INFORMATION REQUESTS OF THE PUB TO
THE INDEPENDENT EXPERTS

GENERAL
PUB/KM-1

Reference: Redacted information

Please:

a) Identify the individuals involved in the preparation of the KM Report and their areas of responsibility;

b) Provide CVs for the individuals listed in (a);

c) Quantify the costs associated with the independent experts preparation of the KM Report;

d) Provide the Terms of Reference of the independent experts;

e) Provide the Confidentiality Agreement between the independent experts and MH;

f) Provide the correspondence as between the independent experts and MH addressing compliance issues, if any, with the confidentiality agreement;

g) For each page redacted in the Report, please explain the reason for the redaction and elaborate on the point KM was attempting to make, without disclosing the redacted information.

ANSWER:

a) Doctor Atif Kubursi and Doctor Lonnie Magee, who wrote the report and Grant Graeme, who edited it.

b) The CVS of KM are attached as schedule 1.

c) The total costs for the independent experts to date is $430,121.10.

d) The terms of reference are set out at schedule C of PUB Order - November 30/2010.

e) The confidentiality agreement is attached as schedule 2.

f) There are two letters of compliance issues from Manitoba Hydro, They are dated November 12, 2010 and November 15, 2010. They are attached hereto as schedule 3.

g) KM will review its answer to this question with MH due to the confidentiality agreement and advise subsequent.

SCHEDULE 1

CURRICULUM VITAE

Name: Kubursi, A.A.

Citizenship: Canadian

Address: 3600 Billings Crt.
Suite 104
Burlington, Ontario
Canada, L7N 3N6
(905) 905-631-6290

Degrees:

B.A. (Distinction)	American University of Beirut	Economics 1963
M.Sc.	Purdue University	Economics 1966
Ph.D.	Purdue University	Economics 1969

Academic and Other Relevant Appointments:

1964-67	Purdue University	Instructor
1967-69	St. Joseph College Indiana	Assistant Professor
1969-74	McMaster University	Assistant Professor
1974-81	McMaster University	Associate Professor
1974-75	Cambridge University	Senior Academic Visitor, Faculty of Economics and Politics
1981-	McMaster University	Professor
1981-82	UNIDO	Industrial Development Officer
1989-1998	Harvard University	Member of the Institute for Social and Economic Policy

2002	United Nations Economic and Social Commission for Western Asian—Interim Chief, Economic Analysis Division.
2006	United Nations Economic and Social Commission Western Asia-Interim Deputy Executive Secretary
2007	United Nations Economic and Social Commission for Western Asia-Acting Executive Secretary and Under Secretary General.

Consulting Activities (Sample List):

I have worked for a number of public agencies in Canada and abroad. Below is a short list.

- Ministry of Treasury, Economics and Intergovernmental Affairs - Government of Ontario.
  - Office of Economic Policy—in the office of budget and macroeconomic analysis designing performance indicators and budget forecasting tools.
  - Economic Analysis Branch—Sectoral studies and regional impact systems.
  - Econometric Research Branch—Developed an Input Output Model for Ontario and sub-regions, an econometric Model for Ontario and the Quarterly Provincial Accounts.
  - Regional Development Branch—Regional Systems of incentives for industrial location in remote areas.
  - Ontario Statistical Office—price and quantity indices and other national accounts indicators, surveys design and implementation, data accuracy measures and tests and risk analysis.
- Ministry of Industry and Tourism - Government of Ontario. Developed models for evaluating the economic impacts of events and the efficacy and rates of return on investment and advertising. Developed Financial Feasibility Model FAIM for evaluating industrial grants.
- Ministry of Natural Resources - Government of Ontario. Developed software for the Timber Planning Process and Financial models of the resource management alternatives.
- Ministry of Industry and Trade - Government of Ontario. Was part of a major

team on developing centres of excellence and the biotech corridor between Ottawa and Windsor.

- Ministry of the Environment – Developed LINK a system that integrates economic and environmental indicators both at interdisciplinary and as separate systems as well as evaluated the environmental impacts of different macroeconomic scenarios over few generations.

- Ontario Economic Council – Analysed the budget allocations by program and department and looked at the implication on the debt and deficit of a number of financing options.

- United Nations Industrial Development Organization

    - Country and Regional Studies Branch – helped in developing the Arab country industrial development reports for Saudi Arabia, Syria, Qatar, UAE, Oman, Egypt and Sudan.
    - Sectoral Studies Branch – developed a large econometric model of the World Petrochemical Industry and an Econometric Model for Forecasting the World Capital Goods Market.
    - Global Studies Branch – was part of the Team that generated the UNITAD global model.
    - Technology Transfer Branch – helped in evaluating different contraction options for the transfer and the management of innovation.
    - Planning Division – helped in drafting a number of reports on Industrial planning in several Southeast Asian and Middle Eastern and South American countries.

- United Nations, Economic and Social Commission for Western Asia

  I worked as a development officer in the Industry Branch where I helped in organizing the Arab Ministers' of Industry Conferences. I also worked as the Interim Chief of the Division of Economic Analysis in 2002. I have produced over 40 reports and was part of many expert teams dealing with industrial and trade development in the ESCWA Region. In 2006 I assumed the responsibilities of the Deputy Executive Secretary of the Commission and in 2007 served as the Acting Executive Secretary at the Under Secretary General Level.

- Ministry of Planning - Iraq – was part of the High Level Manpower Project team that reorganized the educational and training systems.

- Ministry of Planning and Ministry of Industry - Syria – Involved in the analysis of the long term development plan, the industrial rejuvenation program and developed a macro-econometric forecasting model

- Ministry of Planning - Kuwait – was part of the group that used the input output model in Kuwait as part of a model that integrates IO analysis with macroeconomic modelling.

- IDCAS: Industrial Development Centre for Arab States, Tunis, Tunisia. Participated in preparing industrial development reviews for a number of Arab states,

- Gulf Cooperation Council, Riyadh, Saudi Arabia. Led a team of experts that

examined the prospects of resource based industrialization in the GCC countries.

- Ministry of Industry, Indonesia – led a team of UNIDO experts on developing Middle Level Industrial Structures in Indonesia.
- Ministry of Tourism and Recreation - Government of Ontario – developed the MTR12 and FAIM systems that evaluate the economic feasibility and viability of tourism projects and cost/benefit metrics of tourism and small industry loans.
- Ministry of Energy - Government of Ontario – evaluated the energy conservation strategies and initiatives of the Ministry.
- Petroleum Information Committee – Kuwait – helped in organizing seminars and writing books that explain energy decisions and perspectives of OAPEC.
- United Nations – ILO – estimated the vocational and technical requirements of the Arab region.
- Tourism Ontario – Participated in formulating the tourism strategy for Ontario and particularly Niagara Falls.
- National Economic and Social Development Board - Government of Thailand. Developed an industrial reporting and monitoring system for the Board.
- Ministry of Industry - Government of the Sudan. Organized and supervised the implementation of the Industrial Survey of Establishments in the Sudan.
- Tourism Canada – Built the first bilingual economic impact model for tourism in Canada.
- Acres International – evaluated the economic performance of several airports and electrical generation facilities.
- Ministry of Transportation- Government of Ontario – developed TRIM a specialized model that forecasts and evaluates Infrastructural Requirements and Impacts. As well, we evaluated the Transportation-Economy linkages in the light of border delays with the US and the contribution of transportation to competitive fundamentals of Ontario and Canada exports.
- World Bank – several projects on educational planning, globalization, cost/benefit analysis and risk management strategies.
- Alberta Tourism – built two systems for evaluation of tourism projects and industrial initiatives-- TEIM and DEIM. As well I have worked on some of the largest tourism projects in the province including several in Canmore, Banff and on the economic impact of the West Edmonton Mall.
- Energy Mines and Resources – examined the economic impact of mining on remote communities in Northern Ontario
- Harbour Commission, Thunder Bay – evaluated the economic performance and viability of the Harbour in light of major changes in inter-modal transportation links.
- The Economic Impact of Hamilton Harbour. Hamilton Harbour Commission.
- Town of Timmins – Developed specialized software for assessing community development initiatives.

- University of Windsor SSRU/Databank – conducted several studies on the economic and social impacts of Casino Windsor, Hospital Development Initiatives and an Input Out put model for Windsor.

- Town of Banff – The Economic Benefits from Tourism in Banff Alberta.

- Environment Canada – Designed LINK an Economy-Environment Model. Analysed the economics of water conservation in Halton, Hamilton and Waterloo, the economic and environmental impacts of Remedial Action Plans (RAP) in five Ontario locations (One in Hamilton), The Economics of waste management in Ontario and energy conservation programs. The Economic Impact of Waste Water Management in Hamilton, Halton and the Regional Municipality of Waterloo.

- Canadian Centre for Inland Waters – Member of the Board of Experts for the International Joint Commission that oversees the allocation of water among many stakeholders on the Great Lakes. The Board was primarily responsible for assessing the different water management plans under uncertainty. Evaluated the risk potential of different management plans using Monte Carlo Techniques.

- National Round Table on the Economy and the Environment – Development socio-economic indicators of sustainability.

- Council of Ontario Universities – Analyzed the economics of optimal budget allocations and the consequences of cutting funds to universities and colleges.

- Grand Council of the CREE Indians – Helped prepare documentation on the economic impacts of large hydroelectric projects in northern fragile economies.

- Alberta Tourism, Parks and Recreation – developed a park visitation model.

- International Development Research Centre (IDRC) – I have worked on a number of projects for IDRC one involved developing an agricultural optimization model for the Palestinians. The other on compensation regimes for refugees.

- Department of External Affairs – participated as a speaker in seminar on the Iraq's war consequences and in several expert meetings on peace in the Middle East. I also participated in the joint Canadian French Dialogue with the Muslim World.

- A.T. Kearney – the economic impacts of building a railway tunnel between Windsor and Detroit and assessed engineering risks of different alternatives.

- Ministry of Consumer and Commercial Relations – prepared a report on the economic feasibility and consequences of promoting a biotech corridor between Quebec City and Windsor.

- City of Windsor – developed a number of studies on the impact of the casino and slots at the track in Windsor.

- PriceWaterhouseCoopers – I participated with PWC on over 35 projects varying from real estate projects, to power generation, to gaming impacts, to market feasibility studies to the impacts and economic contributions of universities, cost/benefit analysis of new drugs, to the economic impact of the Canadian Wheat Board and the Canadian Bid for Expo 2015 in Toronto.

- KPMG – I participated in over 10 projects with KPMG on gaming impacts,

market feasibility of large projects and the economic impact of airports.

- Ontario Federation of Anglers and Hunters – Prepared a report on the economic impact of hunting and angling expenditures in both Ontario and Alberta designing and implementing surveys and statistical evaluation of results.
- International Institute for Sustainable Development- Development of a suite of sustainability indicators
- Alberta Economic Development and Tourism – I have been involved on a continuous basis with the Ministry. This includes studies on the economics of tourism in Alberta, developing four impact and feasibility systems, preparing studies on international sport events, heritage facilities, large malls, the Rockies, rural areas, film industry in Alberta, etc.
- Heathmount A.E. Corporation – Conducted market, feasibility studies, impact studies and financial pro forma on a number of large projects in New York, Toronto, Germany and the US under uncertainty and risk profiles.
- TransAlta Utilities Corporation – reported on the economics of power generation, power efficiency, privatization and risk mitigation strategies.
- Department of Natural Resources: Canadian Forest Service – analyzed the forestry impacts on native communities and small communities.
- Lake Abitibi Model Forest Communities – developed an Internet Base Community Impact Model.
- Deloitte and Touche – Jointly worked on the economics of tobacco and horse breeding in Ontario, economic impact of research subsidies in Alberta and many other small projects
- Alberta Community Development – Conducted several studies on the economics of the arts, book publishing, the film industry and theatres.
- Department of Planning, Abu Dhabi, UAE – Trained staff on project evaluation. Projects' cycle development and risk mitigation strategies.
- Office of H.H.The President of the UAE. – developed a planning model that integrates economic and demographic norms under unceertainty.
- Ontario Ministry of Agriculture, Food and Rural Affairs – Developed an Intranet system of impact models that apply to local areas, the economic impact of food industries and a bakery in Belleville Ontario.
- United Nations, Development Program-Regional Bureau- Arab States. Participated in the preparation of the three prize winning Arab Human Development Reports, consulted on Syrian plan formulation processes and several other projects in Jordan and the UAE.
- Arab Monetary Fund – participated in the annual meetings of the Arab Monetary Fund and the IMF and prepared a study on the appropriate exchange regime for Lebanon and commented on the Moroccan Exchange Rate Regime.
- Verdiroc Corporation – Prepared a number of real estate commercial viability studies both under certain and uncertain outcomes.
- International Monetary Fund – lectured, trained and prepared studies on globalization impacts.

- City of Elliot Lake-Developed a community impact model and reviewed their strategy of economic diversification.
- City of Guelph – Developed specialized software for assessing community development initiatives.
- Prince Edward Island-Developed a specialized economic impact of tourism software, prepared an economic impact study of tourism on the Island and Sunshine Tourism.
- Agriculture and Agri-Food Canada. A study on the impact of Horticulture in Canada.
- Canadian Agri-Food Policy Institute-The Value of Agriculture in Canada: A three Dimensional Perspective.
- Canadian Food Inspection Agency - Developed a model for assessing the economic implications of disease propagation.
- Ontario Conservation Bureau – Assessed the economic implications and net avoided costs of energy efficiency programs, demand management programs, fuel substitution and customer based generation.
- AREVA-Analyzed the economic impact of building nuclear reactors in Canada under uncertainty and evaluated several risky profiles.
- Alberta Sustainable Resources Development—Surveyed and analyzed the socioeconomic and environmental impacts of Fishing and Hunting in Alberta.
- SNES-Developed Penalty assessment Utility (PAM) that exacts a penalty on polluters that levels the playing field of compliant companies and non-compliant ones.
- Ontario Power Authority – Estimated the economic cost/benefits and impacts of renewable energy resources and programs in Ontario and Canada.
- Delcan Engineering – Participated in Value Engineering Exercises of an LRT by the side of ETR 407 and in assessing different Risk Management Strategies of Engineering Projects.
- McMaster University – Estimated the economic impact of the University on the Economy of Hamilton.
- Public Utility Board of Manitoba – Independent Consultant in GRA Hearing
- Evaluated DRIC report by Wilbur-Smith Associates for MTO and Transportation Canada

Publications:

A. Articles (Sample List):

"Sectoral Characteristics of the Ontario Structure of Production", *Ontario Economic Review*, Special Issue, February, 1972. (with R. Frank)

"Import Structure of Lebanon: A Quantitative Analysis", *Journal of Developing Areas*, (October, 1974), pp, 87-98.

"Programming Models of Government Expenditures", *Public Finance*, Volume XXVIII, No. 1, 1973, pp. 84-94. (with F. Jones).

"Evaluating the Differential Impact of Government Expenditures Classified by Department", *Socio-Economic Planning Sciences*, Volume 8. 1974, pp. 101-108.

"Differential Impact of Government Expenditure Programs", *Public Finance Quarterly*, Volume 3, No. 2, (April, 1975), pp. 131-151 (with R. Frank).

"Sub-Provincial Regional Income Multipliers in the Ontario Economy: An Input-Output Approach", *Canadian Journal of Economics,* Volume VIII, No. 1, (February, 1975), pp. 67-92 (with J.R. Williams and P.J. George).

"Induced Adjustments and the Role of Agriculture in Economic Development: A Case Study of Egypt and Syria", in *Technology, Transfer and Change in the Arab World*, (ed. A.B. Zahlan), Oxford: Pergamon Press, pp. 293-316 (with S. Ahmad).

"Optimal Utilization of Oil in Economic Development: A Case Study of Nigeria", in *Simulation, Modelling and Decisions in Energy Systems*, (M.B. Carver and M.H. Hamza, eds.), Anaheim: Acta Press, 1978, pp. 393-397.

"Indexing and the Unemployment, Inflation Trade-Off", *Journal of Macroeconomics*, Volume 3, No. 2, (Spring, 1981), pp. 227-245 (with D. Butterfield).

"OPEC Optimal Production Strategies", in *Simulation, Modelling and Decisions in Energy Systems*, (M.B. Carver and M.H. Hamza, eds.), Anaheim: Acta Press, 1979 (with D.W. Butterfield and J. Jideonwo).

"Input-Output Tables for Ontario", in (John Bossons ed.), *Input-Output Analyses of Fiscal Policy in Ontario*, Ontario Economic Council, 1978, pp. 31-36.

"Ontario Government Expenditures by Industry", in (John Bossons ed.), *Input-Output Analyses of Fiscal Policy in Ontario,* Ontario Economic Council, 1978, pp. 55-66.

"Ontario Regional Wages and Value Added by Industry", in (John Bossons ed.), *Input-Output Analyses of Fiscal Policy in Ontario*, Ontario Economic Council, 1978, pp. 67-72.

"Differential Income and Employment Multipliers of Ontario Government Expenditures", in (John Bossons ed.), *Input-Output Analyses of Fiscal Policy in Ontario*, Ontario Economic Council, 1978, pp. 73-82.

"Differential Sub-Regional Impact of Ontario Provincial Government Expenditures", in (John Bossons ed.), *Input-Output Analyses of Fiscal Policy in Ontario*, Ontario Economic Council, 1978, pp. 123-156.

"How Efficient Are Ontario Government Expenditures", in (John Bossons ed.), *Input-Output Analyses of Fiscal Policy in Ontario*, Ontario Economic Council, 1978, pp. 157-182.

"The Interest Rate and the Economy", an Appendix to Chapter Six of Edward Ames' *Income and Wealth*, Holt, Rinehart and Winston, 1969, pp. 195-203.

"Errors in Regional Non-Survey Input-Output Models: Analytical and Simulation Results", *Journal of Regional Science*, (August, 1981) pp. 321-339 (with Se Hark Park and M. Mohtadi).

"The Energy Constraint and Development: Consistency and Optimality Overtime", *Energy Economics,* Vol. 5, No. 1, (January, 1983) pp. 9-15 (with Hark Park).

"Regional Equity and Efficiency: Some Experiments For Canada", *Journal of Regional Science,* Vol. 23, No. 3, (September, 1983), pp. 397-411 (with R. Aziz and D. Butterfield).

"Investment Planning and Industrialization in the Syrian Arab Republic: A Simulation Exercise", *Industry and Development*, No. 6, 1981, pp. 65-86 (with D. Butterfield).

"An Econometric Model For Syria, 1961-1981" United Nations, Economic Commission For Western Asia, 1982. (with Se Hark Park)

"The Lima Target: An Analytical Re-consideration", *Journal of Development Economics*. 1982 (with Se Hark Park).

"Industrialization in the Arab Gulf States: A Ruhr without Water", in *Prospects For the World Oil Industry* (Tim Niblock and Richard Lawless, eds.; London: Croom Helm, 1985), pp. 42-66.

"Labour Mobility and Economic Efficiency: Lessons from Canada", in *Modelling and Simulation,* Vol. 14, Part 3, 1983, pp.382-401 (with D.W. Butterfield).

"Inter-regional and Inter-sectoral Fiscal Policy", in *Modelling and Simulation*, Vol. 15, Part 1, 1984, pp. 207-213 (with D.W. Butterfield).

"Factor Mobility and Economic Efficiency When Demand Constraints Are Binding", *Modelling and Simulation*, Vol. 16, Part 1, 1984, pp. 395-399 (with D. Butterfield).

"A Model of the Petrochemical Industry", *The Journal of Energy and Development,* Vol. 9, No. 2, 1984, pp. 299-335 (with D. Butterfield and J.D. Welland).

"The Land Constraint And The Impact Of Borrowing Agricultural Technology: An Evaluation" *Asian Economic Review*, Vol. XXIV, No.3 (December 1987), pp. 1-16. (with V.Upadhyay and D. Butterfield).

"Measuring Economic Stimulation From Capital Investment in Transportation in Canada" *Transportation Research Record*, 1197 (1988), pp. 109-127 (several co-authors).

"Transport Impact Model (TRIM) And Its Application to Financial Decisions" Proceedings of the 1988 Annual Conference, Roads and Transportation Association of Canada (RTAC) pp. B19-B39 (several co-authors).

"Economic Impacts of Wide Area Vehicle Monitoring System" Ministry Of Transportation, Government of Ontario, 1988 (with Butterfield and Kazakov).

"Banker's Preferences and Monetary Control" *Economie Appliquee,* tome XLI-1988, No. 1, pp. 109-127. (with D. Butterfield).

"Imitation, Adaptation and Innovation: The Costs of Developing Domestic Technological Capability" *Industry and Development*, Vol. 26, 1989, pp. 83-88. (with S. Ahmad).

"Recycling, Reducing and Reusing: A Theoretical Framework" in Proceedings of the Technology Transfer Conference, Challenge of A New Decade, Ministry of the Environment, November, 1990, pp. 765-774. (with D.W. Butterfield).

"Economy-Environment Linkages: Models of Sustainable Development" *Proceedings of the Technology Transfer Conference, Ministry of the Environment*, 1991. (With Jack Donnan).

"Labour Mobility, Economic Adjustment and Development: What is Unique about Lebanon? in R. Eckaus (ed.); *Labour Mobility in the Middle East*. MIT Press. 1992.

"The Litani River: Elixir for Economic Development of Lebanon" *Ecodecision*, No. 6, September 1992, pp. 55-59 (with H. A. Amery).

"Structural Change and Economic Development of Egypt Between Planning and The Open Door Policy" *Industry and Development*, No. 33, 1993, pp. 1- 41. (with M.A. Elkahfif).

"The Demand for Gasoline: A Two Stage Approach" *International Journal of Forecasting*, Vol. 9 (1993) pp. 457-465. (with M. Elkhafif).

"The Economic Impact of Recycling in Ontario and Regions" *Canadian Journal of Regional Science,* Vol. XVI:3, Autumn 1993, pp. 413-431 (with D.W. Butterfield).

"The Economic Impact of Natural Resources Management and Extraction" *Analytical Approaches to Resource Management, Proceedings of the First Annual Symposium*, 1993, Queens Printer for Ontario, pp. 96-116 (with S.J. Spencer).

"Recycling, Reducing and Reusing: A Theoretical Framework" in Proceedings of the Technology Transfer Conference, Challenge of A New Decade, *Ministry of the Environment*, November, 1990, pp. 765-774. (with D.W. Butterfield).

"Economy-Environment Linkages: Models of Sustainable Development" *Proceedings of the Technology Transfer Conference*, Ministry of the Environment, 1991. (With David Butterrfield).

"How Strong is Weak Sustainability?" *Economie Appliquee*, Vol. XLVIII:2, 1995, pp. 75-94 (with P. Victor and E. Hanna).

"Sustainable Development Potential and Other Benefits from Restoration, Enhancement and Protection of Watersheds" *International Symposium on Models of Sustainable Development.* Paris, France March 16-18, 1994, Vol. 1, PP. 387-402. (with Peter Stokoe, D.W. Butterfield, and Murray Trott).

"Conservation Strategies Through Pricing". *Proceedings of the American Water Works Association, Water Resources, 1996 Annual Conference*, PP. 545-551. (with David Butterfield, M. Zegarec and K. Schaefer).

"Comparing the Economic Benefits of Water Demand and Supply Management". *Proceedings of the American Water Works Association, Water Resources, 1996 Annual Conference*, pp. 579-586. (with David Butterfield, M.Zegarec and K. Schaefer).

"Water Scarcity, Water Wars, or Dry Peace in the Middle East." *Water and Dispute Prevention: South Perspectives.* Centre for Global South Reports and Papers. American University, Washington, D.C., 1998 No. 19. pp.17-28 (with Jad Isaac).

"Measuring the Returns on Tourism Advertising." *Journal of Travel Research.* Vol. 37, (August 1998). Pp.12-20. (With D. Butterfield and K. Deal).

