The Beta Differential between Gas and Electricity Networks – A Review of the International Regulatory Precedent

A Report for Colonial First State

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1. Summary

This report sets out NERA Economic Consulting's review of the international regulatory precedent for setting different asset betas for gas and electricity networks. Our report is in response to the Commerce Commission's ("Commission") review of the Input Methodologies (IMs) for determining the weighted average cost of capital (WACC). As part of this review, the Commission presented a report by Professor Lally on the review of WACC issues.[1] Professor Lally argues that the Commission's current differential between the asset beta for gas pipelines and electricity distribution of 0.10 is no longer supported by current market evidence. We have conducted a broad review of the international regulatory precedent to assess whether regulators have applied a beta differential between gas and electricity, and if so, whether their motivation for doing so translates to New Zealand.

Our report focuses on the European and Australian regulatory precedent because of their similarities in the regulatory regime with New Zealand's regime. We have not considered US regulatory precedent, since the rate of return regulation more common in the US results in companies facing different risks to those in New Zealand. In addition, US regulators typically apply the Discounted Cash Flow method to set the return on equity, making it difficult to compare their allowance for risk against regulators that use the Capital Asset Pricing Model.

For the European countries we have reviewed, three jurisdictions provide an uplift for increased risk facing gas networks, either through the asset beta or through a separate premium on the cost of equity. The regulators that provide such an uplift accept that gas networks in their jurisdictions face greater risk arising from potential under or over recovery of costs. This seems to us consistent with the situation facing gas pipelines in New Zealand, which face greater potential for under or over recovery relative to electricity networks due to growth options and the greater proportion of demand from industrial customers.

Only one regulator (Ofgem in Great Britain) sets a lower asset beta for gas networks relative to electricity. However, this decision relates to features specific to the GB energy market, concerning the greater capex recovery risks for electricity transmission operators relative to gas network operators. This reasoning does not apply in New Zealand and the facts may support the reverse argument since gas pipelines in New Zealand have a growth option that results in capex recovery risk. Consequently, Ofgem's argument for setting a higher asset beta for electricity networks would support a higher asset beta for gas pipelines in New Zealand. Aside from GB, four other European regulators make no distinction between the beta for gas and electricity.

Overall, the European regulatory precedent supports setting a beta differential for gas in New Zealand, as regulators have recognised the greater risk associated with cost over or under recovery in gas networks.

We have also considered the Australian Energy Regulator's approach as part of its recent Better Regulation review. Although the regulator does not distinguish between the beta for

[1] Lally, M (25 February 2016): "Review of WACC Issues".

gas and electricity, it does note that it only does so because the Australian regime mitigates asset stranding risk through an accelerated depreciation policy. Since the New Zealand regime has no equivalent depreciation policy built into the regulatory framework, the AER's reasoning does not apply. Instead, the Commission currently allows a higher asset beta to compensate gas pipelines for greater probability of decline in demand relative to electricity networks.

The remainder of this report is structured as follows:

- Section 2 reviews recent regulatory precedent in Europe; and
- Section 3 sets out the Australian Energy Regulator's views on betas for electricity and gas.

2. European Regulatory Precedent

This section reviews recent determinations on the beta by European regulators, and considers their motivation for setting different betas for gas and electricity if they have done so.

CRE (France)

CRE currently sets an asset beta of 0.33 for electricity networks, 0.58 for gas transmission and 0.46 for gas distribution.[2] The wide beta differential between electricity and gas networks (particularly gas transmission) reflects the incentives created for gas networks. Under the current regulatory period for gas transmission, CRE provides incentive regulation mechanisms for a number of aspects:[3]

- Operating expense incentives: Any productivity gains beyond the target are kept by the TSO, and equally TSOs bear any additional cost.
- Quality of service incentives: Financial incentives relating to various indicators of quality of service, including consumption forecasts and maintenance programs.

The implication of these incentives is that companies can underperform or outperform relative to the regulatory allowance, which results in additional risk. This risk of over or under recovery can be systematic (i.e. a beta risk) if some of the costs are variable, and related to volumes. In effect, companies bear some volume risk due to the ability to underperform or outperform on costs. This additional risk led the CRE to set a higher beta for gas transmission.

The incentive structure facing gas transmission companies in France bears some resemblance to the one in New Zealand, since NZ gas pipeline also face the risk of under or outperforming on costs relative to the default price-quality path. The French case therefore suggests the Commission should consider setting a higher beta for gas transmission to recognise the risk faced by the companies based on the incentives they face.

