Incentive Regulation for Hydro One Transmission

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Step 1: Calculate 4GIRM and the Supplemental Capital Threshold Value

When a utility is operating under 4GIRM, the revenue for costs addressed by the price cap index in the first indexing year is determined by the following formula:

$$R_1 = ROM_1 + RK_1 = R_0 \cdot (1 + I - X) \cdot (1 + g) + RK_1^+. \qquad [B9]$$

Revenue in year 1 grows with billing determinants and the approved I-X price cap index and there may also be some supplemental capital revenue ("RK_1^+"). The total capital revenue requirement can be decomposed into revenue required for depreciation, the return on rate base, and taxes. However, the rationale for the ACM/ICM materiality threshold is based only on the return on rate base component of capital cost ("CKR"), so we consider only this and the corresponding revenue ("RKR") in the following discussion.

Consider now the difference between CKR and RKR in the first year of an IRM. The former is the proforma return on rate base capital cost incurred by the company and the latter is the return on rate base capital revenue provided by the price cap mechanism and any supplemental capital revenue. The formulas are

$$CKR_1 = r \cdot VK_1^{net} = r \cdot (VK_0^{net} + VKA_1 - CKD_1) \qquad [B10]$$

and, in the absence of supplemental revenue,

$$RKR_1 = r \cdot VK_0^{net} \cdot (1 + I - X) \cdot (1 + g). \qquad [B11]$$

Here $VK_1^{net} = VK_0^{net} + VKA_1 - CKD_0$ because the rate base in year 0 equals the prior year's rate base plus the value of additions made in the current year minus annual depreciation.

In the absence of RK^+, all VKA_1 above the threshold value would be underfunded and cost would exceed revenue, i.e.,

$$CKR_1 > RKR_1. \qquad [B12]$$

Substituting [B10] and [B11] into [B12] yields the following relation:

$$r \cdot (VK_0^{net} + VKA_1 - CKD_1) > r \cdot \left(VK_0^{net} \cdot (1 + I - X) \cdot (1 + g)\right). \qquad [B13]$$

Rearranging, distributing, and collecting terms then gives

$$VKA_1 > CKD_1 + VK_0^{net} \cdot \left(g + (I - X)\right) \cdot (1 + g). \qquad [B14]$$

Inspecting the results, it can be seen that part of the funding for plant additions comes from the depreciation of old plant.

The "Threshold Value" formula in the ACM/ICM materiality threshold for the first indexing year is obtained by dividing both sides of [B14] by depreciation and appending a "markdown factor", $M > 0$, to the right-hand-side.

Threshold Value Formula

$$\frac{VKA_1}{CKD_0} > 1 + \frac{VK_0^{net}}{CKD_0} \cdot \{[g + (I - X)] \cdot (1 + g)\} + M \qquad [B15]$$

This formula was adopted by the OEB in EB-2014-0219. Note that depreciation is in the base year (CKD_0) in the OEB's approved formula.

The markdown factor allows the OEB to set the minimum amount by which capital expenditures must exceed the funded amount before any additions become eligible for extra capital revenue. The OEB initially set M at 20% and later lowered it to 10%. The value of additions that are ineligible for supplemental revenue are then given by the following formula. Since Hydro One is under a revenue cap index, assume $g = 0$.

$$VKA_1^{ineligible} = CKD_0 + VK_0^{net} \cdot (I - X) + M \cdot CKD_0 . \qquad [B16]$$

Since $VKA = VKA^{eligible} + VKA^{ineligible}$, it follows that

$$VKA^{eligible} = VKA - VKA^{ineligible} . \qquad [B17]$$

Plugging [B16] into [B17], the portion of gross plant additions eligible for supplemental capital revenue is then

$$VKA_1^{eligible} = VKA_1 - [CKD_0 + VK_0^{net} \cdot (I - X) + CKD_0 \cdot M] \qquad [B18]$$

$$= VKA_1 - [(1 + M) \cdot CKD_0 + VK_0^{net} \cdot (I - X)]. \qquad [B19]$$

Note here that the markdown factor M only applies to base year depreciation and not to the other source of funding as a result of the OEB's chosen Threshold Value formula. M could reasonably be applied to the second source of funding as well. If the utility's plant additions are close to qualifying for extra revenue, it will be incentivized to bolster its proposed additions so as to obtain supplemental revenue. Bunching of plant additions can help with this.

The full funding for gross plant additions in indexing year 1 is then the sum of gross plant additions provided by the price cap and those eligible for supplemental revenue.

$$VKA_1^{funded} = CKD_0 + VK_0^{net} \cdot [(1 + I - X) - 1] + VKA_1^{eligible} .$$ [B20]

By substituting [B19] into [B20] and carrying out simple algebra, it can be shown that

$$VKA_1^{funded} = VKA_1 - M \cdot CKD_0.$$ [B21]

The share of VKA_1 that is *not* funded under 4GIRM in year 1 is then

$$\frac{VKA_1 - VKA_1^{funded}}{VKA_1} = \frac{VKA_1 - (VKA_1 - M \cdot CKD_0)}{VKA_1}$$ [B22]

$$= \frac{M \cdot CKD_0}{VKA_1}.$$ [B23]

As can be seen from [B23], the percentage of gross plant additions that would not be funded in the first year of an ACM plan is the ratio of M times base year depreciation to gross plant additions in year 1. The percentage markdown will be less to the extent that VKA exceeds the materiality threshold. It can be shown with more algebra that the markdown formula in the second year is the same as the first year but with VKA_2 instead of VKA_1.

We calculate this percentage for Hydro One in each year of its proposed IR plan in Table B2. Were this mechanism used to determine Hydro One's extra capital revenue instead of the proposed C factor, it can be seen that the underfunding would be roughly 3.63% of proposed plant additions in the first indexing year and 3.65% of proposed plant additions in the second year.

Table B2

Calculating the ACM Markdown

Variable Name	Plant Additions Markdown	Base Year 2020	Year 1 2021	Year 2 2022
M	M Factor		10%	10%
CKD_0	Base Year Depreciation ($M)	474.60	--	--
VKA	Gross Plant Additions ($M)		1,297.70	1,293.00
	Markdown = M·CKD_0/VKA_t		3.66%	3.67%