"Water, The Environment and Sustainable Development." *Journal of Development and Economic Policies.* Vol 1, No.2, June 1999, PP.7-37.

"Economic Development Under Globalisation." The Role of Human Resources. Exeter: Exeter University. Centre for Gulf Studies,1999.

Sustainable Human Development Under Globalisation. Human Development Studies Series No.10. United Nations. 1999. A Policy Matrix for Agricultural Policy in Lebanon. New York: United Nations. ESCWA. 2000.

"Transition from the Old to the New Economy" in *Review of Industrial Strategies and Policies: Preparing for the Twenty-First Century.* New York: United Nations. 2002. pp. 31-55.

"Revisiting the Role of the State in Economic and Social Development" *Al Mustaqbal Al Arabi,* Vol. 282 (August 2002) pp. 53-78.

"Iraq: A Strategy for Reconstruction Under Crisis Conditions." *Al Mustaqbql Al Arabi*, Vol. 295. No.9, September 2003, pp.46-67. (with Ali Kadri).

"Oil and Water Never Mix Except in the Arab World" in Arab Economic Concerns. T. Kanaan (ed); Beirut: Centre of Arab Unity Studies, 2001, PP. 187-206.

"Crises in Economic Theories, Models and Methodology" *Al Mustaqbal Al Arabi* , Vol. 274 (December 2001), pp. 30-56.

"Development Perspectives on and a Decision Support System for Aboriginal Community- Based Economies: The Case of Moose Cree First Nation, Northern Ontario." Natural Resources Canada, Northern Forestry Centre, Information Paper NOR-X-390. 2003. (with A Ghbremichael).

"A Development Strategy for Post-War Iraq." *Issues in Economic and Social Reconstruction.* United Nations, July 2003.

"Water Crises, The Environment and Arab Sustainable Development" In *Palestinian and Israeli Environmental Narratives.* Stuart Schoenfeld (ed;) Toronto: Centre for International Security Studies. 2005, pp. 31-47.

"The Role of Transportation in Trade Competitiveness: Understanding the Context Through Quantitative Measures." *Old Foundations and Modern Challenges*, Proceedings of the 40th Annual Conference of the Canadian Transportation Research Forum, May 8-11, 2005, pp. 158-171.

"The Economics of Migration Under Globalization." *International Migration and the Millennium Development Goals.* New York: United Nations, 2005, pp. 155-168 (with Madona Mokbel).

"Water Scarcity and Water Wars in the Middle East". In *Water: Global Commons and Global Problems.* Velma Grover (ed).Oxford and INH Publishing Co., 2005, Pp.617-646.

"The Logic of Economic Reform and its Implications." In *Current Changes and its Role in Arab Reform.* Emirates Centre for Strategic Studies and Research. 2006, pp.67-98.

"The Knowledge-Based Economy" *UNESCO Encyclopedia.* 2006. pp. 134-165.

"The Economy of Lebanon, 1950-2002:What Happened to the Lebanese Economic Miracle?" *Journal of Social Affairs*, Vol. 23, Issue # 89, Spring 2006, pp. 13-39 (with John Siam).

"The Economics of Migration and Remittances Under Globalization." *In Full Employment and Decent Work.* United Nations.2006, pp.159-174.

"Poverty Eradication from a Human Security Perspective." *UNESCO*, 2008.

"Kyoto Protocol and Carbon Sequestration Credits as an Economic Instrument." *In Global Warming and Climate Change.* Velma Grover (ed;). Enfield, NJ: Science Publishers. 2008. pp. 293-314.

"The State Vs. the Market: A False Dichotomy." *Journal of Development and Economic Policies.* Vol.11, No.2. July 2009.pp. 7-57

"The Global Financial Crisis and Sovereign Wealth Funds: Implications and Limitations." In Managing Arab Sovereign Wealth in Turbulent Times and Beyond, Sven Behrerndt and Bassma Kodmani (Eds). *Carnegie Papers*, 2009, pp. 28-32.

Financial Meltdown or an Economic Collapse: The Limits of Ideological Prescriptions." Aljazeera Studies Series, 2009.

The Employment Impact of Energy Conservation. Ontario Power Authority, October 2008. (With INDECO).

B. Books, Monographs and Reports (Sample List).

Cooperation and Development in the Energy Sector. London: Croom Helm, 1985. edited with T. Naylor.

The Economics of the Arabian Gulf: A Statistical Source Book, London: Croom and Helm, 1984.

Oil, Industrialization and Development in the Arab Gulf States, London: Croom and Helm, 1984.

Input Output Analyses of Fiscal Policy in Ontario. Ontario Economic Council, 1978.

Intermediate Macroeconomics. Custom Course Ware, 1986.

Advanced Macroeconomics. Custom Course Ware, 1994.

Globalization and Economic Development. Custom Courseware, 2000.

Development Peace and Human Security. Custom Course Ware, 2001. (with Gary Warner).
A Simulation Model of the Iraqi Economy: The Forecasting Methodology, Arab Projects and Development, 1975.

The Translation of National Socioeconomic Objectives Into Manpower Requirements, APD, 1975 (with Rosemary Said).

High Level Manpower and Economic Activity, APD, 1975.

Admissions and Transitions Within the Iraqi Educational System, APD, 1975.

The Economic Impact of Tourism in Ontario and Regions 1976, Ministry of Industry and Tourism, December, 1978.

The Future Structure of the Lebanese Industrial Sector: A Quantitative Analysis, United Nations: Economic Commission for Western Asia, June, 1978.

A Framework for a Study on Effective Tariff Protection for Lebanon, United Nations: Economic Commission for Western Asia, October, 1978.

Long Term Prospects of Industrial Development in Saudi Arabia, United Nations Industrial Development Organization, January, 1979.

Long Term Prospects of Industrial Development in Syria, United Nations Industrial Development Organization, October, 1979 (with Ayman Midani).

Industrialization in the Arab World: Options and Strategies Year 2000, Joint ECWA/UNIDO Industry Study, January, 1980.

Long Term Prospects of Industrial Development in Kuwait, United Nations, Joint ECWA/UNIDO Study, May, 1980.

The Economic Impact of Energy Conservation in Ontario and Regions, Ministry of Energy, Ontario Government, January, 1985 (with D. Butterfield).

World Demand for Petrochemical Products 1985-2000, United Nations Industrial Development Organization, 1985, (with D. Butterfield and J. Welland).

The Arab Demand for Capital Goods 1980-2000, UNIDO, 1984 (with D. Butterfield).

A Computable General Equilibrium Model for the Arab Republic of Yemen, ESCWA,

1985.(with Se hark Park)

Industrial Development in the Sudan, UNIDO, 1986.

The Economic Impact of Provincial Park Expenditures in Ontario, 1979, February, 1981 (with D. Butterfield).

The Economic Impact of Wildlife Activity in Ontario, 1980, March, 1982 (with D. Butterfield).

Middle East Trade in Engineering Products and Ontario's Export Prospects, 1983.

The Economic Impact of Ontario Tourism Expenditures 1984, July, 1985.

General Economic Stimulation and Energy Indicators For Capital investment Initiatives in Various Transportation Modes. 1988 Ministry of Transportation. (Several Co-authors).

The Economic Impact of Tourism in Ontario, 1988 . Ministry of Tourism and Recreation.

The Economic Impact of Tourism in Northern Ontario,1988. Ministry of Tourism and Recreation.

Tourism Macroeconomic and Regional Impact Model. Ministry of Tourism and Recreation. December, 1989.

Developing an Overall Framework for Evaluating and Communicating the Impacts of Capital Spending to Central Agencies. December, 1989. (several authors).

The Economic Impact of Salmonid Fishing in Thunder Bay. Ministry of Tourism and Recreation. 1990 (with Peter J. George).

Economic Impact of the Remote Tourism Industry: North Algoma, Ministry of Tourism and Recreation, March, 1990.

Site-Specific Economic Impact Model. Ministry of Tourism and Recreation. March 1991. (with Ken Deal).

The Economic Impact of University Expenditure in Ontario. Council of Ontario Universities, 1991.

The Ontario Tourism Advertising Evaluation Model. Ministry of Tourism and Recreation. 1991 (With D.W. Butterfield and K. Deal).

The Economic Impact of the Grande Baleine Hydro Project, 1990-2000. October, 1991.

Indicators of the Primary Impacts of Transportation Improvements. Ministry of Transportation, March, 1991. (Several authors).

TEIM: ALBERTA. A Financial Feasibility System for Alberta Tourism, Parks and Recreation. February, 1992.

Regional Development Impacts of Transportation Investments. (TRIM SYSTEM) Ministry of Transportation, 1991.

Town of Banff: An Economic Profile. Alberta Tourism, Parks and Recreation, 1992.

The Case for Tourism Employment: How beneficial? Alberta Tourism, Parks and Recreation, 1992.

"The Regional Economic Impact Model REIM: Ontario" Ministry of Natural Resources, 1992.

"The Economic Impact of West Edmonton Mall" Alberta Economic Development and Tourism, 1993.

"Windsor and Essex County Tourism Economic Impact Study" The Convention and Visitors Bureau of Windsor/Essex County and Pelee Island, March 1993.

The Demand for Beverage Alcohol in Ontario. An Econometric Model of the Beverage Alcohol Market in Ontario. Ontario Restaurant Association. 1994.

Aboriginal Community Impact Study. Ministry of Natural Resources, February, 1995.

A Socio- Economic Impact Model: Lake Superior Basin. Ministry of Natural Resources, March, 1995.

A Socio-Economic Impact Model (SEIM). Ministry of Natural Resources. 1996.

Sustainable Development Indicators System. Ministry of Natural Resources. 1996.

Explaining The Declining Demand for Beer in Ontario. Brewers of Ontario. 1997.

The Economic Impact of an Environment Levy on Beer Cans: An Econometric Analysis. Brewers of Ontario. 1997.

The Economic Impact of TechnoDome in New York and Toronto. Heathmount A.E Incorporated. 1997.

Sustainable Human Development Under Globalisation: The Third World Challenge. Human Development Studies Series No.10. United Nations. 1999.

A Policy Matrix for Agricultural Policy in Lebanon. United Nations. ESCWA. 2000.

Community Development Modelling: Cochrane and Kapuskasing, Canadian Forest Service and Lake Abitibi Model forest, 2000.

Asymmetrical Exchange and the Canadian Aboriginal Economy. Canadian Forest Service, 2001.

The Economic Impacts of Global Warming on the Forest Sector in Ontario. Ministry of Natural Resources and the Environment Canada, 2001. (With Steven Lonregan and Andy Muller).

The Economic Impact of BIOCouncil Projects in Ontario, Ministry of Energy, science and Technology, 2002.

Socio-economic Benefits of Helicopter & Snowcat Skiing in British Columbia,

Revisiting the Role of the State in Socioeconomic Development, United Nations, 2002

Technological Development and Poverty Alleviation: Cruel Choices or Potential Synergies, United Nations, 2002.

Transition Strategies to the New Economy: Leapfrogging into Prosperity. United Nations, 2002.

The Arab Human Development Report, 2000. United Nations Development Program (Member of the Advisory and Readers Team)

The Arab Human Development Report, 2002. United Nations Development Report. (Member of Core Team of Authors and Advisory Board).

Curriculum Vitae August, 2010

Name: Lonnie John Magee

Address: (H) 71 Skyline Drive
Dundas, Ontario, Canada L9H 3S3
phone: (905) 627-3820

(O) Department of Economics
McMaster University
Hamilton, Ontario, Canada L8S 4M4
phone: (905) 525-9140 ext. 23805
fax: (905) 521-8232
email: magee@mcmaster.ca

Personal: Date of Birth: November 20, 1956
Citizenship: Canadian

Education: Ph.D. (Economics)
University of Western Ontario, Department of Economics, 1984

M.A. (Economics)
University of Western Ontario, Department of Economics, 1980

B. Math (Statistics and Economics)
University of Waterloo, Department of Statistics, 1979

Current Status: Professor, Economics Department, McMaster University.

Professional Organizations:

Canadian Economics Association, American Statistical Association

Employment History:

July 1994 to Present, Professor, Economics Department, McMaster University.

September 1998 to December 1998, Visiting Professor, Economics Department, University of Western Ontario.

July 1988 to June 1994, Associate Professor, Economics Department, McMaster University.

July 1983 to June 1988, Assistant Professor, Economics Department, McMaster University.

October 1984 to June 1985, Post-Doctoral Fellow, Centre for Operations Research and Econometrics, Universite Catholique de Louvain, Louvain-la-Neuve, Belgium.

Scholarly and Professional Activities:

Editorial advisor, Canadian Journal of Economics, 1998-2001
Editorial Advisory Council member, Pacific Economic Review, 1996-

Journal refereeing::

Annals of Statistics, Biometrical Journal, Canadian Journal of Economics, Canadian Public Policy, Communications in Statistics - Simulation and Computation, Communications in Statistics - Theory and Methods, Computational Statistics and Data Analysis, Econometric Reviews, Econometric Theory, Empirical Economics, International Economic Review, Journal of Applied Econometrics, Journal of Business and Economic Statistics, Journal of Economic Education, Journal of Nonparametric Statistics, Journal of Official Statistics, International Journal of Forecasting, Journal of the American Statistical Association, Journal of Econometrics, Journal of Quantitative Economics, Pacific Economic Review, Quality of Life Research, Review of Economics and Statistics, Review of Economic Studies, Survey Methodology, The American Statistician

External grant reviews:

SSHRCC project proposals, National Science Foundation project, Killam Fellowship

Areas of Interest:

Research: Econometrics
Teaching: Econometrics, Statistics, Introductory and Intermediate Economic Theory

Awards:

University Students' Council Teaching Honour Roll Certificate, University of Western Ontario , 1998-99.
Post-Doctoral fellowship, CORE, Universite Catholique de Louvain, Louvain-la-Neuve, Belgium, 1984-85.

Courses Taught:

- Introductory Macroeconomics and Introductory Statistics.
- Intermediate Microeconomics and Intermediate Macroeconomics.
- undergraduate Econometrics.
- graduate Econometrics and Advanced Econometrics.

Supervision:

Supervisor of doctoral students:

Fred Aswani (2000) (co-supervisor)	Sule Alan (2001)
Asmaa Elbadawy (2009)	

Supervisory committee member of doctoral students (Economics unless indicated):

Syed Mahmud (1986)	Surajit Sinha (1987)	Jae Rhee (1992)
Rizwan Tahir (1993)	Xiaodi Xie (1995)	Paul Grootendorst (1995)
Nagla Rizk (1995)	Rob Moir (1996)	Arthur Sweetman (1996)
Aaron Childs (Math & Stats, 1996)		Lori Curtis (1998)
Heather Antecol (1998)	Xiaofen Lin (1998)	Jennifer Stewart (1998)
Herb Schuetze (1999)	Mikal Skuterud (2003)	Malick Souare (2003)
Emmanuelle Pierard (2005)	Vinh Dang (2006)	Nazish Ahmad (2006)
Adrienne ten Cate (2007)	Jiong Tu (2010)	

Supervisor of master's student:

Quanlin Gu (2004)

Supervisory Committee member of doctoral students in progress:

Wei Yang	Iryna Kryvoruchko	Cong Li

Research Funding (last five years):

co-investigator in SSHRCC MCRI grant with principal investigator Byron Spencer and many others: "SEDAP-II: Canada in the 21st Century: Moving Towards an Older Society," 2005-2009, $500,000 per year.

Publications:

Peer Reviewed:

contribution to book:

L. Magee, A. Ullah, and V.K. Srivastava, "Efficiency of Estimators in the Regression Model with First Order Autoregressive Errors," in M.A. King and D.E.A. Giles, eds., *Specification Analysis in the Linear Model: Essays in Honour of Donald Cochrane*, Routledge and Kegan Paul, 1987, pp. 81-98.

J.B. Burbidge, L. Magee and A.L. Robb, "Cohort, Year and Age Effects in Canadian Wage Data," in *Independence and Economic Security in Old Age,* F.T. Denton, D. Fretz and B.G. Spencer (eds), UBC. Press, 2000, pp. 183-214.

R. Smith, L. Magee, A.L. Robb and J.B. Burbidge, "The Independence and Economic Security of Older Women Living Alone," in *Independence and Economic Security in Old Age,* F.T. Denton, D. Fretz and B.G. Spencer (eds), UBC. Press, 2000, pp. 293-327.

journal articles:

A. Ullah, V.K. Srivastava, L. Magee, and A. Srivastava, "Estimation of the Linear Regression Model with Autocorrelated Disturbances," *Journal of Time Series Analysis*, 4, 1983, pp.127-135.

L. Magee, "Efficiency of Iterative Estimators in the Regression Model with AR(1) Disturbances," *Journal of Econometrics*, 29, 1985, pp. 275-287.

J. Burbidge, L. Magee, and M. Veall, "On the Seasonality of Vector Autoregression Residuals," *Economics Letters*, 18, 1985, pp. 137-141.

L. Magee, "Asymptotic Risk Comparisons of Restricted and Unrestricted Maximum Likelihood Estimators," *Communications in Statistics - Theory and Methods*, 16, 1987, pp. 545-558.

L. Magee, "A Note on Cochrane-Orcutt Estimation," *Journal of Econometrics*, 35, 1987, pp. 211-218.

L. Magee, "Approximating the Approximate Slopes of LR, W, and LM Test Statistics," *Econometric Theory*, 3, 1987, pp. 247-271.

L. Magee, "Inequalities For LR, W, and LM Test Statistics," *Economics Letters*, 24, 1987, pp. 141-144.

J. Burbidge, L. Magee, and A.L. Robb, "Alternative Transformations to Handle Extreme Values of the Dependent Variable," *Journal of the American Statistical Association*, 83, 1988, pp. 123-127.

L. Magee, "The Behaviour of the Modified Box-Cox Regression Model when some Values of the Dependent Variable are Close to Zero," *Review of Economics and Statistics*, 70, 1988, pp. 362-366.

D. Grubb and L. Magee, "A Variance Comparison of OLS and Feasible GLS Estimators," *Econometric Theory*, 4, 1988, pp. 329-335.

L. Magee, "Bias Approximations for Covariance Parameter Estimators in the Linear Model with AR(1) Errors," *Communications in Statistics - Theory and Methods*, 18, 1989, pp. 395-422.

L. Magee, "An Edgeworth Test Size Correction for the Linear Model with AR(1) Errors," *Econometrica*, 57, 1989, pp. 661-674.

L. Magee, "The Asymptotic Variance of Extreme Bounds," *Review of Economics and Statistics*, 72, 1990, pp. 182-184.

J.G. MacKinnon and L. Magee, "Transforming the Dependent Variable in Regression Models," *International Economic Review*, 31, 1990, pp. 315-339.

L. Magee, "R^2 Measures Based on W and LR Joint Significance Test Statistics," *The American Statistician*, 44, 1990, pp. 250-253.

L. Magee and M.R. Veall, "Selecting Regressors for Prediction Using PRESS and White *t*-Statistics," *Journal of Business and Economic Statistics*, 9, 1991, pp. 91-96.

L. Magee, J.B. Burbidge and A.L. Robb, "Computing Kernel-Smoothed Conditional Quantiles from Many Observations," *Journal of the American Statistical Association*, 86, 1991, p.673-677.

L. Magee, "Edgeworth-Adjusting Test Statistics for AR(1) Errors," *Communications in Statistics - Simulation and Computation*, 20, 1991, pp. 901-917.

A.L. Robb, L. Magee and J.B. Burbidge, "Kernel Smoothed Consumption-Age Quantiles," *Canadian Journal of Economics*, 25, 1992, pp. 669-680.

Y. Bar-Or, J. Burbidge, L. Magee and A.L. Robb, "The Wage Premium to a University Education in Canada: 1971-1991," *Journal of Labor Economics*, 13, 1995, pp. 762-794.

J.B. Burbidge, L. Magee and A.L. Robb, "Canadian Wage Inequality Over the Last Two Decades," *Empirical Economics*, 22, 1997, pp.181-203.

L. Magee, "Improving Survey-Weighted Least Squares Regression," *Journal of the Royal Statistical Society*, Series B, 60, 1998, pp.115-126.

L. Magee, "Nonlocal Behaviour in Polynomial Regression," *The American Statistician*, 52, 1998, pp.20-22.

L. Magee, A.L. Robb, and J.B. Burbidge, "On the Use of Sampling Weights when Estimating Regression Models with Survey Data," *Journal of Econometrics*, 84(2), 1998, pp. 251-271.

D.A. Dawson and L. Magee, "The National Hockey League Entry Draft, 1969-1995: An Application of a Weighted Pool-Adjacent-Violators Algorithm," *The American Statistician*, 55(3), 2001, pp.194-199.

J.B. Burbidge, L. Magee, and A.L. Robb, "The Education Premium in Canada and the United States," *Canadian Public Policy*, 28(2), 2002, pp. 203-217.

other:

L. Magee, "The Global Power of White's Test for Heteroscedasticity," *Econometric Theory*, 7, 1991, Problems and Solutions Section, p. 139, solution, *Econometric Theory*, 8, p.309, 1992.

L. Magee, "Skewness and Kurtosis in Bivariate Regression," *Econometric Theory*, 7, 1991, Problems and Solutions Section, pp. 417-418.

L. Magee, "ML Estimation of Linear Regression Model with AR(1) Errors and Two Observations," *Econometric Theory*, 9, 1993, Problems and Solutions Section, pp.521-522.

Beveridge, T.M., D. Fretz, M.R. Veall and L. Magee, Study Guide to accompany *Principles of Macroeconomics*, by Case, Fair, Strain and Veall, Prentice Hall, Toronto, 1999.

J. Rutledge, L. Magee and F. Atkins, Study Guide to accompany *Macroeconomics*, by Dornbusch, Fischer, Startz, Atkins and Sparks, McGraw-Hill Ryerson, Toronto, fifth, sixth and seventh Canadian editions, 1999, 2001, and 2004.

L. Magee, "Comment," on the paper "Should the DEA's STRIDE data be used for economic analyses of markets for illegal drugs?," by J. Horowitz, *Journal of the American Statistical Association*, 96, 2001, pp.1266-1268.

Unpublished Documents:

working papers:

L. Magee and E.H. Oksanen, "On the Variance of Forecast Error in the Classical Linear Regression Model," QSEP Research Report No. 110, McMaster University, 1984.

L. Magee, "Sufficient Conditions for Inequalities for LR, W and LM Tests from Taylor Series Expansions," QSEP Research Report No. 126, McMaster University, 1985.

J.G. MacKinnon and L. Magee, "Testing for Transformations of the Dependent Variable," Queen's University Discussion Paper No. 655, 1986.

L. Magee, "Estimator Bias and Test Size Corrections in the Linear Model with AR(1) Errors," QSEP Research Report No. 191, 1987.

L. Magee, "Expected AMSE's of Pretest and Shrinkage Maximum Likelihood Estimators," QSEP Research Report No. 209, 1987.

L. Magee, "A Generalized R^2 Significance-of-Fit Measure," QSEP Research Report No. 223, 1988.

L. Magee, "Size-Corrected Powers of Tests that Over-Reject," QSEP Research Report No. 250, McMaster University, 1989.

L. Magee, "Pretesting in a One-Parameter Symmetric Estimation Problem," QSEP Research Report No. 257, 1989.

L. Magee, "An Algorithm for Robust Regression," QSEP Research Report No. 283, 1991.

Y. Bar-Or, J. Burbidge, L. Magee and A.L. Robb, "Canadian Experience-Earnings Profiles and the Return to Education in Canada: 1971-1990," McMaster Economics Dept. Working Paper No. 93-04, 1993.

J.B. Burbidge, L. Magee, and A.L. Robb, "On Canadian Wage Inequality: the 1970s and 1980s," McMaster Economics Dept. Working Paper No. 93-07, 1993.