In practice, the French regulator sets the beta estimate with reference to empirical evidence for listed comparators. The regulator's consultant recently updated its beta estimates and calculated different betas for electricity and gas networks using separate comparator groups, including European and Australian network operators.[4] The consultant used different comparator groups in order to capture the difference in systematic risk faced by electricity and gas networks.

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2 Council of European Energy Regulators (14 March 2016): "CEER Report on Investment in European Countries", p80-83.

3 CRE (11 December 2013): "Deliberation of the French Regulatory Commission of Energy of 11 December 2013 deciding on the evolution of the tariffs for the use of natural gas transmission networks as of 1 April 2014", p6.

4 Frontier Economics (Novembre 2015): 'Évaluation du taux de rémunération des gestionnaires de réseaux d'électricité et de gaz naturel en France', p97. Source: The consultant's electricity comparators include Elia, Terna, REN, Red Electrica, Electricite de Strasbourg, Repower and Spark Infrastructure Group. The comparators for gas include Fluxys, Enagas, Acsm-Agam, Snam, Hera, APA Group and Australian Gas Networks.

Ofgem (UK)

In Great Britain, Ofgem sets a higher beta for electricity transmission (equity beta of 0.95) than for gas transmission (equity beta of 0.91) on the basis that electricity transmission faces greater capex risk from high investment by electricity transmission companies in the current regulatory period. However, Ofgem has previously remunerated gas networks for greater risk of asset stranding because of policy-induced decarbonisation.[5] Ofgem chose to allow for this risk through front loaded depreciation of assets, instead of changing the cost of capital, but its preferred method still allowed companies additional revenues for the likely decline in utilisation of gas networks. Therefore, aside from the adjustment for higher capex risk in electricity transmission, Ofgem's overall allowance, including the rate of return and depreciation, is higher for gas networks, to reflect the greater risk of asset stranding.

We note that Ofgem only made this depreciation allowance for gas distribution, not transmission, because it believed transmission assets were insulated by demand from gas fired generation. In New Zealand, transmission assets are not insulated in the same manner, as seen by the recent closure of several gas-fired power stations (Otahuhu, Southdown and Huntly), in the face of flat power demand.[6] In a market environment similar to New Zealand, Ofgem may have chosen to apply the depreciation adjustment for asset stranding risk for gas transmission assets.

It is difficult to determine the net impact of Ofgem's depreciation adjustment for asset stranding compared to the lower cost of capital for gas transmission. However, Ofgem's qualitative remarks during the RIIO consultations (the latest round of consultations in GB) suggest that it considers the two markets to face similar risk.

Perhaps more importantly, Ofgem's principles for setting the cost of capital and allowance for the different market suggests gas pipelines in New Zealand should receive a higher beta because of the following factors:

- Capex risk for gas transmission: Ofgem found the capex to regulated asset values of electricity transmission assets was greater than for gas transmission, on which basis it set a higher beta for electricity.[7] In New Zealand the reverse may be true, as Professor Lally argues gas pipelines have the option to grow, creating capex risk for these investments. By implication, Ofgem's argument that capex risk should be remunerated in the cost of capital justifies setting a higher beta for gas pipelines in New Zealand.
- Incentive rates for capex and opex: Ofgem recognised that the incentive rate for cost under or over recovery has an impact on the beta, because it exposes the company to cash flow risk. Although the incentive rates were similar for electricity and gas in GB,

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5 Ofgem (March 2011): "Decision on strategy for the next transmission and gas distribution price controls - RIIO-T1 and GD1 Financial issues", p11.

6 Frykberg ,E (20 August 2015): "NZ may need another power station - Meridian". Source: http://www.radionz.co.nz/news/business/281888/nz-may-need-another-power-station-meridian

7 Ofgem (17 December 2012): "RIIO-T1: Final Proposals for National Grid Electricity Transmission and National Grid Gas", p14-16.

Ofgem's argument suggests the Commission should also remunerate gas pipelines for the cash flow risk associate with potential under or over recovery of costs.

E-Control (Austria)

The Austrian regulator sets a higher cost of capital for gas transmission than electricity because of the additional volume risk borne by gas TSOs. The regulator also allows gas TSOs additional remuneration for new investments if promoters can justify the elevated risks of these projects:[8]

> "*In addition to the volume risk of gas investments, the assessment of individual project applications involves evaluating legal, implementation and social acceptance risks. Should a PCI* [Project of Common Interest] *face higher risks than comparable projects, project promoters must provide proof of such elevated risks in connection with the individual project.*"

Energy Authority (Finland)

In Finland, the regulator sets a lower asset beta of 0.30 for gas networks compared to 0.40 for electricity networks. However, the regulator compensates for this by allowing a premium of 1.5% on the cost of equity for gas to remunerate investors for incentives to maintain and improve its cost efficiency and security of supply level.[9]

Swiss Federal Office of Energy (Switzerland)

In Switzerland, the regulator sets the same asset beta of 0.40 for electricity and gas networks.[10] The regulator references a range of other regulators and academic studies, from which it finds beta estimates for gas companies tend to be higher than electricity. Nevertheless, it chooses to set the same beta for electricity and gas.

