FINAL REPORT

Prepared For:

Australian Pipeline Trust

Level 5, Airport Central Tower

241 O'Riordan Street

SYDNEY NSW 2020

Roma – Brisbane Pipeline: Response to Final Decision on ICB Issues

Prepared By:

Mike Smart

Level 7

107 Pitt Street

Sydney NSW 2000, Australia

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1. INTRODUCTION

The Australian Pipeline Trust (APT) asked CRA International to analyse and comment on the conclusions reached by the Australian Competition and Consumer Commission (ACCC) in its Final Decision on the Roma – Brisbane Pipeline Access Arrangement (the Final Decision)[1] insofar as those conclusions touched on the derivation of the Initial Capital Base (ICB) with reference to the Depreciated Optimised Replacement Cost (DORC) approach. In brief, CRA's conclusions are as follows.

The ACCC's preferred valuation method, linear (or, equivalently, "straight-line") DORC, was calculated using a mixture of actual remaining life and hypothetical optimal total life. APT proposed instead that if linear DORC is to be used, then it should be calculated using actual remaining life and actual total life. What literature is available on this topic (discussed in s3.3 below) holds that it is ambiguous which of these approaches is preferable from a theoretical standpoint. Therefore it is not possible for the ACCC to conclude that APT's approach to linear DORC is unreasonable. Consistent with the precedent established during the GasNet appeal,[2] if a service provider's proposed approach is not unreasonable, then the ACCC must accept it.

Turning to APT's preferred valuation method, NPV DORC, the Final Decision raises three sets of issues. Regarding the first of these, the appropriate discount rate to use in NPV DORC calculations, the Final Decision relies on arguments containing numerous errors of omission, fact and theory, which CRA details in this report. The justification for WACC as the discount rate is dismissed for invalid reasons. Further, the ACCC's conclusion that the discount rate must be the risk-free rate contradicts academic opinion on this specific topic. It is also inconsistent with its own competition depreciation formula, first introduced in the 1999 Draft Statement of Regulatory Principles.[3]

1 Final Decision Revised access arrangement by APT Petroleum Pipelines Ltd for the Roma to Brisbane Pipeline, ACCC, 20 December 2006.

2 *Application by GasNet Australia (Operations) Pty Ltd* [2003] AcompT6 [29].

3 "Draft Statement of Principles for the Regulation of Transmission Revenues," ACCC, 1999.

As to the second set of NPV DORC issues, concerning the incumbent perspective, the ACCC has interpreted the DORC construct in an unprecedented manner to arrive at an artificially reduced value of NPV DORC. It has erred in this process by failing to consider the actual tax circumstances of APTPPL—which it must do in order to faithfully implement the underlying principle. To the extent that the assumed tax position is less favourable to APT than the actual position, this error will result in an underestimate of the incumbent DORC. Errors of this type may prove difficult, if not impossible, to correct given unavoidable ambiguities in the tax position of a single asset within a corporate portfolio. The most prudent course for avoiding them is to use entrant DORC instead of incumbent DORC. As noted by the ACCC and NERA, this choice of ICB methodology will require a departure from the Post-Tax Revenue Model in order to maintain internal consistency.

The third set of NPV DORC issues, namely perceived difficulties in implementing the method, was greatly overstated in the Final Decision. As just noted, once steps are taken to resolve the controversy over discount rates and incumbent versus entrant perspectives, the range of possible NPV DORC values is actually small. The ACCC's concern that a faithful calculation of NPV DORC must rely on private cost information held by the service provider is also misplaced. Cost information enters the NPV DORC formula solely through the parameters, "tech", "prod", "g", and "opex". Apart from "opex", which is disclosed in the Access Arrangement Information, these parameters are forward-looking trend estimates applicable to the entire pipeline industry. As such, the service provider is no better placed than any other reasonably well-informed industry participant, including the regulator, to establish accurate values for them. In any case, APT has sought to minimise any controversy surrounding these parameters by adopting the ACCC's own preferred values.

This report follows the above summary, covering linear DORC first, then the three NPV DORC issues in sequence, finally summarising the conclusions.

2. LINEAR DORC

The ACCC calculated the ICB according to its preferred valuation, linear DORC, using a mixture of actual remaining life and hypothetical optimal total life. APT proposed instead that if linear DORC is to be used, then it should be calculated using actual remaining life and actual total life. What literature is available on this topic (discussed in this section) holds that it is ambiguous which of these approaches is preferable from a theoretical standpoint. Therefore it is not possible for the ACCC to conclude that APT's approach to linear DORC is unreasonable. Consistent with the precedent established during the GasNet appeal,[4] if a service provider's proposed approach is not unreasonable, then the ACCC must accept it.

4 *Application by GasNet Australia (Operations) Pty Ltd* [2003] AcompT6 [29].

When existing and optimal replacement assets have different lives, the question of how best to employ linear depreciation to establish DORC from a given ORC value is not settled from the standpoint of economic theory. Various options have been advanced, but there is no accepted theoretical basis for preferring any one of these. The general formula is straightforward:

Linear DORC = ORC * (Life1 – actual age) / Life2

The options concern the selection of Life1 and Life2 are:

Option (a) Life1 = Life2 = life of existing asset

Option (b) Life1 = Life2 = life of modern equivalent (optimal replacement) asset

Option (c) Life1 = life of existing asset; Life2 = life of modern equivalent,

and, to complete the pattern, although this option has never been proposed, to CRA's knowledge:

Option (d) Life2 = life of existing asset; Life1 = life of modern equivalent.

Option (a) corresponds to the formula for "DORC1" expressed at page 70 of APT's 10 October 2006 Consolidated Response to the Draft Decision. Option (b) corresponds to the formula for "DORC2" on the same page. Option (c) is the ACCC's formula.

The ACCC's Draft Regulatory Principles notes that different valuers have adopted different approaches for deriving DORC from ORC. "*One approach is to consider the present age of existing assets and then depreciate the ORC value by the proportion that this age represents of the potential life of the new assets.*"[5] This approach corresponds to Option (b) above. The ACCC document goes on to note that "*an alternative approach is to consider the likely remaining life of existing assets and set the DORC value in proportion to the remaining life of the assets relative to the expected life of new assets.*"[6] This alternative approach corresponds to Option (c) above. That ACCC document does not express a preference for either approach.

5 "Draft Statement of Principles for the Regulation of Transmission Revenues," ACCC, 1999, p. 46.

6 Ibid.

One of the very few academic articles to consider this question is by Professor David Johnstone. His article presents a formula identical to the one above (apart from notational differences), employing the existing asset's life in the numerator, and noting that the life in the denominator "*is the estimated life of either the existing asset or its modern equivalent.*"[7] If the former life is chosen, then this formula corresponds to Option (a). If the latter, it corresponds to Option (c). Professor Johnstone goes on to say, "*The ambiguity over whether* [the life in the denominator] *should refer to the asset already in place or its new equivalent is typical of replacement cost valuations generally and related to the more general issue of what constitutes asset 'replacement'*".[8] The preferred choice between Option (a)—advanced by APT—and Option (c)—advanced by the ACCC—is ambiguous in the opinion of Professor Johnstone.

