

Ontario Energy Board (OEB)

Pole Attachment Rate Model

January 31, 2017

Delivered to

PAWG

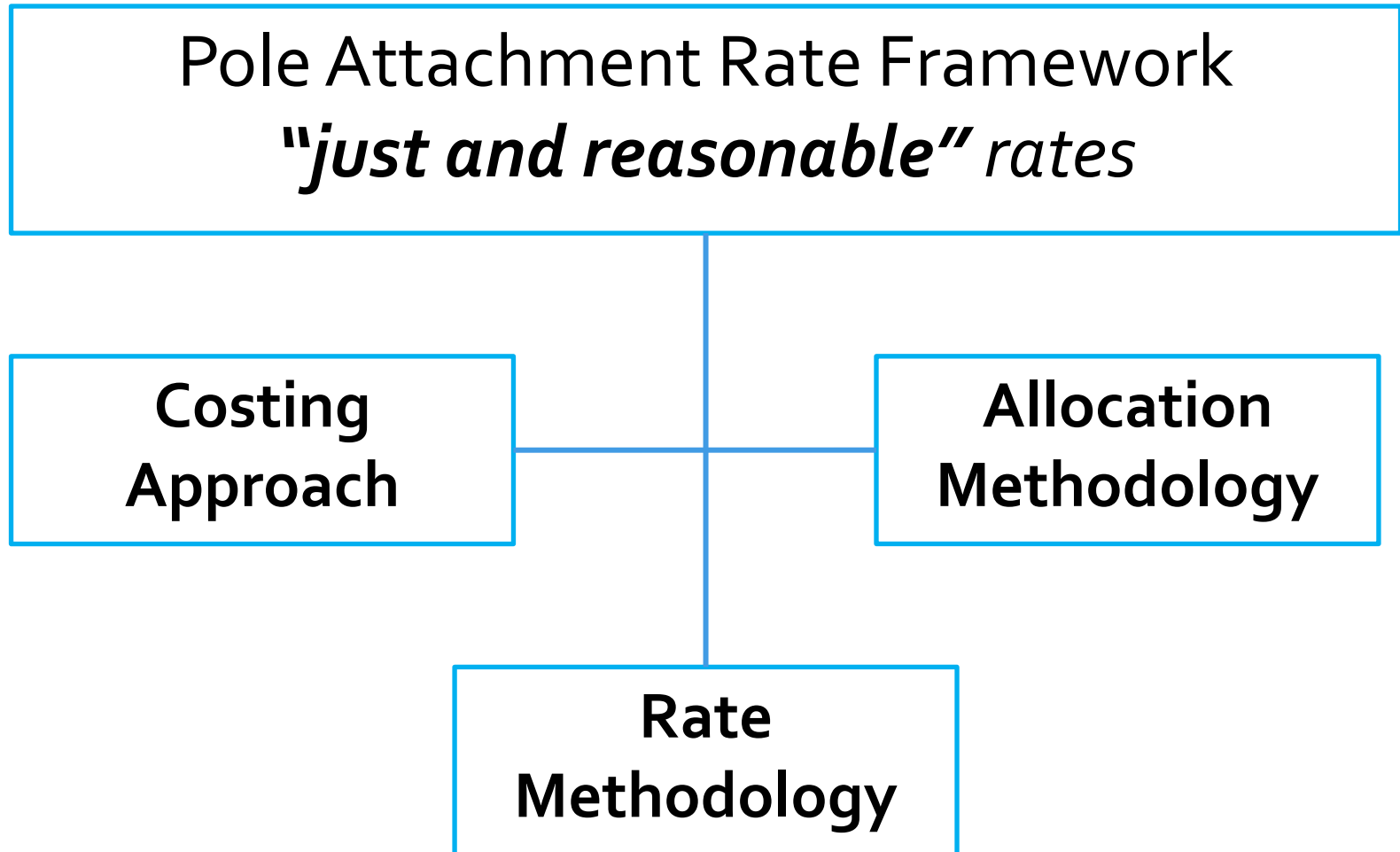
Prepared by

Nordicity

Part I: Capital Cost Base Methodology

OEB 2005 Order (Net Embedded Cost) vs. DCF Method

Key Elements of Pole Attachment Rate Model



Understanding “Just and reasonable”

Accepted principles for utilities rate*

- 1) Provides a reasonable opportunity to recover prudently **incurred costs**
- 2) Entitles to earn a fair and reasonable rate of return on their **capital investments**

** Drawn from two US Courts landmark decisions: (a) Federal Power Commission et al v. Hope Natural Gas Co. ("Hope"), (1944), and (b) Bluefield Water Works and Improvement Co. v. Public Service Commission of West Virginia ("Bluefield"), (1923).*



- **Incurred Cost** refers to historical costs including capital expenditures (investment), maintenance, repair and other related expenses
- **Capital investments:**
 - **Embedded cost** refers to gross book value of capital assets (poles)
 - **Net Embedded cost** refers to net book value of capital assets (poles)
= [gross book value] less [accumulated depreciation]

Other Argument for Historical Cost Approach

Poles costs are not subject technological change (significant cost reduction), but tend to increase due to inflationary factors

“Parties advocating low rates favored replacement cost when equipment costs were expected to decrease, but original costs when such asset prices would be expected to increase” (p.201)

“.....because the costs of acquiring, placing, and maintaining utility poles and conduit tend to increase over time because of their relatively low technology-intensity and relatively high labor-intensity, the use of historical cost pricing was widely believed to produce lower rates than would the use of current cost-based pricing” (p.202-203)

Tardiff, Timothy J. (2015), Journal of Regulatory Economics, Vol. 47, p.201-217

Key Attributes of a Sound Rate Structure*

- 1) The rate should be simple and feasible to implement;
- 2) The rate has public acceptability and free from controversies as to proper interpretation;
- 3) The rate should be effective in yielding total revenue requirement under the fair-return standard;
- 4) The rate should provide revenue stability from year to year, with minimum unexpected changes;
- 5) The rate should be based on fair allocation of total cost among different customers; and;
- 6) The rate should avoid undue discrimination and promote efficiency in use of services

**** Bonbright, James C. (1960), New York Columbia University Press***

Understanding OEB's 2005 Decision and Order



- 1) Main cost inputs drawn from CRTC 99-12 Decision (*see next slide*)
- 2) Based on 25 years useful life, and straight line depreciation method:
 - Embedded cost = $\$31.11 \times 25$ years = **$\$777.75$**
 - Accumulated Depreciation = $\$31.11 \times \sim 9.64$ years = **$\$299.90$**
 - Net Embedded Cost = $\$775.75 - 299.90 = 477.85$ or **$\sim \$478.00$** as shown in the table

Source: OEB (2005), Decision and Order (RP-2003-0249) , Appendix 2: 2.5 Attachers - Shared Costs Evenly Spread Amongst All Users

2005 Capital Cost Inputs – drawn from CRTC 99-13

“196. Based on an estimate of embedded costs obtained by deflating a \$1,270 replacement pole cost using the Consumer Price Index (CPI) over a 25 year period, and assuming an even distribution of poles, the MEA derives an average embedded cost of \$820, a net embedded cost of \$520 and an annual depreciation expense of \$32.80.”

“207. Using an embedded cost of service approach based on utility financial records, Milton Hydro developed a methodology for determining the full costs associated with utility overhead lines and the pole component for those lines. From Appendix A of the Milton Hydro analysis the following figures for poles are available: the net embedded cost of a pole is \$478 and the annual depreciation expense is \$31.11.”

