

MANITOBA HYDRO**2012/13 & 2013/14 ELECTRIC GENERAL RATE APPLICATION****UNDERTAKING PROVIDED BY: L. KENNEDY**

Manitoba Hydro Undertaking # 36

Provide two detailed calculations using an example of investment installed in 1923 with a lifespan date of 2063 and detailed calculations assuming plant installed in 2013 with a lifespan date of 2063.

Response:

The following response was prepared by Gannett Fleming.

Please refer to the following schedules, which provide annual depreciation rates calculated using both the Equal Life Group and Average Service Life Procedures for the two cases requested. The depreciation rates were calculated using the following assumptions:

Case 1

- \$1,000 of investment is added in 1923 with an anticipated Life span ending in 2063.
- A small portion of the original investment will retire each year in accordance with the Iowa R4-125 survivor curve. The Anticipated Closing Balance reflects this small amount of annual retirement.
- The anticipated loss on retirement that would result in the ASL procedure has not been considered in this analysis.
- The total original cost of \$1,000 is fully recovered in both procedures.

Case 2

- \$1,000 of investment is added in 2013 with an anticipated Life span ending in 2063.
- A small portion of the original investment will retire each year in accordance with the Iowa R4-125 survivor curve. The Anticipated Closing Balance reflects this small amount of annual retirement.
- The anticipated loss on retirement that would result in the ASL procedure has not been considered in this analysis.
- The total original cost of \$1,000 is fully recovered in both procedures.

**Case 1 - Annual Depreciation Rates for the years 1923 through 2063 incorporating
the Equal Life Group and Average Service Life Grouping Procedures**

	Anticipated Closing Balance (\$)	ELG		ASL	
		Annual Rate (%)	Annual Expense (\$)	Annual Rate (%)	Annual Expense (\$)
1923	1,000.00	0.87%	8.70	0.823%	8.23
1924	999.99	0.87%	8.70	0.823%	8.23
1925	999.98	0.87%	8.70	0.823%	8.23
1926	999.97	0.87%	8.70	0.823%	8.23
1927	999.96	0.87%	8.70	0.823%	8.23
1928	999.95	0.87%	8.70	0.823%	8.23
1929	999.94	0.87%	8.70	0.823%	8.23
1930	999.93	0.87%	8.70	0.823%	8.23
1931	999.91	0.87%	8.70	0.823%	8.23
1932	999.89	0.87%	8.70	0.823%	8.23
1933	999.87	0.87%	8.70	0.823%	8.23
1934	999.85	0.87%	8.70	0.823%	8.23
1935	999.83	0.87%	8.70	0.823%	8.23
1936	999.80	0.86%	8.60	0.823%	8.23
1937	999.77	0.86%	8.60	0.823%	8.23
1938	999.74	0.86%	8.60	0.823%	8.23
1939	999.70	0.86%	8.60	0.823%	8.23
1940	999.66	0.86%	8.60	0.823%	8.23
1941	999.62	0.86%	8.60	0.823%	8.23
1942	999.57	0.86%	8.60	0.823%	8.23
1943	999.52	0.86%	8.60	0.823%	8.23
1944	999.46	0.86%	8.60	0.823%	8.23
1945	999.40	0.86%	8.59	0.823%	8.23
1946	999.33	0.86%	8.59	0.823%	8.22
1947	999.25	0.86%	8.59	0.823%	8.22
1948	999.16	0.86%	8.59	0.823%	8.22
1949	999.07	0.86%	8.59	0.823%	8.22
1950	998.97	0.86%	8.59	0.823%	8.22
1951	998.86	0.86%	8.59	0.823%	8.22
1952	998.74	0.86%	8.59	0.823%	8.22
1953	998.61	0.86%	8.59	0.823%	8.22
1954	998.47	0.86%	8.59	0.823%	8.22
1955	998.32	0.86%	8.59	0.823%	8.22
1956	998.15	0.86%	8.58	0.823%	8.21
1957	997.96	0.86%	8.58	0.823%	8.21
1958	997.76	0.86%	8.58	0.823%	8.21
1959	997.54	0.86%	8.58	0.823%	8.21
1960	997.31	0.86%	8.58	0.823%	8.21