The ACCC purports to demonstrate its claim that APT's preferred Option (a) approach is unreasonable with two scenarios in the box on page 59 of the Final Decision. This box fails to make out the claim. The discussion of the ACCC's scenario 1 simply shows that the Option (a) formula and the Option (c) formula for linear DORC yield different results. In this case, built on the premise that an optimal pipeline would have a shorter life than the existing pipeline, Option (a) yields a lower DORC. The example provides no objective basis for deciding which of the theoretical outcomes is correct.

The discussion of the ACCC's scenario 2 similarly lacks any objective basis on which to identify the "correct" approach. The claim is made there that the sudden advent of new pipeline technology should reduce the DORC value of the existing pipeline, but that "*APTPPL's approach means that the existence of a superior alternative new technology has no effect on the value of the existing pipeline.*"[9] That criticism of the APT approach is incorrect. New pipeline technology would likely have the effect of reducing the ORC value for an asset that is equivalent to the existing pipeline. The Option (a) formula would result in a reduction in DORC through the reduction in ORC, even though the age discount factor would not change.

The implication that future technological advances need to be considered in the formula is also incorrect. Advances that occur after the ICB is established are irrelevant, as the ICB cannot be modified once it is set.

Given the foregoing points, the ACCC has failed to make out its case that APT's proposal to base linear DORC on Option (a) is unreasonable. Following the legal precedent established by the GasNet appeal, the ACCC is not entitled to require amendment to a proposal from the service provider that falls within reasonable bounds. The Tribunal stated:

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7 Johnstone, David. "Replacement cost asset valuation and the regulation of energy infrastructure tariffs—Theory and practice in Australia," CRI International Series 8, University of Bath School of Management (2003), p. 7.

8 Ibid.

9 Final Decision, p. 59.

> "*However, where there are no conflicts or tensions in the application of the Reference Tariff Principles, and where the AA proposed by the Service Provider falls within the range of choice reasonably open and consistent with Reference Tariff Principles, it is beyond the power of the Relevant Regulator not to approve the proposed AA simply because it prefers a different AA which it believes would better achieve the Relevant Regulator's understanding of the statutory objectives of the Law*."[10]

3. DISCOUNT RATE ISSUE FOR NPV DORC

The Final Decision relies on arguments presented by the ACCC[11] and its consultant NERA[12] containing errors of omission, fact and theory to arrive at its conclusion that NPV DORC must be calculated using the risk-free rate as the discount rate. The justification for WACC as the discount rate is dismissed for invalid reasons. Further, the ACCC's conclusion contradicts academic opinion on this specific topic. It is also inconsistent with the ACCC's own competition depreciation formula, first introduced in the 1999 Draft Statement of Regulatory Principles.[13]

3.1. ERRORS OF OMISSION, FACT AND THEORY

The discussion supporting the ACCC's conclusion that costs must be discounted at the risk-free rate fails to consider an argument put by CRAI in its September 2006 report. At various points, it incorrectly represents CRAI's arguments. Reasoning in support of the ACCC and NERA conclusions suffers from errors of economic theory. Part of NERA's discussion of this topic actually provides an alternative mathematical demonstration that the discount rate must be the WACC.

3.1.1. ACCC failed to consider CRAI argument

The Final Decision focused on arguments put by APT and CRAI concerning the need to discount costs in the NPV DORC formula at the regulatory WACC, rather than the risk-free rate. Particular attention was given by both the ACCC and its consultant NERA to CRAI's axiomatic demonstration of the point. However, no attention was given to an equally important argument.

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10 *Application by GasNet Australia (Operations) Pty Ltd* [2003] AcompT6 [29].

11 Final Decision, pp. 48-51.

12 "Critique of Responses to RBP ICB Draft Decision," NERA, November 2006, s1.1.

13 "Draft Statement of Principles for the Regulation of Transmission Revenues," ACCC, 1999.

CRA also argued in its September 2006 report that adopting the risk-free rate in the NPV DORC formula necessarily implied that the regulated firm would earn below its risk-adjusted cost of capital on its investment, contrary to the preamble to section 8 of the Gas Code.[14] The relevant section of the Code states,

> *"Broad principles for determining the Rate of Return are also set out, essentially requiring a return which is commensurate with the prevailing conditions in the market for funds and the risks involved in delivering the Reference Service."*[15]

The NERA November 2006 report and the Final Decision both fail to discuss that argument at all, despite the obviously serious implication that the Final Decision's approach to the discount rate issue may result in the pipeline owner earning a return on capital that does not reflect the risks involved in delivering the Reference Service—or indeed any risk at all.

To explain the ACCC's difficulty in more detail, it is useful to break the ACCC's logic into a series of steps. The Commission says, in effect:

1. The relevant discount rate for NPV DORC is the discount rate applicable to costs.
2. The discount rate applicable to costs is the risk-free rate.[16]
3. Once DORC is established on this basis, the net present value of allowed revenues less non-capital costs must be equal to that amount.

The critical question is then what discount rate should be used for net revenues in step 3? The main alternatives are to use the risk-free rate or the regulatory WACC. Either alternative leads to serious problems.

If net revenues are discounted at the risk-free rate, then the broad principles set out in section 8 of the Gas Code will be violated, because the rate of return would then not be commensurate with the risks involved in delivering the Reference Service.

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14 "Roma-Brisbane Pipeline: NPV DORC key inputs," CRAI, September 2006, p. 13.

15 Gas Code, s8, p.48.

16 Quite separately to the points argued here, the ACCC's claim that costs exhibit zero systematic risk is not accepted by CRAI or APT. The Commission has never presented any empirical evidence to support this claim. From a theoretical standpoint, one would not expect it to be true. As most costs can be shifted in time to some degree, firms will tend to elect to incur costs when they are relatively more wealthy—such as when market returns are high. Following this logic, one would expect costs to have a positive beta. As long as beta is positive, the risk-free rate will understate the appropriate discount rate for costs.

On the other hand, if net revenues are discounted at the regulatory WACC, then allowed revenues, before discounting, would need to be higher than economic costs. (If they were not, then the present value of net revenues would be less than DORC.) This alternative necessarily requires that the pipeline owner earns positive economic profits in each year. The problem in this case is that the ACCC does not set tariffs in this way. Its building-block approach is designed to permit the pipeline owner zero economic profit in each year.

This dilemma is at the heart of the algebraic demonstrations CRA has previously submitted in support of WACC as the NPV DORC discount rate.

