



London Economics International LLC

Manitoba Hydro 2017/18 & 2018/19 GRA

Prepared for: Manitoba Public Utilities Board (“PUB”)

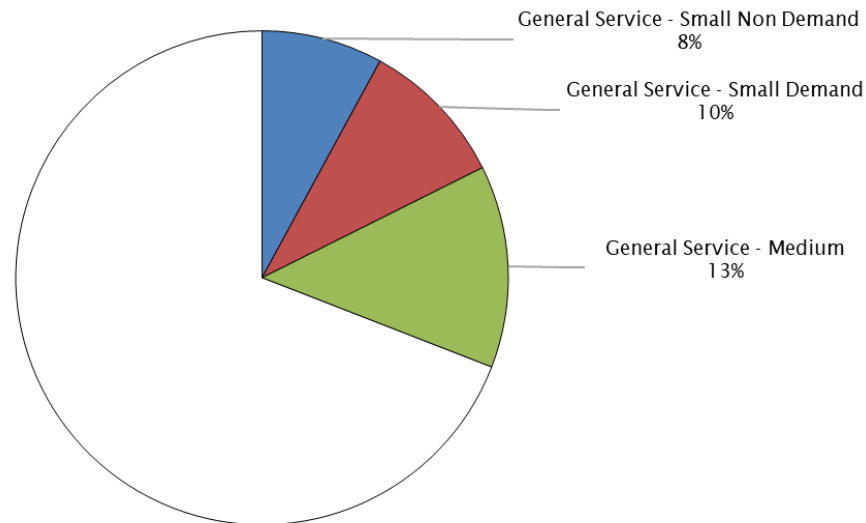
Direct Testimony of A.J. Goulding

1	Key messages
2	Rate increase impacts
3	Manitoba Hydro capital plan
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GSS and GSM customers account for almost a third of Manitoba Hydro's ("MH") revenue requirement

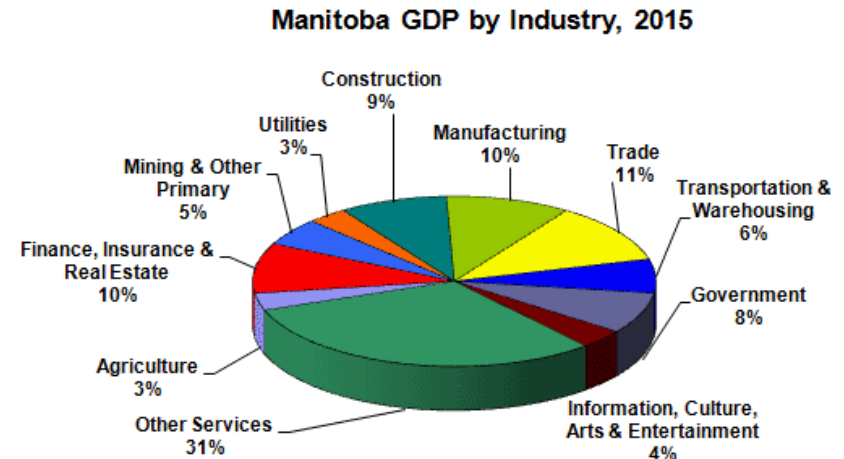
- ▶ London Economics International LLC ("LEI") was retained by Hill Sokalski Walsh Olson ("HSWO") to provide independent evidence to assist the PUB in understanding the views and positions of the GSS/GSM customers in this proceeding
- ▶ In a PUB letter dated September 15, 2017, the scope of LEI's role was expanded to include key issues for the Keystone Agricultural Producers ("KAP")

