REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Executive Summary; Page No.: p. i

PREAMBLE: During the last 10 years, Gross Firm Energy has grown 266 GH.h or 1.2% per year. This ten year period includes the 2009 economic downturn that slowed growth.

QUESTION:

Please provide the growth in Gross Firm Energy over the past 10 years in absolute GWh, average GWh per year and average percentage increase per year excluding the 2009 economic downturn.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Executive Summary; Page No.: p. i

PREAMBLE: During the last 10 years, Gross Firm Energy has grown 266 GH.h or 1.2% per year. This ten year period includes the 2009 economic downturn that slowed growth.

QUESTION:

Please provide the growth in Gross Firm Energy over the past 20 years in absolute GWh, average GWh per year and average percentage increase per year for all years.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Executive Summary; Page No.: p. i

PREAMBLE: During the last 10 years, Gross Firm Energy has grown 266 GH.h or 1.2% per year. This ten year period includes the 2009 economic downturn that slowed growth.

QUESTION:

Please provide the growth in Gross Firm Energy over the past 20 years in absolute GWh, average GWh per year and average percentage increase per year excluding the 2009 economic downturn.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Executive Summary; Page No.: p. i

PREAMBLE: During the last 10 years, Gross Firm Energy has grown 266 GH.h or 1.2% per year. This ten year period includes the 2009 economic downturn that slowed growth.

QUESTION:

Please provide the growth in Gross Firm Energy over the past 5 years in absolute GWh, average GWh per year and average percentage increase per year for all years.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Executive Summary; Page No.: i

PREAMBLE: Residential Basic customer growth is expected to mimic population growth, growing 1.1% per year over the next 20 years.

QUESTION:

From 1992/93 to 2012/13, please provide a table that shows for each year: actual Manitoba population and its annual percentage change, actual Manitoba housing starts and its percentage change, and actual Manitoba Hydro average annual residential customers (including Winnipeg Hydro) and its percentage change.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Executive Summary; Page No.: p. i

PREAMBLE: Residential Basic customer growth is expected to mimic population growth, growing 1.1% per year over the next 20 years.

QUESTION:

On a separate table, please provide on an annual basis the number of total housing starts for the province, the number of housing starts – singles, and the number of housing starts – multiples, for the years 1992/93 to 2012/13.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Executive Summary; Page No.: p. i

PREAMBLE: Residential Basic customer growth is expected to mimic population growth, growing 1.1% per year over the next 20 years.

QUESTION:

For each of the above, please provide full references for data sources on population and housing starts (e.g. Statistics Canada Table reference).

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Executive Summary; Page No.: p. I; Economic Outlook 2013-2034, Economic Analysis Department, preface, p. i, p.11

PREAMBLE: The primary driver of growth in Manitoba is the population, with the secondary driver being the economy. Manitoba Hydro's 2013 Economic Outlook provides both the forecast of the population and the resulting forecast of Residential Basic customers that is used in this document. The population of Manitoba has grown from 1,156,600 people in 2002 to 1,267,000 people in 2012 averaging 0.9% growth per year. The forecast is that Manitoba's population will grow to 1,568,500 by 2032, averaging 1.1% per year. The primary reason for the expected increase of population growth in Manitoba is due to government immigration initiatives.

QUESTION:

Please provide any short-term, medium-term or long-term forecasts for population for Manitoba or the City of Winnipeg prepared by IHS Global Insight, the Conference Board of Canada, Informetrica, Spatial Economics, BMO Nesbitt Burns, CIBC, Desjardins, Laurentian, Royal Bank of Canada, Scotiabank, National Bank, and TD Bank or any other independent forecasting agency or chartered bank which Manitoba Hydro has in its possession.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Executive Summary; Page No.: p. I; Economic Outlook 2013-2034, Economic Analysis Department, preface, p. i, p.11

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QUESTION:

Please provide a table with the data points used to prepare the chart titled "Man. Housing Starts & Man. Pop'n 25-34" on p.11 of Economic Outlook 2013-2034.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Executive Summary; Page No.: p. i; Economic Outlook 2013-2034, Economic Analysis Department, preface, p. i, p.11

PREAMBLE: The primary driver of growth in Manitoba is the population, with the secondary driver being the economy. Manitoba Hydro's 2013 Economic Outlook provides both the forecast of the population and the resulting forecast of Residential Basic customers that is used in this document. The population of Manitoba has grown from 1,156,600 people in 2002 to 1,267,000 people in 2012 averaging 0.9% growth per year. The forecast is that Manitoba's population will grow to 1,568,500 by 2032, averaging 1.1% per year. The primary reason for the expected increase of population growth in Manitoba is due to government immigration initiatives.

QUESTION:

Please calculate the correlation between "Manitoba Housing Starts" & "Manitoba Population 25-34" using these data.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Executive Summary; Page No.: p. i; Economic Outlook 2013-2034, Economic Analysis Department, preface, p. i, p.11

PREAMBLE: The primary driver of growth in Manitoba is the population, with the secondary driver being the economy. Manitoba Hydro's 2013 Economic Outlook provides both the forecast of the population and the resulting forecast of Residential Basic customers that is used in this document. The population of Manitoba has grown from 1,156,600 people in 2002 to 1,267,000 people in 2012 averaging 0.9% growth per year. The forecast is that Manitoba's population will grow to 1,568,500 by 2032, averaging 1.1% per year. The primary reason for the expected increase of population growth in Manitoba is due to government immigration initiatives.

QUESTION:

Please calculate a simple OLS regression with "Manitoba Housing Starts" as the dependent variable and "Manitoba Population 25-34" as the explanatory variable, including an intercept term. Please provide all regression statistics and diagnostics.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Executive Summary; Page No.: p. i; Economic Outlook 2013-2034, Economic Analysis Department, preface, p. i, p.11

PREAMBLE: The primary driver of growth in Manitoba is the population, with the secondary driver being the economy. Manitoba Hydro's 2013 Economic Outlook provides both the forecast of the population and the resulting forecast of Residential Basic customers that is used in this document. The population of Manitoba has grown from 1,156,600 people in 2002 to 1,267,000 people in 2012 averaging 0.9% growth per year. The forecast is that Manitoba's population will grow to 1,568,500 by 2032, averaging 1.1% per year. The primary reason for the expected increase of population growth in Manitoba is due to government immigration initiatives.

QUESTION:

Please provide any short-term, medium-term or long-term forecasts for real GDP for Manitoba prepared by IHS Global Insight, the Conference Board of Canada, Informetrica, Spatial Economics, BMO Nesbitt Burns, CIBC, Desjardins, Laurentian, Royal Bank of Canada, Scotiabank, National Bank, and TD Bank or any other independent forecasting agency or chartered bank which Manitoba Hydro has in its possession.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Executive Summary; Page No.: i; Economic Outlook 2013-2034, Economic Analysis Department, preface, p. i, p.11

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QUESTION:

Please provide a spreadsheet with formulas intact that describes how the consensus forecast used for the real GDP and population forecasts for Manitoba as outlined in the 2013-2034 Economic Outlook were arrived at, including the dates of the input forecasts, the input forecast data, and the input forecast forecasting agency.

RESPONSE:

Table 1 depicts the sources used to derive the forecast of Manitoba population for 2012/13 – 2033/34, as shown in the 2013 Economic Outlook filed as Appendix G.

Table 2 depicts the sources used to derive the forecast of Manitoba Real GDP for 2012/13 – 2033/34, as shown the 2013 Economic Outlook, filed as Appendix G.

Copies of the publicly available source forecasts are attached.

Economic Outlook 2013
Table 1 – Manitoba Population – 000's

	Fcst Date	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Spatial Economics	22-Mar-13	1267	1282	1297	1310	1325	1340	1355	1370	1385	1401	1417	1419	1430	1440	1448	1455	1461	1466	1471	1475	1480	1484	1488
Conference Board	19-Dec-12	1267	1284	1303	1322	1342	1362	1382	1402	1422	1442	1462	1482	1503	1523	1544	1564	1584	1604	1624	1645	1665	1685	1705
IHS Global Insight	5-Dec-12	1267	1283	1298	1313	1328	1343																	
Informetrica	1-Oct-12	1267	1278	1292	1306	1321	1335	1350	1365	1380	1395	1411	1426	1441	1456	1472	1487	1502	1517	1532	1547	1562	1576	1591
Manitoba Bureau of Statistics	7-Dec-12	1267	1281	1295	1310	1324	1339	1354	1370	1385	1401	1416	1432	1447	1463	1478	1493	1508	1524	1538	1553	1568	1583	1597
EO2013 - Calendar		1267	1282	1298	1313	1329	1344	1360	1375	1391	1407	1422	1438	1453	1468	1483	1498	1512	1527	1541	1555	1569	1582	1595

	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
EO2013 - Fiscal	1271	1286	1302	1317	1332	1348	1363	1379	1395	1410	1426	1441	1457	1472	1487	1502	1516	1530	1544	1558	1572	1585

Economic Outlook 2013
Table 2 – Manitoba RGDP - % change

	Fcst Date	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
CIBC	31-Jan-13	2.2	1.8	2.3																				
National Bank	1-Mar-13	2.2	2.1	2.3																				
BMO Nesbitt Burns	15-Mar-13	2.2	2.0	2.3																				
Royal Bank	5-Mar-13	2.2	2.7	2.8																				
Scotia Bank	28-Feb-13	2.2	1.8	2.2																				
TD Bank	4-Apr-13	2.2	1.6	2.4																				
Spatial Economics	22-Mar-13	2.2	1.8	1.5	2.2	1.8	1.9	2.0	2.1	2.2	2.2	2.2	1.4	1.4	1.4	1.3	1.1	0.9	1.0	1.0	1.0	1.0	1.0	1.0
Conference Board	19-Dec-12	2.2	2.1	2.3	2.9	2.2	2.2	2.2	1.9	2.0	2.0	2.1	2.2	2.2	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	1.9	1.9
IHS Global Insight	5-Dec-12	2.2	1.9	2.4	2.6	2.5	2.4																	
Informetrica	1-Oct-12	2.2	2.3	2.8	3.1	3.1	2.1	1.9	2.2	2.3	2.3	2.3	2.2	2.3	2.4	2.5	2.7	2.7	3.0	2.9	2.8	2.7	2.7	2.7
EO2013 - Calendar		2.2	2.0	2.3	2.7	2.4	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0

	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34
EO2013 - Fiscal	2.1	2.1	2.4	2.6	2.3	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0

Note:
1. *2012 is actual data.*
2. *Fiscal year data is calculated as follows: .75*current year value + .25*following year value.*

Spatial Economics

Key Economic Indicators: Manitoba
March 2013 Provincial Forecast

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Real GDP ($Millions)	55696	56541	57802	58870	59963	61148	62445	63838	65261	66687
% Change	1.8	1.5	2.2	1.8	1.9	2.0	2.1	2.2	2.2	2.2
GDP Deflator (Reference Year=1)	1.092	1.108	1.127	1.143	1.156	1.167	1.179	1.193	1.209	1.227
% Change	1.8	1.5	1.7	1.4	1.1	1	1	1.2	1.3	1.5
Nominal GDP ($Millions)	60841	62668	65160	67314	69327	71390	73651	76176	78905	81813
% Change	3.7	3	4	3.3	3	3	3.2	3.4	3.6	3.7
Consumer Price Index (2007=100)	1.224	1.244	1.267	1.284	1.304	1.327	1.349	1.372	1.396	1.42
% Change	1.8	1.6	1.8	1.4	1.6	1.7	1.7	1.7	1.7	1.7
Hourly Labour Income ($)	27.8	28.3	28.9	29.4	30	30.7	31.4	32.3	33.2	34.1
% Change	2.4	1.9	2	2	2.1	2.1	2.4	2.7	2.9	2.9
Employment (000s)	634	639	646	654	661	667	676	686	694	701
% Change	0.6	0.8	1.2	1.1	1.1	0.9	1.4	1.4	1.2	1
Unemployment Rate (%)	5.6	5.7	5.6	5.5	5.4	5.4	5.1	4.8	4.7	4.6
Participation Rate (%)	68.9	68.7	68.7	68.7	68.7	68.6	68.6	68.7	68.7	68.6
Labour Force (000s)	671	677	684	692	699	705	713	720	728	735
% Change	0.9	0.9	1	1	1	0.9	1.1	1.1	1	0.9
Real Hourly Labour Productivity ($)	51.03	51.48	51.99	52.37	52.75	53.28	53.66	54.07	54.61	55.25
% Change	1.2	0.9	1	0.7	0.7	1	0.7	0.8	1	1.2
Population (000s)	1282	1296.7	1310.2	1324.8	1339.6	1354.7	1369.8	1385.2	1401	1416.7
% Change	1.2	1.1	1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Net In-Migration (000s)	8.9	8.5	7.2	8.3	8.5	8.7	8.8	9.1	9.6	9.6
% of Population	0.7	0.7	0.6	0.6	0.6	0.6	0.5	0.7	0.7	0.7
Households (000s)	506.3	513.6	520.8	528.3	535.6	542.7	550	557.3	564.5	571.5
% Change	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.3	1.2

Spatial Economics

Key Economic Indicators: Manitoba
Manitoba Hydro Provincial Forecast - January 2013

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Real GDP ($Millions) - LHS	45302	46333	47082	48232	49158	50158	50983	51796	52565	53333	54185	54950	55708	56481	57203	57857	58407	58985	59558	60156	60757	61371	61992
% Change	2.5	2.3	1.6	2.4	1.9	2	1.6	1.6	1.5	1.5	1.6	1.4	1.4	1.4	1.3	1.1	0.9	1	1	1	1	1	1
GDP Deflator (Reference Year=1)	1.303	1.326	1.353	1.374	1.396	1.422	1.447	1.473	1.5	1.526	1.55	1.575	1.598	1.624	1.65	1.677	1.704	1.733	1.763	1.794	1.826	1.858	1.89
% Change	1.8	1.8	2	1.6	1.6	1.8	1.7	1.8	1.8	1.7	1.6	1.6	1.5	1.6	1.6	1.7	1.6	1.7	1.7	1.8	1.8	1.8	1.8
Nominal GDP ($Millions)	59015	61444	63681	66268	68632	71323	73756	76310	78849	81394	84012	86531	89018	91735	94371	97042	99526	102241	105006	107920	110918	114010	117192
% Change	4.3	4.1	3.6	4.1	3.6	3.9	3.4	3.5	3.3	3.2	3.2	3	2.9	3.1	2.9	2.8	2.6	2.7	2.7	2.8	2.8	2.8	2.8
Consumer Price Index (2002=100)	1.203	1.223	1.249	1.274	1.297	1.325	1.351	1.378	1.404	1.431	1.457	1.483	1.508	1.535	1.563	1.592	1.621	1.652	1.683	1.715	1.748	1.782	1.816
% Change	1.5	1.7	2.1	2	1.8	2.1	2	2	1.9	1.9	1.8	1.8	1.7	1.8	1.8	1.9	1.8	1.9	1.9	1.9	1.9	1.9	1.9
Hourly Labour Income ($)	26.9	27.6	28.2	29	29.8	30.6	31.4	32.3	33.2	34.1	35	35.9	36.8	37.8	38.7	39.8	40.8	41.9	43	44.2	45.4	46.6	47.9
% Change	2.3	2.4	2.3	2.8	2.7	2.8	2.7	2.8	2.8	2.7	2.6	2.6	2.5	2.5	2.6	2.7	2.6	2.6	2.6	2.7	2.7	2.7	2.7
Employment (000s)	629	635	641	651	660	669	675	681	687	691	694	698	701	704	707	710	710	711	712	713	715	717	718
% Change	0.7	1	1.1	1.5	1.4	1.3	0.9	1	0.8	0.5	0.5	0.5	0.5	0.5	0.4	0.3	0	0.2	0.1	0.2	0.2	0.2	0.2
Unemployment Rate (%)	5.4	5.2	5.2	5	5.1	5	5.1	5	4.9	5	5.1	5.1	5.1	5	5	5	5	5	5	5	5	5	5
Participation Rate (%)	69	68.7	68.6	68.8	69.1	69.3	69.3	69.3	69.2	69	68.8	68.6	68.4	68.2	68	67.8	67.5	67.2	67	66.8	66.6	66.4	66.3
Labour Force (000s)	664	670	677	685	696	704	711	717	723	727	731	735	739	742	744	747	748	749	750	751	752	754	756
% Change	0.7	0.8	1	1.3	1.5	1.3	0.9	0.9	0.8	0.6	0.6	0.5	0.5	0.4	0.4	0.3	0.1	0.1	0.1	0.2	0.2	0.2	0.2
Real Hourly Labour Productivity ($)	42.18	42.66	42.93	43.26	43.53	43.83	44.2	44.5	44.82	45.25	45.74	46.18	46.6	47.02	47.44	47.86	48.33	48.75	49.17	49.57	49.95	50.34	50.74
% Change	1.8	1.1	0.7	0.8	0.6	0.7	0.9	0.7	0.7	1	1.1	0.9	0.9	0.9	0.9	0.9	1	0.9	0.9	0.8	0.8	0.8	0.8
Population (000s) - LHS	1265.9	1282.1	1297.6	1311.9	1326.3	1340.5	1354.3	1368	1381.4	1394.7	1407.4	1419.2	1430	1439.6	1448	1455.3	1461.3	1466.4	1471	1475.4	1479.7	1483.8	1487.5
% Change	1.2	1.3	1.2	1.1	1.1	1.1	1	1	1	1	0.9	0.8	0.8	0.7	0.6	0.5	0.4	0.3	0.3	0.3	0.3	0.3	0.2

