Agility

The Construction of DORC From ORC

Agility Management
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1. Purpose:

Given the definition and interpretation of DORC available in:

(i) Final Decision on Access Arrangement by Transmission Pipelines Australia Pty Ltd and related Access Arrangements, Australian Competition and Consumer Commission, October 1998;
(ii) Final Decision on Access Arrangements for Multinet Energy Pty Ltd & Multinet (Assets) Pty Ltd; Westar (Gas) Pty Ltd & Westar (Assets) Pty Ltd; Stratus (Gas) Pty Ltd & Stratus Networks (Assets) Pty Ltd; Office of the Regulator-General, Victoria; October, 1998; and
(iii) Draft Statement of Principles for the Regulation of Transmission Revenues, Australian Competition and Consumer Commission, 27 May 1999

the purpose of this paper is to:

1. describe the proper construction of a DORC valuation from an ORC valuation; and
2. comment on the appropriateness of the construction contained in the ACCC's Draft Statement of Principles for the Regulation of Transmission Revenues.

2. The Definition and Interpretation of DORC – what DORC is attempting to Measure:

The definition and interpretation of DORC valuation are discussed at some length in the three documents referred to in section 1.

2.1 Reference 1: Final Decision on Access Arrangement by Transmission Pipelines Australia Pty Ltd and related Access Arrangements, Australian Competition and Consumer Commission, October 1998

Pages 32 and 33:

> *"The DORC methodology has theoretical economic attraction for a number of reasons. First, regulators often look to competitive or contestable markets for guidance on efficient decision rules for regulating natural monopoly markets. Such comparisons can provide a number of guiding principles for a range of complex regulatory problems. In addition, the establishment of broadly symmetrical pricing and incentive structures across regulated and unregulated markets has intuitive appeal on general resource allocation grounds. It is noted in this regard that one of the objectives for reference tariffs is to replicate the outcomes of a competitive market (section 8.1(b))."*
>
> *"Third, unlike the statements made in some of the submissions, DORC valuations are based on a competitive concept. A return on replacement cost*

is the maximum that a monopoly firm could earn in a perfectly contestable market."

"Lastly, any value that is in excess of DORC may produce reference tariffs that will expose the service provider to being by-passed."

"Another justification for DORC setting the upper limit to valuations comes from what a DORC valuation actually is attempting to measure. This is the maximum price that a firm would be prepared to pay for 'second hand' assets with their remaining service potential, higher operating costs, and (old) technology given the alternative of installing new assets which embody the latest technology, generally have lower operating costs, and which will have a greater remaining service potential. Therefore, if prices reflect a value that is in excess of DORC, then users would be better off were the existing system scrapped and replaced by new assets. Similarly, if assets are sold for prices above the DORC valuation, then this implies that scarce investment funds are being inefficiently applied: in this case, it would have been a more efficient use of investment funds for the existing assets to be scrapped and a duplicate system installed."

2.2 Reference 2: Final Decision on Access Arrangements for Multinet Energy Pty Ltd & Multinet (Assets) Pty Ltd; Westar (Gas) Pty Ltd & Westar (Assets) Pty Ltd; Stratus (Gas) Pty Ltd & Stratus Networks (Assets) Pty Ltd; Office of the Regulator-General, Victoria; October, 1998

Page 8:

"Thus, the DORC valuation is consistent with the asset valuation that would apply to an efficient new entrant and is, in effect, the value the assets would have if they were employed in a competitive market."

Page 51:

"One interpretation of DORC is that it is the valuation methodology that would be consistent with the price charged by an efficient new entrant into an industry, and so is consistent with the price that would prevail in the industry in long run equilibrium."

"Lastly, as noted above, any value that is in excess of DORC is likely to produce Reference Tariffs that will expose the Service Provider to being by-passed."

"Another justification for DORC setting the upper limit to valuations comes from what a DORC valuation actually is attempting to measure. This is the maximum price that a firm would be prepared to pay for 'second-hand' assets with their remaining service potential, higher operating costs, and (old) technology given the alternative of installing new assets which embody the latest technology, generally have lower operating costs, and which will have a greater remaining service potential. Therefore, if prices reflect a value that

is in excess of DORC, then Users would be better off were the existing system scrapped and replaced by new assets. Similarly, if assets are sold for prices above the DORC valuation, then this implies that scarce investment funds are being inefficiently applied: in this case, it would have been a more efficient use of investment funds for the existing assets to be scrapped and a duplicate system installed."

