Manitoba Hydro 2010/11 & 2011/12 GRA
PUB Pre-Ask Questions of the Independent Experts

Pre-Ask PUB/KM - 1

Ref: KM Report, Page 91/92, Exhibit, MH Figure 3.17 (Attached)
MH Drought Strategy Process/Rule Curve

a) Please confirm that MH's back calculation of the 1938-41 drought is premised on a full reservoir level of 715.0 on Lake Winnipeg in the first year of the drought/how likely is this situation?

b) Please compare the modeled water levels with historical levels and plot the historical levels on the representative drought if figure 3.17.

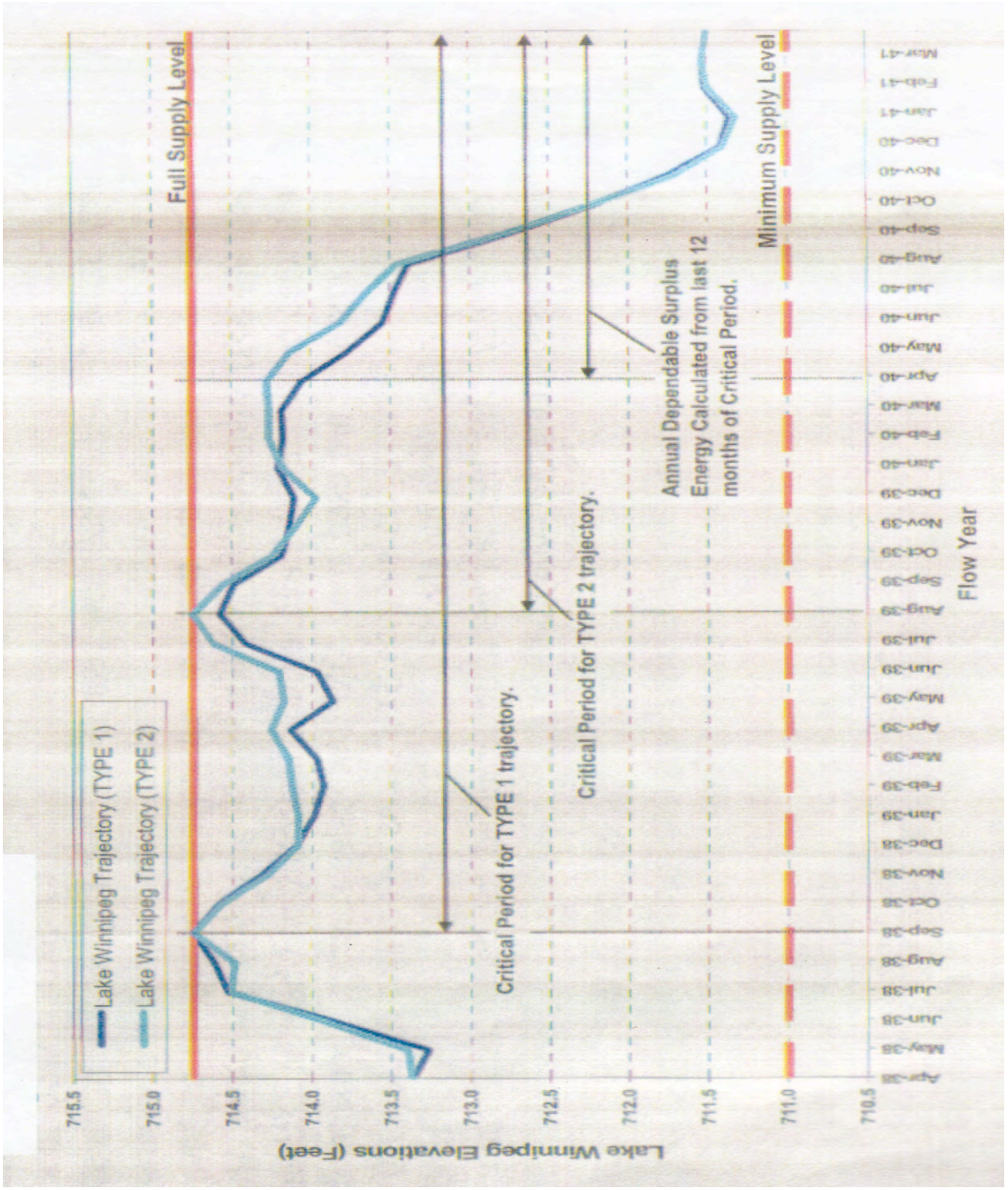
c) Can KM confirm that MH's drought strategy would involve all out thermal generation (or imports) in the first year of the drought in order to avoid drawing energy from storage (e.g., achieve and maintain full supply situation).

d) Please explain how MH would recognize a pending drought in the first year when energy-in-storage is well above average and spring inflows are as yet unknown. (e.g., below average snow pack).

e) Can KM confirm that MH typically looks to maximize exports at about 1,400 GWh/month during May/June/July/August in anticipation of average or better flow years (using imports if/as necessary)?

f) Please confirm that this exceeds the entire hydraulic energy surplus above domestic load in mean flow years (29,500-26,000).

g) Can KM confirm that MH's mean year will typically require 2,500 GWh of fuel and power purchases?


Full Supply Level
Lake Winnipeg Trajectory (TYPE 1)
Lake Winnipeg Trajectory (TYPE 2)
Critical Period for TYPE 1 trajectory.
Critical Period for TYPE 2 trajectory.
Annual Dependable Surplus Energy Calculated from last 12 months of Critical Period.
Minimum Supply Level
Lake Winnipeg Elevations (Feet)
Flow Year
715.5
715.0
714.5
714.0
713.5
713.0
712.5
712.0
711.5
711.0
710.5

Pre-Ask PUB/KM - 2

Ref: MH Figure 3.17 – Lake Winnipeg Critical Trajectory
Drought Strategy Process

a) Please confirm that the basic premise of Figure 3.17 is that MH would know that:

- March 1941 was the end of the drought and that reservoir recovery was assured.
- A full Lake Winnipeg reservoir 714.75 could be assured in August 1939 and in September 1938 by maximizing thermal generation and maximizing imports.
- A Lake Winnipeg reservoir level of 713.5 as of April 1938 was achievable by maximum use of thermal generation and maximum imports in 1936 and 1937.

b) Please confirm that MH would have to significantly restrict Lake Winnipeg outflows in 2036/37 and buy in excess of 10,000 GWh of energy in order to meet domestic and export contract commitments and maintain a Lake Winnipeg level of 713.5.

c) Please explain the probable rationale for MH's required decision in 1936 to maximize imports and/or thermal generation (or curtail non-firm exports) when May/June runoff to Lake Winnipeg was near average and Lake Winnipeg was at 714.0.

d) Did KM do an analysis of cost impacts of this 7-year drought occurring circa 2011/12 to 2017/18? Please provide or explain.

Pre-Ask PUB/KM - 3

Ref: KM Report, Exhibit #3.17, MH Annual Report 2002/03
Lead-Up to 2003/04/ Risk Advisory Reports May 2003, January 2005

a) Did KM test MH's drought back calculation strategy against the 2002/03 to 2003/04 drought situation?

b) Is it KM's understanding that MH did/or did not anticipate the pending drought in:

- Fall 2002 (?) on what basis?
- January 2003 (?) on what basis?
- February 2003 (?) 1st forecast?
- April 2003 (?) energy-in-storage at 4,200 GWh?
- May 2003 (?) Risk Advisory Report?
- July 2003 (?) 2nd forecast?

c) In KM's view, when MH took energy-in-storage down to 4,200 GWh (Lake Winnipeg to 712.0) by April 2003, did this reflect:

- Lower inflows?
  or
- Higher export sales?

d) In KM's view, when did MH first realize a pending water shortage? (MH retained Risk Advisory to develop action plan in late 2002/03)

e) In April 2003, MH's energy-in-storage was 6,300 GWh and Lake Winnipeg was about 712.0. Can KM explain how this relates to MH's drought strategy which assumes – full reservoir at the beginning of drought?

f) Please confirm that in 2003/04, MH chose not to maximize imports or use thermal to minimize withdrawals from storage.

g) Would KM agree that if this had been a 5-year drought, MH would have depleted energy-in-storage after Year 2 of the drought?