3.1.2. Incorrect representation of CRAI argument

The focus of discussion in the Final Decision on the discount rate issue and of NERA's s1.1 is CRA's mathematical demonstration that if certain axioms are accepted, then the discount rate used in NPV DORC estimation must be the pipeline's regulatory WACC.[17] The axioms are that:

1. the NPV of economic profit to the existing pipeline must be zero;
2. the NPV of economic profit to the new pipeline must also be zero; and
3. the revenue earned by the new pipeline is the same as that earned by the existing pipeline each year.

NERA states that these are "*assumptions that we agree are reasonable.*"[18] NERA correctly notes that the axiomatic demonstration relies on the assumption that the discount rate for profit is the same for the new pipeline and the existing one.

NERA incorrectly represents CRA's argument, though, when it states, "*CRA's fourth implicit assumption should have been spelt out as: 4. All risk adjusted discount rates are identical. (Namely, profits have the same risk properties as revenues which have the same risk properties as expenditures …*"[19] CRA did not make that assumption.

17 CRAI, op.cit., s.4.

18 NERA, op.cit., p.1.

19 NERA, op.cit., p.1.

CRA believes it is valid to assume that the new and existing pipelines would have the same discount rate for profit, for the following reasons. The regulatory WACC is established with regard to the systematic risk of a pipeline. Pipeline-specific risk factors, such as its age, are assumed to be diversifiable under the standard CAPM method and are therefore not included in the regulatory WACC. The differences (primarily age) between an existing pipeline and a new one constructed to serve the same load all fall into the category of diversifiable risks, which are ignored in setting a regulatory WACC.[20] Therefore a WACC established by a regulator would be the same for the new and existing pipelines.[21]

3.1.3. Errors of economic theory

NERA's s1.1.2 challenges that conclusion, but in doing so it makes several errors of economic theory. First, it is inconsistent in its selection of discount rates—sometimes linking them to systematic risk and at other times ignoring this link. Second, contrary to well-established theory, it argues the irrelevance of the hypothetically competitive market concept to regulation.

On the first point, NERA observes that two pipelines with the same revenue but different cost profiles will have different net revenue profiles. While that may be so, it is not generally true that two different net revenue profiles must be discounted at different rates. NERA overstates the case when it says, "*We have shown above that, if we assume identical revenue streams then the discount rate on profits is different for pipelines with different expenditure profiles.*"[22] The problem with NERA's demonstration is that, as a matter of economics, the claim is not necessarily true. Two different net revenue profiles over time could have the same systematic risk. If they did, they would have the same discount rate under standard CAPM assumptions.

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20 There may be an argument that if two assets have significantly different cost structures—one with more variable costs than the other—then they would have different systematic risks. However, the cost structure of pipelines, whether old or new, is largely fixed. Older pipelines have higher absolute levels of cost, but the variable/fixed cost split is likely to be similar for pipelines of all ages.

21 Supporting that viewpoint, note that the discussion of rate of return in the Final Decision takes no account of the age of the pipeline. Moreover, the ACCC notes (p. 100) that "*The equity beta measures financial risk that cannot be eliminated in a balanced and diversified portfolio (systematic risk). Inclusion of other technical or operational risk factors is inconsistent with the underlying principles of the CAPM and is not consistent with a market based rate of return.*"

22 NERA, op.cit., p. 4.

The ACCC also errs in this connection. In the Final Decision, the ACCC states that "*The use of the risk free rate* [to calculate the present value of costs in NPV DORC] *assumes that there is no systematic risk associated with costs*".[23] If this statement is true,[24] it implies that the systematic risk of net revenues would equal the systematic risk of revenues, which are assumed to be the same for both pipelines.[25] The ACCC's systematic risk assumption for costs is clearly inconsistent with the view, expressed by NERA and by the ACCC[26] that the two different net revenue profiles must have different discount rates.

On the second point, NERA states, "*Moreover, it is unclear on what basis CRA believes that the regulatory WACC is relevant for either 'hypothetically competitive' pipeline.*"[27] The basis for this belief is the theory of regulation. NERA founder Professor Alfred Kahn noted, "*the single most widely accepted rule for governance of the regulated industries is regulate them in such a way as to produce the same results as would be produced by effective competition, if it were feasible.*"[28] Assuming that regulatory practice follows this maxim with regard to gas pipelines in Australia, the regulatory WACC would be set with regard to the returns that pipeliners would earn in hypothetical conditions of effective competition. The regulatory WACC is not irrelevant to the NPV DORC calculation, as NERA claims.

3.1.4. NERA equations support WACC as discount rate

NERA presents equations that can be used to provide an alternative demonstration that the discount rates for profit, revenue and cost must be equal for a firm that is constrained to make zero economic profit. NERA develops a series of equations, culminating in equation (3), which it uses to illustrate the mathematical relationships between the discount rate for profits, Wp, the discount rate for revenues, Wr, and the discount rate for expenditures, We. The putative aim of this discussion is to illustrate how it is possible for these three discount rates to differ.

23 Final Decision, p. 48.

24 A point which we do not accept, and which has not been substantiated by the ACCC or NERA.

25 Systematic risk for net revenue = Cov(net revenue,M)/Var(M), where M is the return on the market portfolio. Substituting (revenue – cost) for net revenue, and noting that Cov(X+Y,M) = Cov(X,M) + Cov(Y,M), it can be seen that Cov(net revenue,M)/Var(M) = Cov(revenue,M)/Var(M) – Cov(cost,M)/Var(M) = Cov(revenue,M)/Var(M) under the ACCC's assumption that the systematic risk associated with cost is zero.

26 Final Decision, p. 49.

27 NERA, op.cit., p. 4.

28 Alfred Kahn, The Economics of Regulation: Principles and Institutions, Volume I. New York: John Wiley & Sons, 1970, p.17.

To illuminate the subsequent points, it is helpful to restate equation (3) with a slight change in notation. Let PVP be the present value of profits, PVR be the present value of revenues, and PVE be the present value of expenditures.

PVR = R/(1+Wr)

PVE = E/(1+We)

PVP = PVR – PVE (a restatement of equation (1))

With this notational change, equation (3) can be more simply restated as follows:

Wp = ((Wr * PVR) – (We * PVE)) / (PVR – PVE) (restated equation (3))

In this form, it becomes clear that when the present value of profits tends towards zero, equation (3) approaches a singularity. NERA appreciates this point in its footnote 9, which states, "*As the present value of profits approaches zero due to increases in the level of costs the discount rate on profits approaches infinity.*"[29]

The prospect of an infinite discount rate should not be accepted at face value, as it is a counterintuitive concept that implies, among other things, that future events have no importance to present decisions.[30] Three questions must be considered. Is an infinite discount rate plausible? Would the circumstances of zero present value profits be sufficient to justify an infinite discount rate? Is an infinite discount rate a necessary consequence of equation (3) in those circumstances?