L. Magee, "A Binary Choice Model with Coefficients that are Elasticities," QSEP Research Report No. 300, 1993.

L. Magee, A.L. Robb, and J.B. Burbidge, "On the Use of Sampling Weights when Estimating Models with Survey Data," McMaster Economics Dept. Working Paper No. 94-04, 1994.

L. Magee, A.L. Robb, and J.B. Burbidge, "Estimating Regression Models Using Survey Sample Weights," McMaster Economics Dept. Working Paper No. 96-07, 1996.

L. Magee, J.B. Burbidge and A.L. Robb, "The Correlation Between Husband's and Wife's Education: Canada, 1971-1996," SEDAP Research Paper No. 24 and QSEP Research Report No. 353, 2000.

J.B. Burbidge, L. Magee, and A.L. Robb, "The Education Premium in Canada and the United States," SEDAP Research Paper No. 60 and QSEP Research Report No. 364, 2001.

L. Magee and M.R. Veall, "Allocating Awards Across Noncomparable Categories," McMaster Economics Dept. Working Paper No. 02-11 and IZA Discussion paper No. 617, 2002.

A.L. Robb, L. Magee and J.B. Burbidge, "Wages in Canada: SCF, SLID, LFS and the Skill Premium," SEDAP Research Paper No. 106 and QSEP Research Report No. 386, 2003.

L. Magee, "Ordinary Least Squares Bias and Bias Corrections for *iid* Samples," SEDAP Research Paper No. 207 and QSEP Research Report No. 419, 2007.

L. Magee, "The Expected Value of Ordinary Least Squares in iid Samples," submitted to *Econometric Reviews*, 2007.

J.B. Burbidge and L. Magee, "Earnings Profiles for Computing Effective Tax Rates" prepared for Tax Policy Branch Finance Canada, 2007.

other:

L. Magee, "Analytic Studies in Econometric Inference with Small Samples," Doctoral Dissertation, University of Western Ontario, 1984.

L. Magee, "Transformations, Errors in Variables, and Indirect Estimates of Real Per Capita GDP," 1987.

L. Magee, "Bayes Risks of Pretest Estimators," 1989.

L. Magee, "The Efficiency Loss of OLS with Heteroscedastic Errors," 1990.

L. Magee, "Consequences and Detection of an Underspecified Variance Function in Semiparametric Weighted Least Squares," 1990.

L. Magee, "Measuring Bimodality with Moments," 1990.

L. Magee, "Imposing an Invalid Common Factor Restriction," 1991.

L. Magee, "Skewness, Kurtosis, and Bimodality," 1991.

L. Magee, "Descriptive Statistics for Bimodal Conditional Distributions," 1992.

L. Magee, A.L. Robb, and J.B. Burbidge, "Sample Selection Bias with Weighted Survey Data," 1993.

L. Magee, "Robust Regression Using Brown and Hwang's Histogram Approximation Method," 1994.

J.B. Burbidge, L. Magee and A.L. Robb, "Disentangling Year, Cohort and Age Effects in Canadian Earnings Data," 1995.

L. Magee, "Linear Regression with Intercept Breaks," 1997.

L. Magee, "Misspecification-Robust Variance Estimation," 2007.

J. B. Burbidge, K.A. Collins, J.B. Davies, L. Magee, "Effective Tax and Subsidy Rates on Human Capital in Canada," 2010, *Canadian Public Policy*, revise and resubmit.

Presentations at Meetings:

Contributed, peer reviewed,

"Sufficient Conditions for Inequalities for LR, W, and LM Test Statistics," Meeting of the Canadian Econometric Study Group, Queen's University, September 1984, and World Congress of the Econometric Society, M.I.T., August 1985.

"Approximate Magnitudes of LR, W, and LM Test Statistics," Meeting of the Canadian Econometrics Study Group, University of Western Ontario, September 1985.

with M.R. Veall, "Applying the PRESS Criterion for Model Selection: A New Use for 'White *t*-Statistics'," Meeting of the Canadian Economics Association, McMaster University, June 1987.

"Expected AMSE's of Pretest and Shrinkage Maximum Likelihood Estimators," Meeting of the Canadian Economics Association, University of Windsor, June 1988.

"An Algorithm for Robust Regression," Meeting of the Canadian Econometrics Study Group, Universite Laval, September 1991.

"Sample Selection Bias with Weighted Survey Data," (with J.B. Burbidge and A.L. Robb), Meeting of the Canadian Econometrics Study Group, University of Toronto, September 1993.

"Linear Regression with Intercept Breaks," Meeting of the Canadian Econometrics Study Group, Queen's University, September 1997.

"The Correlation Between Husband's and Wife's Education: Canada, 1971-1996," (joint work with J.B. Burbidge and A.L. Robb), Meeting of the Canadian Econometrics Study Group, University of Guelph, October 2000.

Administration:
committee member, unless indicated otherwise:

- Economics Department:
    - chair, graduate studies committee, 1993, 1995, 2001-2004, 2007-
    - undergraduate counsellor, 1985-1987
    - committee on faculty, 1988-1990
    - member, co-chair or chair of research committee, 1993-2000
    - graduate admissions subcommittee, 1993-
    - graduate student workshop organizer, 2006-2010

- Social Science Faculty:
    - Recruitment and Retention, 1983-1984
    - Admissions Study and Review, 1985-1987, 1991-1992
    - Undergraduate Awards and Scholarships, 1987-1992
    - chair, Committee on Computing, 1988-1990
    - chair, Undergraduate Awards and Scholarships, 1992-2000
    - Faculty Council, 2003-2004

- University:
    - Operational Planning Committee, 1988-1990
    - internal review committee, Master of Arts (Teaching) - Master of Science (Teaching) Programme, 1997
    - Graduate Council, 1999-2002, 2009-
        - Ad Hoc Committee on Academic Dishonesty, 1999-2000
        - Ad Hoc Committee on 5th year funding, 2000
        - Executive Committee, 2001-2002, 2010-

- Other:
    - local organizer, Canadian Econometrics Study Group meetings, 1989

- executive board, Canadian Econometrics Study Group, 1994-1995, 1999-2003
- Ontario Graduate Council doctoral selection panel, member 2006-08, chair 2008-09
- Ontario Council on Graduate Studies Appraisal Committee panel member, 2008-10

SCHEDULE 2

THIS AGREEMENT made effective as at February 14, 2010.

BETWEEN:

MANITOBA HYDRO

of the first part,

-and-

DR. ATIF KUBURSI and DR. LONNIE MAGEE, jointly and severally

of the second part.

WHEREAS on or about December 1, 2009, and pursuant to *The Crown Corporations Public Review and Accountability Act,* Manitoba Hydro filed a General Rate Application (GRA) with the Public Utilities Board of Manitoba ("PUB") for approval of rates to be applied in fiscal years 2010/11 and 2011/12;

AND WHEREAS in Order 17/10, the PUB concluded that "a detailed risk and risk management review will proceed as part of the GRA.";

AND WHEREAS in Order 17/10 the PUB stated that "The very concerns raised about confidentiality, including when and whether claims of confidentiality may be invoked, have led the Board to conclude that it is in the public interest to provide resources for an independent expert to assist the Board and all parties to this process with an independent analysis of the risk reports, methodologies and risk management employed by, and recommended for, Manitoba Hydro.";

AND WHEREAS the PUB retained Dr Atif Kubursi and Dr. Lonnie Magee to act as "independent experts" in accordance with the Terms of Reference of their engagement attached as Schedule "C" to Order 30/10;

AND WHEREAS Dr Atif Kubursi has attended at Manitoba Hydro's head office in Winnipeg, has met with several of Manitoba Hydro employees and has requested access to Manitoba Hydro's confidential information including but not limited to various reports containing confidential information and access to its Software and the confidential data contained therein;

AND WHEREAS in an effort to work with the PUB's process as set out in Orders 17/10 and 30/10, Manitoba Hydro is prepared to disclose certain confidential information to the independent experts on terms set out herein;

NOW THEREFORE IN CONSIDERATION OF the sum of ten ($10.00) dollars and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the parties agree as follows:

1. Definitions

In this Agreement:

"Agreement" means this agreement.
"Confidant" means Dr. Atif Kubursi and Dr. Lonnie Magee, jointly and severally.

"Confidential Information" means all information as set out on Schedule "A" to this Agreement, which Schedule "A" is subject to revision pursuant to Article 3 herein.

"Effective Date" means February 14, 2010.

"Hydro" means Manitoba Hydro.

"Permitted Use" means the drafting and submission of written report(s), by the Confidant, to the PUB, and the provision of oral testimony with respect to same in the matter of Manitoba Hydro's 2010/11, 2011/12 GRA, which report(s) shall analyze "the risk reports, methodologies and risk management practices employed by, and recommended for, Manitoba Hydro" and which report may include, but is not limited to, general commentary regarding:

(a) the type of data used by Hydro, including data used in the operation of the Software, and the source of said data;
(b) the Software used by Hydro, including but not limited to
    (i) the general functionality of the Software;
    (ii) the purpose for which the Software is used by Hydro;
    (iii) the assumptions embedded in the Software or its design; and
    (iv) the adequacy of the Software to fulfill Hydro's purpose(s) for using the Software.

Provided however, that such Permitted Use does not serve to disclose, directly or indirectly, Hydro's Confidential Information to any Third Party, except as authorized herein.

"Person" shall be broadly interpreted to include, without limitation, any corporation, partnership, other entity, or individual.

"PUB" means The Public Utilities Board of Manitoba.

"Software" means the Hydro computer software known as: (i) SPLASH; (ii) HERMES; (iii) PRISM; and (iv) PROMOD IV.

"Third Party" means any Person other than Hydro or Confidant, and includes, without limitation, the PUB.

2. **Confidentiality:**

The Confidant shall:

(a) keep the Confidential Information in the strictest confidence;
(b) not disclose Confidential Information to any Third Party without the prior written consent of Hydro, and if such consent is given, prior to such disclosure, ensure that a written confidentiality agreement is entered by Hydro with such Third Party on terms no less restrictive than those in this Agreement.

3. **Additional Confidential Information**

If, during the course of the Confidant's engagement the Confidant requests access to information which Hydro identifies as confidential, but which information is not specifically identified in Schedule "A" nor does it fit within a class of information set out in Schedule "A", Hydro may provide such information to the Confidants, whether written or oral, in advance of same being formally documented in Schedule "A" and where so identified and provided, the information shall be treated as Confidential Information in accordance with the terms herein. It is understood that in these circumstances the parties will make their best efforts to forthwith amend Schedule "A" or if there exists disagreement regarding whether the information is confidential, resolve same pursuant to Article 5 herein.

4. **Review of Reports**

Upon substantial completion, the Confidant shall provide Hydro with a copy of its report(s) in order that Hydro may review same for the purpose of:

a) verification of facts; and
b) ensuring no Confidential Information is directly or indirectly disclosed therein.

Upon completion of its review, Hydro shall identify any mistakes of fact or disclosures of Confidential Information contained in the report(s) and the Confidant will be provided the opportunity to amend the report prior to finalizing and filing same with the PUB.

In the event Hydro and the Confidant disagree regarding the accuracy of a statement of fact and provided the statement of fact does not serve to disclose Confidential Information, the matter may be raised and reviewed in the normal course during the hearing of Hydro's GRA.

In the event Hydro and the Confidant disagree as to whether information disclosed in the report(s) is Confidential Information, the matter shall be referred to the PUB pursuant to Article 5 herein.

Resolution of Disputes

In the event:

a) Hydro identifies information as being confidential at the time it is disclosed to the Confidant, which information is not otherwise identified as confidential in Schedule "A" in accordance with Article 3 herein; or

b) Hydro identifies information contained in the Confidant's report(s) as being Confidential Information and requests its removal pursuant to Article 4 herein;

and the Confidant disagrees with Hydro's opinion that the information is confidential and the parties are unable to agree upon an accommodation satisfactory to both parties, the matter shall be referred to the PUB, by way of motion, for resolution. Until such time as the PUB issues its final order with respect to the confidentiality issue and any reviews or appeals of such order, if any, are exhausted, the information at issue shall be treated as Confidential Information in accordance with the terms herein.

6. Compelled Disclosure

In the event that any of the Confidant or any Third Party referred to in Article 2(b) above to whom the Confidential Information is provided, as permitted by this Agreement, receives notice indicating that it may or shall be legally compelled to disclose any of the Confidential Information, the Confidant shall provide Hydro with prompt notice so that Hydro may at Hydro's sole discretion seek a protective order or other appropriate remedy and/or waive compliance with the provisions of Section 2 hereof.

The Confidant and/or any such Third Party shall cooperate fully with Hydro protecting the confidential and proprietary nature of the Confidential Information sought to be compelled to be disclosed, including providing assistance to Hydro in the prosecution and defense of any action(s) or proceeding(s) brought or made in respect of such matters.

In the event that such protective order or other remedy is not obtained, or that Hydro waives compliance with the provisions of this Agreement, or if the Confidant or Third Party delivers to Hydro a written legal opinion from the Confidant's or Third Party's (as the case may be) legal counsel advising that the Confidant or Third Party will be in breach of a statutory or regulatory requirement, a judicial order or an order of a duly authorized administrative agency if it does not immediately disclose the Confidential Information, such compelled Confidant or Third Party shall furnish only that portion of the Confidential Information in respect of which it shall be legally required to disclose.

Further Covenants

The Confidant shall:

(a) use the Confidential Information only for the Permitted Use and for no other purpose whatsoever;

(b) ensure that Confidential Information shall not be disclosed or otherwise made known, in any report permitted under the Permitted Use, in any regulatory processes (including, without limitation, interrogatories, direct evidence or cross-examination), or in any other way whatsoever, regardless of form, format or medium and whether oral or written, whether pursuant to the Permitted Use or otherwise.

(c) not use or reverse engineer the Confidential Information to develop any software or other product that is competitive with, or performs functions or has a purpose similar to, the Software.

6. No Licence

The Confidant agrees that the Confidential Information is the property of Hydro and it shall not contest or challenge any of Hydro's rights in or to any Confidential Information. The Confidant does not receive any right, title or interest of any nature whatsoever in or to any Confidential Information.

7. Continuing Obligation

The obligations of Confidant under this Agreement shall not terminate but shall continue without limitation of time.

8. Equitable Remedies

In the event of a breach, or threatened breach, of this Agreement by the Confidant, the parties agree that the harm suffered by Hydro would not be compensable by monetary damages alone and, accordingly, that Hydro shall, in addition to any other available legal or equitable remedies, be entitled to an injunction against such breach or threatened breach.

9. Notices

Any notice or other communication required or permitted to be given under this Agreement must be in writing and shall be delivered to:

a) Hydro:
Manitoba Hydro
360 Portage Avenue
Winnipeg, Manitoba R3C 0G8

Attn: General Counsel and
Corporate Secretary
Fax: (204) 360-6147

b) Confidant:
Dr. Atif Kubursi and/or
Dr. Lonnie Magee
c/o Mr. Gavin Wood
Suite #3 - 403 River Ave.
Winnipeg, MBR3L 0C6

Fax: (_204) _943-0461

or such other addresses as either party may notify the other of in writing. Notices may be given by personal service or fax transmission. Any notice given by personal service shall be deemed to have been effectually given and received at the date and time of actual delivery. Any notice sent by fax transmission shall be deemed to have been effectually given and received on the next business day following transmission.

10. Interpretation and Enforcement

This Agreement shall be subject to, interpreted, performed and enforced in accordance with the laws of Manitoba and the applicable laws of Canada without regard to Manitoba or federal Canadian law governing conflicts of law, even if one or more of the parties to this Agreement is resident of or domiciled in any other province, state, or country. The parties hereby irrevocably attorn to the exclusive jurisdiction of the Court of Queen's Bench of Manitoba, Winnipeg Centre. The recitals hereof form an integral part of this Agreement. Section headings in this Agreement are for the convenience of the parties only, and shall not affect the interpretation of this Agreement.

11 Severability

If any provision in this Agreement is illegal, invalid or unenforceable at law, it shall be deemed to be severed from this Agreement and the remaining provisions shall continue in full force and effect. The parties agree that they shall endeavor to replace any such severed provision with a new provision which achieves substantially the same practical effect and which is valid and enforceable.

Waiver

No failure or delay by Hydro in exercising any right, power or privilege hereunder shall operate as a waiver thereof, nor shall any single or partial exercise thereof preclude any other or further exercise thereof or the exercise of any right, power or privilege hereunder. No waiver of any provision of this Agreement, or a breach thereof, shall be effective unless it is in writing and signed by the party waiving the provision or the breach thereof.

13. Amendments

With the exception of the inclusion of additional information within the meaning of Confidential Information in accordance with Article 3 herein, this Agreement may not be modified or amended except by a written instrument duly executed by both parties.

14. Assignment

The Confidant shall not assign this Agreement without the prior written consent of Hydro. No assignment of this Agreement shall operate so as to relieve Confidant from any obligation of this Agreement.

15. Further Acts and Assurances

Each of the parties shall, from time to time, do all acts and things and execute from time to time all such further documents and assurances as may be necessary to carry out and give effect to the terms and conditions of this Agreement.

16. **Fax Execution**

This Agreement may be executed in any number of counterparts, including counterparts signed by fax, each of which shall be deemed an original and all of which together shall constitute one in the same instrument. A photocopied and/or fax copy of this Agreement bearing the signature of each party, in a single document or counterparts thereof as provided herein, shall be deemed an original execution version of this Agreement.

IN WITNESS WHEREOF the parties hereto have duly executed this Agreement as at the Effective Date.

MANITOBA HYDRO

Per: _____
Authorized Signing Officer

DR. ATIF KUBURSI

_____
Witness

DR. LONNIE MAGEE

_____
Witness

SCHEDULE "A' TO THE AGREEMENT BETWEEN MANITOBA HYDRO AND DR. ATIF KUBURSI AND DR. LONNIE MAGEE, DATED AS OF THE 14 TH DAY OF FEBRUARY, 2010

CONFIDENTIAL INFORMATION MEANS:

1) the Software;

2) the specific data inputs and outputs used in the Software;

3) the specific mathematical structure of a model or Software;

4) the specific Terms and Conditions (including prices) of contracts for sale of energy to a counterparty;

5) Hydro's export prices, in any existing or proposed contracts;

6) cost estimates of any new resources on the Hydro system;

7) the generation component of Hydro's marginal cost of energy;

8) the specific output of a specific generating station other than information which is publicly available

9) the specific hydrologic flow data, for a specific location, other than information which is publicly available;

10) names or identifying acronyms of customers, or counterparties;

11) specific outputs from Hydro's resource evaluation process for any supply options being evaluated for future requirements, other than information which is publicly available;

12) any energy, capacity, and/or transmission usage pricing information, including but not limited to annual pricing escalators;

13) information as to the amount and/or the allocation formulae associated with the transfer of environmental attributes;

14) information identified as confidential in Hydro's Corporate Risk Management Reports;

15) information identified as confidential in ICF International's "Independent Review of Manitoba Hydro Export Power Sales and Associated Risks", dated September 11, 2009;

16) information provided pursuant to Article 3 of the Agreement effective February 14, 2010 between Hydro and the Confidant;.

SCHEDULE 3

Manitoba Hydro

PO Box 815 • Winnipeg Manitoba Canada • R3C 2P4
Street Location for DELIVERY: 22nd floor – 360 Portage Avenue
Telephone / N° de téléphone : (204) 360-3468 • Fax / N° de télécopieur : (204) 360-6147
mboyd@hydro.mb.ca

November 12, 2010

Mr. Gavin Wood
Gavin Wood Law Office
3 - 430 River Avenue
WINNIPEG, Manitoba R3L 0C6

Dear Sir:

RE: Report of Drs. Kubursi and Magee - Draft Chapters 1 - 4

Manitoba Hydro appreciates the opportunity to review the draft chapters 1 through 4 provided by the PUB independent consultants on Tuesday, November 9, 2010. In general, the report reflects the direction that Manitoba Hydro wants to take with regard to the modeling community, the use of stochastic models, and Manitoba Hydro's goals. However, there are a number of areas where Manitoba Hydro wishes to provide comments and clarifications which may assist in a fuller understanding of Manitoba Hydro's business.

These matters of understanding, or impressions created by the report are of concern to Manitoba Hydro as in the context of Manitoba Hydro's operations, a slight misunderstanding may result in significant time expended in the regulatory framework, and may lead to less than desirable outcomes for all participants. In many cases, it would be helpful for the technical suggestions to be provided in the proper context in order that Manitoba Hydro's major risks are adequately addressed.

Given the time constraints associated with providing these comments, Manitoba Hydro's comments may be somewhat abbreviated. Manitoba Hydro is not in a position to comment on all specific areas in the time permitted, and as such, silence should not be interpreted as acceptance or agreement with the matters contained in the report for which comments were not provided. With regard to Appendix C and Chapter 4, we appreciate the efforts contained in this material and will be studying this material carefully. Manitoba Hydro recognizes the significant efforts dedicated in these areas and will take the opportunity to explore this further.

It appears that insufficient time was available for as thorough a review of SPLASH as may have been warranted given its importance to Manitoba Hydro. It may be necessary to invest additional time, or to qualify the report accordingly. Manitoba Hydro would be pleased to work with you to resolve this issue.

It would also be appropriate for the report to comment on the purposes for which the models are designed and used. The various models at Manitoba Hydro are unique and have different purposes which, in Manitoba Hydro's view, justify the need for separate models. Considerations such as the Corporation's Standard of Conduct must also be taken into account in this regard.

As a general request, please remove the names of Manitoba Hydro employees from the source notes, the documents are provided by Manitoba Hydro.

Manitoba Hydro's specific comments are provided in the attachment to this letter.

We appreciate your consideration of Manitoba Hydro's comments, and welcome the opportunity to review further any matters which require clarification.

Yours truly,

MANITOBA HYDRO LAW DEPARTMENT
Per: M Boyd

MARLA D. BOYD
Barrister & Solicitor

MDM/

ATTACHMENT

Manitoba Hydro Comments on
Chapters 1 - 4 of the Report of Drs. Kubursi and Magee

Please note that Manitoba Hydro has adopted the convention of Drs. Kubursi and Magee and have in some cases referred to Drs. Kubursi and Magee as "KM".

Section 1.2 – it is important to recognize that Manitoba Hydro's major export market is outside of Canada, and in a foreign jurisdiction.

Page 3 of the report suggests that Manitoba Hydro is under FERC jurisdiction, which is not accurate. It would be more correct to note that Manitoba Hydro is influenced by international regulatory bodies, rather than "subject to". Manitoba Hydro's participation in the US export market is voluntary and we do not attorn to the jurisdiction of FERC.

It should also be noted that MISO is not a regulatory authority, but that Manitoba Hydro has a contractual relationship with MISO related to market and reliability functions in the US.

Page 4 – KM have reflected that Manitoba Hydro does not own its own assets. This is not in fact correct; Manitoba Hydro does own its assets, including generation, transmission and distribution assets. The Manitoba Hydro Act establishes the authority of the corporation to own its assets in section 4(3) and provides that: "Property owned or acquired by the corporation shall be held or acquired in the name of the corporation."

Page 5 – there is a discussion which suggests that public guarantees of debt tempt a public utility to gamble, which is quoting a text. It concludes that the rewards of the gamble are vested in Manitoba Hydro. These statements may leave the reader with the impression that Manitoba Hydro is gambling. We do not understand this to be a finding of KM in the context of their review. Further, the suggestion that the reward is vested in Manitoba Hydro is not accurate in Manitoba. The benefits of export revenues are also for the benefit of ratepayers and are passed on through reduced rates.

KM suggest that the philosophical need to align risk levels rests with the regulator (the PUB). However, the report does not acknowledge Manitoba Hydro's own Board of Directors is tasked with establishing the risk parameters for Manitoba Hydro, and for establishing the rates to be reviewed and approved by the PUB. The mandate of the PUB is narrower by virtue of the statute in Manitoba, and as such, the general statements contained in economic texts must be tempered to take this statutory framework into account.

