

Avoided Cost of Energy, and of Generation, Transmission and Distribution Capacity

March 28, 2008

As set out in the Board's Guidelines for Electricity Distributor Conservation and Demand Management (the "Guidelines"), conservation and demand management ("CDM") initiatives should be evaluated on the basis of a cost effectiveness test known as the Total Resource Cost (TRC) test. The TRC test assesses CDM costs and benefits from a societal perspective. The benefits are defined as "avoided costs". This represents the benefit to society of not having to provide an extra unit of supply – typically expressed as kW and/or kWh. For electricity, supply costs include energy, and generation, transmission and distribution capacity.

Attachment 1 contains the most recent set of avoided costs that distributors should use for the purposes of evaluating CDM programs approved by the Board.

For Ontario, avoided costs have been developed for seasonal peak, mid-peak and off-peak as well as for generation and transmission capacity. The report entitled "Avoided Cost Analysis for the Evaluation of CDM Measures" (Avoided Cost Study) filed with the Board by Hydro One Networks Inc. on June 15, 2005 provides the basis for avoided costs should be used in assessing CDM technologies, programs and portfolios for TRC analysis. Hydro One also submitted a preliminary evaluation of its distribution system capacity avoided costs. A copy of the filings is available on the Board's Web Site at: http://www.oeb.gov.on.ca/documents/dcdm_hydro_acar_170605.pdf

The data contained in the table of Avoided Costs in Attachment 1 has been extracted from these studies and has been grossed up for inflation to provide the values that distributors should use in assessing program benefits.

Instructions on Using the Avoided Cost Values

The avoided cost values include seasonal and time specific energy, and generation, transmission and distribution capacity values. Distributors should use the avoided cost values provided in the table of Avoided Costs, for energy (columns B-I), generation capacity (column J) and transmission capacity (column K) for CDM measures. If a CDM measure contributes to the avoidance of distribution capacity costs (column L), the distributor should include these avoided costs in its TRC analysis. Distributors can refer to the methodology used by Hydro One Networks Inc., which is described in Attachment 2, as a guide for calculating their avoided distribution capacity costs.

For measures which provide summer on-peak period demand response but no energy savings, distributors should use the avoided generation capacity values in column M only.

Attachment 1:

**Avoided Cost of Energy, and of Generation, Transmission
and Distribution Capacity**

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Avoided Cost of Energy, and of Generation, Transmission and Distribution Capacity¹**

A	B	C	D	E	F	G	H	I	J	K	L	M
Year	Ontario Seasonal Average Avoided Energy Cost (CAD\$/MWh)								Avoided Generation Capacity Costs (CAD\$/kw-yr) n/a	Avoided Transmission Capacity Costs (CAD\$/kw-year) n/a	Avoided Distribution Capacity Cost ² (CAD\$/kw-year) na	Avoided Capacity Costs for Demand Response (CAD\$/KW-yr) na
	Winter			Summer			Shoulder					
Hours/Period	On Peak 602	Mid-Peak 688	Off-Peak 1614	On Peak 522	Mid-Peak 783	Off-Peak 1623	Mid-Peak 1305	Off Peak 1623				
2006	120.8	83.9	45.4	112.9	81.4	47.5	84.2	42.3	0.00	0.00	0.00	0.00
2007	124.6	84.3	45.2	111.5	79.6	45.9	81.4	40.8	0.00	0.00	0.00	0.00
2008	115.4	86.8	48.9	110.6	83.6	50.1	90.4	44.9	74.65	5.62	0.00	144.84
2009	111.9	77.1	48.9	104.5	79.5	47.6	85.8	43.4	83.57	5.76	0.00	146.70
2010	113.5	77.4	52.1	107.0	80.5	48.2	83.5	43.4	71.49	5.90	0.00	148.55
2011	110.2	77.3	52.7	103.2	81.3	48.5	84.2	43.0	85.42	6.05	0.00	150.41
2012	112.4	78.9	53.3	113.1	84.6	51.2	88.5	47.8	81.20	6.20	0.00	152.27
2013	125.2	86.4	59.9	116.9	91.3	54.0	92.5	51.9	61.60	6.36	0.00	154.25
2014	125.7	92.4	62.8	127.9	96.8	56.7	98.9	54.4	46.63	6.52	0.00	156.23
2015	127.4	94.7	69.6	151.6	106.7	62.5	102.8	59.9	23.16	6.68	0.00	158.22
2016	131.7	97.3	70.9	152.5	108.1	63.9	104.5	61.4	26.88	6.85	0.00	160.21
2017	136.0	100.0	72.1	153.5	109.5	65.3	106.2	62.8	29.94	7.02	0.00	162.33
2018	140.3	102.7	73.4	154.4	110.9	66.8	108.0	64.3	31.66	7.19	0.00	164.32
2019	144.6	105.4	74.6	155.3	112.3	68.2	109.7	65.7	32.41	7.37	0.00	166.59
2020	148.9	108.1	75.9	156.3	113.6	69.6	111.4	67.2	31.85	7.56	0.00	168.73
2021	152.4	110.4	78.0	157.1	116.5	71.5	114.7	69.1	38.27	7.74	0.00	170.87
2022	155.8	112.7	80.0	157.9	119.4	73.4	117.9	71.0	41.97	7.94	0.00	173.16
2023	159.3	115.0	82.1	158.7	122.4	75.3	121.1	72.9	44.22	8.14	0.00	175.46
2024	162.7	117.3	84.2	159.5	125.3	77.2	124.3	74.8	44.56	8.34	0.00	177.77
2025	166.1	119.7	86.3	160.3	128.2	79.1	127.5	76.7	42.02	8.55	0.00	180.08