**Case 1 - Annual Depreciation Rates for the years 1923 through 2063 incorporating
the Equal Life Group and Average Service Life Grouping Procedures**

	Anticipated Closing Balance (\$)	ELG		ASL	
		Annual Rate (%)	Annual Expense (\$)	Annual Rate (%)	Annual Expense (\$)
1961	997.05	0.86%	8.57	0.823%	8.21
1962	996.77	0.86%	8.57	0.823%	8.20
1963	996.47	0.86%	8.57	0.823%	8.20
1964	996.15	0.86%	8.57	0.823%	8.20
1965	995.81	0.86%	8.56	0.823%	8.20
1966	995.43	0.86%	8.56	0.823%	8.19
1967	995.03	0.85%	8.46	0.823%	8.19
1968	994.60	0.85%	8.45	0.823%	8.19
1969	994.14	0.85%	8.45	0.823%	8.18
1970	993.65	0.85%	8.45	0.823%	8.18
1971	993.11	0.85%	8.44	0.823%	8.17
1972	992.53	0.85%	8.44	0.823%	8.17
1973	991.92	0.85%	8.43	0.823%	8.16
1974	991.27	0.85%	8.43	0.823%	8.16
1975	990.57	0.85%	8.42	0.823%	8.15
1976	989.81	0.85%	8.41	0.823%	8.15
1977	989.01	0.85%	8.41	0.823%	8.14
1978	988.15	0.84%	8.30	0.823%	8.13
1979	987.24	0.84%	8.29	0.823%	8.12
1980	986.28	0.84%	8.28	0.823%	8.12
1981	985.24	0.84%	8.28	0.823%	8.11
1982	984.14	0.84%	8.27	0.823%	8.10
1983	982.97	0.84%	8.26	0.823%	8.09
1984	981.73	0.84%	8.25	0.823%	8.08
1985	980.42	0.84%	8.24	0.823%	8.07
1986	979.01	0.84%	8.22	0.823%	8.06
1987	977.52	0.84%	8.21	0.823%	8.04
1988	975.95	0.84%	8.20	0.823%	8.03
1989	974.30	0.84%	8.18	0.823%	8.02
1990	972.56	0.83%	8.07	0.823%	8.00
1991	970.70	0.83%	8.06	0.823%	7.99
1992	968.74	0.83%	8.04	0.823%	7.97
1993	966.68	0.83%	8.02	0.823%	7.96
1994	964.51	0.83%	8.01	0.823%	7.94
1995	962.23	0.83%	7.99	0.823%	7.92
1996	959.80	0.83%	7.97	0.823%	7.90
1997	957.25	0.83%	7.95	0.823%	7.88
1998	954.58	0.82%	7.83	0.823%	7.86

**Case 1 - Annual Depreciation Rates for the years 1923 through 2063 incorporating
the Equal Life Group and Average Service Life Grouping Procedures**