Manitoba Hydro would appreciate an understanding of the reasons for the conclusion that Manitoba Hydro's tolerance and acceptance of gambles "may be (and generally is) different from that of the public". This broad statement does not appear to be supported by examinations undertaken by KM. Inserting the word "potential" in the third sentence

of section 1.2.2 would clarify that these comments are of a general nature, rather than suggesting that this issue has been factually determined by KM. ("The potential lack of alignment of risk tolerance between shareholders and management of Manitoba Hydro could be compounded by these large volumetric risks...")

Page 7, Section 1.2.3 – this reflects the same governance issue noted above. Manitoba Hydro's Board of Directors is appointed by the Provincial government, and as such is representative of the "shareholders" being the people of Manitoba. In all situations, the costs AND benefits of Manitoba Hydro's participation in the export market rest with the ratepayers.

Page 9 – rather than noting that there is a "likelihood" of climate change, this is more accurately noted as a possibility. There are a number of IR's filed in this proceeding that note Manitoba Hydro's studies and findings on climate change. Manitoba Hydro's information is that the variability is no different in the past 10 years than it has been in the last 100 years. In the alternative, the sources of KM conclusions should be cited. Manitoba Hydro can also provide further information as to its current participation in climate change studies if this is of interest to KM.

Page 11 - it should be noted that there were no "domestic supply shortages" in 2003/04. It would be factually accurate to say that there were "hydraulic supply shortages", and that in order to avoid the use of Manitoba Hydro's more expensive combustion turbines, Manitoba Hydro chose to import supply. Bookouts were a more economic way of serving the load and allowed for the maintenance of higher reservoir storage to maximize energy security. It is noted that under current market conditions of low natural gas prices, a loss of the magnitude referenced would not be experienced should similar conditions prevail. The reference to "committed supplies" is also more accurately reflected as "committed sales".

Page 12 – the reference to "serious water modeling" is more accurately described as "comprehensive water modeling". The sentence leaves the impression that Manitoba Hydro does not conduct such modeling. It also creates the impression that Manitoba Hydro does not have a plan to address drought management.

This page also notes the "inherent competition between domestic load and firm exports". While Manitoba Hydro agrees that there is potential for such competition, this is not an accurate description of Manitoba Hydro's circumstances. This is a hypothetical issue as in all circumstances, Manitoba Hydro's firm export contracts have second priority to domestic load, which should be reflected. Manitoba Hydro's participation in the export market is described in the response to CAC/MSOS/Manitoba Hydro I-121(a) and (d). This could also be noted in the last paragraph on page 13 which suggests that this has not been addressed in Manitoba Hydro's contracts.

Page 13 also notes that "Manitoba Hydro has made sure that the two [firm exports and opportunity exports] have equal shares". While this is true for the years noted, this is not a matter of policy or design.

Page 13 – it would be of assistance if KM could expand or reference the "important implications" referenced at the end of the second paragraph.

Page 14 – perhaps it can be clarified whether the reference to Ontario generation is hydraulic only.

Page 15 – "capacity to export" is also constrained by international regulation.

Page 17 – insert "mainly" before "through the Midwest Independent System Operator". Note that the share of exported energy for 2007/08 was 95% to the US, mainly through MISO.

We will await the insertion of the conclusions referenced in Section 1.5.

Chapter Two

Page 41 - First line the reference is more correctly to "CRMSC". The last paragraph indicates "**Recently** MH has defined specific limits...." The current approved version of policy is dated November 22, 2007 and the limits were first established in 2002.

Page 45 – there is a suggestion that "There are many other emergencies and drastic events that may occur that need to be expected and plans made to deal with them." Manitoba Hydro notes that the corporation has developed many preparedness plans as stated in policy:

Manitoba Hydro's Corporate Policy states that "Manitoba Hydro will have emergency response plans in place for foreseeable emergencies arising from natural or man-made events that pose a real or potential threat to:

- the health and safety of employees, contractors, and the general public;
- the assets of the Corporation and related environmental protection;
- the ability to generate, transmit and distribute electricity, transmit and distribute natural gas, and provide related services; and
- the ability of the Corporation to conduct business in the normal course.

Manitoba Hydro develops Emergency Response Plans to ensure the Corporation meets the above requirements. Emergency Response Plans are built to address all hazards and risks to which the Corporation may be exposed, such as fire, flood, gas/electric supply interruption, dam failure, hazardous materials, explosions and emissions, disease, workforce disruption, etc.

Drought has always been a concern for Manitoba Hydro. The suggestion that this was not an important consideration for Manitoba Hydro prior to 2000 is not accurate.

Page 45 – Manitoba Hydro is not able to confirm that "The Front Office argues that it is not needed since 70% of the risks are volumetric and these can be easily, more efficiently and effectively handled by the Front Office." This is not the position of Manitoba Hydro's Front Office.

The referenced to Drought Preparedness Plan being a critical necessity suggests that Manitoba Hydro does not already consider drought preparedness. The process undertaken by Water Management is a weekly exercise which reflects the current circumstances on a go-forward basis. Drought does not significantly alter the ongoing planning. The Power Resource Plan and the supply/demand tables only consider the lowest flow, and as such, the plans for drought conditions are ongoing. The onset of drought is a gradual process and is certainly an integral part of Manitoba Hydro's planning.

Page 56, paragraph 2, first sentence - ST Vista is not a real time operations model, rather it is a short term planning model (ie. next one to two week operating horizon).

Last paragraph, first sentence - Not the Transmission and Distribution Unit, instead should read, "Transmission Business Unit." Manitoba Hydro notes that "Energy Supply and Sales" should be replaced with "Power Sales and Operations."

Page 60 – the seventh conclusion suggests that the utility is using its market power to maximize its rents at the expense of the domestic load. As noted above, this is inaccurate because Manitoba firm load is always modeled as a constraint and as such has priority over any external load obligation, regardless of economics. In that context, maximizing net revenues is appropriate.

Page 63 – the reference to "errors" in the HERMES model is not in any way quantified, and the reader is left without an indication of how significant this issue is, in the context of Manitoba Hydro's risks. Manitoba Hydro believes that using a linear representation is inconsequential, in the context of the risks Manitoba Hydro faces. The approximations made by Manitoba Hydro reflect an adequate representation of the non-linear aspects of the operations in the HERMES and SPLASH models.

Page 67, and generally throughout this section - It is not fair to state that HERMES has failed if it cannot predict actual weather, water and market conditions. For example, the "error" of 11% noted is not an error of the model, but simply reflects the reality of uncertainty in future water conditions, weather conditions, Manitoba load and market conditions, and is not a reflection of the accuracy of the model or Manitoba Hydro's process.

The noted source referencing HERMES on each of the charts is inaccurate. These graphs and charts are not an output of HERMES.

We note that the total revenue figures attributed in page 68 charts are not in fact total revenues, but are export revenues only and exclude domestic revenues which may explain a portion of the variation in export revenues.

Page 69 – the reference to "rise in costs" is unclear. The variances reflected in the chart of page 70 overlook the compensating effect of revenues related to purchases for resale,

and are not related to HERMES, but rather are a result of the function of rules under the MISO Energy market.

The forecasting "errors" incorrectly attributed to HERMES suggest that the overall outcomes can be accurately predicted by HERMES. The financial accuracy of the model must be judged by considering the offset between exports and domestic load, which is affected by economic and weather effects.

Page 72, Table 3.5 - this table is not provided by Manitoba Hydro, and appears to be generated by KM. Please clarify this matter.

Page 73 – the reference to the "worrisome" practice suggests that there is some impropriety on the part of Manitoba Hydro. This is misleading as the forced solution referenced is designed to reflect operational limits such as those associated with Manitoba Hydro's Lake Winnipeg license and is a mandatory requirement of operations.

Page 76 – it must be noted that SPLASH is a Resource Planning model and is not a water and generation management operational tool.

Page 78 – optimization takes place over a one year time frame, and not multi-years, and therefore a discount rate is not applicable.

Please see our comments above regarding the recognition of the need to adjust for non-linear aspects in the linear modeling (p. 63).

p. 79 – it must be recognized that there are more constraints that require the use of different models than just the time horizon. Manitoba Hydro's set of models have been designed to support different decisions of the corporation, which have different time horizons, from hourly to those twenty years into the future.

In response to paragraph three on page 79 – Manitoba Hydro can confirm that Manitoba Hydro has the ability to incorporate any of our contractual liabilities into the modeling process.

Page 81 – please correct the number "86" to "94" years.

Page 81, 4th paragraph – Manitoba Hydro relies only on contracted imports. The first sentence should be clarified to provide that imports are "necessary or economic". The third sentence should also be clarified by inserting "dependable, contractual" before the reference to "energy".

p. 83 – it must be clarified that the reference in the second paragraph is to "dependable hydraulic energy", and "system dependable energy" is comprised of dependable hydraulic energy, dependable wind, contractual imports, and Manitoba Hydro's own thermal generation.

p. 84 – It should be noted that the firm load is not predicted by SPLASH. Manitoba Hydro's load forecast is relied upon for load forecast. The last sentence of the full paragraph is unclear.

Page 87 – first paragraph, fourth line from the bottom, we believe that the word "not" is incorrectly inserted.
In the second paragraph, it is stated that "it is assumed that flows will increase" – it should be added that "consistent with Manitoba Hydro's Board-approved Generation Planning criteria, which relies on the historical lowest flow period."

Page 89 – the sentence which reads "But the model introduces all variables as if they are certain...", and Manitoba Hydro suggests that this should note the exception of water flows.

Page 90 – the statement that "There are a number of issues, however, that need to be addressed before this system can deliver on its promises" is unnecessarily provocative, and could be ended after "addressed".

Page 91 – With respect to the paragraph starting with "Third", as noted above, SPLASH and HERMES serve different purposes and support different decisions. Manitoba Hydro does not agree that there is danger in the models producing different results as the results are fully reconcilable. Manitoba Hydro questions the reference to SPLASH being "optimistic" and requires some context or explanation. It appears that the conclusion that SPLASH is more "optimistic" is based on one factor, however, there are many different (and some offsetting) areas in which one model may be more optimistic than the other, and as such Manitoba Hydro could not support this generalization.

With respect to the paragraph commencing "Seventh", Manitoba Hydro has no reluctance to demonstrate SPLASH and was fully prepared to provide the demonstration, however, the opportunity did not arise after the initial meeting. In no way should this detract from the capabilities of the model. Manitoba Hydro would be pleased to demonstrate this model at your convenience.

With respect to the paragraph commencing "Eighth", the second sentence is unclear. We would appreciate a clarification of this recommendation so that we can consider it in the future.

Page 92 – With respect to the paragraph commencing with "Tenth", the sentence is unclear. SPLASH assumes no non-dependable energy imports are available. SPLASH uses only "firm" imports to the extent necessary up to 100% of the dependable energy import amount. Under the dependable flow case, this means that 100% of firm imports could be called upon. Costs and volumes of imports are considered in conjunction with the use of thermal resources in Manitoba. Manitoba Hydro's gas resources are typically more expensive than the majority of imports being relied upon. Therefore, imports and Manitoba Hydro's thermal resources will be dispatched based upon economics.

In the paragraph commencing "Eleventh" the statement that "When water levels in reservoirs are kept at their minimum levels...the actual costs of a drought would be seriously understated" is incorrect. This statement overlooks the fact that the model, having drawn down storage levels, has already dispatched Manitoba Hydro's expensive gas generation, which additional costs offset the apparent savings associated with withdrawals from reservoir storage. In addition, this conclusion overlooks the fact that water carried over in storage reduces the costs associated with additional imports or allows additional export revenues in subsequent years. To the extent that water levels are drawn down in any one year, there will be a cost in subsequent years to replenish storage levels.

Section 3.2.7 – PRISM
It must be noted that PRISM is a prototype model. It is being developed by Manitoba Hydro and is a work in progress, and does not presently form part of Manitoba Hydro's decision making process.

Page 94 – it is noted that PRISM is an in-house model, under development, built to assist Manitoba Hydro with doing more detailed modeling with its other models.

Page 98, there appears to be a discrepancy between paragraphs 2 and 4.

Load Forecast
Residential Sector – p. 99 we note that the increase in residential load sector was as a result of the acquisition of Winnipeg Hydro.

Page 105 – we note that there are many reasons why customers are attracted to Manitoba, and as such, Manitoba Hydro is not able to confirm that relatively cheap energy is the reason for their interest in the Province.

p. 111 – the suggestion that we limit the reliance on load forecast to five years does not address the fact that Manitoba Hydro must do 20 year planning. Manitoba Hydro agrees with the indication that routine updating of the forecast is appropriate, but suggests that there is no alternative but to use the forecast beyond five years despite the lower degree of certainty associated with longer time horizons. We would appreciate any advice that can be offered.

Conclusions and Recommendations (page 115 and following) – our comments above are reiterated in these conclusions. We also note that the conclusions on SPLASH in the conclusion are not the same as those in the body of the report.

Chapter 4 - Table A4 – Manitoba Hydro System Uncontrolled Inflows is captured by the confidentiality agreement as it is considered proprietary information. Please redact this table in its entirety or remove it from the report.

Manitoba Hydro

PO Box 815 • Winnipeg Manitoba Canada • R3C 2P4
Street Location for DELIVERY: 22nd floor – 360 Portage Avenue
Telephone / N° de téléphone : (204) 360-3468 • Fax / N° de télécopieur : (204) 360-6147
mboyd@hydro.mb.ca

November 15, 2010

Mr. Gavin Wood
Gavin Wood Law Office
3 - 430 River Avenue
WINNIPEG, Manitoba R3L 0C6

Dear Sir:

RE: Report of Drs. Kubursi and Magee - Draft Chapters 6 and 7

Thank you for the opportunity to review the draft Chapters 6 and 7 provided by the PUB independent consultants on Sunday, November 14, 2010. Manitoba Hydro appreciates the significant efforts evidence by the report, and wishes to suggest some areas where Manitoba Hydro wishes to provide comments and clarifications which may assist in a fuller understanding of Manitoba Hydro's business, or items which must be redacted in order to preserve confidential or commercially sensitive information, as detailed in the attachments to this letter.

As noted in our earlier correspondence, these matters of understanding, or impressions created by the report are of concern to Manitoba Hydro as in the context of Manitoba Hydro's operations, a slight misunderstanding may result in significant time expended in the regulatory framework, and may lead to less than desirable outcomes for all participants. Given the time constraints associated with providing these comments, Manitoba Hydro's comments may be somewhat abbreviated. Manitoba Hydro is not in a position to comment on all specific areas in the time permitted, and as such, silence should not be interpreted as acceptance or agreement with the matters contained in the report for which comments were not provided.

We appreciate your consideration of Manitoba Hydro's comments, and welcome the opportunity to review further any matters which require clarification.

Yours truly,
MANITOBA HYDRO LAW DEPARTMENT
Per: M Boyd

MARLA D. BOYD
Barrister & Solicitor

ATTACHMENT

Manitoba Hydro Comments on
Chapter 6 and 7 of the Report of Drs. Kubursi and Magee

Please note that Manitoba Hydro has adopted the convention of Drs. Kubursi and Magee and have in some cases referred to Drs. Kubursi and Magee as "KM".

The issues and comments provided on Friday, November 12, 2010 and Sunday November 14, 2010 also apply to Chapter 7 and accordingly, Chapter 7 should be reviewed in light of the comments made with respect to Chapters 1 - 5.

Chapter 6
Manitoba Hydro notes that the content of Chapter 6 does not address the title of the chapter, "Quantification of Manitoba Hydro Risks". Manitoba Hydro is unclear as to the purpose of the material provided in this Chapter.

Manitoba Hydro is extremely concerned with the inclusion of the data contained in Table 6.1 and the charts created therefrom. This creates the impression of a degree of accuracy which is not reasonably available from the Statistics Canada data used, and the very short duration of the data record (2001 – 2007).

If the intention of this material is to be illustrative of the type of analysis which can be undertaken, this must be clearly enunciated in the document. This statement must be made clear in the document in order to make readers aware of the limitations of the information. Some qualification is included with respect to rates, however, there are a number of other variables for which it must be made clear that the data is not representative of actual Manitoba Hydro data.

This should not be portrayed as a definitive analysis. It is a simplistic analysis. If an analysis of business risks are to be undertaken, it should be done carefully, and not based on summary output information provided by Statistics Canada, as opposed to the underlying inputs and processes that are fundamental to Manitoba Hydro's operations. The level of detail in the modeling documented in this chapter does not align with earlier recommendations that encourage Manitoba Hydro to fully integrate its operational, planning and risk assessment tools. The conclusions reached as to the actual values associated with the particular tables and graphs cannot be supported by Manitoba Hydro data. Readers should be strongly cautioned as to reliance on the actual data produced by this exercise, and the conclusions drawn.

Such an analysis, to be reliable, would require verified Manitoba Hydro data and would be required to take into consideration all relevant factors, including, for example, physical system capabilities (e.g. tie lines, generation capacity), the effects of load growth, new contracts, new generation, changes in market rules, the effects of regulatory changes on operations (e.g. Brandon Unit #5), and correlations between parameters. These examples are not an exhaustive list, but are illustrative of the wide range of

variables which must be considered to undertake a fulsome analysis and from which definitive conclusions are drawn. The information in the table does not include uncertainties for variable parameters and therefore ignores the physical aspects of the system.

Page 248 – it is noted that "Major events and therefore large risks occur in clusters" – Manitoba Hydro is not aware of any data which would support this conclusion.

Page 248 – it is also noted that "Drought is often accompanied by higher import prices". We would refer you to Manitoba Hydro's response to CAC/MSOS/MH I-62(g) which demonstrates that the correlation between drought and import prices is not strong. Manitoba Hydro is a small part of the market, and the occurrence of drought in Manitoba does not drive prices in the MISO market as it is mainly non-hydro based.

Page 248 also notes that "Risks must then be quantified separately and in combinations" – this is more correctly noted to be "...quantified separately and in combinations having regard for their correlations and inter-relationships."

Page 249 – as noted above, Manitoba Hydro views this as an appropriate place for a further qualifying statement regarding this data and the conclusions of the analysis based on the limitations of the data.

Page 250 – Table 6.1 contains many instances of incorrect information. For example:

- The table indicates total export revenues of $1.125 billion, compared to actual calendar year results of $588 million for 2007;
- Firm exports in 2007 are shown as 3,538 GW.h, compared to actuals of 4,136 GW.h;
- The table shows 2007 Canadian firm exports of 1,232 GW.h compared to actuals of 131 GW.h;

Manitoba Hydro has not conducted a complete review of all of the information contained in the Table, but would suggest that any conclusions drawn from an analysis of this information is misleading and dangerous in the regulatory process, particularly in light of the detailed probability analyses that are dependent on the accuracy of this data as inputs. For example, the probability distribution shown in Figure 6.27 relies heavily on the 2007 data of $0.1572 per kwh for Canadian firm exports, whereas the actual price for the only Canadian firm export (Lake St. Joseph return energy) was $0.0014 per kwh.

Page 252 – we note with concern that the last paragraph of this page draws definitive conclusions based on the erroneous information from Table 6.1 and the derived probability distributions created therefrom. We respectfully suggest that definitive conclusions cannot be drawn from this information, and should be noted that the results are only illustrative of the type of process that could be used with this type of data and these types of models.

Finally, it is suggested that the upper bound of the 5 or 7 year results can be obtained by simple multiplication. It is noted that this is an extreme upper bound, and is not consistent with the finding in Chapter 5, section 5.2.2 which correctly noted that water flow data are serially correlated and mean-reverting in the long run. This simplistic calculation could be misleading to readers.

Page 253 – Table 6.2 – Manitoba Hydro notes that this table is an illustrative quantification of Manitoba Hydro's relative risks, and not a definitive valuation of such. Manitoba Hydro suggests that this Table be re-labeled to reflect this, by altering the title to "Illustrative Quantification of Manitoba Hydro Relative Risks".

Page 257 - The reference that Manitoba Hydro has accumulated large long term debt owed primarily to the US is factually incorrect. Manitoba Hydro notes that as of March 31, 2008, Manitoba Hydro's proportion of long term US debt to total long term debt was 35%. The discussion on rising interest rates also ignores the fact that most of Manitoba Hydro's debt is fixed for the long term, and short term changes in interest rates will have very little impact on financing costs.

Page 266 - Manitoba Hydro questions whether it is appropriate for a Summary of Findings to be included in this section having regard for the concerns cited above. Manitoba Hydro suggests that given the illustrative nature of the calculations and the unreliable nature of the data, these conclusions are not supportable. If it is determined that this section will remain, it should be accompanied by a strongly qualified statement. It is also noted that the reference to interest rates as a major cause of risk should be reconsidered in light of the above comments. Further, Manitoba Hydro cannot agree that "changes in labour cost, material cost, purchase of electricity costs and wind have limited Impacts" on Manitoba Hydro's financial position because of the long term and compounding implications of these factors.

Chapter 7
Manitoba Hydro respectfully requests that previous comments be considered in finalizing this Chapter.

In addition to the comments previously provided, upon further review, Manitoba Hydro wishes to express its concern with the comments regarding SPLASH. Section 3.2.6 appears to draw positive aspects, particularly as to KM's satisfaction with the simulation structure of the system and the insights it can add to the utility. Chapter 5 (Finding 4) recognizes SPLASH, HERMES and PRISM as "indispensable operational, planning and risk assessment tools" at Manitoba Hydro. It would be helpful to have some of the more positive aspects of the findings with respect to SPLASH reiterated in the conclusions.

Our further review of Chapter 5 has also disclosed three further redactions required on page 237 of the report. A revised page 237 is attached.

5.2.4.1.5 Will the Prices, Curtailment Provisions and the Import Upset Price in the New Contracts Prove Sufficient to Prevent Seller and Buyer Regret?

The new contracts are structured differently than the old ones in several respects, but primarily by the inclusion o

Contract prices are set at the expected long-term nominal price with escalators to account for inflation and other factors that affect expected prices. MH uses the The latter only reflects the changes in prices in a basket of consumer goods, whereas the reflects price changes in the entire produced over a year. The escalators are not linked to market prices of electricity because that would change the fixed price contract into a variable one which contradicts the logic of fixed price contracts.

The specifics of these escalations are clear and can be summarized as follows:

The contract wit allows the escalation o If, however, th then capacity and energy prices fro calculated using th

In the contract, th but the capacity price is not allowed in any year to fall belo in 2008 dollars. The The fixed energy price in any year is not allowed to fall below in 2008 dollars.

In the contract, the in 2008 dollars. The guaranteed energy price is

g) Dealing in turn with each page containing a redaction in the Report:

(i) page 210 -
contains price information concerning foreign contracts, which information was received in confidence from MH. The redaction confirms positions of KPMG and ICF;

(ii) page 211-
I - contains information on pricing premium with respect to peak period demand. KM's point is that such premium exists. Provided by MH in confidence.
II - contains information on several factors which have affected long term export negotiations. Factors fall within Confidentiality Agreement. KM considered these additional factors in understanding how prices negotiated;

(iii) pages 212, 214, 214-215 and 215
all these redactions deal with factors in export contacts which result in price escalations. This information is part of confidential information provided by MH. KM wishes to consider the appropriateness of these factors for each of the long-term export contracts;

(iv) pages 216 and 217
these redactions deal with curtailment condition provisions under the various long-term contracts. KM wished to consider the appropriateness of the curtailment protection, which MH provided in confidence;

(v) page 218
these redactions involve a summary of certain information referenced in previous redactions;

(vi) page 224 and 288
the redaction involves KM's finding from a comparison of contract prices to international forecasters prediction. KM's purpose was to determine if negotiated contract prices are appropriate. The information falls within the Confidentiality Agreements;

(vii) page 311

this redacted information contains uncontrolled water flow data which KM drew on in various segments of the Report. MH provided this information to KM in confidence.