Conference Board - December 2012

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Mb Real GDP	42578	43569	44826	45808	46798	47826	48723	49694	50690	51729	52857	54013	55038	56095	57182	58299	59450	60633	61831	63057	64252	65478
% change	2.1	2.3	2.9	2.2	2.2	2.2	1.9	2.0	2.0	2.1	2.2	2.2	1.9	1.9	1.9	2.0	2.0	2.0	2.0	2.0	1.9	1.9
Mb GDP	57999	60550	63592	66403	69223	71842	74321	77089	80009	82976	86222	89677	92881	96176	99596	103007	106561	110151	113981	118070	122203	126481
Mb GDP Price Deflator	1.36	1.39	1.42	1.45	1.48	1.50	1.53	1.55	1.58	1.60	1.63	1.66	1.69	1.71	1.74	1.77	1.79	1.82	1.84	1.87	1.90	1.93
Mb CPI	1.23	1.26	1.28	1.31	1.34	1.37	1.39	1.42	1.45	1.48	1.51	1.53	1.56	1.60	1.63	1.66	1.70	1.73	1.77	1.81	1.85	1.89
Mb Popn of Lab Force Age	976	990	1004	1018	1031	1044	1058	1072	1086	1101	1116	1131	1147	1163	1179	1196	1212	1229	1246	1263	1280	1297
Mb Employment	640	651	662	672	681	688	694	700	707	714	722	729	736	744	752	760	769	778	787	796	805	815
Mb Unemployment Rate	5.3	5.3	5.1	5.0	4.9	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.9	4.8	4.8	4.8	4.8	4.8	4.7
Mb Housing Starts	8724	8911	8045	8419	8498	8475	8526	8524	8477	8442	8458	8603	8782	8789	8791	8806	8876	8906	8912	8921	8925	8966
Mb Single Starts																						
Mb Total Population	1284	1303	1322	1342	1362	1382	1402	1422	1442	1462	1482	1503	1523	1544	1564	1584	1604	1624	1645	1665	1685	1705
Mb Household Formation	7.686	8.025	8.520	8.575	8.372	8.276	8.530	8.522	8.447	8.369	8.446	8.611	8.892	8.885	8.767	8.774	8.909	8.915	8.827	8.830	8.941	8.963
Mb Interprovincial In-Migration	4393	4340	4264	4196	4109	4026	3947	3864	3786	3706	3633	3556	3470	3379	3304	3221	3138	3061	2985	2911	2838	2767
Mb Interprovincial Out-Migration	4913	4800	4690	4582	4476	4373	4273	4174	4078	3985	3893	3803	3716	3631	3547	3466	3386	3308	3232	3158	3085	3014
Mb Net International Migration	14.001	13.944	13.788	13.370	13.232	13.171	12.990	12.976	12.789	12.827	12.858	12.887	12.963	12.839	12.870	12.902	12.936	12.972	12.652	12.841	12.832	12.824
Mb Natural Increase	0.00139	0.00140	0.00144	0.00152	0.00148	0.00146	0.00150	0.00147	0.00149	0.00144	0.00142	0.00141	0.00138	0.00138	0.00133	0.00131	0.00129	0.00127	0.00127	0.00124	0.00122	0.00121
	1780.18	1820.21	1908.71	2036.16	2012.35	2043.05	2097.64	2086.83	2142.66	2102.52	2112.36	2114.43	2102.76	2134.98	2075.64	2078.84	2068.78	2059.33	2088.35	2057.5	2061.66	2062.25

IHS Global Insight - December 2012

Manitoba

	2012	2013	2014	2015	2016	2017
Source Population (Thousands)	965	977	988	999	1,010	1,021
Participation Rate (%)	69.0	68.9	69.3	69.6	69.8	69.7
Labour Force (Thousands)	666	673	684	696	705	711
Employment (Thousands)	630	638	648	659	668	674
Unemployment (Thousands)	36	36	36	36	37	37
Unemployment Rate (%)	5.4	5.3	5.3	5.2	5.2	5.2
Average Wage $s per Year	43,635	44,502	45,608	46,471	47,076	47,572
Compensation of Employees (Millions of dollars)	29,073	29,985	31,218	32,329	33,184	33,846
Other Household Income (Millions of dollars)	9,151	9,637	9,972	10,558	11,451	12,548
Primary Household Income (Millions of dollars)	38,224	39,602	41,190	42,887	44,635	46,394
Personal Income Taxes Paid (Millions of dollars)	6,546	6,805	7,181	7,648	8,139	8,645
Net Other Transfers (Millions of dollars)	4,966	5,159	5,457	5,805	6,162	6,540
Contributions to Social Insurance Programs (Millions of dollars)	2,816	2,963	3,085	3,182	3,267	3,348
Household Disposable Income (Millions of dollars)	33,828	34,993	36,380	37,861	39,391	40,940
Retail Sales	16,662	17,220	17,938	18,663	19,357	20,041
CPI 2002 = 100	120.1	122.2	124.7	127.1	129.6	132.3
Total Motor Vehicle Sales	50,032	50,570	53,471	54,523	54,431	54,407
GDP at Market Prices (Millions of dollars)	57,843	60,077	62,661	65,548	68,552	71,708
GDP Price Index (2007 = 1.00)	1.062	1.082	1.103	1.125	1.148	1.172
GDP at Market Prices (Millions of Chained 2007 dollars)	54,486	55,506	56,816	58,266	59,735	61,160
Housing Starts	7,464	6,923	6,370	6,352	6,309	6,311
Business Gross Fixed Capital Formation, Residential Structures (Millions of dollars)	3,784	3,921	4,048	4,201	4,363	4,518
Business Gross Fixed Capital Formation, Residential Structures Price 2007 = 1.00 (Index)	1.200	1.228	1.257	1.288	1.319	1.352
Gross Fixed Capital Formation, Residential Structures (Millions of Chained 2007 Dollars)	3,153	3,194	3,220	3,262	3,307	3,342
Gross Fixed Capital Formation, Non-Residential Structures (Millions of dollars)	3,185	3,335	3,225	3,252	3,278	3,322
Gross Fixed Capital Formation, Non-Residential Structures Price 2007 = 1.00 (Index)	1.166	1.185	1.219	1.254	1.290	1.327
Gross Fixed Capital Formation, Non-Residential Structures (Millions of Chained 2007 Dollars)	2,733	2,815	2,646	2,593	2,541	2,503
Population (Thousands)	1,267	1,283	1,298	1,313	1,328	1,343
Births (Thousands)	16	17	17	17	17	17
Deaths (Thousands)	11	11	11	12	12	12
Net Migration (Thousands)	10	10	10	10	9	10
Crude Birth Rate (%)	12.91	12.91	12.91	12.92	12.94	12.80
Crude Death Rate (%)	8.39	8.52	8.67	8.82	8.91	8.90
Households (Thousands)	491	499	505	512	519	525
People per Household	2.58	2.57	2.57	2.56	2.56	2.56
Goods GDP (GDP by Industry at basic prices, millions of chained 2002 dollars)	10,848	11,027	11,242	11,492	11,845	12,108
Services GDP (GDP by Industry at basic prices, millions of chained 2002 dollars)	30,625	31,227	32,018	32,879	33,632	34,458
Real GDP % chge	2.1	1.9	2.4	2.6	2.5	2.4
GDP Deflator % chge	1.4	2.0	1.9	2.0	2.0	2.2
CPI % change	1.4	1.8	2.0	2.0	2.0	2.1

Informetrica - October 1, 2012

Workbook Contents
Manitoba: Basic Indicators

IL Reference October 1, 2012		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
	Population (000s)																						
GPTTTL	Population	1278.2	1292.1	1306.3	1320.7	1335.3	1350.1	1365.1	1380.2	1395.3	1410.6	1425.8	1441.1	1456.3	1471.6	1486.7	1501.8	1516.9	1531.8	1546.7	1561.6	1576.3	1591
GSTTTL	Source Population	966.6	976.1	985.8	995.2	1004.6	1014.2	1024.1	1034	1044.2	1054.8	1065.8	1077	1088.4	1099.9	1111.5	1123.3	1135.2	1147.2	1159.2	1171.3	1183.5	1195.6
GHLTTL	Households	490.7	497.1	503.7	510.2	516.6	523	529.5	535.8	542.1	548.2	554.1	560.1	566.1	572	577.8	583.7	589.8	595.8	601.8	608	614.2	620.5
GFLTTL	Family	333.5	337	340.7	344.3	347.8	351.2	354.6	357.8	361	364.1	367.1	370	372.9	375.8	378.7	381.5	384.5	387.6	390.9	394.4	398.1	401.8
gnltl	Non-family	157.2	160	163	165.9	168.8	171.8	174.9	178	181	184.1	187.1	190.1	193.2	196.2	199.2	202.2	205.2	208.1	210.9	213.5	216.1	218.7
	Labour Markets (000s)																						
GLTTTL	Labour Force	699.9	708	716.8	725	733	738.1	743.1	747.8	752.5	757.2	761.5	766	771	776.7	782.9	789.5	797	804.3	811.4	818.3	824.7	829.7
GRTTTL	Participation Rate (%)	72.4	72.5	72.7	72.8	73	72.8	72.6	72.3	72.1	71.8	71.5	71.1	70.8	70.6	70.4	70.3	70.2	70.1	70	69.9	69.7	69.4
GTOTET	Employment	642.7	649.3	658.7	668.6	676	682	688.3	695.2	703	711	718.1	725.7	733.4	741.5	750.5	760	771.1	782.1	793.4	804.9	816.5	828.3
GUTTTR	Unemployment Rate (%)	8.2	8.3	8.1	7.8	7.8	7.6	7.4	7	6.6	6.1	5.7	5.3	4.9	4.5	4.1	3.7	3.3	2.8	2.2	1.6	1	0.2
	Gross Domestic Product ($97 Mns)																						
GTOTYK	Total	40161	41294	42556	43870	44813	45645	46629	47694	48813	49950	51066	52226	53459	54797	56289	57786	59525	61245	62958	64665	66389	68190
	% change	2.3	2.8	3.1	3.1	2.1	1.9	2.2	2.3	2.3	2.3	2.2	2.3	2.4	2.5	2.7	2.7	3.0	2.9	2.8	2.7	2.7	2.7
GGDSYK	Goods	10244	10506	10932	11450	11791	12075	12375	12714	13035	13373	13712	14045	14404	14791	15197	15580	16048	16517	16962	17400	17850	18322
genryk	Energy (1)	1184	1234	1276	1318	1332	1352	1378	1406	1434	1461	1488	1518	1550	1583	1619	1654	1695	1737	1776	1817	1857	1899
govryk	Non-energy, Energy-intensive (2)	1114	1085	1136	1192	1211	1226	1233	1247	1264	1285	1307	1333	1364	1395	1423	1444	1475	1506	1522	1535	1545	1554
gogsyk	Other	7946	8187	8520	8939	9249	9496	9764	10061	10337	10627	10917	11194	11490	11812	12155	12482	12878	13275	13663	14048	14449	14869
GSVCYK	Services	29917	30788	31624	32421	33021	33571	34254	34980	35779	36576	37354	38181	39054	40006	41092	42206	43477	44728	45997	47265	48540	49867
GTSPYK	Transportation & Warehousing	2695	2757	2843	2917	2981	3037	3101	3173	3250	3334	3422	3517	3622	3736	3862	3991	4140	4292	4449	4608	4773	4950
gsocyk	Public Administration & Social Services	7632	7745	7904	8019	8114	8232	8379	8533	8701	8875	9049	9233	9421	9621	9834	10053	10291	10525	10764	11015	11267	11534
gsvvyk	Other Services	19590	20286	20877	21485	21926	22302	22774	23274	23827	24367	24882	25431	26011	26649	27396	28162	29047	29911	30783	31642	32500	33383
gost	Output per Employee ($1997 000s)	62.5	63.6	64.6	65.6	66.3	66.9	67.7	68.6	69.4	70.3	71.1	72	72.9	73.9	75	76	77.2	78.3	79.4	80.3	81.3	82.3
	Income																						
GYYPRC	Personal Income ($Nominal, Mns)	46077	47613	48552	50112	52820	55334	57713	60156	62610	65095	67740	70666	73787	77036	80288	83633	87086	90794	94636	98684	102931	107439
GYTWAC	Wage Income	29358	30252	30661	31705	33788	35498	37045	38594	40132	41679	43365	45272	47335	49472	51594	53759	55980	58394	60873	63470	66160	68971
GYYDSC	Disposable Income	36964	38192	38948	40206	42368	44352	46242	48190	50151	52140	54258	56601	59099	61697	64297	66977	69750	72731	75816	79071	82487	86120
gydspc	per capita ($000s)	28.9	29.6	29.8	30.4	31.7	32.8	33.9	34.9	35.9	37	38.1	39.3	40.6	41.9	43.2	44.6	46	47.5	49	50.6	52.3	54.1
gyyprk	Personal Income ($1997 Mns)	33908	34354	34345	34755	35943	36935	37785	38628	39432	40210	41041	41993	43007	44042	45021	45998	46976	48036	49109	50229	51388	52613
GYYDSK	Disposable Income	29042	29103	29116	29555	30607	31368	32152	32966	33776	34563	35353	36189	37076	38006	38977	39949	41023	42094	43149	44238	45348	46526
GPTOTI	CPI, Province (1992=100)	151.6	154.6	157.7	160.8	163.9	167.1	170.4	173.7	177.1	180.6	184.1	187.7	191.4	195.1	198.9	202.8	206.8	210.8	215	219.2	223.4	227.8

