Review of Oxera's Report, *Input methodologies - Review of the '75th percentile' approach*

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Executive summary

1. This is a peer review of Oxera's report *Input methodologies - Review of the '75th percentile' approach*, prepared for the New Zealand Commerce Commission (NZCC). It assesses if Oxera's report addresses the High Court's comments in paragraphs 1422-1487 of the input methodologies merits appeal judgement and if it applies a sound economic rationale.

2. The Oxera Report may be the first serious empirical attempt towards providing a cost-benefit analysis of the policy of setting a regulated WACC above its expected measured value. In doing so Oxera goes a significant way towards fulfilling the High Court's aspirations for a NZCC decision on the optimal percentile of the WACC distribution. It provides for some sound empirical base for a decision.

3. Based on an informal model Oxera's general approach is to empirically estimate the expected losses to consumers from overestimating the true cost of capital and setting them against the net expected losses to consumers from underestimating the true cost of capital and to do this for various percentiles of the WACC distribution.

4. The report is careful in describing the various steps involved in doing the empirical analysis and in highlighting the problems incurred. While the costs to consumers from higher prices associated with a higher WACC turn out to be conceptually straightforward and measurable, the costs to consumers from a WACC below the true cost of capital are complex and, according to Oxera, fraught with "fundamental" uncertainty, leaving an ultimate assessment to the regulator's judgment.

5. Thus, while Oxera's analysis is likely to inform the regulator about the nature of the problem, it is only weakly suggestive of the outcome, which is for the NZCC to set an allowed WACC between the 60th and the 70th percentile of the WACC distribution. In my view, the report's main insight is that only some of the relationships necessary for a sound decision can empirically be estimated and that for the remaining relationship the NZCC needs to its use judgment. The main omission, in my view, within Oxera's model concerns the lack of an explicit treatment of the effects of investments on the RAB.

6. Oxera uses a consumer welfare approach for its policy assessment. Compared to a total surplus approach such an approach tilts the evidence against using a higher WACC percentile.

7. While I can follow Oxera's rejection of the "two-tier proposal" of differentiating the WACC for existing assets versus that for new investments, a WACC uplift for all assets does provide the regulated grids with an extra benefit available to stipulate investment.

8. The Report argues against the use of a case-by-case approach to the WACC percentage, but leaves open if a different approach should be used for different industries. Such openness is, in my view, warranted by differences between regulated industries and may even extend to differences between electricity distribution and transmission grids. Further case-specific differences may be warranted for different indirect effects of investments, such as innovation effects in contrast to the reliability effects treated exclusively by Oxera.

9. Oxera's empirical analysis involves five inter-linked relationships that need to be estimated in order to do a cost-benefit analysis of the WACC policy. Oxera makes strong attempts at empirically estimating three of these effects. In particular, the Oxera researchers provide a clear characterization of the probabilities of different sizes of WACC shortfalls and of static consumer welfare losses from price increases due to a higher than the midpoint WACC. They also provide data from New Zealand and abroad, supporting the conclusion that a one billion NZ$ outage could be at stake for New Zealand under an investment shortfall. However, Oxera found that they could not determine the probability of such an outage, let alone relate it to the amount of investment shortfall. Oxera explains this lack of information with fundamental uncertainty about the probability and about the investment shortfall. The analysis would be substantially enhanced by information on the probability of an outage, which could be supplied by New Zealand electricity distribution businesses and Transpower.

10. While I agree that these relationships cannot (at this time) be estimated with any precision and that some judgment needs to be exercised with respect to them, one can probably come much closer by engaging the network providers in filling the gap.

11. In particular, I show that the investment shortfall is bounded by simple limits and that the investment shortfall itself has strong consequences for the policy assessment. If it is large relative to the benefits then it weighs heavily in the static welfare assessment. If it is small relative to the benefits then other policies may provide cheaper ways of reaching the same result. This leads to the paradox that the WACC policy may be bad if it is associated with small investment effects and may be just as bad if it is associated with large investment effects. My personal view is that a higher than midpoint WACC is likely to be good policy mainly when the associated investment increase produces sufficiently large net beneficial effects *and if there are no better substitute policies*.

12. Regarding outage probabilities and their effects I suggest considering international benchmarking in order to find out where New Zealand stands relative to other countries that are faced with similar problems.