CHAPTER I INTRODUCTION:
PUB/KM-2.

Reference: Risk Tolerance Page 6, paragraph 3

KM refers to misalignment of risk tolerance between MH and Manitoba public.

a) Describe the characteristics of risk appetite at MH that are different from public risk appetite.

b) Explain the statement the "potential rewards of the risk-taking are internalized within MH?

c) What process is available to ensure the "shareholder" (ie the citizens of Manitoba) is not subject to undue risks or costs from Manitoba Hydro actions and that Manitoba Hydro's management of risk is appropriate?

ANSWER:

(a) The public is typically risk averse and would have little appetite for risk taking. This is not typically the case for utilities and businesses that generally have different assessment of risks, even when they are inclined to be conservative. MH has generally a greater appetite for risk taking than the public; the last drought is a case in point. MH may feel less inclined to stop selling electricity at the early part of a possible drought as precipitation declines in the spring, fearing that refraining from selling electricity at this early stage may represent forgone revenues if the precipitation levels were to change. The public may not have the same evaluation of these forgone earnings; they are not likely to see any change in their rates on their account; the rate setting in Manitoba is not explicitly sensitive to these earnings.

(b) As long as there is not explicit formula that ties rate setting to net earnings of MH and the residents of Manitoba do not have a mechanism whereby they influence the distribution of MH net earnings, the increased earnings from selling electricity at times when a risk exists that water flows may decline means that the rewards of risk taking by MH are reflected in higher earnings for the utility which may not be shared by the rate payers or losses that the rate payers and/or tax payers may have to shoulder.

(c) A risk management plan consistent with best practice in other hydro utilities and best risk management principles of the type described at length in Chapter 2 of the KM Report would help align the risk management plan and risk governance with shareholder expectations. The public would like to see their Corporation is fully aware of expected risks, their consequences, their probability of occurrence and have in place risk mitigation and control plans to deal with them. MH has an evolving risk management plan that is more consistent with best practice, but that there are a few adjustments and improvements

that can be put in place to make it more consistent with expectations and best practice standards. A few of these recommendations have been outlined at length in KM Report Chapter 2 and Chapter 7.

PUB/KM-3.

Reference: Section 1.4. Page 17 Blackouts
Second, 'There are no grounds to believe that there exists a serious material risk for blackouts in Manitoba."

a) Please explain KM's analysis and provide detailed calculations and scenarios to support the above statement.

b) How does the above statement apply in the following circumstances:

i. Drought scenarios.
ii. Generation facility failures.
iii. Transmission facility failures.
iv. Need for load cutbacks/load shedding.

c) Please clarify whether "brown out" events are included in the blackout reference.

ANSWER:

(a) In chapter 4, KM conducted an econometric analysis of the monthly flow data from 1912 until 2005. KM estimated auto-regressive analyses on the data and bolstered this with another check using extreme value distributions. KM found out that the actual minimum that MH uses to calculate dependable energy is consistent with average minimum of all 100 randomly chosen samples of 94 years. While indeed the possibility of a lower minimum exists, these lower minima are at the 2.5% confidence interval. This suggests that such a minimum has the probability of occurrence once in 392 years.

There are also other alternatives open to MH to deal with lower minima. It can use thermal energy generation, wind, and coal until 2017, demand management, in addition to imports. The alternatives may imply excessive costs but these would raise financial issues but not physical constraints that a blackout would entail. Of course there may be generation failures and other severe transmission constraints that could combine to create the possibility of a physical shortage. This possibility can happen but its probability of occurrence is very low. If the two events are independent (a highly likely event), the probability of occurrence is very low.

(b) There is no question that a severe drought worse than any in the historical record would present a serious challenge for MH to meeting reliably domestic load. KM have estimated the probability of this occurrence to be quite low. There could be generation failures but one catastrophic all-encompassing one is surely a remote possibility (if independence can be realistically assumed that would be equal to (1/2)^N where N is the number of generators. The binary assumption of ½ is very high. Perhaps the most worrisome is a transmission failure at a time of shortage. This is indeed a worrisome event with some non-trivial probability.

(c) No. It does not include brown outs.

PUB/KM-4.

Reference: Section 1.4, Page 17 — Drought Reserves

Third 'The financial losses of a severe drought are massive and these can deplete accumulated retained earnings of MIT in less than three years.'

a) Please clarify whether the statement reflects 2010/11 specifically when referring to accumulated retained earnings.

b) Please comment on the relative adequacy of 1FF 09-1 retained earnings in:

- 2015 — after Wuskwatim G.S.
- 2020 — after Keeyask G.S. and Bipole III.
- 2025 — after Conawapa G.S.

c) Does KM consider the retained earnings as a dedicated drought reserve?

ANSWER:

(a) The statement refers to an average situation over the period 2001-2007. This period was specifically chosen because it reflects both a severe drought and above average flows. The calculations are all at the expected value of net revenue (average net revenue). We have calculated the annual average loss of a low flow and high import prices. We did not factor in the inter-years correlations but when the total accumulated net revenues up to 2007 is divided by the average loss, the result is lower than 3. Total accumulated net revenues were estimated at $L407 million (MH-Electric Board t5h7 Annual Report March 31, 2008). Average losses were $343 million for water flows no different than the worst drought in the historic record and $755 million for a worst water flow in the historic record and high import prices capped at $120/MWh (Table 6.2 in the KM Report). Even with an average of the two scenarios the cumulative retained earnings would barely last three years and about two years under the last scenario.

(b) The accumulated net income is projected to increase slightly over the period because the net impact of two opposing forces is projected by MH to be positive. The increased generation that the new investments would bring about would exceed the projected increases in financing and operational costs. The assumptions upon which these calculations are predicated at this juncture of time may be optimistic, as capital costs can rise unpredictably as the economic slag of the current recessions wears off by 2014. Expected increases in interest rates will take their toll on net revenue and these could easily exceed their forecast values. There is also uncertainty as to the value of the exchange rate of the Canadian dollar. The productivity discount (the difference between average labour productivity in the US and that of Canada) is at least 20% in favour of the US. Average labour compensation in Canada is higher by almost 5% than the corresponding US value. These two factors combine to raise Canadian average cost by

over 20% over the US. The exchange rate often reflects values that equalize costs across the border. This suggests that the Canadian dollar would depreciate by an amount not exceeding this average cost differences. Any depreciation in the Canadian dollar would have limited effects because any increase in net income from net exports would just offset increases in debt payment on the US component of long term debt.

The three key and critical variables above define a complicated picture of the possible future effects on net revenues. Increases in capital costs and interest rates would be balanced by depreciation in the Canadian dollar and increases in demand for exports as the US economy recovers, This is why it is quite difficult to see the net impacts on net revenues before a clearer picture of where these key variables would be in the future.

(c) No. KM have argued that an eclectic drought mitigation strategy is needed of which net revenue reserves is a single component.

PUB/KM-5.

Reference: Section 1.4, Page 18 — Water Storage as Risk Mitigation

a) Please expand on the concept of energy storage reserves that could be used to reduce overall retained earnings reserves.

b) Would this concept of energy storage reserves take the form of:

- Minimum reservoir levels in particular periods of the year?
- Restrictions on outflows?
- Constraints on off-peak sales?
- Thermal generation?
- Firm imports?

c) How would such a water storage reserve be costed and allocated:

(i) To export?
(ii) Across other customer classes?

ANSWER:

(a) KM have recommended an eclectic formula for self insuring against a severe drought. The formula is displayed below:

RE = Retained earnings above the targeted minimum
WS = Water level in storage above the minimum determined by dependable energy targets.
r Is the premium rider added to rate payers bills.
B = Borrowing target above the existing level.
= These are the weights that MU will negotiate with its Board and PUB.

It includes a convex combination of a number several variables of which water storage is one component. KM did not fix the weights. This is for MN and Manitoba's oversight institutions to determine. But KM felt that a conservative and proactive risk mitigation strategy should always target to keep more water in storage as a policy and to refrain from taking unnecessary risks of being caught having less water in storage when needed.

(b) The target is exclusively in terms of reservoir levels but surely it takes into account all the other components of the remaining factors listed below the minimum reservoir levels.

(c) There is of course a real direct cost (in addition to an opportunity cost of forgone earnings) to this water level in storage. The assignment of this cost should of course be across all customers domestic and abroad.

PUB/KM-6

Reference: Section 1.4 Page 18— Long Term Contracts

Sixth "Long-term contracts are now well structured...."

(a) Please confirm that KM reviewed the actual contract documents up to 2015 and the pending NSP post-2015 contracts in detail.

(b) Please explain how the "innovative curtailment provisions" would have protected MH under:

i. The 2003/04 flow situation when previous year export sales may have contributed to an energy shortage in the summer and in the winter;
ii. Under the 2006/07 flow situation when summer exports (including diversity sales and off-peak sales) may have contributed to reduced energy supplies and reduced winter exports.

ANSWER:

a) KM have reviewed all term sheets past and present, and the actual contract with NSP post 2015.

b-i) The quotation fragments the entire sentence that should be read in its entirety. It states ... 'Long Term Contracts are now well structured and include many new and innovative curtailment provisions, reasonable escalators and upset heat rate based import prices. But these contracts need to be staggered over time and diversified over a larger group of counterparties."

The new curtailment clauses are far better than those in the old contract and should prove their worth in the event that they are needed. It may be argued that better terms could have been negotiated but that is, in our opinion, pure speculation. If that is the case. one would wonder why MH would refrain from wrestling better terms from the counterparty. The issue with this thinking is the treatment of each component of the contract separately from the rest of the components. The contract has to be seen in its entirety as it is outcome of protracted and difficult negotiations: the agreement is a set of compromises acceptable to both parties.

The exact structures of the curtailment provisions negotiated differ by contract. In the NSP contract the curtailment causes include:
In the event of adverse water conditions (MH unable to meet firm load), MH has the right to reduce guaranteed energy during winter (November 1 to April 30) in increments of 50 MWs provided MH declares this situation by September 15. MH has to pay the positive difference between the contract price and the result of multiplying [redacted] heat rate by the forward price of natural gas (NNG Ventura Index).

Curtailment can be exercised under the following circumstances:

1) [redacted]

2) [redacted]

3) [redacted]

4) [redacted]

MH would follow a curtailment priority criteria in which firm power delivery takes precedence over system participation power sales.

In the WPS (Term Sheets) these curtailment conditions are specified to include:

1) [redacted]

2) [redacted]

a) [redacted]

b) [redacted]

c) [redacted]

d) [redacted]

Also, MH would follow a curtailment priority criteria in which firm power delivery takes precedence over system participation power sales.

The general conditions for curtailment in the contract with NSP are the same as those in the MP and WPS contracts with slight modifications.

The new provisions are clear and spelled out and are far better than those that existed in previous contracts.

b-ii) The curtailment provisions have nothing to do with this special case. The flows in 2006/07 do not qualify for curtailment provisions. This is an issue of managing inter monthly flows and timing of sales rather than curtailment provisions.

PUB/KM-7

Reference:

Section 1.4 Page 19— Environmental Attributes

Tenth "Future long contracts should include a higher proportion of the value of embedded environmental attributes for MH. it is very likely that the heightened concern for the environment will soon translate into higher carbon charges." (Emphasis added)

a) Please indicate the approximate environmental attribute value (%) that KM assumes is included in:

- 2005-2015 NSP Contract.
- 2015-2025 pending NSP Contract.
- Pending WPS and MP Term Sheets.

b) Please explain how higher carbon charges are very likely when:

- U.S. and Canadian legislation on C02 is seriously stalled.
- Coal generation continues to account for at least 50% of the MISO market supply.
- Thermal generation (coal and natural gas) capacity substantially exceeds demand and is currently producing energy at less than MEs average embedded G&T cost.
- Hydraulic generation does not qualify as 'renewable in most U.S. jurisdictions.

c) Please indicate to what extent KM reviewed MH's methodology for forecasting future carbon pricing and provide KM's view on the appropriateness of that methodology.

ANSWER:

a) KM have no estimates of this percentage, but it is KM's opinion that some valuation can be made. The fact that this component is forgone suggests that MH has received some other value in return. This value can be assigned to these attributes.

b) The present situation is characterized by a major US recession that has migrated to many other world economies. Perhaps this is the second time in the annals of the economic history of the previous 100 years that the entire world economies have slumped together. At this time it is difficult to put environmental concerns ahead of economic woes. This situation will not continue. There are serious forecasts (OECD. IMF. and several private consulting houses) that suggest that the economic slump will most likely be behind us in 2014. Climate change concerns are already mounting. There are two conflicting dynamics—the economic decline of major industrial economies and the escalating concern for the environment and increased evidence of serious climate changes. At this

time these two dynamics are working against each other. Once economic growth resumes. the two dynamics would work in the same direction. It is then, and this is forecast to happen soon, the environmental concerns would heighten and the expectation that higher carbon charges would result. Projecting the current situation to hold in the future is not reasonable. but the future is anybody's guess. Hydro generation does not qualify yet as renewable or green energy, but this is a matter of time and politics.

c) KM have not reviewed MH's carbon price forecasts. but there are a number of these in the public literature. The most recent work on this reveals that between $80 and $100 per tonne would be required for any serious policy dealing with climate change. At this time this is a far fetched possibility.

PUB/KM-8.
Reference: Section 1.4, Page 19 — System Expansion

Eleventh. 'System expansion is necessary and massive capital will be needed sooner or later to meet the expanding load in Manitoba...."

a) Please provide the specific load forecast and power resource references that support the conclusions in the eleventh finding.

b) Please clarify how this statement is impacted by:
Economic downturn to 2009 and 2010.
A drop in MH's domestic load of 1,000 to 1,500 GWh/year after 2008.
A weak electricity export market over the last two years.
A possible continuation of low natural gas prices.
A stalled C02 pricing process.

ANSWER:

a) The issue is timing of these investments. Sooner or later, Manitoba demand would catch up to existing capacity. This present cannot be projected forward. There are a number of special events that would not hold for long. These include the present sluggish recovery in the US and to some extent in Canada. Consensus forecasts have marked 2014 as the beginning of a major recovery. The present is also witness to a major decline in natural gas prices. Shale gas has generated an excess supply of gas. Its impact on water and other technical and environmental considerations are being cited as reasons why this excess supply cannot be expected to last for long period. Carbon taxes are very low and a few measures needed to combat global warming and climate change are being shelved. There is no evidence, however, that this reticence and slow response to climate change can be expected to remain in place. The reversal of economic trends by themselves should anchor a healthy and steady rise in electricity demands. When this aided by weather changes and extreme events, the combination would translate into higher and higher demands. Environmental considerations would have limited volumetric impacts given their slow and gradual manifestations but could have serious implications for prices.

b) i) The current economic slowdown has reduced energy demand particularly by industry. This cannot be expected to last beyond 2014 and a few economists and organizations (IMF and OECD) have even projected that recovery would start in 2011 and would take a firm hold by 2014.

ii) A drop of MH load is again a reflection of a poor economic recovery. This recovery is expected to strengthen in the next few years.

iii) Weak electricity exports are also the result of poor economic conditions in the US

and could also be the result of implicit protectionism and buying American. If it is the result of the former, then the expected economic recovery would change the outlook. If it is the latter the rebound in the export market may be delayed but not reversed.

iv) Natural gas prices are low because of sluggish demand for electricity and because of abundant gas supplies on account of shale gas. The water requirements and quality of water impingements could easily slow this reliance on shale gas and natural gas prices could start rising.

v) The stalled CO_2 process is worrisome; it affects prices more than quantities but could reduce profitability of any new investment in generation.

The critical factor is again are the costs and timing of the investment in capacity expansion. History has taught us not to exaggerate the present; it is not the best indicator of the future, particularly of the present is encumbered.

CHAPTER 2: Enterprise Risk Management: Best Practices and MH Procedures
PUB/KM-9.
Reference: xxv Water flow predictions

Several water flow prediction approaches are provided. Please provide a matrix indicating the strengths and weaknesses of each of the approaches proposed and the proposed approach recommended by KM to be followed. Please compare these approaches with the one currently employed by MH.

ANSWER:

water flow prediction approach	description	advantage	disadvantage
Historical simulation (empirical distribution)	Actual past observations are re-sampled	- Intuitively appealing - Easy to understand - Cannot generate nonsensical (e.g. negative) numbers	- does not allow for future outcomes that are different from past outcomes - is particularly restrictive in the way it handles extreme observations, e.g. the minimum observed value becomes the minimum possible simulated outcome by assumption - difficult to simulate possible time series except by simply repeating past sequences
AR(p) model	Current value is predicted by past ("lagged") values with coefficients estimated by least squares regression method	- well-known method derived from Box-Jenkins time series methodology used in many disciplines since 1960's. - flexible, number of lags can be adjusted - easy to use results for dynamic simulations - easy to generalize by including other predictors and transforming variables (see next row) - same simulations can be used for single-year and various multi-year drought predictions	- standard AR approach assumes the process is stationary (e.g. no climate change effects, no change in coefficients during droughts) - no automatic mechanism to prevent simulating nonsensical eg. negative) results. - no sure-fire way to decide on the right or best value of p, the number of lags.
AR(p) with Box-Cox	Like AR(p), but the values of	- transformation can result in better fit	- more complicated than standard AR(p) model

transformation	the original variables are replaced by a Box-Cox transformation of their values	- easy to simulate, then convert to un-transformed values at end.	- if transformation was unnecessary, the extra complexity also leads to less precise estimates
Extreme Value Theory	The distribution of low water flow outcomes is estimated directly	- focuses on the low water outcomes without letting the results be affected by the other outcomes, which might not be relevant. - is well-known technique familiar in financial applications (value at risk)	- unlike the AR approach, EVT is difficult to incorporate in a simulation because it does not lend itself to a dynamic model (where past values are linked to current value)

MH employs the historical simulation method for drought scenarios, and uses the AR method for short-run water flow predictions.

As mentioned above in the advantages and disadvantages, KM's feel that both the AR and EVT approaches are better than the historical simulation method for examining future drought scenarios.

PUB/KM-1O.

Reference: Page 32 Internal Responsibility System; Page 47 & 48;

In the context of MH's main risks, please provide examples of insufficient resources and inadequate authority that currently exists. Please elaborate on the link between accountability and oversight, and that one without the other is not advisable? Please provide examples in MH's current system.

ANSWER:

KM believe it would make a great deal of sense to organize specialized teams to assess major identified risks for their probability of occurrence and their impact on business objectives. Risk teams should elicit assistance from "Subject Matter Experts (SME)" or functional units to assess the risks in their respective fields, but they should all funnel their expertise and calculations to the Middle Office. MH can surely benefit from greater visibility and use of statisticians and actuarial experts and from instituting these expert committees, especially when they are all linked and integrated to the risk management function and the responsible body (Middle Office) for it within the Organization. The Middle Office can surely benefit from recruiting specialized experts in statistics and risk analysis, at present it appears to be under staffed. All of these would require additional resources.

KM found out that at this time of writing their Report, the CRMC was only an advisory body and was without any executive powers. It is here that KM recommended infusing authority to the CRMC.

PUB/KM-11

Reference: Page 34 & 47 Risk Management at MH

a) Based on the schematic provided (pg 34) reflecting best practices. please provide MH's schematic reflecting MH's current risk management framework and compare that framework against best practices.

b) Define MH's current deficiencies;

c) Please identify the areas MB is currently addressing.

ANSWER:

KM believes that there is an evident multiplicity of bodies dealing with risk (EPRMC, PSOMC, and CRMC, etc.). This is not a problem, but it becomes so in the absence of a well defined integrated and centralized structure that can harmonize the lines of authority, obligations and accountability. In the final analysis all of the risks must be combined and integrated. Dealing with all of them simultaneously is critical for the success of the Organization. KM argued for more visible and credible quantitative assessments of risks based on a simultaneous evaluation of the impacts of all identified risks on a coherent basis with a focussed approach and integrated administrative structure. KM suggested that this can best be achieved through Joint Risk Management Committees organized and supervised by the Middle Office through CRMC.

KM noted the absence of Risk Preparedness Plans and Manuals for all costly risks. KM believe that a Drought Preparedness Plan is a critical necessity. It must be completed and instituted in the working mechanisms of the organization immediately. The preparedness plans should not stop at the Drought Plan. There are many other emergencies and drastic events that may occur that need to be expected and plans made to deal with them. A broad preparedness plan can make substantial contributions to the effectiveness of risk management services and plans at MH.

KM observed that MH has set limits and tolerance levels quantitatively in the areas of Merchant Transactions and Customer Credit. The setting of quantitative targets and rules should be extended to all areas of operations particularly power trading and export sales. The Exposure versus Limits reports should cover all aspects of operations with financial implications for MH. Variance and Exception reports should be all encompassing and produced routinely.

Best practice requires that any business transaction should be evaluated on its own but particularly for all the risks that it may encounter. This should be done by the business unit directly involved (Front Office) but an independent review must be undertaken by the Middle Office. Before a business opportunity is approved the Middle Office should validate its appropriateness of the market research, models, curves used to value the opportunity. But more importantly, the Middle Office should independently identify and quantify the various risks

involved in accepting the new business. KM urged MH to direct the Middle Office to undertake such an assessment with every business opportunity above a certain dollar limit but particularly all Long Term Contracts.

Many functions and activities in the organization are operating with deterministic models and frameworks. This is not particularly helpful for an organization that has taken the challenge to manage and control effectively and proactively all of its risks.

PUB/KM- 12

Reference: Page 40 Mark-to-Market and Credit Risk

a) Please provide a description of the Mark to Market (MTM) measures and indicate to what extent MU currently incorporates MTM.

b) Provide an example of how MH should incorporate MTM measures in quantifying financial risk;

c) Please elaborate and provide examples of how the current practice of assigning long-term probability of default to all credit. including accounts receivable, exaggerates the risk exposure.

d) Please explain and provide an example how MH's not using MTM underestimates the credit exposure.

ANSWER:

KM recommended that the quantification of financial exposure should use fair market values (replacement costs). The Mark to Market (MTM) measures should take precedence over other benchmark evaluations of financial risks. This is a preferred measure of value in the energy market and is premised on calculating the true exposure (taking account of unrealized losses and gains of the portfolio) as current prices differ from forward settlement prices. In this respect MTM prices gauge the true value of the financial risk exposure and can be compared to stop loss provisions and other risk tolerance rules set my MH. The MTM measures also help define the requisite financial hedges and their effectiveness. KM, however, have argued that the use of MTMs may have to be limited to financial risks and credit risk evaluations. In this vain KM recommended the use OF MTM to value future contracts. But doing so may open MH to the exposure of new risks but it also avails MH the opportunity to use hedging instruments.

KPMG provided a good and simple example of MTM that KM approves of. This can be located at KPMG (MH-External Quality Review April 2010, 258).

PUB/KM-13.
Reference: Page 44 VAR Utilization

Into what additional areas should MH expand the use of VAR. Please provide the benefits of utilizing VAR in each case.

ANSWER:

KM recommended the use of VAR for risk assessment in the financial area and over the short term. VAR is useful in quantifying how much could be lost (risk exposure) in a given financial transaction (magnitude) in one day, one month or one year (time horizon), with what level of confidence (confidence level, 95% or 99%).

This recommendation would entail MH using a VAR calculation on any and all financial transactions without exception not extending beyond three years.

PUB/KM- 14

Reference: Page 48 Risk Rewards and Penalties

a) Please provide a description of the concept of moral hazard and provide examples of this concept as applicable to MH

b) Please list the current system of rewards and penalties that exist at MH.

c) Please provide examples of systems of rewards and penalties that should be implemented by MH within its risk framework.