Pre-Ask PUB/KM - 4

Ref: KM Report, Exhibit #3.17
Lake Winnipeg Critical Period Trajectory/Historical Lake Winnipeg Levels During Drought Periods

a) Please confirm that MH's SPLASH model assumes:

- A near empty reservoir at end of drought (Lake Winnipeg at 711.5) going into the first three months of 1941 (without the knowledge that the next nine months will see substantially below average Lake Winnipeg inflows requiring some 10,000 GWh of energy purchase). A further purchase of 4,000 GWh will be required in the April-September period of 1942.

- A near maximum full reservoir (Lake Winnipeg @ 714.0) in April 1940 allowing the withdrawal of about 18,000 GWh from energy-in-storage in the subsequent nine months (avoiding any energy purchases).

- That the near maximum reservoir (Lake Winnipeg @ 714.0) will also be available in April 1939 (no net withdrawal from energy-in-storage).

b) Did KM confirm that Lake Winnipeg levels in the first summer of each historical drought actually achieved 714.0? Please list specific years.

Historical Lake Winnipeg Levels During Drought Periods

Year	April	July	October
1928/29	714.7	715.0	714.7
1029/30	713.0	713.0	**712.0**
1930/31	**711.0**	**712.1**	**710.6**
1931/32	**710.9**	**711.0**	**710.8**
1932/33	**710.3**	**711.5**	**710.8**
1933/34	**711.2**	712.6	**711.7**
1934/35	**711.7**	713.6	713.2
1935/36	712.8	713.7	713.2
1936/37	713.0	714.1	712.7
1937/38	**711.8**	712.8	**711.9**
1938/39	**711.7**	713.3	**712.5**
1939/40	**711.6**	**712.0**	**711.1**
1940/41	**710.7**	**710.6**	**709.8**
1941/42	**709.7**	**710.3**	**709.9**
1942/43	**711.5**	**712.4**	**712.4**
1943/44	**712.2**	714.3	713.8
1959/60	**712.2**	**714.5**	**714.0**
1960/61	**713.9**	714.6	713.2
1961/62	**712.5**	**712.4**	**711.4**
1962/63	**711.2**	713.0	**712.3**
1963/64	**712.5**	714.0	713.0
1976/77	**715.0**	714.0	712.5
1977/78	711.5	**711.6**	**711.7**
1978/79	712.9	714.2	714.4
1979/80	713.6	715.3	714.0
1980/81	713.5	713.8	713.6
1981/82	**712.4**	713.3	712.8
1982/83	712.7	714.2	713.6
1983/84	713.6	714.6	713.5
1984/85	713.3	714.0	712.9
1985/86	--	713.4	714.8
1986/87	714.7	715.2+	714.0
1987/88	713.6	714.3	713.2
1988/89	**712.1**	--	**711.7**
1989/90	**712.0**	713.2	712.6
1990/91	**712.1**	713.8	713.2
1991/92	**712.2**	712.8	**712.1**
1992/93	**712.3**	714.3	714.6
1993/94	713.2	714.0	714.4
2001/02	713.4	714.7	713.7
2002/03	**712.2**	713.9	713.2
2003/04	**712.1**	**712.0**	**711.6**
2004/05	**712.4**	714.5	714.5
2006/07	714.3	714.6	712.9
	712.6	714.7	713.7

Source: Water Survey of Canada or D005 | Lake Levels < 712.5 (Highlighted), Drought Periods (Shaded)

Pre-Ask PUB/KM - 5

Ref: PUB/MH B.O.D. 6, Page 25
Typical Export Sales

a) Please confirm that in the absence of advance notice indicating low flows (pending shortage), MH would in Q_1 of a year look to:

- Maximizing export sales to tie-line capacity limits for 7x16 energy and also 7x8 energy during Q_1.
- Continuing export sales to tie-line capacity limits for 7x16 energy and perhaps 7x8 energy during Q_2.
- Exporting about 6,000 to 7,000 GWh of energy in Q_1 and Q_2 and an additional 1,500 to 2,000 GWh of energy in Q_3 and Q_4.

b) Would KM agree that MH typically (in 75% of historical years) would look to export at least 7,000 to 8,000 GWh of energy while employing up to 3,000 GWh of purchased/thermal energy (largely winter purchases)?

c) Would KM agree that currently in about 25% of the historical years export sales would only be achieved via matching imports or power purchases [no exports from hydraulic generation].

Pre-Ask PUB/KM - 6

Ref: PUB/MH I-29 2004/04/19 & PUB/MH II-39 2004/05/17 (2004/05 GRA), Table 1 Total Unregulated Monthly Inflow Data for Lake Winnipeg Historical Data Derivation

a) Please confirm that KM reviewed MH's entire historical flow and annual hydraulic generation estimates record from 1912 to date in order to define the adequacy of the stress test for droughts.

b) Please explain KM's understanding of how the above flow data prior to 1958 was derived from:

- Winnipeg River flow records?
- Red River flow records?
- Saskatchewan River flow records?
- Local inflows?
- Lake Winnipeg level changes?

c) Please explain how the associated monthly hydraulic generation was determined.

d) Specifically, did KM have access to MH's mathematically derived monthly Lake Winnipeg inflows:

- For 1929/30 to 1933/34 drought period (5 years)?
- For 1936/37 to 1942/43 drought period (7 years)?

Source: MH 2004/05 GRA

PUB/MH I-29

Reference: **Tab 7 - Page 6 (Figure 7.3.4)**

a) Why is energy in storage substantially lower in 2003/04 than in 1988 when total inflows to Lake Winnipeg were similar?

ANSWER:

Although the Manitoba load and firm export loads have grown significantly since 1988 energy reserves in reservoir storage were lower in 2003/04 compared to 1988 for the following reasons:

1) The addition of 260 MW of combustion turbines at Brandon GS in 2002 increased Manitoba Hydro's dependable energy capability by 2,300 GWh which is available to meet firm load commitments during drought. This additional capability allows Manitoba Hydro to maintain lower hydraulic reserves without additional risk to the Manitoba load.

2) Since 1988 Manitoba Hydro has increased its import capability from the US by 500 MW which theoretically could provide 4,000 GWh of energy supply. This additional capability allows Manitoba Hydro to maintain lower hydraulic reserves without additional risk to the Manitoba load.

PUB/MH I-29

Reference: **Tab 7 - Page 6 (Figure 7.3.4)**

b) Please provide monthly Lake Winnipeg inflow data for the entire period of record.

ANSWER:

Table 1 is a summary of monthly unregulated inflow into Lake Winnipeg for the period, 1912 to 1998. Unregulated inflow consists of all inflows upstream of Lake Winnipeg that are not regulated by Manitoba Hydro. The unregulated inflow into Lake Winnipeg as summarized in Table 1 includes the streamflows from the Winnipeg and Saskatchewan Rivers that have been regulated outside of Manitoba. The regulation of the Saskatchewan River at Grand Rapids using Cedar Lake storage has not been considered in these unregulated inflows.

An additional component of unregulated inflow is the Lake Winnipeg partial inflow available for outflow (PIAO), which represents the total inflow from all Lake Winnipeg tributaries, excluding the Winnipeg and Saskatchewan Rivers, and evaporation and precipitation effects directly on the lake. The PIAO flow quantity is calculated on the basis of known streamflows (that is: Winnipeg and Saskatchewan Rivers) and recorded outflows from Lake Winnipeg and the change in storage in the reservoir.

The PIAO can be negative or positive reflecting large evaporation losses and/or imprecision in the input data for the calculation of the PIAO. These evaporation losses can be so large that they offset other inflows and consequently the total unregulated inflow into Lake Winnipeg can be negative.

