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?

Answers:

a) The Rule Curve simulation embedded in SPLASH operates with the assumption that all reservoirs are full at the beginning of the period. The Rule Curve is used to ensure that water levels at the start of the period (water year) are sufficient to validate system firmness through the critical sequence. Full level of Lake Winnipeg is defined at 715 feet. This is a theoretical assumption under perfect foresight conditions and with imports limited to firm imports. This Rule Curve simulation is used for planning rather than for operations, as SPLASH is a planning model.
b) This calculation is not representative of history and therefore when historical data are used they would not reflect this situation.
c) MH has a number of options to maintain generation balance. The latter involves the following relationship

Generation + Imports = Load + Exports

It is possible to increase thermal generation, raise imports and reduce nonfirm exports. Any combination would work, and the most desirable method would depend on prices and costs.

Under the new contracts, even firm exports are subject to curtailment provisions, which becomes another means of obtaining generation balance.

d) KM have recommended that a Drought Preparedness Plan be implemented, documented and distributed. This plan should make clear what triggers are monitored or should be monitored. MH has made it clear that it does not predict droughts; KM agree that predicting rainfall beyond a few days, maybe a few weeks, is not reliable. What MH does is it tries to protect itself when it feels that conditions become unfavourable. It simply asks itself: if inflows are low, snow pack is below average, and if it were to face the worst flow conditions, will it have enough dependable resources to meet load and firm exports from its own resources and firm imports. KM believe that this is not enough. KM suggest that a set of triggers be put in place to ensure that MH has sufficient and "efficient" resources. The latter condition is crucial if MH is to avoid paying shortage prices for imports and avoid costly backout of energy commitments.

e) KM recognize that HERMES seek to maximize net revenues which come primarily from opportunity exports (other components are not subject to choice once contracts are signed),but this objective entails maximizing this net revenue over the entire period subject to many constraints. This objective operates under the condition that MH generation must meet with equality domestic load.

f) KM have estimated the mean generation under mean flows at 30,000 GWh.

g) What is clear to KM is that satisfying the generation balance equation under mean conditions would entail both exports and imports. The precise GWh magnitude is one value that would entail generally exports in the summer and imports in the winter such that the generation balance is maintained.

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.

Answers:

a) Figure 3.17 is illustrative of the Rule Curve embedded in SPLASH under perfect foresight. KM can confirm that this theoretical situation underpins the calculations in SPLASH. Whether these exact numbers are part of the assumptions is already displayed in Figure 3.17.
b) Every foot in Lake Winnipeg translates into approximately 2000 GWh. This translates in a potential loss of 3,000 GWh in storage when 713.5 feet are left in Lake Winnipeg. If MH has to meet exactly its load and firm commitments using the critical period flows, this shortfall would have to be made from imports, or curtailment of opportunity exports and/or boosting thermal generation.
c) This question should be directed to MH. KM do not want to speculate about hypothetical conditions. It is also a question about historical versus regulated water levels. This is a hydrological issue about which KM have no particular expertise.
d) Yes they did and these include:

Cost of a five year drought

Drought with 1937/41 flows	$1,572 million

Drought with 1937/41 flows and high import prices	$6,019 million

Cost of a Seven Year Drought

Drought with 1936/42 flows	$1,998 million
Drought with 1936/42 flows and high import prices	$7,655 million.

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?