2005 Order – Illustration of Capital Cost Recovery

Currently Used Net Embedded (Net Book Value) Method

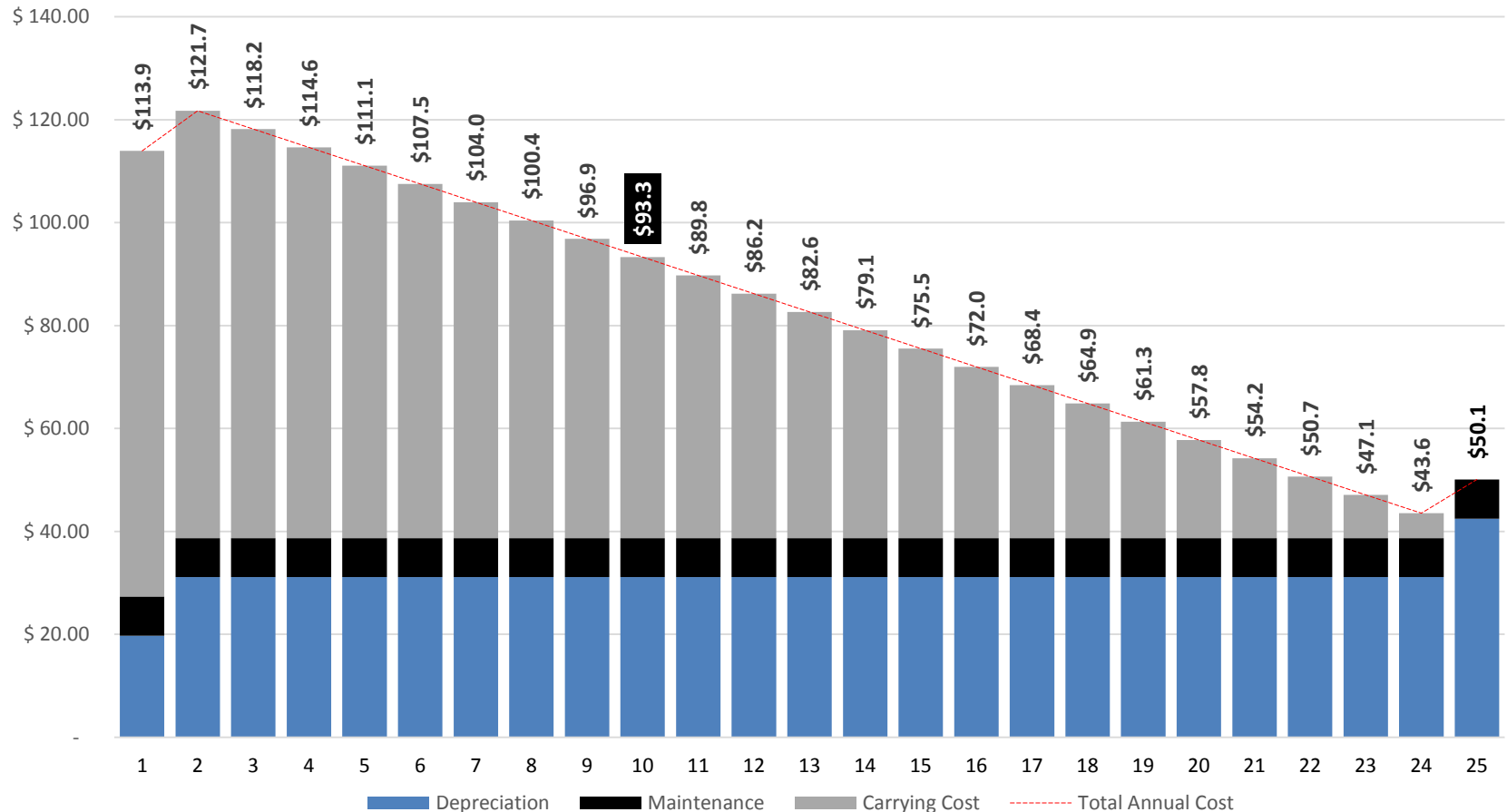
- Provides varying year to year rate over pole's life cycle
 - 25 years used in the 2005 Decision

Year (N)	Embedded	Depreciation	Accumulated Depreciation	Net Embedded	Carrying Cost	Maintenance	Total Annual Cost	Investment Repayment	Present Value Factor	Present Value Factor
	A	B	C = C (Previous Year) + B	D = A - C	E = D x 11.42%	F	G = B + E + F	H = B + E	I = $1/(1+10.81\%)^N$	J = H x G
0	\$ 777.75	-	-	\$ 777.75	-	-	-	-	1.0000	-
1	\$ 777.75	\$ 19.76	\$ 19.76	\$ 757.99	\$ 86.56	\$ 7.61	\$ 113.93	\$ 106.32	0.9024	\$ 95.95
2	\$ 777.75	\$ 31.11	\$ 50.87	\$ 726.88	\$ 83.01	\$ 7.61	\$ 121.73	\$ 114.12	0.8144	\$ 92.93
3	\$ 777.75	\$ 31.11	\$ 81.98	\$ 695.77	\$ 79.46	\$ 7.61	\$ 118.18	\$ 110.57	0.7349	\$ 81.26
4	\$ 777.75	\$ 31.11	\$ 113.09	\$ 664.66	\$ 75.90	\$ 7.61	\$ 114.62	\$ 107.01	0.6632	\$ 70.97
5	\$ 777.75	\$ 31.11	\$ 144.20	\$ 633.55	\$ 72.35	\$ 7.61	\$ 111.07	\$ 103.46	0.5985	\$ 61.92
6	\$ 777.75	\$ 31.11	\$ 175.31	\$ 602.44	\$ 68.80	\$ 7.61	\$ 107.52	\$ 99.91	0.5401	\$ 53.96
7	\$ 777.75	\$ 31.11	\$ 206.42	\$ 571.33	\$ 65.25	\$ 7.61	\$ 103.97	\$ 96.36	0.4874	\$ 46.96
8	\$ 777.75	\$ 31.11	\$ 237.53	\$ 540.22	\$ 61.69	\$ 7.61	\$ 100.41	\$ 92.80	0.4398	\$ 40.82
9	\$ 777.75	\$ 31.11	\$ 268.64	\$ 509.11	\$ 58.14	\$ 7.61	\$ 96.86	\$ 89.25	0.3969	\$ 35.42
10	\$ 777.75	\$ 31.11	\$ 299.75	\$ 478.00	\$ 54.59	\$ 7.61	\$ 93.31	\$ 85.70	0.3582	\$ 30.69
11	\$ 777.75	\$ 31.11	\$ 330.86	\$ 446.89	\$ 51.03	\$ 7.61	\$ 89.75	\$ 82.14	0.3232	\$ 26.55
12	\$ 777.75	\$ 31.11	\$ 361.97	\$ 415.78	\$ 47.48	\$ 7.61	\$ 86.20	\$ 78.59	0.2917	\$ 22.92
13	\$ 777.75	\$ 31.11	\$ 393.08	\$ 384.67	\$ 43.93	\$ 7.61	\$ 82.65	\$ 75.04	0.2632	\$ 19.75
14	\$ 777.75	\$ 31.11	\$ 424.19	\$ 353.56	\$ 40.38	\$ 7.61	\$ 79.10	\$ 71.49	0.2375	\$ 16.98
15	\$ 777.75	\$ 31.11	\$ 455.30	\$ 322.45	\$ 36.82	\$ 7.61	\$ 75.54	\$ 67.93	0.2144	\$ 14.56
16	\$ 777.75	\$ 31.11	\$ 486.41	\$ 291.34	\$ 33.27	\$ 7.61	\$ 71.99	\$ 64.38	0.1934	\$ 12.45
17	\$ 777.75	\$ 31.11	\$ 517.52	\$ 260.23	\$ 29.72	\$ 7.61	\$ 68.44	\$ 60.83	0.1746	\$ 10.62
18	\$ 777.75	\$ 31.11	\$ 548.63	\$ 229.12	\$ 26.17	\$ 7.61	\$ 64.89	\$ 57.28	0.1575	\$ 9.02
19	\$ 777.75	\$ 31.11	\$ 579.74	\$ 198.01	\$ 22.61	\$ 7.61	\$ 61.33	\$ 53.72	0.1422	\$ 7.64
20	\$ 777.75	\$ 31.11	\$ 610.85	\$ 166.90	\$ 19.06	\$ 7.61	\$ 57.78	\$ 50.17	0.1283	\$ 6.44
21	\$ 777.75	\$ 31.11	\$ 641.96	\$ 135.79	\$ 15.51	\$ 7.61	\$ 54.23	\$ 46.62	0.1158	\$ 5.40
22	\$ 777.75	\$ 31.11	\$ 673.07	\$ 104.68	\$ 11.95	\$ 7.61	\$ 50.67	\$ 43.06	0.1045	\$ 4.50
23	\$ 777.75	\$ 31.11	\$ 704.18	\$ 73.57	\$ 8.40	\$ 7.61	\$ 47.12	\$ 39.51	0.0943	\$ 3.72
24	\$ 777.75	\$ 31.11	\$ 735.29	\$ 42.46	\$ 4.85	\$ 7.61	\$ 43.57	\$ 35.96	0.0851	\$ 3.06
25	\$ 777.75	\$ 42.46	\$ 777.75	-	-	\$ 7.61	\$ 50.07	\$ 42.46	0.0768	\$ 3.26
Total		\$ 777.75			\$ 1,096.94	\$ 190.25	\$ 2,064.94	\$ 1,874.69		\$ 777.75