MB

Draft Manitoba Projection: Components of Population Growth — Dec. 7, 2012

	Population	Births	Deaths	Intraprovincial In Migration	Intraprovincial Out Migration	Interprovincial In Migration	Interprovincial Out Migration	Immigration - Provincial Nominee	Immigration - Other	Emigration	Other Migration	Growth	Pop+Growth
2011	1,251,690	15,946	10,313	26,133	26,133	13,319	17,994	11,436	3,698	2,068	1,131	15,154	1,266,844
2012	1,266,844	16,148	10,427	26,400	26,400	12,660	16,997	10,518	3,549	2,034	1,066	14,482	1,281,327
2013	1,281,327	16,489	10,543	26,400	26,400	12,000	16,000	9,600	3,400	2,000	1,000	13,945	1,295,272
2014	1,295,272	16,825	10,643	26,400	26,400	12,020	15,920	9,600	3,400	2,000	1,000	14,281	1,309,554
2015	1,309,554	17,150	10,740	26,400	26,400	12,040	15,840	9,600	3,400	2,000	1,000	14,610	1,324,164
2016	1,324,164	17,465	10,829	26,400	26,400	12,060	15,760	9,600	3,400	2,000	1,000	14,936	1,339,100
2017	1,339,100	17,727	10,920	26,400	26,400	12,080	15,680	9,600	3,400	2,000	1,000	15,207	1,354,307
2018	1,354,307	17,965	11,019	26,400	26,400	12,100	15,600	9,600	3,400	2,000	1,000	15,446	1,369,752
2019	1,369,752	18,151	11,115	26,400	26,400	12,100	15,600	9,600	3,400	2,000	1,000	15,536	1,385,289
2020	1,385,289	18,299	11,226	26,400	26,400	12,100	15,600	9,600	3,400	2,000	1,000	15,573	1,400,862
2021	1,400,862	18,400	11,333	26,400	26,400	12,100	15,600	9,600	3,400	2,000	1,000	15,567	1,416,429
2022	1,416,429	18,481	11,446	26,400	26,400	12,100	15,600	9,600	3,400	2,000	1,000	15,535	1,431,964
2023	1,431,964	18,549	11,567	26,400	26,400	12,100	15,600	9,600	3,400	2,000	1,000	15,482	1,447,446
2024	1,447,446	18,594	11,691	26,400	26,400	12,100	15,600	9,600	3,400	2,000	1,000	15,402	1,462,848
2025	1,462,848	18,653	11,834	26,400	26,400	12,100	15,600	9,600	3,400	2,000	1,000	15,319	1,478,167
2026	1,478,167	18,711	11,984	26,400	26,400	12,100	15,600	9,600	3,400	2,000	1,000	15,227	1,493,394
2027	1,493,394	18,775	12,137	26,400	26,400	12,100	15,600	9,600	3,400	2,000	1,000	15,138	1,508,532
2028	1,508,532	18,832	12,312	26,400	26,400	12,100	15,600	9,600	3,400	2,000	1,000	15,020	1,523,553
2029	1,523,553	18,904	12,481	26,400	26,400	12,100	15,600	9,600	3,400	2,000	1,000	14,923	1,538,476
2030	1,538,476	18,985	12,668	26,400	26,400	12,100	15,600	9,600	3,400	2,000	1,000	14,817	1,553,293
2031	1,553,293	19,079	12,860	26,400	26,400	12,100	15,600	9,600	3,400	2,000	1,000	14,719	1,568,012
2032	1,568,012	19,204	13,062	26,400	26,400	12,100	15,600	9,600	3,400	2,000	1,000	14,642	1,582,654
2033	1,582,654	19,334	13,255	26,400	26,400	12,100	15,600	9,600	3,400	2,000	1,000	14,578	1,597,232
2034	1,597,232	19,487	13,449	26,400	26,400	12,100	15,600	9,600	3,400	2,000	1,000	14,538	1,611,770
2035	1,611,770	19,652	13,643	26,400	26,400	12,100	15,600	9,600	3,400	2,000	1,000	14,510	1,626,280
2036	1,626,280	19,844	13,838	26,400	26,400	12,100	15,600	9,600	3,400	2,000	1,000	14,506	1,640,786
2037	1,640,786	20,035	14,046	26,400	26,400	12,100	15,600	9,600	3,400	2,000	1,000	14,489	1,655,275
2038	1,655,275	20,248	14,236	26,400	26,400	12,100	15,600	9,600	3,400	2,000	1,000	14,513	1,669,788
2039	1,669,788	20,476	14,402	26,400	26,400	12,100	15,600	9,600	3,400	2,000	1,000	14,573	1,684,361
2040	1,684,361	20,717	14,552	26,400	26,400	12,100	15,600	9,600	3,400	2,000	1,000	14,665	1,699,026
2041	1,699,026	20,966	14,697	26,400	26,400	12,100	15,600	9,600	3,400	2,000	1,000	14,768	1,713,794
2042	1,713,794	21,220	14,826	26,400	26,400	12,100	15,600	9,600	3,400	2,000	1,000	14,894	1,728,689
2043	1,728,689	21,480	14,949	26,400	26,400	12,100	15,600	9,600	3,400	2,000	1,000	15,030	1,743,719
2044	1,743,719	21,736	15,071	26,400	26,400	12,100	15,600	9,600	3,400	2,000	1,000	15,166	1,758,885
2045	1,758,885	21,987	15,173	26,400	26,400	12,100	15,600	9,600	3,400	2,000	1,000	15,314	1,774,198
2046	1,774,198	22,230	15,250	26,400	26,400	12,100	15,600	9,600	3,400	2,000	1,000	15,480	1,789,679

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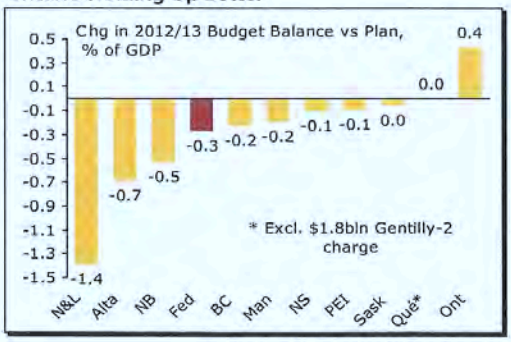
In contrast, nominal GDP growth has been better insulated in Central Canada. Underlying fiscal targets remain intact in Québec (excluding the costs of mothballing a nuclear power plant), while Ontario is poised to narrow its deficit to less than $12 bn in 2012/13. Indeed, Ontario is the sole province positioned to better its 2012/13 fiscal target (Chart 6), in part a nod to the lift provided by a stronger US. Ontario no longer has the largest deficit in the country as a percent of GDP.

In contrast to very real restraint being administered in provinces like Ontario, the ability of lower debt regions to relax timelines for deficit reduction (e.g., in Manitoba) or to bring forward infrastructure outlays (e.g., in Alberta) suggests a less immediate fiscal drag for some. The result is that with lower-debt provinces enjoying less of a growth differential, and less pressed to tighten fiscally, the gaps in deficit-to-GDP performance look to be narrowing.

There are important implications for credit markets, with Ontario's progress on deficit targets putting off the threat of a credit rating downgrade and its relatively stronger fiscal showing meaning that province will account for a smaller share of provincial bond supply ahead. So don't be surprised if Ontario bonds continue to recoup some of the earlier spread widening to other provincial peers, a trend that is already apparent but likely still has some room to run.

Chart 6

Revisions to 2012/13 Budget Plans: Ontario Holding Up Better



Source: CIBC, Provincial governments

Table 2

Detailed Economic Forecast

	Real GDP Yr/Yr % Chg			Employment Yr/Yr % Chg			Unemployment Rate %			Housing Starts 000s Units			Consumer Price Index Yr/Yr % Chg		
	2012E	2013F	2014F	2012A	2013F	2014F	2012A	2013F	2014F	2012A	2013F	2014F	2012A	2013F	2014F
BC	2.1	1.6	2.4	1.7	0.8	1.5	6.8	6.7	6.3	27.5	22.0	21.3	1.1	0.8	1.8
Alta	3.4	2.3	2.8	2.6	1.4	1.5	4.7	4.6	4.6	33.3	31.9	31.0	1.1	1.1	2.4
Sask	3.0	2.4	2.9	2.1	1.8	1.6	4.8	4.6	4.5	10.0	10.0	9.8	1.6	1.3	2.3
Man	2.3	1.8	2.3	0.9	1.4	1.3	5.3	5.3	5.1	7.4	6.4	6.1	1.6	1.7	2.1
Ont	2.0	1.8	2.5	0.8	1.7	1.6	7.9	7.8	7.4	77.0	63.0	62.3	1.4	1.4	2.2
Qué	1.0	1.3	2.0	0.7	1.4	1.1	7.8	7.6	7.4	47.2	42.0	41.6	2.1	1.7	1.8
NB	0.8	1.3	1.8	-0.1	0.0	0.8	10.3	10.5	10.0	3.3	3.0	2.9	1.7	1.4	1.7
NS	1.4	1.7	2.3	0.7	0.5	1.2	9.0	9.0	8.6	4.5	4.6	4.5	1.9	1.5	2.0
PEI	1.5	1.6	1.9	1.0	1.4	1.0	11.3	11.3	11.0	0.9	0.9	0.9	2.0	1.3	1.7
N&L	0.0	4.5	2.0	2.1	2.0	1.5	12.5	11.7	11.4	4.0	3.4	3.3	2.1	1.7	2.3
Cda	2.0	1.7	2.4	1.1	1.4	1.4	7.3	7.2	6.8	215	187	184	1.5	1.3	2.1

Sources: CIBC, Statistics Canada, CMHC

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NATIONAL BANK
FINANCIAL MARKETS
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Annex

Main economic indicators - Provinces

	2008	2009	2010	2011	2012f	2013f	2014f
Real GDP (% growth)							
Newfoundland & Labrador	-1.0	-10.3	6.3	3.0	0.0	3.0	1.0
Prince Edward Island	0.9	0.3	2.6	1.6	1.3	1.5	1.5
Nova Scotia	2.5	-0.3	1.9	0.5	1.0	1.3	2.0
New Brunswick	0.9	-0.6	3.1	0.0	0.6	1.3	2.1
Quebec	1.4	-0.5	2.5	1.9	0.8	1.0	2.1
Ontario	-0.2	-3.5	3.2	1.8	2.0	1.2	2.4
Manitoba	4.0	-0.4	2.5	2.0	2.5	2.1	2.3
Saskatchewan	5.4	-4.0	4.4	4.9	3.1	2.5	3.0
Alberta	1.6	-4.4	4.0	5.1	3.2	2.5	3.1
British Columbia	1.1	-2.5	3.2	2.8	2.1	1.8	2.7
Canada	1.1	-2.8	3.2	2.6	1.9	1.5	2.4
Employment (% growth)							
Newfoundland & Labrador	1.0	-2.9	3.5	2.8	2.1	1.5	0.5
Prince Edward Island	1.2	-1.4	3.1	1.8	1.0	0.8	0.7
Nova Scotia	0.9	-0.1	0.2	0.0	0.7	0.7	0.9
New Brunswick	0.6	0.1	-0.9	-1.1	-0.1	0.7	1.1
Quebec	1.2	-0.8	1.8	1.0	0.7	0.8	1.1
Ontario	1.5	-2.4	1.6	1.8	0.8	0.8	1.1
Manitoba	1.7	0.0	1.9	0.7	0.9	1.0	1.2
Saskatchewan	1.7	1.3	0.9	0.3	2.1	1.5	1.7
Alberta	3.1	-1.3	-0.4	3.5	2.6	1.5	1.7
British Columbia	2.0	-2.1	1.8	0.8	1.7	1.0	1.3
Canada	1.7	-1.6	1.4	1.5	1.1	1.0	1.2
Unemployment rate (%)							
Newfoundland & Labrador	13.3	15.6	14.3	12.7	12.6	11.2	11.0
Prince Edward Island	10.7	12.0	11.3	11.3	11.3	10.9	10.2
Nova Scotia	7.6	9.1	9.3	8.9	9.0	8.6	8.0
New Brunswick	8.5	8.7	9.3	9.5	10.3	10.0	9.3
Quebec	7.3	8.5	7.9	7.8	7.8	7.8	7.3
Ontario	6.5	9.0	8.6	7.8	7.8	8.1	7.7
Manitoba	4.2	5.3	5.4	5.4	5.3	5.5	5.2
Saskatchewan	4.1	4.8	5.2	5.0	4.7	4.9	4.8
Alberta	3.6	6.6	6.5	5.4	4.7	4.8	4.6
British Columbia	4.6	7.7	7.6	7.5	6.8	6.8	6.8
Canada	6.1	8.3	8.0	7.5	7.3	7.4	7.0
Housing starts (000)							
Newfoundland & Labrador	3.3	3.1	3.6	3.5	4.0	3.3	3.1
Prince Edward Island	0.7	0.9	0.8	0.9	0.9	0.7	0.7
Nova Scotia	4.0	3.4	4.3	4.6	4.5	4.0	3.8
New Brunswick	4.3	3.5	4.1	3.5	3.3	2.9	2.7
Quebec	47.9	43.4	51.4	48.4	47.2	41.5	39.0
Ontario	75.1	50.4	60.4	67.8	77.0	63.5	61.7
Manitoba	5.5	4.2	5.9	6.1	7.4	7.0	6.5
Saskatchewan	6.8	3.9	5.9	7.0	10.0	9.5	8.9
Alberta	29.2	20.3	27.1	25.7	33.3	31.6	31.0
British Columbia	34.3	16.1	26.5	26.4	27.5	24.0	23.0
Canada	211.1	149.1	189.9	194.0	215.2	188.1	180.4
Consumer Price Index (%							
Newfoundland & Labrador	2.9	0.3	2.4	3.4	2.2	1.2	2.2
Prince Edward Island	3.4	-0.1	1.8	2.9	2.0	1.3	2.2
Nova Scotia	3.0	-0.1	2.2	3.8	1.9	1.1	2.2
New Brunswick	1.7	0.3	2.1	3.5	1.7	1.1	2.2
Quebec	2.1	0.6	1.3	3.0	2.1	1.3	2.1
Ontario	2.3	0.4	2.4	3.1	1.5	1.2	2.1
Manitoba	2.2	0.6	0.8	2.9	1.6	1.4	2.2
Saskatchewan	3.2	1.1	1.3	2.8	1.7	1.4	2.2
Alberta	3.2	-0.1	1.0	2.4	1.3	1.6	2.1
British Columbia	2.1	0.0	1.4	2.3	1.1	0.8	1.8
Canada	2.4	0.3	1.8	2.9	1.6	1.4	2.1

f: forecast National Bank, Economy and Strategy Group

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Provincial Economic Outlook

BMO Capital Markets Economics
March 15, 2013

	Cda	BC	Alta	Sask	Man	Ont	Que	NB	NS	PEI	Nfld
Real GDP Growth (% change, chain-weighted)											
2010	**3.2**	3.2	4.0	4.4	2.5	3.2	2.5	3.1	1.9	2.6	6.3
2011	**2.6**	2.8	5.1	4.9	2.0	1.8	1.9	0.0	0.5	1.6	3.0
2012 f	**1.8**	2.1	3.2	3.0	2.4	1.9	0.9	1.0	1.5	1.3	0.5
2013 f	**1.5**	1.7	2.2	2.4	2.0	1.5	1.2	1.4	1.6	1.7	4.0
2014 f	**2.3**	2.5	2.9	2.8	2.3	2.3	1.8	1.6	2.0	1.7	1.8
Employment Growth (% change)											
2010	**1.4**	1.8	-0.4	0.9	1.9	1.6	1.8	-1.0	0.2	3.1	3.5
2011	**1.5**	0.8	3.8	0.3	0.7	1.8	1.0	-1.2	0.0	1.9	2.7
2012	**1.2**	1.6	2.6	2.2	0.9	0.8	0.8	-0.2	0.6	1.0	2.1
2013 f	**1.3**	0.7	1.6	2.0	1.0	1.3	1.5	-0.4	0.3	1.1	1.7
2014 f	**1.4**	1.4	1.6	1.2	1.1	1.5	1.2	0.6	1.0	0.4	0.3
Unemployment Rate (percent)											
2010	**8.0**	7.6	6.5	5.2	5.4	8.6	7.9	9.3	9.2	11.3	14.3
2011	**7.5**	7.5	5.5	5.0	5.4	7.8	7.7	9.5	8.8	11.4	12.6
2012	**7.3**	6.8	4.6	4.8	5.3	7.9	7.8	10.3	9.0	11.3	12.5
2013 f	**6.9**	6.4	4.5	4.4	5.3	7.4	7.4	10.7	8.7	11.3	12.4
2014 f	**6.6**	6.2	4.3	4.3	4.9	7.0	7.1	10.2	8.3	11.1	12.3
Housing Starts (thousands)											
2010	**191**	26.7	26.9	6.0	6.1	60.7	50.9	4.5	4.4	0.8	4.1
2011	**193**	26.3	25.5	7.1	5.9	67.7	48.2	3.2	4.7	1.0	3.6
2012	**215**	27.5	33.3	10.0	7.4	77.0	47.2	3.3	4.5	0.9	4.0
2013 f	**175**	21.1	30.0	8.5	6.3	55.0	42.0	2.9	4.9	0.8	3.6
2014 f	**170**	20.5	30.0	7.5	6.0	53.5	41.3	2.7	4.8	0.8	3.3
Consumer Price Index (% change)											
2010	**1.8**	1.4	1.0	1.3	0.8	2.4	1.3	2.1	2.2	1.8	2.4
2011	**2.9**	2.4	2.4	2.8	3.0	3.1	3.0	3.5	3.8	2.9	3.4
2012	**1.5**	1.1	1.1	1.6	1.6	1.4	2.1	1.7	1.9	2.0	2.1
2013 f	**1.3**	0.6	1.3	1.5	1.4	1.3	1.6	1.8	1.5	1.3	1.7
2014 f	**1.9**	1.7	2.0	2.1	1.8	1.9	1.8	1.5	1.7	1.5	2.0

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RBC ECONOMICS | **RESEARCH**

