

Why the Current Cost Charging Method Used in the NG Transmission Model Needs to be Reviewed.

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Introduction

An important element of the National Grid transmission charging model is the calculation of the Expansion Constant: that is, the estimated cost of transmitting 1MW for 1Km.

A verbal description of how the Expansion Constant is calculated is given in Appendix B of the NG document “Transmission Use of System Charges Review: Proposed Investment Cost Related Pricing for Use of System” dated June 1992. This description is not altogether clear: but it has been verified in discussion with NG that the procedure used is an application of the current cost Regulatory Capital Value pricing method as widely used by utility regulators in the UK.

As will be shown in this paper, there are serious issues and problems with this pricing method, which are likely to lead to charges being set too high. In the light of these problems, there is an urgent need to review the operation of current cost charging in its application in the NG transmission charging model.

Background

A paper by Cuthbert and Cuthbert submitted to OFGEM’s RPI-X @20 review dealt with the current cost Regulatory Capital Value (CCRCV) pricing method, based primarily on the version of the model as it had been introduced in the water industry in Scotland. The Regulatory Strategy Manager at NG subsequently responded to that paper by means of another submission to the RPI-X@20 review, pointing out that the version of current cost charging analysed in our paper differed from the method applied by NG. (The difference arises because, in the NG version, the charge is worked out by applying a real rate of interest to the current cost regulatory capital value of the utility: whereas in the original Scottish version, a nominal rate of interest had been applied. The difference between these two approaches was noted in the earlier paper – but the detailed analysis was carried out on the Scottish version.)

In their comment on the Cuthbert and Cuthbert paper, NG re-worked some of the calculations in that paper. For the avoidance of doubt, it should be made clear that this paper is concerned with the NG variant of the method, and in the calculations of tables 2 and 3 below, we in fact use a spreadsheet tool provided by NG. (Copies of the original Cuthbert and Cuthbert paper, the NG comment, and the NG spreadsheet tool, can be found on the web under the OFGEM RPI-X @20 forum.)

The Current Cost Charging Method as applied by NG.

The Regulatory Capital Value, (or RCV), of a utility is an estimate of capital value used in setting charges. Under the current cost version of the RCV method used by NG, the RCV is rolled forward each year by uprating for inflation, adding in the value of new investment, and subtracting off current cost depreciation. The charge to be levied is then calculated as the sum of

- a) current cost depreciation, and
- b) an interest charge calculated by applying a real interest rate to the value of RCV: if

i denotes nominal interest rate, and r the rate of inflation, then the real interest rate is calculated as $(i - r)/(1 + r)$.

Under this charging scheme, if there is an initial drawdown of capital (investment) in year zero, followed by a sequence of positive charges as determined by this current cost charging method in years 1 up to n , (where n is asset life), then the internal rate of return (IRR) of this sequence is the nominal interest rate i : in other words, the stream of payments, discounted at discount rate i , has a net present value equal to the original capital investment.

Current Cost Charging in the Steady State.

One of the things which was done in the original Cuthbert and Cuthbert paper was to consider the position of a utility operating in a steady state: that is, carrying out a constant amount of real investment each year. In the long run, how would charges under the variant of the CCRCV model analysed in that paper compare with what would happen if charges were set to cover historic cost interest and depreciation? In the Cuthbert and Cuthbert paper, the excess of current cost charges over historic cost charges in the steady state was expressed as a percentage for various combinations of n , i , and r . For example, table 1a calculated the excess for $i = 5\%$, $n = 10, 20, 30$ or 40 years, and various values of r from 0 to 5% . In their comment on our paper, NG recalculated table 1a for their version of the current cost charging approach. The NG recalculation is as follows:

Table 1: NG recalculation of Table1a: Steady State percentage excess of Current cost charges over historic cost: nominal interest rate 5%.

	10	20	30	40	Asset life
0.5%	0.4%	1.4%	3.2%	5.7%	
1.0%	0.6%	2.5%	5.5%	9.5%	
1.5%	0.8%	3.2%	6.9%	11.9%	
2.0%	0.9%	3.5%	7.6%	12.9%	
2.5%	0.9%	3.6%	7.6%	12.8%	
3.0%	0.9%	3.3%	7.0%	11.7%	
3.5%	0.8%	2.8%	5.9%	9.7%	
4.0%	0.6%	2.1%	4.3%	7.1%	
4.5%	0.3%	1.1%	2.3%	3.8%	
5.0%	0.0%	0.0%	0.0%	0.0%	
Inflation					

Some of the values in this NG recalculation are in themselves fairly large: for example, they indicate that charges under the NG version of the current cost pricing method would be almost 13% above historic cost charges for the particular combination of $n=40$, $r=2.5\%$ and $i = 5\%$.