Table 1
Total Unregulated Monthly Inflow Data for Lake Winnipeg
Winnipeg River, Saskatchewan River and Lake Winnipeg Partial Inflow Available for Outflow (PIAO)

	Monthly Inflow (Kcfs)												
Fiscal Year	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Average
1912/13	83.4	97.5	100.8	98.5	50.5	38.7	45.1	54.9	59.7	58.7	59.2	58.7	67.2
1913/14	96.5	112.2	112.6	95.0	59.6	41.6	57.8	69.2	69.3	61.8	58.8	56.2	74.3
1914/15	67.5	80.9	87.6	65.4	18.7	33.4	59.3	59.7	49.9	52.0	39.4	35.3	54.1
1915/16	61.9	69.8	68.5	114.8	30.2	42.3	56.1	59.3	62.1	49.5	50.4	49.1	59.6
1916/17	83.3	130.4	157.3	136.7	96.5	76.5	61.1	92.8	69.6	68.7	62.7	61.1	91.5
1917/18	106.5	96.6	126.2	70.8	64.5	55.7	60.2	63.1	76.7	60.4	62.7	48.3	74.2
1918/19	56.3	92.0	115.1	66.4	69.2	32.2	23.7	73.7	47.9	42.6	56.8	47.7	60.2
1919/20	65.0	72.3	63.9	58.3	36.7	27.7	43.8	55.4	56.1	48.7	53.0	53.8	52.9
1920/21	94.3	92.8	95.7	64.2	45.1	42.3	50.4	47.4	34.5	36.9	48.7	51.7	58.6
1921/22	85.8	92.7	122.6	74.5	68.1	59.7	50.9	40.4	59.1	53.9	54.4	55.4	68.1
1922/23	89.9	137.4	99.2	87.2	42.0	51.5	34.3	38.9	36.0	39.2	40.2	43.0	61.6
1923/24	91.3	106.0	125.8	80.6	67.5	50.6	49.4	57.1	42.3	48.0	49.8	47.9	68.0
1924/25	65.1	76.3	76.9	67.5	38.7	33.1	45.5	58.1	43.7	40.5	39.8	58.6	53.7
1925/26	95.4	91.6	143.8	85.4	79.8	45.8	61.4	75.2	56.8	59.1	59.2	48.9	75.2
1926/27	71.9	57.7	82.4	57.7	37.9	61.8	63.8	77.4	76.0	59.5	65.9	62.1	64.4
1927/28	163.8	177.6	173.8	175.1	102.1	114.1	109.2	97.8	58.6	58.2	58.9	80.1	114.3
1928/29	94.7	85.6	99.4	123.6	68.6	39.3	50.1	50.0	49.4	55.4	54.9	64.2	69.7
1929/30	69.7	90.2	61.4	40.0	34.1	7.5	12.5	19.0	34.6	38.6	50.7	48.1	42.2
1930/31	38.0	73.0	80.7	83.1	-9.0	-10.7	37.5	57.3	60.5	47.8	46.9	20.8	43.8
1931/32	44.2	46.6	62.1	52.2	44.9	45.1	41.5	38.8	27.5	25.6	28.7	33.7	40.9
1932/33	49.3	62.3	91.5	69.1	34.9	19.4	19.9	41.6	51.7	51.6	47.0	49.6	49.0
1933/34	59.9	93.9	90.8	73.8	38.1	18.7	23.9	43.8	55.9	58.9	56.8	44.7	54.9
1934/35	77.4	136.9	113.8	95.8	45.4	64.7	57.1	52.0	65.1	59.7	48.1	61.0	73.2
1935/36	76.0	95.8	102.1	94.8	59.7	57.1	59.6	75.3	68.6	62.0	60.8	61.9	72.9
1936/37	93.3	111.3	104.6	52.5	18.5	18.6	14.9	26.2	52.7	36.9	43.7	44.7	51.5
1937/38	51.0	120.8	106.8	80.3	51.2	30.7	28.7	57.0	49.9	57.3	52.6	50.1	61.4
1938/39	51.0	105.6	113.0	65.5	71.4	21.2	16.1	22.9	37.2	44.4	44.5	47.2	53.4
1939/40	32.6	38.3	74.2	54.3	29.0	2.0	23.9	25.0	46.8	48.5	43.9	40.1	38.2
1940/41	32.0	24.3	31.8	22.7	-10.9	-7.9	8.8	20.6	21.0	30.0	31.5	35.7	19.9
1941/42	64.0	83.9	55.5	45.5	19.1	46.2	75.0	73.9	54.0	51.4	52.8	72.3	57.8
1942/43	90.5	124.0	78.9	72.3	56.4	49.8	66.4	63.3	59.3	53.9	53.0	50.0	68.2
1943/44	115.1	115.9	125.1	106.8	64.5	54.3	39.1	63.6	54.8	51.5	45.8	60.3	74.8
1944/45	51.4	68.6	121.4	88.7	68.3	66.4	67.8	72.3	58.6	50.2	61.2	82.8	71.5
1945/46	107.6	115.9	115.9	105.7	49.7	56.7	54.7	70.5	64.7	63.3	49.8	81.8	78.1
1946/47	98.6	89.5	98.5	80.0	40.8	43.2	61.6	60.2	58.0	64.2	79.8	60.8	69.5
1947/48	95.9	146.1	151.6	108.2	75.6	50.1	67.4	61.2	54.3	53.4	61.5	52.6	81.6
1948/49	108.8	161.7	127.7	101.5	52.0	20.0	24.6	30.6	54.9	49.9	52.7	46.1	69.3
1949/50	78.5	81.0	69.3	62.7	40.3	28.1	59.8	66.2	67.8	72.7	68.0	55.0	62.4
1950/51	89.8	210.5	177.6	161.5	95.8	70.6	104.6	82.3	62.6	65.5	63.6	67.9	104.7
1951/52	112.4	129.9	123.2	110.7	55.3	66.0	71.3	62.7	77.7	69.0	68.5	59.6	83.9
1952/53	125.4	107.1	100.2	87.6	53.5	54.5	50.8	45.1	56.2	54.6	55.3	55.3	70.5

Table 1 (cont'd)
Total Unregulated Monthly Inflow Data for Lake Winnipeg
Winnipeg River, Saskatchewan River and Lake Winnipeg Partial Inflow Available for Outflow (PIAO)

