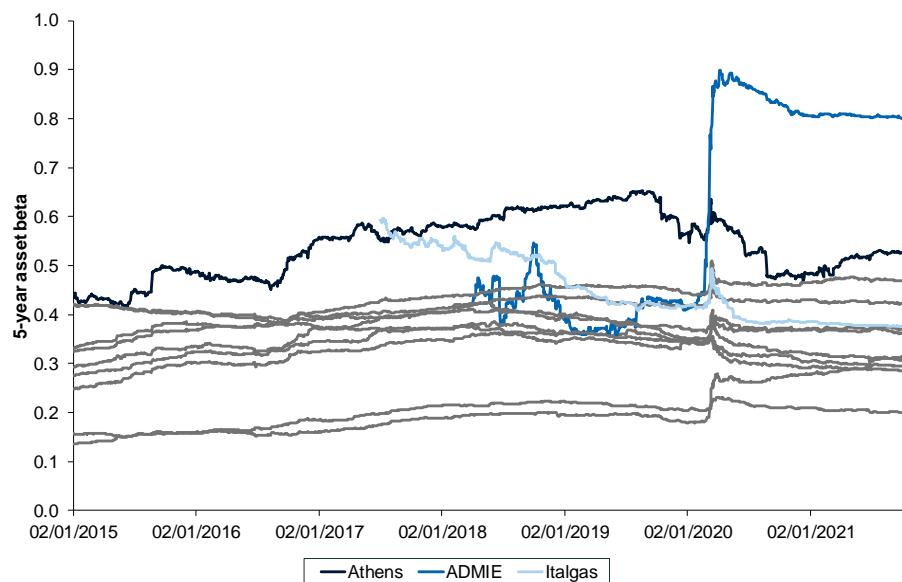
- ADMIE's stock has been trading since 19 June 2017;

- Italgas's stock has been since 7 November 2016.

It is therefore not possible to estimate ADMIE's five-year market beta, and we exclude it from further investigation. However, once enough data is available, it will need to be considered further.

2.10 Figure 2.9 below shows the evolution of the market asset betas of all 12 comparators. The evolution of ADMIE and Italgas is not representative because estimates in the earlier years are based on less than five years of data.

2.11   The asset beta of Athens Water Supply & Sewage is particularly volatile, and is therefore unlikely to be reliable. Given that we also observed that its stock is relatively illiquid and that its beta is the highest after ADMIE's, we consider it appropriate and conservative to exclude the company from the sample.

Figure 2.9   Five-year market asset betas of 12 companies of the comparator sample after sector, geography and liquidity filtering

Note: UK company equity betas are estimated relative to the FTSE All-Share index, using daily data. European energy company equity betas are estimated relative to the EuroStoxx TMI index, using daily data. A debt beta of 0.05 is assumed. The cut-off date is 30 September 2021.

Source: Oxera analysis.

2.12   Table 2.1 shows the sample that results from this stage of filtering and the current five-year asset betas of the companies in that sample.

Table 2.1   Comparator sample with market asset betas after sector, geography and liquidity filtering, and additional cross-check

Company	Five-year market asset beta
Elia Group (energy, Belgium)	0.31
Enagás (energy, Spain)	0.37
Italgas (energy, Italy)	0.38
National Grid (energy, the UK)	0.36
Red Eléctrica (energy, Spain)	0.31
REN (energy, Portugal)	0.20
Severn Trent (water, the UK)	0.30
Snam (energy, Italy)	0.47
Terna (energy, Italy)	0.42
United Utilities (water, the UK)	0.29

Note: UK company equity betas are estimated relative to the FTSE All-Share index, using daily data. European energy company equity betas are estimated relative to the EuroStoxx TMI index, using daily data. A debt beta of 0.05 is assumed. The cut-off date is 30 September 2021.

Source: Oxera analysis.

3   Step 2—appropriateness of the initial sample: review of regulatory frameworks

3.1   Companies within the same sector (or, as in our case, within similar sectors) can still be exposed to different levels of systematic risk. Commonly mentioned factors affecting the systematic risk level can be summarised as follows.

- **Industry differentiators**, such as long-term demand risk, elasticity of demand, competitive pressure, growth options, and asset stranding risk.

- **Operational risk factors**, such as the scale of investment (e.g. measured by CAPEX to assets) and asset intensity (the ratio of assets to revenue).

3.2   In the case of regulated networks, the regulatory regime is a key driver of systematic risk exposure. While regulation may to some extent mitigate underlying business risks (e.g. by making profits less sensitive to short-term upside and downside deviations in demand), the degree to which these risks are mitigated may vary across different regimes. Regulation may also introduce new risks. In particular, there is regulatory risk resulting from the exercise of regulatory discretion and potential for the regulatory approach to change over time. For example, the regulator can exercise a large degree of judgement over the level of the cost of equity allowance, and there is always a risk that the level will change significantly due to changes in methodology.

3.3   The importance of regulatory risk for regulated utility networks has been widely recognised by regulators and equity analysts. For instance, in 2012 the UK competition authority recognised that higher degrees of regulatory uncertainty might affect investor confidence in the longer term, increasing the return required to undertake investments.[20] Equity analysts also recognise the importance of regulatory risks by highlighting the impact that regulatory determinations have on share prices.[21]

3.4   Although other factors also play a role in defining the systematic risk of regulated utilities, regulatory risk is a significant contributor and is relatively under-researched. Therefore, we focus the rest of our assessment on the systematic risk associated with regulatory frameworks.

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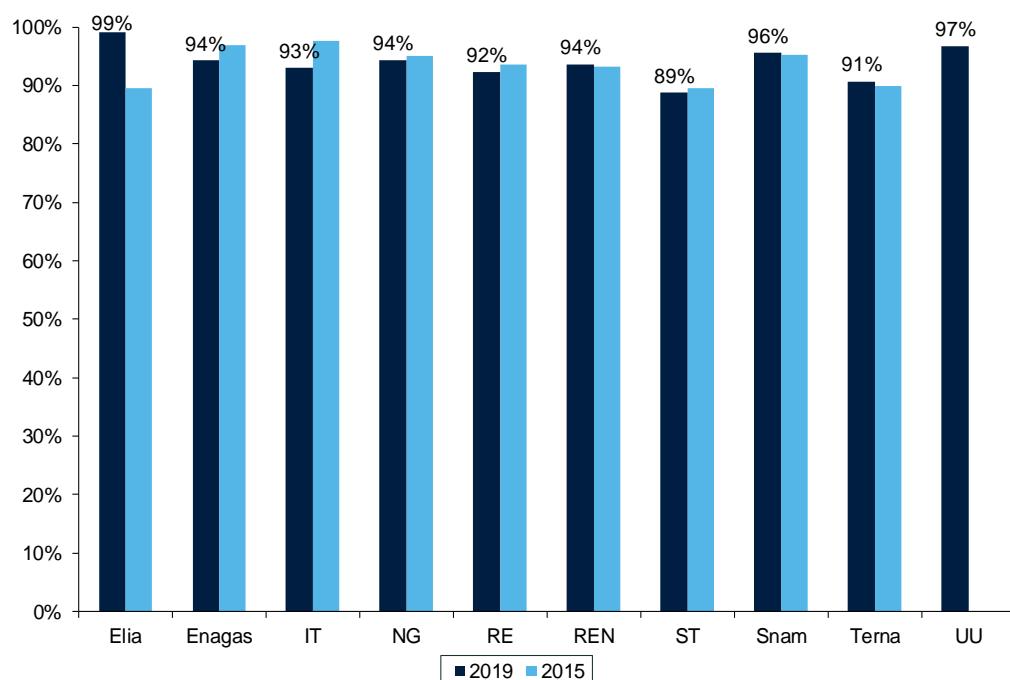
[20] Competition Commission (2012), 'Phoenix Natural Gas Limited price determination', pp. 8–22.
[21] See, for example, J.P. Morgan (2020), 'UK Utilities: Ofgem Draft Decision disappointing; expect weakness in NG/ and SSE today', 9 July, p. 1; HSBC (2018), 'National Grid: Regulatory obfuscation (but work in progress)', 19 December, p. 1; Morgan Stanley (2014), 'Elia System Operator SA: Supportive regulatory terms in Belgium', 1 September, p. 1; and J.P. Morgan (2019), 'UK Utilities: Ofwat Business Plan Assessment – Fast-Track Boost for UU, SVT and PNN', 31 January, p. 1.

Proportions of regulatory revenue

3.5   For the avoidance of doubt, we double-check that as a result of our qualitative
        sector filtering described in Box 2.1 of section 2B.3, the companies left in our
        initial sample all have high proportions of regulated revenues. Figure 3.1 below
        shows that the proportion of regulated revenues for all companies is above
        89%, based on data from 2019 (or FY 2018/19). For some of the companies,
        regulated revenues accounted for close to 100% of their revenues. We have
        also checked the robustness of our results by considering the percentage of
        regulated revenues in 2015 (or FY 2014/15). The results show that, in 2015, all
        the companies in our sample also had high proportions of regulated revenues.

Figure 3.1   Proportions of regulated revenues
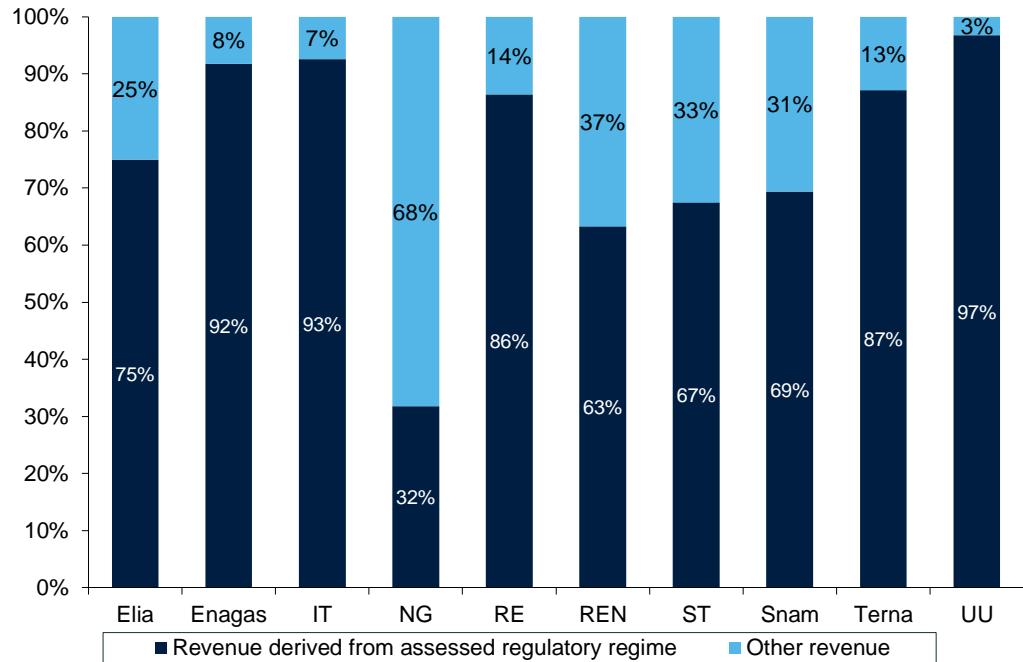
Note: IT, Italgas. Based on 2019 (FY 2018/19) and 2015 (FY 2014/15) data. No data on United
Utilities was available for 2015.
Source: Oxera analysis based on companies' annual reports.

3.6   In appendix A1, we investigate whether comparatively high market betas in our
        sample could be explained by companies having high levels of unregulated
        revenues (as unregulated activities may be associated with a higher level of
        systematic risk and higher market betas). We find no evidence of this and
        conclude that our beta estimates are unlikely to be biased upwards due to
        companies being exposed to unregulated business environments.