2005 Order – Illustration of Capital Cost Recovery

Current Net Embedded (Net Book Value) Method

- Provides varying year to year rate over pole's life cycle
 - *25 years used in the 2005 Decision*



2005 Order – Illustration of Capital Cost Recovery Annualized (Discounted Cash Flow) Method

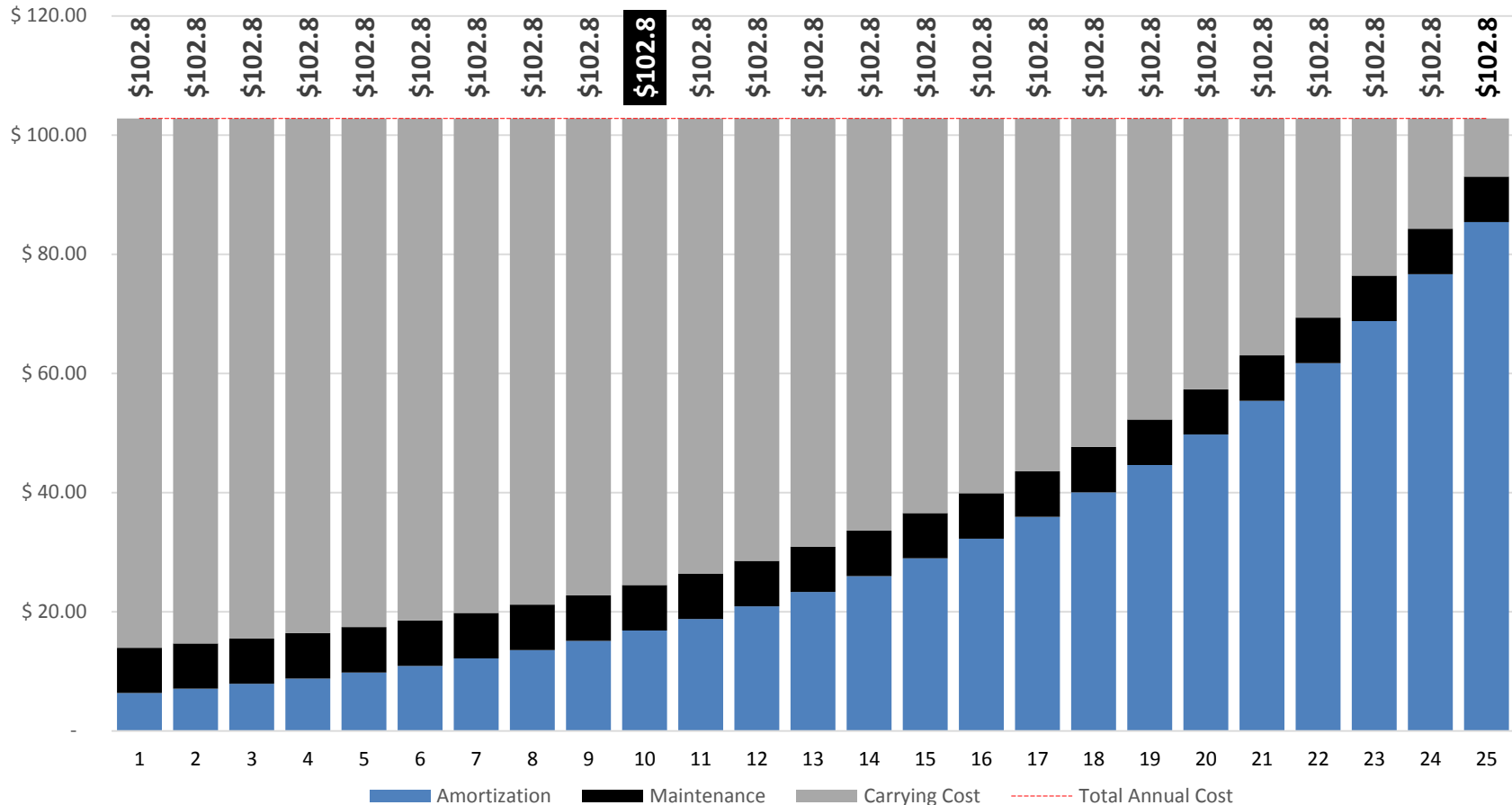
- Provides single year to year rate over pole's life cycle
 - 25 years used in the 2005 Decision

