ATTACHMENT

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Bell Canada's Appendix Q
referred to in CRTC Interrogatory
700 (b)

Conceptual Equations for Calculating NPV

The conceptual equation for calculating NPV may be expressed as the difference between the present worth of revenues and the present worth of annual costs (PWAC), i.e.,

$$\begin{aligned} NPV &= \text{PW Cash Inflows} - \text{PW Cash Outflows} \\ &= (1 - t)\,(1 - M_f)\,(\text{PW Revenues} - \text{PWAC}) \end{aligned}$$

where, t denotes “Bell Canada’s composite, federal and provincial, income tax rate”, M_f denotes “the adjusted revenue miscellaneous tax factor” and PW Revenues denotes “the present worth of revenues expected for the service”.

PWAC is defined as the present worth of annual costs including the annual cost of taxes. No revenue cash flows are included in PWAC. Since income tax and revenue related miscellaneous tax are functions of revenue, the calculation of these taxes in PWAC is based on the assumption that revenues will exactly cover all costs including the cost of taxes.

In the calculation of NPV using the above formula, the factors (1 – t) and (1 - M_f) adjust for the income tax payable (see Appendix L) and for the revenue related miscellaneous tax (see Appendix K) resulting from any difference between expected revenues and the revenues assumed for the calculation of taxes for PWAC. M_f adjusts for the time lag between the tax base (defined as nonexempt revenues earned in the previous year) and the payment of current-year taxes. M_f is developed by discounting the current tax factor (rmt) for one year using the current cost of capital (i), i.e.,

$$M_f = \frac{rmt}{1 + i}$$

For example, economic studies performed in 1980 were based on a tax rate “rmt” of 5%, a cost of capital “i” of 14.25% and a tax factor “M_f” of 4.376%.

For a single capital expenditure of FC at time zero with a service life of n years and a salvage of S_n per dollar of FC at time n, the equation for PWAC is as shown below:

$$PWAC = FC\,(a - bS_n) + PW\ Expenses$$

where,

PW Expenses denotes the present worth of items such as miscellaneous taxes (calculated under the revenue assumption), maintenance, administration, and removal costs.

a and b are the amortization and income tax factors, applied to initial capital expenditure and salvage at time n. These are defined below.

$$a = \left(1 + \theta - \frac{C}{C+i} * \frac{i}{j} * \theta_A * \left(\frac{1 + .5i}{1 + i} \right) + \left(\frac{(P/A')}{LE}_{LE} x(\theta_A - \theta) \right) \right)$$

$$b = \frac{1}{(1 + i)^{LE}} \left[\left(\frac{(1+ \theta) * t * i}{j(1 + i)} \right) \left(\frac{i * (1 - .5C)}{(C + i)} \right) + 1 \right]$$

Symbols used in the expressions for a and b are detailed below:

LE = life estimate of plant purchased by FC.

i = Bell Canada's effective annual cost of capital rate.

j = Bell Canada's nominal annual cost of capital rate = ln (1 + i) = natural logarithm of (1 + i).

e = the base for natural logarithms = 2.7182818….

$$\theta = \left(\frac{t}{1-t}\right)\left(1 - \frac{rj_d}{j}\right)$$

where t = Bell Canada's composite (federal and provincial) income tax rate

r = Bell Canada's debt ratio

j_d = Bell Canada's nominal annual cost of debt rate = ln $(1 + i_d)$

i_d = Bell Canada's effective annual cost of debt rate

$$\theta_A = \left(\frac{t}{1-t}\right)\left(1 - \frac{trj_d}{j}\right) = t\ (1 + \theta)$$

C = the Capital Cost Allowance rate for the class of capital in question.

(P/A') = present worth of a continuous annuity factor.