3.7   In addition to the proportions of revenues sourced from regulated activities, we
        check how much revenue is sourced from the activities regulated specifically
        under the main domestic energy or water network regulatory frameworks. We

then limit our assessment to those frameworks. Figure 3.2 below shows the breakdown.

Figure 3.2   Proportions of revenues regulated under the assessed regulatory frameworks

Notes: Based on 2019 (FY 2018/19) data.
'Elia has revenues from Elia Transmission, 50Hertz Transmission and Nemo Link. Revenues from Nemo Link, offshore regulation and energy revenues were classified as 'Other revenue'. For Enagás, revenues from Enagás Transporte S.A.U. and Enagás GTS S.A.U. are classified as revenue derived from the assessed regulatory regime. Revenues from Enagás Transporte del Norte S.L are classified as 'Other revenue' (classified as regulated in Figure 3.1). For Italgas, technical assistance, engineering, IT, water distribution, water sales and gas sales are classified as 'Other revenue'. Italgas's revenue from infrastructure construction and improvements (IFRIC 12) is included in the revenue derived from the assessed regulatory regime. For NG, we classify the regulated revenue from the USA and National Grid Ventures as 'Other revenue'. For Red Eléctrica, we classify revenues from telecommunications (classified as regulated in Figure 3.1) and international revenue as 'Other revenue'. For REN, we classify revenues derived from gas transmission and distribution (classified as regulated in Figure 3.1), as well as international revenue (also classified as regulated in Figure 3.1) and lease revenues from hydro protection zones as 'Other revenue'. For Severn Trent, we classify non-household retail (classified as regulated in Figure 3.1 as per the company's own classification), business services and corporate revenue as 'Other revenue'. Snam's 'Other revenue' includes its revenue from storage, regassification and corporate activities. Terna's 'Revenue derived from assessed regulatory regime' includes revenue from construction services performed under concession; 'Other revenue' in our classification includes 'other regulated revenues' in the company's accounts. For UU, the revenue derived from the assessed regulatory regime includes wholesale water charges, wholesale wastewater charges and residential retail charges, while 'other' in the company's accounts is classified as 'Other revenue' in the figure.

Source: Oxera analysis based on companies' annual reports.

3.8   Figure 3.2 highlights that the assessment of the regulatory frameworks presented in the remainder of this section covers at least 75% of revenues for all comparators except NG (with a significant proportion of revenue coming from the regulated USA activities), REN (which, in addition to the ET network, operates GT and GD networks, and an ET network in Chile), Snam (which in

addition to the GT networks, operates regulated gas storage), and Severn Trent (which in addition to being active in regulated water and wastewater also operates a non-household retail business). Other activities may have an impact on the overall level of systematic risk reflected in these companies' market betas, which should be accounted for when interpreting the assessment of regulatory frameworks.

3.9   The remainder of this section is structured as follows.

- In section 3A, we outline the principles used in our assessment of systematic risk associated with regulatory frameworks when compared to RIIO-2.

- In section 3B, we provide the details of European regulatory frameworks and our comparative risk assessment for each of them.

- In section 3C, we summarise our findings and conclusions from this section.

3A   Regulatory frameworks risk assessment principles

3.10   The primary risk factors accounted for in our assessment of European regulatory regimes are outlined below. We compare all regimes with RIIO-2, to assess whether they are associated with higher or lower systematic risk. We focus on the most recent regulatory periods without putting much weight on the upcoming regulatory reforms (e.g. in Italy, Portugal or Germany). This is because we are interested in the impact of regulatory frameworks on investors' expectations and therefore stock returns over the historical period for which betas are estimated. The assessment will need to be updated once the new regulatory regimes become significant in affecting marked betas.

3.11   We split all factors into two groups:

- the **regulatory process** factors (including the appeal regime, political interference, regulatory independence, and regulatory consistency);

- the **regulatory regime design** factors (including the profit buffer factor, cost efficiency incentives and demand risk).

These are described below.

3.12   We start with the process factors.

- **Appeal regime**. An appeal regime creates constraints on regulatory discretion. The greater the scope of the appeal body review, the greater the constraint on regulatory discretion and, therefore, the lower the systematic

risk associated with regulatory decisions. However, the rule should be applied carefully, as it is the degree of regulatory discretion after the constraint of the appeals process that matters. If the regulator exercises less discretion (e.g. because its methodology is constrained by law) then even if the appeal regime scope does not impose an additional limit on regulatory discretion, the overall risk will still be lower. With regard to the appeal regime itself, we draw a distinction between redeterminations, where the appeal body is required to redetermine the price control (as is the case in E&W water), and court procedures, where the appeal body is limited to finding whether the regulator was wrong on any of the specific grounds. The recent RIIO-2 CMA appeals show that the regime in GB energy is closer to the latter.

- **Examples of political interference**. Cases of political interference show greater dependence of regulated returns on the political and social environment, and therefore indicate greater systematic risk.

- **Regulatory independence**. In addition to examples of political interference, we checked for major reasons to consider the regulators to be less independent of their governments than Ofgem. For example, the European Commission has recently referred a few states to the European Court of Justice (ECJ) for not providing their regulator with sufficient independence. We assess this factor in combination with the examples of political interference.

- **Regulatory consistency**. Any regulatory decision, especially one that requires substantial consideration and economic analysis, is associated with a degree of regulatory discretion and therefore potential systematic risk. We follow the principle of greater regulatory consistency over time being associated with lower systematic risk. However, greater consistency may also be closely linked to lower transparency and may lead to deviations of the allowances from the underlying factors that should drive the allowances. In such cases, consistency may not lead to a net reduction in risk.

3.13 The regulatory regime design factors that we assess are as follows.

- **Profit buffer**. If a company has an opportunity to earn revenue over and above the core building blocks (using RIIO-2 as a benchmark) without a symmetric risk of being penalised, it has the potential to create a profit buffer. Such a buffer may be argued to reduce systematic risk. This potential would exist even if, in theory, the rewards and penalties are symmetrical. This is

because, in practice, the target required to get the reward might be easy for the company to meet. The opposite would also apply—i.e. when revenue-earning opportunities are more negatively skewed than in RIIO-2, we consider this to increase systematic risk.

- **Cost-efficiency incentives**. We consider these in the context of CAPEX, OPEX and cost of debt in relation to three sub-factors.

  - First, we check how high-powered the cost-efficiency incentives are. High-powered cost-efficiency incentives expose networks to deviations of actual costs from allowances and therefore to any regulatory judgement applied in setting those allowances, while pass-through clauses protect companies from this. Where allowances are set ex ante, the proportions of out- and underperformance shared with customers show how high-powered the incentives are.

  - We then consider how the regulator sets cost allowances. If ex ante allowances are set for each company individually, mechanically reflecting its past performance, they account for the company's individual circumstances and regulatory discretion is limited. If ex ante allowances are based on the cost data of other companies as well—i.e. the costs are benchmarked and assessed for efficiency—the company may find it more challenging to meet the targets and there is more scope for regulatory judgement.

  - Finally, we consider whether the regulator assesses cost efficiency after the costs have been incurred. In particular, such mechanisms expose companies to asymmetric risk because it is easier to identify areas of inefficiency and disallow these costs than it is to identify areas of efficiency and allow additional revenue to be earned.

- **Demand risk**. We differentiate revenue cap (short-term protection from demand risk) from price cap (exposure to demand risk) regimes. For this exercise, we did not differentiate regimes by the timing of demand-related under-recoveries (e.g. during the price control period versus after it) or by the underlying demand risk, assuming that revenue caps neutralise this risk.

In addition, we considered exposure to inflation risk, as this varies across the regimes. In some regimes, unlike in RIIO-2, the regulatory asset base (RAB) and tariffs are not indexed to inflation indices, and companies are exposed to inflation

risk until the next price control re-set point. However, it is unclear whether inflation indexation increases or reduces systematic risk. On the one hand, inflation indexation protects investors from inflation risks; on the other hand, where returns are linked to inflation, nominal returns are correlated with the state of the economy—where the economy is strong, inflation is higher and returns are higher—increasing systematic risk and beta. Therefore, we have not included this factor in our assessment.

3.14 There are many more factors that could have been considered, such as indexation of real price effects (RPEs), return adjustment mechanisms, or treatment of assets funded by third parties. However, we considered that the ones outlined above are the most common and significant drivers of differences in systematic risks between regulatory regimes.

3.15 In terms of comparative importance of the factors, each of the process factors effects the entire regime, while design factors are related only to parts of it. Therefore, process factors have a greater weight in our assessment than individual design factors.

3B   Regulatory frameworks risk assessment

3.16 Below, we assess the regulatory regimes under which the comparator companies of the initial sample operate. We focus on the recent price control periods and do not comment on the upcoming changes—we consider this approach to be the most consistent with the timing of beta estimation windows. The index of the regimes assessed is as follows.

- Section 3B.1: Great Britain, T and GD, to compare other regimes against it. The reviewed price control period is 2021–26.

- Section 3B.2: Portugal, ET, covering the largest part of REN's operations. The reviewed price control spans from 2018 to 2021.

- Section 3B.3: Italy, GT, GD, and ET, for Snam, Italgas and Terna respectively. The reviewed price control periods are 2020–23, 2020–25 and 2016–23 respectively.[22]

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[22] The price control periods for GD and ET in Italy are divided into two semi-periods. Given that the overall regulatory framework typically remains constant between semi-periods, we assess the whole price control period as one.

- Section 3B.4: Spain, ET, GT, for Red Eléctrica and Enagás. The reviewed price control periods run from 2020 to 2025 and from 2021 to 2026 respectively.

- Section 3B.5: Belgium, ET, for Elia. We consider the framework of the Belgian federal energy regulator, CREG, only, and do not assess the Flemish, Walloon and Brussels regional regulatory frameworks. The reviewed price control period is 2020–23.

- Section 3B.6: Germany, ET, for Elia (which operates 50Hertz, a German ET network). The reviewed price control period is 2019–23.

- Section 3B.7: Great Britain, water, for United Utilities and Severn Trent. The reviewed price control period is 2020–25.

3B.1 Great Britain: transmission and gas distribution, RIIO-2

Factor	Description
Appeal regime	Regulatory decisions can be challenged before the CMA, which is limited to finding whether Ofgem is wrong on any of the specific grounds raised by appellants. We consider this to be comparable to court procedures where expert evidence is considered.
Examples of political interference	There are examples of regulatory pressure on companies to charge customers less than was agreed at the price review. In particular, Ofgem urged networks to make voluntary contributions due to their outperformance in the RIIO-1 price control period, with most companies obtaining (real) double-digit returns. The voluntary contributions yielded over £700m in savings to customers.
Regulatory independence	Ofgem is an independent regulator which sets tariffs independently from the government.
Regulatory consistency	Although Ofgem does not change regulatory principles at every price control review, it reconsiders its framework methodologies to set parameters and parameter estimates. Sophisticated methodologies and regulatory judgement are applied in the review process, introducing regulatory risk. Examples of changes between RIIO-1 and RIIO-2 price controls are as follows. • Set of incentives—information quality incentives (IQI) were removed, the business plan incentive (BPI) was introduced; the set of output delivery incentives (ODIs) was revisited. • Cost-efficiency incentives—the mechanism did not change; sharing rates, ex ante allowances and the efficiency factor were revised. • Output targets were revised; new outputs were added to the outputs framework for RIIO-2. • The risk-free rate (RfR) methodology (as an example within the cost of equity allowance methodology) moved from a combination of evidence points to spot yields on government bonds, and indexation was also introduced. Other methodological changes in relation to the cost of equity allowance included changes in the allowed equity beta, the allowed debt beta, and the total market return. • Cost of debt methodology—the length of the trailing average for indexation was revised, among other changes. • Returns adjustments—an ex ante reduction to returns was introduced based on the expected outperformance (albeit this was

	overturned on appeal); threshold levels for returns were introduced. Returns above or below thresholds are adjusted downwards or upwards respectively, using an adjustment rate.
Profit buffer	There are ODIs and a BPI. As these are associated with both rewards and penalties, they do not create a profit buffer.
Cost-efficiency incentives—OPEX	There is an ex ante total expenditure (TOTEX) allowance. The incentive rates are between 33% and 50%, implying that 50–67% of exposure is shared with customers (we refer to the latter as 'the sharing rate'). The costs of all companies in the sector are assessed in order to set TOTEX allowances.
	In addition, RIIO-2 involves ex post assessment of costs and outputs. For example, evaluative price control deliverables (PCDs) allow consumers to be refunded if an output is not delivered (or not delivered to a specified standard).[23] Evaluative PCDs account for a substantial share of allowed TOTEX.[24]
Cost-efficiency incentives—CAPEX	As above.
Cost-efficiency incentives—cost of debt	The cost of debt allowance is based on the iBoxx trailing average, set to match the sector average actual cost of debt. The companies face the risk that this does not correspond to their actual cost of debt.
Demand risk	A revenue cap is in place.