In fact, however, the particular choice of parameter values considered in table 1 do not illustrate the kind of situation likely to be encountered in practice. In particular, real interest rates are likely to be set at some target value. So if the excess of current cost charges over historic cost charges is calculated for, say, a real interest rate of 3.5% , and the same combinations of asset life and inflation as considered in table 1, the results are as follows.

Table 2: Steady State percentage excess of Current cost charges over historic cost: real interest rate 3.5%.

	10	20	30	40	Asset life
0.5%	0.3%	1.1%	2.5%	4.4%	
1.0%	0.6%	2.2%	4.9%	8.4%	
1.5%	0.8%	3.2%	7.0%	12.0%	
2.0%	1.1%	4.2%	9.0%	15.3%	
2.5%	1.3%	5.1%	10.9%	18.3%	
3.0%	1.6%	6.0%	12.6%	21.0%	
3.5%	1.8%	6.8%	14.2%	23.5%	
4.0%	2.1%	7.6%	15.7%	25.8%	
4.5%	2.3%	8.3%	17.1%	27.9%	
5.0%	2.5%	9.0%	18.4%	29.8%	

Inflation

If, instead, the real interest rate is 5%, the result is as follows:

Table 3: Steady State percentage excess of Current cost charges over historic cost: real interest rate 5%.

	10	20	30	40	Asset life
0.5%	0.4%	1.6%	3.6%	6.3%	
1.0%	0.8%	3.2%	6.9%	12.0%	
1.5%	1.2%	4.6%	10.0%	17.2%	
2.0%	1.6%	6.0%	12.9%	21.9%	
2.5%	1.9%	7.3%	15.5%	26.2%	
3.0%	2.3%	8.5%	18.0%	30.0%	
3.5%	2.6%	9.7%	20.3%	33.6%	
4.0%	2.9%	10.8%	22.4%	36.8%	
4.5%	3.3%	11.9%	24.4%	39.8%	
5.0%	3.6%	12.9%	26.3%	42.5%	

Inflation

Note that the values in tables 2 and 3 have been calculated using the NG spreadsheet tool referred to in the preceding section, and are therefore definitely in line with NG's application of current cost pricing.

As tables 2 and 3 illustrate, the excesses of the revenues calculated in the steady state using current cost as compared with historic cost charges are very material, for several combinations of parameters which are quite likely. For example, for $n = 40$, and inflation = 4.5%, (that is, close to the current value), the excess is 28% when the real interest rate is 3.5%, and the excess is almost 40% when the real interest rate is 5%. In the view of the author, the excesses illustrated in tables 2 and 3 are so significant that they themselves call into question the validity of the current cost approach, and highlight the need for an urgent review.

Profile of Current Cost Charges

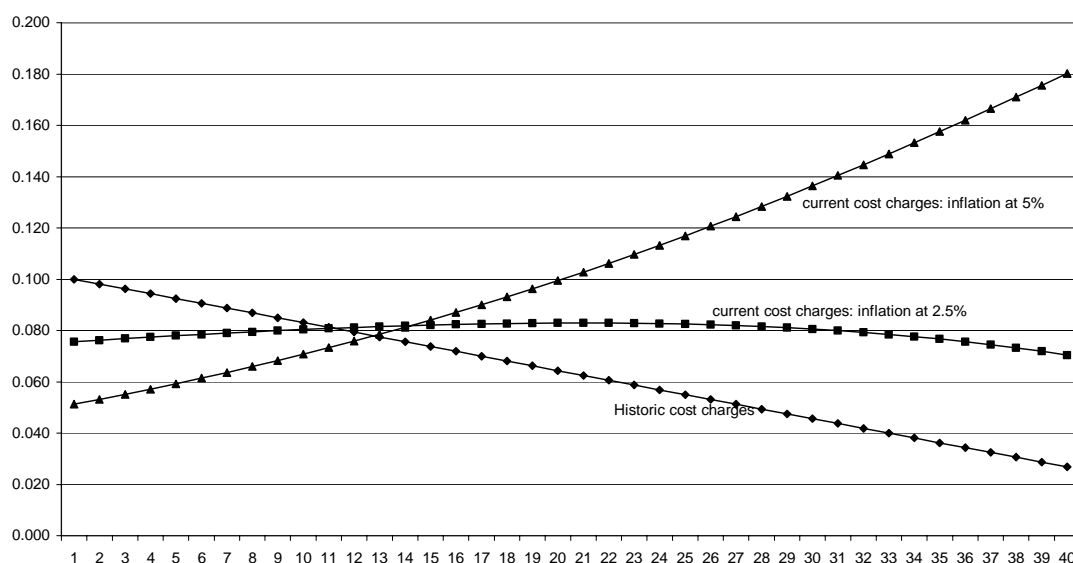
In the NG comment on the Cuthbert and Cuthbert paper, the argument is put forward that, despite the apparent steady state surplus, no excess revenues exist in