13. A sound WACC-related policy requires a further analysis of its benefits and drawbacks as a policy tool relative to other policies dealing with investment-related market failures. This is important (a) because these policies run parallel and (b) because they determine if and to what extent there is a current investment problem. For example, we do not currently know if because of other policies New Zealand's electricity grid reliability is at, above or below its optimal level.

14. My conclusion is that Oxera has ventured on a new path by empirically estimating important relationships between the choice of the allowed WACC percentile and consumer welfare. In doing so Oxera has been able to differentiate between knowable relationship and those that with our current knowledge cannot be established with any degree of certainty. The current review has been critical about these unknowable relationships both because more can be known about them than the Oxera Report reveals and because their omission can lead to the omission of costs of this policy relative to its benefits and relative to other policies. This could weaken Oxera's soft recommendation of a WACC in the 60th to 70th percentile range. My rudimentary additions to Oxera's empirical numbers indicate a somewhat lower percentile. Nevertheless, Oxera's conclusion stands that the NZCC's judgment beyond theoretical and empirical analysis is required for the decision. In that sense the Oxera Report fulfils the requirements stipulated by the High Court.

I. Introduction

(1) The New Zealand Commerce Commission (NZCC) has asked me to peer review Oxera's report *Input methodologies - Review of the '75th percentile' approach*, prepared for the New Zealand Commerce Commission, 23 June 2014 (hereafter: either Oxera or the Report). In particular, I shall cover the following key points:

1. An assessment of whether in my opinion the report addresses the High Court's comments in paragraphs 1422-1487 of the input methodologies merits appeal judgement.

2. A review of the economic rationale behind Oxera's recommendations on the WACC percentile, including:

    a. the robustness of any analytical models developed or applied;

    b. the reasonableness of the assumptions; and

    c. the interpretation and choice of data.

(2) The High Court Decision of the input methodologies merits appeal, *Wellington International Airport Ltd & Ors v Commerce Commission* [2013] NZHC [11 December 2013], paragraphs 1422-1487, essentially criticizes the NZCC's one-size-fits-it-all approach of generally using the 75th percentile of the WACC distribution/spread. The High Court would rather like to see an approach that "if practicable" (paragraph 1486) provides an empirical and theoretical basis for the choice made. Otherwise, it would have to become clear that such an approach cannot be fully done. The Court also suggests that the NZCC consider differentiating the WACC for existing assets versus that for new investments ("two-tier proposal"). In making these suggestions the Court is aware of the difficulties that would arise if one tried to empirically establish a valid loss function in general or for each case. Thus, the NZCC is expected to use its judgment but it needs to be carefully reasoned. In this regard the Court's criticism of various submissions and of the

NZCC's IM is important: They do not provide enough (or even any) theoretical and/or empirical basis for the choice of percentile. Thus, wherever the NZCC comes out, the decision has to be well-reasoned and supported by theoretical and empirical material to the extent available.

II. General Assessment

(3) The Oxera Report "Input methodologies" is thoughtful and ambitious. It may be the first serious empirical attempt towards providing a cost-benefit analysis of the policy of setting a regulated WACC above its expected measured value. In doing so Oxera goes a significant way towards fulfilling the High Court's aspirations for a NZCC decision on the optimal percentile of the WACC distribution. It provides for some sound empirical base for a decision. Oxera's general approach is to empirically estimate the expected losses to consumers from overestimating the true cost of capital and setting them against the net expected losses to consumers from underestimating the true cost of capital and to do this for various percentiles of the WACC distribution. There is no formal analytical model, though, on which the empirical analysis is based. The closest to a formal model is found in Dobbs (2011) and referred to in the Report. Rather, Oxera uses a plausible informal model, which is illustrated in Figure 5.3 on p. 45.

(4) The report is careful in describing the various steps involved in doing the empirical analysis and in highlighting the problems incurred in doing so. It turns out that, while the costs to consumers from higher prices associated with a higher WACC are conceptually straightforward and measurable both in size and in terms of probabilities involved, the costs to consumers from a WACC below the true cost of capital are complex and, according to Oxera, fraught with "fundamental" uncertainty, leaving an ultimate assessment to the regulator's judgment. Thus, while the whole analysis is likely to inform the regulator about the nature of the problem, it is only weakly suggestive of the outcome, which is for the NZCC to set an allowed WACC between the 60^{th} and the 70^{th} percentile of the WACC distribution. While the report recommends against using a case-by-case approach, it provides empirical arguments only for the electricity industry; and these may not hold the same way for gas distribution, airports or telecommunications network providers. In my view, the report's main insight is that only some of the relationships necessary for a sound decision can empirically be estimated and that for the remaining relationship the NZCC needs to use its judgment.