Year (N)	Principal	Amortization	Accumulated Amortization	Principal Outstanding	Carrying Cost	Maintenance	Total Annual Cost	Investment Repayment	Present Value Factor	Present Value Factor
	A	B	C = C (Previous Year) + B	D = A - C	E = D x 11.42%	F	G = B + E + F	H = A ÷ sum(I)	I = $1/(1+11.42\%)^N$	J = H x G
0	\$ 777.75	-	-	\$ 777.75		-	-			
1	\$ 777.75	\$ 6.38	\$ 6.38	\$ 771.37	\$ 88.82	\$ 7.61	\$ 102.80	\$ 95.19	0.8975	\$ 85.44
2	\$ 777.75	\$ 7.10	\$ 13.48	\$ 764.27	\$ 88.09	\$ 7.61	\$ 102.80	\$ 95.19	0.8055	\$ 76.68
3	\$ 777.75	\$ 7.92	\$ 21.39	\$ 756.36	\$ 87.28	\$ 7.61	\$ 102.80	\$ 95.19	0.7230	\$ 68.82
4	\$ 777.75	\$ 8.82	\$ 30.21	\$ 747.54	\$ 86.38	\$ 7.61	\$ 102.80	\$ 95.19	0.6489	\$ 61.77
5	\$ 777.75	\$ 9.83	\$ 40.04	\$ 737.71	\$ 85.37	\$ 7.61	\$ 102.80	\$ 95.19	0.5824	\$ 55.44
6	\$ 777.75	\$ 10.95	\$ 50.99	\$ 726.76	\$ 84.25	\$ 7.61	\$ 102.80	\$ 95.19	0.5227	\$ 49.75
7	\$ 777.75	\$ 12.20	\$ 63.19	\$ 714.56	\$ 83.00	\$ 7.61	\$ 102.80	\$ 95.19	0.4691	\$ 44.66
8	\$ 777.75	\$ 13.59	\$ 76.78	\$ 700.97	\$ 81.60	\$ 7.61	\$ 102.80	\$ 95.19	0.4210	\$ 40.08
9	\$ 777.75	\$ 15.14	\$ 91.92	\$ 685.83	\$ 80.05	\$ 7.61	\$ 102.80	\$ 95.19	0.3779	\$ 35.97
10	\$ 777.75	\$ 16.87	\$ 108.80	\$ 668.95	\$ 78.32	\$ 7.61	\$ 102.80	\$ 95.19	0.3391	\$ 32.28
11	\$ 777.75	\$ 18.80	\$ 127.60	\$ 650.15	\$ 76.39	\$ 7.61	\$ 102.80	\$ 95.19	0.3044	\$ 28.97
12	\$ 777.75	\$ 20.95	\$ 148.54	\$ 629.21	\$ 74.25	\$ 7.61	\$ 102.80	\$ 95.19	0.2732	\$ 26.00
13	\$ 777.75	\$ 23.34	\$ 171.88	\$ 605.87	\$ 71.86	\$ 7.61	\$ 102.80	\$ 95.19	0.2452	\$ 23.34
14	\$ 777.75	\$ 26.00	\$ 197.89	\$ 579.86	\$ 69.19	\$ 7.61	\$ 102.80	\$ 95.19	0.2200	\$ 20.95
15	\$ 777.75	\$ 28.97	\$ 226.86	\$ 550.89	\$ 66.22	\$ 7.61	\$ 102.80	\$ 95.19	0.1975	\$ 18.80
16	\$ 777.75	\$ 32.28	\$ 259.15	\$ 518.60	\$ 62.91	\$ 7.61	\$ 102.80	\$ 95.19	0.1773	\$ 16.87
17	\$ 777.75	\$ 35.97	\$ 295.12	\$ 482.63	\$ 59.22	\$ 7.61	\$ 102.80	\$ 95.19	0.1591	\$ 15.14
18	\$ 777.75	\$ 40.08	\$ 335.20	\$ 442.55	\$ 55.12	\$ 7.61	\$ 102.80	\$ 95.19	0.1428	\$ 13.59
19	\$ 777.75	\$ 44.66	\$ 379.85	\$ 397.90	\$ 50.54	\$ 7.61	\$ 102.80	\$ 95.19	0.1281	\$ 12.20
20	\$ 777.75	\$ 49.75	\$ 429.61	\$ 348.14	\$ 45.44	\$ 7.61	\$ 102.80	\$ 95.19	0.1150	\$ 10.95
21	\$ 777.75	\$ 55.44	\$ 485.04	\$ 292.71	\$ 39.76	\$ 7.61	\$ 102.80	\$ 95.19	0.1032	\$ 9.83
22	\$ 777.75	\$ 61.77	\$ 546.81	\$ 230.94	\$ 33.43	\$ 7.61	\$ 102.80	\$ 95.19	0.0926	\$ 8.82
23	\$ 777.75	\$ 68.82	\$ 615.63	\$ 162.12	\$ 26.37	\$ 7.61	\$ 102.80	\$ 95.19	0.0831	\$ 7.92
24	\$ 777.75	\$ 76.68	\$ 692.31	\$ 85.44	\$ 18.51	\$ 7.61	\$ 102.80	\$ 95.19	0.0746	\$ 7.10
25	\$ 777.75	\$ 85.44	\$ 777.75	(\$ 0.00)	\$ 9.76	\$ 7.61	\$ 102.80	\$ 95.19	0.0670	\$ 6.38
Total		\$ 777.75			\$ 1,602.12	\$ 190.25	\$ 2,570.12	\$ 2,379.87	8.1701	\$ 777.75

2005 Order – Illustration of Capital Cost Recovery

Annualized (Discounted Cash Flow) Method

- Provides single year to year rate over pole's life cycle
 - 25 years used in the 2005 Decision



Part II: Cost Update

Comparative Cost Summary – 2005 vs 2017

Cost Components per Pole			2005 OEB	2017 NGL	2017 OEB
Direct Cost	Administration Cost	A	\$ 0.69	\$ 2.85	\$ 2.85
	Loss in Productivity	B	\$ 1.23	\$ 3.30	\$ 3.30
	Total Direct Cost	C = A+B	\$ 1.92	\$ 6.15	\$ 6.15
Indirect Direct (Common) Cost	Net Embedded Cost per pole	D	\$ 478.00	\$ 760.47	\$ 1,133.00
	Capital Carrying Cost Rate %	E	11.42%	8.25%	8.25%
	Depreciation Expense	F	\$ 31.11	\$ 30.69	\$ 28.33
	Pole Maintenance Expense	G	\$ 7.61	\$ 10.86	\$ 8.70
	Capital Carrying Cost	H = D x E	\$ 54.59	\$ 62.74	\$ 93.47
	Utility Tax Cost	I	-	-	-
	Loss in Productivity	J	incl. above	incl. above	incl. above
Total Indirect (Common) Cost	K=F+...+J	\$ 93.31	\$ 104.28	\$ 130.50	
Capital Cost Base	Embedded Cost per pole		\$ 777.75	\$ 1,227.45	\$ 1,398.00
	Accumulated Depreciation		\$ 299.75	\$ 466.98	\$ 265.00
	Accumulated Depreciation		38.54%	38.05%	18.96%

See slide # 28: “Net Embedded” to “Embedded” Cost Ratio

Illustrative Rate Based Updated Inputs

Pole Specs	2005 OEB (Equal Sharing)				2005 OEB (Equal Sharing) - Updated Attacher Average			
	Joint Pole Length (ft.)	Attachers	Length Per Attacher (ft.)	Explanation	Joint Pole Length (ft.)	Attachers	Length Per Attacher (ft.)	Explanation
A Power space	11.50	÷ 1.00		A	11.50	÷ 1.00		A
B Communication space	2.00	÷ 2.50	= 0.80	B	2.00	÷ 1.40	= 1.40	B
C Separation space	3.25	÷ 2.50	= 1.30	C	3.25	÷ 1.40	= 2.30	C
D Total Usable Space	16.75	3.50	2.10	= A + B + C	16.75	2.40	3.70	= A + B + C
E Clearance	17.25			E	17.25			E
F Buried	6.00			F	6.00			F
G Total Common Space	23.25	3.50	6.64	= D + E + F	23.25	2.40	9.69	= D + E + F
H Total Pole Length	40.00		8.74	= D + G	40.00		13.39	= D + G
I Allocation Rate			21.9%	= 8.74 ÷ 40.0			33.5%	= 13.39 ÷ 40.0
J Common Cost	\$ 93.31		\$ 20.43	= \$93.21 x 21.9%	\$ 93.31		\$ 31.20	= \$93.31 X 33.5%
K Direct Cost			\$ 1.92				\$ 1.92	
L Total Rate			\$ 22.35	= J + K			\$ 33.12	= J + K

Pole Specs	2017 NGL (Equal Sharing) - with 2005 Attacher Average				2017 NGL (Equal Sharing) - updated attacher ratio			
	Joint Pole Length (ft.)	Attachers	Length Per Attacher (ft.)	Explanation	Joint Pole Length (ft.)	Attachers	Length Per Attacher (ft.)	Explanation
A Power space	11.50	÷ 1.00		A	11.50	÷ 1.00		A
B Communication space	2.00	÷ 2.50	= 0.80	B	2.00	÷ 1.40	= 1.40	B
C Separation space	3.25	÷ 2.50	= 1.30	C	3.25	÷ 1.40	= 2.30	C
D Total Usable Space	16.75	3.50	2.10	= A + B + C	16.75	2.40	3.70	= A + B + C
E Clearance	17.25			E	17.25			E
F Buried	6.00			F	6.00			F
G Total Common Space	23.25	3.50	6.64	= D + E + F	23.25	2.40	9.69	= D + E + F
H Total Pole Length	40.00		8.74	= D + G	40.00		13.39	= D + G
I Allocation Rate			21.9%	= 8.74 ÷ 40.0			33.5%	= 13.39 ÷ 40.0
J Common Cost	\$ 104.28		\$ 22.84	= \$104.28 x 21.9%	\$ 104.28		\$ 34.90	= \$104.28 X 33.5%
K Direct Cost			\$ 6.15				\$ 6.15	
L Total Rate			\$ 28.99	= J + K			\$ 41.05	= J + K