Source: Oxera, based on regulatory determinations.

3B.2 Portugal: electricity transmission

Property	Risk compared to RIIO-2	Description
Appeal regime	Similar risk	Regulatory decisions can be challenged in front of The Court of Competition, Regulation and Supervision (TCRS). We consider this to be associated with comparable risk to RIIO-2.
Examples of political interference	Similar risk	There has been some political interference. For example, since 2014 REN has paid a tax of 0.85% of the RAB (CESE), which the law prohibits to be recovered via allowed revenues.
Regulatory independence	Similar risk	No referral by the European Commission to the ECJ for failing to comply with the EU energy market rules in relation to regulatory independence.
Regulatory consistency	Lower risk	The regime is associated with high consistency in regulatory decisions. Parameters are not revised using discretionary methodologies as regularly as in RIIO-2. Examples of elements of the regimes that changed or stayed unchanged ahead of the 2018–21 regulatory period are as follows.
		• Set of incentives—the 'end of life incentive' was replaced with the 'economic rationalisation of the investments' (IREI) scheme. However, for stability, the value of the reward in the base case was kept approximately the same.
		• Cost-efficiency incentives—no change to the framework. Minor changes were made to the reference cost-sharing mechanism relative to the

[23] Cost-efficiency assessment is mentioned only indirectly: in cases of underspend, networks need to demonstrate that the underspend is attributable to efficiencies or innovation rather than non-delivery. However, given the required detailed ex post assessment, we consider it unlikely that cost efficiency would not be included within the scope of the assessment. See Ofgem (2021), 'Guidance – PCD Reporting Requirements and Methodology', paras 5.3–5.4.

[24] For example, Scottish Hydro Electric Transmission's (SHE-T) evaluative PCDs have a total value of £869m. Expressed as a percentage of SHE-T's TOTEX allowance, this corresponds to approximately 32% of the allowance. See Ofgem (2021), 'RIIO-2 Final Determinations – SHET Annex (REVISED)'.

Property	Risk compared to RIIO-2	Description
		previous price control. Since 2009 CAPEX reference costs have been updated only for the efficiency factor and have not otherwise been revised. OPEX is re-set mechanically based on the historical level. No change to the efficiency factor compared to the previous regulatory period. • Output targets—three new performance-related KPIs were introduced as part of the IREI incentive scheme. • The RfR methodology remained unchanged relative to the previous price control. • Cost of debt methodology remained unchanged relative to the previous price control, to the extent that it is disclosed.
Profit buffer	Lower risk	We find more factors contributing to lower risk than factors contributing to higher risk. • CESE: a non-recoverable tax of 0.85% of the RAB; this contributes to higher risk. • IREI: an incentive reward of €0–32m, which has been c. 0.7% of the group RAB or c. 1.3% of the electricity transmission RAB since the start of the assessed regulatory period in 2018. This contributes to lower risk. • WACC indexation: the rate of return allowance is linked to the yields on Portuguese government bonds in the proportion of 2.5:1 (i.e. when Portuguese government bond yields increase by 2.5%, the allowance increases by 1%), with a cap and collar to limit extreme movements in the allowance. For the 2018–21 regulatory period, the rate of return was set at 5.53%, while the cap and collar were 9.5% and 4.5%, making the upside greater than the downside. This contributes to lower risk.
Cost-efficiency incentives—OPEX	Lower risk	There is an ex ante OPEX allowance, with no sharing mechanism, which would make the risk higher compared to RIIO-2. However, the allowance is set at the level achieved by the company in the past, with annual efficiency adjustments. This target is lower risk for the company than those set in RIIO-2, which are set relative to the costs of all companies in the sector. We give more weight to how challenging the target is and how much discretion the regulator applies to setting the ex ante allowances over the sharing rates.
Cost-efficiency incentives—CAPEX	Lower risk	The costs set ex ante (the 'reference costs') are based on a study of REN's historical costs, carried out by an independent consultancy, and an efficiency factor. The reference costs, as defined in the initial study, are updated for the efficiency factor, defined by ERSE, at the start of each regulatory period. As a result, ex ante CAPEX allowances are not directly linked to the company's recent performance. Given that no rules are specified, this might arguably be associated with higher risk than in RIIO-2, where costs are benchmarked against other companies. The reference cost scheme allows a share of outperformance to be retained and rewards investments that are deemed efficient, with a premium of 0.75% on the allowed rate of return. There are no penalties for underperformance. In this sense, the scheme is asymmetric, implying lower risk than in RIIO-2. The magnitude of the scheme is considerable: in 2019, 55%

Property	Risk compared to RIIO-2	Description
		of REN's electricity transmission RAB was remunerated at a premium.
		Overall, we consider the CAPEX mechanism to be associated with lower risk than in RIIO-2.
Cost-efficiency incentives— cost of debt	Similar risk	The cost of debt is not based on the actual cost of debt of the company and needs to be determined by the regulator, which is similar to RIIO-2.
Demand risk	Similar risk	A revenue cap is in place.

Source: Oxera, based on regulatory determinations.

3B.3 Italy: gas transmission, gas distribution, electricity transmission

Property	Risk compared to RIIO-2	Description
Appeal regime	Similar risk	There is no redetermination by a competition authority; rather, legal proceedings are used to investigate the administrative procedures. This implies a similar risk to RIIO-2.
Examples of political interference	Similar risk	Although we are not aware of explicit examples of political interference affecting networks, there is an example of the Ministry of Economic Development (MiSE) overruling ARERA's decision in the electricity supply sector. In particular, during the process of liberalisation of the SMEs, ARERA set a cap on the volumes (i.e. the maximum number of consumers) that an operator could win in an auction. In December 2020 the MiSE changed (and lowered) this limit.
		We find no reason to conclude that ARERA's decisions are more or less affected by political agendas than those of Ofgem.
Regulatory independence	Similar risk	ARERA is an independent administrative authority but has to take into account the general policy guidelines introduced by the government and Parliament.
		Italy was not referred by the European Commission to the ECJ for failing to comply with the EU energy market rules in relation to regulatory independence.
Regulatory consistency	Similar risk	The regulatory framework has been through a few changes over the last decade. As in GB energy, potential changes to the framework, methodologies to set parameters and parameter estimates are considered at every price control review.
		Examples of changed and unchanged elements of the regimes are as follows.
		• Set of incentives—there has been a general shift from input-based to output-based incentives since the previous price control. New outputs (e.g. a new standard for the number of interruptions and their length for ET) and output-based mechanisms were introduced (e.g. incentives to obtain EU grants to finance investments or incentives for the acquisition of small transmission companies for ET).
		• Cost-efficiency incentives—the mechanism is unchanged relative to the previous price control. It does not involve many parameters or assessment of ex ante allowances that would be subject to change.
		• Output targets—some outputs were revised relative to the previous price control—e.g. the energy non-served (ENS) incentive mechanism.

Property	Risk compared to RIIO-2	Description
		• Rate of return methodology—the new WACC methodology for setting the allowed rate of return for all regulated energy sectors, introduced in 2015, was scheduled to be in place until 31 December 2021. The allowance was set for a period of six years, with a mid-period update. The methodology for the following WACC period is currently undergoing consultation and, according to ARERA, one of the principles is for investor returns to be relatively stable. Two elements of the WACC methodology described below illustrate the changes introduced in 2015 and how they contribute to stabilisation of the level of returns. • The RfR methodology—the RfR is estimated with reference to AAA and AA rated EUR-denominated government bonds. Previously, it was estimated with reference to the yield on Italian government bonds. In 2015, a RfR floor of 0.5% was introduced and is still in place. • Cost of debt methodology—before 2015, the cost of debt was estimated as the sum of the RfR and a debt premium. Under the current methodology, ARERA estimates the cost of debt as the sum of the RfR, the country risk premium and a debt risk premium. • RAB-related changes—the additional remuneration for the regulatory lag time for ET and GT was removed; asset categories and respective asset lives for ET were revised.
Profit buffer	Similar risk	There are positive and negative effects of different elements, while the net position is unclear. Since it is unclear whether there is any upward or downward bias, we conclude that the risk is similar to RIIO-2. • Investments are recognised in the RAB only when they are in operation. Work-in-progress CAPEX is remunerated at a lower rate than the allowed rate of return (and, for ET, at a decreasing rate and for a maximum of four years). This is associated with fewer revenue-recovery opportunities than in RIIO-2, where investments are recognised when they are undertaken and work-in-progress CAPEX is not treated differently from the rest of TOTEX. • In ET, a premium of 1% is recognised on investments put into operation during the period 2012–14, which is additional to the standard building blocks of RIIO-2. • In ET, some output-based incentive mechanisms linked to service quality (e.g. in relation to ENS, continuity, or interruptions) are asymmetric. For example, the cap on penalties for ENS is lower than that on rewards, while continuity and interruptions can only result in costs for Terna. At the same time, some incentive mechanisms can only result in rewards (e.g. incentives to obtain EU grants to finance investments, or incentives for the acquisition of small transmission companies). Although the exact balance is unclear, this is in principle similar to RIIO-2, where some output-based incentives are asymmetric (e.g. output mechanisms such as the timely connection ODI-F for NGET result only in penalties, while others such as the SO:TO optimisation ODI-F for NGET result only in rewards).

Property	Risk compared to RIIO-2	Description
		• In GT, a premium of 1.5% on top of the allowed WACC is recognised for a period of ten years on new investments entered into operation between 2020 and 2022 with a benefit-to-cost ratio higher than 1.5. This premium is on top of the standard building blocks of RIIO-2.
Cost-efficiency incentives—OPEX	Similar risk	In GT/GD/ET, there is full exposure to out- and underperformance of efficiencies over the course of the regulatory period in which these are incurred. In addition, the targets are set in a way that strengthens the incentive—the target OPEX in the first year of the regulatory period is set at the level of actual OPEX at the base year + 50% of out- or underperformance in the base year, instead of being linked to the actual OPEX in the base year. The incentive is more high-powered than in RIIO-2 and therefore would imply higher risk. On the other hand, ex ante allowances are set on the basis of regulatory accounting data and according to specific formulas, thereby providing fewer opportunities for regulatory discretion (the efficiency factor in some sectors is still set according to regulatory discretion), which would imply lower risk.