Page 58:

"There are two equivalent definitions of what DORC attempts to measure:

- *the asset value that is consistent with the prices that would prevail in a competitive market (that is prices which reflect the cost structure of an efficient new entrant); and*
- *the price that a firm with a certain service requirement would pay for existing assets in preference to replicating the assets."*

and:

"A number of implications flow from both definitions for the methodology: …

***Depreciation is implied** - the value of an asset in a competitive market is the net present value of future income from that asset, which will be lower for an asset that is part of the way through its life. Similarly, assets which have a lower remaining life will need to be replaced earlier than new assets, implying that a buyer would pay less for older assets."*

2.3 Reference 3: Draft Statement of Principles for the Regulation of Transmission Revenues, Australian Competition and Consumer Commission, 27 May 1999

Pages 39:

"The main economic principle for assessing the economic value of any assets is that their value to investors is equal to the net present value of the expected future cash flows generated by those assets. The practical difficulty in making this assessment for regulated monopoly businesses is that the future revenue derived from the assets is itself determined by the regulator – hence the issue of circularity associated with the use of ODV as a methodology to value sunk assets.

This potential circularity is eliminated by the use of DORC. The DORC of a network is the sum of the depreciated replacement cost of the assets that would be used if the system were notionally reconfigured so as to minimise the forward looking costs of service delivery. There are two definitions of what DORC attempts to measure:

- *One interpretation of DORC is that it is the valuation methodology that would be consistent with the price charged by an efficient new entrant into an industry, and so it is consistent with the price that would prevail in the industry in long run equilibrium.*

- *The second interpretation is that it is the price that a firm with a certain service requirement would pay for existing assets in preference to replicating the assets."*

Page 40:

> *"Finally, another justification for DORC setting the upper limit to valuations comes from what a DORC valuation actually is attempting to measure. This is the maximum price that a firm would be prepared to pay for 'second-hand' assets with their remaining service potential, higher operating costs, and (old) technology - given the alternative of installing new assets which embody the latest technology, and which generally have lower operating costs, and which will have a greater remaining service potential. Therefore, if prices reflect a value that is in excess of DORC, then users would be better off if the existing system were scrapped and replaced by new assets. Similarly, if assets are sold for prices above the DORC valuation, then this implies that scarce investment funds are being inefficiently applied: in this case, it would have been a more efficient use of investment funds for the existing assets to be scrapped and a duplicate system installed."*

2.4 Summary:

The statements of principle in all three documents are consistent and, in several instances, identical. The common thread to all the statements is that the DORC is a market value concept. For the purposes of this paper, the concept is most clearly enunciated:

from Reference 3, Page 39:

> *"The main economic principle for assessing the economic value of any assets is that their value to investors is equal to the net present value of the expected future cash flows generated by those assets."*
>
> and:
>
> *"- One interpretation of DORC is that it is the valuation methodology that would be consistent with the price charged by an efficient new entrant into an industry, and so it is consistent with the price that would prevail in the industry in long run equilibrium."*

from Reference 2, Page 58:

> *" … DORC attempts to measure the asset value that is consistent with the prices that would prevail in a competitive market (that is prices which reflect the cost structure of an efficient new entrant)"*
>
> and:

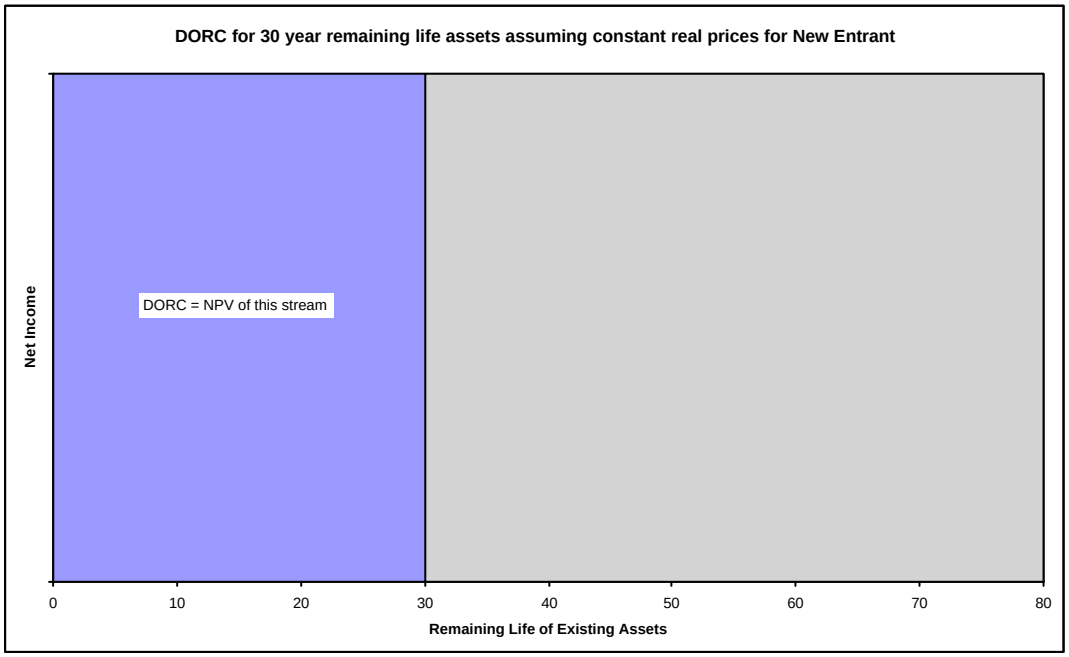
Depreciation is implied *- the value of an asset in a competitive market is the net present value of future income from that asset, which will be lower for an asset that is part of the way through its life. Similarly, assets which have a lower remaining life will need to be replaced earlier than new assets, implying that a buyer would pay less for older assets."*

3. The Construction of DORC from ORC:

To be consistent with the statements of principle in the ORG and ACCC Decisions, and in the Draft Statement of Principles, the DORC for existing assets must be constructed as the net present value of the future income from those assets, where the income is consistent with the prices that would be charged by an efficient new entrant, but recognising that the income stream for the DORC valuation will have a life equal to the remaining life of the existing assets[1]. That life is less than the life of the new entrant's assets.

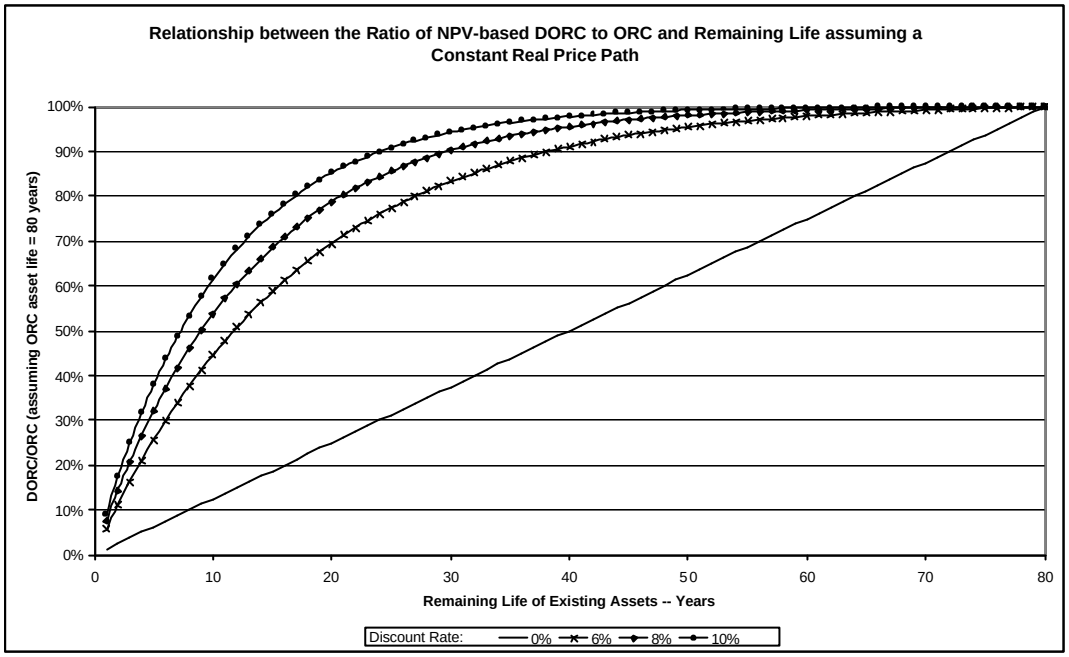
By definition, the value of the new entrant's assets is ORC, and the price charged by the new entrant must be such as to ensure that the NPV of the future income stream over the life of those assets is equal to the ORC. Having determined the income stream for the new entrant's assets, the DORC value for the existing assets is then determined as the NPV of the first L years of that stream, where L is the remaining life of the existing asset.