III. Critique in detail

(5) While most of the assumptions made for the empirical analysis of the Report are reasonable, there are certain omissions both within the model and concerning the scope of the model. The main omission, in my view, within the model concerns the lack of an explicit treatment of the effects of investments on the RAB. The omissions on the scope of the model concern the deliberate concentration of the model on reliability investments, leaving out concerns about any other types of investments. While it may be difficult to model other types of investment within the time and resource constraints faced by Oxera, they should at least be given an over-the-thumb treatment in order to assess the magnitude of the omission for the NZCC's decision.

(6) While the regulatory approach used in the NZ energy sector is known as price-cap (PC) regulation, the WACC issue discussed in the Report also fits to rate-of-return (RoR) regulation ("gold plating"). The issue of potential over-investment has a whole literature under RoR regulation, while the literature mostly associates PC regulation with under-investment. In practice, both types of regulation are not as different as perceived in the literature. As I read the regulatory approach in New Zealand for electricity and gas distribution and transmission companies, it involves price/revenue caps within regulatory periods with adjustments based on RoR regulation methods between regulatory periods (of 4-5 years). Thus, from the RoR regulation perspective there would be a regulatory lag of up to 5 years. Such a long lag itself imposes risks that may affect investment.

(7) Particularly in Box 4.1, p. 29, Oxera does a good job discussing the consumer welfare approach taken. It should generally be clear that the consumer welfare approach is more conservative w.r.t. any uplift to the WACC than a total surplus approach. Thus, if no move from the 75th percentile to the 50th percentile is recommended under the consumer welfare approach then it is also not recommended under the total surplus approach. In my view, the main argument for the total surplus approach is that the promise of higher profits can spur investment and innovation. Under this argument the long-run interest of the consumer is somehow captured in the total surplus approach, where profits proxy for the positive long-term effects on consumers. In the current proceeding, however, the investment and innovation incentives are specifically related to the WACC chosen. So, there is no need to count profits and losses in addition to consumer welfare.

(8) Oxera rejects the "two-tier proposal" of differentiating the WACC for existing assets versus that for new investments (Table 3.1, pp. 18/19). I generally agree with Oxera's whole life of an asset approach. If the investment community expects that the future WACC will be lower than in the first period it will require an even higher current WACC to compensate. However, from this does not follow that the higher WACC percentile should be applied to the whole RAB. That would only hold in the very long run, when a steady state is reached. Thus, if the allowed WACC is lifted above the midpoint then using the whole RAB approach does provide the regulated grids with an extra benefit available to stipulate investment.

(9) The Report argues cogently against the use of a case-by-case approach to the WACC percentage (pp. 18/19), but leaves it open if a different approach should be used for different industries. There clearly is a difference for the case-by-case method between time consistency and cross-industry consistency. Since many investments span several regulatory periods, it is important to be time consistent, because the incentives should hold for whole (staggered) asset lives. There may, however, be a case for a more tailored approach for different industries. The gas case and the airports case and the telecommunications case may differ enough to justify different percentiles of the WACC distribution, which each then could be consistently applied over time. One can only know this for sure if an analysis similar to the one done here on electricity grids is done for at least one of the other industries. Even if such an analysis discovers major differences and suggests a different outcome for different industries the NZCC

may decide against a case-by-case approach. There exist many policies in other areas, where different cases are treated the same, because that saves difficult and time-consuming analyses and generates more predictable results. Examples include patent laws with uniform patent lives in spite of very variable innovation incentives between industries or the U.S. treble-damage rules in antitrust in spite of very different deterrence effects for different cases. As a compromise for the current proceeding the NZCC could use a one-size-fits-all approach to the WACC for all regulated industries, but have different 2nd tools on a case-by-case basis. For example, the electricity distribution industry could face incentive regulation w.r.t. outages with penalties for increased outage frequencies and bonuses for outage reductions.