Data Summary – Capital Cost per Pole

Installation Cost per Pole	Total		Applicable to Poles (%)	Estimated Cost	
Pole Price	\$ 409.41	5.4%	100.0%	\$ 409.41	27.3%
Labour	\$ 3,971.11	52.4%	15.2%	\$ 605.33	40.3%
Material	\$ 706.59	9.3%	15.2%	\$ 107.71	7.2%
Other	\$ 2,484.46	32.8%	15.2%	\$ 378.71	25.2%
Total	\$ 7,571.57	100.0%		\$ 1,501.16	100.0%

Embedded Cost per Pole (1830)	Total		Applicable to Poles (%)	Estimated Cost	
Pole	\$ 1,227.45	81.8%	100.0%	\$ 1,227.45	100.0%
Towers	-	-	-	-	-
Power Fixtures	\$ 247.86	16.5%	-	-	-
Other	\$ 25.85	1.7%	-	-	-
	\$ 1,501.16	100.0%		\$ 1,227.45	100.0%

Data Summary – Maintenance Cost per Pole

Maintenance cost per Pole (5120)	Total		Applicable to Poles (%)	Estimated Cost	
Poles	\$ 0.90	6.8%	100.0%	\$ 0.90	14.9%
Towers	-	-	-	-	-
Power Fixtures	\$ 12.31	93.1%	41.7%	\$ 5.13	85.1%
Other	\$ 0.01	0.1%	-	-	-
Total	\$ 13.22	100.0%	45.6%	\$ 6.03	100.0%

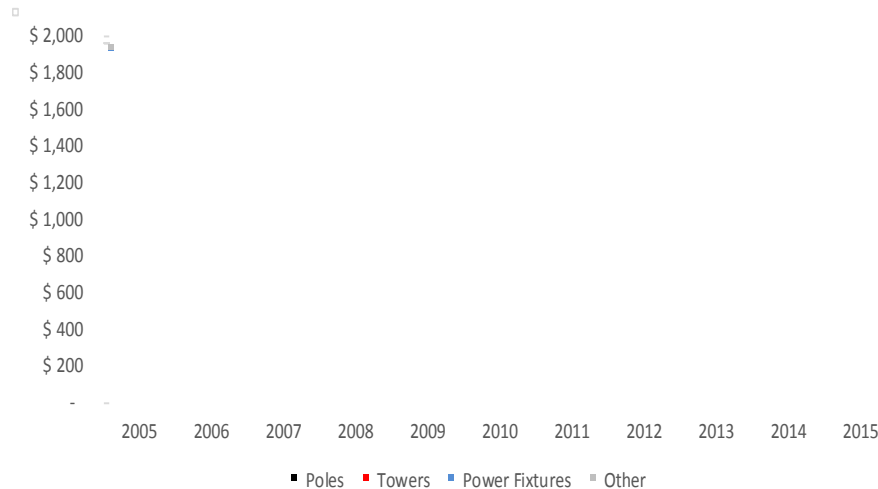
Repair & Right of Way (5135)	Total		Applicable to Poles (%)	Estimated Cost	
Labour	\$ 57.88	81.5%	6.8%	\$ 3.94	81.5%
Material	\$ 0.84	1.2%	6.8%	\$ 0.06	1.2%
Truck	\$ 10.81	15.2%	6.8%	\$ 0.74	15.2%
Other	\$ 1.47	2.1%	6.8%	\$ 0.10	2.1%
Total	\$ 71.01	100.0%		\$ 4.83	100.0%

Back Up

Historical Capital Cost Per Pole

Year	Installed Poles	Total General Submission		Distribution Of Capital Cost - Act 1830							
				Poles		Towers		Power Fixtures		Other	
2005	1,682,644	\$ 1,182.70	100.0%	\$ 971	82.1%	-	0.0%	\$ 191.98	16.2%	\$ 19.48	1.6%
2006	1,728,781	\$ 1,211.74	100.0%	\$ 996	82.2%	-	0.0%	\$ 196.24	16.2%	\$ 19.69	1.6%
2007	1,736,323	\$ 1,271.95	100.0%	\$ 1,045	82.2%	-	0.0%	\$ 205.95	16.2%	\$ 20.75	1.6%
2008	1,759,177	\$ 1,356.02	100.0%	\$ 1,107	81.7%	-	0.0%	\$ 223.57	16.5%	\$ 25.03	1.8%
2009	1,769,658	\$ 1,425.86	100.0%	\$ 1,162	81.5%	-	0.0%	\$ 237.30	16.6%	\$ 26.95	1.9%
2010	1,781,330	\$ 1,481.52	100.0%	\$ 1,207	81.5%	-	0.0%	\$ 246.52	16.6%	\$ 27.91	1.9%
2011	1,793,909	\$ 1,568.97	100.0%	\$ 1,277	81.4%	-	0.0%	\$ 261.71	16.7%	\$ 30.13	1.9%
2012	1,800,004	\$ 1,592.92	100.0%	\$ 1,296	81.4%	-	0.0%	\$ 267.95	16.8%	\$ 28.66	1.8%
2013	1,810,903	\$ 1,715.97	100.0%	\$ 1,399	81.5%	-	0.0%	\$ 287.16	16.7%	\$ 29.85	1.7%
2014	1,822,431	\$ 1,814.17	100.0%	\$ 1,482	81.7%	-	0.0%	\$ 301.74	16.6%	\$ 30.47	1.7%
2015	1,835,514	\$ 1,890.97	100.0%	\$ 1,559	82.5%	-	0.0%	\$ 306.35	16.2%	\$ 25.47	1.3%
Average	1,774,607	\$ 1,501.16		\$ 1,227.45	81.8%	-	0.0%	\$ 247.86	16.5%	\$ 25.85	1.7%

Installed poles represent ~97% of the province

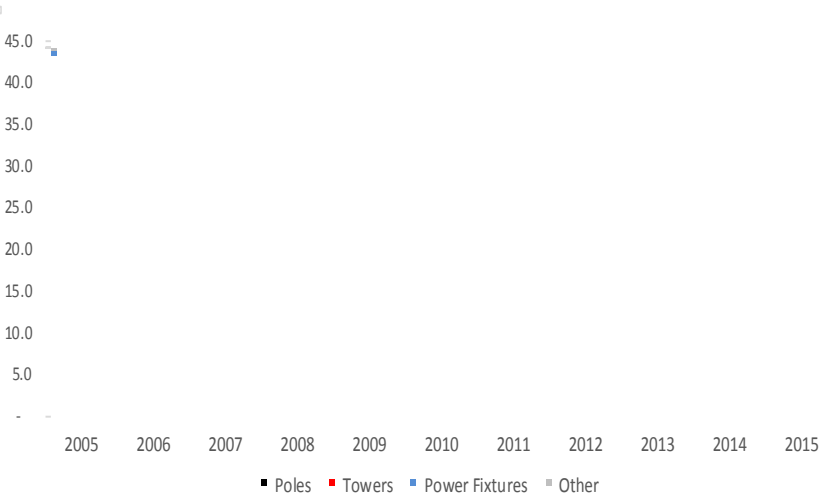


- Overall cost **increased** by 4.8% annually
- Two LDCs submitted complete table
- Poles cost represent most of the cost in this account
- Ratio of poles ranges from 63% to 85% of total cost