PROVINCIAL OUTLOOK

March 2013

Forecast detail

Average annual % change unless otherwise indicated

	Real GDP				Employment				Unemployment rate %				Housing starts Thousands				Retail sales			
	11	12F	13F	14F	11	12	13F	14F	11	12	13F	14F	11	12	13F	14F	11	12	13F	14F
N.& L.	3.0	0.4	5.1	1.3	2.7	2.3	2.0	1.5	12.7	12.5	11.8	11.3	3.5	4.0	3.4	3.2	5.1	4.8	4.2	4.3
P.E.I	1.6	1.4	1.7	1.8	1.9	1.1	1.6	1.3	11.4	11.3	11.0	10.4	0.9	0.9	0.9	0.7	5.6	3.4	2.6	3.3
N.S.	0.5	1.1	1.9	2.1	0.1	0.6	0.3	1.1	8.8	9.0	9.0	8.6	4.6	4.5	4.0	3.8	3.5	1.0	3.4	3.1
N.B.	0.0	0.6	1.1	1.8	-1.1	-0.2	0.6	1.0	9.5	10.2	10.5	9.9	3.5	3.3	3.0	3.0	4.8	-0.5	2.1	3.0
QUE.	1.9	0.8	1.2	2.0	1.0	0.8	1.5	1.0	7.8	7.8	7.6	7.5	48.4	47.1	40.3	38.0	2.9	0.7	3.0	3.5
ONT.	1.8	1.9	1.6	2.8	1.8	0.8	1.3	1.4	7.8	7.8	7.6	7.3	67.8	76.9	58.9	58.0	3.6	1.6	3.1	3.8
MAN.	2.0	2.7	2.7	2.8	0.8	0.9	1.7	1.2	5.4	5.3	5.0	4.8	6.1	7.4	6.2	5.5	4.3	1.3	3.6	4.4
SASK.	4.9	2.6	2.9	3.7	0.3	2.1	2.7	1.6	5.0	4.7	4.3	4.3	7.0	10.0	7.9	6.9	7.5	6.7	5.4	4.9
ALTA.	5.1	3.5	3.0	4.2	3.8	2.6	2.6	1.9	5.5	4.6	4.4	4.5	25.7	33.3	33.0	32.0	6.9	7.6	5.3	5.2
B.C.	2.8	1.8	1.6	2.7	0.8	1.7	1.0	1.4	7.5	6.7	6.3	6.3	26.4	27.5	23.9	23.5	3.1	2.2	2.9	3.9
CANADA	2.6	1.8	1.8	2.9	1.6	1.2	1.5	1.3	7.4	7.2	7.0	6.7	194	215	182	175	4.1	2.5	3.5	4.0

Key provincial comparisons

2011 unless otherwise indicated

	N. & L.	P.E.I.	N.S.	N.B.	QUE	ONT	MAN	SASK	ALTA	B.C.
Population (000s) (2012)	513	146	949	756	8,055	13,506	1,267	1,080	3,874	4,623
Gross domestic product ($ billions)	33.6	5.4	37.0	32.2	345.8	654.6	55.9	74.7	295.3	217.7
Real GDP ($2007 billions)	28.9	4.9	35.4	28.9	322.7	605.2	53.4	57.5	274.7	206.2
Share of provincial GDP of Canadian GDP (%)	1.9	0.3	2.1	1.8	19.6	37.1	3.2	4.2	16.8	12.4
Real GDP growth (CAR, 2007-11, %)	-0.6	1.1	0.9	0.7	1.0	0.2	1.6	2.1	1.2	0.9
Real GDP per capita ($ 2007)	56,370	33,467	37,349	38,290	40,448	45,277	42,638	54,392	72,714	45,051
Real GDP growth rate per capita (CAR, 2007-11, %)	-0.7	0.2	0.8	0.5	0.3	-0.5	0.9	1.0	-0.1	-0.1
Personal disposable income per capita ($)	28,181	23,879	26,256	26,277	25,646	28,660	26,201	31,223	37,894	28,375
Employment growth (CAR, 2006-11, %)	1.0	1.1	0.5	0.1	1.1	0.9	1.2	1.3	1.8	1.2
Employment rate (Nov. 2012, %)	54.5	60.6	58.3	56.3	60.6	61.3	65.5	66.2	69.9	60.4
Discomfort index (inflation + unemp. rate, Oct. 2012)	14.1	13.8	10.6	13.0	9.6	9.3	7.3	6.2	5.1	7.2
Manufacturing industry output (% of GDP, 2011)	3.2	8.7	7.5	11.3	14.2	12.4	11.5	6.3	6.4	7.2
Personal expenditures on goods & services (% of GDP)	41.0	69.8	69.7	60.9	58.2	56.6	58.2	40.5	40.5	62.2
International exports (% of GDP)	39.9	18.5	20.9	47.4	25.7	32.8	28.0	44.0	33.1	22.7

Global Forecast Update

Provincial	2000-11	2012e	2013f	2014f	2000-11	2012e	2013f	2014f
	Real GDP (annual % change)				Budget Balances*, FY March 31 ($millions)			
Canada	2.2	1.9	1.6	2.4	106	-26,220	-25,000	-18,000
Newfoundland & Labrador	3.1	1.0	3.0	2.0	133	883	-726	n.a.
Prince Edward Island	1.9	1.1	1.0	1.7	-32	-78	-80	n.a.
Nova Scotia	1.7	1.1	1.4	2.1	70	-248	-277	n.a.
New Brunswick	1.8	0.8	0.9	1.7	-77	-261	-411	n.a.
Quebec	1.9	0.9	1.2	2.1	-623	-2,628	-1,500	0
Ontario	1.9	2.0	1.5	2.1	-3,374	-12,969	-11,859	n.a.
Manitoba	2.2	2.0	1.8	2.2	189 **	-999	-567	n.a.
Saskatchewan	2.2	3.1	2.5	2.9	393	352	54	n.a.
Alberta	3.0	3.4	2.6	3.1	3,627	0	0	n.a.
British Columbia	2.6	2.0	1.5	2.6	540	-1,840	-1,228	197
	Employment (annual % change)				Unemployment Rate (annual average, %)			
Canada	1.5	1.2	1.1	1.1	7.1	7.2	7.1	6.9
Newfoundland & Labrador	0.9	2.3	1.5	1.3	15.0	12.5	12.1	11.5
Prince Edward Island	1.5	1.1	0.7	0.8	11.3	11.3	11.0	10.8
Nova Scotia	1.0	0.6	0.7	0.8	8.8	9.0	8.6	8.3
New Brunswick	0.6	-0.2	0.4	0.7	9.4	10.2	10.0	9.8
Quebec	1.4	0.8	1.0	1.0	8.2	7.8	7.6	7.5
Ontario	1.5	0.8	1.0	1.0	7.0	7.8	7.6	7.5
Manitoba	1.2	0.9	0.8	1.1	4.9	5.3	5.2	5.0
Saskatchewan	0.9	2.1	1.5	1.6	5.1	4.7	4.5	4.4
Alberta	2.8	2.7	1.9	2.0	4.8	4.6	4.5	4.4
British Columbia	1.5	1.7	1.0	1.3	6.7	6.7	6.5	6.4
	Housing Starts (annual, thousands of units)				Motor Vehicle Sales (annual, thousands of units)			
Canada	200	215	175	170	1,588	1,677	1,690	1,695
Atlantic	12	13	11	10	114	126	128	128
Quebec	45	47	40	40	405	416	417	418
Ontario	73	77	58	57	603	618	621	623
Manitoba	5	7	6	5	44	50	50	50
Saskatchewan	4	10	8	7	42	55	56	56
Alberta	34	33	29	29	205	239	244	245
British Columbia	27	27	23	22	175	173	174	175

*FY13 & FY14 data: Provinces' estimates.
**FY04-FY11.

Forecast Changes

Provinces

- Projected growth has been edged lower for the majority of provinces for 2012. Recently released information indicates soft year-end retail sales for a number of provinces, particularly New Brunswick, Quebec and British Columbia. As well, international export receipts slowed substantially for Central and Western Canada in the latter months of 2012.
- For 2013, slightly slower advances are now forecast for British Columbia, Ontario and Quebec, with the anticipated scaling back of housing activity. While growth for both Saskatchewan and Alberta remains buoyant, a mixed commodity price outlook is tempering their expansion somewhat this year. Several positive events are emerging in Nova Scotia in 2013, including investments to prepare for its extensive shipbuilding contracts and the start-up of its new offshore natural gas field. However, with much of the ramp-up in activity likely in the second half of 2013, the full-year boost awaits 2014.
- Next year, the ongoing U.S. economic recovery is expected to be constructive for Ontario, which still relies on the U.S. for almost four-fifths of its international merchandise export receipts. As U.S. housing construction continues to strengthen over the next two years, provinces with a focus on wood and building product exports, such as British Columbia, Quebec and New Brunswick, should benefit.
- British Columbia's February *Budget*, given the challenge of eliminating its deficit in fiscal 2013-14, introduced several revenue increases, including a one percentage point rise in its general corporate income tax rate as of April and a new top personal income tax bracket for 2014 and 2015. Additional restraint is anticipated from a number of other provincial *Budgets* this spring to sustain their fiscal repair given tempered revenue growth.

Scotiabank

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PROVINCIAL ECONOMIC FORECASTS

REAL GROSS DOMESTIC PRODUCT (GDP)
Annual average per cent change

	2009	2010	2011	2012E	2013F	2014F
CANADA	-2.8	3.2	2.6	1.8	1.6	2.6
N. & L.	-10.3	6.3	3.0	0.4	3.4	1.1
P.E.I.	0.3	2.6	1.6	1.5	1.3	1.8
N.S.	-0.3	1.9	0.5	1.3	1.2	1.9
N.B.	-0.6	3.1	0.0	1.1	1.2	2.0
Québec	-0.5	2.5	1.9	1.0	1.4	2.3
Ontario	-3.5	3.2	1.8	1.7	1.4	2.5
Manitoba	-0.4	2.5	2.0	2.1	1.6	2.4
Sask.	-4.0	4.4	4.9	2.9	2.3	3.2
Alberta	-4.4	4.0	5.1	2.9	2.5	3.3
B.C.	-2.5	3.2	2.8	2.1	1.6	2.6

E | F: Estimate, Forecast by TD Economics as of April 2013.
Source: Statistics Canada / Haver Analytics

NOMINAL GROSS DOMESTIC PRODUCT (GDP)
Annual average per cent change

	2010	2011	2012E	2013F	2014F
CANADA	6.4	5.9	3.1	3.1	4.5
N. & L.	14.5	17.5	-5.3	5.0	3.1
P.E.I.	5.1	3.7	2.9	2.5	3.7
N.S.	4.1	1.8	3.0	2.8	3.8
N.B.	6.6	4.0	2.5	2.8	3.9
Québec	4.5	4.7	2.6	2.7	4.0
Ontario	5.2	4.7	3.4	2.7	4.3
Manitoba	4.8	4.9	3.8	3.2	4.2
Sask.	8.4	13.2	3.7	4.2	6.0
Alberta	10.7	9.0	3.9	4.0	5.7
B.C.	6.5	4.5	3.4	3.1	4.6

E | F: Estimate, Forecast by TD Economics as of April 2013.
Source: Statistics Canada / Haver Analytics

EMPLOYMENT
Annual average per cent change

	2009	2010	2011	2012	2013F	2014F
CANADA	-1.6	1.4	1.6	1.2	1.4	1.4
N. & L.	-2.9	3.3	2.7	2.3	2.2	1.0
P.E.I.	-1.3	2.9	2.0	1.1	1.0	1.0
N.S.	-0.1	0.2	0.1	0.6	0.9	1.4
N.B.	0.1	-0.9	-1.2	-0.2	-0.1	1.3
Québec	-0.8	1.7	1.0	0.8	1.4	1.3
Ontario	-2.5	1.7	1.8	0.8	1.3	1.2
Manitoba	0.0	1.9	0.8	0.9	1.5	1.6
Sask.	1.3	0.9	0.3	2.1	2.0	1.8
Alberta	-1.4	-0.4	3.8	2.7	2.0	1.9
B.C.	-2.1	1.7	0.8	1.7	1.3	1.6

E | F: Estimate, Forecast by TD Economics as of April 2013.
Source: Statistics Canada / Haver Analytics

UNEMPLOYMENT RATE
Annual, per cent

	2010	2011	2012	2013F	2014F
CANADA	8.0	7.4	7.2	7.1	7.0
N. & L.	14.4	12.7	12.5	12.3	12.2
P.E.I.	11.2	11.3	11.3	11.4	11.3
N.S.	9.3	8.8	9.0	9.0	8.7
N.B.	9.3	9.5	10.2	10.3	10.2
Québec	8.0	7.8	7.8	7.8	7.7
Ontario	8.7	7.8	7.8	7.6	7.4
Manitoba	5.4	5.4	5.3	5.3	5.1
Sask.	5.2	5.0	4.7	4.6	4.6
Alberta	6.5	5.5	4.6	4.6	4.5
B.C.	7.6	7.5	6.7	6.6	6.5

E | F: Estimate, Forecast by TD Economics as of April 2013.
Source: Statistics Canada / Haver Analytics

CONSUMER PRICE INDEX (CPI)
Annual average per cent change

	2009	2010	2011	2012	2013F	2014F
CANADA	0.3	1.8	2.9	1.5	1.1	1.8
N. & L.	0.3	2.4	3.4	2.1	1.5	2.0
P.E.I.	-0.2	1.9	2.9	2.0	1.7	1.8
N.S.	-0.2	2.2	3.8	2.0	1.4	1.7
N.B.	0.3	2.1	3.5	1.7	1.2	1.8
Québec	0.6	1.2	3.0	2.1	1.0	1.7
Ontario	0.4	2.5	3.1	1.4	1.0	1.7
Manitoba	0.6	0.8	3.0	1.6	1.2	1.7
Sask.	1.0	1.4	2.8	1.6	1.5	2.4
Alberta	-0.1	1.0	2.4	1.1	1.5	2.1
B.C.	0.0	1.3	2.4	1.1	1.0	2.0

E | F: Estimate, Forecast by TD Economics as of April 2013.
Source: Statistics Canada / Haver Analytics

RETAIL TRADE
Annual average per cent change

	2010	2011	2012	2013F	2014F
CANADA	5.6	4.1	2.4	2.4	3.4
N. & L.	4.6	5.1	4.8	4.0	2.9
P.E.I.	5.3	5.6	3.4	1.9	2.9
N.S.	4.5	3.5	1.0	1.8	3.0
N.B.	5.0	4.8	-0.6	1.4	3.1
Québec	6.2	2.9	0.6	1.6	2.9
Ontario	5.4	3.6	1.5	1.7	3.0
Manitoba	5.7	4.3	1.4	2.1	2.9
Sask.	3.4	7.5	6.8	4.8	4.7
Alberta	6.0	6.9	7.6	4.7	5.0
B.C.	5.4	3.1	2.2	2.4	3.5

E | F: Estimate, Forecast by TD Economics as of April 2013.
Source: Statistics Canada / Haver Analytics

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REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Executive Summary; Forecast Details - Residential Basic Tables 13 & 14; Page No.: p. i; pp. 17-18

PREAMBLE: An increase in average use per customer adds 0.3% to the growth and is primarily due to increased use of electric space heating and electric water heating in homes.

QUESTION:

Please prepare a table for the years from 1992/93 to 2012/13 which displays annually for Residential Basic (including Winnipeg Hydro): the actual sales (GWh), the weather adjustment to sales (GWh), the weather adjusted sales (GWh), the actual use per customer (kWh/cust) and the weather adjusted use per customer (kWh/cust).

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Executive Summary; Forecast Details - Residential Basic Table 14; Page No.: p. i; p.18

PREAMBLE: An increase in average use per customer adds 0.3% to the growth and is primarily due to increased use of electric space heating and electric water heating in homes.