An infinite discount rate implies complete myopia—an utter disregard for consequences of present actions even in the very near future. While it remains a theoretical possibility it lacks any practical application in the context of forward-looking decision makers in a world that is expected to continue into the future.

The circumstances of zero present value profits are not extremely unusual. They are characteristic, for example, of many regulated firms and firms in highly competitive markets. These common circumstances are not sufficient to justify the assumption of complete myopia. Regulated firms are certainly not myopic. Their shareholders and governments require their managers to give due weight to future events, particularly as such firms typically own assets with long lives. An infinite discount rate for profits is not realistic.

Turning to the question of whether equation (3) necessarily implies an infinite discount rate when the present value of profits approaches zero, it is helpful to rewrite equation (3) as follows:

29 NERA, op.cit., p.3.

30 With an infinite discount rate, even large financial events in the very near future have a present value of zero.

$$Wp = ((Wr * PVR) – (We * PVE) + (We*PVR) – (We*PVR)) / (PVR – PVE)$$

$$= We *(PVR – PVE) / (PVR – PVE) + (Wr – We)*PVR / (PVR – PVE)$$

$$= We + (Wr – We)*PVR/PVP$$

In this form, it is clear that equation (3) avoids a singularity at PVP = 0 if and only if Wr = We.[31] In that situation, Wp = We.

To summarise this line of argument, if it is presumed that the discount rates for revenue and expenditure are different, equation (3) leads to the implausible conclusion that a firm's discount rate for profit tends to infinity as the present value of its profits tends to zero. This implausible conclusion can be avoided only if the discount rates for revenue and expenditure are equal. If they are, they must also be equal to the discount rate for profit.

3.1.5. Summary of ACCC errors on discount rate

To summarise, the ACCC and its consultant NERA have made errors of omission, fact and theory in concluding that the risk free rate must be used in the NPV DORC formula. They err in omitting to discuss the serious problem raised in CRAI's September 2006 report that the use of the risk-free rate in NPV DORC implies an asset owner will earn less than a risk-adjusted rate of return on its pipeline investment, contrary to s8 of the Code, or alternatively that the pipeline must earn positive economic profits before discounting. The principal error of fact is the incorrect representation of the fourth assumption in CRAI's axiomatic demonstration. Errors of theory include the following:

- including non-systematic risks (such as those associated with pipeline age) in the discount rate for profit, contrary to CAPM assumptions;
- inconsistent approaches to the systematic risk of costs and of net revenues;
- disclaiming the relevance of the hypothetical competitive market construct to regulatory pricing; and
- claiming that the discount rate for profit would rise to infinity as the net present value of a firm's profit tends to zero.

31 This conclusion assumes, plausibly, that the present value of revenues is non-zero.

3.2. INVALID DISMISSAL OF WACC AS DISCOUNT RATE

Much of the Final Decision's new discussion on the discount rate issue critiques arguments put by APT and CRAI. The previous section highlighted a number of errors in that critique. The ACCC and NERA also devote several pages to criticism of s4.3 of CRA's September 2006 report. That section reconciles CRA's conclusions with the views of Professor Grundy, which appear at first glance to be contradictory.[32] The assumption of zero economic profits is essential to CRA's conclusions on discount rate, whereas the conclusions reached by Professor Grundy refer to firms that are not necessarily so constrained. CRA's point was that Professor Grundy's opinion does not contradict CRAI's conclusions once account is taken of the particular circumstances of a regulated pipeline.

The grounds on which NERA and the ACCC dismiss CRA's reconciliation are invalid. NERA incorrectly represents CRA's argument.

In addition, both organisations make unsupportable claims about competition between insurance firms. The reason for focusing on insurance firms here is that NERA's 25 July 2006 report "*Assessment of Elements of APT's DORC Calculations for RBP*" went to some lengths in its s2.2 to point out the incorrectness of discounting future costs of an insurance company using WACC. CRA sought, in its September 2006 report at s4.3, to draw a distinction between a regulated pipeline and an insurance firm on the ground that the latter was not constrained to earn zero economic profit. In response, the ACCC made the unusual claim that competition between insurance companies drives their economic profits to zero. In s3.2.2 below, we demonstrate the implausibility of that claim with empirical evidence from the United States.

3.2.1. Incorrect representation of another CRAI argument

The bulk of NERA's criticism of that reconciliation appears to turn on a distinction NERA makes between firms in competitive markets and regulated firms. What both have in common is that they are constrained to earn zero economic profit. That is the only aspect of price regulation that is fundamental to CRA's conclusions.

NERA incorrectly represents CRA's argument later when it says "*CRA appears to be arguing that NERA/Grundy analysis relates to competitive firms and is therefore irrelevant because, unlike competitive firms, regulated firms are constrained to earn zero economic profits.*"[33] CRA did not argue this position. In particular, we did not say that the NERA/Grundy analysis relates to competitive firms. CRA has no way of knowing whether the firms to which Professor Grundy refers are competitive or not, because the source document (Brealey, et.al.) did not identify them.

32 NERA, op.cit., s1.1.3.

33 NERA, op.cit., p. 6.

3.2.2. Unsupportable claims about competition between insurance firms

Regarding insurance companies, which are used by NERA as examples, CRA stated that they are not constrained to earn zero economic profit. In response, the ACCC noted, "*In fact, it is generally accepted that the effect of competition on firms in competitive markets (such as insurance companies) is to drive economic profit towards zero.*"[34] We would agree that the general tendency of competition is to reduce economic profits. However, the implication that insurance companies earn zero economic profit is highly questionable.

Appendix A outlines recent econometric evidence regarding health insurance markets in the United States. The clear conclusion of that study is that these insurance firms have significant market power.

Fears were also raised in the contemporaneous American press concerning the consolidation of health insurance firms and the possible formation of local monopolies. In light of this evidence, the ACCC's suggestion that competition between insurers eliminates economic profits is unsupportable.

To summarise, CRA stands by its earlier explanation that the discount rate conclusions depend on the assumption of zero economic profit, and that this constraint—arising either from regulation or competitive conditions—is absent for the firms which Professor Grundy and NERA use to draw their contrary conclusions. Criticisms of this explanation by the ACCC and NERA are based on misrepresentation and a factually inaccurate view of insurance markets.

3.3. CONTRADICTION OF ESTABLISHED THEORY

The ACCC's position on the discount rate issue in the present matter is at odds with one of the few academic authorities available on this topic and with the concept of competition depreciation, advocated by the ACCC itself in 1999.

Professor Johnstone's 2003 paper[35] is devoted to an exploration of the full consequences of a replacement cost asset valuation paradigm for regulated energy infrastructure. The starting premise is that DORC equals or approximates the amount that a new entrant would have to pay to replicate existing infrastructure. Professor Johnstone explains why this premise underlies the valuation approaches of all Australian regulators,[36] particularly the ACCC, whose documents are cited extensively in the paper.