Answers:

a) KM did not test MH drought strategy for the drought of 2003/04. We are not sure what strategy the question is referring to. The losses of $436 million could suggest that there was, perhaps, no effective strategy in place. Again this is why KM keep insisting on MH developing a DPP.
b) KM did not evaluate any monthly forecasts. It examined annual forecasts during the drought period and noted in their Report that forecast errors during the drought of 2003/04 were high for all variables but particularly net revenues and generation. We note again that MH has asserted that it does not try to predict droughts. Well then, that is why triggers, projective indicators and other sign posts may be helpful as part of a DPP.
c) In KM's view this is not an either-or issue. It could be both, and could even be the outcome of other intervening variables.

d) KM believe that it was not an issue of a lagged recognition but an issue of lagged response. In the winter of 2002 MH recognized that flows were lower than usual, and again in the winter of 2003. So the issue was not about when it was recognized, but an issue as to when MH took these triggers and signs as indicative of a drought to be acted upon.

e) This question assumes that MH uses full reservoir levels as an operation rule. MH has noted that it does not. It is in this regard that KM felt that some additional water should be retained than what MH has retained on average, as part of their drought mitigation (operational) strategy. If indeed they kept reservoirs' levels to full capacity we would not have recommended additional waters should be stored.

f) KM note that imports in 2003/04 were at about 11 terawatt hours. MH had a choice to fire its gas turbines or import. It chose to maximize imports, because it was reasonable to do so as the cost of imports was less than the cost of firing the turbines. Of course it had the option to draw down the energy in storage.

g) It all depends on the sort of drought assumed. If the question was anchored on a specific drought profile say 1937-1941, KM would agree that MH would have depleted energy in storage in the second year, other things being equal.

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.

Answers:

a) KM believe that SPLASH assumes full reservoir level at the beginning of the period.

b) No KM did not. Examining the Table provided on Page 6, it is possible to answer this question depending upon an agreement as to the start of each historical drought.

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].

Answers:

a) The answers to all these questions depend on whether MH targets exports maximization. MH is constrained to meet domestic load and is constrained to meet firm exports. The only leeway MH has in opportunity exports. Indeed the objective there is to maximize net export revenues, but this is not independent of the mentioned constraints.

b) The issue here is whether or not MH is targeting a particular level of exports. KM recognize the stability of some of these export and import levels, but does not believe they are targets.

c) The options open to MH to balance its generation are many; if imports are the cheapest alternative to meet dependable energy, then this meets the efficiency requirement.

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 1938 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)?

Answers:

a) KM reviewed the regulated water flows from 1912 to 2005 annually and monthly.

b) KM had a general idea as to the proportions contributed by the various rivers. KM are aware that a gauge was set up at Slave Falls on the Winnipeg River as far back as 1912. Starting with total water flows from Lake Winnipeg, the contributions of other rivers to the flows (Red River, Saskatchewan River and Churchill River) can be subtracted to get Local Inflows. Churchill River flows were gauged in 1928 before that they were based on a statistical relationship between precipitation and flows.

c) The flows through the stations are converted into generation using standard equations that take into account head, efficiency, etc.

d) KM did not have the mathematical procedures; they had the flows as Kcfs.

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 7.3A)

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.

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 1999/00 to FY 2003/04, Inclusive

Fiscal Year	Monthly Inflow (Kcfs) Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Average
1999/00	121.4	127.2	104.0	93.6	36.0	8.0	26.8	36.5	48.2	49.2	64.4	57.0	62.8
1999/00	108.8	128.1	120.8	108.9	44.8	53.6	42.2	66.5	66.1	66.6	66.8	72.8	78.4
2000/01	74.2	81.3	113.8	124.8	72.2	66.7	41.3	108.8	78.5	64.9	67.8	61.1	78.1
2001/02	142.3	201.0	163.5	133.5	66.4	36.0	36.2	49.9	67.1	66.8	62.7	46.9	84.7
2002/03	78.4	92.9	142.2	148.2	78.2	46.7	29.9	39.4	60.3	46.2	41.2	46.0	68.2
2003/04	80.9	72.8	87.6	47.2	14.1	22.4	16.9	36.9	46.0	51.6	66.4	66.4	51.4
(Estimated) 2004/05	75.7	77.7	61.9	45.7	27.6	32.0	35.7	46.3	49.7	72.9	70.7	69.1	57.2
Average †	98.7	114.7	118.2	91.8	61.8	42.6	47.8	67.3	66.2	66.4	67.6	66.8	66.8

† The average is calculated for the entire record, FY 1911/12 to FY 2003/04, inclusive.