ANSWER:

a) Moral Hazard arises primarily in the insurance system. It focuses on the probability of an event that may be affected by the actions taken by the insured. An extreme case would involve an insurance company reimbursing an individual for stealing his bicycle; the individual ha no incentive to take care of his bicycle at all (e.g., locking it). In the health industry, a patient that is insured would have less incentive to take preventative actions to reduce his exposure to disease or injury. This lack of incentive to take care is called moral hazard.

b) KM did not review the system of rewards and penalties used; it simply noticed that no action was explicitly taken to hold a specific person or office responsible for what might be considered "avoidable mistakes" during the drought.

c) This is beyond the scope of KM's assignment.

PUB/KM-15

Reference: Page 51 deterministic models

a) Define Deterministic Model':

b) Define 'Stochastic Model':

c) Define 'Dynamic Model';

In relation to MH's operation, please elaborate on KM's views on the uses of the above concepts.

ANSWER:

a) A deterministic model does not contain random variables.

b) A stochastic model has random variables in it. Random and stochastic are synonyms.

c) A dynamic model relates the value of some variable at a time period to the values of variables in earlier time periods (e.g. at time t-1, t-2, etc.)

The opposite of a dynamic model is a static model. A static model relates variables that are observed at the same time. In a static model changing the value of a variable has no effect on the future. It is not concerned with the time dimension of relationships between variables.

A deterministic model can be dynamic or static.

A stochastic model can be dynamic or static.

A static model can be deterministic or stochastic.

A dynamic model can be deterministic or static.

d) In some cases, MH uses deterministic models in which future values of some variables are projected according to low/medium/high scenarios instead of being treated as random (stochastic). There may be advantages to using models of a more stochastic nature. Two potential advantages are:

(1) there may be more information given by a model containing a random variable that can take a large number of potential values as opposed to just three values, and

(2a) a model containing two related variables can be examined by treating them as stochastic and correlated, as opposed to a deterministic model in which one would be faced with a 3-by-3 array of outcomes corresponding to the nine combinations of low/medium/high scenarios for the two variables, with unstated probabilities of being in the various nine states.

(2b) If there are three or four or more such variables, the deterministic/scenario approach becomes so unwieldy that it is seldom attempted. whereas the stochastic approach remains manageable by specifying a joint probability density function for the correlated random variables.

CHAPTER 3: Manitoba Hydro Models
PUB/KM-16

Reference: 3.2.11 Economic Outlook

a) Explain the 'centrality and criticality' of the Economic Outlook (EO) for MH.

b) What risk exposure arises from the current inputs to the ED.

c) How does the model factor in the economic considerations in export markets?

d) What should the economic model consider given the critical nature of exports and the export market that Manitoba Hydro participates in?

ANSWER:

The centrality and criticality of the EO is based on the use of its forecasts and analysis by all models within MH from Load Demand Model to HERMES, SPLASH and PRISM. This centrality of use and function KM believed should be enough to persuade MH to devote more resources and expertise to this strategic group. At this time, KM feel that there is an imbalance between the functions and status OF EO and EAD and this could be easily rectified. This Department could do more than just combining eclectic forecasts. KM were told that EAD conducts impact analysis and cost/benefit studies in conjunction with environmental impact qualifications. These functions can be extended to a greater familiarity and expertise in modeling and forecasting.

In March of each year the Economic Analysis Department (EAD) of the Corporate Strategic Review Division of MH prepares an Economic Outlook (EO) that becomes a reference for other departments and models. The forecasts included in the EO cover a wide range of variables from Gross Provincial Product to short and long term interest rates, the short term and long term exchange rate of the Canadian dollar, population, employment, unemployment rate, residential customers and commodity prices. Only a limited number of forecasts are made in-house. Most of the forecasts are derived from consulting companies (HIS Global Insight, Infometrica, and Spatial Economics), Canadian banks (BMO, CIBC, RBC, TD Bank, and the National Bank of Canada), and statistical bureaus (Manitoba Bureau of Statistics (MBS) and Statistics Canada) as well as the Conference Board of Canada.

KM noted that there are a number of issues that arise in connection with the use of multiple forecasts and forecasters. Most of these forecasts are made in the context of consistent models (e.g., Infometrica uses its CANDIDE model), and the Conference Board has its own model, as do many of the banks' economic departments. The forecasts they generate are outcomes of the use of their models' structures and assumptions. This fact makes it difficult and inappropriate to lift a single variable forecast from one model and to use it independently of the other forecasts that were simultaneously generated. This, of course, creates a dilemma. If one uses the Infometrica's

forecasts of interest rates or exchange rates, then one needs to use all other forecasts from Infometrica. If other forecast variables are drawn from other models this will amount to mixing apples and oranges.

KM also noted that the real issue is not the independence of forecasts and forecasters but their accuracy and consistency. EAD states, "...Forecasts from Consensus Economics, Province of B.C., Federal Finance, and Desjardins, will no longer be used as they are not considered statistically independent." KM would prefer to see an in-house macro econometric model. This may be asking too much given the resources it would require. It could be sourced out to a University in Manitoba or to a single consulting firm where tests of the accuracy of their forecasts have been carried out. The eclectic approach, if it is the only alternative, should be based not on a large number of forecasters but only on those that meet the accuracy criterion that MH must establish. Averaging their forecasts assumes that they are equally accurate, but they are not. Another way to deal with the problem of using an inappropriately specified forecast is for the EO to undertake a full @RISK specification of the underlying probability distributions that best capture the patterns of these forecasts. If this is not within the capacity and expertise available at EAD, then the experts using PRISM should work closely with EAD to re-generate the forecasts as a full probability distribution instead of a single deterministic vector (series).

The inaccuracies of forecasts would carry both operational and planning risks. Overestimation of revenues creates an optimistic atmosphere of complacency and over commitment. Underestimation would result in the opposite atmosphere; both are costly.

PUB/KM-I 7

Reference: Page 64 Model Validation and Verification.

a) Please explain how model validation and verification should address model inputs:

b) Should MH incorporate back testing of historical results (i.e. expert prices and after levels) in testing model inputs?

ANSWER:

a) Models are evaluated in terms of both their individual components and also in terms of their performance. Forecasting models are validated in terms of the accuracy of their forecasts. This testing can be performed within the sample and outside it. If it is within the sample the model is used to predict an already known value by using actual data on its exogenous variables (predictors) that exist within the sample. For example, the model is estimated for a period 1990-2010, it can be used to predict 2009 using actual values that exist for 2009. Any inaccuracy remaining may arise from the model specification and less from data errors.

KM have recommended the use of back-testing of the type described above.
of forecasts and forecasters but their accuracy and consistency. EAD states, "...Forecasts from Consensus Economics, Province of B.C., Federal Finance, and Desjardins, will no longer be used as they are not considered statistically independent." KM would prefer to see an in-house macro econometric model. This may be asking too much given the resources it would require. It could be sourced out to a University in Manitoba or to a single consulting firm where tests of the accuracy of their forecasts have been carried out. The eclectic approach, if it is the only alternative, should be based not on a large number of forecasters but only on those that meet the accuracy criterion that MH must establish. Averaging their forecasts assumes that they are equally accurate, but they are not. Another way to deal with the problem of using an inappropriately specified forecast is for the EO to undertake a full @RISK specification of the underlying probability distributions that best capture the patterns of these forecasts. If this is not within the capacity and expertise available at EAD, then the experts using PRISM should work closely with EAD to re-generate the forecasts as a full probability distribution instead of a single deterministic vector (series).

The inaccuracies of forecasts would carry both operational and planning risks. Overestimation of revenues creates an optimistic atmosphere of complacency and over commitment.
Underestimation would result in the opposite atmosphere; both are costly.
ns taken by the insured. An extreme case would involve an insurance company reimbursing an individual for stealing his bicycle; the individual ha no incentive to take care of his bicycle at all (e.g., locking it). In the health industry, a patient that is insured would have less incentive to take preventative actions to reduce his exposure to disease or injury. This lack of incentive to take

care is called moral hazard.

b) KM did not review the system of rewards and penalties used; it simply noticed that no action was explicitly taken to hold a specific person or office responsible for what might be considered "avoidable mistakes" during the drought.

This is beyond the scope of KM's assignment.

KM recommended the use of VaR for risk assessment in the financial area and over the short term. VaR is useful in quantifying how much could be lost (risk exposure) in a given financial transaction (magnitude) in one day, one month or one year (time horizon), with what level of confidence (confidence level, 95% or 99%).

This recommendation would entail MH using a VaR calculation on any and all financial transactions without exception not extending beyond three years.

PUB/KM.- 18.
Reference: Section 3.2.3.3. Pages 71 to 77 Forecasting Accuracy of HERMES

a) KM evaluation of HERMES accuracy (generation/export revenue/costs/etc.) focused on annual results; did KM test the accuracy of MHs seasonal forecasts on system outputs as of April 1; July 1; October 1: February 1? Explain.

b) Can KM confirm whether HERMES does/does not target specific energy-in-storage or inflow situations during the year?

ANSWER:

1. KM did not test the monthly or seasonal forecasting accuracy of HERMES.

2. KM know that the ending lake levels are outputs of HERMES and inputs. If these were targets, they would have appeared as inputs.

PUB/KM-19.

Reference: Section 3.2.3. Table 35, Page 77 — Mil Models

a) Please confirm that the comparison of forecast and actual exports is complicated by a possible difference in flow situation definitions:

e.g..

First Forecast	Second Forecast
Based on mean flows	Based on combination of median flows and actual energy-in-storage

b) Please verify that MHs second forecast in each year was made about six months into the fiscal year when about 70-80% of export sales had already taken place or had been committed

ANSWER:

a) KM believe that the difference between mean or median flows would make a difference in the forecasts.

b) KM are not aware that 70-80% of exports would have been made in the first six months of the operating year.

PUB/KM-20

Reference: Section 3.21.3 (Table 3.1/3.2/3.3/3.4), Pages 72-76 —
Forecasting Accuracy of HERMES

a) Please confirm that the most significant non-favorable forecasting errors occurred in the following years:

Year	Generation	Total Export Revenue	Total Cost	Net Income
01/02	-3%	-4% -	+3	-7%
02/03	-3%	8%	+31%	-20%
03/04	-11%	-10%	+15%	-79%
06/07	-4%	0%	+36%	-29%

b) Would KM agree that the above results suggest an apparent limited ability in MH's modeling process to recognize impending drought events?

ANSWER:

a) KM confirms that these are the forecasting errors reported.

b) KM cannot confirm on the basis of these errors that the model would fail to forecast an impending drought. The errors in 03/04 are large for all variables. This is an argument for further fine tuning and stricter validation of the model and its components.

PUB/KM-21

Reference: Page 65 Objective Function

Please elaborate on how the modeling function should change to minimize the cost of generation and delivery rather than maximization of net revenue. Explain how the changes in the objective function would result in model output changes that would benefit ratepayers.

ANSWER:

Maximization of profit is only subject to the production function underlying the generation, other balance and upper and lower bound constraints. There is no output constraint. In cost minimization, a given output is stipulated whose costs would be minimized. In rare circumstances are the two the same (except when a saddle point exists). No output constraint in the profit maximization (or sale maximization) may tempt over selling and therefore greater risk exposure to Manitobans.

PUB/KM-22

Reference: Section 3.2.4. Page 77 Hydrological Models

a) Please provide an overview of MH's use in its current modeling process of various flow and weather-related factors that determine available energy for export in dry and wet periods, including:

- Previous summer flows.
- Fall (October) energy-in-storage.
- Winter (October to February) precipitation.
- Spring (April 1st) energy-in-storage.
- Spring (March/April) precipitation.
- Spring and early summer (April to July flows.
- Mid-summer (July) energy-in-storage.
- Summer (May-September) precipitation.
- Summer (May-September) reservoir evaporation.

b) Explain how MH's modeling process dealt with the variability of each watershed inflow, how MH has dealt with the variable ungauged inflow, and comment on how this could be improved.

c) Please comment on the potential operational benefits that MH might achieve by employing a more rigorous flow prediction process (as listed in (a)) in the seasonal management of water supply and (net) export sales volumes during the summer and winter months.

d) Please confirm that the winter constraints on Lake Winnipeg outflows are:

- Most significant when fall Lake Winnipeg levels are at lower end of the operating range (711).
- Less of an issue when fall Lake Winnipeg levels are above the mid-point of the operating range (713±).
- Reduced if MH cuts back on summer export sales.

ANSWER:

a) KM have not examined the HERMES model at this level. Evaluating seasonal variables at the level required above would have entailed far more resources and time than we had available.

b) KM are not in a position to confirm the way MH deals with un-gauged flow but is aware of the way MH treats variability of watershed inflows.

c) KM have argued for the integration of hydrological models to improve its explanatory and predictive capacities of HERMES and even SPLASH.

d) KM are aware of these constraints but not in the way set in the posed question.

PUB/KM-23

Reference: Page 79 Hydrology Models

a) Please elaborate on the expected benefits from hydrological model in HERMES and SPLASH:

b) Discuss, in the context of forecasting errors observed in the HERMES model, how would the use of such a hydrology model during the 2003/04 to 2006/07 timeframe have potentially improved the reported financial results.

c) With respect to the quality control of model input data. please explain whether KM reviewed Hydros hydraulic accounting for possible errors or inconsistencies?

d) Did KM assess whether Manitoba Hydros hydraulic data is accurate and are their data collection and management methods appropriate?

Answer:

a) KM have recommended the use of hydrological models. The excessive dependence of MH on water conditions makes this modeling a necessity. The way KM believe hydrological models would help in firming up the modeling of precipitation, evaporation, spills and un-gauged flows. Hydrological modeling would explain these variables in terms of their determinants and would help in gauging the responses of these key variables to different weather and temperature specifications. Furthermore, the water flow equations would be based on valid structural determinants rather than statistical or simple averaging procedures.

b) This is a technical consideration and can only be confirmed when the hydrological model is in place. KM suspect that this would improve the ability of MH to handle future droughts.

c) KM is not in a position to respond to this question.

d) KM used the data between 1912 and 2005. They are aware of the data accuracy issues raised about data before 1942. KM used statistical processes to pick 100 samples that allowed KM to abstract from quality limitations of the data.

PUB/KM-24

Reference: Page 79 Model Synchronization

Please indicate to what extent the models use different data inputs, and coefficients and explain the actual consequences.

ANSWER:

NYC had raised questions about different energy production coefficients between HERMES and SPLASH. KM have noted and agreed with NYC's concern but not her calculations. Theoretically using the wrong production coefficient could drive a wedge between the actual and forecast values of generation. The wedge could lead to sub-optimization because it may use less or more water to produce a given amount of electricity or more or less electricity from a given amount of water. MH claims that system operators do not hold water flow or production of electricity to the forecast values of the model. If system operators were to hold more water than is necessary given the wrong production coefficient, this water represents forgone revenue particularly it would be spilled or sold at lower values than what could have been obtained.

The losses cannot be high and are pale by comparison to changes in export prices, water flow conditions, and load variations. It would be appropriate for MH to examine this issue and assess the accuracy or lack of it the calculations of the NYC and those made by KPMG.

KM are convinced that these issues would be resolved when the different models are integrated and put on the same platform.

PUB/KM-25

Reference: Section 3.0, Section 3.2.5. Pages 85, 89, 91. 93 — SPLASH Forecasting Process

a) Please explain how the interruptible clauses could be input into the 94 year simulations in SPLASH, when each fiscal year is assumed to start from a full reservoir situation and the drought or adverse water situation may not be apparent until at least mid-summer or even September and therefore relief for MH might essentially apply to only winter exports.

b) Please confirm that this interruptible clause relief would only apply to the energy deficiency' that is incremental to the worst historical year.

c) Did KM conclude that MHs Rule Curve (Pages 91-93) required either:

- Specific energy-in-storage levels at particular times of the year?
- Minimum Lake Winnipeg levels in fall (October) of each year?

d) Is MH's Rule Curve compatible with the 1FF mean hydraulic generation and export predictions?

ANSWER:

a) It would be difficult to introduce the curtailment provisions in SPLASH but not in HERMES. This said the model operators can intercede with overwriting a particular value in a given year. KM are not thoroughly familiar with the gear work of SPLASH, but this can easily be done in HERMES.

b) Yes and no. Under the worst drought scenario on historical record, force majeure and other system failure.

c) A good insight of SPLASH is embedded in the outcome of simulating all possible sequences of the low flow. The emerging envelope of the highest required reservoir elevations will be determined and referred to as the rule curve elevations. If the controlled reservoirs are kept at or above these levels in forward simulations the system is guaranteed to meet all firm energy demands even if low flows on record were to be repeated. This envelope is the expression of the minimum level required in storage by SPLASH. When the simulations are run to meet firm energy demands under critical conditions, market prices are not considered. Regardless of the cost of imports the system will import all it can to remain in a position to meet the firm load. If prices were to change no adjustment is made to the rule or dependable energy runs. But volume quantities in either supply or demand will change the rule curve reservoir levels. The rule curve elevation will decrease with new energy sources and will increase with higher new demands.

d) The IFF is based on mean reverting flows and is not designed to reflect critical but actual flows.

PUB/KM—26.

Reference: Section 3.2.5, Page 87— Opportunity Export/Import Prices in SPLASH Forecasting Process

a) Is it KM's understanding that the revenue/cost unit price profiles are proportionally the same for each load year in the forecast regardless of the water supply situation?

b) Can KM confirm that the revenue/cost unit price profiles in 2003/04 and 2006/07 were not consistent with Figure 3.13?

c) Please comment on potential impact of shortage pricing on 1FF results.

ANSWER:

a) KM's understanding is that these are prices are either set by PUB or obtained in the MISO and export markets where MH is a price taker in the opportunity market and contractual in the firm long term markets. Whether they vary with water conditions or not is not particularly relevant. Revenues are of course affected as volumes change with water conditions.

b) The depictions in Figure 3.13 are about slopes and not about any particular unit price or unit cost.

c) Shortage prices would affect directly and significantly the IFF. Imports of electricity at high prices would impose a major cost on MH and would reduce significantly its net revenues if exports are constrained and/or sold at lower prices than import prices.

PUB/KM-27

Reference: Section 3.0. Page 91 — Lake Winnipeg Critical Period Trajectory

a) Please confirm that the Figure 3.17 suggested use of Lake Winnipeg storage requires perfect foresight with respect to:

i. Initial onset of pending drought:
ii. Assured inflow hydrographs;
iii. Reasonably priced imports to support or allow retention of energy-in-storage for an unknown 3-4 year period.

b) Does KM consider this Figure 3.17 scenario to be a realistic possibility and should the IFF be based on such an assumption?

c) With reference to Pages 89 and 91, please explain KMs understanding of Full Supply Level on April 1, 1938; is this equivalent to Lake Winnipeg at 715.0 or 713.5? (in Figure 3.17) or any particular level of energy-in-storage?

d) Can KM confirm that the minimum supply level of 711.5 and the 1938 minimum flow situation would allow MB to supply firm load (domestic and export) via thermal generation and firm power purchases without violating MHs reservoir licenses; if not, please indicate the resulting energy-in-storage situation.

e) Can KIVE indicate the order-of-magnitude of the changes in IFF hydraulic generation that results from the assumption that flows will always increase at the end of a drought or revert back to the average?

ANSWER:

a) Perfect foresight is assumed with respect to i), ii) but not iii). Actually SPLASH is predicated on importing all its needs regardless of price to meet firm demands.

b) Figure 3.17 is a simulation and as such it is a construct which may or may not be met in actuality. KM cannot suggest that the IFF be based on it.

c) It is based on 713.5 on April 1, 1938 but rising to FSL which is closer to 715 by Sept. 1, 1938.

d) No it would not without violating the reservoir licences.

e) This assumption underlies IFF forecasts and operations; there are only two choices here. First, MH will use a generalized rule such as mean reverting one or it has to make forecasts about the water flow conditions without a hydrological model. KM's preference is for hydrological based forecasts to underlie IFF.

PUB/KM-28

Reference: Section 3.2.8 Page 104

Please elaborate on how the external forecasts of prices may be supported by a "firmer probabilistic approach" within PRISM.

ANSWER:

The current forecasts are in the form of a single vector. If they were generated from a probability density function, it would be a richer display with different confidence levels. This ability to fit a probability density function to a vector is embedded in @RISK and can easily be used. This procedure would add a stochastic flavour to the results.

PUB/KM-29

Reference: Page 96 SPLASH VS. HERMES

a) Please elaborate on the extent to which SPLASH and HERMES are integrated. Please elaborate on the different results experienced between SPLASH and HERMES.

b) Please elaborate on the "real danger" and the implications on MH of SPLASH and HERMES producing different results on how risks are managed.

c) Given the confidentiality agreement under which the assignment was undertaken. please indicate what reasons were provided for not allowing KM access to SPLASH on the same basis as that provided to HERMES.

ANSWER:

a) SPLASH and HERMES are not physically integrated. They are run separately, use different solvers, assumptions, operated by different people and backstopped by different arrangements. They are designed for different purposes and cover different time periods, steps and slices. At this time they cannot be expected to generate similar answers and differences have been already noted. Their integration is not a simple matter, but would help reconcile any differences.

b) Reference the answer to PUB/KM-24.

c) KM requested to see model runs of SPLASH. This was not done, instead KM received many written documentations on the nature and output of SPLASH but not its equations and structure.

PUB/KM-30

Reference: Page 96 SPLASH

Please elaborate on what would be incorporated in an audit by an external committee of experts and the benefits to be derived by having such an audit.

ANSWER:

An audit would review the structure of the model (equations, variables, constraints, and objective function), inputs (data structure and accuracy), model results and forecasts. These would be assessed by themselves and in comparison to other models used by different utilities. KM believe that this committee would elaborate on forecasting errors, actual uses, and may recommend making the model dynamic and stochastic. It is hard to second guess what this committee of experts would recommend, but this exercise would bring to the table arms length practitioners with experience and expertise to enrich the model formation and use process at MH.

PUB/KM-31

Reference: Section 32.11 Page 117

a) Please provide the referenced document which outlines the Economic Analysis Department forecasting methodology.

b) Please indicate which scenarios were discontinued and why such scenarios were discontinued.

ANSWER:

a) The document is referenced as " Forecasting Methodology: To be used in the Forecast of Economic and Financial Variables !O2010." released April 22, 2010.

b) There were two scenarios that hypothesized a stagflation condition where the rates of unemployment and inflation increased simultaneously. The document declared obsolete the following: Alternative High /Low scenarios and the scenario's that were developed in 1980s

PUB/KM-32
Reference: Section 2.2.5 Page 129 Weather

a) Please explain how weather is currently incorporated in the HERMES model and discuss the implications of it being included in only one equation. Please expand on KM's recommendations that MH should consider the inclusion of weather in other equations in the model.

b) Please identify the date. author. and file a copy of the Report on weather and climate effects on precipitation and evaporation.

c) Did KM request access to the models that generates the Report in (b) above.

ANSWER:

The weather here refers to temperature and it is included in HERMES on a weekly and daily basis. Given the high sensitivity of several load variables to temperature and weather, KM are convinced that this addition would bear fruits in terms of tracking accurately changes and could be reflected in more accurate forecasts.

Bill Girling, Resource Planning & Market Analysis. Status of Drought Research in Manitoba Hydro. DRI Workshop, Saskatoon, January 11, 2006.

Reference in the paper was made to SPIGOT: Stochastic Model. KM requested this Model but did not receive it.

CHAPTER 4: Water Flows: Statistical Modeling.
Predictions of Droughts and Other Issues

PUB/KM-33

Reference: Section 4.1. Page 132— Water Flows/Hydraulic Generation

a) Please provide KM's understanding of the following. on an order-of-magnitude basis:

Watershed	Average Watershed Flows	Average Overall Potential Hydraulic Generation Contribution
Upper Churchill River	19%	
		32%
Saskatchewan River	20%	
	Subtotal 39%	
Winnipeg River	39%	
Red River		
Local Lake Winnipeg		68%
Local Nelson River		
	Subtotal 22°/s	

b) Please explain the extent to which the KM review dealt with both the watershed river flow inputs to HERMES/SPLASH and the hydraulic generation outputs by watershed.