34 Final Decision, p. 50.

35 Johnstone, op.cit.

36 The present controversy concerning the entrant versus incumbent perspective had not yet emerged at the time of publication of Professor Johnstone's paper.

He cites Professor King's 2001 paper[37] in which a present value model is derived that, according to Professor Johnstone, correctly defines the competition exclusion limit on the regulatory asset base. That model is, of course, NPV DORC. In pages 16-22 of his paper, Professor Johnstone sets out to clarify and complete the King NPV DORC model.[38]

Importantly, Professor Johnstone's formulae use WACC as the discount rate. See, for example, his equation (7),[39] which gives DORC as a function of ORC, the asset inflation rate, and WACC. There is no possibility that he intended to refer to a generic discount rate that could as easily have been the risk-free rate as the WACC. He refers to the "*indifference condition for new investment as NPV = 0 (at a discount rate r = WACC)*".[40] A firm would not be indifferent to entry that earned zero net present value discounted at the risk-free rate.

Professor Johnstone goes on to note that the definition of DORC as the competition exclusion limit implies a particular scheme of depreciation, wherein the period t write-down of remaining asset value is given by his equation (8). He notes that when the asset inflation rate is zero, equation (8) coincides with the ACCC definition of 'annuity depreciation.'[41] That formula is set out in the ACCC's 1999 Draft Statement of Regulatory Principles,[42] where it is clear that the discount rate is the regulatory rate of return. If the risk-free rate were used in this annuity depreciation formula (as it would have to be if the ACCC is correct in the present matter) then the only return on capital available to regulated asset owners would be the risk-free rate.

Professor King also notes the equivalence between his NPV DORC formula and the ACCC competitive depreciation rule.[43]

In summary, the ACCC's present position on the NPV DORC discount rate is inconsistent with respectable academic opinion on the topic, and with its own competitive depreciation rule.

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37 King, Stephen. "Report on the Construction of DORC from ORC", Report to IPARC (2001), p.8.

38 One subtlety that should be noted is that the Johnstone/King versions of the NPV DORC formulae assume that differences in non-capital costs between the new and existing pipeline are reflected in the tariff. In other words, they are able to simplify the NPV DORC formulae because they assume that revenues net of non-capital costs are equal between pipelines. The NPV DORC formulae advanced so far in the present matter assume that total revenues are equal between pipelines.

39 Johnstone, op.cit., p. 18.

40 Johnstone, op.cit., p.17.

41 Johnstone, op.cit., p.19.

42 ACCC (1999), op.cit., p. 66.

43 King, op.cit., p. 21.

4. INCUMBENT PERSPECTIVE FOR NPV DORC

As to the second set of NPV DORC issues, concerning the incumbent perspective, the ACCC has interpreted the DORC construct in a manner that is without precedent[44] to arrive at an artificially reduced value of NPV DORC. The ACCC's justification for this new approach is the desire to ensure that APT's post-tax return on capital is no greater than the amount that a hypothetical new entrant would earn from the same tariff. The ACCC has erred in this process by failing to consider the actual tax circumstances of APT—which it must do in order to faithfully implement the principle underlying the Post Tax Revenue Model (discussed further in s4.1 below). To the extent that the assumed tax position is less favourable to APT than the actual position, this error will result in an underestimate of the incumbent DORC.

For various reasons, including the Trust structure of APT and the fact that debt and tax arrangements reflect portfolio-wide issues, it is very difficult, if not impossible, to reliably determine the specific tax position of the Roma-Brisbane Pipeline. Given those practical difficulties, it would be preferable to employ the more straightforward entrant DORC approach to determine the ICB. The ACCC noted its concern that this ICB might lead to excessive returns,[45] but it would only do so if the Post-Tax Revenue Model (PTRM) is used to determine tariffs. An alternative pre-tax revenue method based on entrant DORC would overcome these consistency problems.

In the previous CRA report,[46] we identified a mechanism through which an incumbent pipeline owner could expect to derive some financial benefit from the favourable tax position of a purchaser of that pipeline. NERA was strongly critical of that analysis,[47] but NERA's own analysis oversimplified the issues. When these issues are viewed in their proper perspective, it becomes clear that the incumbent can in some circumstances capture some of the purchaser's tax benefit by selling—although the tradeoffs are more subtle than either CRA's previous report or NERA's critique suggested. In brief, the tradeoff is between the benefit derived from continued ownership arising from the tax deductibility of interest payments on one hand and the benefit derived from selling that arises from the accelerated tax depreciation available to the buyer on the other hand. In some plausible circumstances, the two types of benefit will offset each other, with the result that an incumbent may indeed be better off after tax by selling for entrant DORC rather than continuing to own the pipeline under a regulatory valuation of incumbent DORC. The algebraic demonstration of this point is provided in section 4.3 below.

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44 The specific form of incumbent DORC proposed by the ACCC in the present matter has only previously been used in conjunction with the appeal to the Australian Competition Tribunal of the Moomba-Sydney Pipeline Access Arrangement. In that case, it has not so far formed any part of the tariff decision.

45 Final Decision, p. 53.

46 CRA, op.cit., s2.2.

47 NERA, op.cit., s.1.3.

In summary, the ACCC has erred in its calculation of incumbent DORC, and these errors may prove difficult, if not impossible, to correct given the unavoidable ambiguities in the tax position of a single asset within a corporate portfolio. The most prudent course for avoiding those errors is to use entrant DORC instead of incumbent DORC. As noted by NERA,[48] this choice of ICB methodology will require a departure from the PTRM in order to maintain internal consistency.

4.1. ACCC ERRS BY FAILING TO CONSIDER APT'S ACTUAL TAX POSITION

The ACCC's preference for the incumbent perspective on DORC is tied to its use since October 2001 of the Post-Tax Revenue Model (PTRM) framework.[49] In voicing support for this type of approach during an earlier policy debate, Professor Kevin Davis of the University of Melbourne noted,[50]

> "*The approach suggested in the ACCC / ORG paper, which involves estimating a target revenue stream which allows for estimated company tax payments (net of franking benefits) explicitly in the revenue stream and which is based on providing a fair required post-tax return on equity, is an appropriate one. It allows for explicit treatment of the unusual tax position of the gas businesses and uses concepts with which the market is familiar."*

The unusual tax position of the gas businesses to which Professor Davis refers is that it is "*markedly at variance*" with the assumption that these businesses are "*consistently in a tax paying position and providing equity returns in the form of franked dividends.*"[51]

In other words, gas businesses were perceived at that time to be achieving a higher than intended post-tax return on equity as a result of a pre-tax revenue approach that assumed a more adverse tax position than the actual position of those firms. The remedy was to add the firm's actual tax to the fair required post-tax return on equity plus costs to determine the permitted revenue.