(10) The empirical exercise in Section 5 on the benefits of investments triggered by a higher allowed WACC percentile (called "wider social and economic effects" by Oxera) is well thought through with a good effort in getting the numbers right. It is concentrating on reliability as the main policy objective of investment in electricity grids. While this is true, the section does not contain all effects but only concentrates on the effects of outages. For example, the innovation aspect (that is always mentioned in the context of asymmetric error costs) is missing. In electricity distribution, investments for smart grids, distributed generation etc. come to mind. See, for example, the ASEC report submitted in this proceeding by Unison Networks. For energy networks there can be specific other effects related to investments that have strong welfare implications. In its comments Transpower mentions that overall transmission costs can be higher with less investment than with more investment. It should also be noted that transmission bottlenecks can have unwanted consequences for consumers in terms of competitive choices even if reliability is not affected.

IV. Oxera's methodology

(11) As illustrated in Figure 5.3 on p. 45, Oxera uses five fundamental relationships for deriving the potential net benefits from a higher allowed WACC percentage than the midpoint of the estimated WACC distribution.

1. The first is the relationship between the allowed WACC percentage and the probability of the actual WACC exceeding the allowed WACC by certain amounts.

2. Estimating the first relationship would be necessary for estimating as the second relationship the amount of investment reduction stemming from the allowed WACC being below the actual WACC relevant for the firm in financing investments (at the time).[1]

3. The third relationship is that between the estimated investment shortfall and the probability of outage frequencies and durations.

4. The fourth relationship is between the estimated effects in terms of outage frequency and duration and the economic damages incurred by these outages.

[1] Effects on investments of the allowed WACC exceeding the actual WACC are only briefly hinted at in the Report.

5. While these four effects all concern dynamic effects and benefits of choosing a higher allowed WACC percentage, the fifth relationship concerns the policy costs in terms of static consumer welfare loss from paying higher electricity prices on account of the higher allowed WACC.

(12) Oxera makes strong attempts at empirically estimating the first, fourth and fifth of these effects. In particular, the Oxera researchers provide a clear characterization of the probabilities of different sizes of WACC shortfalls. They show (on p. 53) that under the midpoint estimate there is a high probability of a significant shortfall, while at the 75th percentile such probabilities are small. For the fourth relationship Oxera provides data from New Zealand and abroad, supporting the conclusion that a one billion NZ$ outage could be at stake for New Zealand under an investment shortfall. However, Oxera found that they could not determine the probability of such an outage (the third relationship above), let alone relate it to the amount of investment shortfall (the second relationship). Oxera explains this lack of information with fundamental uncertainty about the probability and about the investment shortfall. The analysis would be substantially enhanced by information on the probability of an outage, which could be supplied by New Zealand electricity distribution businesses and Transpower. Oxera currently gets around the probability issue by taking the cost of the policy under the fifth relationship as the price of insurance against such outages and by asking, how high such an insurance cost should be relative to the occurrence of a one billion NZ$ outage. They find (p. 73) that the NZ$ 105 million consumer welfare loss found for the 75th percentile passes that test, while NZ$ 200 million for the 90th percentile does not. These static costs for the policy of different WACC percentages relative to the midpoint WACC were derived very plausibly from data on the RAB (p. 28) for the sector and on the difference found for the WACC percentages from the NZCC's 2010 "Input Methodologies" paper (p. 53). Thus, the static costs refer to consumer welfare losses from overpricing. Oxera makes the case that all other policy costs are of negligible size.

V. Areas of fundamental uncertainty

(13) In this section I would like to focus on the second and third relationships above that Oxera has not further analyzed because of fundamental uncertainty. I agree that these relationships cannot (at this time) be estimated with any precision and that some judgment needs to be exercised with respect to them. However, one can probably come much closer by engaging the network providers in filling the gap.