GSS/GSM share of PCOSS18 revenue requirement



GSS & GSM accounts for 31%

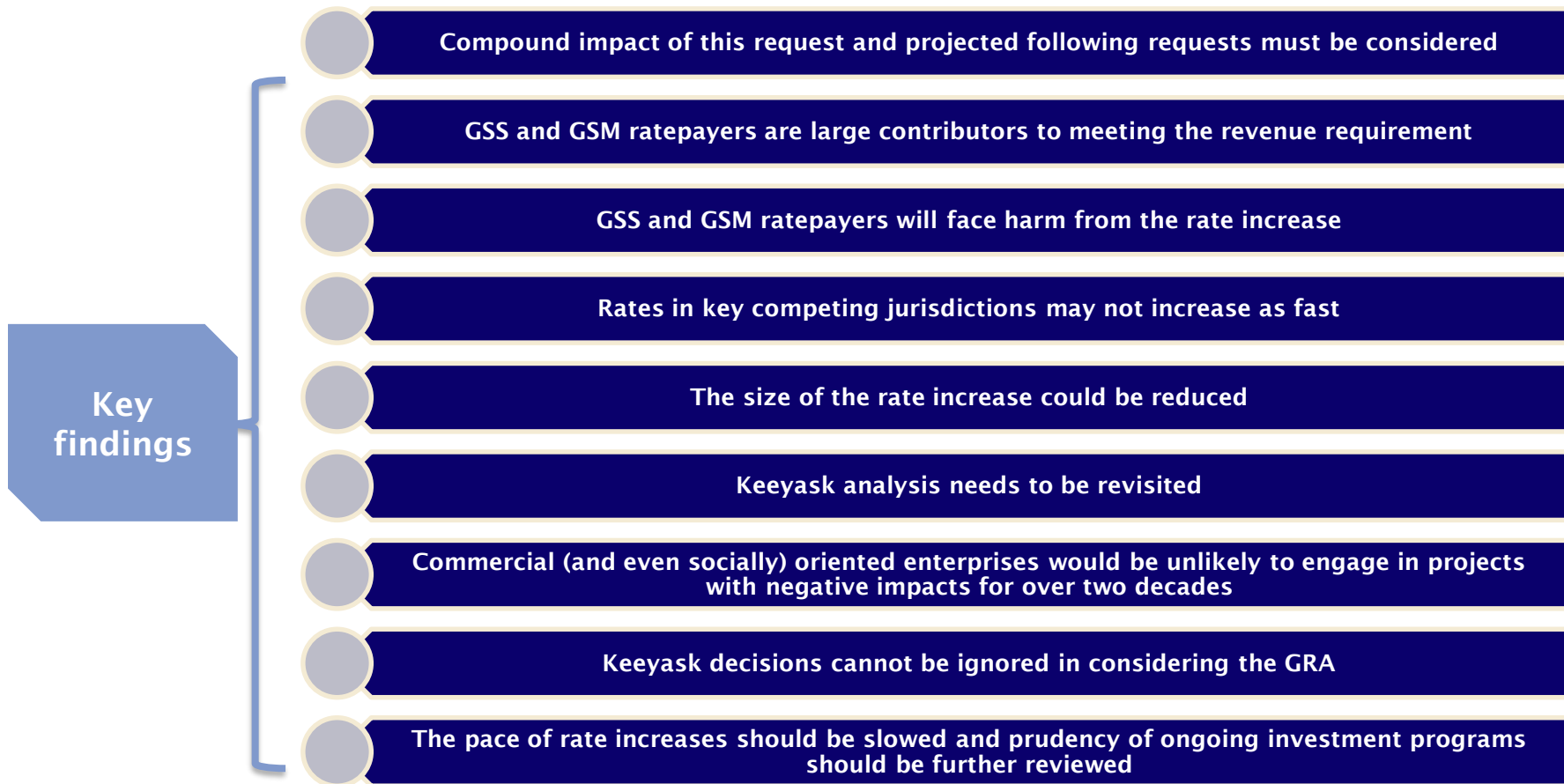
These sectors are a substantial proportion of the Manitoba economy



GSS & GSM sectors include agriculture, transportation & warehousing, government and professional services