48 See NERA, op.cit., conclusion 1.3, p. 11.

49 See "Post-tax revenue handbook," ACCC, October 2001.

50 Davis, Kevin, "Cost of Capital Models and Revenue Determination for the Gas Industry," prepared for the ORG and ACCC, 21 August 1998, p. 1.

51 Davis, op.cit., p.2.

Turning now to the case at hand, the ACCC's calculation of the incumbent DORC compares the present value of tax concessions for the new pipeline to the present value of projected tax concessions for the existing pipeline. The former tax concessions are necessarily hypothetical. The latter tax concessions are treated by the ACCC as if they were hypothetical, too. They are calculated according to formulae that are driven by assumptions about dates and costs of future investments in pipeline components, the lives and the applicable tax depreciation rates for each component. Importantly, the existing pipeline itself is assumed to have no remaining tax concessions, even though all sections of pipe apart from the original 1969 section are less than 20 years old. Moreover, the ACCC does not attempt to reconcile its hypothetical tax calculations for the existing asset with APT's actual tax position.

In failing to do this reconciliation, the ACCC introduces an inconsistency. The original motivation for introducing the PTRM was to employ the actual tax position of a gas business to avoid windfall gains or losses to the firm. Now, with the same ostensible aim, the ACCC is reducing the post-tax equity return by adopting a hypothetical estimate of the tax payable in place of the actual tax.

The original motivations for the PTRM, articulated in the quotes from Professor Davis above, have been defeated by the ACCC's use of presumed tax instead of actual tax in the incumbent DORC calculation. In this case, though, regulatory pessimism regarding tax payable could be expected to work against the regulated firm's legitimate business interests.

4.2. DETERMINATION OF TAX POSITION OF AN ASSET WITHIN A PORTFOLIO

It may prove difficult, if not impossible, to rectify the ACCC's error in adopting a presumed tax position because it is not a straightforward matter to establish the tax payable in respect of income earned on a single asset within a portfolio of assets held by a Trust such as APT.

As we have just explained, a calculation of incumbent DORC that is faithful to the underlying principles must be based on the actual tax position of the relevant asset. If that cannot be reliably determined, then an alternative DORC method should be used instead. Entrant DORC would be a preferable choice of method because it does not require calculation of the pipeline's actual tax position. The consistency problems that were noted by the ACCC and NERA concerning the use of entrant DORC with the PTRM could be resolved simply by determining a pre-tax revenue requirement based on entrant DORC.

4.3. INCUMBENT INCENTIVES TO SELL PIPELINE AFTER TAX BENEFITS ARE CONSUMED

In its earlier report, CRA noted "*that it is incorrect to assume in the NPV DORC calculation that an incumbent owner does not obtain any tax depreciation benefits from the existing pipeline.*"[52] This statement, and the associated analysis of how players in a competitive pipeline market would respond to taxation incentives, is criticised by NERA.[53]

The focus of this criticism is NERA's claim that CRA failed to recognise the taxability of proceeds from the sale of a pipeline that is fully depreciated for tax purposes. NERA proceeds from this claim to develop an argument that, "*This means that the Incumbent would never accept such a purchase offer of New Entrant DORC because, in after tax terms, it would leave them worse off than if they continued to own the existing pipeline.*"[54] NERA's conclusion 1.2 explains further that a sale price of New Entrant DORC would be rejected by the incumbent in favour of deriving Incumbent DORC from continued ownership.

In CRA's view, even if NERA's view of tax law is accepted, that conclusion is incorrect. The algebraic demonstration of this point in NERA's equations (4) – (6) fails to make the relevant comparison—that between after-tax benefits to the incumbent of sale on the one hand and of continued ownership on the other. In the interest of clarity, CRA develops the appropriate comparison in this section.

Assume, first, that the incumbent's sale proceeds are taxable at the corporate rate, in keeping with NERA's view of tax law. The net proceeds after tax (NP) for a pipeline with no remaining tax deductions for depreciation would be:

$$NP = (1-t)\,SP - g*ICB$$

"SP" is the sale price. "t" is the corporate tax rate. "g" is the gearing ratio (Debt/Value) for the pipeline, and "ICB" is the pipeline's initial capital base. This equation deducts income tax from the sale price then deducts the outstanding debt principal (g*ICB) to obtain the net proceeds.

The value of continued ownership (VOCO) can be expressed as a difference of present values:

$$VOCO = PV(\text{post-tax revenue}) - PV(\text{expenditure})$$

The incumbent faces the following financial expenditure streams:

- Non-capital costs (tax deductible)

52 CRA, op.cit., p.4.

53 NERA, op.cit., s1.2.1 and conclusion 1.5, p.16.

54 NERA, op.cit., p.7.

- Interest costs (tax deductible)
- Amortisation of debt (not deductible for pipeline > 20 years old)

Revenue is determined by regulation according to the building-block approach, which includes sufficient revenue to meet the financial expenditures itemised above plus the following economic costs:

- Return on equity, and
- "Amortisation of equity principal."

The item "Amortisation of equity principal" is the difference between asset depreciation and amortisation of debt (*depreciation = debt amortisation + equity amortisation*). It can be considered conceptually to be the return of equity. Taking account of this composition of revenues and expenditures,

VOCO = PV(non-capital cost) + PV(interest) + (1-t) PV(debt amortisation)

+ (1-t) PV(equity amortisation) + (1-t) PV(return on equity)

– PV(non-capital cost) – PV(interest) – PV(debt amortisation)

The non-capital cost terms in revenue and expenditure cancel each other out. The present value of interest can be rewritten as:

PV(interest) = (1-t) PV(interest) + t*PV(interest)

Making this substitution and rearranging terms,

VOCO = t*PV(interest) + (1-t) PV(interest + return on equity + depreciation)

– PV(interest + debt amortisation)

The present value of the sum of interest and debt amortisation is simply the initial amount of outstanding debt principal = g*ICB. The present value of the sum of interest, return on equity and depreciation is the initial capital base = ICB. Making these substitutions,

VOCO = t*PV(interest) + (1-t) ICB – g*ICB

It is now possible to examine the incumbent's willingness to sell the pipeline. The incumbent would be indifferent to selling if the net proceeds equal the value of continued ownership:

NP = VOCO, which implies,

(1-t) SP – g*ICB = t*PV(interest) + (1-t) ICB – g*ICB

Canceling the common term g*ICB from both sides and dividing both sides by (1-t), the sale price (before tax) that would make an incumbent indifferent between continuing to own the pipeline and selling (and paying tax on the proceeds) depends on the regulatory ICB in the following manner:

SP = ICB + t*PV(interest)/(1-t) (**incumbent indifference to sale**)

For a pipeline with no debt, and therefore no interest cost, the owner would be indifferent between continued ownership and selling for a price equal to the ICB:

SP = ICB (at the indifference point).