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?

Answer:

a) KM did not review in details the water conditions and energy in storage in Lake Winnipeg for all of these years. KM reviewed only those for 2003/04.
b) There should be no correspondence between these events and the actual minimum dependable energy, as some of them did not involve water levels below the critical period inflows, and in most of these cases did not involve energy shortages (demand exceeding supply).
c) KM can confirm that based on Lake Winnipeg inflows an impending drought may have been expected eight times.
d) KM consider the Rule Curve as a Planning Curve and not an Operational Curve.
e) KM can confirm that this is typical of the historical flows but cannot consider it as a one-to-one mapping.

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?

Answers:

KM cannot answer these questions as they refer to years that are not appropriate to the data.

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 Apr-June (1,000 cfs Months)	Q2 July-Sept (1,000 cfs Months)	Q3 Oct-Dec (1,000 cfs Months)	Q4 Jan-Mar (1,000 cfs Months)	Annual Average (1,000 cfs)
Average	315	185	165	186	70
1929/30	222 (70%)	82 (44%)	66 (40%)	138 (77%)	42 (60%)
1930/31	192 (61%)	63 (34%)	151 (92%)	116 (64%)	44 (61%)
1931/32	153 (48%)	142 (77%)	108 (65%)	89 (48%)	41 (59%)
1932/33	203 (64%)	123 (66%)	113 (68%)	148 (82%)	49 (70%)
1933/34	245 (78%)	131 (71%)	124 (81%)	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?

Answer:

a) Yes KM worked with flow data that are quite similar to what is in the Table above.
b) Yes probably MH would have made export sales. But the issue here in our opinion is more complex. It cannot be premised simply on a particular lake level. A host of other variables would have to be taken into account—availability of imports, relative prices of exports, load growth, etc.
c) KM cannot confirm these levels as necessary. They are based on a Rule Curve that is not considered to be an operational rule.
d) The same answer applies here as it applied to sub-question c) above.

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_3?).

Answers:

There appears to be typos with respect to years. The Table refers to 1936/37 to 1942/32. We will assume these to be the relevant years for our answers.

a) KM reviewed the numbers and accept them as representative of the years under question with a small number of exceptions. KM are not sure, however, as to how the averages were calculated. The averages do not reflect the numbers in the Table.

b) The logic underpinning this sub-question is based on a Rule Curve structure. MH at the time referred to did not have SPLASH. KM wonder whether the question pertains to 1936/37 or another period?

c) KM are not in a position to answer the question that goes back to the date in the Table?

d) MH bases much of its expected decisions on a mean reverting assumption.

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?

Answers

a) The numbers are representative of 1960/61 to 1962/63 flows but KM are not sure about the averages calculated; they do not jibe with numbers in the Table.

b) The real issue is about anticipation, which technically refers to prediction. MH has always claimed that it does not predict or try to predict. It simply assumes a particular worst-case sequence that defines its dependable energy. If this sequence holds, they are protected by ensuring that they have enough dependable energy to meet load and firm exports. If not, they have a surplus that they will try to export. Now of course, it would make sense to try to define some anticipatory norms. The real issue is not about only recognition lags but also response lags. MH needs to be in a position to alter its export profile (opportunity sales) to make sure that it does not get caught over-selling.

KM are sympathetic with the spirit driving the questions; MH has asserted that it is conservative and does not operate subject to the Rule Curve, but rather to what HERMES would suggest as the optimal operational choices.

Pre-Ask PUB/KM - 12

Ref: PUB/MH 1-29 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 (1,00) 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	7(
1976/77	317 (101%)	47 (25%)	98 (59%)	121 (67%)	49 (70%)
1977/78	111 (35%)	106 (57%)	215 (130%)	186 (103%)	5? (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_1 of 1977/78?