	Monthly Inflow (Kcfs)												
Fiscal Year	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Average
1953/54	57.4	87.8	185.6	147.9	88.3	74.4	48.2	61.0	72.0	74.4	64.3	54.4	84.7
1954/55	89.2	118.2	167.3	155.8	104.9	110.4	101.6	94.6	82.4	75.7	81.5	78.8	105.1
1955/56	131.9	158.1	174.6	124.0	71.1	60.2	41.4	61.0	74.6	73.8	64.5	61.7	91.4
1956/57	76.7	193.9	139.4	112.9	53.1	58.6	17.7	77.8	82.1	54.4	69.9	61.6	83.2
1957/58	91.9	111.0	128.5	74.6	61.8	67.2	-4.7	49.9	68.8	57.6	46.8	52.4	67.1
1958/59	61.1	56.7	52.1	99.0	5.0	39.4	34.4	78.9	50.5	55.6	42.9	53.1	52.4
1959/60	68.1	186.8	144.5	102.5	76.9	34.8	72.4	91.3	74.8	54.7	65.7	61.3	86.3
1960/61	101.6	138.0	83.4	59.9	24.9	23.9	27.2	28.2	49.4	52.3	52.3	45.9	57.3
1961/62	65.9	76.4	36.9	29.9	3.9	12.9	11.6	13.7	43.7	37.9	40.9	45.6	34.9
1962/63	65.5	107.8	138.7	84.2	93.4	77.3	38.4	46.8	53.2	53.2	58.6	65.7	73.6
1963/64	65.2	138.7	127.2	83.8	37.4	16.5	49.2	28.4	60.8	58.8	51.2	50.2	64.1
1964/65	56.4	130.2	101.0	80.1	36.4	39.8	51.2	72.1	68.4	58.0	55.3	62.2	67.7
1965/66	158.4	186.9	193.5	157.6	54.5	66.5	57.1	98.0	91.9	86.4	77.3	80.2	109.0
1966/67	170.4	222.8	192.1	138.4	61.6	35.7	39.2	68.7	89.1	93.3	82.4	68.5	105.2
1967/68	149.1	154.7	110.7	68.5	26.4	7.3	37.2	71.9	70.2	54.7	51.5	55.2	71.5
1968/69	79.1	86.1	97.1	142.1	95.1	110.6	68.7	79.9	99.6	84.3	81.3	64.0	90.7
1969/70	165.1	164.2	103.2	129.0	136.5	81.2	102.7	89.7	74.5	49.9	68.3	80.4	103.9
1970/71	132.6	167.5	156.9	168.9	50.5	42.0	60.9	81.2	90.9	55.9	57.0	81.4	95.7
1971/72	163.5	123.0	125.4	103.8	21.8	25.3	55.8	84.9	92.1	83.7	79.0	98.6	88.0
1972/73	154.2	161.8	114.5	89.7	36.0	18.2	24.8	57.2	70.7	59.9	57.1	73.6	76.5
1973/74	76.9	62.6	109.6	51.3	36.0	39.0	58.8	97.9	88.0	76.5	71.2	83.9	70.9
1974/75	174.6	319.1	227.4	190.8	69.4	71.7	52.2	65.7	78.1	67.3	76.8	84.7	123.4
1975/76	99.0	169.4	136.9	136.0	75.6	62.4	50.7	64.6	71.3	68.2	71.6	62.2	89.1
1976/77	140.6	69.6	107.1	48.0	15.6	-16.5	23.2	31.6	43.4	47.1	35.0	39.0	48.6
1977/78	25.9	51.6	33.2	40.7	21.8	45.7	39.3	90.7	84.7	63.1	59.5	62.8	51.6
1978/79	137.7	94.8	80.9	97.8	49.3	61.4	66.9	59.9	62.0	60.5	53.9	59.9	73.8
1979/80	123.2	258.5	172.6	76.8	8.3	35.4	50.7	58.1	44.7	62.3	65.0	54.8	84.2
1980/81	82.7	73.4	45.6	50.3	25.9	14.8	43.0	17.5	60.6	76.8	57.1	32.7	48.4
1981/82	48.3	45.1	51.8	72.3	35.9	9.2	47.6	64.2	47.9	28.4	52.8	47.6	45.9
1982/83	79.2	109.8	93.6	117.3	49.2	11.9	70.1	47.8	73.4	68.8	67.1	80.8	72.6
1983/84	90.1	106.8	96.1	89.0	28.5	3.2	27.1	51.4	41.9	55.8	58.7	51.6	58.3
1984/85	99.9	55.8	100.3	57.7	12.7	20.2	46.0	57.9	58.9	50.6	67.4	51.3	56.3
1985/86	113.5	121.3	133.8	102.0	100.9	68.1	94.0	75.4	89.1	79.9	74.4	84.7	94.9
1986/87	169.4	163.7	120.9	67.4	53.8	18.1	93.4	47.8	70.4	43.6	68.9	64.8	81.9
1987/88	113.7	88.5	60.8	51.1	34.4	10.9	21.2	5.3	19.7	15.7	41.1	39.3	41.8
1988/89	54.5	79.2	40.4	23.9	-0.7	-13.6	23.3	29.9	44.3	40.7	29.2	48.8	33.4
1989/90	57.8	95.2	81.1	90.5	65.6	45.1	26.3	37.9	27.2	44.8	41.8	59.9	56.2
1990/91	82.5	117.9	123.7	106.2	37.5	10.6	5.8	38.1	32.9	19.3	44.4	47.3	55.5
1991/92	69.9	62.0	56.3	85.3	35.7	8.1	38.1	49.3	49.1	59.2	62.1	68.9	53.7
1992/93	89.1	100.3	114.0	97.9	65.7	71.9	109.7	51.8	49.7	61.6	56.7	51.0	76.7
1993/94	62.3	61.1	52.7	86.7	179.8	133.4	43.4	69.3	71.6	47.3	52.1	54.8	76.4
1994/95	87.3	89.0	58.1	94.3	68.5	34.3	42.5	36.4	74.1	82.8	72.4	75.9	68.1
1995/96	120.8	115.8	109.8	82.7	72.0	55.7	49.4	21.8	56.7	51.2	59.9	76.6	72.7
1996/97	81.0	213.6	236.5	130.6	69.8	51.8	48.8	54.4	78.5	87.8	76.2	79.7	100.8
1997/98	114.1	300.9	202.7	106.4	33.2	21.3	84.7	90.5	75.3	46.7	64.8	79.3	101.9
Average	**90.5**	**115.1**	**109.9**	**90.0**	**51.6**	**41.8**	**48.8**	**57.6**	**60.4**	**56.2**	**57.1**	**58.6**	**69.8**

Source: MH 2004/05 GRA

PUB/MH II-39

Reference: **Volume 4, PUB/MH I -29(b)**

Please expand the Total Unregulated Inflow Data for Lake Winnipeg table to include the years 1999 to 2004 year to date.

ANSWER:

The attached table contains the total unregulated inflow data for Lake Winnipeg up to the end of fiscal year 2003/04.

Table 1
Total Unregulated Monthly Inflow Data for Lake Winnipeg
Winnipeg River, Saskatchewan River and Lake Winnipeg Partial Inflow Available for Outflow (PIAO)
Extended Period: FY 1998/99 to FY 2003/04, Inclusive

	Monthly Inflow (Kcfs)												
Fiscal Year	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Average
1998/99	121.4	127.2	104.0	93.6	38.0	-9.0	24.8	39.6	43.3	49.2	64.4	57.0	62.8
1999/00	108.9	128.1	120.3	105.6	44.6	53.8	42.2	66.5	69.1	66.5	58.5	72.8	78.4
2000/01	74.2	81.3	113.3	124.6	72.2	60.7	41.3	106.6	79.5	64.9	57.4	61.1	78.1
2001/02	142.3	201.0	152.3	123.5	82.6	32.0	26.3	49.9	57.1	50.8	52.7	44.9	84.7
2002/03	78.4	82.8	142.2	148.2	78.3	46.7	23.0	38.4	50.3	40.2	41.2	46.0	66.2
2003/04	60.9	72.8	57.6	47.2	14.1	32.4	16.6	26.9	45.0	51.6	55.4	66.4	45.4
Forecast 2004/05	75.7	90.8	83.8	63.9	41.6	33.0	43.4	46.2	50.9	79.9	76.1	69.1	62.2
Average †	99.7	114.7	110.2	91.8	61.9	42.6	47.5	57.3	60.2	66.4	57.6	66.9	69.8

† The average is calculated for the entire record, FY 1912/13 to FY 2003/04, inclusive.

2004 05 17

Source: MH 2004/05 GRA

Manitoba Hydro Undertaking #16

Exhibit # MH-22
June 16/04

PUB/MH II-39

Forecast Lake Winnipeg Monthly Inflow (Kcfs)

Fiscal Year

	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Average
2004/05	75.7	90.8	83.8	63.9	41.6	33.0	43.4	66.2	82.9	79.9	76.1	69.1	67.2

Pre-Ask PUB/KM - 7

Ref: KM Report Page 91, PUB B.O.D. 41 – Page 98
Historical Data Recorded

a) Did KM review the more recent drought circumstances (Lake Winnipeg inflows/energy-in-storage/reduced hydraulic generation) with respect to:

- 1960/61 to 1961/62 (2 years)?
- 1976/77 to 1977/78 (2 years)?
- 1980/81 to 1981/82 (5 years)?
- 1987/88 to 1991/92 (5 years)?
- 2002/03 to 2003/04 (2 years)?
- 2006/07 (1 year)?

b) Did KM look to confirm MH's correlation of these events to MH's actual minimum dependable hydraulic generation?

c) Based on Lake Winnipeg inflows, would KM agree that in the last 100 years, MH would have been faced with an impending drought period eight times? (for a total of 26 years of drought)

d) Would KM agree that MH's drought response strategy (rule curve) would have had to be initiated at least eight times, and possibly more in the last 100 years?

e) Would KM agree that low flow/drought years are typically indicated by low flows in the prior winter and spring?

Pre-Ask PUB/KM - 8

Ref: KM Report Page 91, Figure 3.17: Lake Winnipeg Critical Period Trajectory SPLASH Model 1938-41 Simulation

a) Please confirm that an April/2041 Lake Winnipeg level of Lake Winnipeg of 711.5 would be adequate to deal with six months (April to September) of 60% of average inflows.

b) Please explain how drawing down Lake Winnipeg from 714.0 to 711.5 over 12 months (April/2040 to March/2041) could have been reasonably contemplated (without MH knowing the drought would end in October 1941).

c) Please explain how a minimum Lake Winnipeg level of 214.0 could be maintained in 2039/40 when Lake Winnipeg inflows were only 50% of average (unless MH anticipated 2040/41 inflows would be about 30% of average).

d) Please explain how a minimum Lake Winnipeg level of 214.0 could be maintained in 2038/39 when Lake Winnipeg inflows were about 75% of average (unless MH anticipated 2040/41 inflows two years ahead of time).

e) Please confirm that a Lake Winnipeg level of 713.5 in April 2038 would not be certain in light of below average Lake Winnipeg inflows in 2037/38 (87%) and 2036/37 (74%).

f) Would KM agree that MH's Drought Management Strategy (rule curve) is only workable for 2036/37 to 2042/43 if the pattern of annual flows are predictable several years in advance?