QUESTION:

Please prepare a table for the years from 1992/93 to 2012/13 which displays annually for Residential Basic the % Electric Space Heat and the % Electric Water Heat similar to the presentation in Table 14.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Executive Summary; Page No.: p iii

QUESTION:

Please confirm that data for Gross Firm Energy for fiscal years 2002/03 through 2011/12 in Table 1 have not been weather adjusted. If this cannot be confirmed, please explain.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Executive Summary; Page No.: p iii

QUESTION:

Please confirm that the –1.4% in the Growth (%) column for 2012/13 Wadj Gross Firm Energy and –2.8% for Gross Total Peak represents the difference between the weather adjusted value and the actual value for the same year, not an annual growth rate. If not, please explain what these values represent and how they are calculated.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Executive Summary; Page No.: iii

QUESTION:

Please restate Table 1 for Gross Firm Energy and Gross Total Peak using weather adjusted historical figures.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Executive Summary; Page No.: p iii

QUESTION:

Please explain if this restatement has any effect on the forecast values, including % growth for individual years.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: General Consumers Customer Forecast, Page No.: 4; Appendix G: 2013-2034 Economic Outlook; Section: Reference Case Forecast; Page No.: 3; Appendix A: Integrated Financial Forecast; Section: Overview; Page No.: A-1; Appendix B: Manitoba Hydro 2011/12 Power Resource Plan; Section: Manitoba Hydro 2011/12 Resource Plan; Page No.: B-1

PREAMBLE: Manitoba Hydro's 2013 Economic Outlook provides the forecast of Residential Basic customers, and this document uses that forecast. It calls for a growth of 5,577 (1.2%) per year over the next ten years and 5,423 (1.1%) per year over the next 20 years.

QUESTION:

Please provide technical details about how the residential customer forecast was calculated, including any equations, calculations or models, or point to where these details were provided in the NFAT documents.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: General Consumers Customer Forecast; Page No.: p.4

PREAMBLE: General Service Mass Market customers have grown 571 (0.9%) per year over the last 10 years. They are forecast to grow 545 (0.8%) over the next ten years and 512 (0.7%) over the next 20 years.

QUESTION:

Please provide technical details about how the General Service Mass Market customer forecast was calculated, including any equations, calculations or models, or point to where these details were provided in the NFAT documents.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: General Consumers Customer Forecast; Page No.: p.4

PREAMBLE: Residential Seasonal customers, who are mainly cottages with lower usage, are growing at a slower rate than Residential Basic averaging 51 (0.3%) customers per year over the last 10 years. They are forecast to grow at 96 (0.5%) over the next 10 years and 98 (0.5%) over the next 20 years.

QUESTION:

Please provide the details and rationale for why the growth in Residential Seasonal customers is forecast to almost double on an annual basis for the next 20 years. Specifically, what is driving Residential Seasonal to increase by 100 between 2013/14 and 2014/15 when the actual number of customers declined by 113 between 2011/12 and 2012/13? What is the basis of this sustained increase over the next 20 years?

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: General Consumers Sales Energy; Residential Sales; General Service Mass Market; Page No.: p. 7-Table 5; p. 17 Table 13; p. 20 Table 15

QUESTION:

Please confirm that historical actual Residential Basic GW.h and General Service Mass Market GW.h are not weather adjusted, other than the row titled 2012/13 Wadj. If not confirmed, please reconcile with Tables 5 and 13.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: General Consumers Sales Energy; Residential Sales; General Service Mass Market General Consumers Sales Energy; Residential Sales; General Service Mass Market ; Page No.: p. 7-Table 5; p. 17 Table 13; p. 20 Table 15

QUESTION:

Please provide a revised table based on Table 5 that provides the following historical information for each fiscal year in the period 1992/93 to 2012/13: Residential Basic, Diesel, Seasonal and FRWH actual GWh and percentage change from previous year, weather adjustment, and weather adjusted actual GWh and percentage change from previous year.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: General Consumers Sales Energy; Residential Sales; General Service Mass Market; Page No.: p. 7-Table 5; p. 17 Table 13; p. 20 Table 15

QUESTION:

Please provide a revised table based on Table 5 that provides the following historical information for each fiscal year in the period 1992/93 to 2012/13: General Service Mass Mkt, Top Cons, Diesel, Seasonal, FRWH and SEP actual GWh and percentage change from previous year, weather adjustment, and weather adjusted actual GWh and percentage change from previous year.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: General Consumers Sales Energy; Residential Sales; General Service Mass Market; Page No.: p. 7-Table 5; p. 17 Table 13; p. 20 Table 15

QUESTION:

Please provide a revised table based on Table 5 that provides the following historical information for each fiscal year in the period 1992/93 to 2012/13: Lighting actual GWh and percentage change from previous year, weather adjustment, and weather adjusted actual GWh and percentage change from previous year.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: General Consumers Sales Energy; Residential Sales; General Service Mass Market; Page No.: p. 7-Table 5; p. 17 Table 13; p. 20 Table 15

QUESTION:

Please provide a revised table based on Table 5 that provides the following historical information for each fiscal year in the period 1992/93 to 2012/13: Total Sales actual GWh and percentage change from previous year, weather adjustment, and weather adjusted actual GWh and percentage change from previous year.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Comparison of the 2012 Forecast to the 2012/13 Weather Adjusted Actuals; Page No.: Table 2 - p.iv., Table 7 - p.11 attachment of table located in the technical reports

QUESTION:

Please complete the table in the attached spreadsheet, "1 Year Forecast Error Table" to examine the next year forecast error of Manitoba Hydro's Electric Load Forecast for the past 5 years. Please note that column D, 2012 Forecast, 2011 Forecast, etc., refers to the forecast for 2012/13 in the 2012 Electric Load Forecast, the forecast for 2011/12 in the 2011 Electric Load Forecast, and so on.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Forecast Details - Residential Basic; Page No.: pp. 17-18

PREAMBLE: "The primary drivers of Residential Basic growth are population and average use per customer... The increase in average use per customer is expected to add another 0.3% to the growth. The average use (kWh/customer) for Electric Heat Billed customers is decreasing as apartments are making up a higher proportion of the growth and as existing homes become better insulated. The average use for Other customers is increasing primarily due to the increase in electric water heaters."

QUESTION:

Please provide an explanation to reconcile the seemingly contradictory statements above about average use; namely, that average use per customer is one of the primary drivers of Residential Basic growth, but that the average use for Electric Heat Billed customers is decreasing as apartments are making up a higher proportion of the growth and as existing homes become better insulated.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Forecast Details - Residential Basic; Page No.: pp. 17-18

PREAMBLE: "The primary drivers of Residential Basic growth are population and average use per customer... The increase in average use per customer is expected to add another 0.3% to the growth. The average use (kW.h/customer) for Electric Heat Billed customers is decreasing as apartments are making up a higher proportion of the growth and as existing homes become better insulated. The average use for Other customers is increasing primarily due to the increase in electric water heaters."

QUESTION:

Please provide a schedule for the past ten years that compares annual average use per customer for Residential customers attributable to electric space heating and the average use per customer for Residential customers attributable to electric water heating. In the schedule, please also provide the number of customers with electric space heating and the number of customers with electric water heating.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Chapter 4: The Need for New Resources; Section: 4.2.2.3; Page No.: 20 line 5

QUESTION:

Please explain the methodology used by Manitoba Hydro to estimate and verify the past savings of 1,990 GWh and 586 MW.

RESPONSE:

This information response has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Chapter 4: The Need for New Resources; Section: 4.2.2.3; Page No.: 20 line 5

QUESTION:

Has Manitoba Hydro benchmarked the methodology or is Manitoba Hydro aware of any applicable benchmarking?

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Executive Summary; Section: Reducing Demand Through Demand Side Management; Page No.: 10 lines 28, 29

QUESTION:

Are the energy savings the annual GWh for 27/28?

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Executive Summary; Section: Reducing Demand Through Demand Side Management; Page No.: 10 lines 28, 29; Consolidated Financial Forecast IFF-12; Section: 2.4; Page No.: 4

PREAMBLE: With 490 MW capacity savings 1,552 GWh savings implies a 36% load factor for all DSM measures versus 63% for system as a whole.

QUESTION:

How does Manitoba Hydro explain how the DSM portfolio has a much lower Load Factor than the system average?

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Executive Summary; Section: Reducing Demand Through Demand Side Management; Page No.: 10 lines 28, 29

PREAMBLE: With 490 MW capacity savings 1,552 GWh savings implies a 36% load factor for all DSM measures versus 63% for system as a whole.

QUESTION:

How does Manitoba Hydro evaluate the energy versus the capacity savings for its DSM measures?

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Executive Summary; Section: 4.2.2.3; Page No.: 31 line 28; 29 line 9

QUESTION:

Is the "ideal" range the same as Technical potential in the **Appendix 4.3 – Demand Side Management Potential Study? If not, please explain.**

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Chapter 4: The Need for New Resources; Section: 4.2.2; Page No.: 19 line 16

PREAMBLE: The document discusses load management at this point.

QUESTION:

How were the impacts of DSM measures (such as MH's Curtailable Rates program) on capacity assessed?

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Chapter 4: The Need for New Resources; Section: 4.2.2; Page No.: 19 line 16

PREAMBLE: The document discusses load management at this point.

QUESTION:

Is peak-shifting an objective of Manitoba Hydro?

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Chapter 4: The Need for New Resources; Section: 4.2.2; Page No.: 20 line 5-6

PREAMBLE: Existing DSM has a 39% Load Factor

QUESTION:

Why is the future DSM load factor expected to be lower than in the past?

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Chapter 4: The Need for New Resources; Section: 4.2.2.1; Page No.: 21 line 3

QUESTION:

What is the average cost per MWh of savings over the projected period?

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Chapter 4: The Need for New Resources; Section: 4.2.2.2; Page No.: 23 line 2-9

PREAMBLE: "The LUC for DSM opportunities cannot be simply assessed against alternative LUC's for generation options because the revenue impacts of DSM initiatives and supply-side options are different."

QUESTION:

Please explain further why DSM and supply options cannot be evaluated on the basis of lowest economic cost and how the inclusion of revenues is consistent with the Total Resource Cost screening criterion.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Chapter 4: The Need for New Resources; Section: 4.2.2.2; Page No.: 23 line 23

QUESTION:

Please provide more details on how the various metrics are used as "guidelines".

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Chapter 4: The Need for New Resources; Section: 4.2.2.2; Page No.: 23 line 23

QUESTION:

Are individual DSM measures treated on a case-by-case basis following the metrics as loose guidance or are there strict rules for applying the metrics that may be varied according to judgment?

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Chapter 4: The Need for New Resources; Section: 4.2.2.2; Page No.: 24 line 13

PREAMBLE: Manitoba Hydro under its legislation recovers from domestic loads all costs.

QUESTION:

Please explain further why domestic customers of Manitoba Hydro who do not participate in DSM programs should be viewed differently than participating customers for the purpose of DSM measure screening.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Chapter 4: The Need for New Resources; Section: 4.2.2.2; Figure 4.12; Page No.: 25 line 13

QUESTION:

Please provide examples of DSM opportunities that might exceed the marginal cost (6.7 cents) but have qualitative characteristics that would lead to their inclusion in the DSM plan.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Chapter 4: The Need for New Resources; Section: 4.2.2.1; Page No.: 27 line 15; 25 line 16

QUESTION:

Please explain the difference between the 2.4 cents/kWh on p 27 versus 3.8 cents/kWh on p25.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Chapter 4: The Need for New Resources; Section: 4.2.2.2; Figure 4.13; Page No.: 27 line 15

QUESTION:

Is Refrigerator Retirement DSM measure included in the Power Smart program?

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Chapter 4: The Need for New Resources; Section: 4.2.2.2; Figure 4.13; Page No.: 27 line 15

QUESTION:

Is Water and Energy Saver DSM measure included in the Power Smart Plan?

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Chapter 4: The Need for New Resources; Section: 4.2.2.2; Figure 4.13; Page No.: 27 line 15

QUESTION:

Is the Commercial Chiller DSM measure included in the Power Smart Plan?

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Executive Summary; 2013 Update to Forecasts and DSM Sensitivities; Page No.: 31 line 25

QUESTION:

How were the relative economics of the enhanced DSM programs and generation deferral assessed?

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Executive Summary; Section: 2013 Update to Forecasts and DSM Sensitivities; Page No.: 31 line 25

QUESTION:

What are the assumptions for DSM beyond 2028?

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Executive Summary; 2013 Update to Forecasts and DSM Sensitivities; Page No.: 31 line 25

QUESTION:

Has Manitoba Hydro undertaken in the past Integrated Resource Planning (IRP)? If so, why did Manitoba Hydro not continue?

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Executive Summary; 2013 Update to Forecasts and DSM Sensitivities; Page No.: 31 line 25

QUESTION:

Please provide a copy of the last IRP that was completed by Manitoba Hydro.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix E 2013-2016 Power Smart Plan; Page No.: 1

QUESTION:

Does the load forecast take into account reductions in load due to improved codes and standards?

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix E 2013-2016 Power Smart Plan; Page No.: 31

QUESTION:

Please explain why there is no variation in the capacity savings for the entire period (past and forecast).

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix 4.3 Demand Side Management Potential Study; Section: Data Development; Page No.: 2-16

QUESTION:

Please provide the information listed on page 2-16 as "utility-provided data".

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix 4.3 Demand Side Management Potential Study; Section: Data Applied for the Market Profiles, Data Deends for the Measure Characteristics in LoadMAP; Page No.: 2-19, 2-23

QUESTION:

Please provide the Manitoba Hydro Measure database, mentioned in Tables 2-12 and 2-18.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix H Corporate Strategic Plan 2012-2013; Section: Provide Exceptional Customer Value; Page No.: 6

PREAMBLE: In many jurisdictions "smart grid" technology features prominently in DSM (along with other areas). In the entire Business Case filing the term "smart grid only appears" six times.

QUESTION:

Did Manitoba Hydro examine other jurisdictions' plans to adopt "smart grid" technology and factor such technologies into its DSM planning?

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix H Corporate Strategic Plan 2012-2013; Section: Provide Exceptional Customer Value; Page No.: 6

PREAMBLE: In many jurisdictions "smart grid" technology features prominently in DSM (along with other areas). In the entire Business Case filing the term "smart grid only appears" six times.

QUESTION:

If so, which jurisdictions did Manitoba Hydro review and how did Manitoba Hydro use the information gathered?

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix 3.1 Long-Term Price Forecast for Manitoba Hydro's Export Market in MISO - The Brattle Group; Section: Base Case Scenario - Discussion; Page No.: 36

QUESTION:

How did Manitoba Hydro evaluate the potential contribution of smart meters and time-of-use pricing into its DSM and load forecasting activities?

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix 7.1 Emerging Energy Technology Review; Section: 4.6.3; Page No.: 61

PREAMBLE: "The adoption of advanced metering and smart grid related technologies over time could potentially improve efficiency and reliability of the Manitoba grid".

QUESTION:

Has Manitoba Hydro carried out any studies in relation to the smart grid in Manitoba, including advanced metering?

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix 7.1 Emerging Energy Technology Review; Section: 4.6.3; Page No.: 61

PREAMBLE: "The adoption of advanced metering and smart grid related technologies over time could potentially improve efficiency and reliability of the Manitoba grid".

QUESTION:

If so, please provide the studies.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

SMART GRID STRATEGY TASK FORCE

REPORT ON

MANITOBA HYDRO'S SMART GRID STRATEGY

PREPARED BY:	Smart Grid Strategy Task Force
DATE PREPARED:	2011 05 10
REVIEWED BY:	
FILE NUMBER:	

RECOMMENDED FOR IMPLEMENTATION

DEPARTMENT:

DIVISION:

DATE:

Task Force Members

Jamie Hall (co-Chair)
Brent Jorowski (co-Chair)
Lois Morrison
Terry Miles
Brad Ireland
Domenic Pellegrino
Ian Page
Bill Henderson
Robin Wiens

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EXECUTIVE SUMMARY

The Smart Grid, or the Smart Energy Network, is a vision which spans the entire electric energy system, from generation sources to end use devices. Although often associated with a single project or technology (e.g. smart meters), a Smart Grid is not defined by a single project. It involves a series of actions and changes that as a whole transforms the way electricity is used, delivered and produced. Ultimately, it encompasses the enhancement of generation and transmission systems; the modernization of the distribution system; and the introduction of new devices to provide consumer choices for effectively managing their electricity use, including emerging customer loads such as electric vehicles, and the utilization of diverse and dispersed energy storage and generation.

While there are Smart Grid elements in place within Manitoba Hydro's infrastructure, the use and scope of the Smart Grid is still evolving as needs and technologies change. Manitoba Hydro's generation and transmission systems already employ a well developed communications infrastructure and many smart technologies to provide a high degree of system visibility, control, automation, and protection. The distribution system has a sizable and growing population of intelligent electronic devices with the capability for providing additional benefits in the future.