Annual Maintenance Cost Per Pole

Year	Installed Poles	Total General Submission		Distribution Of Maintenance Cost - Act 5120							
				Poles		Towers		Power Fixtures		Other	
2005	1,682,644	\$ 35.11	100.0%	\$ 1.79	5.1%	-	0.0%	\$ 33.32	94.9%	\$ 0.00	0.0%
2006	1,728,781	\$ 42.75	100.0%	\$ 2.16	5.1%	-	0.0%	\$ 40.58	94.9%	\$ 0.00	0.0%
2007	1,736,323	\$ 11.58	100.0%	\$ 0.63	5.5%	-	0.0%	\$ 10.94	94.5%	\$ 0.00	0.0%
2008	1,759,177	\$ 13.02	100.0%	\$ 0.87	6.7%	-	0.0%	\$ 12.14	93.2%	\$ 0.01	0.1%
2009	1,769,658	\$ 12.73	100.0%	\$ 0.85	6.7%	-	0.0%	\$ 11.87	93.3%	\$ 0.01	0.1%
2010	1,781,330	\$ 12.28	100.0%	\$ 0.91	7.4%	-	0.0%	\$ 11.35	92.5%	\$ 0.01	0.1%
2011	1,793,909	\$ 16.06	100.0%	\$ 1.07	6.7%	-	0.0%	\$ 14.98	93.3%	\$ 0.01	0.1%
2012	1,800,004	\$ 13.80	100.0%	\$ 1.02	7.4%	-	0.0%	\$ 12.77	92.5%	\$ 0.01	0.1%
2013	1,810,903	\$ 14.50	100.0%	\$ 1.07	7.4%	-	0.0%	\$ 13.42	92.5%	\$ 0.01	0.1%
2014	1,822,431	\$ 13.33	100.0%	\$ 0.90	6.7%	-	0.0%	\$ 12.42	93.2%	\$ 0.01	0.1%
2015	1,835,514	\$ 11.67	100.0%	\$ 0.77	6.6%	-	0.0%	\$ 10.89	93.4%	\$ 0.01	0.1%
Average	1,774,607	\$ 17.89		\$ 1.10	6.1%	-	0.0%	\$ 16.79	93.8%	\$ 0.01	0.0%

Installed poles represent ~97% of the province

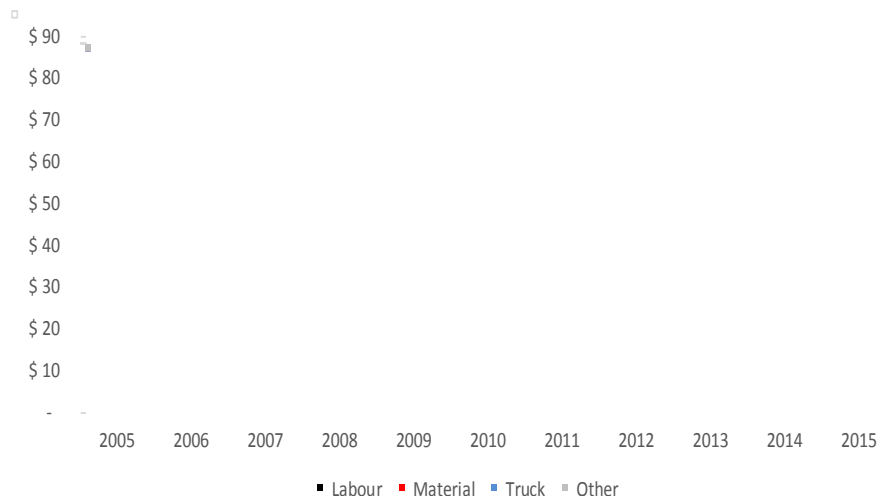


- Overall cost **decreased** by 10.4% annually, primarily due to very high costs in 2000/6
- Two LDCs submitted complete table
- Wide variation in proportion of poles cost
- Ratio of poles ranges from 5% to 92% of total cost

Annual Repair & Right of Way Cost Per Pole

Year	Installed Poles	Total General Submission		Distribution Of Maintenance Cost - Act 5135							
				Labour		Material		Truck		Other	
2005	1,682,644	\$ 53.94	100.0%	\$ 43.94	81.5%	\$ 0.64	1.2%	\$ 8.22	15.2%	\$ 1.14	2.1%
2006	1,728,781	\$ 55.10	100.0%	\$ 44.90	81.5%	\$ 0.65	1.2%	\$ 8.39	15.2%	\$ 1.15	2.1%
2007	1,736,323	\$ 67.98	100.0%	\$ 55.40	81.5%	\$ 0.81	1.2%	\$ 10.36	15.2%	\$ 1.42	2.1%
2008	1,759,177	\$ 72.29	100.0%	\$ 58.94	81.5%	\$ 0.85	1.2%	\$ 11.01	15.2%	\$ 1.50	2.1%
2009	1,769,658	\$ 71.63	100.0%	\$ 55.89	78.0%	\$ 0.86	1.2%	\$ 11.34	15.8%	\$ 3.54	4.9%
2010	1,781,330	\$ 75.52	100.0%	\$ 60.40	80.0%	\$ 0.86	1.1%	\$ 12.84	17.0%	\$ 1.43	1.9%
2011	1,793,909	\$ 75.59	100.0%	\$ 62.21	82.3%	\$ 1.03	1.4%	\$ 11.32	15.0%	\$ 1.04	1.4%
2012	1,800,004	\$ 78.25	100.0%	\$ 64.33	82.2%	\$ 1.17	1.5%	\$ 11.62	14.8%	\$ 1.12	1.4%
2013	1,810,903	\$ 81.76	100.0%	\$ 68.39	83.6%	\$ 1.11	1.4%	\$ 11.13	13.6%	\$ 1.13	1.4%
2014	1,822,431	\$ 79.95	100.0%	\$ 65.16	81.5%	\$ 0.66	0.8%	\$ 12.53	15.7%	\$ 1.60	2.0%
2015	1,835,514	\$ 69.06	100.0%	\$ 57.17	82.8%	\$ 0.63	0.9%	\$ 10.16	14.7%	\$ 1.10	1.6%
Average	1,774,607	\$ 71.01		\$ 57.88	81.5%	\$ 0.84	1.2%	\$ 10.81	15.2%	\$ 1.47	2.1%

Installed poles represent ~97% of the province

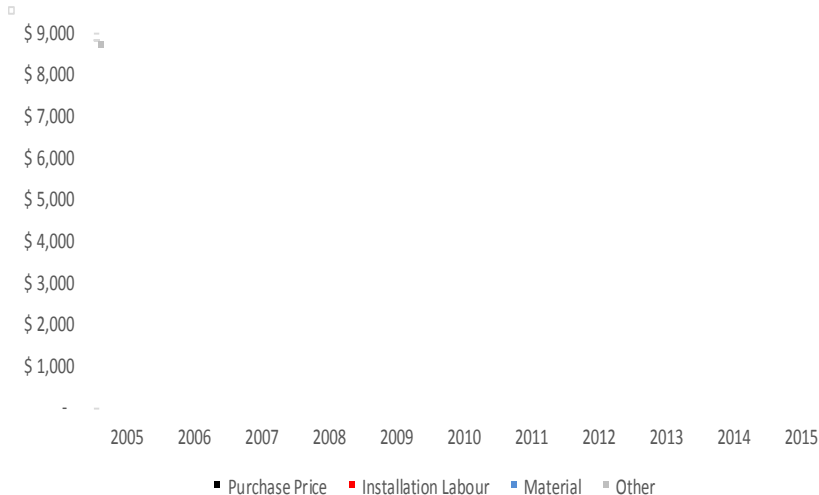


- Overall cost ***increased*** by 2.5% annually
- Two LDCs submitted complete table, except order volumes
- Ratio of labour ranges from 80% to 85% of total cost
- How much of these cost should apply to poles?