For example, if the new entrant's revenue stream were constant in real terms, and the remaining life of the existing assets was 30 years compared with an 80 year life for the new entrant's assets, the DORC will be the NPV of the first 30 years of the new entrant's net income:



[1] In practical applications the higher cost of maintaining existing (DORC) assets vis a vis new (ORC) assets should be taken into account. Because maintenance is asset specific, this factor is not included in the analysis that follows. The effect on DORC for capital intensive infrastructure assets will be small.

On this basis, the relationship between DORC and ORC for an asset with a new entrant life of 80 years is depicted in the following graph:



From this it can be observed that the higher the discount rate, the closer is the DORC to ORC for any given remaining life.

The straight line relationship reflects the assumption that DORC is to ORC as the remaining life of existing assets is to the life of new (ORC) assets. This assumption results in a significant understatement of the value of the NPV-based DORC.

4. The Profile of the Revenue Stream – "Competition Depreciation"

The above analysis assumes that the new entrant will charge constant real prices. However, in Reference 3, Page 27, the ACCC observes that:

> *"The choice of traditional depreciation profiles [linear] gives rise to inter-temporal and possible geographic economic distortions that would not be observed in competitive business activities. For example, two otherwise similar [service providers] under the same regulatory framework and using similar equipment may have different prices due purely to the age of the equipment.[25] Such discontinuities create unnecessary economic distortions.*

[25] *For example, the cost of freight services has little to do with the age of the trucks used – indeed the customer would not normally be aware of the age of the truck or its market value when arranging transport of his or her goods. Competition generally forces the charges to a common level so that the service prices or potential revenue associated with a new truck is much the same as for an old truck. Nevertheless, all the truck owners will be aware that they need to cover all their costs including capital costs over its useful life."*

and suggests that a "competition depreciation" approach to depreciation will yield a revenue profile which is more reflective of the prices which would occur in the presence of competitive forces:

> *"To avoid problems such as these, the Commission has adopted an approach that assigns depreciation in an economically meaningful way. In a competitive environment this would correspond to asset values being depreciated in line with changes in replacement costs or the costs of alternative (competing) technologies. One of the primary motives for this approach is that in a competitive environment pricing of services is independent of the vintage of the assets which provided those services. Adopting this approach, revenues will assume a time profile which is closely related to the replacement costs of assets or alternative technologies where these exist."*