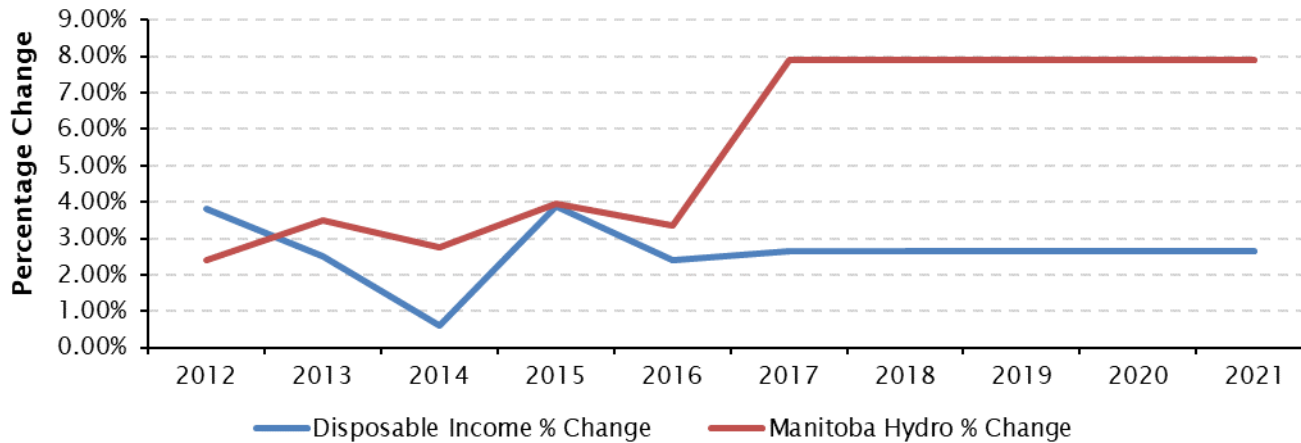
This hearing provides an opportunity for the Board to determine guidelines for future capital prudence in the interest of ratepayers

- ▶ **LEI finds that the proposed rate increase should be held in abeyance until:**
 - Comprehensive macroeconomic modeling is performed
 - A robust independent analysis of whether Keeyask should be postponed, modified, or cancelled is submitted
 - An additional independent review of Manitoba Hydro costs, staffing, and operating procedures is developed



MH's proposal of 7.9% is three times higher than historical disposable income growth of 2.64% between 2012 and 2016

Percentage changes of disposable income and electricity rates (2012-2021)



For a **residential customer** using 1,000 kWh per month the cumulative annual increase of \$483.58 by 2021 is roughly equivalent to one month's worth of groceries for the average Canadian household



For a **GSS customer** using 5,000 kWh per month the cumulative annual increase by 2021 amounts to \$2,429.16



For a **GSM customer** connected at 500kVA with a 50% load factor, the cumulative annual increase by 2021 amounts to \$66,869.76

If the approximately 2,000 GSM customers were all connected at 500 kVA with a 50% load factor, the overall cumulative five-year increase is \$133.7 million which equates to cost of 2,500 FTEs

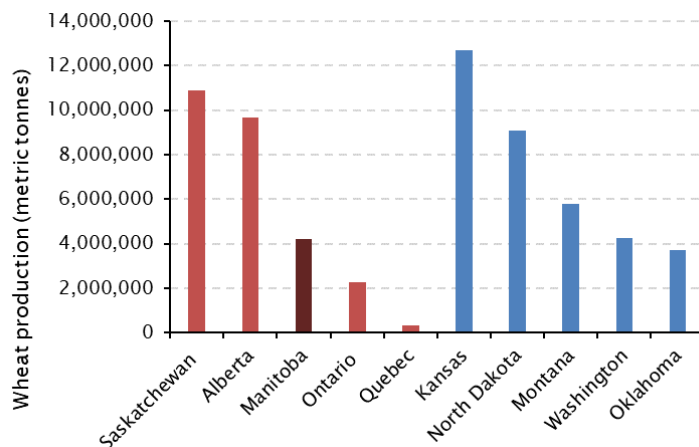
Note: FTE - Full time equivalent of \$53,560 assumes an average hourly wage of \$25.75 and assuming a 5-day 40 hour work week