Moreover, in the case of cost increases, there is a possibility to recover these costs if fully justified (e.g. costs resulting from unforeseeable and exceptional events, from changes in the policy framework or from incremental OPEX due to new investments). This is comparable to RIIO-2 uncertainty mechanisms.

On balance, we consider the risk associated with OPEX allowances to be similar to RIIO-2. |
| Cost-efficiency incentives—CAPEX | Lower risk | There are no efficiency targets on CAPEX. Allowances are set at the level of costs incurred in year T-1, which is similar to a cost-plus basis with a lag. There are also no opportunities for regulatory discretion. We consider this to be lower risk than in RIIO-2.

There is an ex ante downwards adjustment to CAPEX allowances in GT if the benefit-to-cost ratio is below 1 and the amount of investment meets certain thresholds (the cost–benefit assessment is limited to investments >€25m for the national network or >€5m for the regional network). Investments are included in the RAB for a value corresponding to that of the benefits. Although no ex ante downward adjustments are undertaken based on benefit-to-cost ratios in RIIO-2, companies' investment plans are scrutinised, which leads to downward adjustments to ex ante allowances. From our experience, the level of scrutiny is greater under Ofgem's regime than under that of ARERA. Therefore, we do not consider this factor to outweigh a generally lower-powered and lower-risk incentive mechanism. |
| Cost-efficiency incentives—cost of debt | Similar risk | The cost of debt is not company-specific; instead, and similar to RIIO-2, it is set at the same level for all the electricity and gas companies in the sector. |
| Demand risk | Similar risk | In GT, there is volume risk on less than 1% of the allowed revenue, due to the capped risk exposure on the OPEX component.

In GD, there is no demand risk exposure due to ex post corrections.

In ET, 10% of revenue is exposed to volumes. However, when considered together with the expected |

Property	Risk compared to RIIO-2	Description
		level of demand volatility, the volume exposure of the allowed revenue is widely referred to as 'negligible' or 'limited'. Therefore, we do not put much weight on it.[25]

Source: Oxera, based on regulatory determinations.

3B.4   Spain: electricity transmission, gas transmission

Property	Risk compared to RIIO-2	Description
Appeal regime	Similar risk	Regulatory decisions can be challenged before the National High Court (NHC). No redetermination is undertaken by a competition authority; rather, legal proceedings are used to investigate the administrative procedures. This implies a similar risk to RIIO-2.
Examples of political interference	Similar risk	We are not aware of explicit examples of political interference into the CNMC's regime and could conclude on there being lower risk than RIIO-2. However, this may be because independent regulation has been in place in Spain for only a couple of years (see below). We therefore mark this factor as indicating similar risk.
Regulatory independence	Similar risk	Until 2020, the ministry was responsible for fixing and approving tariffs, which made regulation dependent on the political environment, and was arguably associated with a higher risk than RIIO-2. Since 2020, an independent regulator, the CNMC, has been provided with more powers, and regulatory independence has become comparable to that of Ofgem. Since we are focusing on the price control that starts in 2020, we mark this factor as indicating similar risk.
Regulatory consistency	Similar risk	In 2020, when the CNMC was provided with additional powers, the regulatory framework was maintained consistent with the previous regulatory period. As in GB energy, before the start of every regulatory period, methodologies and parameters can be updated. Examples of changed and unchanged parameters in the current regulatory period are as follows. • Set of incentives—for GT, the REVU (remuneration for useful life extension) component has been strengthened since the last price control, i.e. higher OPEX recognised for fully depreciated assets. For ET, a REVU component has been introduced. For GT, remuneration for the continuity of supply (RCS) component is being phased out gradually. • Cost-efficiency incentives—for ET, the CAPEX sharing mechanism has changed. Where there is a large difference between the actual and reference costs, a different sharing rate of out-/underperformance has been introduced. For ET, an efficiency parameter on OPEX has been introduced to share efficiency achieved in the previous period with network users. For ET, unit costs were not updated before the current regulatory period. • Output targets—for ET, a change was introduced following the previous price control in the availability

[25] See BANCA IMI (2020), 'Company Note. Terna', p. 1. Moody's (2020), 'Regulated electric and gas networks – EMEA', 2 December, p. 24, Exhibit 22.

Property	Risk compared to RIIO-2	Description
		threshold for the incentive mechanism to maximise grid availability, in order to strengthen the incentive.
		• Rate of return methodology—a new methodology to set the financial remuneration was established in 2019. WACC is now used instead of adding a spread (and an additional RCS component in GT) on top of the average yield on Spanish government bonds.
		• RfR methodology—this is not applicable as the financial remuneration methodology has changed.
		• Cost of debt methodology—this is not applicable as the financial remuneration methodology has changed.
Profit buffer	Similar risk	There are positive and negative effects of different elements, while the net position is unclear. Since it is unclear whether there is any upward or downward bias, we conclude that the risk is similar to RIIO-2.
		• Grants are generally excluded from the RAB, but in the case of EU funds, only 90% of the amount received will be deducted from the RAB. This implies lower risk.
		• Assets under construction are not included in the RAB. This implies higher risk.
		• In GT, an RCS component (remuneration for continuity of supply) is provided on top of the building blocks. This component was linked to demand in the previous regulatory period. Since the RCS revenues were fixed for 2020, for each of the years of the regulatory period, a decreasing share of this amount will be recognised. This implies lower risk.
		• In ET, incentives to maximise grid availability range from -3.5% to +2.5% of the OPEX allowance for that asset. The impact on risk is unclear as the probability-weighted range is not known.
		• The REVU component allows for higher OPEX for fully depreciated assets. There is no concept of OPEX directly linked to fully depreciated assets in RIIO-2; therefore, the impact on risk compared to RIIO-2 is unclear.
Cost-efficiency incentives—OPEX	Similar risk	In ET, as in Italy, there is full exposure to out- and underperformance of efficiencies over the course of the regulatory period in which these are incurred. In addition, the targets are set in a way that strengthens the incentive—the target OPEX is set at the level of actual OPEX in the base year + 50% of out- or underperformance in the base year, instead of being linked to the actual OPEX in the base year. The incentive is more high-powered than in RIIO-2 and would therefore imply higher risk. On the other hand, base-year costs are not reduced by an efficiency factor to set the target, limited regulatory judgement is applied to set ex ante allowances, no ex post adjustments are mentioned in the methodology, and ex ante allowances are not benchmarked to other companies, which would all imply lower risk. On balance, we consider the risk associated with OPEX allowances in ET to be similar to RIIO-2.
		In GT, there is also full exposure to out- and underperformance of efficiencies over the course of the regulatory period in which these are incurred. The targets are based on reference costs set by the regulator without direct reference to the company's recent actual costs. These factors would imply a higher

Property	Risk compared to RIIO-2	Description
		risk than in RIIO-2. However, no ex post efficiency adjustments are mentioned in the methodology. In addition, there is an asymmetric efficiency incentive—the company can keep 50% of its outperformance in the previous regulatory period. No penalty for underperformance is mentioned in the methodology. Given that these factors imply lower risk than in RIIO-2, we conclude that, on balance, the risk is similar.
Cost-efficiency incentives—CAPEX	Similar risk in ET Higher risk in GT	In ET, cost allowances are set based on reference costs, which are not necessarily linked to the recent actual costs. Given that no rules are specified, this might arguably be associated with higher risk than in RIIO-2, where costs are benchmarked against other companies. The sharing and corresponding incentive rates are also in the same range as those in RIIO-2, and have an element similar to the return adjustment mechanism (RAM) in RIIO-2. The details are as follows. • If the actual costs are *below* the reference costs, the minimum of 50% of the difference and 12.5% of the actual costs are allowed to be added to the RAB in addition to the actual costs. (We find these comparable to the 33–50% incentive rates range in RIIO-2.) • If the actual costs are *above* the reference costs, the minimum of 50% of the difference and 12.5% of the reference costs are allowed to be added to the RAB in addition to the reference costs. (We find these comparable to the 33–50% incentive rates range in RIIO-2.) Significantly higher costs need to be justified. We assume that poorly justified costs may not be allowed for partial recovery, which is similar to the ex post adjustments applied in RIIO-2. Overall, we consider this to be associated with a similar risk to that in RIIO-2. In GT, cost allowances are also set based on reference costs, which are not necessarily linked to the recent actual costs. As in ET, we consider this to be higher risk than in RIIO-2. A 50% sharing rate is applied to out- and underperformance, which is comparable or even somewhat higher than in ET (where companies bear at most 50% of the difference) and RIIO-2 (where companies bear 33–50% of the difference). In addition, ex post efficiency adjustments may be applied to the actual costs before sharing. Given that this is applicable to all costs, we consider this to be greater risk than in ET or RIIO-2. Overall, we consider risk to be slightly higher than in RIIO-2.
Cost-efficiency incentives—cost of debt	Similar risk	The cost of debt allowance is set using a comparator-based approach and is not company-specific, although it is different for ET and GT.
Demand risk	Similar risk	In ET, there is no direct volume risk exposure. In GT, there is a component of revenues that varies with demand (RCS). However, the component is additional to the building blocks, i.e. it provides an upside without a downside. Overall, the risk is higher than an additional component without volume risk, but lower than having no additional component at all. Since the asymmetry of additional components is considered as a separate factor, we conclude on a similar risk here.

Source: Oxera, based on regulatory determinations.

3B.5   Belgium: electricity transmission

Property	Risk compared to RIIO-2	Description
Appeal regime	Similar risk	The law provides for an appeal to the *Cour des marches* (the markets court) against all decisions of the CREG, and to the Belgian Competition Authority against certain decisions. In practice, all decisions regarding tariffs and allowed returns have been referred to the court rather than to the competition authority.
Examples of political interference	Similar risk	We are not aware of explicit examples of political interference into the CREG's regime and could conclude on the risk being lower than RIIO-2. However, this is countered by the higher risk in relation to the regulatory independence (see below), and we therefore mark this factor as indicating similar risk.
Regulatory independence	Higher risk	In 2019, the European Commission referred Belgium to the ECJ for not giving the national energy regulator sufficient independence, as required by EU rules.[26] In particular, the Commission pointed out that the Belgian national energy regulator can only make proposals to the government, which is in turn responsible for taking decisions. This shows that the regulator is not entirely independent, which is associated with a higher risk than RIIO-2.
Regulatory consistency	Lower risk	The law governing the electricity transmission methodology is general in nature and does not include highly specific articles that would significantly limit CREG's ability to exert regulatory discretion. However, the vast majority of the components of CREG's decisions are identical across the two most recent regulatory periods (including WACC parameters such as the equity risk premium (ERP) and an allowed minimum equity beta threshold).[27] This implies a high regulatory consistency and a low level of regulatory judgement applied.
		A few changed and unchanged elements of the regime are outlined below.
		• Set of incentives—incentives to improve quality have changed since the previous price control.
		• Cost-efficiency incentives—unchanged cost incentive mechanism and sharing rates on controllable costs since the previous price control; a shift from 15% to 20% of 'influenceable costs' out- and underperformance being borne by the company; a revision to the ex ante cost allowances.
		• Output targets—unclear from the reviewed sources whether output targets have been revised or not relative to the previous price control.
		• RfR methodology—a shift from ex post annual calculation (i.e. indexation) to ex ante determination of RfR. The methodology still relies on the same underlying government bonds.
		• Cost of debt methodology—has remained unchanged relative to the previous price control.

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[26] European Commission (2019), 'Energy: Commission refers Belgium to the Court for failing to comply with EU rules on electricity and gas markets', 25 July.
[27] The market beta is estimated annually based on Elia's stock returns. If the market beta is below the minimum beta threshold, the equity beta allowance is set at the level of the threshold. If the market beta is above the threshold, the market beta is allowed.