Where the owner would require a selling price higher than ICB it is debt, not tax depreciation, that increases the seller's reserve price. The additional value of continued ownership is derived from the tax deductibility of interest payments.

The important question is whether, in plausible circumstances, the difference between entrant DORC and incumbent DORC is sufficiently great to overcome that bias in favour of continuing to own the pipeline—would an incumbent with an ICB based on incumbent DORC be prepared to sell the pipeline for a price equal to entrant DORC? NERA's claim, quoted above, to the effect that an incumbent would never accept entrant DORC as a sale price supposes that the answer to this question is "no." CRA demonstrates the incorrectness of this claim by showing that it leads to a contradiction.

The difference between incumbent DORC (iDORC) and entrant DORC (eDORC) relates to the accelerated depreciation tax incentives for assets such as gas pipelines. This difference is noted in NERA's equation (4), restated below in a slightly different form:

eDORC = iDORC + t*PV(eDORC/tax life) (**restated NERA equation (4)**)

The last term on the right-hand-side is the present value of tax depreciation benefits, which are available only for 20 years.

An incumbent whose ICB is based on the incumbent DORC methodology would refuse to sell for a price equal to entrant DORC as long as entrant DORC is less than the indifference price:

eDORC < SP = ICB + t*PV(interest)/(1-t) (**refuse-to-sell condition**)

Using restated NERA equation (4) to substitute for eDORC in the refuse-to-sell condition:

ICB + t*PV(eDORC/tax life) < ICB + t*PV(interest)/(1-t)

Simplifying, this condition is equivalent to requiring that:

PV(eDORC/tax life) < PV(interest)/(1-t)

This condition will be met in some conceivable interest payment scenarios. However, for some plausible scenarios it clearly will not be. For example, if the debt is repaid in equal instalments over 20 years, the refuse-to-sell condition can be expressed as follows:

$$eDORC * SUM1 / TL < d*g*ICB*(SUM1 – SUM2/TL)/(1-t)$$

or, equivalently:

$$(eDORC/ICB) < d*g*TL*(SUM1 – SUM2/TL)/(SUM1*(1-t))$$

Where d is the interest rate, SUM1 is the sum of $(1+ d)^{-i}$ from i = 1 to TL, and SUM2 is the sum over the same index values of $i/(1+ d)^{i}$.

If the following specific parameter values (most of which are derived from the Final Decision) are adopted:

- corporate tax rate, t = 30%;
- tax life, TL = 20 yrs;
- initial debt principal, g*ICB, with g=60%;
- interest rate, d=7%; and
- tax benefits and interest payments are discounted at the same rate = d,

the refuse-to-sell condition is equivalent to:

$$(eDORC/ICB) = (eDORC/iDORC) < 0.7$$

leading to the contradiction that entrant DORC < 0.7 * (incumbent DORC), contrary to restated NERA equation (4). The derivation of this numerical result is shown in Appendix B.

As entrant DORC is greater than incumbent DORC, the incumbent would prefer to sell (given these plausible assumptions about loan repayments and the other parameters) for an amount equal to entrant DORC, despite the posited requirement to pay tax on the sale proceeds.

NERA's conclusion 1.2 is untrue as a general proposition because it is incorrect for plausible assumptions such as the ones just considered. There are likely to be some scenarios for which conclusion 1.2 is valid, but NERA fails to note that the conclusion depends on particular assumptions about the pattern of interest payments, nor does NERA specify those assumptions. NERA presents a highly conditional conclusion as if it were unconditionally true.

The significance of this point is that the dismissal of CRA's prior arguments on the incumbent perspective relied heavily on NERA's erroneous view.[55] The ACCC conclusions on the incumbent perspective appear also to be strongly influenced by NERA's view.[56]

5. IMPLEMENTABILITY OF NPV DORC

The third set of NPV DORC issues, which concern the implementability of the method, were greatly overstated in the Final Decision. As just noted, once steps are taken to resolve the controversy over discount rates and incumbent versus entrant, the range of possible NPV DORC values is actually small. The ACCC's concern that a faithful calculation of NPV DORC must rely on private cost information held by the service provider is also misplaced. Cost information enters the NPV DORC formula solely through the parameters, "tech", "prod", "g", and "opex". Apart from "opex", which is disclosed in the Access Arrangement Information, these parameters are forward-looking trend estimates for the entire pipeline industry. As such, the service provider is no better placed than any other reasonably well-informed industry participant, including the regulator, to place accurate values on them. In any case, APT has sought to minimise any controversy surrounding these parameters by adopting the ACCC's own preferred values.

6. SUMMARY OF CONCLUSIONS

The ACCC's Final Decision on the Roma – Brisbane Pipeline Access Arrangement bases the ICB primarily on the linear DORC methodology. The ACCC's implementation of linear DORC differs from the implementation proposed by APT, which was not shown by the ACCC to be invalid or otherwise unreasonable. Indeed, what academic literature is available on the subject suggests that economic theory provides no unambiguous basis for a preference between APT's linear DORC method and the ACCC's method. Relevant precedent indicates that it is not within the ACCC's power to replace reasonable proposals by the facility owner with its own proposals. In these circumstances, the ACCC's rejection of APT's estimate of linear DORC appears open to challenge.

Linear DORC was selected by the ACCC despite some shortcomings in that method because the main alternative approach—NPV DORC—was held to be unworkable. The perceived unworkability of NPV DORC was linked to three main issues:

- Divergent views on the correct discount rate to use in the NPV DORC calculation;

55 The erroneous view, that an incumbent would reject a sale price of entrant DORC, is noted at NERA, op.cit., pp.11-13,16.

56 See, for example, Final Decision, p. 53.

- Divergent views on the correct tax perspective (incumbent or entrant) to use in the NPV DORC calculation; and

- Concerns that NPV DORC estimation requires information that is asymmetrically held by the facility owner.

Regarding discount rate, APT proposed the use of the regulatory WACC, whereas the ACCC used the risk-free rate instead. The ACCC's choice in this regard relies on arguments that contain errors of economic theory. CRA's prior arguments in favour of WACC have been misrepresented by the ACCC and its consultant NERA, and invalidly dismissed. An important argument that using the risk-free rate for NPV DORC was likely to lead to a breach of s8 of the gas code was overlooked by the ACCC and NERA. Beyond these errors, the ACCC position is inconsistent with established theory on the specific question of NPV DORC estimation.

Regarding the proper tax treatment, the ACCC applied the incumbent perspective instead of the entrant perspective proposed by APT. The ACCC's incumbent DORC calculation is based on the Post-Tax Revenue Model, but it misapplies that concept, using a hypothetical tax approach when an actual tax approach is required. The use of such an actual tax approach may be difficult, if not impossible. Thus, a preferable approach would be to use the entrant DORC in conjunction with a pre-tax revenue approach in order to maintain internal consistency in the tariff determination. CRA's earlier analysis of the tax question was rejected on the strength of NERA's analysis. However, NERA's analysis draws an inappropriate comparison, leading to a conclusion which was demonstrated in this report to be invalid for conditions that closely resemble the circumstances of the Roma – Brisbane Pipeline.