<u>The relationship between an allowed WACC below the actual WACC and the investment shortfall</u>

(14) While Oxera provides data for the RAB for all New Zealand electricity grids, they have not done so for the annual investments. Based on currently available data the annual investments of the New Zealand electricity grid companies come to about NZ$ 1 billion.[2] Since the 75th percentile policy has been in place for several years, one can take this figure of NZ$ 1 billion as the

[2] Based on information received from the NZCC the latest available data is NZ$ 679.5 million for the distribution companies in 2012/2013 and NZ$ 318.5 million for Transpower in 2014/15.

expected 75th percentile investment. The main question then is, how high would the investment shortfall be under a midpoint allowed WACC? A second question, not treated by Oxera, is what would be the annual cost saved by this lower investment relative to the investment under the 75th percentile WACC? This cost saved would be important, because it would lower the price paid by consumers (and would be a genuine cost saving in terms of total surplus).[3]

(15) Let us first deal with the first question. Dobbs' (2011) assumption that any WACC shortfall will make investment cease altogether appears to be unrealistic. While there is a natural upper limit of NZ$ 1 billion per year (assuming that the grid owners cannot demolish or sell their assets), I would be surprised if the average expected investment reduction from moving from the 75th percentile to the midpoint would exceed 20% or be less than 5%. However, it should be possible to do better than such a guess by going more into the details of the investment categories and finding out what triggers these investments (such as line replacements versus new lines for new residential or commercial developments). Oxera develops a time line for potential investment shortfalls, starting from the planning stage. This stays at a general level. However, it suggests that the investment shortfall may start small and grow over time.

(16) Transpower (in this proceeding) also makes the important point that network companies will rank investments by importance if they cannot cover their cost of capital. Thus, they will first do investments they are legally required to do (such as connect new customers) and defer voluntary investments. Thus, it may be that the reliability effects emphasized by Oxera may turn out to be less important than effects on innovative investments, which are not legally required. Reliability investments are, however, not immune, as Transpower states. "[C]onstraining capital clearly has the potential over the long run to lead to lower levels of reliability. While system reliability is clearly a very high priority for Transpower, decreasing the financial attractiveness of investing could bring about subtle changes in approach to grid planning."

(17) The complexity of getting the ΔI right could also be a reason for a case-by-case approach for specific investments related to reliability.

(18) Let me now deal with the second question: What would be the annual cost saved by this lower investment relative to the investment under the 75th percentile WACC? In the Oxera Report the static consumer welfare effects of price changes only include effects from the change in WACC for a given RAB. However, the "wider effects" discussed in Section 5 of the Report come from changes in investment (ΔI), which, in my view, would also change the RAB. These changes in the RAB would trigger price changes that create static welfare effects not counted in Oxera's static consumer welfare losses. In contrast to those static welfare effects, which depended only on the absolute WACC levels, the current price effects depend on the allowed WACC relative to

[3] Thus, under a total surplus approach this cost saved would totally trump the effect of the consumer price increase from the higher WACC percentile. That deadweight loss is only about 0.1-1.0% of the consumer surplus loss (pp. 33/34).

the true cost of capital and are therefore probabilistic in nature. The annual cost of the investment saved (ΔI) is the WACC on the addition to the rate base plus the annual depreciation. Thus, for example, if the ΔI were 10% of the annual assumed investment of NZ$ 1 billion this would be NZ$ 100 million x 7.2% or about NZ$ 7.2 million for the WACC plus, say, NZ$ 3.5 million for depreciation for the first year. However, there will be additional costs for the years to come, and those costs need to be added to those years' costs. Discounted at the regulated company's discount rate the present value of all these costs should come down just to the cost of the investment in question. Under this discounting assumption we can therefore simply put in the investment cost as the annual cost to society. Now, these costs have to be borne (or are saved) by consumers in the prices they pay. Thus, this amount needs to be added to the static costs incurred.[4] Assuming that the annual cost is NZ$ 100 million for the ΔI from moving from the midpoint to the 75th percentile the static consumer welfare loss increases from NZ$ 105 million to NZ$ 205 million.[5] This would be a number, where Oxera's cost-benefit calculation looks already much less favorable than before.

(19) In contrast, under a small ΔI of, say, NZ$ 5 million (leading to a capital cost of the same amount) Oxera's cost-benefit analysis would stay almost unchallenged. However, there is a good news/bad news story in both a small and a large ΔI. If the ΔI were only NZ$ 5 million then consumers would pay an "insurance premium" of NZ$ 110 million[6] for an extra investment of NZ$ 5 million. Although they get a large benefit in terms of increased reliability, this is hardly a good deal. In fact, by asking the consumers to pay for the ΔI directly (as, for example, suggested by ASEC in the current proceeding) consumers would be much better off. Thus, while the cost-benefit analysis may show net benefits, the policy of using the WACC percentile may fail in a cost-cost analysis comparing different policies with the same effect.