	Anticipated Closing Balance (\$)	ELG		ASL	
		Annual Rate (%)	Annual Expense (\$)	Annual Rate (%)	Annual Expense (\$)
1999	951.79	0.82%	7.80	0.823%	7.83
2000	948.87	0.82%	7.78	0.823%	7.81
2001	945.77	0.82%	7.76	0.823%	7.78
2002	942.53	0.82%	7.73	0.823%	7.76
2003	939.14	0.82%	7.70	0.823%	7.73
2004	935.60	0.81%	7.58	0.823%	7.70
2005	931.91	0.81%	7.55	0.823%	7.67
2006	928.01	0.81%	7.52	0.823%	7.64
2007	923.95	0.81%	7.48	0.823%	7.60
2008	919.72	0.81%	7.45	0.823%	7.57
2009	915.32	0.81%	7.41	0.823%	7.53
2010	910.75	0.80%	7.29	0.823%	7.50
2011	905.94	0.80%	7.25	0.823%	7.46
2012	900.95	0.80%	7.21	0.823%	7.41
2013	895.77	0.80%	7.17	0.823%	7.37
2014	890.40	0.80%	7.12	0.823%	7.33
2015	884.84	0.80%	7.08	0.823%	7.28
2016	879.02	0.79%	6.94	0.823%	7.23
2017	873.00	0.79%	6.90	0.823%	7.18
2018	866.77	0.79%	6.85	0.823%	7.13
2019	860.34	0.79%	6.80	0.823%	7.08
2020	853.70	0.79%	6.74	0.823%	7.03
2021	846.78	0.78%	6.60	0.823%	6.97
2022	839.65	0.78%	6.55	0.823%	6.91
2023	832.30	0.78%	6.49	0.823%	6.85
2024	824.73	0.78%	6.43	0.823%	6.79
2025	816.95	0.78%	6.37	0.823%	6.72
2026	808.88	0.77%	6.23	0.823%	6.66
2027	800.58	0.77%	6.16	0.823%	6.59
2028	792.05	0.77%	6.10	0.823%	6.52
2029	783.28	0.77%	6.03	0.823%	6.45
2030	774.26	0.77%	5.96	0.823%	6.37
2031	764.88	0.77%	5.89	0.823%	6.29
2032	755.20	0.76%	5.74	0.823%	6.22
2033	745.20	0.76%	5.66	0.823%	6.13
2034	734.87	0.76%	5.59	0.823%	6.05
2035	724.19	0.76%	5.50	0.823%	5.96
2036	713.01	0.76%	5.42	0.823%	5.87

**Case 1 - Annual Depreciation Rates for the years 1923 through 2063 incorporating
the Equal Life Group and Average Service Life Grouping Procedures**

	Anticipated Closing Balance (\$)	ELG		ASL	
		Annual Rate (%)	Annual Expense (\$)	Annual Rate (%)	Annual Expense (\$)
2037	701.44	0.75%	5.26	0.823%	5.77
2038	689.46	0.75%	5.17	0.823%	5.67
2039	677.06	0.75%	5.08	0.823%	5.57
2040	664.24	0.75%	4.98	0.823%	5.47
2041	650.85	0.75%	4.88	0.823%	5.36
2042	637.04	0.74%	4.71	0.823%	5.24
2043	622.81	0.74%	4.61	0.823%	5.13
2044	608.18	0.74%	4.50	0.823%	5.01
2045	593.15	0.74%	4.39	0.823%	4.88
2046	577.63	0.73%	4.22	0.823%	4.75
2047	561.77	0.73%	4.10	0.823%	4.62
2048	545.59	0.73%	3.98	0.823%	4.49
2049	529.13	0.73%	3.86	0.823%	4.35
2050	512.40	0.73%	3.74	0.823%	4.22
2051	495.39	0.73%	3.62	0.823%	4.08
2052	478.22	0.72%	3.44	0.823%	3.94
2053	460.92	0.72%	3.32	0.823%	3.79
2054	443.53	0.72%	3.19	0.823%	3.65
2055	426.08	0.72%	3.07	0.823%	3.51
2056	408.63	0.72%	2.94	0.823%	3.36
2057	391.24	0.72%	2.82	0.823%	3.22
2058	373.94	0.71%	2.65	0.823%	3.08
2059	356.76	0.71%	2.53	0.823%	2.94
2060	339.74	0.71%	2.41	0.823%	2.80
2061	323.00	0.71%	2.29	0.823%	2.66
2062	306.52	0.71%	2.18	0.823%	2.52
2063	289.87	0.71%	2.06	0.823%	2.39
			1,000.81		1,000.37