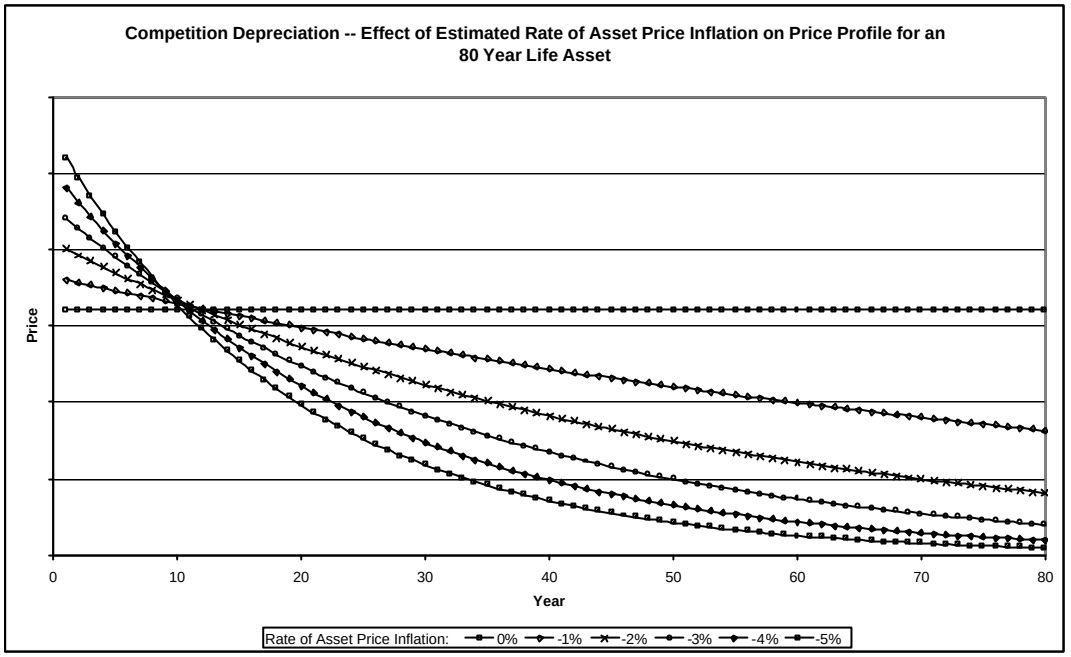
On page 69 of the Draft Statement of Principles, the competition approach to depreciation is described by reference to:

> *"….the 'competition' term referring to the responsiveness of associated pricing to changes in replacement costs taking account of general price increases and technological change in a manner which mimics competitive market behaviour."*

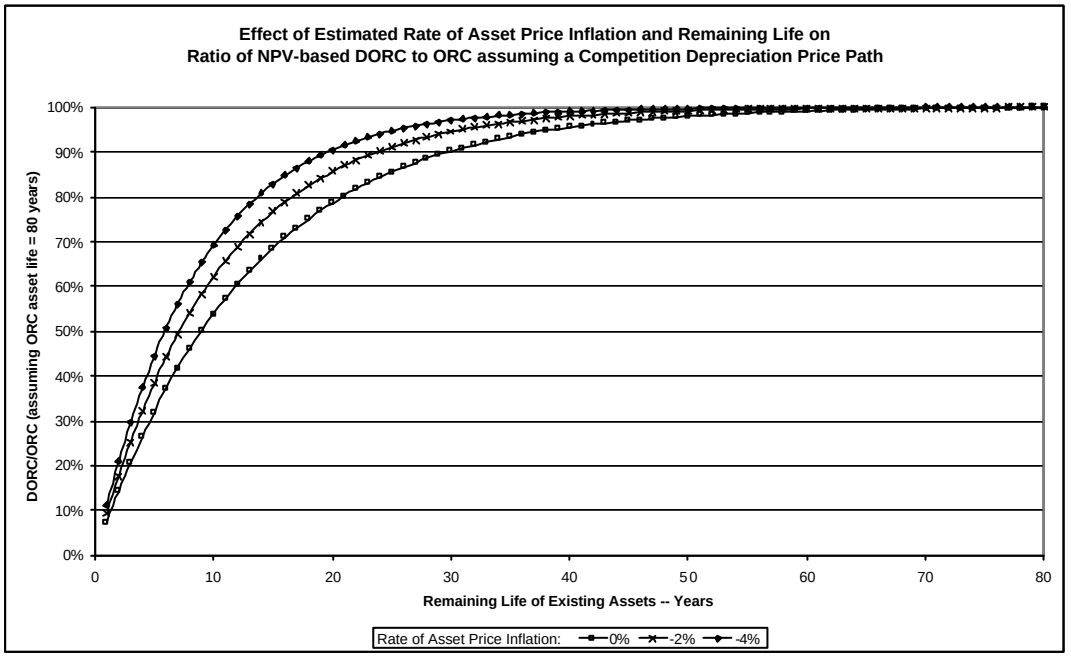
These components – general price increases and technological change – are reflected in a term which the Draft Statement of Principles calls the "rate of asset price inflation" (page 66):

g	=	estimated rate of asset price inflation;
	=	(1+f) . (1-p) –1, where:
f	=	inflation rate; and
p	=	trend productivity growth