Installation Cost Per Pole

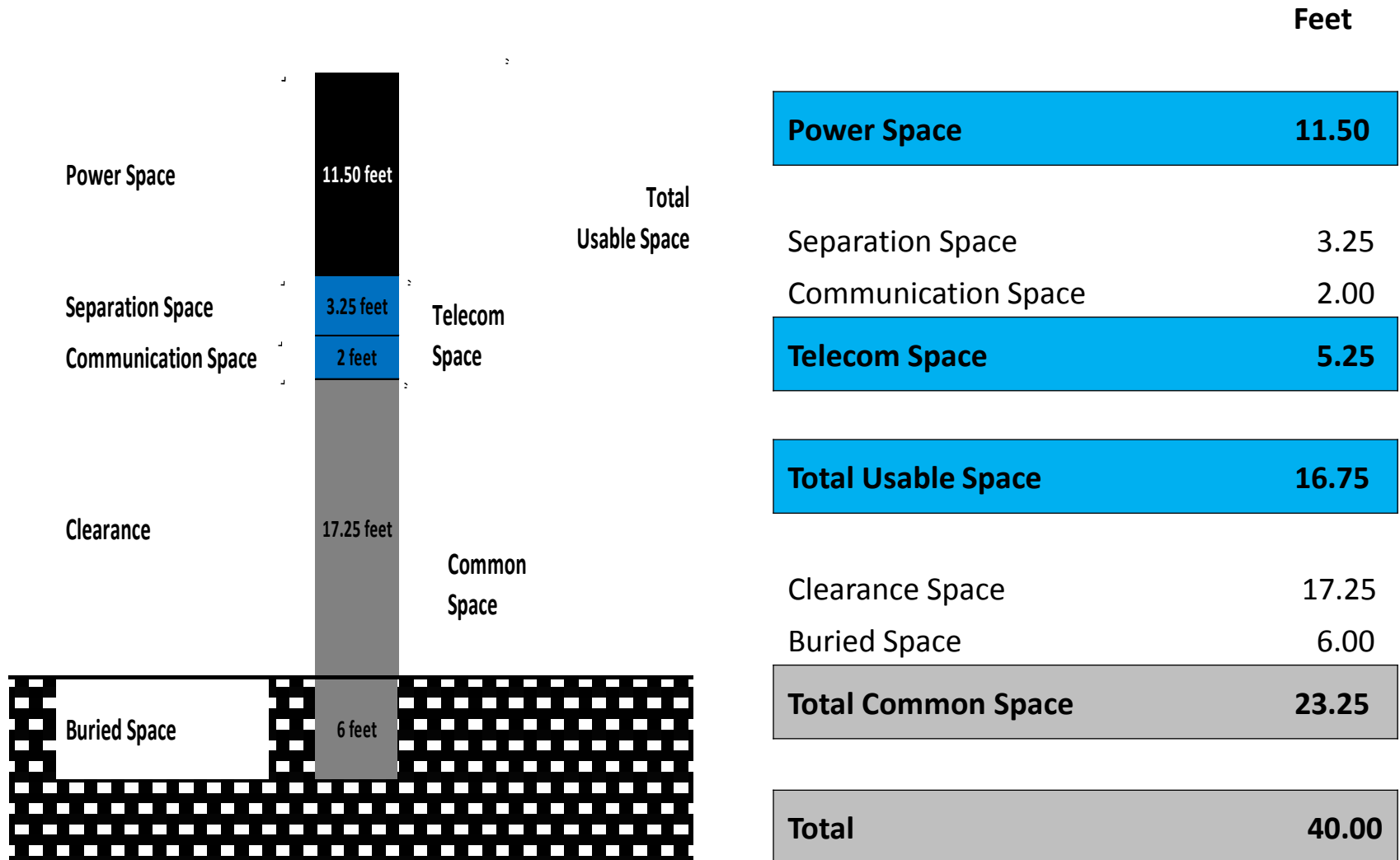
Year	New Poles Installed	Poles Installed Cost (Growth / Replacement / Renewal)									
		Total Installation Cost		Purchase Price		Installation Labour		Material		Other	
2005	3,541	\$ 8,047.3	100.0%	\$ 254.48	3.2%	\$ 3,725	46.3%	\$ 1,530.5	19.0%	\$ 2,536.88	31.5%
2006	6,106	\$ 6,805.2	100.0%	\$ 188.93	2.8%	\$ 3,214	47.2%	\$ 1,255.5	18.4%	\$ 2,146.66	31.5%
2007	8,248	\$ 6,540.2	100.0%	\$ 196.45	3.0%	\$ 3,328	50.9%	\$ 1,106.7	16.9%	\$ 1,909.27	29.2%
2008	7,878	\$ 6,894.7	100.0%	\$ 138.82	2.0%	\$ 3,712	53.8%	\$ 851.4	12.3%	\$ 2,192.52	31.8%
2009	8,842	\$ 7,396.8	100.0%	\$ 164.14	2.2%	\$ 3,934	53.2%	\$ 844.4	11.4%	\$ 2,453.98	33.2%
2010	8,721	\$ 7,788.0	100.0%	\$ 535.76	6.9%	\$ 4,127	53.0%	\$ 488.6	6.3%	\$ 2,636.95	33.9%
2011	8,809	\$ 7,845.1	100.0%	\$ 492.34	6.3%	\$ 4,232	53.9%	\$ 495.0	6.3%	\$ 2,625.68	33.5%
2012	9,078	\$ 7,848.0	100.0%	\$ 581.90	7.4%	\$ 4,140	52.8%	\$ 473.3	6.0%	\$ 2,652.64	33.8%
2013	12,340	\$ 7,472.6	100.0%	\$ 551.90	7.4%	\$ 4,133	55.3%	\$ 217.8	2.9%	\$ 2,569.45	34.4%
2014	12,680	\$ 8,532.3	100.0%	\$ 723.09	8.5%	\$ 4,668	54.7%	\$ 247.9	2.9%	\$ 2,893.64	33.9%
2015	13,694	\$ 8,117.0	100.0%	\$ 675.70	8.3%	\$ 4,469	55.1%	\$ 261.4	3.2%	\$ 2,711.41	33.4%
Average	9,085	\$ 7,571.57		\$ 409.41	5.4%	\$ 3,971.11	52.4%	\$ 706.59	9.3%	\$ 2,484.46	32.8%

Installed poles represent ~97% of the province



- Overall cost **increased** by only 0.1% annually
 - 10.8% annual increase pole purchase price, aligns with independent quotes
 - 1.8% annual increase in installation labour
 - 16.2% **decrease** in material cost
- Three LDCs submitted complete table
- Installation labour range from 41% to 67% of total cost
- Installation labour significantly high – presumable, power related installations constitute majority of the labour cost

Maintain Existing (2005 Order) Pole Specs?



Average Attachers per Pole

Pole Size (Feet)	London Hydro	Hydro Ottawa	Horizon	Average Attachers per Pole (excl. Hydro One) ⁽¹⁾
30	1.31	1.78	2.60	2.05
35	1.83	2.04	2.39	2.19
40	2.26	2.15	2.61	2.36
45	2.25	2.19	3.03	2.53
50	3.01	2.08	3.28	2.81
55	2.88	2.28	3.52	2.85
60	1.53	2.41	3.18	2.25
65	1.73	2.26	3.52	2.19
70	1.55	2.09	3.18	1.97
75	1.67	1.70	2.00	1.70
80	n/a	1.52	n/a	1.52
Others	n/a	1.09	n/a	1.09
Sample	2.13	2.13	2.70	2.37
Total	2.23	2.09	2.73	2.40

- Pole sizes 35' , 40' and 45' represent 75% of the total provincial population – referred to as “sample” group.
- Hydro One, who represents over 85% of the population, did not provide attacher data per each pole size, as requested.
- For the sample group, the average number of attachers per pole is 2.37, excluding Hydro One.
- OEB’s current rate (as per the 2005 Decision) is based on 2.5 average attachers or a total of 3.5 attachers including power.

(1) Average attachers per pole (excluding Hydro One), is calculated based on the total number of poles from the above utilities and the number of attachers (i.e. the utility itself, telecom attachers and other attachers). The method used is population-weighted average.