EI (Sweden)

The Swedish regulator sets the same cost of capital for electricity and gas networks,[11] but recognises that the CAPM may not be sufficient in remunerating companies for all the risks they face. The regulator commissioned two consultants at the last review, and they concluded on a risk premium of up to 1.5% on the cost of equity to take account of the following risks:

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8 E-Control: "Methodology and criteria for evaluating investments in electricity and gas infrastructure projects", p6.

9 Energy Authority (10 July 2015): "National Report 2015 to the Agency for the Cooperation of Energy Regulators and to the European Commission", p44.

10 SFOE (November 2011): "Schweizer Gasmarkt und Kosten des Netzzugangs - Ermittlung der risikogerechten Kapitalverzinsung für schweizerische Gasnetze Erste Fassung Bern, November 2011 Andrea Zanzi Fachbereich Energie".

11 The Swedish regulator does not provide the exact derivation of its final cost of capital allowance, so it is not possible to exactly determine its parameter estimates.

- Uncertainty in the estimate of the WACC:[12] The first consultant argued that analysts and market participants may have different assessments of risk and return for the same investment and therefore included a risk premium on equity of 1% to account for uncertainty in the assessment of the required rate of return.
- Non-CAPM risks:[13] The second consultant included a premium of 1.2% on the cost of equity to reflect a number of risks not included in the CAPM, such as regulatory risk and structural risk associated with small operators.

The regulator set the final cost of capital within the range of its consultant's estimates, implicitly incorporating the non-CAPM risks into the final allowance.

Table 2.1 summarises the recent European regulatory precedent, and includes cases where some European regulators have allowed an additional premium.

Table 2.1
Recent Beta Decisions EU Benchmarks

	Year	Gas Asset Beta	Spread to Electricity	Additional Premium	Volume Risk	Overall Risk Allowance relative to Electricity
France	2013	0.58	0.25	Yes on WACC for certain investments	Yes, 50% on shortfall of +/- 10%	Higher
Sweden	2014	0.45	0.07	1.5% on CoE	No	Higher
Finland	2015	0.30	-0.10	1.5% on CoE	N/A	Higher (from additional premium)
Germany	2011	0.38	-	No	No	Same
Austria	2012	0.325	-	3.5% on CoE + additional premium	Yes	Same
Netherlands	2013	0.35	-	No	No	Same
Switzerland	2011	0.40	-	-	No	Same
GB	2012	0.40	-0.09*	No	No	Lower

Source: NERA analysis of recent regulatory decisions. Note: For comparability, we calculate the asset beta from equity beta determined by each regulator.
**Premium for electricity transmission in GB driven by high investment by ET companies in the next regulatory period. Note: On volume risk in the Swedish regime – there is no direct impact of volumes on the revenue cap, but indirectly through the over/undercharging mechanism (see below).*

Table 2.1 shows that, for the countries we have reviewed, three jurisdictions provide an uplift for gas, either through the asset beta or through a premium on the cost of equity. The regulators that do allow an uplift recognise that gas networks face greater risk arising from potential under or over recovery of costs.

[12] Ernst & Young (18 February 2011): "Energimarknadsinspektionen: Estimering av kalkylränta för elnätsverksamhet för åren 2012-2015", p18.

[13] Grant Thornton (April 2011): "Energimarknadsinspektionen – Estimering av Kalkylranta (WACC) for Enatsverksamhet under tillsynsperioden 2012-15", p18-19.

Only one EU regulator (Ofgem in Great Britain) sets a lower asset for gas networks relative to electricity. However, this relates to features specific to the GB energy market, in particular, the greater capex recovery risks for electricity network operators in GB relative to the gas network operators. The same feature is not true in New Zealand, and may in fact operate in reverse, since gas pipelines in New Zealand have a growth option that results in capex recovery risk. By implication, Ofgem's argument for setting a higher for electricity networks would result in a higher asset beta for gas pipelines in New Zealand. Aside from GB, four other European regulators make no distinction between the beta for gas and electricity.