Answer:

KM tender the same answers here that KM gave to Question 11.

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_2 Apr-June (1,000 cfs Months)	Q_3 July-Sept (1,000 cfs Months)	Q_4 Oct-Dec (1,000 cfs Months)	Q_1 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%)	49 (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?

Answer:

This question is similar to the previous two questions. KM would suggest that the answer given to Question 11 applies to this Question 13 too.

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%)**	**113 (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_3 and Q_4 very likely would not have been curtailed?

Answer:

This question is also similar to Questions 11-13 and KM would use the same answer given in Question 11.

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 Portial Available for Outflow)

	Q_2 Apr-June (1,000 cfs Months)	Q_3 July-Sept (1,000 cfs Months)	Q_4 Oct-Dec (1,000 cfs Months)	Q_1 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 (1 7%)	235 (142%)	67 (95%)
				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?

Answer:

This question is again very similar to the previous Questions 11-14; the same answer would hold here as that KM gave to Question 11.

Pre-Ask PUB/KM - 16

Ref: PUB/MH 1-29 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?

Answer:

a) KM did not apply the Rule Curve to MH's Drought Management Strategy.
b) KM reviewed Lake Winnipeg Levels and became aware that Lake Winnipeg flows were below average in October to December in 2002 and January to February in 2003.
c) KM became aware that winter precipitation was way below average in 2002/03.
d) KM were aware of MH's noting that the Utility was in a drought situation in early 2003, but not aware that they attributed it solely to low snowpack.
e) KM were aware that MH annual report for 2003/04 indicated a drought situation existed in the second half of 2003/04.
f) KM are aware that MH bought gas for use in its Turbines and maximized imports.
g) No. KM are not able to perform this recalculation.

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 32,000) to supply domestic load.

Answers:

a) KM can confirm that MH uses the 1987/88 to 1991/92 runoff data for the 2011/12 to 2015/16 load years.
b) KM are not privy to this information.
c) KM were aware of this drawdown.
d) KM has suggested and recommended that MH use all hydrological knowledge, forecasts and indicators as part of its tool bag to prepare for drought risk management.
e) KM would want MH to be in a position to meet its dependable energy requirements regardless of reservoir levels.
f) KM are aware that hydro generation below 26000 would require rebalancing through a number of options of which would be imports, export scaling and possibly thermal generation.
g) Imports would be necessary to fill any shortfall between load and firm exports exceeding generation.

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		-240	-295	-188	-245	-188	-1124
Expense							
Water Rental		-24	-38	-17	-19	-18	-111
Fuel & Power Purchase							
Thermal		105	317	-26	1	-5	388
Import	On-Peak	14	40	7	7	3	71
	Off-Peak	197	127	93	-108	90	525
	Total	225	483	80	-114	99	993
Net Revenue (Excluding Finance Expense)		-416	-742	-949	-337	-271	2003
Impact of 5-Year Drought on Energy (GWh/yr)							
Extra-Provincial Sales		-3542	-4130	-3162	-4428	-3916	-17318
Hydro Generation		-9217	-10707	-8080	-5894	-4779	-33248
Fuel & Power Purchase							
Thermal		972	3130	-164	3	-71	3852
Import	On-Peak	208	521	94	98	78	990
	Off-Peak	-1841	-3007	-1908	-1654	-1361	-9498
	Total	-2921	-5658	-1515	-1748	-1358	-13334

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.**

Answers:

a) KM can confirm that the 5 year drought in PUB-MH-I-206(a) scenario identifies the drought imports in IFF-90-1 revenue, sales and power purchases that would fall from a five year drought starting 2011/12 and ending in 2015/16.
b) The $0.065 per Kwh is a weighted average of several prices including on-peak, off-peak, firm contract exports, etc. It does not represent a Kwh price used as an input in the calculations.
c) Again the $0.074 Kwh costs are a composite number of different inputs.