Average Attachers per Pole

		HydroOne		Other		Total	
Number of Poles							
A	Power only	1,001,477	64%	138,960	53%	1,140,437	62%
B	Joint Use	572,185	36%	125,170	47%	697,355	38%
C = B + C	Total	<u>1,573,662</u>	100%	<u>264,130</u>	100%	<u>1,837,792</u>	100%
Attachers							
D = C	Power	1,573,662	68%	264,130	60%	1,837,792	67%
E	Telecom + Other	733,753	32%	175,400	40%	909,153	33%
F = D + E	Total	<u>2,307,415</u>	100%	<u>439,530</u>	100%	<u>2,746,945</u>	100%
Average Attacher Per Pole							
G = E / B + 1	per Joint Use Poles	2.28		2.40		2.30	
H = F / C	per All Poles	1.47		1.66		1.49	

Pole Specs

Pole Size (Feet)	All Pole Classes						Province ⁽¹⁾	
	Power Space (Feet)	Sepa. Space (Feet)	Comm. Space (Feet)	Clear. Space (Feet)	Buried Space (Feet)	Total (Feet)	Joint Use Poles	
30	3.86	2.87	1.90	14.91	4.95	28.50	61,047	9%
35	7.83	3.02	2.00	15.18	6.30	34.33	185,504	27%
40	11.77	3.22	2.00	14.56	7.17	38.73	192,239	28%
45	15.44	3.17	2.54	14.05	9.59	44.79	144,981	21%
50	20.96	3.33	2.00	13.99	8.77	49.06	46,437	7%
55	26.45	3.05	2.00	16.00	7.50	55.00	31,490	5%
60	30.64	3.08	2.00	16.28	8.00	60.00	18,725	3%
65	34.26	3.06	2.00	16.13	8.59	64.04	8,695	1%
70	38.79	3.08	2.00	17.13	9.00	70.00	3,086	0%
75	43.58	3.16	2.00	16.75	9.50	74.99	1,608	0%
Sample	11.39	3.14	2.15	14.64	7.53	38.85	522,724	75%
OEB	11.50	3.25	2.00	17.25	6.00	40.00	n.a.	n.a

(1) The province column only presents the total of all the data already submitted.

Here follow key differences relative to pole specs in OEB's current rate (as per the 2005 Decision)

- **The average power space is 11.39' . This is consistent to the current specs (11.5').**
- The average telecom space (communication + separation) is consistent with the current specs (3.14' vs. 3.25' and 2.15 vs. 2.00).
- The average common space (clearance + buried) is slightly different from the current specs (14.64' vs. 17.25' and 7.53' vs. 6.00').

Pole Population

Year	Toronto Hydro	London Hydro	Ottawa Hydro	Hydro One	Horizon	Total ⁽²⁾
2005	159,000	27,700	44,600	1,451,344	n/a	1,682,644
2006	190,816	27,860	46,761	1,463,344	n/a	1,728,781
2007	181,397	28,000	51,582	1,475,344	n/a	1,736,323
2008	142,300	28,000	49,201	1,487,344	52,332	1,759,177
2009	140,771	28,698	48,699	1,499,344	52,146	1,769,658
2010	139,842	29,424	48,574	1,511,344	52,146	1,781,330
2011	140,641	29,384	48,377	1,523,344	52,163	1,793,909
2012	135,986	28,345	48,298	1,535,344	52,031	1,800,004
2013	135,986	27,980	47,978	1,547,344	51,615	1,810,903
2014	135,986	27,680	47,825	1,559,522	51,418	1,822,431
2015	137,172	27,184	48,384	1,571,384	51,390	1,835,514
Average	149,082	28,205	48,207	1,511,364	51,905	1,774,607
CAGR	-1.47%	-0.19%	0.82%	0.80%	-0.26%	0.87%

(1) CAGR: Compound Annual Growth Rate

(2) The "Total" represents the total of pole data submitted by LDCs as above

- Pole stats provided by Hydro One here include all poles (i.e. power-only poles, poles with telecom attachers and poles with other attachers such as street lights).
- Pole stats provided by all other utilities are ASSUMED to be joint use poles.

Net Embedded to Embedded Cost Ratio

Year	Average Cost Per Pole											
	Toronto Hydro		London Hydro		Ottawa Hydro		HydroOne		HorizonOne		Province Average	
	Embedded	Net Embedded	Embedded	Net Embedded	Embedded	Net Embedded	Embedded	Net Embedded	Embedded	Net Embedded	Embedded	Net Embedded
2005	\$ 1,779	\$ 1,083	\$ 270	\$ 235	\$ 2,404	\$ 1,122	\$ 1,061	\$ 550	n/a	n/a	\$ 1,151	\$ 610
2006	\$ 1,530	\$ 893	\$ 308	\$ 263	\$ 2,439	\$ 1,133	\$ 1,116	\$ 599	n/a	n/a	\$ 1,185	\$ 641
2007	\$ 1,694	\$ 961	\$ 369	\$ 310	\$ 2,328	\$ 1,065	\$ 1,169	\$ 647	n/a	n/a	\$ 1,246	\$ 687
2008	\$ 2,253	\$ 1,236	\$ 443	\$ 369	\$ 2,494	\$ 1,085	\$ 1,231	\$ 702	\$ 1,206	\$ 745	\$ 1,335	\$ 752
2009	\$ 2,348	\$ 1,233	\$ 1,227	\$ 625	\$ 2,251	\$ 1,087	\$ 1,286	\$ 754	\$ 1,340	\$ 841	\$ 1,398	\$ 802
2010	\$ 2,455	\$ 1,245	\$ 1,208	\$ 600	\$ 1,092	\$ 1,092	\$ 1,351	\$ 815	\$ 1,446	\$ 921	\$ 1,431	\$ 856
2011	\$ 2,637	\$ 1,393	\$ 1,271	\$ 630	\$ 1,242	\$ 1,210	\$ 1,423	\$ 885	\$ 1,634	\$ 1,073	\$ 1,517	\$ 935
2012	\$ 2,816	\$ 1,483	\$ 1,354	\$ 699	\$ 1,399	\$ 1,331	\$ 1,490	\$ 951	\$ 1,222	\$ 1,164	\$ 1,577	\$ 1,003
2013	\$ 2,910	\$ 1,528	\$ 1,420	\$ 736	\$ 1,582	\$ 1,475	\$ 1,608	\$ 1,067	\$ 1,337	\$ 1,245	\$ 1,694	\$ 1,112
2014	\$ 1,511	\$ 1,463	\$ 1,505	\$ 792	\$ 1,792	\$ 1,641	\$ 1,750	\$ 1,210	\$ 1,450	\$ 1,322	\$ 1,721	\$ 1,237
2015	\$ 1,999	\$ 1,883	\$ 1,586	\$ 837	\$ 2,016	\$ 1,819	\$ 1,793	\$ 1,254	\$ 1,587	\$ 1,420	\$ 1,805	\$ 1,314
Average	\$ 2,176	\$ 1,309	\$ 997	\$ 554	\$ 1,913	\$ 1,278	\$ 1,389	\$ 858	\$ 1,403	\$ 1,091	\$ 1,460	\$ 905
CAGR (1)	1.1%	5.2%	17.5%	12.2%	(1.6%)	4.5%	4.9%	7.8%	3.5%	8.4%	4.2%	7.2%

(1) CAGR: Compound Annual Growth Rate

- The above numbers are based on the LDCs responses to the first data request
- The 10 year provincial average net embedded cost is \$905, which is 61.95% of the embedded cost – accumulated depreciation is $1 - 61.95\% = 38.05\%$.
- This is almost double the current net embedded cost (2005 OEB Decision) - \$478. Average net embedded costs from 2011 and later are ~3 times higher.
- Cost by utility varies significantly, ex: \$1,309 (Toronto Hydro) vs. \$554 London Hydro.
- The provincial pole population increased by 9% (2005 to 2015) vis-à-vis 27% (embedded) / 48% (net embedded). This finding implies that capital expenditure has primarily been directed toward pole replacements rather than pole growth.
- Based on the depreciation rate information provided, the useful life of a pole ranges between 25 to 50 years
- Subsequently, A/C 1830 extracts were used to determine average embedded cost per pole