**Case 2 - Annual Depreciation Rates for the years 2013 through 2063 incorporating
the Equal Life Group and Average Service Life Grouping Procedures**

	Anticipated Closing Balance (\$)	ELG		ASL	
		Annual Rate (%)	Annual Expense (\$)	Annual Rate (%)	Annual Expense (\$)
2013	1000	0.99%	9.90	0.99%	9.90
2014	999.99	1.99%	19.90	1.98%	19.82
2015	999.98	1.99%	19.90	1.98%	19.82
2016	999.97	1.99%	19.90	1.98%	19.82
2017	999.96	1.99%	19.90	1.98%	19.82
2018	999.95	1.99%	19.90	1.98%	19.82
2019	999.94	1.99%	19.90	1.98%	19.82
2020	999.93	1.99%	19.90	1.98%	19.82
2021	999.91	1.99%	19.90	1.98%	19.82
2022	999.89	1.99%	19.90	1.98%	19.82
2023	999.87	1.99%	19.90	1.98%	19.82
2024	999.85	1.99%	19.90	1.98%	19.82
2025	999.83	1.99%	19.90	1.98%	19.82
2026	999.8	1.99%	19.90	1.98%	19.82
2027	999.77	1.99%	19.90	1.98%	19.82
2028	999.74	1.99%	19.89	1.98%	19.81
2029	999.7	1.99%	19.89	1.98%	19.81
2030	999.66	1.99%	19.89	1.98%	19.81
2031	999.62	1.98%	19.79	1.98%	19.81
2032	999.57	1.98%	19.79	1.98%	19.81
2033	999.52	1.98%	19.79	1.98%	19.81
2034	999.46	1.98%	19.79	1.98%	19.81
2035	999.4	1.98%	19.79	1.98%	19.81
2036	999.33	1.98%	19.79	1.98%	19.81
2037	999.25	1.98%	19.79	1.98%	19.81
2038	999.16	1.98%	19.78	1.98%	19.80
2039	999.07	1.98%	19.78	1.98%	19.80
2040	998.97	1.98%	19.78	1.98%	19.80
2041	998.86	1.98%	19.78	1.98%	19.80
2042	998.74	1.98%	19.78	1.98%	19.80
2043	998.61	1.98%	19.77	1.98%	19.79
2044	998.47	1.98%	19.77	1.98%	19.79
2045	998.32	1.98%	19.77	1.98%	19.79
2046	998.15	1.98%	19.76	1.98%	19.78
2047	997.96	1.98%	19.76	1.98%	19.78
2048	997.76	1.98%	19.76	1.98%	19.78
2049	997.54	1.98%	19.75	1.98%	19.77
2050	997.31	1.98%	19.75	1.98%	19.77
2051	997.05	1.98%	19.74	1.98%	19.76

**Case 2 - Annual Depreciation Rates for the years 2013 through 2063 incorporating
the Equal Life Group and Average Service Life Grouping Procedures**

	Anticipated Closing Balance (\$)	ELG		ASL	
		Annual Rate (%)	Annual Expense (\$)	Annual Rate (%)	Annual Expense (\$)
2052	996.77	1.98%	19.74	1.98%	19.76
2053	996.47	1.98%	19.73	1.98%	19.75
2054	996.15	1.98%	19.72	1.98%	19.74
2055	995.81	1.98%	19.72	1.98%	19.74
2056	995.43	1.98%	19.71	1.98%	19.73
2057	995.03	1.98%	19.70	1.98%	19.72
2058	994.6	1.98%	19.69	1.98%	19.71
2059	994.14	1.98%	19.68	1.98%	19.70
2060	993.65	1.98%	19.67	1.98%	19.69
2061	993.11	1.98%	19.66	1.98%	19.68
2062	992.53	1.98%	19.65	1.98%	19.67
2063	992.53	1.98%	19.65	1.98%	19.67
			999.74		999.04