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 (@10.2¢/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).

a) PUB calculations in the Table associated with this question are based on these assumptions. The figures (generation and export sales) are from IFF 2009 and the following sources.

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 NFR Prices PUB/MH II-191 (a)

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

Answers:

KM can confirm the GWh are from the sources listed above. They cannot confirm the prices. This is because the prices are composite numbers (weighted averages of several prices—off peak, on peak, contract prices, etc.). If the weights of these composites change over time (i.e., the same proportions are not observed), -the calculations in the Table will not hold.

a) KM cannot conclude that the forecast reductions in exports in IFF 2009 are consistent with $0.065 price per 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 exports 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.

Answers:

a) KM cannot confirm beyond the first year when the $0.065 per Kwh price held any future calculations of losses.
b) KM did not verify MH's calculations; it conducted its own. One of the major reasons for doing this is the concern KM had about the confidentiality of some of the prices.
c) KM did not undertake a comparison of MH's five year droughts for the historical periods listed under this question.

d) KM would need a significant amount of time and would need more information than they have now to undertake this task. KM estimate at least two weeks to complete this undertaking.

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

Answers:

a) KM cannot confirm that MH faces these choices by the exact dates listed above. KM are not sure that MH operates in this manner. Some of the MISO offerings bids are made hourly in real time.

b) HERMES and MOST are two operational tools that optimize hourly and weekly operations. The results of both models are backstopped by management. This is a fairly rigorous process.

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)

Answers:

a) There is no question that hydro generation is clean and cheap and quite often involves the lowest marginal cost of production of electricity.
b) KM can confirm that in the event generation falls below domestic load, MH faces potentially higher costs than its generation costs from hydro resources.
c) KM cannot confirm this proposition. It rests on an assumption of a hydro generation profile that is likely to fall short of domestic load.
d) KM is not in a position to confirm this assertion.
e) KM can confirm that at prices equal or close to the marginal cost of production are not profitable, given a cost of replacement that is higher than the realized prices.

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.

Answers:

a) KM are sympathetic with the proposition that export curtailment provisions are helpful and necessary. KM cannot confirm the dates assigned to these constraints but understand the nature of PUB's concern for making exports sensitive to water conditions. KM reticence about validating the dates is already explained in our answers to Question 21.

b) KM are not familiar enough with the progressive-up approach to comment on this question.

c) KM accept the need and desirability to export. KM also appreciate the mixing of opportunity and fixed contract sales. KM would like greater flexibility in curtailment, more conservative assignment of environmental attributes, and greater firmness of escalators.

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.

Answers:

a) KM accept this tally of MISO resources.
b) KM recognize that there are some constraints on what is economically available from MISO to MH but do not believe it is possible to fix a proportion.
c) KM are aware that wind energy is a rising proportion in the MISO market, but is also aware that transmission issues remain.
d) KM are aware of a proportion of non-price competitive peaking plants but are not certain that they have a comparable cost to MH's SCCT.

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 part certain 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).

Answers:

a) KM is aware that this is a risk factor to take into account.
b) KM believe that non-firm energy can be made available, but by its very nature, it cannot be depended upon for extended periods of time.
c) The experience of MH during the 2003/04 drought raises some red flags as to the probable price responses in MISO. But this time the access to an open market structure offers MH an option to

access energy from a system wide market that did not exist in 2003/04.

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 drough: 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 MISC 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?

Answers:

a) The answers to these questions are already embedded in the question. PUB identifies a drought situation over a large geographic area. KM feel that this is a possibility but with a low probability of occurrence. One of the mitigating natural factors to a drought is the rich diversity of climatic zones in the MH watersheds. The question is abstracting from this reality and assuming a climatic invariance over a wide area. KM concedes the possibility of this event but would like to assert again its low probability. Even a system-wide phenomenon such as climatic change seem to have two variants for MH's watersheds.

b) Again KM can concede the possibility of these correlations but there is no causal mechanism to expect it to be lielier than other combinations of events.