Source: GSS/GSM-9 London Economics Evidence

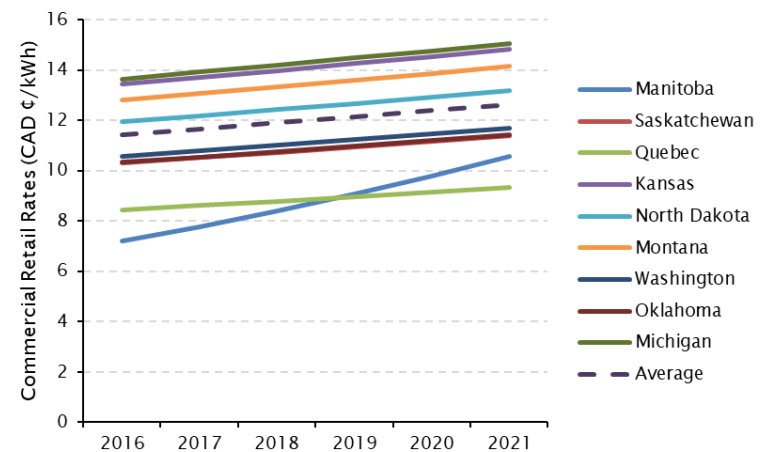
Impact of corporate tax cuts in the US may further narrow Manitoba's competitive margin after MH rates increase

- ▶ With 5 years of 7.9% rate increases, the competitive margin of Manitoba commercial electricity prices against the average of competitors will be eroded from 37% to 16% over the 2016-2021 period, before considering impact of US tax cuts
- ▶ Commissioners in Kansas, Michigan and Montana are requiring utilities to account for effects of the corporate tax reform by setting aside money for customer benefit, and are inclined toward ratepayer refunds
- ▶ Of the 5 US jurisdictions examined, only Washington has contemplated the introduction of carbon pricing with a proposal to introduce a \$20 carbon tax in 2019, growing by 3.5% annually thereafter

Top 5 Canadian and US wheat producers in 2016



Commercial retail rates of Manitoba compared to other jurisdictions

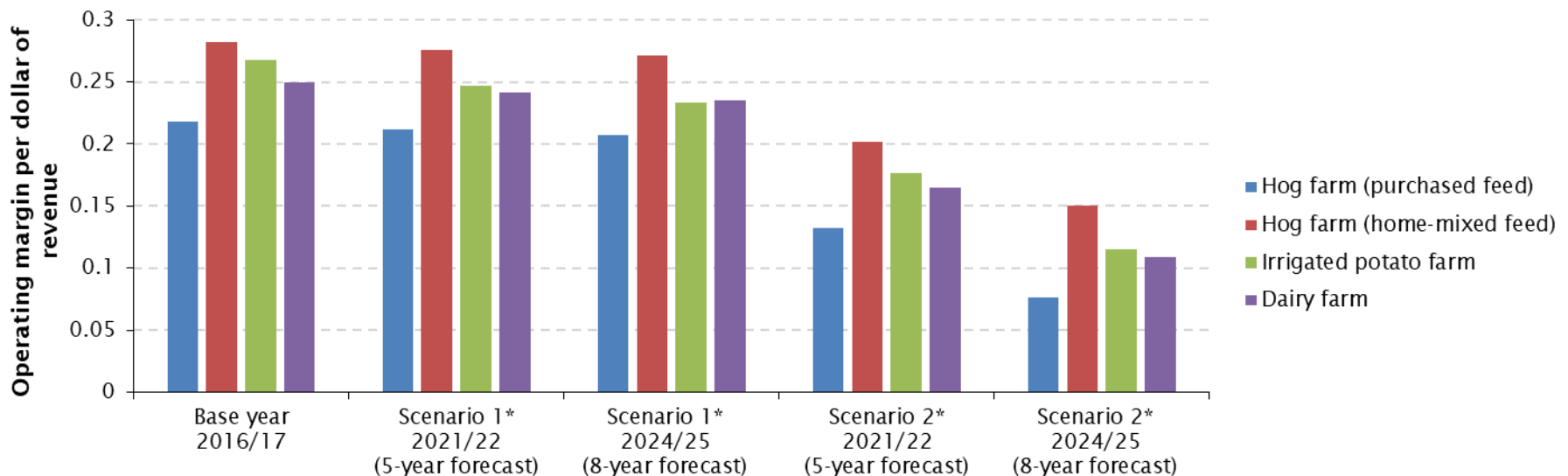


Rate increases of this magnitude are likely to have a significant impact on GSS, GSM, and agricultural ratepayers