total – because, over the life time of a given investment asset, the net present values of the income streams yielded by the historic cost and current cost approaches would be the same. To understand why this argument does not answer the concerns about the current cost approach, it is necessary to look in more detail at the actual profile of current cost charges for a given investment.

Chart 1 shows the payment streams that would result from a unit investment in year zero in a 40 year asset, if the nominal interest rate was 7.5%, under

- a) historic cost charges.
- b) current cost charges, with inflation at 2.5%.
- c) current cost charges, with inflation at 5%.

**Chart 1: Charges under different payment regimes, relating to a single unit investment in year 0:
asset life 40 years: nominal interest rate 7.5%.**



Since both the historic cost and current cost charging methods satisfy the net present value criterion, the net present value of each of the three payment streams, calculated at a 7.5% discount rate, will indeed equal the original investment of 1. It is clear, however, that the payment profiles of the three different payment streams are very different. In fact, under the historic cost payment profile, the interest rate of 7.5% is paid on an outstanding debt which equals 51.1% on average of the original investment over the 40 year life of the asset. For the current cost profile which would result if inflation were at 2.5%, the 7.5% interest would be paid on an outstanding debt averaging 74.1% of the original investment. While for the current cost profile which would result if inflation were at 5%, the 7.5% interest would be paid on an outstanding debt averaging 111.3% of the original investment. This case illustrates how, under current cost charging, interest can easily be paid on an average debt which actually exceeds the original investment.

While the point made in the NG paper is technically correct, namely, that the NPVs of the different payment streams are the same, this does not mean that the phasing of the different payment streams is irrelevant, for the following reasons - among others.

- a) for one thing, and critically, using a discount rate equal to the nominal rate paid by the utility does not adequately represent the viewpoint of the customer. Ultimately, of course, all charges are borne by the customer. For customers, for whom real interest rates on personal savings are currently negative, the correct nominal interest rate to represent their time preference would be much lower than the nominal interest rate paid by the utility. Discounting the different payment streams in Chart 1 at a discount rate lower than 7.5% would yield different NPVs for the different profiles – with the NPV being higher the more the payment profile is weighted towards the later years. The differences are very material: for example, at a discount rate of 4%, the NPV of the historic cost payment stream would be 1.44: and the NPVs of the two current cost streams in the chart would be 1.58 and 1.78 respectively. So although the different payment streams in chart 1 are equivalent at a discount rate of 7.5%, they are far from equivalent from the point of view of the customer.
- b) another aspect of concern relates to the potential dynamics of current cost charging. Suppose a company makes an investment, funded largely by borrowing from the market at a fixed nominal interest rate. If inflation subsequently rises, and the regulator maintains the same real interest rate target, then this means that the IRR the company will earn on its investment through its charges will approximate the target real interest rate plus the new rate of inflation, which is likely to be higher than the nominal interest rate at which it originally borrowed to fund the asset. Further, because the profile of current cost charges will have lengthened, the company will be earning this larger IRR on an increased averaging outstanding debt over the lifetime of the asset. Under these circumstances, the company will receive a windfall profit – potentially a very large windfall profit. Conversely, if inflation were to fall, the company could be squeezed – although the likelihood of this is reduced because of the inherent cushion which is anyway built into current cost charging, (as tables 2 and 3 demonstrate.)

Conclusion

Because of the effects identified in the preceding section, it is far too simplistic to imply that, because current cost charging satisfies the net present value criterion, issues of profiling can be neglected. Overall, it is the view of the author that issues like these, together with the likely overcharging stemming from current cost pricing, mean that an urgent review of this aspect of the transmission charging model is required.

Reference

Cuthbert, J.R., Cuthbert, M.: "Fundamental Flaws in the Current Cost Regulatory Capital Value Method of Utility Pricing": Fraser of Allander Institute Quarterly Economic Commentary, Vol 31, No.3: (2007).