Finally, we note that a recent study by the Council of European Energy Regulators (CEER) found that European regulators have generally set a higher beta for gas than for electricity.[14] The values for the electricity sector are between 0.24 and 0.48 and for gas between 0.27 and 0.58, and are summarised in Table 2.2. The asset betas reported below may not be the same as the ones in Table 2.1 above, since CEER does not always report the latest available decision.

Table 2.2
Asset Betas Set by European Regulators in Recent Determinations for Energy Networks

Country	Year (Elec, Gas)	Electricity Transmission	Electricity Distribution	Gas Transmission	Gas Distribution	Avg Spread between Gas and Electricity
Austria	2012, 2012	0.325	0.325	0.325	0.325	0.00
Germany	2008, 2008	0.35	0.35	0.35	0.35	0.00
Finland	2015, 2015	0.40	0.40	0.30	0.30	-0.10
France	2013, 2013	0.33	0.33	0.58	0.46	0.19
Great Britain	2012, 2012	0.38 – 0.43	0.32	0.34	0.32	-0.02
Hungary	2012, 2009	0.33	0.33	0.48	0.42	0.12
Ireland	2010, 2007	0.34	0.34	0.43	0.43	0.09
Italy	2012, 2014	0.364	0.386	0.364	0.44	0.03
Lithuania	2013, 2012	0.24	0.24	0.27	0.27	0.03
Luxembourg	2011, 2011	0.41	0.41	0.41	0.41	0.00
Netherlands	2010, 2011	0.40	0.42	0.40	0.42	0.00
Poland	2015, 2015	0.43	0.43	0.43	0.43	0.00
Portugal	2014, 2013	0.32	0.36	0.32	0.57	0.12
Slovenia	2009, 2009	0.48	0.48	0.42	0.39	-0.08
Average (excl. Finland & using lower bound for GB)		**0.36**	**0.36**	**0.39**	**0.40**	**0.04**

Source: Council of European Energy Regulators (14 March 2016): "CEER Report on Investment in European Countries", p80-83; Note: All betas are reported using the Modigliani-Miller formula, aside from GB, for which the Miller formula is used, in line with the regulator's approach.

[14] Council of European Energy Regulators (14 March 2016): "CEER Report on Investment in European Countries", p85.

The CEER's review shows that on average, European regulators have set a gas beta 0.04 higher than the electricity beta. For the purpose of calculating this average, we have excluded Finland, which adjusts for the higher risk of gas through a separate premium on the cost of equity, and used the lower bound for the GB electricity transmission beta range, since the upper bound reflects the greater capex risk for electricity networks in GB (not a relevant consideration in New Zealand).

3. Australian Regulatory Precedent

The Australian regulatory regime is based on an ex-ante, incentive-based approach with respect to capital and operating expenditure and service standards. Therefore, Australian regulatory precedent is a useful reference for the Commission.

The Australian Energy Regulator (AER) set the same equity beta of 0.7 across all electricity and gas markets as part of its Better Regulation programme in 2013.[15] AER considered that all markets face similar systematic risk exposure.

In forming this view, AER considered two factors that might result in differences in systematic risk across markets:[16]

- Stranding risk: AER argued that the Australian regime also mitigated asset stranding risk by providing prudent discount pricing options and accelerated depreciation provisions in the event of significant changes in demand.
- Competition risk: AER argued that gas service providers are protected from competition from other pipelines because they enter into long term contracts with consumers, which underwrite the revenue requirements. Moreover, AER believed that the demand for gas and electricity is relatively inelastic, and therefore there is likely to be limited substitution between the two in the immediate term.

The AER also acknowledges that the ability to pass costs through to customers, where expenditure was unforeseen at the start of the regulatory period, can lower systematic risk.[17] In other words, a regulatory framework that allows under or over recovery of costs, like in New Zealand, would increase systematic risk.

Although AER did not set different betas, the risk mitigation mechanisms that informed its decision are not available for gas pipelines in New Zealand. In particular, the fact that AER puts in place accelerated depreciation policies in the event of significant changes in demand shows that it considers asset stranding risk warrants an adjustment to regulatory approach. Given changes in demand across multiple regulatory periods could result in sunk assets for gas pipelines in New Zealand, the current the asset beta differential to electricity networks provides some compensation for this risk.

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15 AER (December 2013): "Better Regulation – Rate of Return Guideline", section 5.

16 AER (December 2013): "Better Regulation – Explanatory Statement – Rate of Return Guideline (Appendices), p37.

17 AER (December 2013): "Better Regulation – Explanatory Statement – Rate of Return Guideline (Appendices), p40.

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