Finally, this report demonstrates the incorrectness of the allegation that NPV DORC requires private information held asymmetrically by the pipeline owner. The only information required to calculate NPV DORC concerns replacement costs, current operating costs, and trend rates of change in pipeline replacement costs and operating costs over long periods of time. Current operating costs are reported to and tested by the regulator in the Access Arrangement process. Trend rates of change are industry-wide rates that are equally well known to all Australian industry participants, including regulators. In any case, APT has adopted the parameter settings preferred by the ACCC specifically to minimise controversy in this area.

In conclusion, the ACCC's Final Decision and the supporting NERA report contain errors which leave all of its main conclusions concerning the DORC valuation open to challenge.

APPENDIX A: – COMPETITION IN INSURANCE INDUSTRY

The American Medical Association's "*2005 Competition in Health Insurance – A Comprehensive Study of U.S. Markets*" was released in April 2006. That study was an econometric analysis of market shares and concentration indices for health insurance organisations in regional markets in the United States. It prompted the headline "*Health insurers build up market clout—New evidence raises fears that local monopolies forming*."[57]

Among the specific findings of that study:[58]

- in the Health Maintenance Organisation (HMO)[59] product market,
    - 99% of the Metropolitan Statistical Areas (MSAs) have an a Herfindahl-Hirschman Index (HHI)[60] in excess of 1800;
    - 64% of the MSAs have an insurer with a market share of 50% or more;
- in the Preferred Provider Organisation (PPO)[61] product market,
    - 99% of the MSAs have an HHI in excess of 1800;
    - 78% of the MSAs have an insurer with a market share of 50% or more;
    - 36% of the MSAs have an insurer with a market share of 70% or more;
- in the combined HMO/PPO product market,[62]

57 http://www.marketwatch.com/News Russ Britt, 1:40pm ET Apr 17, 2006, accessed 21 Dec. 2006.

58 Competition in Health Insurance: A Comprehensive Study of U.S. Markets, American Medical Association (2005), p. 6.

59 Health Maintenance Organisation, one of the product scope definitions for the relevant health insurance markets. Patients who obtain medical insurance through an HMO are only reimbursed for treatment received from professionals within the HMO network.

60 The Herfindahl-Hirschman Index is the sum of the squares of the market shares of industry participants, expressed in percentage terms. It is a widely used indicator of market concentration. In a monopoly, the HHI is 10,000—its maximum possible value. A market with two equal firms would have an HHI of 5,000 = 50*50 + 50*50. A market with five equal firms would have an HHI of 2,000 = 20*20 + 20*20 + 20*20 + 20*20 + 20*20. An HHI of 1800 or more is considered indicative of a relatively concentrated market.

61 Preferred Provider Organisation, another of the product scope definitions for the relevant health insurance markets. A PPO is similar to an HMO, but the terms of payment by the patient are somewhat different (larger deductibles or co-payments) and greater flexibility is available in terms of choice of doctor or hospital.

- 95% of the MSAs[63] have a Herfindahl-Hirschman Index (HHI) > 1800; and
- 56% of the MSAs have one insurer with a market share of 50% or more.

These quantitative results indicate dominant market shares for the largest provider in a significant proportion of geographic markets and high concentration levels generally. While market share and concentration data is not necessarily conclusive evidence of market power, it is more indicative in the presence of high entry barriers. The AMA report states that the barriers to entering health insurance markets are "very substantial."[64]

62 The combined HMO/PPO product scope definition for the relevant market was considered to determine whether the AMA study's conclusions were sensitive to a broadening of the product scope. Narrower product markets for HMO or PPO alone were examined as well.

63 Metropolitan Statistical Areas, used as the geographic scope of the relevant health insurance markets in the AMA study.

64 AMA, op.cit., p. 2.

APPENDIX B: – "REFUSE-TO-SELL" CONDITION

Adopting the nomenclature set out in s4.3 above, the condition under which an incumbent pipeline owner would reject sale of the asset in favour of continued ownership is equivalent to the condition that:

PV(entrant DORC/tax life) < PV(interest)/(1-t)

This condition will be met in some conceivable interest payment scenarios. However, for some plausible scenarios it will not be. In the situation in which debt is repaid in equal instalments over 20 years, the refuse-to-sell condition can be expressed as follows:

Entrant DORC * SUM1 / TL < d*g*ICB*(SUM1 – SUM2/TL)/(1-t)

or, equivalently:

(entrant DORC/ICB) < d*g*TL*(SUM1 – SUM2/TL)/(SUM1*(1-t))

SUM1 is the sum of $(1+ d)^{-i}$ from i = 1 to TL. SUM2 is the sum over the same index values of $i/(1+ d)^{i}$. The evaluation of SUM1 is straightforward—it is simply the finite sum of a geometric series:

SUM1 =r (1 – r^TL) / (1 – r)

= [1 – (1/(1+ d))^TL] / d , where r = 1/(1+ d).

The evaluation of SUM2, the finite sum of ir^i , is somewhat more involved. The following finite summation formula is provided in L.B.W. Jolley, Summation of Series 2nd revised edition, Dover, New York (1961), equation (5), pp. 2-3:

SUM2 = (r – (TL+1)r^(TL+1) + TLr^(TL+2)) / (1 – r)^2

Again, r = 1/(1+d). Jolley's formula is somewhat more general than this one, which was obtained by setting Jolley's parameter "a" to zero and "d" to 1. Jolley's parameter "n" corresponds to TL+1.

If the following specific parameter values (most of which are derived from the Final Decision) are adopted:

- corporate tax rate, t = 30%;
- tax life, TL = 20 yrs;
- initial debt principal, g=60% of ICB;
- interest rate, d=7%; and
- tax benefits and interest payments are discounted at the same rate = d,

SUM1 = 10.59, and SUM2 = 88.1.

The refuse-to-sell condition can now be evaluated by substituting the assumed numerical values into the formula:

(entrant DORC/ICB) < 7% * 60% * 20 * (10.59 – 88.1/ 20) / (10.59 * 70%)

which implies that the incumbent would prefer to sell as long as

(entrant DORC/ICB) = (entrant DORC/incumbent DORC) < 0.7

This condition is clearly inconsistent with one of the starting premises, that entrant DORC > incumbent DORC. This contradiction proves the incorrectness of NERA's general claim that "*This means that the Incumbent would never accept such a purchase offer of New Entrant DORC because, in after tax terms, it would leave them worse off than if they continued to own the existing pipeline.*"[65] [emphasis added]

65 NERA, op.cit., p.7.