¹ Navigant Consulting Ltd. on behalf of Hydro One Network Inc. "Avoided Cost Study for the Evaluation of CDM Measures" June 14, 2005 inflated at 2.5% and Hydro One Networks Inc. "Preliminary Distribution Cost Assessment for Hydro One" June 14, 2005 inflated at 2.5%.

² Please refer to the cover document titled "Avoided Cost of Energy, and of Generation, Transmission and Distribution Capacity" and Attachment 2 for instructions.

Attachment 2:

**Preliminary Distribution Avoided Cost Assessment for Hydro
One**

Preliminary Distribution Avoided Cost Assessment for Hydro One

To develop preliminary distribution based avoided costs, Hydro One utilized the same approach as that taken by Navigant, in developing avoided costs for transmission. This included an assessment of annual investments to major distribution plant attributed to load growth such as increasing the capacity of distribution stations, feeders emanating from transformer stations and LV facilities. Costs associated with directly connecting new customers, such as new radial supplies, provision of secondary services and metering were not included, as these investments are required to connect new developments and cannot be deferred by CDM programs.

The approach involved reviewing each planned addition to the distribution system for 2006 and establishing whether or not it was appropriate for avoidance or deferral via CDM programs. Distribution projects for 2006 are well defined and determined to be representative of a typical year. If the project was deemed to be a candidate for deferral, through CDM programs, its cost and related capacity were included in the assessment, similar to the approach used in the transmission analysis. The illustrative example appearing in Table 1.0 uses 2009 as the original need date. Since the 2006 costs were representative of a typical year they were escalated to 2009, by using a 2.5% escalation rate.

Table 1.0 below illustrates the level of avoided distribution costs that would be expected, under these assumptions. As with avoided transmission costs, the distribution avoided costs are capacity based.

Table 1.0 Hydro One Illustration of a Distribution Avoided Cost Analysis

Category	2009	2010	2011	2012
<i>CDM Impact (assumed equal to demand growth)</i>	180	180	180	180
New Need Date				X
Old need Date	X			
	(Cost in \$Millions)			
Original Cost	19.92			
Avoided Carrying Charges on Original Cost Avoided	1.84	1.84	1.84	
Avoided O&M		0.20	0.20	0.21
Cost with Inflation				21.45
<i>Net Avoided Cost</i>	1.84	2.04	2.05	(1.32)
<i>Levelized Avoided Cost (\$millions)</i>	1.26	1.26	1.26	1.26
<i>Avoided Distribution Development (\$2005/kW-yr)</i>	6.50	6.50	6.50	6.50

As discussed by Navigant in their assessment of transmission avoided costs, it is important to recognize that this preliminary distribution avoided cost analysis allocates the avoided costs associated with deferring localized distribution capacity upgrade projects across the system-wide CDM impacts. As such, they will understate the value of CDM in those areas in need of localized distribution capacity upgrades and overstate the value of CDM in those areas that do not require localized distribution capacity upgrades.

This effect is expected to be significantly more pronounced with distribution costs since individual assets serve significantly fewer customers and are therefore more dependent on the penetration rates and

effectiveness of local programs targeted at those few customers. CDM will have little or no distribution benefit in the areas where the distribution system experiences little or no growth. Hydro One experience indicates that a relatively low level of the avoided costs should be attributed to system wide avoided distribution costs and that calculations of localized avoided costs should be allowed and encouraged.

It should be noted that these distribution system avoided costs are preliminary in nature and are only applicable for customers supplied from Hydro One's distribution system. This includes Hydro One end-use distribution customers, embedded LDCs and LDCs supplied from Hydro One LV facilities. Accordingly, other LDCs would have to add avoided costs for their own part of the distribution system.

Finally, the avoided costs calculated by Navigant for energy, generation capacity, transmission capacity and environmental damages represent the costs at a wholesale delivery point – the interface between the transmission system and an LDC. Accordingly, LDCs should apply their approved loss factors to the avoided costs for these elements in order to account for losses experienced on the distribution system.