Property	Risk compared to RIIO-2	Description
Profit buffer	Lower risk	There are asymmetric performance incentives providing additional income to the network operator. The performance incentives are capped in terms of a total amount per incentive, as well as a percentage of the RAB.
		The performance incentives have ex ante allowances but the regulator has discretion to determine the aggregate amount ex post, with any differences being added to the income of the next regulatory period.
		Given that no penalties are involved and, although discretionary, the incentive can provide an upside only, we consider it to be associated with lower risks.
Cost-efficiency incentives—OPEX	Similar risk	The costs are categorised as 'non-manageable' (for which no sharing is considered), 'manageable' (or controllable) and 'influenceable' (less controllable than the manageable costs). For the manageable costs, the regulator allows 50% of under- and overperformance to be shared with consumers, while, for the influenceable costs, 80% can be shared. (These 50% and 80% rates are to be compared to the 50–67% sharing rates in RIIO-2.) Manageable and influenceable costs are set according to company-specific annual budgets and are subject to international comparison. In addition, ex post adjustments are applied in the case of changes to the scope of investments.
		The sharing factors are relatively similar to RIIO-2. Ex ante allowances are benchmarked to other companies where appropriate and the ex post adjustment mechanism was inspired by the RIIO framework—overall, we consider the risks to be similar to RIIO-2.
Cost-efficiency incentives—CAPEX	Similar risk	As for OPEX, the costs are categorised as 'non-manageable' (for which no sharing is considered), 'manageable' (or controllable) and 'influenceable' (less controllable than the manageable costs). For the manageable costs, the regulator allows 50% of under- and overperformance to be shared with consumers. For the influenceable costs, 20% of outperformance is retained by the network operator (with no risk exposure for underperformance) if it is below the cap of €6m—not a significant amount. (The 50% and 20% rates are to be compared to the 33–50% incentive rates in RIIO-2.)
		The regulator's methodology is not explicit about international benchmarking and ex post adjustments for CAPEX, but we assume the treatment is the same as for OPEX. In addition, CAPEX is subject to cost–benefit analysis carried out by the network operators, which needs to be approved by CREG. This ensures that the investments are carried out efficiently.
		Overall, a similar treatment to OPEX and therefore RIIO-2.
Cost-efficiency incentives—cost of debt	Lower risk	There is pass-through of the actual cost of debt.
Demand risk	Similar risk	A revenue cap is in place, as in GB energy.

Source: Oxera, based on regulatory determinations.

3B.6   Germany: electricity transmission

Property	Risk compared to RIIO-2	Description
Appeal regime	Similar risk	BNetzA rulings in the energy sector may be challenged before civil courts. Decisions are appealed to the 'Kartellsenat' of OLG Düsseldorf (a regional court) in the first instance and can then be appealed to the Bundesgerichtshof (BGH), the highest German civil court.
		Little attention is given to economic arguments, which could imply that the regulator has greater discretion in its decisions and would be associated with higher risk. However, as explained below, BNetzA does not have much discretion in the first place, with most of the methodologies being prescribed by law. As explained in the principles section, it is the overall level of discretion that matters.
		Overall, we see this regime as lower risk than RIIO-2, which is reflected in the regulatory consistency criteria.
Examples of political interference	Lower risk	We are not aware of examples of regulatory pressure on companies to charge customers less than was agreed in the price review that could be driven by political motives. As outlined in the regulatory assessment section, the methodologies in the regulatory framework are specified in law, which arguably makes it less likely that they would be violated. We conclude that the risk corresponding to this factor is lower than RIIO-2.
Regulatory independence	Similar risk	On 2 September 2021, the ECJ ruled that the German Federal Government's legislative approach to prescribing a specific and detailed regulatory methodology violates the political independence of the BNetzA. The ECJ pointed out that the BNetzA should have 'complete independence' from political bodies. This shows that the regulator is not entirely independent, which is arguably associated with a higher risk than having examples of political interference in GB energy. However, given that the methodologies are prescribed by law, arguably even the government's discretion on regulatory decisions is limited. We therefore see this regime as lower risk than RIIO-2, which is reflected in the regulatory consistency criteria. To reflect that we do not consider the regulatory independence factor to offset the regulatory consistency factor, we mark the regulatory independence criterion as indicating a similar risk.
Regulatory consistency	Lower risk	The regime is characterised by a high level of consistency, with many methodologies having been set in law (although this may change over time, following the ECJ decision) and therefore not being subject to regulatory discretion. The details are as follows.
		• Set of incentives—these are fixed in law.
		• Cost-efficiency incentives—ex ante cost allowances have been revised since the last price control period, but cost assessment methodologies are fixed in law.
		• Output targets—the targets have been revised since the last price control period, but the law prescribes the methods used to determine them.
		• RfR methodology—this is prescribed by law.
		• Cost of debt methodology—this is prescribed by law.

Property	Risk compared to RIIO-2	Description
		Following the ECJ decision against Germany, the regime may be reformed in the near future. However, the regulator has announced that it will minimise uncertainties associated with the transition process, and until the law prescribing the framework is unchanged, the regulator has to comply with it.
Profit buffer	Similar risk	A symmetric reward/penalty mechanism is in place for balancing energy and congestion management costs, which is broadly consistent with the symmetry of ODI rewards and penalties in RIIO-2.
Cost-efficiency incentives—OPEX	Similar risk	Ex ante allowances are set for controllable TOTEX based on the costs in the base year. They are subject to an efficiency challenge across networks, the methodology for which is prescribed by law. No sharing is applied to out- and underperformance.
		Permanently uncontrollable costs are passed through to allowed revenues. No ex post adjustments are allowed.
		Due to no sharing of deviations in controllable costs from allowances, this could be considered higher risk than in RIIO-2. However, this is balanced out by the fact that no elements are dependent on the regulator's ex post discretional assessment and limited elements are dependent on its ex ante discretional assessment (due to the methodologies being fixed in law). Therefore, we consider the risk to be similar.
Cost-efficiency incentives—CAPEX	Lower risk	The amount allowed for recovery of baseline costs is based on the actual book value and a linear depreciation, and is therefore similar to a pass-through allowance.
		Expansion and restructuring investments are approved in advance, but the costs are treated as non-controllable with full recovery allowed.
		Since the mechanism is similar to a pass-through, and the opportunities for regulatory discretion are limited, we consider the risk to be lower than in RIIO-2.
Cost-efficiency incentives—cost of debt	Lower risk	The actual cost of debt is passed through if considered efficient, according to the methodology prescribed by law.
Demand risk	Similar risk	A revenue cap is in place

Source: Oxera, based on regulatory determinations.

3B.7 Great Britain: water

Property	Risk compared to RIIO-2	Description
Appeal regime	Lower risk	Regulatory judgement is bound by the appeal system where the CMA redetermines any appealed determinations. Given that the scope of the CMA's review is not limited to considering the regulator's errors under specific grounds of appeal, but is as broad as redetermining the price control, we consider the constraints to regulatory discretion to be greater than in RIIO-2 and the systematic risk to be lower.

Property	Risk compared to RIIO-2	Description
Examples of political interference	Similar risk	As in GB energy, there are examples of regulatory pressure on companies to charge customers less than was agreed in the price review. For example, in 2014 Ofwat called on companies not to make use of their full allowed price increases in light of the difficult economic circumstances faced by customers. Six companies committed to reducing the allowed bill increases.
Regulatory independence	Similar risk	Ofwat is an independent regulator which sets tariffs independently from the government.
Regulatory consistency	Similar risk	Without major changes to regulatory principles, Ofwat reviews its framework methodologies to set parameters and parameter estimates at every price control review. Sophisticated methodologies and regulatory judgement are applied in the review process. Examples of changes between the PR14 and PR19 price controls are as follows. • Set of incentives—the set of ODIs was revised. • Cost-efficiency incentives—'menu regulation' was removed, sharing rates were revised, ex ante allowances were revised (including the methodology to assess enhancements separately), and a stricter efficiency challenge was introduced. • Output targets—these were revised. • RfR methodology—Ofwat switched to spot rates for 15-year RPI-linked gilts uplifted with market expectations for forward rates to set the RfR in PR19, after using a combination of a ten-year historical average, regulatory precedents and forward-looking expectations in PR14. • Cost of debt methodology—the cost of new debt was indexed in PR19 after being fixed in PR14. In addition, the details of the methodology were revised. For example, the length of the trailing average for the cost of embedded debt was increased from 10 to 15 years.
Profit buffer	Similar risk	ODIs are negatively skewed, rendering the risk slightly higher than in RIIO-2, where, according to Ofgem, ODIs are balanced on a probability-weighted basis. However, given that this is subject to a detailed assessment with judgement involved, we consider that assessing this as similar risk to RIIO-2 is appropriate.
Cost-efficiency incentives—OPEX	Similar risk	There is an incentive mechanism on TOTEX. Ex ante allowances are subject to benchmarking against other companies in the industry, similar to RIIO-2. The share retained by the companies ranges from 31.9% to 60.1% for outperformance and the share borne for underperformance ranges from 50% to 75%, applicable to both water resources and water network plus controls. For wastewater, the equivalent ranges are from 33.2% to 59.1% (outperformance) and 50% to 75% (underperformance). Given that the sharing rates are asymmetric with greater exposure to underperformance than to outperformance, we consider this to be higher risk than in RIIO-2. There is no material ex post cost assessment, which reduces regulatory discretion and risk to companies. There are no volume drivers, which could be argued to increase cost risks relative to RIIO-2 where volume drivers are used. However, assuming 'within period'

Property	Risk compared to RIIO-2	Description
		CAPEX in water is more predictable than in energy, we consider that the volume drivers mechanism in RIIO-2 is required to balance the underlying higher uncertainty for energy networks.
		Overall, we consider the risk to be similar to RIIO-2 because the factors mentioned above balance out.
Cost-efficiency incentives—CAPEX	Similar risk	As above.
Cost-efficiency incentives—cost of debt	Similar risk	Similar to RIIO-2, the cost of debt is not based on the company-specific actual cost of debt. Ofwat can make company-specific adjustments, which Ofgem is also able to do in RIIO-2, although in practice such adjustments are few and small.
Demand risk	Similar risk	A revenue cap is in place. There is a two-year true-up period, as in RIIO-2.

Source: Oxera, based on regulatory determinations.

3C   Conclusion on the regulatory regimes assessment

3.17   Based on the above assessment, we identified two comparator companies that are regulated under regimes with lower systematic risk than RIIO-2: REN, operating in Portugal, and Elia, operating in Belgium and Germany.

- The **Portuguese** (ET) regime is associated with a high degree of regulatory consistency over time in applied methodologies and parameters, a greater potential for a positive profit buffer, as well as lower-powered cost-efficiency incentives, which limit the scope of regulatory discretion.

- The **German** (ET) regulatory regime is also associated with a high degree of regulatory consistency over time, with the majority of methodologies having been prescribed by law in past regulatory decisions—albeit this may gradually change following the recent ECJ decision that calls for greater regulatory independence. In addition, company-specific interest expenses on debt are allowed for as a pass-through item, subject to being checked for efficiency, and CAPEX cost-efficiency incentives are lower-powered and leave the regulator with limited discretion.

- The **Belgian** (ET) regulatory regime is also associated with somewhat lower risk, with one factor showing higher risk and a few showing lower risk. In combination with our assessment of the German regime as being lower risk, we conclude that Elia is overall subject to lower regulatory risk.

3.18   We consider the Italian and Spanish regulatory regimes to be broadly similar to RIIO-2 in terms of their systematic risk, although there is still some variability.