The primary drivers of Smart Grid implementation are widely acknowledged by utilities in North America, Europe and Asia; however, many are not applicable to Manitoba Hydro's business context—for example, reducing dependence on non-renewable generation, availability of economic stimulus funding, expensive electricity rates and explicit direction on Smart Grid from shareholders or government. Furthermore, Manitoba Hydro has several strengths including a surplus of renewable generation, good reliability, low rates and high customer satisfaction. Our challenges include a widely dispersed customer base and significant distances between our energy resources and the majority of our load base.

The primary drivers for progress toward a Smart Grid that are most relevant and applicable to Manitoba Hydro's business context are to maintain or improve reliability, manage localized capacity constraints, operate more safely and efficiently and better manage our infrastructure and evolving customer load and expectations. It is in these areas that Manitoba Hydro envisions an opportunity to invest incrementally and, over time, increase the intelligence of our system. In order to maintain our reliability, for example, we may require the application of advanced system monitoring and automation to manage localized capacity constraints, to reduce distribution system outage times, and to identify and manage infrastructure or system risks, allowing proactive action to avoid emerging problems.

In implementing a Smart Grid, Manitoba Hydro monitors and participates in the development of industry standards, new technology and approaches. Pilot projects have been and continue to be

implemented across all areas of the power system. As well, Manitoba Hydro also continuously monitors developing customer and stakeholder needs and expectations. As an example, plug-in electric vehicles may drive the need for some aspects of a Smart Grid and, depending on uptake, may be the first technologies implemented at the retail customer level.

Considering the business context, drivers and priorities, the proposed Manitoba Hydro Smart Grid Strategy can be summarized as:

- Manitoba Hydro will continue to build a smarter grid by investing strategically in cost effective initiatives that improve safety, efficiency and reliability, and with consideration for evolving customers' expectations.
- The primary areas of focus in the coming years will be:
    - extension of the communication and information technology infrastructures
    - modernization of the distribution system including customer metering
- Separate funding will not be set aside for Smart Grid initiatives, but will remain part of our normal financial processes and will require the same level of scrutiny and approval as other projects and activities. Overall capital allocations are not expected to increase due to the development of a smarter energy system.
- Manitoba Hydro will participate in the development of Smart Grid standards and use established approval and R&D processes to develop and test new technologies.

Smart Grid principles can also be applied to Manitoba's natural gas distribution system. However, this report focuses only on the electrical system in Manitoba with regard to Smart Grid activities.

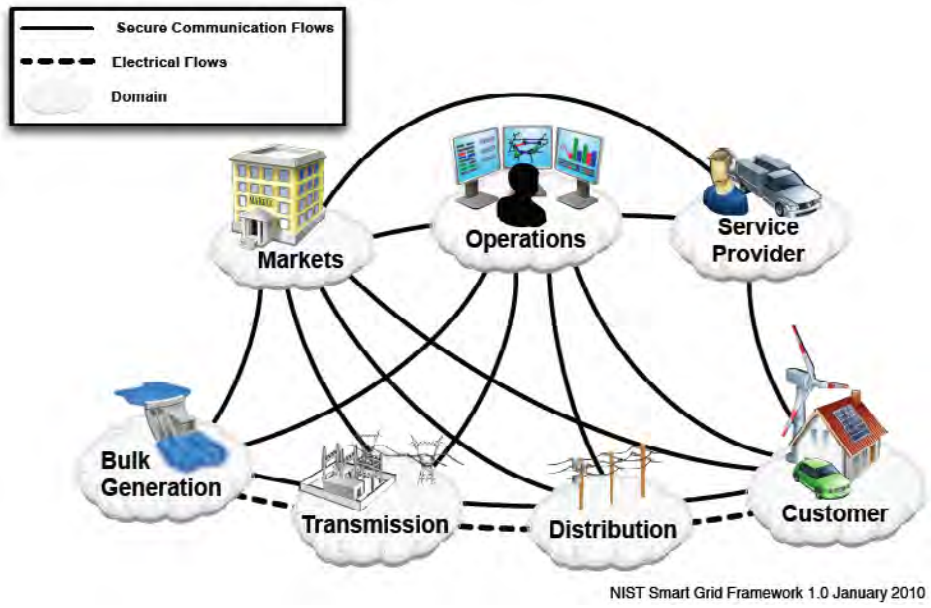
INTRODUCTION

The purpose of this paper is to articulate Manitoba Hydro's strategy with regard to the evolving Smart Grid. This strategy is unique to the needs of Manitoba Hydro and will focus on our customer needs, present and future, while respecting the complex and unique environment in which Manitoba Hydro operates. The strategy presented in this paper aligns with and contributes to Manitoba Hydro's mission which is, "to provide for the continuance of a supply of energy to meet the needs of the province and to promote economy and efficiency in the development, generation, transmission, distribution, supply and end-use of energy."

WHAT IS A SMART GRID? A DEFINITION

The Smart Grid is an integrated network of electric grid equipment, intelligent devices and information technologies, connected together through two-way communication systems, which facilitates and enables improved grid system reliability, safety, and efficiency, increased business efficiencies, and customer choice and participation. A Smart Grid is not defined by a single project and will ultimately reach beyond the electric grid to encompass the entire electric energy system, from generation sources and energy storage to end use devices such as electric vehicles. It is a modular system developed through a series of incremental actions and changes that provide features such as advanced system monitoring, analysis and automation, and ultimately, as a whole transform the way electricity is used, produced and delivered.

The following diagram provides a vision of what a fully integrated electrical Smart Grid would look like. Some of the communication links shown on the diagram, such as the links between Generation, Transmission and Operations (e.g. Control Centre), have already been integrated within the Manitoba Hydro system.



Smart Grid principles can also be applied to Manitoba's natural gas distribution system. However, this report focuses only on the electrical system in Manitoba with regard to Smart Grid activities.

THE COMPONENTS OF A SMART GRID

Smart Grid technologies will ultimately impact every part of the energy network, from generation to end use devices. These technologies can be separated into seven technology areas as shown below. Additional information on each technology area as well as the status of their development in Manitoba is provided in Appendix A.

1. Consumer Technologies
    - Including smart appliances, home area networks (HANs), commercial and industrial energy management systems and electric vehicles.
2. Distributed Resources
    - Including distributed generation (wind, solar, biomass) and distributed energy storage (batteries, flywheels, compressed air.)
3. Metering
    - Advanced metering infrastructure (AMI)
4. Distribution
    - Including distribution automation (DA), distribution control, Distribution Management System (DMS) and microgrids
5. Transmission
    - Including Station Automation Systems (SAS), Phasor Measurement Units (PMU), Special Protection Systems, Flexible AC Transmission Systems (FACTS) and dynamic line & equipment ratings.
6. Communication
    - Including data networks and the use of fibre, microwave, wireless and other communication technologies.
7. Information Systems Technology and Infrastructure
    - Including various information data systems

SMART GRID DRIVERS

THE DRIVERS OF SMART GRID ACTIVITY FOR UTILITIES IN NORTH AMERICA, EUROPE AND ASIA ARE AS FOLLOWS:

PRIMARY DRIVERS

- Reducing emissions and shifting to renewable sources of energy, often as directed by government renewable portfolio standards.
- Economic stimulus funding by governments, provided to utilities, independent power producers or consumers.
- Direction from governments and regulators.
- Supply and capacity constraints.
- Improved management of electrical system infrastructure.
- Reliability requirements.

SECONDARY DRIVERS

- Reducing energy use by consumers.
- Progress of technology development.
- Technical standards development.
- Security (physical and cyber).
- Opportunities to operate more safely and efficiently.
- Consumer expectations, perspectives and sophistication regarding energy products and services and loads.

A utility's response to each of these drivers will vary as a result of many factors including geographic location, dependence on non-renewable generation, customer expectations, political and regulatory environment, service territory, and age of plant and availability of capital.

THE DRIVERS OF SMART GRID ACTIVITY FOR MANITOBA HYDRO ARE AS FOLLOWS:

PRIMARY DRIVERS

The four most pertinent drivers of Smart Grid in Manitoba are:

- Manage localized capacity constraints,
- Operate more safely and efficiently,
- Improve management of our infrastructure, and
- Maintain and improve reliability.

SECONDARY DRIVERS

- Meet evolving customer expectations and behaviours,
- Address provincial government interest in energy-related issues and initiatives, and
- Participate in technical standards development.

More detail on the Smart Grid drivers and their relevance to Manitoba Hydro is presented in Appendix B.

A good understanding of drivers relevant to its circumstances is essential for a utility to develop an effective strategy for Smart Grid. A high level review of the drivers presented in Appendix B supports Manitoba Hydro's current approach to invest over time in initiatives and technologies that support our key drivers. (i.e., the Early Majority strategy as presented in Appendix D.)

Manitoba Hydro expects the Smart Grid to deliver a number of benefits that address our primary drivers, including:

- Improved grid system reliability, safety, and efficiency,
- Increased business efficiencies, and
- Customer choice and participation.

Increased business efficiencies, for example, can be achieved by employing Smart Grid technologies to provide automated system loading profiles to allow distribution planners to enhance their system improvement plans, or to reduce the time that elapses between meter reads and billing.

At present, our drivers are primarily internal to our organization. Should an external driver emerge, it may be appropriate to adopt a more aggressive approach in a particular technology area. This underscores the importance of monitoring the on-going development of new technologies and standards, staying connected to our stakeholders and beginning the groundwork of a strong foundation upon which to adopt changes to our system at the appropriate time.

MANITOBA HYDRO'S SMART GRID STRATEGY

VISION

Manitoba Hydro envisions a future electrical system that aligns with our corporate mission and securely delivers:

- Improved grid system reliability, safety, and efficiency;
- Increased business efficiencies; and
- Customer choice and participation.

STRATEGY

Manitoba Hydro stays abreast of developing trends and undertakes initiatives that help guide our activity and pace of adoption of Smart Grid technologies. Appendix C contains a summary of Smart Grid technologies and initiatives at Manitoba Hydro.

As Manitoba Hydro continues to maintain and expand the power system and respond to emerging customer needs, the following strategy will help ensure that the corporation continues to enhance our Smart Grid:

- Manitoba Hydro will continue to build a smarter grid by investing strategically in cost effective initiatives that improve safety, efficiency and reliability, and with consideration for evolving customers' expectations.
- The primary areas of focus in the coming years will be:
    - extension of the communication and information technology infrastructures
    - modernization of the distribution system including customer metering
- Separate funding will not be set aside for Smart Grid initiatives, but will remain part of our normal financial processes and will require the same level of scrutiny and approval as other projects and activities. Overall capital allocations are not expected to increase due to the development of a smarter energy system.
- Manitoba Hydro will participate in the development of Smart Grid standards and use established approval and R&D processes to develop and test new technologies.

PRIORITY INITIATIVES

Manitoba Hydro's success to date is evidence of the positive impact of the past investments on the generation and transmission systems including sophisticated communications and data networks. Manitoba Hydro will continue to expand and enhance intelligence on these systems, but acknowledges that ultimately we must have a smart grid that extends all the way to our customers. The next step is modernization of Manitoba Hydro's distribution system.

This list is not intended to be an exhaustive list of priorities. These are near term priorities given our present drivers.

COMMUNICATION AND IT INFRASTRUCTURE

The development of Smart Grids is dependent upon having a strong communication and IT infrastructure. Automated data collection and control are currently in place for generation and transmission systems; however, since they are in the infancy stages for the distribution system, significant effort and investment will be required to build and extend these systems. Eventually, the communications and IT networks will be extended right to the customer.

DISTRIBUTION MODERNIZATION

Much of the distribution system dates back to the days of rural electrification and requires modernization. As upgrading and modernization is undertaken, there is an opportunity to transform incrementally the distribution elements of our system to modern, smart components. This effort will include the introduction of distribution control which will be a fundamental improvement in the way we operate the distribution system. Modernizing the distribution grid will not only improve safety, reliability and capacity management, but also ensure our grid is ready when customer expectations extend into distributed generation, energy storage and more sophisticated home energy management systems. In fact, the modernization of the distribution system and customer metering infrastructure is an essential prerequisite to extending benefits such as these to consumers.

The cost to modernize the distribution system will be difficult to quantify. Much of the modernization will take place as normal capacity or reliability related system improvement is implemented. In these instances, intelligent devices will be installed, in some cases at an incrementally higher cost. With a growing communication infrastructure we will find more

and more devices, already in service, with which we can connect. There are already approximately 1500 smart devices in service on the distribution system that are not connected to our communication network.

There will be other investments that will be over and above the normal incremental cost of modernizing the system as we perform system improvements. These will include the creation of distribution control centres and the related operational costs as well as the Distribution Management System and the component I.T. systems to support it. To a certain extent, these can also grow in stages.

STANDARDS DEVELOPMENT

Effort will be directed towards supporting the development of industry definitions, standards and protocols to reduce investment risk when investment is made in a particular technological arena.

IMPLICATIONS

SYSTEMS (TRANSMISSION, DISTRIBUTION, INFORMATION AND COMMUNICATION)

GENERATION AND TRANSMISSION SYSTEMS

Changes on the generation and transmission systems can be characterized as making a Smart Grid smarter. The existing communication system and IT infrastructure provides the foundation for installing additional and enhanced intelligent devices to optimize the reliability, security and capacity of these systems.

DISTRIBUTION SYSTEM

Manitoba Hydro's distribution system will face the most change and investment as we move toward a Smart Grid. Presently there is very little communication or IT infrastructure to support widespread improvements in reliability or capacity management. Although much of the existing distribution infrastructure will remain, the installation of smart devices such as switches, breakers and generators will require a whole new approach to planning,

operating and managing this system with significant implications to processes, human resource requirements, technical trades training programs, etc.

INFORMATION TECHNOLOGY SYSTEMS

IT services will increasingly be integrated within the day-to-day business activities and processes. As an example, our transmission operations group currently includes embedded, specialized IT resources to help develop, operate and maintain its SCADA/EMS system.

COMMUNICATION SYSTEM

The changes on the communication system can be characterized by a continued growth, rather than a change of role. The communication system that serves the generation and transmission systems can be expanded to also serve the distribution system. Certainly other communication mediums may be used, but all can be managed under the umbrella of the existing communications infrastructure.

SKILL SETS & ORGANIZATION STRUCTURE

The nature of the work and skill sets in a number of areas will need to evolve as Smart Grid related initiatives are undertaken throughout the corporation. As part of this evolution, there will be fundamental change in the role that both information technology and communication play in the service to customers. The role of both of these business areas will be foundational to the provision of service, rather than the supportive roles they play now. The distribution system will require support from many of the skill sets (e.g. communication technicians, power electricians and protection technicians) that are currently supporting the transmission and generation systems and have not traditionally been a part of the distribution system.

RESPONSIBILITIES

DISTRIBUTED RESOURCES

Historically, any instance involving the generation of electricity involved Power Supply. Likewise, any instance of connecting to the distribution system involved Customer Service & Distribution. With generation now connected to distribution these roles and organizational responsibilities will need to be reviewed.

CUSTOMER METERING

Customer metering improvements can result in benefits for both Manitoba Hydro and the customer and should continue to be coordinated between Customer Care & Marketing and Customer Service & Distribution.

CAPITAL

A wholesale implementation of a Smart Grid is not practical from a capital perspective. Building a smarter energy network incrementally based upon sound and justified projects will facilitate managing the capital investment requirements. Smart Grid projects will compete with all other projects in our capital plan and in this regard can be prioritized and staged appropriately according to our corporate priorities. There are likely some larger projects such as AMI implementation, which will have a significant impact on our capital plan. Relatively speaking, these projects are not expected to be of the magnitude of other large transmission and generation projects that are presently in our capital plan. Furthermore , these as well can likely be staged over multiple years.

RATES

Because our Smart Grid activity will be part of our normal process for capital improvement, it is not expected to impact rates any differently from our other normal activities. As well, without a detailed analysis of specific Smart Grid initiatives it is difficult to forecast the magnitude of operating cost reductions that may result. Some individual larger initiatives may have a potential impact on the rate base, but this will be considered in the business case for these specific initiatives.

CUSTOMER/STAKEHOLDER EXPECTATIONS

Manitoba Hydro's perception in customers' and stakeholders' eyes will be important as Smart Grid awareness grows amongst the public and as Manitoba Hydro initiatives deploy. Accordingly, Manitoba Hydro will develop and implement a communications strategy to manage expectations and to explain and build understanding amongst customers and stakeholders about our Smart Grid activities and capabilities.

RESEARCH & DEVELOPMENT

Manitoba Hydro has been investigating new technologies related to Smart Grids and this activity is expected to continue. This activity should be guided by the specific drivers and priority initiatives of Smart Grids at Manitoba Hydro.