The effect of adopting competition depreciation is to change the profile of prices over time. There is, of course, an overriding constraint that the net present value of the expected future cash flows generated by the assets is equal to their first cost. Thus under the competition depreciation profile, the greater the expected rate of technological improvement, the higher the initial price and rate of depreciation of the assets, and the greater the reduction in prices over the life of the asset. This is illustrated in the graph below:



When price profiles consistent with competition depreciation are used in the calculation of DORC the relationship between DORC and ORC changes as follows:



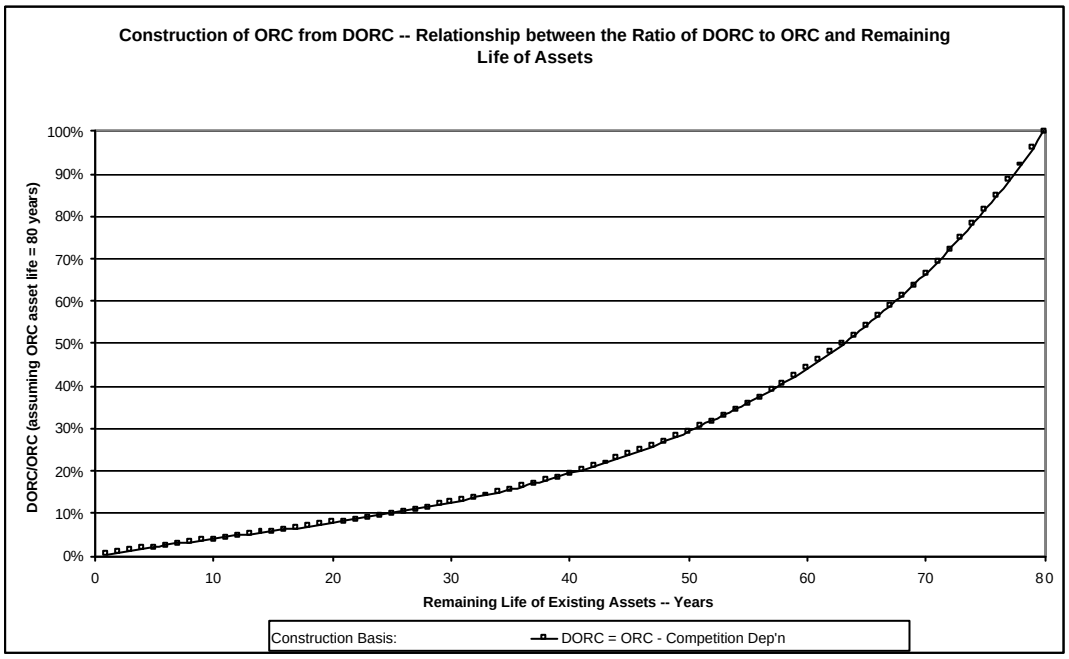
From this it can be observed that the greater the rate of technological change, the closer is the NPV-based DORC to the ORC for any given remaining life and discount rate.

5. Appropriateness of the construction of DORC from ORC in the Draft Statement of Principles for the Regulation of Transmission Revenues