- We assess the risk of the **Italian** regulatory regimes as being slightly lower than that of RIIO-2, primarily due to the CAPEX recovery mechanism being similar to a cost-plus basis. However, we consider them to be more similar to RIIO-2 than those described above, because all process factors and the rest of the regime design factors except for CAPEX are similar. The Italian regimes correspond to Italgas, Snam, and Terna.

- We find that the **Spanish** regimes (applied to Red Eléctrica and Enagás) are associated with similar risks to those of RIIO-2 across the factors, with one exception for GT (Enagás): we find CAPEX incentives in GT to be associated with greater regulatory discretion and hence higher risk. This is, however, only one of the design factors, while all process factors imply similar risk.

3.19 The **E&W water regime** (as represented by United Utilities and Severn Trent in our assessment) is associated with lower risks than those of RIIO-2 in relation to the process factors. In particular, it is the E&W water redetermination regime that is unique in its power of protecting investors from the consequences of regulatory judgement. As explained above, we put more weight on process factors than individual regime design factors because the former cover the entire regime, while the latter are related only to individual parts of it. Based on that, we conclude that the difference between E&W water and RIIO-2, on the one hand, is greater than the difference between Italian/Spanish regimes and RIIO-2, on the other hand.

3.20 Table 3.1 summarises this assessment.

Table 3.1   Summary of risk comparison by assessment criterion

Property	Portugal (ET)	Italy (GD/GT/ET)	Spain (GT/ET)	Belgium (ET)	Germany (ET)	E&W water
Regulatory process factors						
Appeal regime	Similar	Similar	Similar	Similar	Similar	Lower
Examples of political interference	Similar	Similar	Similar	Similar	Lower	Similar
Regulatory independence	Similar	Similar	Similar	Higher	Similar	Similar
Regulatory consistency	Lower	Similar	Similar	Lower	Lower	Similar
Regime design factors						
Profit buffer	Lower	Similar	Similar	Lower	Similar	Similar
Cost-efficiency incentives— OPEX	Lower	Similar	Similar	Similar	Similar	Similar
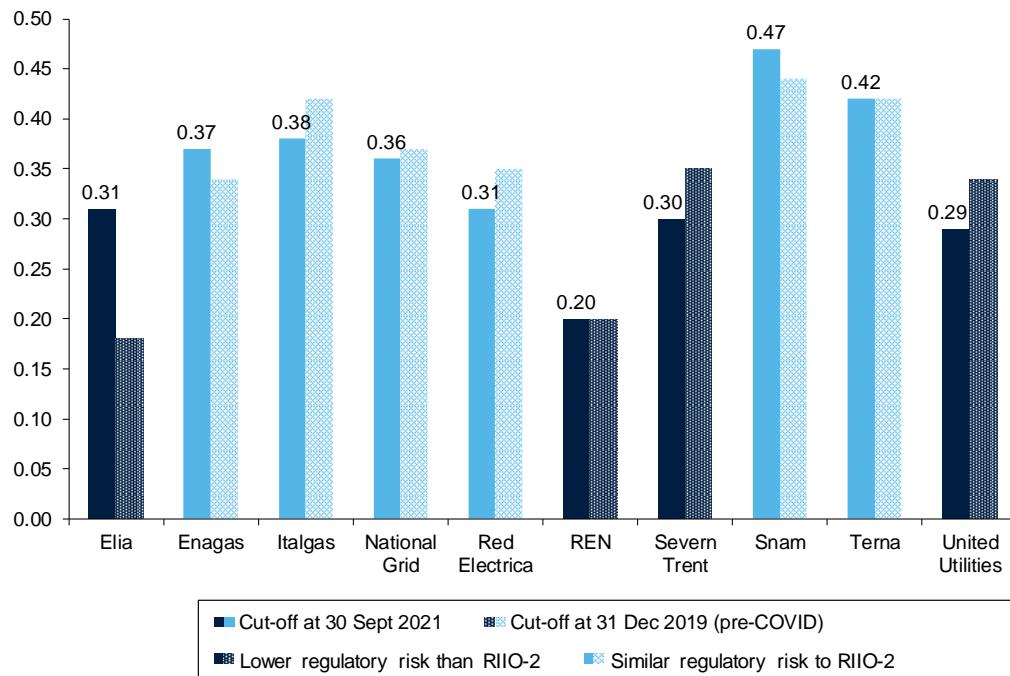
|						
Cost-efficiency incentives—CAPEX	Lower	Lower	Similar risk in ET Higher risk in GT	Similar	Lower	Similar
Cost-efficiency incentives—cost of debt	Similar	Similar	Similar	Lower	Lower	Similar
Demand risk	Similar	Similar	Similar	Similar	Similar	Similar
Overall conclusion	**Lower**	**Similar (towards lower risk)**	**Similar (towards higher risk for GT)**	**Lower[1]**		**Lower**
Comment	Regulator's consistency in applied methodologies and parameters (process), lower-powered cost-efficiency incentives (design)	Framework similar to GB energy with lower-powered CAPEX incentives (design)	Framework similar to GB energy, with higher risk for GT due to CAPEX incentives being associated with greater regulatory discretion (design)	High degree of regulatory consistency in applied methodologies (process) and lower risks on financing costs in both regulatory regimes (design)		Lower regulatory discretion due to the redetermination regime (process) with similar regime design

Note: [1] We draw a conclusion for Belgian and German regulatory frameworks together for the assessment of risks associated with Elia's networks operating in both countries.

Source: Oxera.

3.21 Figure 3.3 below presents our assessment next to the current and pre-COVID-19 five-year asset beta estimates. It shows that the market asset betas of REN and Elia are lower than those of most other companies in the comparator set, and that this is particularly pronounced for the data unaffected by the COVID-19 pandemic. This is consistent with our assessment of the regulatory frameworks.

3.22 Figure 3.3 also shows that the market asset betas of Severn Trent and United Utilities are towards the lower end of the betas range for the rest of the comparators. This is again consistent with our assessment of the regulatory frameworks.

Figure 3.3   Five-year market asset betas against comparative risk assessment of systematic risks associated with regulatory regimes

Note: UK company equity betas are estimated relative to the FTSE All-Share index, using daily data. European energy company equity betas are estimated relative to the EuroStoxx TMI index, using daily data. A debt beta of 0.05 is assumed.
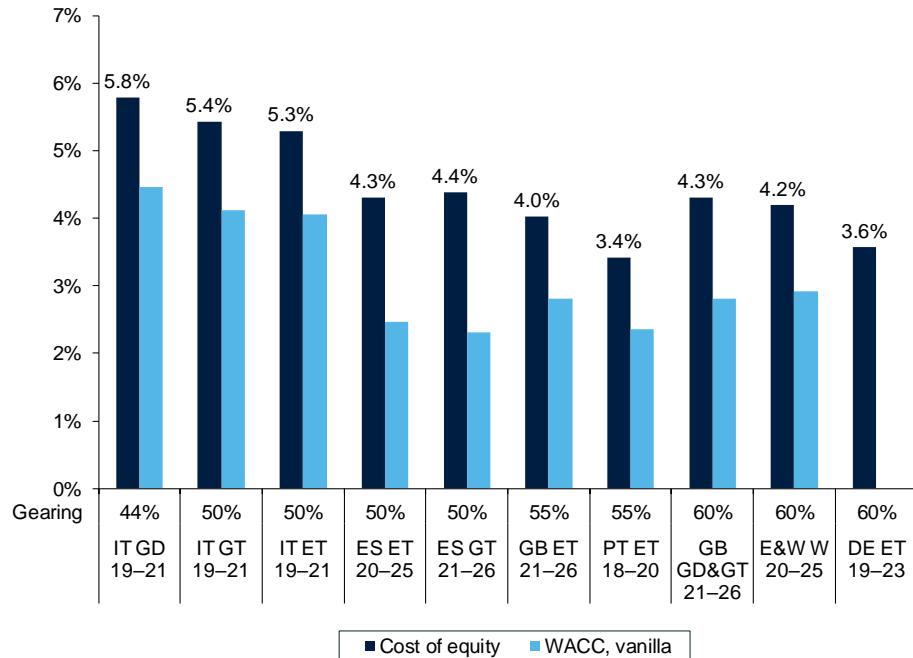
Source: Oxera analysis.

3.23   Figure 3.4 presents the cost of equity and WACC regulatory allowances for the assessed regulatory periods in the price controls considered. We observe that Portuguese (for REN) and German (for Elia)[28] regulators provide lower cost of equity allowances to these companies, despite using higher notional gearing. This once again shows that the judgement of these national regulators over the relative level of required returns is consistent with our qualitative assessment of risk.

3.24   The figure also shows that Ofwat provides a lower cost of equity allowance to E&W water networks than Ofgem does to GD and GT networks (the notional gearing for which is comparable with E&W water unlike that of ET networks). This comparison does not hold for Ofgem's GD and GT GB energy networks cost of equity allowances (4.30% CPIH-real) and the CMA's redeterminations

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[28] There is no set cost of equity allowance in Belgium—equity beta (and therefore the cost of equity) is updated annually, based on market estimates with a floor.

for E&W water (4.73% CPIH-real).[29] However, we consider that to be reflective of the differences in the appeal regime.

Figure 3.4   Regulatory cost of equity and WACC allowance across regulatory regimes (real)

Note: E&W W—E&W water. Where the European regulatory regimes are specified on a nominal basis, an assumption of 2% inflation is used to convert the allowances from nominal to real terms. There are no cost of debt or WACC allowances in Germany as the cost of debt is recoverable for each company individually. There are no set allowances in Belgium—as in Germany, the cost of debt is recoverable for each company individually, while the allowed equity beta (and therefore the cost of equity) is updated annually based on market estimates, with a floor applied. GB energy allowances are shown after the impact of the outperformance adjustment and on a CPIH-real basis. E&W water allowances are also shown on a CPIH-real basis.

Source: Oxera, based on regulatory determinations. E&W water allowances also correspond to Ofwat's rather than CMA's determination.

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[29] CMA (2021), 'Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited Price Determinations. Summary of Final Determinations', 17 March, Table 7, p. 27.

4 Step 3—cross-check on traded yield spreads

4.1 To cross-check our risk assessment of regulatory frameworks, we examined the cost of traded debt (using data on traded yield spreads) of water and energy comparators as a measure of relative risk. Wider yield spreads, when controlling for differences in gearing and maturity, indicate higher asset risk premium and therefore asset risk. As such, traded yield spreads can be used as a cross-check on the information contained in market asset betas and on the qualitative assessment of risks.

4.2 By controlling for differences in gearing, we are aiming to capture a significant proportion of non-regulatory factors affecting the credit rating (and hence the yield spread). Indeed, financial ratios are typically related to gearing, and they form an important evidence base for the overall credit rating—40% of the final scoring, according to the Moody's methodology. However, a detailed assessment of the factors that determine the credit rating would complement the analysis.

4.3 Box 4.1 describes the bonds selected for the analysis and how we estimated yield spreads.

Box 4.1   Data used for the yield spreads analysis

Selection of bonds
Using Dealogic and Bloomberg, we searched for corporate bonds currently outstanding for Elia, Enagás, Italgas, NG, RE, REN, ST, Snam, Terna, and United Utilities.

Two filters are applied to the search results:

- no embedded options (i.e. not callable or puttable)—embedded options are valuable to either the issuer (callable) or the investors (puttable), and these additional values could affect the bond yields, making them less comparable to the yields of vanilla bonds without embedded options;

- the bond has a maturity between five and ten years, to minimise the impact of any residual term premium embedded in yield spreads. Since no REN bonds have maturities longer than five years, we make an exception for REN and include three REN bonds with 1.7, 2.7 and 3.4 years of remaining time to maturity respectively (as of September 2021).