Pre-Ask PUB/KM - 9

Ref: PUB/MH I-29 2004/04/19 (2004/05 GRA) - Lake Winnipeg Inflow, Table 1 – 1929/30 to 1933/34 Drought

a) Would KM agree that the summary below reasonably captures the Lake Winnipeg Inflow Available for Outflow situation from 1929 to 1934 (which MH presumably supplied to KM)?

Total Unregulated Monthly Inflow to Lake Winnipeg
(Winnipeg River/Saskatchewan River/
Local Lake Winnipeg Partial Available for Outflow)

90-Year Average	Q_1 Apr-June (1,000 cfs Months)	Q2 July-Sept (1,000 cfs Months)	Q_3 Oct-Dec (1,000 cfs Months)	Q_4 Jan-Mar (1,000 cfs Months)	Annual Average (1,000 cfs)
Average	315	185	165	180	70
1929/30	**222 (70%)**	**82 (44%)**	**66 (40%)**	**138 (77%)**	42 (60%)
1930/31	**192 (61%)**	**63 (34%)**	**151 (92%)**	**116 (64%)**	44 (63%)
1931/32	**153 (49%)**	**142 (77%)**	**108 (65%)**	**89 (49%)**	41 (59%)
1932/33	**203 (64%)**	**123 (66%)**	**113 (68%)**	148 (82%)	49 (70%)
1933/34	**245 (78%)**	**131 (71%)**	124 (83%)	161 (89%)	55 (80%)
				5 Year Average	**46 (66%)**

b) Please confirm that with an April Lake Winnipeg level of 713.0, MH would not have recognized the 1929/30 developing drought situation and would most likely have made normal summer export sales in Q_1 and Q_2 (to end of September) from hydraulic energy and effectively taking about 6,000 GWh out of energy-in-storage.

c) Please confirm that this 6,000 GWh energy-in-storage deficit would have to offset by additional F&PP in order for MH's drought strategy to function as intended out to 1933/34 resulting in a minimal energy-in-storage of <4,000 GWh.

d) Was KM aware that prior to this drought, Lake Winnipeg inflows in 1934/35 and 1935/36 were only average, and with mean operation would not allow recovery of energy-in-storage at the start of 2036/37; energy-in-storage would likely end up well below average of 8,000 GWh?

Pre-Ask PUB/KM - 10

Ref: PUB/MH I-29 2004/04/19 (2004/05 GRA) - Lake Winnipeg Inflow, Table 1 – 1936/36 to 1942/43 Drought

a) Would KM agree that the summary below reasonably captures the Lake Winnipeg inflow available for outflow situation from 2036 to 2042?

Total Unregulated Monthly Inflow to Lake Winnipeg
(Winnipeg River/Saskatchewan River/
Local Lake Winnipeg Partial Available for Outflow)

	Q_1 Apr-June (1,000 cfs Months)	Q_2 July-Sept (1,000 cfs Months)	Q_3 Oct-Dec (1,000 cfs Months)	Q_4 Jan-Mar (1,000 cfs Months)	Annual Average (1,000 cfs)
Average	315	185	165	180	70
1936/37	309 (98%)	**90 (49%)**	**94 (57%)**	**125 (69%)**	52 (74%)
1937/38	288 (83%)	162 (88%)	136 (82%)	160 (89%)	61 (87%)
1938/39	270 (86%)	158 (85%)	**76 (46%)**	**136 (76%)**	53 (76%)
1939/40	**144 (46%)**	**85 (46%)**	**96 (58%)**	**133 (74%)**	38 (54%)
1940/41	**88 (28%)**	**5 (3%)**	**33 (20%)**	**97 (54%)**	20 (29%)
1941/42	**204 (65%)**	**111 (60%)**	203 (123%)	176 (98%)	58 (83%)
1942/43	**194 (62%)**	**140 (76%)**	189 (115%)	157 (84%)	68 (97%)
				7 Year Average	**50 (71%)**

b) Would KM agree that with an April Lake Winnipeg level of 713.0, it is likely that the return of drought conditions in 2036/37 would not have been obvious until after September (Q_2)? Maximizing summer exports would be a mistake.

c) Would KM agree it is probable that drought actions would not have been undertaken until after October to December (Q_3)? However, conditions in 2037/38 were about 90% of average suggesting no drought.

d) In KM's opinion, when should MH expect to return to average operations in 1943/44 (Q_1?/Q_2?).

Pre-Ask PUB/KM - 11

Ref: PUB/MH I-29 2004/04/19 (2004/05 GRA) - Lake Winnipeg Inflow, Table 1 – 1960/61 to 1962/63 Drought

a) Would KM agree that the summary below reasonably captures the Lake Winnipeg inflow available for outflow situation from 1960 to 1963?

Total Unregulated Monthly Inflow to Lake Winnipeg
(Winnipeg River/Saskatchewan River/
Local Lake Winnipeg Partial Available for Outflow)

90-Year Average	Q_1 Apr-June (1,000 cfs Months)	Q_2 July-Sept (1,000 cfs Months)	Q_3 Oct-Dec (1,000 cfs Months)	Q_4 Jan-Mar (1,000 cfs Months)	Annual Average (1,000 cfs)
Average	315	185	165	180	70
1960/61	**223 (71%)**	**109 (59%)**	**105 (64%)**	151 (84%)	57 (81%)
1961/62	**178 (57%)**	**47 (25%)**	**69 (42%)**	**124 (69%)**	35 (50%)
1962/63	**211 (60%)**	254 (137%)	138 (84%)	168 (93%)	74 (106%)
				3 Year Average	**55 (79%)**

b) Would KM agree that with an April Lake Winnipeg level of 713.9, MH's:

- Anticipation prior to end of Q_2 of 1960/61 seems unlikely?
- Recognition of drought and movement into drought mode actions would be unlikely until after Q_1 of 1961/62?
- Anticipation of the end of the drought in Q_1 of 1962/63 would not be certain?

Pre-Ask PUB/KM - 12

Ref: PUB/MH I-29 2004/04/19 (2004/05 GRA) - Lake Winnipeg Inflow, Table 1 – 1976/77 to 1977/78 Drought

a) Would KM agree that the summary below reasonably captures the Lake Winnipeg inflow available for outflow situation from 1976 to 1978?

Total Unregulated Monthly Inflow to Lake Winnipeg
(Winnipeg River/Saskatchewan River/
Local Lake Winnipeg Partial Available for Outflow)

90-Year Average	Q_1 Apr-June (1,000 cfs Months)	Q_2 July-Sept (1,000 cfs Months)	Q_3 Oct-Dec (1,000 cfs Months)	Q_4 Jan-Mar (1,000 cfs Months)	Annual Average (1,000 cfs)
Average	315	185	165	180	70
1976/77	317 (101%)	**47 (25%)**	**98 (59%)**	**121 (67%)**	49 (70%)
1977/78	**111 (35%)**	**106 (57%)**	215 (130%)	186 (103%)	52 (74%)
				2 Year Average	**50 (72%)**

b) Would KM agree that with an April Lake Winnipeg level of 715.0, it is unlikely that MH would have taken drought action until after Q_2 1976/77 and would have likely continued that action into Q_3 of 1977/78?

Pre-Ask PUB/KM -13

Ref: PUB/MH I-29 2004/04/19 (2004/05 GRA) - Lake Winnipeg Inflow, Table 1 – 1980/81 to 1984/85 Drought

a) Would KM agree that the summary below reasonably captures the Lake Winnipeg inflow available for outflow situation from 1980 to 1985?