KM Answers Cont'd

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 (@10.2¢/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).

a) PUB calculations in the Table associated with this question are based on these assumptions. The figures (generation and export sales) are from IFF 2009 and the following sources.

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)

Answers:

KM can confirm the GWh are from the sources listed above. They cannot confirm the prices. This is because the prices are composite numbers (weighted averages of several prices—off peak, on peak, contract prices, etc.). If the weights of these composites change over time (i.e., the same proportions are not observed), -the calculations in the Table will not hold.

a) KM cannot conclude that the forecast reductions in exports in IFF 2009 are consistent with $0.065 price per 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 exports 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.

Answers:

a) KM cannot confirm beyond the first year when the $0.065 per Kwh price held any future calculations of losses.
b) KM did not verify MH's calculations; it conducted its own. One of the major reasons for doing this is the concern KM had about the confidentiality of some of the prices.
c) KM did not undertake a comparison of MH's five year droughts for the historical periods listed under this question.

d) KM would need a significant amount of time and would need more information than they have now to undertake this task. KM estimate at least two weeks to complete this undertaking.

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

Answers:

a) KM cannot confirm that MH faces these choices by the exact dates listed above. KM are not sure that MH operates in this manner. Some of the MISO offerings bids are made hourly in real time.

b) HERMES and MOST are two operational tools that optimize hourly and weekly operations. The results of both models are backstopped by management. This is a fairly rigorous process.

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)

Answers:

a) There is no question that hydro generation is clean and cheap and quite often involves the lowest marginal cost of production of electricity.
b) KM can confirm that in the event generation falls below domestic load, MH faces potentially higher costs than its generation costs from hydro resources.
c) KM cannot confirm this proposition. It rests on an assumption of a hydro generation profile that is likely to fall short of domestic load.
d) KM is not in a position to confirm this assertion.
e) KM can confirm that at prices equal or close to the marginal cost of production are not profitable, given a cost of replacement that is higher than the realized prices.

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.

Answers:

a) KM are sympathetic with the proposition that export curtailment provisions are helpful and necessary. KM cannot confirm the dates assigned to these constraints but understand the nature of PUB's concern for making exports sensitive to water conditions. KM reticence about validating the dates is already explained in our answers to Question 21.
b) KM are not familiar enough with the progressive-up approach to comment on this question.
c) KM accept the need and desirability to export. KM also appreciate the mixing of opportunity and fixed contract sales. KM would like greater flexibility in curtailment, more conservative assignment of environmental attributes, and greater firmness of escalators.

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.

Answers:

a) KM accept this tally of MISO resources.
b) KM recognize that there are some constraints on what is economically available from MISO to MH but do not believe it is possible to fix a proportion.
c) KM are aware that wind energy is a rising proportion in the MISO market, but is also aware that transmission issues remain.
d) KM are aware of a proportion of non-price competitive peaking plants but are not certain that they have a comparable cost to MH's SCCT.

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 part or all 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).

Answers:

a) KM is aware that this is a risk factor to take into account.
b) KM believe that non-firm energy can be made available, but by its very nature, it cannot be depended upon for extended periods of time.
c) The experience of MH during the 2003/04 drought raises some red flags as to the probable price responses in MISO. But this time the access to an open market structure offers MH an option to

access energy from a system wide market that did not exist in 2003/04.

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?

Answers:

a) The answers to these questions are already embedded in the question. PUB identifies a drought situation over a large geographic area. KM feel that this is a possibility but with a low probability of occurrence. One of the mitigating natural factors to a drought is the rich diversity of climatic zones in the MH watersheds. The question is abstracting from this reality and assuming a climatic invariance over a wide area. KM concedes the possibility of this event but would like to assert again its low probability. Even a system-wide phenomenon such as climatic change seem to have two variants for MH's watersheds.

b) Again KM can concede the possibility of these correlations but there is no causal mechanism to expect it to be lielier than other combinations of events.