After the filtering, we identified 35 bonds issued by nine companies (19 by UK companies and 16 by European companies). The individual bonds are presented in Appendix A2.

Calculating yield spreads
For all bonds, we use a one-month average traded yield to maturity (YTM) to estimate the yield spreads. The index-linked bonds are considered in combination with break-even inflation.
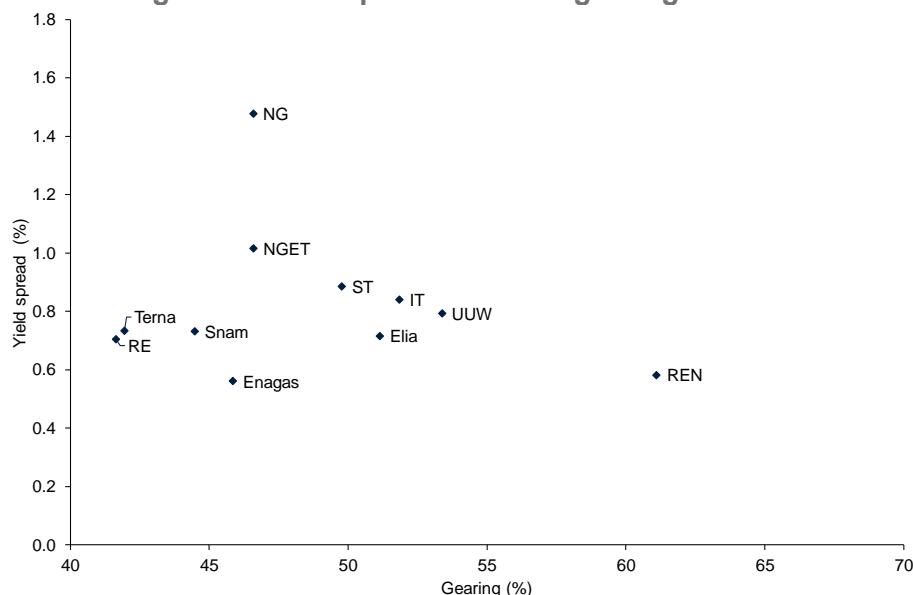
Yield spreads are calculated by subtracting the maturity-matching sovereign yields from the traded YTMs of the corporate bonds. In addition to maturity, the currency denomination of the sovereign yields matches those of the corporate bonds.

> For EUR-denominated bonds, we calculate yield spreads using the average yields of maturity-matching German and Dutch government bonds, as Germany and the Netherlands are the only two major eurozone members with an AAA credit rating from S&P.

Source: Oxera.

4.4 Index-linked bonds, when considered in combination with break-even inflation, tend to show yields that differ from comparable fixed-rate bonds. We observe this effect in our analysis, with index-linked bond spreads calculated in this way being consistently higher, and therefore consider fixed-rate bonds separately from the index-linked ones.

4.5 Figure 4.1 shows the companies' weighted-average bond spreads, limited to fixed-rate bonds, against their market gearing ratios, calculated as market capitalisation/(book value of net debt + market capitalisation). Figure 4.2 provides more detail, outlining the spreads of individual bonds for the same companies. For more granularity, the spreads of the inflation-linked bonds (which are not used to calculate the weighted-average spreads for Figure 4.1) are also presented in Figure 4.2 (in light blue).
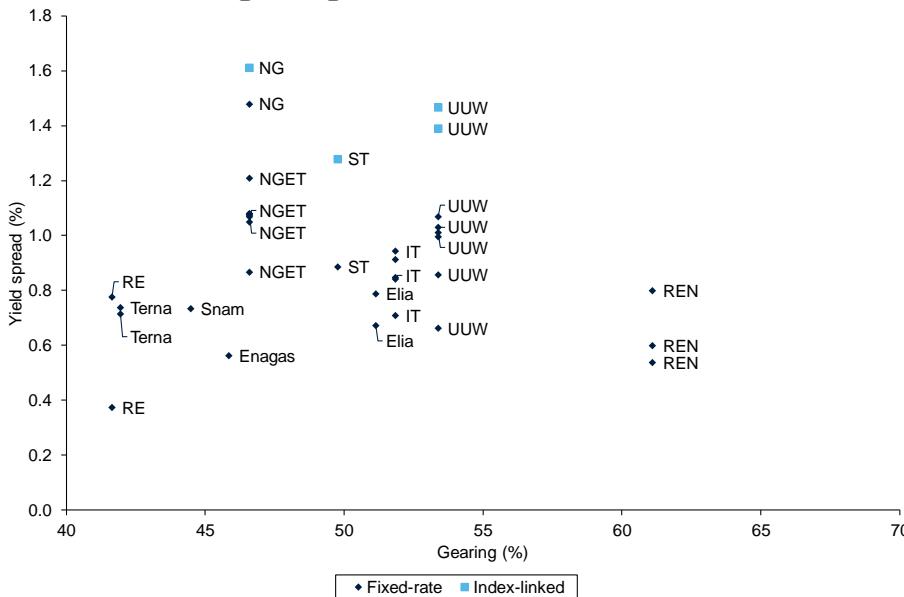
**Figure 4.1   Weighted-average yield spreads for fixed-rate bonds against the companies' market gearing**

Note: Based on the traded YTMs over the month preceding 30 September 2021. UUW—United Utilities water, NG—National Grid Group (excluding NGET bonds), NGET—National Grid Electricity Transmission. The gearing is based on 2020 (or FY 2020/21).

Source: Oxera analysis based on Bloomberg and Dealogic data.

Figure 4.2   Yield spreads of individual bonds against the companies' market gearing

Note: Based on the traded YTMs over the month preceding 30 September 2021. The gearing is based on 2020 (or FY 2020/21).

Source: Oxera analysis based on Bloomberg and Dealogic data.
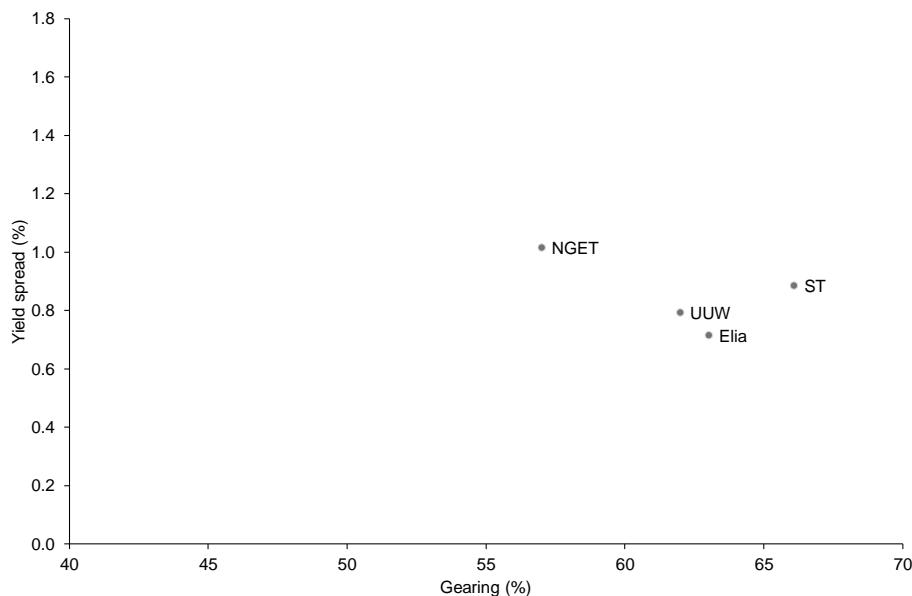
4.6   National Grid Group and NGET, despite having lower gearing, have similar or wider yield spreads than Severn Trent and United Utilities. This implies that National Grid Group and NGET have higher credit risk (when controlling for differences in gearing) and are likely to have higher asset risk than the water networks.

4.7   We also observe that the yield spreads for REN and Elia are similar to the yield spreads for Terna, Snam, Red Eléctrica, and Enagás, while the gearing ratios of REN and Elia are higher. The gearing of Elia and Italgas are at about the same level, but Elia's spreads are lower, which is consistent with the relative assessment of Elia against other companies. In other words, after controlling for gearing, the yield spreads of REN and Elia are narrower than those of the rest of the European networks in the sample.[30] The same pattern can be observed in the market asset betas of these companies—they are lower than the market asset betas of other European comparator networks.

4.8   The data is less conclusive regarding the comparative risks of the seven European energy comparators taken as a group and the UK water networks.

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[30] Unlike all the other bonds in the sample, the remaining time to maturity for REN's bonds is less than five to ten years (see Box 4.1 for details). The lower yield spreads could therefore be partly reflective of the lower embedded remaining time premium. At the same time, REN's gearing is significantly higher than the levels of the other European networks, while only the remaining time premium would be embedded in the spread (with the remainder being controlled for by subtracting the maturity-matching sovereign yields). We therefore find the evidence informative, even though not entirely consistent with the rest of the sample.

The yield spreads of the UK water networks are slightly wider; however, their gearing ratios are also higher, and it is therefore unclear how the yield spreads would compare when controlling for gearing.

4.9   To ensure the robustness of our analysis, we also test the sensitivity of the above results to two adjustments: controlling for the 'ring-fencing' status of bond issuances; and replacing market gearing with regulatory gearing for the UK issuers.

- First, we control for the status of the issuing companies based on their ring-fencing status, which determines the ultimate economic entity responsible for paying the coupon payments and principal repayments of the bonds issued. In our analysis, 'ring-fenced' issuances include those paid for by entities that operate the underlying regulated assets, and 'not ring-fenced' issuances include those paid for by the holding companies, which are the ultimate owners of both the regulated and unregulated assets. For example, issuances paid for by, and only by, NGET are separated from those paid for by the National Grid Group. This sensitivity helps to test whether 'ring-fence' status has an impact on the observations on yield spreads set out above. According to our assessment, the UK-based issuers as well as Elia are ring-fenced.

- Second, for ring-fenced issuers, we replace their market gearing with their regulated gearing, which we obtain from their regulatory accounts. The regulated gearing is defined as net debt/RAB, which more closely tracks the gearing of the ring-fenced issuers' regulated activities.

4.10   Figure 4.3 below shows the ring-fenced issuers' weighted-average yield spreads, limited to fixed-rate bonds, against their regulatory gearing ratios. Figure 4.4 provides more detail, outlining the spreads of individual bonds for the same companies.

4.11   The results observed from these charts are largely consistent with those summarised above. The key finding is that, after applying regulatory gearing to ring-fenced UK issuers, NGET remains as having lower gearing and yield spreads that are similar to or wider than those of Severn Trent and United Utilities, implying a higher credit and, by extension, asset risk.
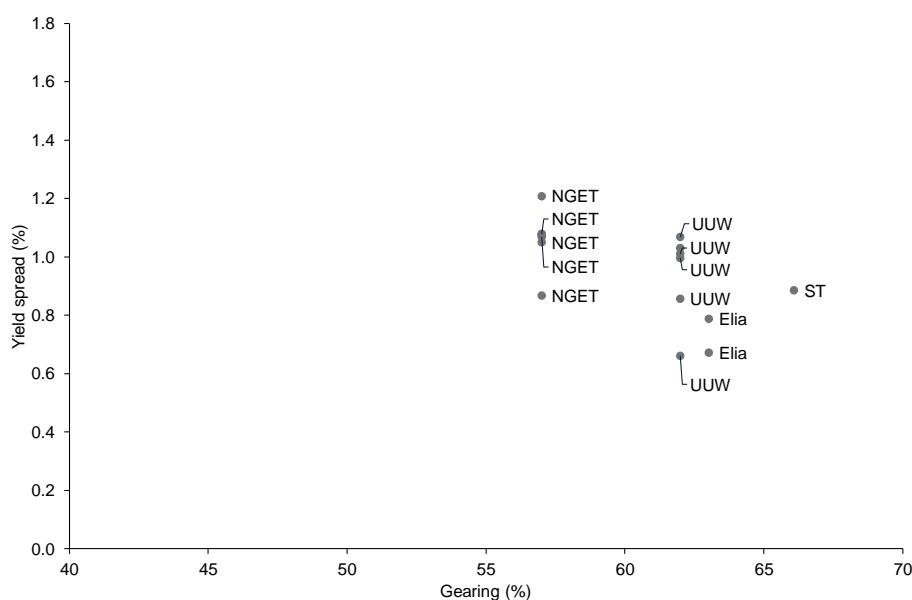
Figure 4.3   Weighted-average yield spreads for fixed-rate bonds against the companies' regulatory gearing for ring-fenced issuers

Note: Based on the traded YTMs over the month preceding 30 September 2021. Regulatory gearing is based on FY 2020/21 data for all companies but Elia, for which 2019 data is used due to data availability.