Total Unregulated Monthly Inflow to Lake Winnipeg
(Winnipeg River/Saskatchewan River/
Local Lake Winnipeg Partial Available for Outflow)

90-Year Average	Q_1 Apr-June (1,000 cfs Months)	Q_2 July-Sept (1,000 cfs Months)	Q_3 Oct-Dec (1,000 cfs Months)	Q_4 Jan-Mar (1,000 cfs Months)	Annual Average (1,000 cfs)
Average	315	185	165	180	70
1980/81	**202 (64%)**	**91 (49%)**	**121 (73%)**	167 (93%)	48 (69%)
1981/82	**145 (46%)**	**117 (63%)**	159 (96%)	**129 (72%)**	46 (66%)
1982/83	283 (90%)	183 (99%)	191 (116%)	207 (119%)	73 (104%)
1983/84	293 (93%)	**121 (65%)**	**120 (73%)**	166 (92%)	58 (83%)
1984/85	256 (81%)	**91 (49%)**	163 (99%)	169 (94%)	58 (83%)
				5 Year Average	**57 (81%)**

b) Would KM agree that with an April Lake Winnipeg level of 713.5, it is unlikely that MH would have taken drought action until Q_2 of 1980/81?

c) Would KM agree that recovery from the 1980/81 and 1981/82 drought years would be incomplete when the drought resumed in 1983/84?

d) Would KM agree that MH might not fully recover from these drought years until 1985/86 (5 years after the start)?

Pre-Ask PUB/KM - 14

Ref: PUB/MH I-29 2004/04/19 (2004/05 GRA) - Lake Winnipeg Inflow, Table 1 – 1987/88 to 1991/92 Drought

a) Would KM agree that the summary below reasonably captures the Lake Winnipeg inflow available for outflow situation from 1987 to 1992?

Total Unregulated Monthly Inflow to Lake Winnipeg
(Winnipeg River/Saskatchewan River/
Local Lake Winnipeg Partial Available for Outflow)

90-Year Average	Q_1 Apr-June (1,000 cfs Months)	Q_2 July-Sept (1,000 cfs Months)	Q_3 Oct-Dec (1,000 cfs Months)	Q_4 Jan-Mar (1,000 cfs Months)	Annual Average (1,000 cfs)
Average	315	185	165	180	70
1987/88	264 (84%)	**96 (52%)**	**46 (28%)**	**96 (53%**	42 (60%)
1988/89	**174 (55%)**	**20 (24%)**	**98 (59%)**	**119 (66%)**	33 (47%)
1989/90	**234 (74%)**	201 (109%)	**93 (56%)**	146 (81%)	56 (80%)
1990/91	324 (103%)	154 (83%)	**77 (47%)**	**111 (62%)**	56 (80%)
1991/92	**188 (60%)**	**129 (70%)**	136 (82%)	190 (106%)	54 (72%)
				5 Year Average	**48 (69%)**

b) Would KM agree that with an April 1987 energy-in-storage of 8,700 GWh and an April Lake Winnipeg level of 713.6 after average winter flows, MH had no advance indications of drought until after Q_2 and export sales for Q_1 and Q_2 very likely would not have been curtailed?

Pre-Ask PUB/KM - 15

Ref: PUB/MH I-206(a)PUB/MH I-29 2004/04/19 (2004/05 GRA) - Lake Winnipeg Inflow, Table 1 –, 2002/03 to 2004/05 Drought

a) Would KM agree that the summary below reasonably captures the Lake Winnipeg inflow available for outflow situation from 2002 to 2004?

Total Unregulated Monthly Inflow to Lake Winnipeg
(Winnipeg River/Saskatchewan River/
Local Lake Winnipeg Partial Available for Outflow)

	Q_1 Apr-June (1,000 cfs Months)	Q_2 July-Sept (1,000 cfs Months)	Q_3 Oct-Dec (1,000 cfs Months)	Q_4 Jan-Mar (1,000 cfs Months)	Annual Average (1,000 cfs)
2002/03	303 (96%)	273 (148%)	**113 (68%)**	**127 (71%)**	68 (97%)
2003/04	**192 (61%)**	**94 (51%)**	**90 (55%)**	172 (96%)	45 (64%)
2004/05	**250 (79%)**	**138 (75%)**	193 (117%)	255 (142%)	67 (96%)
				3 Year Average	**60 (86%)**

b) Would KM agree that despite an April Lake Winnipeg level of 712.2, MH's drought actions did not kick in Q_3 and Q_4 of 2002/03 or even fully in Q_1 2003/04?

c) In the context of a multi-year event, did MH's 2002/03 to 2003/04 performance conform to MH's Lake Winnipeg Drought Management Strategy (rule curve) with respect to:

- Minimizing Lake Winnipeg outflows in 2002/03 by purchasing energy in the fall and winter of 2002/03 when inflows were 70% of average?
- Maintaining a high lake level (and energy-in-storage) going into 2003/04 when inflows were about 50% of average?

Pre-Ask PUB/KM - 16

Ref: PUB/MH I-29 2004/04/19 (2004/05 GRA) - Lake Winnipeg Inflow, Table 1 , Risk Advisory January 2005 Report on 2002-2004 Drought Management, 2003/04 Annual Report

a) Did KM look to apply MH's Drought Management Strategy (rule curve) to the 2002/03 to 2003/04 drought?

b) Would KM be aware that Lake Winnipeg flows had been well below average in October to December 2002 (70%) and January to February 2003 (70%)?

c) Would KM be aware that (October to February), winter precipitation was extremely low (60% of average)?

d) Was KM aware that MH had noted the potential of low flows due to very low snowpack?

e) Was KM aware that MH's annual report for 2003/04 indicated a drought situation existed in the second half of 2002/03?

f) How would MH's drought management strategy have been employed in 2002/03 when energy-in-storage was below average (April 2003 – energy-in-storage 6.3 – Lake Winnipeg – 712.2) and low winter flows (70% of average) with respect to imports/thermal generation?

g) Did KM recalculate the 2002/03 to 2003/04 revenue/cost situation using MH's drought management strategy?

Pre-Ask PUB/KM - 17

Ref: PUB/MH I-206 (a) Exports/ Import Prices/5-Year Drought Quantification

a) Please confirm that the five-year drought process defined by MH (in this I.R.) employs 1987/88 to 1991/92 runoff data for the 2011/12 to 2015/16 load years.

b) Please confirm in 2011/12 (1987/88) MH's drought strategy suggests about a 25% cutback in hydraulic generation would be required for the year.

c) Was KM aware that in 1987/88 MH did not cutback hydraulic generation, but rather drew 3,900 GWh (8,700 – 4,800) from energy-in-storage?

d) Would KM agree that drought recognition is very difficult in the spring and summer months of the year without reference to snow pack?

e) Would KM agree that a full reservoir system at the beginning of a drought is highly unlikely?

f) Please confirm that when MH's hydraulic generation falls below 26,000 GWh/year, all exports rely and are made possible by imports (or thermal generation).

g) Please confirm that by 2016/17, domestic load will exceed 27,000 GWh , in about 8 years out of the last 30 years (25%), MH could have to purchase about 5,000 GWh/year (27,000 to 22,000) to supply domestic load.

PUB/MH I-206

Reference: Tab 13, 13.4 (3) 20 -Year Financial Outlook
Pages 14 & 15 - Five Year Drought

a) Please provide the assumptions (GWh, ¢/kW.h, carbon adder, natural gas prices) with respect to revenue and costs employed to define a 5-year drought impact.

ANSWER:

The impact of the 5-year drought beginning in 2011/12 is defined as the differential between 5-year drought chronology (1987/88 to 1991/92) and the expected financial consequences (i.e. average of all flow cases). The attached table summarizes the impact of the 5-year drought in terms of the difference in revenues and energy supply. Specific information on export price forecast, carbon adders or natural gas prices is not provided because this is commercially sensitive information.