ANSWER:

a) KM surmise that the table is meant to indicate a discrepancy between the 39%-6% split in average watershed /lmt'.s and the 32%-68% split in average overall potential hydraulic generation contribution. The difference between these two splits may be due to differences in the two concepts — e.g. waterflow may not translate one-to-one to potential hydraulic generation —because the power coefficient changes with waterflow

b) KM's review of HERMES/SPLASH concerned the overall methodology of the programs and their inter-relationships. The models are highly disaggregated - they model the separate watersheds and hydraulic generation outputs in detail.

KM did not review the river flow inputs into the 2 Models or the hydraulic generation by watershed.

PUB/KM-34

Reference: Section 4.5, Pages 138-150. Table 4.5. Page 151 — Prediction of Low Flow Conditions

a) Please confirm that each of the three methods On Section 4.5) for generation prediction had a wide output range for the specified drought situation identified below:

• Single-year minimum over 94-year period: values of 54.378 cfs were actually recorded. but predictions ranged from about 30,000 to 80,000 cfs (Table 4.5).

• For the minimum 5-year water flow (in 94 years): predictions ranged from 60,000 to 100,000 cfs while 82,085 cfs was actually recorded (Table 4.6).

• For the minimum single month flow (over 94 years): predictions ranged from about 11,000 to 40,000 cfs compared with an actual minimum of 16,320 cfs.

b) Please comment on how the above results reflect on MHs current antecedent forecasting process; Is MH's process prone to over estimating flow in dry or drought situations?

ANSWER:

a) The single-year, 5-year and single month minimum flow ranges reported in this JR do indeed appear to be quite wide. Their wideness depends on the choice of quantile, which is arbitrary. KM chose 2.5% and 97.5%. in keeping with what we consider to be the most common choice of confidence level for confidence intervals, 95%. If we had chosen 99% (that is, 0.5% and 99.5% quantiles) then the range would have been even wider, and if we had chosen 90% (that is, 5% and 95% quantiles) they would have been narrower.

The main point is that the single-year and five-year minimum flows that were observed in the 94-year period may be quite different (smaller or larger) than the corresponding minimum flows that will be observed over the next 94-year period.

b) KM would not conclude that MHs current practice of using the observed minimum to represent a kind of benchmark drought scenario is prone to overestimating underestimating flow in drought situations. The observed minimum flow tends to lie roughly in the middle of the range of predicted minimum flows. KM's point is not that its process overpredicts, but that it does not capture the fact that future dry situations will not all be the same as the past ones.

CHAPTER 5: Review of Risk Reports: A Critical Evaluation

PUB/KM-35

Reference: Section 52.O Page 167

a) Please provide a listing of issues that were not sufficiently addressed by previous parties. Please indicate the deficiencies by issue and by party.

b) Please provide a table listing the claims on pages 167 to 173 and in each case provide KM's reasons as to whether the claims are of substance and need attention.

ANSWER:

a) Issues related to models integration, stochastic and dynamic specifications, use of probability density functions instead of forecasts vectors, issues relating to the development of Internal Responsibility Matrix, internal generation of economic forecasts, environmental regulatory risks, etc.

b) the NYC still makes a number of serious allegations about defective, erroneous and stale inputs, flawed modeling structures particularly in the hydrology framework, manipulation of input and output data by Front Office, wrong forecasts, inappropriate use of the model outputs in power trading and FTR bids, the concealment of model data and results rendering the model a "black box". Furthermore, the Consultant also claims that the Front Office engages in self-evaluation without any vetting and validation by Middle Office raising serious issues about the lack of checks and balances in reviewing and validating the models, inconsistencies among the models inputs and outputs; HERMES and SPLASH use different model parameters, inappropriate use of the models in risk assessment, and the lack of any contribution to risk mitigation especially in PRISM. The Consultant also presents a number of estimates of the costs these mistakes would entail for MH and the rate payers of Manitoba.

The Consultant claims that not using current market prices in HERMES has resulted in inappropriate water releases that sub-optimised operations, resulted in lower revenues in the range of millions of dollars, and exposed MH to greater financial risks. Furthermore, the Consultant alleges that the prices used in the Generation Estimate Report and those used in HERMES are different. This gives rise to different financial results confusing decisions and engendering inefficiency at MH. The Consultant is particularly unhappy about the current MH use of antecedent forecasting. NYC believes that this method can be improved by back-testing and disregarding water flow data before 1942. Another allegation is about the critical assumption in SPLASH of perfect foresight, where the model assumes lake ending water levels that cannot be expected in the real world, raising concerns over using the SPLASH model to estimate the cost of drought. Furthermore, NYC alleges that there are serious discrepancies between SPLASH and HERMES in regard to lake level balances which has resulted in different financial forecasts used in the IFF.

KM argue that the quantity constraints are obviously more critical determinants of MH's operations, but this does not eliminate the concern that the correct and most up-to-date prices should be used. The financial implications of price-mistakes can not be exaggerated. KPMG created a number of scenarios where they use forecast prices versus actual MISO prices in the optimization runs. The differences they found ranged up to $45 million (KPMG, 104-108). This is not a small amount of money and serves to indicate that accurate price forecasts are a key determinant of forecast net revenues.

Furthermore, the Consultant alleged that MH assumes a 100% correlation between on-peak and off-peak prices. The actual prices in HERMES had a correlation coefficient of 0.59 and 0.62 whereas the actual market data (ex-post) show correlations of 0.81 and 0.84 for the MHEB node. The true correlations were higher than both MH's and the Consultant. The latter claimed that the correlation was only 40%. In this respect, neither party has used the correct correlations. The assumptions made about the presumed correlations between off-peak and on-peak prices need to be rooted in actual calculations.

The Consultant claims that the accuracy of the historical water flow data before 1942 is not high. However, in our opinion, to discard this series is unjustified. The use of the historical series as if it is the only reliable series on which to base calculations of dependable energy is also not recommended. By drawing over a 100 different samples of 94 year flows generated by a statistical process AR (3), which KM have complemented by an extreme value distribution, KM have demonstrated that the minimum of the actual historical series is consistent with the average of all the minima computed from the stochastically generated series.

Different production coefficients in HERMES and SPLASH are a problem. This problem pertains to the nonlinearity of the generation equation that links water flows to energy and the time strip differences between the two systems. Harmonising the two systems on a common platform will minimize these discrepancies. The revenue losses due to this problem are limited and nowhere close to NYC's exaggerated calculation of $26 million.

HERMES, SPLASH and PRISM are indispensable operational, planning and risk assessment tools at MH. These decision support tools are consistent with the standard systems currently used in many leading utilities in North America. They can be expanded, harmonized, and integrated. They should be reviewed internally and externally and upgraded and updated regularly. BC Hydro and Hydro Quebec have or are moving to dynamic and stochastic systems: MH may wish to follow suit. A hydrological sub-model to complement HERMES and even SPLASH should be considered seriously as water management issues become more complicated under possible climatic change.

The MH systems require formal documentation, more staff should be trained on using and supporting the systems, that external reviews are needed, and that the Middle Office should be involved (particularly in verifying and checking the results). The PRISM model should also be run in the Middle Office.

Notwithstanding the small dollar amount of discrepancy between the Generation Estimate and HERMES solutions, these discrepancies raise concern about the accuracy of the model and the

reporting system. The real problem is more profound. HERMES and SPLASH are static models and do not handle time in a manner consistent with dynamic programming. MH may wish to consider some of the existing dynamic programming systems in use in other utilities.

The predictive accuracy of HERMES can be improved. The antecedent forecasts need to be reviewed. Back-testing should be used. The practice of continuous adaptive forecasting reviews and fine tuning has its benefits.

HERMES is not directly linked to the trading floor and its forecasts are not used as bids on the floor. But whether HERMES is relied upon to inform decisions in the opportunity market is another matter; models are useful tools for informing users' decisions, not replacing them. It makes sense, however, to dispel this concern by streamlining and documenting trading decisions and practices.

KM are in agreement with ICF International, Dr. Bhattachryya, KPMG, RiskAdvisory, all share the general appreciation that MH's Middle Office is evolving and that major progress has been made towards best practice. We all also recognize that much is needed in terms of strengthening the HR expertise set at the Middle Office, the independence of its functions, the MTM measures of all risks, the expansion of risk limits standards and process control limitations to all aspects of MH functions, the development of an Internal Responsibility Matrix, the need for quantification of risks at Middle Office, and its involvement in contract risk assessment. Most of us recognize that there is some merit in NYC's comments about risk governance issues with respect to the independence of the Middle Office and the greater need for oversight, but we all disagree with her claims of lack of competence in the CRMC, and the concealment and manipulation of data by the Front Office.

PUB/KM-36

Reference: Section 5.2.1.5 HERMES Model Accuracy

a) Please indicate to what extent KM validated the claims of the Consultant that the HERMES results called for lower levels of water balances than is warranted in future prices and risk management.

b) Indicate whether KM attempted to validate the loss calculations for 2006/07 by the NYC and by Dr. Bhattacharyya.

ANSWER:

a) Even if HERMES calls for lower levels than is justified by future export prices or best practice risk management, this pre-supposes that HERMES' forecasts are directly used by operators. This MH has assured KM is not the case and KM have no basis to doubt this.

b) There were very scanty data or information of how NYC calculated anything. All the NYC formulas and procedures were considered intellectual property of the Consultant. Some independent checks using what KM surmised may be the basis (VaR) did not confirm the NYC's loss calculations. While Dr. Bhattacharyya did not claim to have intellectual property rights on his calculations, his assumption were based on old data that were overridden by events.

PUB/KM-37.

Reference: Section 5.2.1.1 Model Inputs: Prices Page 174 Paragraph 3

a) KM refers to KPMG scenarios as showing forecast pricing differences versus actual MISO prices, up to $45 million dollars. What is the resultant impact of such differences on MH's 1FF?

b) What independent verification did KM perform of MHs expert price updates.

c) What is the quantitative impact on MH at present, arising from the KM Finding Number l (page 176), if any? What benefits derive for MH by using the same price inputs in the Generation Estimate report?

ANSWER:

a) Forecasting errors of HERMES are not translated into financial losses unless these forecasts were used by operators. KM were unable to confirm that these forecasts were used in operational decisions at MH.

b) KM did not verify MH's export forecast other than through the accuracy of the results given by HERMES.

c) KM would like to see MH developing an alternative to purchased forecast by building the forward price curves.

PUB/KM-38.

Reference: Section 5.2.1 Pages 184 to 187

a) Given the discussion related to forecasting errors in HERMES. what analysis did KM perform to verify or refute what is KM's view of the Consultant's claim that "many errors have been found in HERMES' forecasts and these have resulted in large financial losses".

ANSWER:

The forecasting errors in HERMES are annual errors. The operations decisions are daily and MH is adamant that they are not based on model forecasts. Therefore, it is not possible to claim that these forecasting errors imply financial losses.

PUB/KM-39

Reference: Section 5.2.2 Page 189 Drought Risk

Please provide a table that compares the probability of a drought estimated by KM, the Consultant KPMG, and ICF. Also include the calculated cost of a five year drought from KM. the Consultant, MH, KPMG and ICF. Compare and contrast the results and provide KM's view of the reason for any differences in the calculated amounts.

ANSWER:

It is difficult to compare and contrast the estimates of the probability of a drought and its consequences of the different consultants. The estimates differ markedly because of the many different assumptions that underpin the forecasts.

ICF estimates are discussed in the ICF. Independent Review of MH Export Power Sales and Associated Risks on page 114. The details of the probabilities and confidence levels are as follows:

PUB/KM-40

Reference: Page 203 MH Long Term Contract Risk

"Fourteenth, the large capital projects to be undertaken by MH will act to pre-empt further expansions in the US. With large wind projects expected in the near future, it s a strategic imperative to stake a claim in the market ahead of others plan to expand."

Please explain how the INTRODUCTION of shale gas and the availability of cheap natural gas for the next ten to twenty years will impact the expansion of CCGT in MH's export markets at incremental costs below that imbedded in proposed export contracts and affect Tenn Contract Risk.

ANSWER:

The decline in gas prices will have serious impacts on MH's opportunity exports, but not those covered by long term agreements. Actually, this development is a strong argument for Long Term export contracts that protect MH from the slump in expected electricity prices. To the extent that long term contracts hold, they will result in higher net earnings for MH and therefore greater resilience to risks.

PUB/KM-41

Reference: Section 52.4.L2 Long Term Exports Page 210 Finding 11

a) Detail the information reviewed by KM and advise whether long term exports will always lead to positive net revenues?

b) If net revenues are not positive, how do the other identified benefits support the plan for long term export contracts?

ANSWER:

a) KM reviewed NSP contract and the term sheets of other contemplated contracts. KM are satisfied that the negotiated prices would cover MH costs and generate positive net revenues as long as inflation rates are moderate and the escalation clauses firm real returns. Should inflation rates escalate quickly, negotiated prices would erode as the escalators do not cover the full inflation escalation.

b) Even when net revenues are not positive, the other benefits from the counter-parties' investment in expanding transmission capacity, MH having indirect influence through trading partners in the MISO market, the diversity contracts and other intangible benefits of voice and association carry financial benefits that should not be discounted.

PUB/KM-42

Reference: Page 212 Subsidization

a) Provide and explain KM's calculations of MI-I's long term marginal cost of generation and explain why it could be declining over a relevant range given the large fixed cost involved in generation.

b) Please confirm that KM were provided with MH's latest G&T Capital cost estimate:

Wuskwatim G.S. $1.7 B (CEF-07-1)
Keeyask G.S. $4.6 B (CEF-09-1)
Conawapa G.S. $6.3 B (CEF-09-1)
Bipole $2.3 B (CEF-07-1)/$4.0 B (WFP MH update)

c) Please confirm that these projects would impact MH's future 1FF expenditures by about:

$150 M/yr after 2012 (Wuskwatim in-service)
o incremental cost 1500 GWh/yr @ 10.00 KWh
$400 M/yr after 2018 (Keeyask in-service)
o incremental cost 4400 GWh/yr @ 9.0O/KWh
$550 M/yr after 2024 (Conawapa in-service)
o incremental cost 7700 GWh/yr @ 7.00/KWh
$200 —350 M/yr after 2018 (Bipole RI in-service)
o incremental cost 12000 GWh @4.0 to 8.00/KWh after 2018 @ 1.7 to 3.00/KWh after 2024

d) Please explain KM's understanding of MH's approach to cost responsibility of exports vs. Domestic on each of these projects as they come online and in effect increase the average cost of bulk (G&T) power from about 4.50/KWh in 2010.

ANSWER:

a) KM used two methods to calculate the marginal cost of generation. First, the cost of material and fuel purchased divided by generation. The second method, which is more appropriate, involved dividing the change in operating costs by the change in generation on an annual basis and taking the average over the years. Both methods result in almost similar values -- a long run marginal cost of about 1.55 cents per GWh. The long run marginal cost is expected to decline because the average total cost is declining and the marginal cost is always below it. The average cost could decline but the marginal cost may be increasing but is always below the average total cost in the declining range of the average total cost.

b) KM can confirm that they have the exact costs for Keeyask, Conawapa and Bipole III. KM do

not have the exact capital cost estimate for Wuskwatim. The difference is due to the CEF-09 vs. CEF-07.

c) KM are not in a position to confirm the entirety of these numbers. KM have the incremental capital cost but no the per GWh numbers.

d) KM cannot respond to this question as there are some numbers missing.

CHAPTER 6: Quantification of Manitoba Hydro Risks

PUB/KM-43

Reference: Page 25 Financial Risk Mitigation

Please discuss how MIT should address financial risk mitigation related to an economic downturn. How should such considerations be factored into the review of the risks related to major investments in infrastructure?

ANSWER:

MH does not list economic downturns as one of the risk variables in its CMRC categories; it is subsumed under the different components of demand (Domestic Load and Exports). But economic downturns also affect supply and costs. Slow economic growth is associated with lower labour and capital costs.

KM has not seen any separate discussion of the risks attendant to economic slowdown or the mitigation measures dedicated to deal with their consequences. The fact that economic slowdowns work in opposite directions on demand factors and supply factors lessens the severity of their consequences.

PUB/KM-44

Reference: Page 27 Risk Ranking Scoring

Please provide an illustrative example utilizing the risks faced by MH on the metrics of probability,. cost consequence and risk ranks.

ANSWER:

KM has undertaken the calculation of the probability and consequences of a number of variables affecting MH net income. By way of example we can examine the probability of a drought as severe as the one in the historical record, five year drought and 7 year drought.

The details of the impacts and consequences are depicted below:

The estimated annual AR(3) model was simulated using re-sampled residuals for one million years. For the five-year droughts, every consecutive five-year period from this one million year period was averaged, producing 999,996 such five-year averages. The number of these averages that were less than the observed average water flow during the 1987-91 and 1937-1941 droughts were counted. The proportion of these five-year averages that were less than the 1987-1991 average was .013833 and the proportion less than the 1937-41 average were .008466. A similar exercise with 7-year averages found that the proportion of simulated 7-year averages that were less than the 7-year average water flow observed during the 1936-1942 period was .012840. Summarizing:

The probability that a randomly chosen five-year period's average water flow is less than the average water flow observed during 1987-1991 is .013833 (one in 72).

The probability that a randomly chosen five-year period's average water flow is less than the average water flow observed during 1937-1941 is .008466 (one in 118).

The probability that a randomly chosen seven-year period's average water flow is less than the average water flow observed during 1937-1941 is .012840 (one in 78).

The probability that a randomly chosen year's water flow is less than the minimum year observed during the 94-year period is .00407 (one in 246).

The consequence of a one year drought on net income is $788 million, while that of a five year drought is $3,342.7 million and a seven year drought $4,548.3 million.

PUB/KM-45

Reference: Section 5.0— Risk Reports. Section 6.4, Page 245, Section 5.2.1.1, Page 175 —MH's Export Price Forecasts

a) Please confirm that KM reviewed MH's export price assumptions in 1FF 09-1 and concluded that they are consistent with the 2008 external consultant export price forecasts.

b) Please confirm that these 2008 forecasts for 2010/2011 electricity prices would be indicative of 57-8/01 natural gas prices and significant environmental premiums related to pending GHG legislation.

c) Did KM test the validity going forward of MHs 'FT 09-1 pricing assumptions in light of the actual economic downturn in 2009 and 2010 and the drop in natural gas prices (to below $4/GJ)?

d) With MH's 2009/10 and 2010/11 average export prices under 40/KWh, does KM see arapid recovery of average export electricity prices prior to 2015 hen the new NSP contracts come into force? Explain.

ANSWER:

a) KM reviewed export prices assumptions in IF 09-1 but did not compare them to the 2008 external consultant price forecasts.
b) KM is not a position to confirm this. KM is aware that price forecasts for 2010 and 2011 factored in lower natural gas prices.
c) KM did not test the validity of the underlying assumptions about prices in the IFF 09-1 but noted that natural gas have declined sharply in 2010 and would likely stay low in 2011.
d) KM did not test the validity of MH's IFF 09-1pricing assumptions in light of the actual economic downturn in 2009 and 2010 and the drop of natural gas prices to below $4/GJ. KM noted that these factors should be integrated into the forecasts.

PUB/KM-46

Reference: Section 6.0, Section 6.2. Page 227— Quantification Energy Pricing

a) Please confirm whether that KM's examination of MH's energy pricing history for exports and imports is summarized by Table 6.1.

b) On the assumption that KM had access to more detailed (monthly) price data for 2002/03. 2003/04. and 2006/07. please provide KM's assessment of ME's seasonal exports/seasonal imports/energy buybacks during those years.

c) Please confirm that MH's Surplus Energy Program (SEP) would reflect the price of electricity at the margin and would in. the absence of contract buybacks, have resulted in even higher import prices and hence. overall greater net income losses in 2003/04.

d) Please comment on the role/cost of buybacks in 2003/04 and their probable role/cost in extended droughts (e.g., 5 year/7 year).

ANSWER:

a) Part of this history is captured in Table 6.1. KM have looked at different series of these prices in addition to the annual data in 6.1.

b) KM did not have access to this monthly data. Even when this is available it would be difficult to see how these prices were integrated in the seasonal exports, imports and buy outs. KM reviewed the costly buy outs in 2003/04 when they reviewed the costs of the drought in 2003/04.

c) KM cannot confirm this.

d) Buy backs were the major cost for MH during the drought in 2003/04 as replaced energy for meeting firm export commitments was more expensive than the export firm price. Should future droughts occur MH has successfully negotiated two relieves. First, a partial curtailment of its obligations in the case of a drought worse than on the historical record, inability to meet its domestic load and an upset price on replacement of energy.

PUB/KM-47
Reference: Section 6.0 — Risk Scenarios

a) Please provide aggregated risk scenarios including finance expenses. for the following scenarios (Iff-09 20 year based case):

- Single year (1940) drought occurring in alternatively 20 14/15; 2024/25; 2029/30 with:
  i. High export prices and high import prices.
  ii No curtailments of energy supply.
  iii. Exchange rate at 1.0.

- Five-year drought, starting in alternatively 2011/12; 20 18/19; and 2024/25:
  i. High export prices and high import prices
  ii.No curtailments of energy supply.
  iii. Exchange rate at 1.0.

b) Please verify that KM is not aware of any energy supply curtailments made by MH on:

i. Export sales in 2003/04.
ii. Export sales in 2006/07.
iii. U.S. customers in the post 1977 — (Lake Winnipeg Regulation — Churchill River Diversion) period.

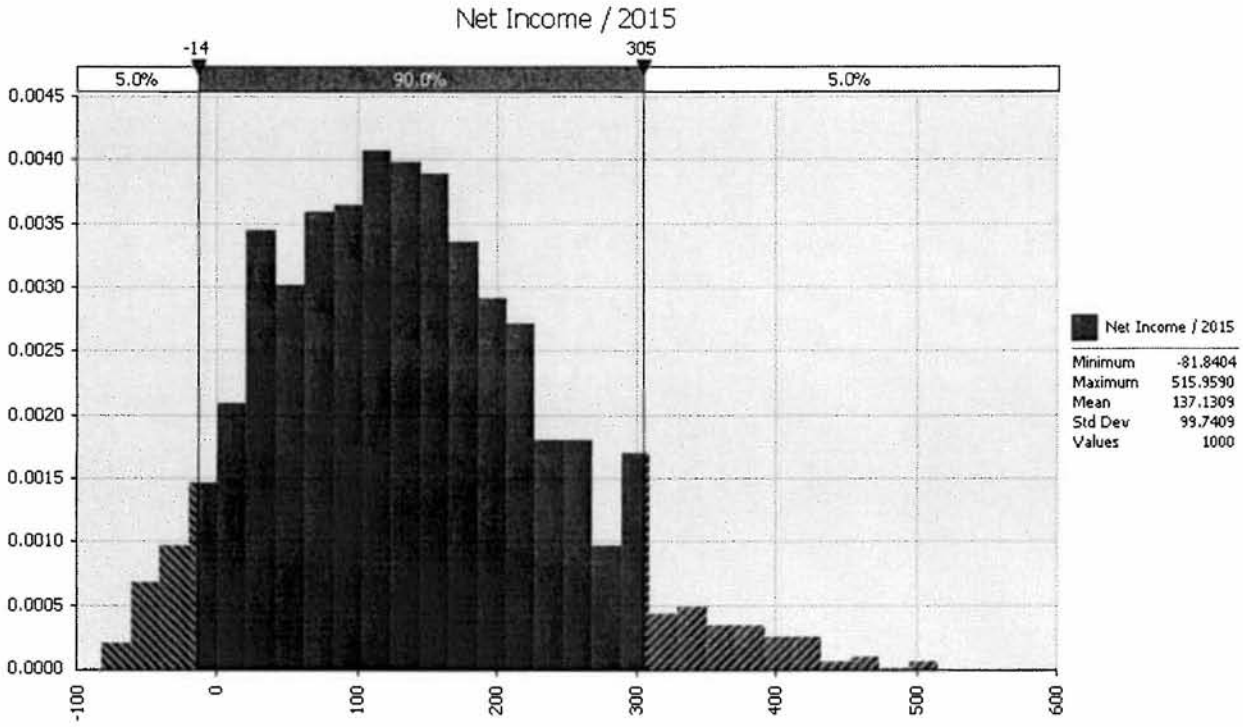
ANSWER:

It is not possible to generate the requested analysis. The IFF's do not provide details on the prices and the other assumptions underlying the calculations. KM were able to generate the impact of a drought of equal severity to the one in the historical record for both 2015 and 2020.