(20) This leads to the paradox that the WACC policy may be bad if it is associated with small investment effects and may be just as bad if it is associated with large investment effects. My personal view is that a higher than midpoint WACC is likely to be good policy mainly when the associated investment increase produces sufficiently large net beneficial effects *and if there are no better substitute policies*. In the current case, adding the ΔI to Oxera's lost consumer benefits numbers and subtracting the total from Oxera's indirect benefits numbers makes me conjecture that an increase of the allowed WACC to the 75th percentile only pays in terms of reliability improvement if the ΔI is below NZ$ 50 million. This is an amount, where other policies should be better for consumers in achieving the same investment outcome.

[4] Oxera's failure in this respect is best seen in Oxera's Figure 3.1 on p. 17. In its subsequent numerical analysis Oxera only looks at the gross benefits of investment, i.e., at the integral under the marginal benefit curve in Figure 3.1. However, Oxera omits deducting the area under the marginal-cost-of-investment curve in the same figure.

[5] If one applied the same argument Oxera uses for applying the WACC percentile to all investments rather than only to new investments, one would derive even higher investment costs than above. Under the assumption of a ΔI of 10% the steady-state RAB would be reduced by 10%. With an RAB of NZ$ 14 billion this would come to NZ$ 1.4 billion, leading to annual capital costs of about NZ$ 150 million (WACC + depreciation).

[6] NZ$ 105 million for the increased WACC percentage + NZ$ 5 million for the ΔI = NZ$ 110 million.

(21) An issue not treated so far is that of a potential shock for capital markets from a reduction of the allowed WACC from the 75th percentile to, say, the 50th percentile. Following Oxera's numbers for the additional consumer expenditure this would reduce overall electricity grid profits by NZ$ 105 million annually.[7] Based on its 2013 annual report this would, for example, be about an 8% overall profit reduction for Vector Limited and that would continue into the future. For Transpower it would represent about NZ$ 32 million annually. These are significant numbers. The resulting stock market reactions could even have an effect on the beta values for the WACC calculation. Moving to the 60th percentile instead would reduce Vector Limited's overall profits "only" by 5%, still not a negligible number.

The relationship between the investment shortfall and the outage probabilities

(22) I now return to the third relationship above, which is the one between the investment shortfall and the outage probabilities. Here one can probably also get better empirical answers than Oxera by first looking at the actual outage experience (probabilities, extent and durations) in New Zealand and by finding out which policies are currently in place for assuring reliability. Regulators in New Zealand and abroad are doing more and more work on best practices in avoiding outages and in restricting their effects. The UK and the Netherlands come to mind. In its submission for this proceeding ASEC provides some relationships between fault rates and investments by types of assets. ENA in its submission in the current proceeding suggests that the NZCC "could establish estimates of the costs of lower reliability through engineering studies, which examine how reliability levels might change if certain investments were not undertaken over the next 10 years." So, this relationship might be known at some point in time. In my companion paper I suggest an alternative approach: "… some information could be gained from knowledge about current outage statistics in New Zealand compared to other countries in the world. I do not know to what extent other countries have optimized their outage rates, but there are some countries that have put substantial effort into reliability policies and into setting incentives (that relate to expected costs of outages). My conjecture is that the countries with the highest reliability may actually have too reliable networks. However, the next tier may be quite close to the optimum. Comparing the New Zealand data to these countries may at least provide for a good feel about where New Zealand stands. Corrections to such international benchmarking may have to be made for geography, including for weather and earthquakes." Overall, the benchmark approach to the third relationship appears to me to be more feasible than trying to optimize for New Zealand separately and independently. This holds, in particular, because in contrast to the case of ΔI treated above there is no natural upper bound for the potential expected loss from power outages.

[7] I am here neglecting the effect of the ΔI, which is of second-order magnitude, because the resulting revenue reduction is associated with a cost reduction of similar magnitude.