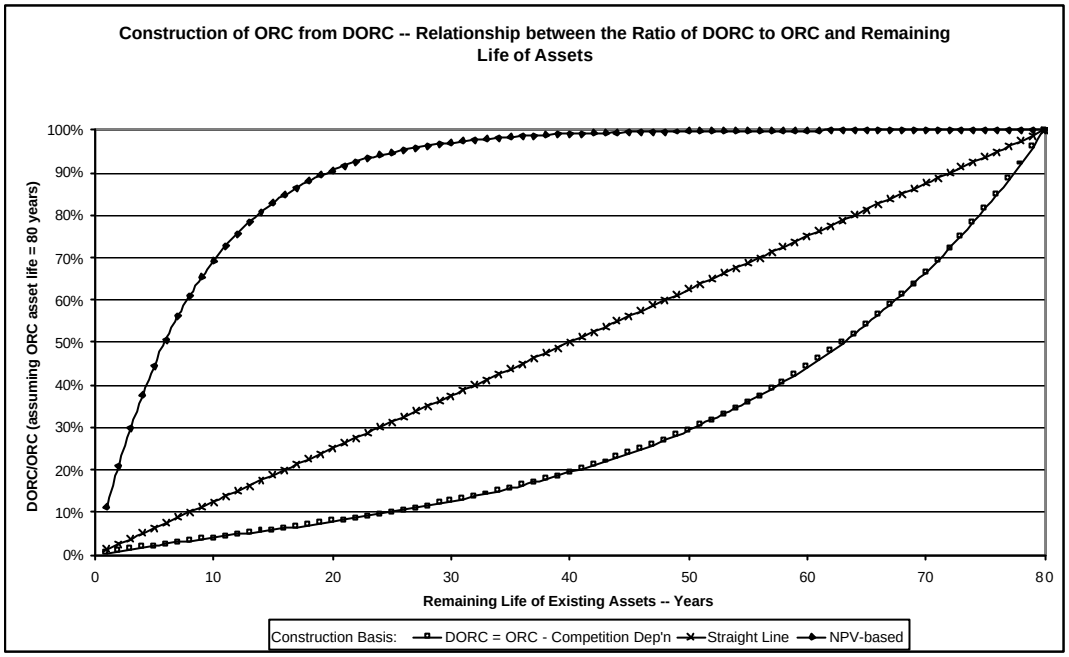
The construction of DORC from ORC is described on pages 42 through 48 of the Draft Statement of Principles. This approach calculates DORC as ORC less depreciation. On page 47 the Draft Statement proposes that depreciation for these purposes should be competition depreciation:

> *"….the approach to depreciation which integrates both of these features [smoothing of revenue paths designed to avoid anomalous pricing associated with the vintage of the assets employed, and adjustments to reflect the impact of future potential stranding] is called competition depreciation. For overall consistency of the proposed regulatory framework it is important that depreciation of ORC to obtain the DORC valuation should adopt the same approach"*

Assuming that DORC was constructed as ORC less depreciation, and depreciation was calculated as "competition" depreciation, then the relationship between DORC and ORC for a new entrant asset with a life of 80 years is as depicted in the figure below.



This is contrasted with the construction of DORC from ORC using straight line depreciation, and with the NPV-based construction proposed in this paper (which is consistent with the definition and interpretation of DORC in the ORG and ACCC Decisions and in the Draft Statement of Principles) in the figure below:



It appears that the construction of DORC proposed in the Draft Statement of Principles, where DORC equals ORC less "competition" depreciation, results in a move away from, rather than towards, the correct value of DORC.

The references cited earlier in this paper establish clearly that the DORC is attempting to measure the value at which a potential new entrant would be indifferent between purchasing the existing 'second hand' assets and building an optimised replacement system taking into account the future rate of technological improvement. The references also establish that the value is to be determined by reference to NPVs:

> *" … DORC attempts to measure the asset value that is consistent with the prices that would prevail in a competitive market (that is prices which reflect the cost structure of an efficient new entrant)"*
>
> ***"Depreciation is implied** - the value of an asset in a competitive market is the net present value of future income from that asset, which will be lower for an asset that is part of the way through its life.*

It follows that the value calculated simply by adjusting ORC for accumulated depreciation, whether by the "traditional" straight line approach or by the "competition" depreciation approach, is not the DORC value of the existing assets. That this is so has been demonstrated by comparing the results of these constructions against the proper (NPV-based) construction of DORC. It can also be shown by determining prices on a DORC constructed by reference to the approach proposed in the Draft Statement of Principles; these prices will not equal *prices which reflect the cost structure of an efficient new entrant.*

6. Summary

To be consistent with the statements of principle in the ORG and ACCC Decisions, and in the Draft Statement of Principles, the DORC for existing assets must be constructed as the net present value of the future income from those assets, where the income is consistent with the prices that would be charged by an efficient new entrant, but recognising that the income stream for the DORC valuation will have a life equal to the remaining life of the existing assets.

The common assumption, that DORC equals ORC less depreciation, is incorrect and significantly understates the proper value of DORC. This is true regardless of whether depreciation is determined as straight line, or as competitive depreciation (as proposed in the Draft Statement of Principles).