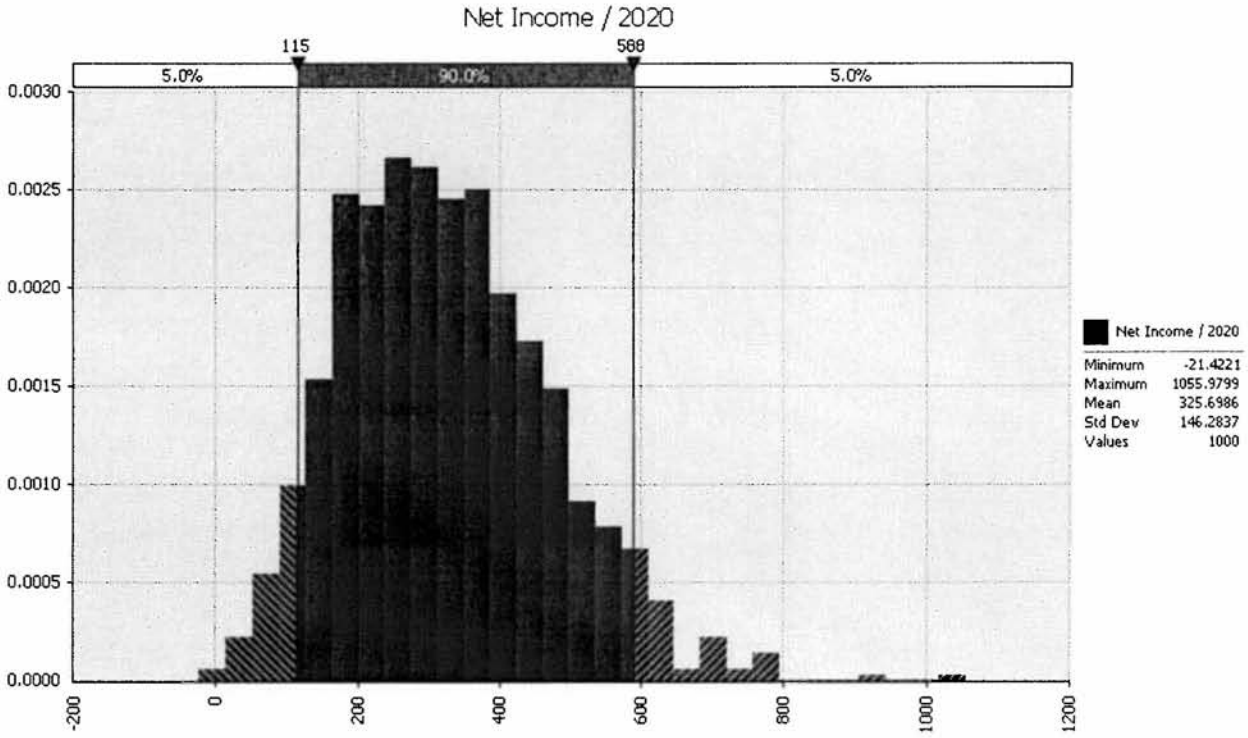
KM started with the benchmark conditions in 2015 and 2020 and introduced the volumetric declines without altering any of the other assumptions. For 2015, a drought would result in an average annual loss in net income of $499 million and $712 million in 2020. The results are shown in the figures below at different confidence levels.

KM confirms that they are not aware of any curtailments in the three cases under question (b) above.

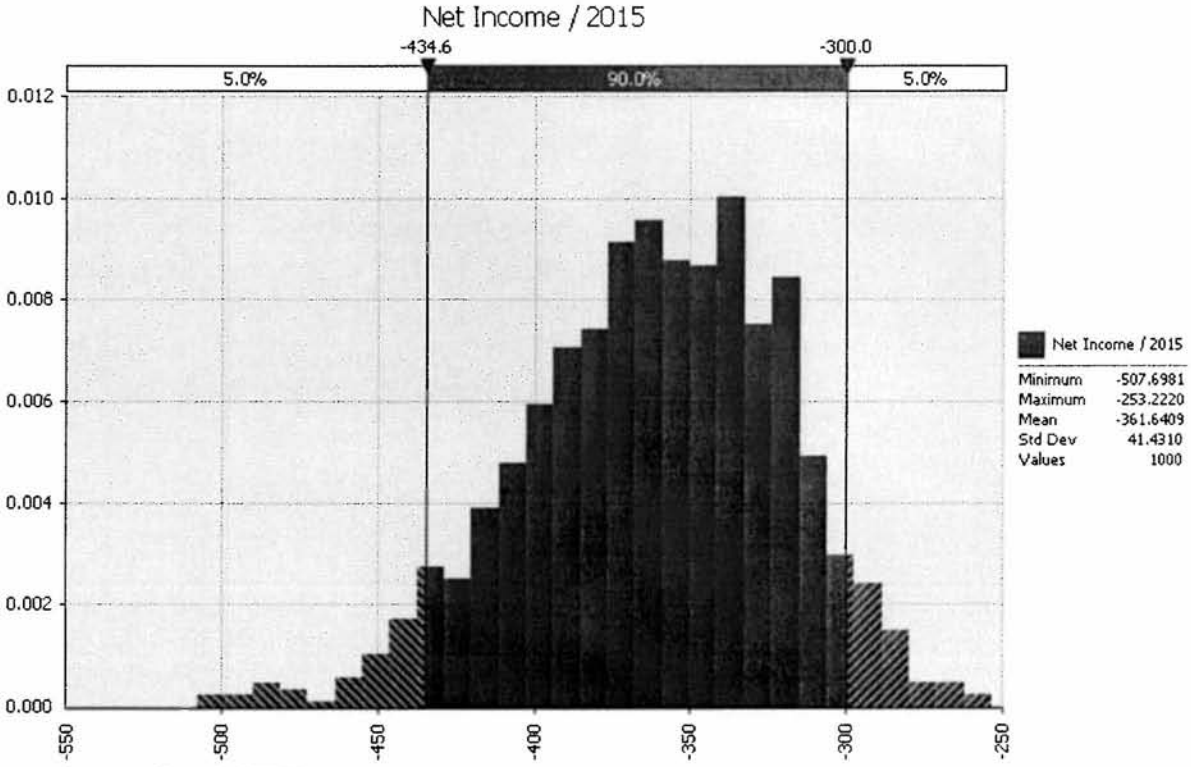
IFF 09-1 Benchmark
Millions of Dollars



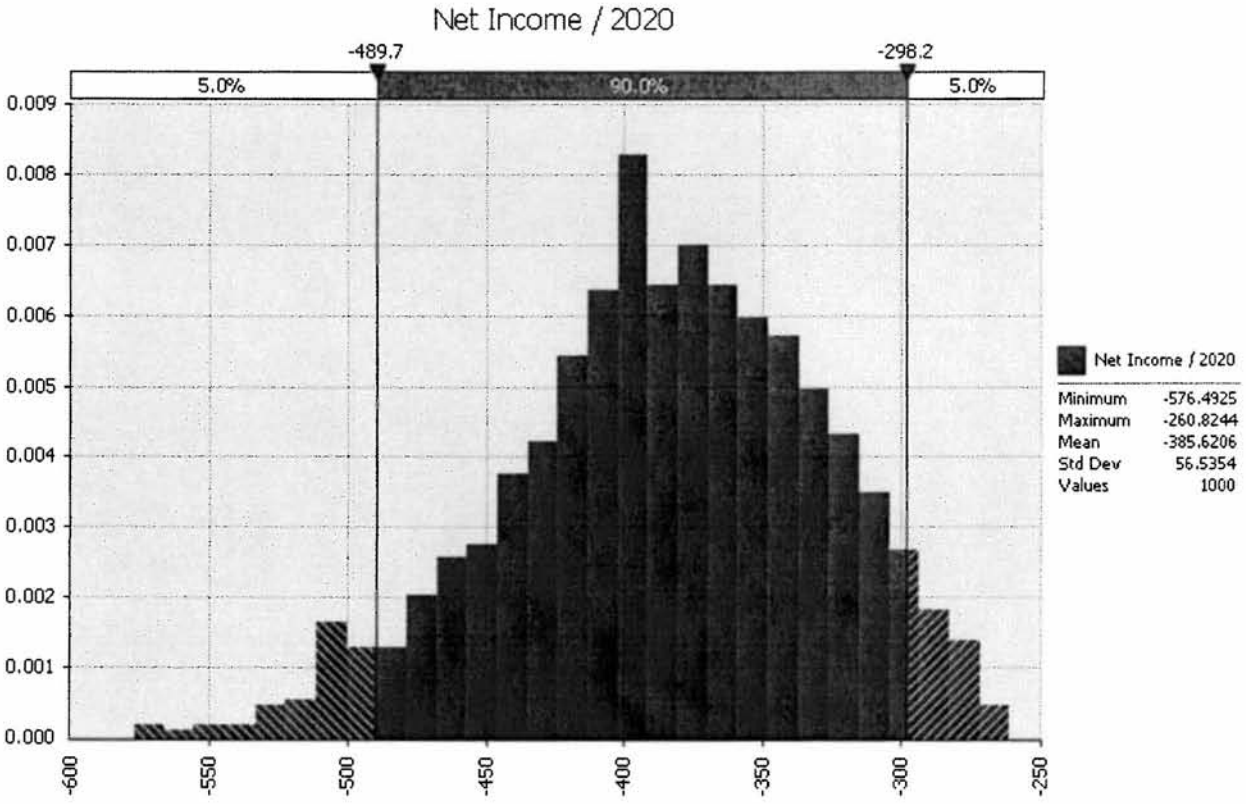
IFF 09-1 Benchmark
Millions of Dollars



Low Flow Benchmark IFF 09-1
Millions of Dollars



Low Flow Benchmark IFF 09-1
Millions of Dollars


Net Income / 2020
-489.7
-298.2
5.0%
90.0%
5.0%
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0.000
-600
-550
-500
-450
-400
-350
-300
-250
Net Income / 2020
Minimum -576.4925
Maximum -260.8244
Mean -385.6206
Std Dev 56.5354
Values 1000

PUB/KM-48

Reference: Page 229 Five Year and Seven Year Droughts (PUB/MH II — 196)

"We did not examine the results of a fie or seven year drought as we did not have and did not think that the actual series would produce the best correlation given that our estimate came from a statistical simulation exercise. We could use our estimates of a five year drought from Chapter 4 but for comparison purposes we calculated these losses only for the representative year."

Please provide a five year and seven year drought estimates including finance expense, based on the analysis undertaken in Chapter 4 and compare with the estimated cost of a five or seven year drought, including finance expense, provided by MH.

ANSWER:

The probability of a five year drought equal or worse than the 1937-1943 drought and that of a seven year drought are discussed in the following paragraph:

The estimated annual AR(3) model was simulated using re-sampled residuals for one million years. For the five-year droughts, every consecutive five-year period from this one million year period was averaged, producing 999,996 such five-year averages. The number of these averages that were less than the observed average water flow during the 1987-91 and 1937-1941 droughts were counted. The proportion of these five-year averages that were less than the 1987-1991 average was .013833 and the proportion less than the 1937-41 average were .008466. A similar exercise with 7-year averages found that the proportion of simulated 7-year averages that were less than the 7-year average water flow observed during the 1936-1942 period was .012840. Summarizing:

The probability that a randomly chosen five-year period's average water flow is less than the average water flow observed during 1987-1991 is .013833 (one in 72).

The probability that a randomly chosen five-year period's average water flow is less than the average water flow observed during 1937-1941 is .008466 (one in 118).

The probability that a randomly chosen seven-year period's average water flow is less than the average water flow observed during 1937-1941 is .012840 (one in 78).

The costs of a five year drought under bench mark conditions are $3, 342.3 million and $4,548.3 million.

PUB/KM-49

Reference: Page 229 Five Year & Seven year Drought

a) Please explain the time period (i.e. fiscal Year(s) represented in table 6.2.)

b) Please detail the assumptions utilized on pricing and the year utilized.

c) Please reconcile or contrast the values in table 6.2 with a five year and seven year drought defined by Manitoba Hydro. (PUB/MH 11— 196)

d) Please recalculate the values in table 6.2 for the years 2015 and 2025.

ANSWER:

a) The data in Table 6.2 refer to calendar years.

b) KM used the average prices between 2001 and 2007 for the specific assumptions, but the stochastic distributions of the rest of the variables as outlined in Chapter 6.

c) MH estimates are based on the actual correlations of flows in the years defining the drought. They also used some distributions on prices that were restricted to either normal or truncated normal and uniform. KM picked the correlations from the samples for 5 and 7 years but chose to use different probability distributions on the stochastic variables and used the implicit price series produced by Statistics Canada.

d) The level of effort to do this at this juncture is very long. KM are prepared to bring these estimates at a later date. It would help to limit the number of scenarios to manageable level.

PUB/KM-50

Reference: Section 6.4 Risk Mitigation Strategies for MA
Page 244

a) Current mitigation strategies used by MU and listed by KM are found at items 1-9. Please provide details of MH Risk Mitigation strategy items 5, 8 and 9.

b) Please provide KM's recommendations of additional risk mitigation components for each of the nine risk mitigation measures listed.

c) Please quantify the required equity (retained earnings) target to approximate the thigh percentage of the full cost of a seven year severe drought with high import prices, high interest rates, appreciated Canadian dollar.'

d) Please quantify the loss of infrastructure risk.

ANSWER:

The nine strategies and instruments are the following:

1) Accumulation of retained earnings and an expanded borrowing capacity.
2) Mix of export sale types and contracts.
3) Multiple counterparties, diverse terms and staggered times.
4) Contact provisions that allow MH to decrease long term sales in a drought of a severity that exceeds the worst on record.
5) Financial risk management instruments.
6) Domestic demand management.
7) Contract provisions to reduce transmission risks.
8) Drought Preparedness Plans.
9) Adequate Risk Capital.

a) There exists a diverse menu of financial instruments that can be used by MH. Some of these instruments have already been used. The accent will be on derivatives, puts and calls. Their use involves experience and expertise. MH has a good part of these resources and can augment them in the areas where they may be deficient. KM are of the opinion that Drought Preparedness Plan would spell out the Internal Responsibility Matrix and would define triggers and early warning mechanisms that would call for immediate responses leaving little or nothing to chance and to delays in awareness or responses. MH has cash and retained earnings that it can draw upon to meet emergencies and absorb risks. KM have suggested that exclusive reliance on retained earnings for drought risk mitigation is not advisable as these resources need to be used in several other areas and for

different purposes.

b) KM suggested the use of a rider on rates that rate-payers would pay that is akin to an insurance premium (paid by consumers), targeted volumes of water above minimum levels needed to meet dependable energy requirements (insurance premium paid by MH), a target limit on borrowing and a target for retained earnings dedicated to risk coverage. In addition KM recommended a menu of other measures including staggering long term contracts, time-phasing of investments that correspond to actual need, many counter-parties, weather derivative if a liquid market is in place, etc.

c) This quantification is only possible once the weights on the mitigation equation are fixed. This is the joint responsibility of PUB and MH.

d) This will be supplied before the hearing.

PUB/KM-51

Reference: Page 228 & 229 Table 6.2

Please provide an update quantification of MH's four largest risks that impact net income, utilizing the 20-year 1FFO9-I for the years 2015 and 2025.

ANSWER:

This is beyond the scope of this exercise. The reason KM went to Statistics Canada is because not all the assumptions that underpin the IFF 09-1 were available.

CHAPTER 7: Conclusions and Recommendations

PUB/KM-52

Reference: Page 266 Qualitative Risks Page 35 36

Please indicate risks which KM has identified that require a quantitative analysis in addition to a qualitative analysis.

ANSWER:

KM have outlined the areas where quantitative estimation of probabilities and consequences in Table 6.2. The only missing variables from this analysis are those related to infrastructure, BI-Pole III, generation shut-down in specific locations, and a number of minor issues of operating costs such as depreciation.

PUB/KM-53

Reference: Page 269 Preparedness Plans

With respect to MH's operations please indicate which substantial risks or foreseen emergencies require the preparation of broad preparedness plans

ANSWER:

KM recommended the completion of the Drought Preparedness Plan but also suggested that Preparedness Plans can be prepared for all aspects of MH operations. These manuals should be prepared by operational staff and management to take into consideration all possible eventualities and the set of actions required to deal with them.

Analysts of policy making and strategic behaviour highlight major issues of lags in appreciation of a problem, understanding its dimensions and responding to it. There is an awareness lag. This is about recognizing a problem when it emerges or is about to emerge. There is recognition lag. This is about recognizing the problems seriousness and nature. There is a response lag. There is an implementation lag. All of these lags compound one another. A preparedness plan would anticipate all of these issues and dimensions and would include triggers and derivers that minimize lags.

PUB/KM-54
Reference: Page 285 Production Coefficients

Please provide KM's calculations related to the revenue loss resulting from the HERMES and SPLASH models not being harmonized.

ANSWER:

KM believes that there would be economies of scale and scope to this integration but KM are not a position to fix a quantitative estimate of the cost of the errors that may be eliminated by integration. KM also recognize that this integration is not costless and that new resources would be needed to effect it.

PUB/KM-55

Reference: Page 286 Static vs Dynamic Programming

Please provide a description of the implications of HERMES and SPLASH being static models and how dynamic programming would improve modeling.

ANSWER:

Upgrading HERMES and/or SPLASH would improve the handling of time in these models. At this time variables are added to reflect different time periods. In a dynamic setting each time subscript is a variable at a particular point of time. Lags can be made explicit. The handling of capital and accumulation would be direct and explicit. The need to develop a discount rate to connect variables at different points of time will be necessary and made explicit. Dynamizing the model would increase its complexity but would also allow for the possible introduction of a nonlinear structure and even a stochastic one. The increased complexity is rewarded by increased sophistication and realism.

PUB/KM-56

Reference: Executive Summary (Pages xxx.iii — - xxxv) — Contract and Export Sales

a) Please confirm that in low flow years. MH's energy shortages could relate to:

- Firm contract sales commitments in the summer and winter.
- Diversity sales in the summer.
- Short-term summer sales.
- Day-ahead and real time sales in the summer.

b) Please confirm that the above sales may. at times, result in winter energy shortages and that MH may face high import prices.

c) Please confirm that the decision to undertake the above sales commitments may well predate MHs anticipation of a drought situation.

ANSWER:

a) Meeting firm commitments anytime would subtract from available energy for other uses. Diversity sales in the summer are not firm obligations; MH can charge a high price that would scare off possible buyers. Short term sales in the summer if water conditions do not warrant them would indeed affect availability in the winter. Day-ahead or real time sales in the summer become a problem is water conditions are not certain. The flip side is that not making these sales (at a possibly high price as the US market peaks in the summer) would represent foregone revenue if water in the winter is more than sufficient to meet domestic load.

b) Only to the extent that water conditions do not support winter requirements or that MH has oversold energy in storage. Import prices are not determined by Manitoba conditions, MH is a small player in the MISO market.

c) This is a distinct possibility that a preparedness plan would reduce its probability of happening.

PUB/KM-5 7

Reference: Executive Summary (Page xxxvii)
First 'A total of $788M can be lost with a repeat of the worst drought on record"

a) Please explain whether this drought is a one y ear/five year/or seven year event.

b) Please define the finance expenses increase that is or is not covered by the $788M.

ANSWER:

a) This is for a single year drought under average benchmark conditions.

b) This does not include the $440 million or so in interest payments, but is the opportunity cost not the real cost, because KM added the positive normal net incomes to the real losses in that year.

PUB/KM-58

Reference: Executive Summary (Page xxxvii)
Second 'A more severe drought than the worst on record would trigger the Force Majeure clause in the contract."

a) Can MH claim Force Majeure, in 'a more severe drought than the worst on record" If the following events occur (i) individually or (ii) in combination:

- No winter precipitation?
- Very low energy-in-storage?
- Accumulated winter and spring precipitation?
- Very low summer flow?
- Very low fall energy-in-storage?

b) If proof of a drought is needed to trigger Force Majeure, would Mu have to rely on actual events after they have happened?

c) If the answer to (b) is yes —then would MH only have "after-the-fact" remedies and seek recovery of its losses from its export counterparties.

d) Please indicate/discuss the extent of Force Majeure' relief for MH in a worse than recorded drought;

- Assuming all MH hydraulic resources are required for domestic load.
- Assuming all MH internal resources are required for domestic load.
- Assuming contract counterparty has to resort to high price SCCT natural gas generation.
- Assuming the contract counterpart\ has to resort to high carbon/inefficient coal generation.

e) Please explain how MH could prove that 1 5.000-20.000 GWH of hydraulic generation should trigger 'Force Majeure' relief for part or all the energy shortfall when in 2003/2004 MH did not even attempt to curtail with only 18,500 GWH of hydraulic generation.

ANSWER:

a) [redacted]

b) MH has to declare the adverse water conditions before September 15 to be permitted to reduce commitment by 2/7 between November and April.[redacted]

c) KM are not able to confirm this proposition.
d) Once Force Majeure is declared all obligat obligations are suspended. If only adverse water conditions are declared and curtailment is applied, MH is liable to pay the positive difference between the contract price and the result of multiplying a [redacted] heat rate by the forward price of natural gas (NNG Ventura Index).

e) The new contracts are in KM's opinion better structured than the old ones.

PUB/KM - 59

Reference: Executive Summary p. xv Risk Management Practices at MH

What principles should be examined when testing for the proper balance between risk and reward for MH?

ANSWER:

The underlying principle of balancing risks and returns is that only two parameters (mean and standard deviation) are needed to assess and rank portfolios. This is only true if the returns are normally distributed and/or the underlying investor's utility of risks and returns is quadratic.

Both of these criteria are not expected to hold in actual fact, but this principle provides many insights on the proper management of risk. First, any additional risk is only justified if it brings higher returns. This implies that there is a trade-off between risks and returns and that efficient portfolios are those that balance the actual trade off with the investor's appetite for risk. In some sense examining the portfolio of an investor in terms of these two parameters should indicate its risk preference.

The assignment of tolerances and ranking by MH of the different risks it faces is a way to gauge its preference and trade-off profile between risks and returns. It is here that KM recommended that such an examination takes place and that shareholders' trade offs should be compared and any misalignment corrected.

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Reference: Chapter 6 - Pages 245 and 246

"Retained earnings and water in storage should be complemented by an additional rider on domestic rates totally devoted to a specially created fund to be used in the event of a drastic drought. This additional rider should also be treated as insurance premium paid by domestic consumers of electricity to be used in emergencies to save the rate-payers from rate shocks and the province from having to guarantee additional debt."

a) Please provide any studies or analysis that substantiates your conclusion that Manitoba Hydro rate-payers would be exposed to rate shock in the event of a drastic drought given the current level of retained earnings and Manitoba Hydro's debt to equity ratio.

ANSWER:

a) KM does not have any studies or analysis.

KM is saying that in the time of drought there would be 4 means of dealing with the situation (by water management, use of retained earnings, a rider on rates, and from borrowing). It is the position of KM that all 4 of the methods of dealing with a drought should be utilized in order to prevent a rate shock as set out in their report.