RISKS

This section is intended to identify the risks associated with the assumptions and strategies developed in this paper.

Some of the risks associated with this strategy for Smart Grid at Manitoba Hydro arise from assumptions made about the drivers of Smart Grid activity in Manitoba. If conditions change and other drivers dominate, Manitoba Hydro may become reactive rather than proactive. The discussion below also looks at the possibility of change in the drivers previously identified in section 4 and the resulting consequences.

STIMULUS FUNDING FOR NEW CUSTOMER LOADS OR GENERATION

If the provincial or federal government were to provide incentives for new loads or generation, such as electric vehicles, there may be a significant change in consumer behaviour compared to our current forecasts. This would drive Manitoba Hydro to accelerate the development of a distribution system that could support this load.

FAILURE OF CRITICAL ASSETS ON THE POWER SYSTEM

We know that we have firm capacity issues during certain times of the year on both of our transmission and distribution systems. If a critical component, such as a transformer or transmission line were to fail at such a time, we may face an extended outage and subsequent scrutiny and pressure to reduce the likelihood of another similar fault occurring. For example, we may be directed to install enhanced monitoring following an event that could have been detected. Further, a significant event on the North American transmission grid may impact how all utilities operate, including Manitoba Hydro.

CUSTOMERS ADOPT A DIFFERENT PERSPECTIVE

Individuals' perspectives can change dramatically. Manitoba customers are and will continue to be exposed to nation-wide and continent-wide media that may create expectations that are not congruent with the Manitoba situation (eg. The sale of smart appliances). If this causes a swift and significant change in customer behaviour, it may cause us to become reactive and advance the implementation of large projects.

SIGNIFICANT PENETRATION OF ELECTRIC VEHICLES

A significant adoption of electric vehicles (or any other load) could aggravate existing capacity issues on the distribution system and trigger additional capital expenditures.

ENTRY OF NEW PLAYERS INTO OUR INDUSTRY

Google Energy and Schneider (a large electrical industry manufacturer) both have developed energy management offerings. In addition Google Energy has been granted permission to buy and sell energy even though they do not own any generation or transmission assets. The entry of new players such as this could change our relationship with large customers and drive change in the way we provide energy and services. It is conceivable that an energy management and consulting service could target large, national companies to manage their energy needs.

CYBER-SECURITY

Extending the utility's communication system outside of its normal boundaries presents some risks with respect to cyber security. The introduction of many new network access points, most of which will not be physically secured, can create a substantial security risk.

LIFE CYCLE OF TECHNOLOGY INVESTMENTS

Many of the standards and protocols associated with Smart Grid technology are developing and evolving. A significant investment in a developing technology prior to well-established standards presents a risk of shortening the useful life of those assets. In addition, this risk speaks to ensuring solid vendor support for the technologies in which we invest.

CONCLUSION

The Smart Grid represents a major change in the utility industry worldwide. Manitoba Hydro understands the factors that will drive this change in our province. We will embrace a moderately aggressive approach participating in the development of standards, monitoring developments and implementing initiatives that align with our unique drivers and deliver tangible benefits. We have assessed the drivers, opportunities and risks to guide our future actions, and we have set out a specific Smart Grid strategy.

APPENDIX A

Components of a Smart Grid

Smart Grid technologies will ultimately impact every part of the energy network, from generation to end use devices. The following table provides a list of the technology areas typically associated with a Smart Grid, along with a brief description of the status, from Manitoba Hydro's perspective, of each area. Additional information on each technology area is provided at the end of this table.

Technology Area		Status in Manitoba	Comments
Consumer Technologies	Smart appliances	Emerging	Monitoring industry developments. Coordinating demonstrations with developers.
	Home area network (HAN)	Emerging	HAN programs will be tied to Advanced Metering Infrastructure (AMI) and require stand-alone justification.
	Commercial/ Industrial Energy Management Systems	Testing	Testing technologies such as advanced lighting controls and demand response. Developing Enertrend smart meter consumption information infrastructure (Power Smart).
	Electric Vehicles	Emerging	Emerging trend in transportation market forecast. Considerable provincial government interest.
Distributed Resources	Distributed generation (wind, solar, biomass)	Testing	Small number of customers pursuing economic projects to augment their operations. Economics do not currently support the widespread adoption. Small scale utility owned generation may serve to address reliability and localized capacity issues on the distribution system.
	Energy Storage (batteries, flywheels, compressed air)	Emerging	Potential benefits to distribution & transmission as costs of technology decrease.
Metering	Advanced Metering Infrastructure (AMI)	Testing	Electric and gas AMI pilot undertaken which included a meter data management system, lab tests of HAN

			devices and trial AMI applications (customer web presentment, revenue protection transformer load management). Business case for wider deployment being developed.
Distribution	Distribution Automation (DA)	Testing	Early stages of adoption. Several related pilots underway including Waverley West Automation & station automation at Burrows & Frobisher.
	Distribution Management System (DMS)	Emerging	DMS will ultimately be the core of information management on the distribution system.
	Microgrids	No Activity	Dependant on wider adoption of Distributed Generation (DG).
Transmission	Station Automation Systems (SAS)	Implemented	Widely employed to meet requirements for automation, local and remote control & monitoring of stations.
	Phasor Measurement Units (PMU)	Adopted	Early stages of adoption. Pilot PMU installation at Dorsey. Other installations currently being studied.
	Flexible AC Transmission System (FACTS) Devices	Implemented	Utilized at three stations as alternatives to more expensive system improvements.
	Dynamic Line & Equipment Power Ratings	Emerging	Commercial technology available but not yet proven out in Manitoba.
Communication	Data Networks	Evolving	Technologies well established. Widespread adoption of fibre and microwave. Application of wireless technologies on MH network is currently limited.
Technology Infrastructure & Information Systems	Information/Data Systems	Evolving	Technologies well established. Some are currently being implemented at MH as part of Transmission Operations Data System (TODS) project. Meter Data Management System being tested under the AMI project.

CONSUMER TECHNOLOGIES

Consumer's expectations are evolving for energy and energy services. As the system moves toward more automation and greater focus on renewable energy sources, customers will be seeking more flexibility, more options, and greater reliability from energy providers. While all aspects of a Smart Grid will contribute towards meeting these expectations, there are a number of technologies which will be directly employed by our customers.

The use of customer energy management systems, including smart appliances, advanced control systems and metering information provided by the utility, offer customers the opportunity to monitor and manage their electricity usage to improve convenience and support growing efficiency and environmental awareness. These technologies also enable potential partnerships with the utility to provide automatic demand response in times of system problems. In some jurisdictions outside of Manitoba that have time-of-use rate structures, these technologies can be used for peak load shaving. While not widely deployed today, technologies such as smart appliances are expected to become standard offerings from manufacturers in the medium-term future.

Another consumer technology expected to impact the electric grid in Manitoba, possibly more immediately, is the plug-in Electric Vehicle (EV) either pure electric or plug-in hybrid. The EV has the potential to reduce Manitoba's carbon footprint and the provincial government has significant interest in decreasing the province's dependence on out-of-province fossil fuels. This technology offers both challenges and opportunities to the grid. Depending on the level and geographical concentration of consumer adoption, system upgrades and other Smart Grid technologies may be required to manage PHEV charging requirements. It is unclear at this point if the auto industry will adopt technologies to track the charging of vehicles independent of the charging location. Federal and provincial governments may require some mechanism to track vehicle charging as a means to replace lost fuel taxes. On the other hand, the energy stored in connected EV batteries, if properly controlled, may be a future potential source of stored energy for the system.

DISTRIBUTED RESOURCES

In the future, distributed resource technologies, in the form of distributed generation and storage, may be directly employed by residential, commercial or industrial customers, independent power producers or the utility itself. Distributed generation will take many forms, including renewable energy sources, such as solar and wind, combined heat and power, and generation fuelled by waste products. Energy storage technologies include batteries, flywheels, pumped hydro, compressed air and superconducting magnetic energy storage.

Distributed resources will allow customers to supply specific energy needs, sell surplus energy to Manitoba Hydro, and potentially reduce their costs and environmental impact through the use of renewable energy sources located very close to the point of usage. These energy sources, if appropriately controlled, can also be used by the utility to support grid operations and planning through peak shaving, load shifting and demand response. Energy storage can also be used to firm up the capacity of intermittent sources of renewable generation such as solar and wind.

Some of Manitoba Hydro's customers are already considering the connection of distributed generation to the grid, based on the favourable economics resulting from the integration of the generation with their operations. While the economics do not currently support the widespread adoption of renewable energy sources and storage in Manitoba, there are environmental and political drivers which may increase the deployment of these resources. Further, declining prices for the various generation and storage technologies may open up opportunities in the medium-term future for these technologies to be considered as alternatives to distribution and transmission system expansions.

As alternative technologies continue to evolve and installation costs decrease relative to other energy options, the demand for alternative resource options is increasing. As a result, the potential to have additional alternative generation sources in Manitoba will increase and systems must be flexible enough to meet this demand. The advancement of energy storage technologies has the potential to increase the feasibility of intermittent resources such as wind and solar.

METERING

Advanced Metering Infrastructure (AMI), which includes Smart Meters, is a key enabling technology for the Smart Grid. AMI will serve as the interface and provide a two-way communication path between the customer and the utility. It offers benefits on both sides of the meter. From the utility's perspective, this technology provides opportunities for outage detection, loss and theft detection, remote connections and disconnections of loads (including demand response), detailed real-time load analysis of different customer types, and power quality monitoring at each customer's site, which can be used to improve grid operations and planning. The AMI technologies can also provide consumption and other signals to a customer's energy management system.

DISTRIBUTION

As Smart Grids progress, distribution grids will be transformed from a system with one-way energy flows and limited monitoring, automation and control, to one with two-way energy flow which employs existing and new technologies to assist communities and customers with meeting their evolving energy needs on a sustainable basis, to accommodate distributed resources, and to maintain or improve reliability while minimizing capital and operating expenditures.

The Distribution Management System (DMS) will ultimately be the core of information management on the distribution system. It will include a myriad of information about distribution assets, customers and outages. It will enable more efficient operation of the system, prediction of and faster responses to outages, better decisions about system improvements and better system related information for our customers.

The DMS will be truly leveraged by the introduction of Distribution Control. Where the transmission system uses SCADA, planned outage management, contingency analysis and load monitoring, Distribution Control will bring all of the benefits of these features to the distribution system as well as forced outage management, load flow analysis, customer communication, etc.

Distribution Automation includes technologies for distribution station and feeder monitoring, automation and control. Automation systems, which consist of a variety of intelligent electronic devices (IED) interconnected in interactive networks, allow for enhanced centralized visibility and logging of distribution system conditions, and for automatic reconfiguration of the distribution system to minimize the duration and number of customers affected by outages and to ensure the optimal operation and safety of the system. The increased visibility of distribution system conditions provided by Smart Grid sensors can also substantially improve the effectiveness and economics of grid planning. These types of technologies can be introduced to the system as part of more conventional capital reliability improvement projects or as stand-alone improvements justified by operational and/or financial considerations.

A microgrid would utilize distributed generation located on the distribution system to supply load connected to an isolated (islanded) grid in the event that the utility's main supply is interrupted. This concept requires a sufficient level of installed distributed generation and advanced monitoring and automation on the distribution system and is currently not being considered at Manitoba Hydro.

TRANSMISSION

Manitoba Hydro's transmission system already utilizes many of the technologies typically associated with a Smart Grid. This infrastructure has been developed over decades to provide economic solutions to meet system reliability and operational requirements. However, other opportunities for improved reliability, maximizing performance with existing infrastructure and accommodating new forms of geographically dispersed generation such as wind power, bioenergy and solar are emerging. These investments will involve the increased incorporation of Smart Grid technologies.

Three Static VAR Compensators, which are part of the Flexible AC Transmission System (FACTS) family of technologies, have already been installed on the transmission system in place of more expensive transmission improvements. These devices allow operators to make more intensive use of the existing transmission grid. The transmission system also already utilizes many types of IEDs interconnected into Station Automation Systems (SAS) to provide station monitoring, automation and control capabilities, special protection systems and equipment monitoring. A specialized IED known as a phasor measurement unit (PMU) is a high speed monitoring device which measures both the magnitude and the phase angle of the voltages and currents on the grid, and when installed at key points on an interconnected transmission grid, can provide operators with an enhanced, wide-area awareness of current grid conditions. Current monitoring devices only provide operators with the magnitudes of these important electrical quantities. Relatively inexpensive incremental monitoring capability, such as the PMU and advance equipment condition monitors can considerably improve operator awareness of potential problems while there is still time to take action.

In the future, new or emerging technologies may be implemented on the transmission system to utilize energy storage and dynamic line and equipment ratings to more fully utilize our installed transmission infrastructure. Current line and equipment ratings are based on worst case environmental conditions. Providing operators with the prevailing conditions which impact line and equipment ratings may allow the operators to safely load these assets beyond the worst case ratings if necessary.

COMMUNICATION

Communication infrastructure and technologies which support two-way communication throughout the energy network are the cornerstones of a Smart Grid. Communication allows for data to move from the utility to the customer and from the customer to the utility (and all points in between) in real time.

Communications brings the data accumulated by meters, sensors and other field devices, into centralized information technology systems which can process and extract intelligence from this information.

The communications network must employ technologies to provide sufficient bandwidth, speed, reliability, scalability and security. Manitoba Hydro's transmission system currently has such a network which links major stations and the System Control Centre to provide the basic communication requirements associated with operating the transmission grid. This network can be leveraged and extended to meet additional needs including distribution system monitoring, automation and control, advanced equipment monitoring, and special protection systems. Such extensions can be done economically, but must be justified on a case by case basis.

The ultimate Smart Grid communication system will be comprised of a variety of technologies, including microwave, radio, WiFi, fibre optics, cellular and power line carrier. This network will interconnect customers, distribution and transmission systems operators, and power producers, enabling the interaction of all these participants. The Smart Grid communication system will evolve slowly from what we have today over the medium to long-term as dictated by business needs.

Extending the utility's communication system outside of its normal boundaries presents some risks with respect to cyber security. The introduction of many new network access points, most of which will not be physically secured, can create a substantial security risk. The utility's communication systems will need to be designed and employ technologies to ensure that all of Manitoba Hydro's core operations along with customer data are well protected, and that all NERC Critical Information Protection requirements are met.

TECHNOLOGY INFRASTRUCTURE AND INFORMATION SYSTEMS

Obtaining data from the devices in the field to support business processes requires communications and applicable technology infrastructure. This infrastructure encompasses the applicable communications, networks, and servers that are utilized in collecting and hosting the data from the field devices.

Information systems will be employed to help validate, manage, and archive data coming in from the field devices. These systems are the business applications required to provide information that will enable business decisions through analysis tools, event notification and reporting.

With an increasing number of devices providing data, more intelligent ways of managing that data are required. Historian and archival systems will be needed to manage the large volumes of data. Reporting and analysis systems will be required to filter the data for people to make sense of the information.

The Transmission Operations Data System (TODS) project is an example of such an IT system that has been developed for Transmission. Hardware and software technologies have been employed to integrate various data sources into central data repositories and to provide data validation and consistency, and seamless access by users and reporting/analysis tools.

Traditionally, Energy Management Systems (EMS) connected to SCADA devices were restricted to generation and transmission systems. With the Intelligent Electronic Devices (IED) now available to the entire power system, business areas will require new systems to take advantage of the monitoring and control functionality now available to them.