Source: Oxera analysis based on Bloomberg and Dealogic data.

**Figure 4.4   Yield spreads of individual fixed-rate bonds against the companies' regulatory gearing for ring-fenced issuers**

Note: Based on the traded YTMs over the month preceding 30 September 2021. Regulatory gearing is based on FY 2020/21 data for all companies but Elia, for which 2019 data is used due to data availability.

Source: Oxera analysis based on Bloomberg and Dealogic data.

5 Conclusion

5.1 As a result, we identified six networks that could be considered as having systematic risks comparable to those of the GB energy networks, based on the factors assessed in this report: Enagás, Italgas, National Grid, Red Eléctrica, Snam, and Terna. We find the regulatory frameworks of these networks to be sufficiently comparable to RIIO-2 and see no reason to exclude them from the sample of comparators based on this factor.

- According to our assessment, the regulatory frameworks of the other two energy networks that we assessed, REN and Elia, are associated with lower systematic risk than RIIO-2. This is supported by our analysis of the yield spreads on the networks' bonds. Moreover, the stock of these companies is relatively illiquid, which might result in their market beta estimates underestimating their systematic risks. Therefore, we consider it appropriate to exclude REN and Elia from the sample.

- We also find that the regulatory framework for E&W water is associated with lower risks than those of RIIO-2 due to the redetermination regime, which characterises the regulatory process. We give significant weight to regulatory process factors. In addition, the evidence from yield spreads suggests that E&W water networks have lower asset risk than NGET. Therefore, we conclude that E&W water companies should also be excluded from the sample.

5.2 Although we found the systematic risks of the companies in our final comparator set sufficiently comparable, the range of their market asset betas is still relatively wide. Assessing the factors that may be driving that variance could be complementary to our analysis. That could include an assessment of business risk factors such as long-term demand risks and growth opportunities, and an assessment of the regulatory frameworks of the remaining regulated parts of the businesses.

A1 Proportion of regulated revenue and asset betas

A1.1 Revenues subject to regulation are typically less exposed to changes in the economic environment than revenues derived from open-market activities. This notion motivated us to investigate whether any of the comparatively higher market betas are the result of firms having exposure to unregulated business environments.

A1.2 To do this, we collect information about the proportion of regulated revenue. Box A1.1 details the sources and methodology we use to obtain regulated revenues.

Box A1.1   Sources and methodology to obtain proportions of regulated revenues
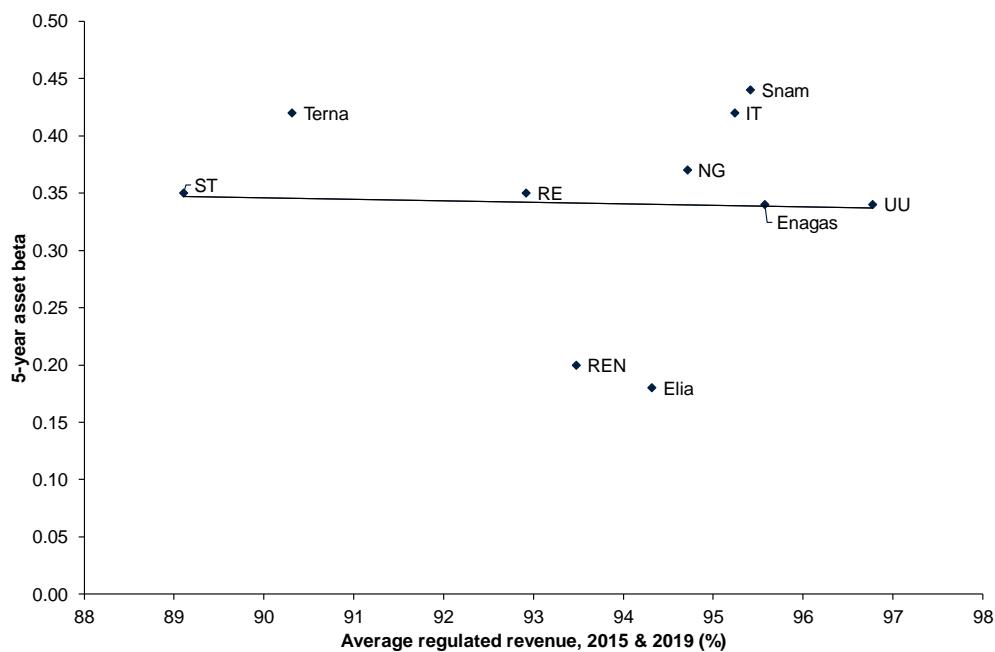
We obtain regulated revenues from companies' annual accounts and express them as a share of total revenues, for both 2015 (or FY 2014/15) and 2019 (or FY 2018/19).

Where companies report their regulated revenues, we use these readily available values. Where companies do not give a breakdown of their revenues by regulated and unregulated segments, we calculate these by qualifying business segments as regulated or unregulated. Revenues are classified as regulated even if the regulated activities are in other industries or other countries—i.e. regulated revenues do not necessarily derive from utility network activities.

Source: Oxera.

A1.3 Figure A1.1 below displays the relationship between the five-year market asset beta as at December 2019 and the average percentage of regulated revenues in 2015 and 2019. The figure shows no notable correlation.

Figure A1.1   Percentages of regulated revenues plotted against five-year market asset betas

Note: Proportions of regulated revenues are based on the average of 2019 (or FY 2018/19) and 2015 (or FY 2014/15) data. As the trendline demonstrates, there is no relationship in the data. Market asset betas are as at 31 December 2019, assuming a debt beta of 0.05. UK company equity betas are estimated relative to the FTSE All-Share index, using daily data. European energy company equity betas are estimated relative to the EuroStoxx TMI index, using daily data.

Source: Oxera analysis based on company annual reports and Bloomberg data.

Overall, based on our analysis of company market asset betas and the percentages of regulated revenues, we find no evidence to indicate that comparatively higher market betas of companies in our sample are related to high proportions of non-regulated revenues.

A2 Individual bonds used in the traded yield spreads cross-check

A2.1 Table A2.1 below shows the individual bonds selected for the traded yield spreads cross-check discussed in section 4.

Table A2.1   Bonds issued by companies considered in the traded yield spreads analysis

Company	ISIN	Maturity date	Time to maturity	Total face value (£m)	Index-linked	Currency	Reference rate (government bond)	1-month average spread (%)	Issuer credit rating[1]
Elia	BE0002432079	04/04/2028	6.52	466	n/a	EUR	Dutch and German	0.67	Baa1
Elia	BE0002466416	07/04/2029	7.52	290	n/a	EUR	Dutch and German	0.79	Baa1
Enagás	XS1403388694	05/05/2028	6.60	591	n/a	EUR	Dutch and German	0.56	Baa2
IT	XS2090807293	11/12/2031	10.20	421	n/a	EUR	Dutch and German	0.94	Baa2
IT	XS2032727310	24/04/2030	8.57	535	n/a	EUR	Dutch and German	0.91	Baa2
IT	XS1685542497	18/01/2029	7.31	664	n/a	EUR	Dutch and German	0.84	Baa2
IT	XS2299001888	16/02/2028	6.38	435	n/a	EUR	Dutch and German	0.85	Baa2
IT	XS1551917591	19/01/2027	5.31	648	n/a	EUR	Dutch and German	0.71	Baa2
NG	XS0132735373	27/07/2028	6.83	600	n/a	GBP	UK	1.48	Baa2
NG	XS0132734483	27/07/2030	8.83	1,000	RPI	GBP	UK	1.61	Baa2
NGET	XS0407912053	13/01/2031	9.29	379	n/a	GBP	UK	1.21	Baa1
NGET	XS0789331948	08/06/2027	5.69	575	n/a	GBP	UK	0.87	Baa1
NGET	XS2208310271	27/07/2028	6.83	100	n/a	GBP	UK	1.05	Baa1
NGET	XS0863543657	13/12/2027	6.21	24	n/a	HKD	Hong Kong	1.08	Baa1
NGET	XS0884734426	07/02/2028	6.36	25	n/a	HKD	Hong Kong	1.07	Baa1
NGET	XS2107332566	24/01/2028	6.32	42	n/a	HKD	Hong Kong	1.08	Baa1
NGET	XS2110793044	29/01/2031	9.34	65	n/a	USD	United States	1.07	Baa1
RE	XS1076263448	18/06/2029	7.72	12	n/a	EUR	Dutch and German	0.37	A3
RE	XS1190892635	24/02/2027	5.41	56	n/a	EUR	Dutch and German	0.78	A3
REN	XS1189286286	12/02/2025	3.37	370	n/a	EUR	Dutch and German	0.60	Baa3
REN	XS1423826798	01/06/2023	1.67	426	n/a	EUR	Dutch and German	0.54	Baa3
REN	PTRELDOM0007	26/06/2024	2.74	64	n/a	JPY	Japanese	0.80	Baa3
Snam	XS1505573482	25/10/2026	5.07	1,126	n/a	EUR	Dutch and German	0.73	Baa2
ST	XS0129965942	30/05/2028	6.67	70	RPI	GBP	UK	1.28	Baa1
ST	XS0296066680	26/04/2029	7.58	9	n/a	JPY	Japanese	0.89	Baa1
Terna	XS1503131713	11/10/2028	7.04	891	n/a	EUR	Dutch and German	0.74	Baa2
Terna	XS1652866002	26/07/2027	5.82	129	n/a	EUR	Dutch and German	0.71	Baa2

Company	ISIN	Maturity date	Time to maturity	Total face value (£m)	Index-linked	Currency	Reference rate (government bond)	1-month average spread (%)	Issuer credit rating[1]
UUW	XS1223999316	27/04/2027	5.58	38	n/a	EUR	Dutch and German	0.86	A3
UUW	XS1309718572	26/10/2030	9.08	22	n/a	EUR	Dutch and German	1.01	A3
UUW	XS1429528315	09/06/2031	9.70	23	n/a	EUR	Dutch and German	1.03	A3
UUW	XS0159728236	20/12/2027	6.22	300	n/a	GBP	UK	0.66	A3
UUW	XS1222727965	23/04/2030	8.57	60	RPI	GBP	UK	1.47	A3
UUW	XS1497735412	30/09/2028	7.01	47	RPI	GBP	UK	1.39	A3
UUW	XS1692878991	04/10/2027	6.01	79	n/a	HKD	Hong Kong	1.07	A3
UUW	XS2217307805	24/08/2031	9.90	27	n/a	USD	United States	1.00	A3

Note: [1] Issuer credit rating by one of the credit rating agencies at of 30 September 2021.

Source: Oxera analysis based on Bloomberg and Dealogic data.