VI. Setting a high WACC percentile versus other policies

(23) Using the allowed WACC percentage is a crude policy instrument that is not well targeted and is likely to generate quite uncertain results relative to a targeted policy. At the same time, it can give the regulated firm discretion to find the best solution for a policy problem. Thus, the WACC policy is potentially less interventionist than other regulatory policies, such as the direct regulation of network reliability. It is therefore important to evaluate the WACC percentile policy against other policy instruments. For example, INCENTA argues for ENA in this proceeding that regulated firms may substitute labor for capital if capital costs are not covered (as would be implied by the Averch-Johnson model). Or, ASEC suggests increased capital contributions from customers. As far as I know, electricity network reliability is regulated in New Zealand anyhow. However a policy maker ultimately sets the specific WACC percentile he/she has to take the interaction with other policies into consideration. If one sets a high WACC percentile the investment climate for the firm will be positive. Then other policies do not have to provide additional positive incentives that give the firm extra bonuses for investments. If, on the contrary, the WACC percentile is set low then other policies will have to do some lifting and offer bonuses for investment (in the form of incentive payments for achieving reliability targets).

(24) In my companion paper (Vogelsang, 2014) I use some simple theoretical insights in order to approach the issue of costs and benefits of a policy of setting the WACC percentile. The purpose there is to get a different perspective towards the potential costs and benefits of setting a WACC higher than the midpoint. The main new perspective is that of optimal investment. Assume that at the 75^{th} percentile WACC investment occurs at the optimal level. What happens if the regulator reduces the WACC, say, to the 70^{th} percentile? There will be some small reduction in investment together with some small reduction in reliability. Both of these are likely to be second-order effects. However, there will be a consumer price reduction with a first-order effect on consumer welfare. Thus, the often-claimed superiority of dynamic over static efficiency only holds if (a) investment is significantly below the dynamic optimum and (b) the regulator uses total surplus instead of consumer welfare as the relevant criterion. I therefore suggest exploring the market failures that lead to under-investment and the policies in place for dealing with these failures. My conjecture is that these policies are generally better targeted and are likely to yield better outcomes. In contrast, a policy of using the WACC percentile is going to be better if the other policies are not in place, not effective or are viewed as too interventionist. Examples, where the WACC policy might be more effective are w.r.t. innovations.

VII. Differentiating WACC percentiles for distribution and transmission grids?

(25) Even if one restricts the analysis to electricity reliability issues it probably makes sense to differentiate between distribution and transmission grids. Transmission grid investments are typically more lumpy and in very different (rural versus urban) neighborhoods. The types of investments differ. As I point out in my companion paper (Vogelsang, 2014), “for example,

reliability investments in transmission grids often take the form of redundant lines or higher-capacity lines that in addition to increasing reliability reduce congestion, reduce power losses and allow for more competition between generators over these lines. Capturing all these joint benefits and their interaction magnifies the complexity of the empirical task and shows that concentrating on only one effect, such as increased reliability, will likely underestimate the investment benefits." This complexity may make the policy of a WACC differential relatively more suitable for transmission grids than for distribution grids, where reliability is the prime objective. As noted above, outages are not the whole problem of underinvestment. One could also add, for example, effects on competition in generation and on peak-time network congestion.

VIII. Conclusions

(26) My conclusion is that Oxera has ventured on a new path by empirically estimating important relationships between the choice of the allowed WACC percentile and consumer welfare. In doing so Oxera has been able to differentiate between knowable relationship and those that with our current knowledge cannot be established with any degree of certainty. The current review has been critical about these unknowable relationships both because more is known about them than the Oxera Report reveals and because their omission can lead to the omission of costs of this policy relative to its benefits and relative to other policies. This could weaken Oxera's soft recommendation of a WACC in the 60^{th} to 70^{th} percentile range. Nevertheless, Oxera's conclusion stands that the NZCC's judgment beyond theoretical and empirical analysis is required for the decision. In that sense the Oxera Report fulfils the requirements stipulated by the High Court. Oxera has provided the empirical analysis for a particular case. Since the High Court refers to the Telstra case's stipulation "for robust empirical examination, well-guided by theory, of the actual facts of any particular case" (paragraph 1486), Oxera's analysis does not extend beyond the electricity reliability issue.

(27) My rudimentary additions to Oxera's empirical work indicate that, because of the effects of ΔI on static consumer welfare, the WACC uplift should be lower than indicated by Oxera. However, there are reasons (at least for transmission grids) to believe that reliability captures only part of the investment benefits. However, if individual empirical analyses of these cases are deemed infeasible, because they either cannot be done or because they are too time-consuming or too expensive, then a common WACC percentage level should be chosen. Since this would be a compromise between different situations, it should represent some average.

IX. References

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