		2011/12	2012/13	2013/14	2014/15	2015/16	Total
Impact of 5-Year Drought on Revenues (millions of $ Cdn)							
Revenue							
Extra-Provincial Sales		-220	-295	-186	-225	-198	-1124
Expense							
Water Rental		-24	-36	-17	-19	-16	-111
Fuel & Power Purchase							
Thermal		103	317	-20	1	-5	396
Import	On-Peak	14	40	7	7	4	71
	Off-Peak	107	127	93	106	90	523
	Total	223	483	80	114	89	990
Net Revenue (Excluding Finance Expense)		-419	-742	-249	-320	-271	-2003
Impact of 5-Year Drought on Energy (GWh/yr)							
Extra-Provincial Sales		-3542	-4190	-3162	-3408	-3016	-17318
Hydro Generation		-7117	-10707	-5060	-5584	-4779	-33246
Fuel & Power Purchase							
Thermal		972	3130	-184	3	-71	3850
Import	On-Peak	208	521	94	90	76	990
	Off-Peak	1841	2007	1605	1654	1391	8496
Total		3021	5658	1515	1748	1396	13338

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Pre-Ask PUB/KM - 18

Ref: PUB/MH I-206(a) (Recalculated) IFF 09-1 Assumptions/Prices
5-Year Drought Quantification

a) Can KM confirm that the 5-year drought in PUB/MH I-206(a) scenario identifies the drought impacts on IFF 09-1 revenue, sales, and power purchases that would fall from a 5-year drought starting in 2011/12 and ending in 2015/16?

b) Can KM confirm that MH's value of lost exports over the entire drought was determined using 6.5¢/KWh as the lost export price in comparison to the export forecast prices in IFF 09-1 ranging from 6.6¢/ kWh (2011/12) to 9.2¢/KWh (2015/16)? **Not consistent with the fact that firm export contract prices of 5 to 6¢/KWh would be only exports still in play.**

c) Can KM confirm that MH's value of incremental F&PP costs over the entire drought were determined using 7.4¢/kWh in comparison to power purchase costs in IFF 09-1 ranging from 6.5¢/kW.h to 8¢/kWh. **Not consistent with high value of foregone exports or drought shortfall pricing.**

PUB/MH I-206 (a) Recalculated. Foregone Revenue Losses

Ref.		2011/12	2012/13	2013/14	2014/15	2015/16	
(1)	IFF 09 Export Revenue	7,841 GWh @ 6.6¢ = $518 M	8,150 GWh @ 6.7¢ = $546 M	8,020 GWh @ 7.2¢ = $577 M	7,430 GWh @ 7.4¢ = $550 M	7,181 GWh @ 9.1¢ = $653 M	
(2)	Existing Contracts Firm	3,400 GWh @ 5.5¢ $187 M (4)	3,300 GWh @ 5.5¢ = $182 M	3,200 GWh @ 6.0¢ = $192 M	3,200 GWh @ 6.0¢ = $192 M	1,600 GWh @ 8.0¢ = $128 M	
(1) minus (2)	Possible Revenue Loss	($331 M) @ 7.5¢/kWh (4,441 GWh) (5)	($364 M) @ 7.5¢/kWh (4,850 GWh)	($385 M) @ 8.0¢/kWh (4,820 GWh)	($358 M) @ 8.1¢ /kWh (4,430 GWh)	($525 M) @ 9.4 ¢/kWh (5,581 GWh)	($1,961 M)
(3)	PUB/MH I-206 MH Est. Foregone Revenue Discrepancy	($220 M) @ 6.2 ¢/kWh (3,542 GWh)	($295 M) @ 7.0 ¢/kWh (4,190 GWh)	($186 M) @5.9¢/kWh (3,162 GWh)	($225 M) @6.6 ¢/kWh (3,408 GWh)	($198 M) @6.6 ¢/kWh (3,018 GWh)	($1,124 M)
	Difference in Foregone Revenue	$111 M	$69 M	$199 M	$133 M	$327 M	$839 M

Notes:

(1) IFF09-1 export assumptions PUB/MH B.O.D. #6, Page 25

(2) Power Resources Plan PUB/MH B.O.D. #32

(3) PUB/MH I-206 (a)

(4) Unit contract prices estimated by reference to dependable prices PUB B.O.D. #6 Page 27 and NEB Prices PUB/MH II -191 (a)

(5) Unit cost of possible revenue loss is calculated from revenue loss $ M divided by foregone Exports (GWh)

PUB/MH I-206(a) Import Costs

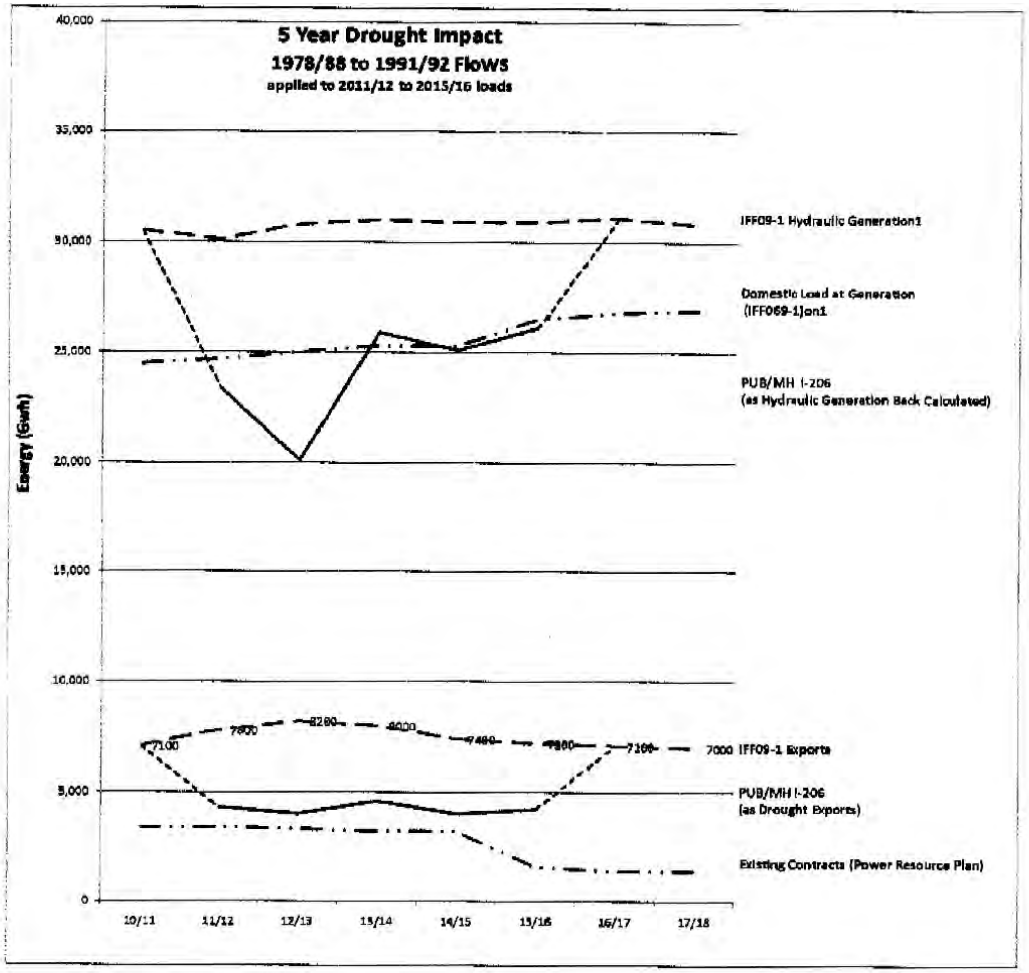
Manitoba Hydro 2010/11 & 2011/12 GRA
PUB Pre-Ask Questions of the Independent Experts

Ref.		2011/12	2012/13	2013/14	2014/15	2015/16
IFF 09-1	Thermal	432 (GWh)	437 (GWh)	441(GWh)	444(GWh)	497(GWh)
PUB/MH	Thermal	+972	+3,130	-184	+3	-71
I-206(a)	Total	1,404	3,567	257	447	426
IFF 09-1	Imports	2,616 @ 6.5¢/kWh	2,576 @ 6.7¢/kWh	2,569 @ 7.0¢/kWh	2,608 @ 7.1¢/kWh	2,663 @ 7.3¢/kWh
PUB/MH	Peak	208	521	94	90	76
I-206(a)	Import (1)	@ 7.0¢/kWh	@ 7.5¢/kWh	@ 7.5¢/kWh	@ 7.8¢/kWh	@ 5.3¢/kWh
PUB/MH	Off-Peak	1,841	2,007	1,605	1,654	1,391
I-206(a)	Import (2)	@ 6.0¢/kWh	@ 6.3¢/kWh	@ 5.5¢/kWh	@ 6.0¢/kWh	@ 6.5¢/kWh

Notes

(1) PUB/MH I-206 (a) Peak import prices do not escalate; while IFF09-1 export & import prices do.
(2) PUB/MH I-206 (a) Off–peak import prices do not escalate at same rate as IFF09-1 export & import prices.