APPENDIX B

Drivers of Smart Grid Activities and Relevance to Manitoba Hydro

Driver	Relevance to Manitoba Hydro	Rationale
Reducing emissions and shifting to renewable sources of energy, often defined by governments in renewable portfolio standards.	**Low**	Low priority in Manitoba given that 99% of generation is renewable At this point, our government is not specifically mandating a significant shift to other energy sources. However, implementation of *The Climate Change and Emissions Reductions Act* has restricted generation from coal.
Economic stimulus funding by governments, provided to either utilities, independent power producers or to consumers.	**Low**	The provincial and federal governments have not presented significant stimulus packages for Smart Grid development.
Direction from governments and regulators	**Low with Potential to Increase**	The Manitoba government and PUB have some interest in Smart Grid technologies.
Supply and capacity constraints	**High in Distribution and Transmission, Moderate in Power Supply**	Our power planning efforts ensure that we have generation capacity to meet future domestic requirements. However, different parts of the province develop and grow at different and sometimes unanticipated rates. This creates areas where the distribution and sometimes the transmission system, are constrained. The deferral of capacity upgrades on the distribution system has created a significant capacity constraint in the city of Winnipeg. With more accurate and timely information about the power system, there will be opportunities to identify and access additional capacity. For transmission and power supply, this may involve dynamic capacity, or the ability to respond to current conditions. For the distribution system, this involves starting to gather the same

		information we presently used on the transmission system and implementing automated load transfer schemes. Eventually, for customers this may mean participation in Demand Response opportunities (such as individual curtailable energy contracts), a large driver in some other jurisdictions.
Improved management of our infrastructure.	**High**	Much of our transmission and distribution infrastructure still has its foundations in the system that was developed in the 1950s. As our system grows and ages, there are benefits in adopting a consistent and systemic approach to managing these assets. As well, technologies and systems that help identify assets facing the greatest risk of failure as well as those whose life can be extended will contribute to more effective management of both operating and capital costs.
Reliability requirements • NERC • Industrial customers	**High**	Reliability is one of the areas in which Manitoba Hydro excels. However, while we are still a leader amongst other utilities, we have failed to achieve our internal targets for the past several years and have shown a slow trend of worsening reliability. Combine this with the increased requirements, our integration/ interconnection with the overall system, scrutiny by NERC of our transmission system, and growing expectations by some of our major customers, and this becomes a primary driver for our investment in Smart Grid activities to increase system automation and employ more advanced system analysis and protection technologies.
Increasing energy costs to consumers	**Low**	While Manitoba Hydro forecasting the need for ongoing rate increases, this is not a strong driver for our Smart Grid activity as our rates are comparatively low and projected increases are not as significant as those forecasted in other Canadian jurisdictions. As a result, pressure for time of use rates has not been high, although may be forthcoming for large users.
Progress of technology development	**Low**	This driver balances the value of investing in research and development with the hype often created by manufacturers and suppliers. While Manitoba Hydro values research, this is not a strong driver for our Smart Grid development. As technologies become commercialized and

		more economical, Manitoba Hydro will explore the return to ratepayers.
Technical standards development.	**Moderate**	Manitoba Hydro has participated in standard development and considers it a valuable investment to influence standards that may affect our future. This is true for Smart Grid standards as well.
Security (physical and cyber).	**Moderate**	NERC Critical Infrastructure Protection (CIP) standards are driving change, especially in Transmission and Power Supply. Conversely, security is proving to be a barrier to Smart Grid development on the distribution system in some jurisdictions.
Opportunities to operate more safely and efficiently.	**High**	This involves providing staff with tools and information to work more safely and efficiently and make better decisions. From a planning perspective, better and more complete information about load and performance will lead to better decisions about the capital funded improvements to the distribution system. From an operating perspective, information such as fault location and feeder performance combined with geographical data will help reduce the length of outages. As well, improvements to the switching process as well as automated control and monitoring will reduce exposure to the hazards faced by field staff.
Consumer expectations, perspectives and sophistication regarding energy products, services and loads.	**Moderate and Evolving**	The strength of our Power Smart initiatives and other marketing efforts has resulted in satisfied customers who are informed about energy efficiency and the cost of electricity and a have a positive impression of Manitoba Hydro. Manitoba Hydro's role is to continue to anticipate customers' expectations and be ready to fill them when a business case exists. A significant increase in load to a broad consumer group could easily raise capacity constraint concerns on our distribution system. Distribution Planning & Design monitors load growth and attempts to predict and respond accordingly. Requirements for public charging infrastructure to serve electric vehicles or a need to track usage for government revenue collection purposes could drive IT and communications requirements at the distribution level. Any vehicle-to-grid communications will require appropriate

		cyber-security measures.

APPENDIX C

Current Status of the Smart Grid in Manitoba

In addition to keeping abreast of industry trends in the various areas of Smart Grids, Manitoba Hydro has undertaken a number of initiatives related to a Smart Grid, including:

FOUNDATIONAL WORK

Some foundational components of a Smart Grid are already being put into place. The Industrial Data Network (IDN) is currently being installed for the transmission system to replace legacy systems and provide the communications necessary to operate the transmission grid. The IDN can be scaled and extended to meet other business needs such as Smart Grid communication requirements for the transmission and distribution systems. The Transmission Operations Data System (TODS) currently being implemented will integrate numerous data sources into one central repository to eliminate duplication, provide data validation, and enable more effective analysis of the data being collected. The TODS architecture and technologies can be applied to the wider Smart Grid data management systems to facilitate interconnection in the future.

Intelligent Electronic Devices (IEDs) have been installed at a large number of our transmission and distribution stations to provide basic system protection. IEDs have also been installed at our transmission stations to provide control functions and implement special protection systems which detect abnormal conditions and take automated corrective actions in addition to the normal isolation of faulted components to maintain system reliability.

THE DISTRIBUTION ROADMAP

The Distribution Roadmap lays out a path to transform our distribution system into a smart and responsive system. The roadmap encompasses the technical, process and cultural changes that must occur to successfully carry out this transformation. Manitoba Hydro has made progress on a number of the initial, foundational initiatives, including the development of some important policy and philosophies as well as pilots.

RESEARCH & PILOT PROJECTS

Below are some of the current research or pilot projects presently underway at Manitoba Hydro that could be considered Smart Grid initiatives based on the definition presented at the start of this paper.

- The Electric and Natural Gas Advanced Metering Infrastructure (AMI) pilot with smart meters and a meter data management system has been installed and remains in service today. This pilot provided knowledge which is now being used to help develop a business case for a wider AMI deployment.
- The Waverley West Automation pilot is testing the application of feeder automation technologies on a suburban distribution grid.
- The Grid Sense and SubStation IED pilots are developing the processes for gaining real time access to devices that are already in place or could be installed at a minimal cost.
- A 66 kV system fault location pilot is aimed at reducing the outage time of 66 kV outages by providing district operators with fault locations, thus dramatically reducing outage durations.
- A Phasor Measurement Unit (PMU) has been installed on the transmission system at Dorsey station, along with other similar units throughout the interconnected MISO transmission grid, to test this relatively new technology and to contribute towards the development of tools which can help detect and prevent wide-area system problems.
- Manitoba Hydro has been testing and gaining knowledge with electric vehicles for a number of years. The effort to gain knowledge in this area is currently being stepped up to prepare for the upcoming releases of electric and plug-in hybrid vehicles to the market. The Province also has a high level of interest in this area. Three hybrid fleet vehicles have been converted to plug-in hybrids and are part of a larger test with vehicles from a number of agencies in the province to determine the viability of PHEVs in Manitoba. Agreements have been signed with a number of manufacturers of plug-in vehicles to evaluate consumer charging behaviour and corresponding grid impacts. An Electric Vehicle Steering Committee has been established to guide the Corporation's activities in order to actively prepare for the upcoming public release of a number of plug-in hybrid and pure electric vehicles to the market. Looking further ahead, Manitoba Hydro has also been involved with industry working groups to research the re-purposing of batteries no longer suitable for electric vehicle usage into utility storage devices.
- Manitoba Hydro maintains awareness of generation technologies in the industry and has been investigating the feasibility of using technologies such as solar power, biomass and geothermal in Manitoba.

APPENDIX D

Strategic Approaches to Smart Grids

Utilities across North America and Europe are pursuing many different Smart Grid strategies. Given our drivers and business environment currently faced by Manitoba Hydro, it is appropriate for Manitoba Hydro to generally pursue an early majority strategy related to the Smart Grid (see definition below). At present, our drivers are primarily internal to our organization. Should an external driver emerge, it may be appropriate to adopt a more aggressive strategy in a particular technology area. This underscores the importance of monitoring the on-going development of new technologies and standards, staying connected to our stakeholders, and beginning the groundwork of a strong foundation upon which to adopt changes to our system at the appropriate time. For certain technologies and circumstance, different strategies may be more appropriate.

INNOVATORS

These utilities have typically been pushed into the Smart Grid arena by regulators or governments. Some are enticed by government stimulus incentives (e.g. Obama's stimulus funding), others are forced by government policy (e.g. Ontario's Clean Energy Act). All face the fact that they are investing significantly in new and unproven technology that may become obsolete before the end of its useful life. However, this is where Smart Grid progress is being made and new products and services pioneered.

EARLY ADOPTERS

Other utilities have found that they have a unique set of drivers that enable (and/or require) them to take advantage of one small aspect of Smart Grid and they have focused their efforts accordingly. (Example: Hydro Quebec's Volt/Var Optimization program). These utilities are still investing in new and developing technology, but often with less risk and more confidence in the benefits of these investments.

EARLY MAJORITY

These utilities accept that energy networks need to become smarter and better connected. Based upon a positive business case, they begin investing incrementally in proven technology to increase the intelligence of their overall energy networks.

LATE MAJORITY

Utilities that don't have strong external drivers may adopt a wait and see approach to implementing newer technologies. Often there is a benefit to waiting until the technology is proven and costs decrease. The risk of this approach lies in the fact that the next technology is always around the corner and the time to enter into a technology, after a large change, becomes uncertain.

LAGGARDS

There are likely some utilities that have no compelling drivers of change and remain unaware or unconcerned of Smart Grid developments. This may be an effective strategy as long as customers are not demanding new or improved services and there are no external factors driving change.

End of Report

REFERENCE: Volume: Chapter 4: The Need for New Resources; Section: 4.2.2.2; Page No.: p 22

PREAMBLE: In September 2007 the Ontario Power Authority, as required by legislation, submitted to the Ontario Energy Board the Integrated Power System Plan (IPSP). The OEB received interrogatories and evidence from many parties on the IPSP. One pertinent submission is: Exhibit L-8-3: Evidence of Scudder H. Parker, Vermont Energy Investment Corporation, Optimizing the CDM Resources in Ontario http://www.powerauthority.on.ca/integrated-power-system-plan/l-evidence-intervenors

QUESTION:

Please comment on the applicability of Mr Parker`s critique of the DSM components of the IPSP to the MH Power Smart plan, especially in relation to the importance of evolving DSM measures appropriately over time.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Overview - Meeting Manitobans' Electricity Needs; Section: 5) Keeyask 2019, 750 MW Interconnection, Large Export Pathway; Page No.: 12

QUESTION:

Please describe how Manitoba Hydro ensures that there is limited 'double counting' of DSM savings that may be attributed to energy efficiency activities undertaken by the Government of Manitoba as described in Manitoba's Clean Energy Strategy

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix C 2012 Electric Load Forecast; Section: Forecast Details - Residential Basic; Page No.: p 17

PREAMBLE: "In addition, the market share of electric heat customers is expected to increase from 35.7% in 2011/12 to 40.6% in 2031/32…"

QUESTION:

Please explain the basis for this assumption outlined in the 2012 Electric Load Forecast, including any background materials and sources that are relevant.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Residential Basic Methodology; Page No.: 59

PREAMBLE: "Residential Survey Data – The 2009 Residential Survey was used to provide estimates as of November 2009 of the following:… Customers by Heating Type"

QUESTION:

Please indicate if 2009 is the most recent Residential Survey. If not, please indicate the most recent year and provide the survey results.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Residential Basic Methodology; Page No.: 59

PREAMBLE: "Residential Survey Data – The 2009 Residential Survey was used to provide estimates as of November 2009 of the following… Customers by Heating Type".

QUESTION:

Within the past 20 years, please indicate how often the Residential Survey has been carried out. Please indicate which years Manitoba Hydro has Residential Survey Data.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Residential Basic Methodology; Page No.: 59

PREAMBLE: "Residential Survey Data – The 2009 Residential Survey was used to provide estimates as of November 2009 of the following:… Customers by Heating Type".

QUESTION:

What is the actual measured market share of electric heat from the most recent Residential Survey that was carried out? Please indicate the date of this survey.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Residential Basic Methodology; Page No.: 59

PREAMBLE: "Residential Survey Data – The 2009 Residential Survey was used to provide estimates as of November 2009 of the following… Customers by Heating Type"

QUESTION:

Please provide the relative cost of heating an average residence in Manitoba with Electric Heat versus Gas Heat with a high efficiency natural gas furnace in 2009 and in 2013. Please show the calculated costs and the relative cost ratio for both years.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: General Service Top Consumers; Page No.: 21-22 and 64

QUESTION:

"Please provide more detail on the following: Please describe the assumptions and current information available to Manitoba Hydro that underlies the forecast for PLIL (Potential Large Industrial Loads) to increase monotonically by 100 GWh each year from 2016/17 to 2032/33."

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: General Service Top Consumers; Page No.: 21-22 and 64

QUESTION:

"Please provide more detail on the following: Please provide a schedule that sets out on an annual basis from 2002/03 to 2012/13 the annual increase in GWh energy sales due to new large industrial load categorized as General Service Top Consumers, the annual decrease in GWh energy sales due to the loss of existing large industrial load categorized as General Service Top Consumers, and the net change in annual GWh energy sales due to new large industrial load and loss of existing large industrial load categorized as General Service Top Consumers."

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Weather Effect and Weather Adjustment; Page No.: 42

PREAMBLE: "The weather effect is determined in any sector by regressing the last two years of actual monthly energies against the actual DDH and DDC for the month. This results in a GWh per DDH effect and a GWh per DDC effect for that sector."

QUESTION:

Please confirm the weather effect regressions are based on 24 data points (2 years of monthly data). If not, please clarify.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Weather Effect and Weather Adjustment; Page No.: 42

PREAMBLE: "The weather effect is determined in any sector by regressing the last two years of actual monthly energies against the actual DDH and DDC for the month. This results in a GWh per DDH effect and a GWh per DDC effect for that sector."

QUESTION:

Please indicate what the start and end point is for the data series for each weather effect regression used for the 2013 Electric Load Forecast.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Weather Effect and Weather Adjustment; Page No.: 42

PREAMBLE: "The weather effect is determined in any sector by regressing the last two years of actual monthly energies against the actual DDH and DDC for the month. This results in a GWh per DDH effect and a GWh per DDC effect for that sector."

QUESTION:

Please provide the regression results, regression diagnostics and statistics for each regression equation used to determine the weather adjustment effect.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Weather Effect and Weather Adjustment; Page No.: 42

PREAMBLE: "Weather Adjustment = DDH weather effect * (DDH actual - DDH normal) + DDC weather effect * (DDC actual - DDC normal)"

QUESTION:

Please confirm that the weather adjustment in the above equation is calculated on a monthly basis and that DDH and DDC normal and actual values are monthly values. If this cannot be confirmed, please clarify.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Weather Effect and Weather Adjustment; Page No.: 42

PREAMBLE: "Weather Adjustment = DDH weather effect * (DDH actual - DDH normal) + DDC weather effect * (DDC actual - DDC normal)"

QUESTION:

Please provide a schedule that sets out monthly actual DDH and DDC values and monthly normal DDH and DDC values for the period 2002/03 to 2012/13.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Weather Effect and Weather Adjustment; Page No.: 44-45

QUESTION:

Please confirm that Manitoba Hydro has assumed historic load variability is distributed according to a Normal Probability Distribution for the purpose of its probabilistic-based variability analysis. If this cannot be confirmed, please indicate what assumption Manitoba Hydro has made about the distribution of historic load variability.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Weather Effect and Weather Adjustment; Page No.: 44-45

QUESTION:

Has Manitoba Hydro conducted any tests for normality on the variability of historic load? If so, please provide the results of these tests.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: 5 and 10 Year Forecast Accuracy, Tables 35 & 36; Page No.: 47-49

QUESTION:

Please prepare tables similar to Table 35 – Energy Accuracy and Table 36 – Peak Accuracy that indicate 15 year per cent accuracy and 20 year per cent accuracy for the years for which this is possible.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: Residential Basic Methodology; Page No.: 59

PREAMBLE: "The Residential Basic forecast was determined using a combined electricity and natural gas end use approach."

QUESTION:

Has Manitoba Hydro tried to develop an econometric-based forecast for the Residential Basic load forecast? If so, please provide the econometric forecast methodology details and any resulting forecast. If not, why not?

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.

REFERENCE: Appendix D 2013 Electric Load Forecast; Section: General Service Mass Market Customer Forecast; Page No.: 61

QUESTION:

Please provide the data used to estimate the equation for percentage change in number of customers outlined on p.62. Please include the number of customers used to calculate the percentage change in number of customers.

RESPONSE:

This Information Request has been withdrawn by the IEC as no longer required, having been satisfied through discussion with Manitoba Hydro.