Plot of 5-Year Drought Impact 1987/88 to 1991/92



Pre-Ask PUB/KM - 19

Ref: PUB/MH I-206(a) 5-Year Drought

a) Please confirm that MH's 5-year scenario in total involves:

- A 33,200 GWh hydraulic generation reduction from average.
- A 17,300 GWh export sales reduction (@ 6.5¢/KWh = $1,124 M).
- Additional thermal generation of 3,850 GWh (@10.3¢/KWh = $396 M).
- Additional peak imports of 990 GWh (@7.1¢/KWh = $71 M).
- Additional off-peak imports of 8,498 GWh (@ 6.2¢/KWh = $523).

b) Did KM conclude that MH export sales reduction price of 6.5¢/KWh (5-year average) is consistent with IFF 09-1 forecast prices:

- 2011/12 – 6.6¢/KWh (fixed contract 5.5¢/KWh + variable 7.2¢/KWh).
- 2012/13 – 6.7¢/KWh (fixed contract 5.5¢/KWh + variable 7.2¢/KWh).
- 2013/14 – 7.2¢/KWh (fixed contract 5.5¢/KWh + variable 7.9¢/KWh).
- 2014/15 – 7.4¢/KWh (fixed contract 5.5¢/KWh + variable 8.1¢/KWh).
- 2015/16 – 9.1¢/KWh (fixed contract 5.5¢/KWh + variable 10.0¢/KWh).

Pre-Ask PUB/KM - 20

Ref: PUB/MH I-206(a), Drought Impacts Fuel and Power Purchase

a) Please confirm that MH's five-year drought [starting in 2011/12] analysis suggests five-year totals of:

- 17,300 GWh of foregone experts worth $1,124 million(average price 6.5 ¢/kWh)
- 13,300 GWh of Increased fuel & power purchases worth $990 million (average cost 7.5 ¢/kWh.
- 33,200 GWh of reduced hydraulic generation.

b) Did KM verify these outputs from MH's analysis (and in particular identify the energy in storage changes)

c) Did KM undertake a comparison of MH's five-year drought (foregone revenue, fuel and power purchases and reduced hydraulic generation) for each of the historical droughts :

- 1929/32 to 1933/34
- 1936/37 to 1942/43
- 1964/61 to 1962/63
- 1976/77 to 1977/78
- 1980/81 to 1984/85
- 1987/88 to 1991/92
- 2002/03 to 2004/05

d) Please undertake to provide KM's analysis of each of these droughts.

Pre-Ask PUB/KM - 21

Ref: KM Report, Page 91 Operating Rules/Issues

a) Please confirm that MH theoretically faces critical decision points at various times during each fiscal year, e.g.:

- Fall (October) as to level of additional winter sales:
  - Peak?
  - Off-peak?

- End of February as to level of additional spring and summer sales:
  - Firm/peak (summer only)?
  - Non-firm peak (spring)?
  - Off-peak (spring)?

- Beginning of April as to confirmation of:
  - Additional firm/peak summer sales?
  - Peak/non-firm spring/summer sales?
  - Off-peak sales spring/summer sales?

- End of April as to re-confirmation of:
  - Additional firm/peak summer sales?
  - Peak/non-firm summer sales?
  - Off-peak/weekend summer sales?
  - Off-peak overnight summer sales?

- Mid-July as to need to reduce:
  - Additional firm/peak summer sales?
  - Peak/non-firm summer sales?
  - Off-peak/weekend summer sales?
  - Off-peak/overnight summer sales?

b) In KM's view, does MH have a sufficiently rigorous decision process in place to deal with the seasonal variability and potential sudden changes in hydraulic resources

Pre-Ask PUB/KM - 22

Ref: KM Report, Page 91 / IFF09-1 Assumptions, PUB/MH B.O.D. Operating Rules/Export Sale Profitability

a) Please confirm that MH's export sales operations are most profitable when all domestic load and exports are served from existing hydraulic generation.

b) Can KM confirm that MH's export sales are only marginally profitable whenever domestic load equals or exceeds hydraulic generation:

- Cost of wind – 5-6¢/KWh. (PUB/MH B.O.D. #6)
- Cost of MH's natural gas thermal generation 8-12¢/KWh. (IFF09-1 Export Assumptions)
- Cost of imports – 4-10¢/KWh. (IFF09-1 Export Assumptions)

c) Can KM confirm that MH's firm export sales over the next five years are likely to come entirely from other than hydraulic generation at least one third of the years.

d) Please confirm that MH's off-peak opportunity export sales over the next eight years are likely to come entirely from other than hydraulic generation in 75% of the years (and may only be profitable 1 year in 4).

e) Please comment on the profitability of MH's Off Peak summer sales at market prices in 1-3¢/KWh range when repurchase (if required) in winter may command higher prices (2 - 4¢/KWh range)

Pre-Ask PUB/KM - 23

Ref: KM Report, Rule Curve Page 91
Reference Figure 3.17

a) Please confirm that MH could significantly mitigate financial risks associated with drought by setting out specifically defined constraints on exports based on hydrologic conditions at various decision points of times, these decisions points could include:

- End of February forecasts for upcoming fiscal year of probable firm peak opportunity sales for the upcoming six months based on energy-in-storage levels and on winter precipitation (% of average).

- End of March interim forecasts which confirm or deny the availability for the next two months of hydraulic generation surpluses for firm and opportunity export sales based on the winter precipitation and energy storage as of April 1st.

- End of April interim forecasts which confirm or deny the availability of hydraulic generation surpluses for firm and peak opportunity exports and define the potential for off-peak (weekend or overnight) export sales for the next two months.

- End of July revised forecasts which confirm or deny the availability for the next four month's hydraulic generation surpluses for firm exports and the continuation on an incremental basis of:
  - Peak opportunity exports?
  - Off-peak weekend opportunity exports?
  - Off-peak overnight opportunity exports?

b) Is it KM's opinion that MH already employs an ongoing progressive-step approach (similar to that outlined) for decisions on export sales? Identify differences.

c) Explain KM's perception of the adequacy of MH's export sales decision process including the need for improvements.

Pre-Ask PUB/KM - 24

Ref: MISO Market Import Prices , T5351 D Cormie MH, T2730 – 31 J. Rose/ ICF, MH Appendix 56

a) Does KM accept that when MH suggests that the MISO market gives MH access to 126,000 MW of power, this resource (Appendix 56, J Flynn May 31, 2010) is made of about:

- 50% coal (used for based load)
- 8% nuclear (used for base load)
- 4% hydro
- 4% renewables
- 21% natural gas
- 13% other coal/oil/ etc

b) Would KM accept that the power resource that might be available to MH on an assured basis under energy shortage situation is at most 38 MW (30% of 126 MW) .

c) Would KM accept that the actual energy output available from hydro and renewable (wind) might be about 40% or 10 MW (8% of 126 MW).

d) Would KM agree that the natural gas resource includes a large component of usually non-price competitive peaking plants that might command high output charges similar to MH's SCCT plants.

Pre-Ask PUB/KM - 25

Ref: MISO Market Import Prices , T5349 D Cormie, PUB/MH I-20 T5356 D. Cormie

a) Would KM accept that when MH favors financial settlements [which avoid higher transmission costs] in the MISO market, this also suggests that the purchases to meet domestic load shortfalls will be faced with higher transmission charges?

b) Please provide KM's view on MH's suggestion that non-firm energy could be employed during a drought; in particular as this would apply to meeting:

- Extended domestic load shortfalls.
- Extended long term contract commitments

c) Please provide KM's view on the probable MISO market price response to MH's need (in PUB/MH I-206 (a)) for 10,700 GWh of energy/year (probably involving MH's maximum import transmission capacities on an extended basis).

Pre-Ask PUB/KM - 26

Ref: KM Report, Summary of Findings Page xxxvii - 3rd point
Import Prices

a) Can KM confirm (explain) that a broad geographic drought situation such as existed in either:

- 1929/30 to 1935/36?
  or
- 1939/37 to 1942/43?
  or
- 1987/88 to 1992/93?

Would have likely have involved:

- Low precipitation in much of the entire MISO region?
- High summer temperatures in much of the entire MISO region?

Could have involved:

- Average or below average winter temperatures in much of the entire MISO region?

b) Can KM confirm that MH's drought situations would coincidentally result in:

- Higher electricity demand in the entire MISO in the summer (and possibly in the winter)?
- Lower hydraulic generation in South Dakota and other states with hydro resources?
- Higher market prices (peak and off-peak) within the entire MISO region as a reflection of increased demand and reduced supply?