Changes in operating margin per dollar of revenue of commercial customers

- ▶ Assuming that all other costs and revenue remain constant, gross margins for convenience stores (GSS) will fall from 21% to 17% over a 5-year period
- ▶ Assuming that all other costs and revenue remain constant, gross margins for hotels (GSM) will fall from 17.8% to 15.2% over a 5-year period

Changes in operating margin per dollar of revenue of agricultural customers

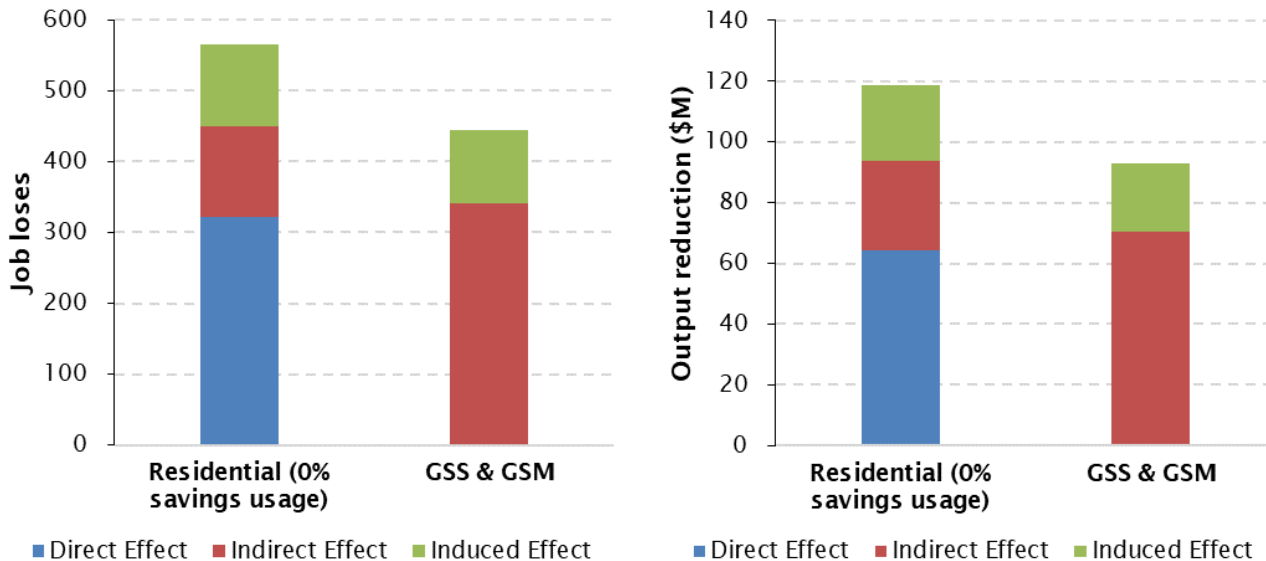


*Note: Both Scenarios 1 and 2 apply a 7.9% rate increase each year from 2017/18 to 2023/24, followed by a 4.54% rate increase in 2024/25; however, Scenario 1 assumes all costs apart from those associated with electricity remain constant, while Scenario 2 assumes all costs apart from those associated with electricity inflate at a rate of 2% each year. Net sales are assumed to remain constant throughout the specified forecast horizon for both scenarios.

Proposed rate increases will be detrimental Manitoba residents and GSS/GSM customers

- ▶ From LEI's evidence, the increase in rates on residential customers could result in employment decreases ranging from 93 to 418 jobs
 - In the extended analysis in PUB/GSS-GSM-KAP 14 on proposed rate impacts through 2024/25, projected employment reductions range from 278 to 566 jobs
- ▶ Increases for GSS and GSM customers could result in the loss of 352 jobs by 2019/20 and 445 by 2024/25

Macroeconomic impacts results summary

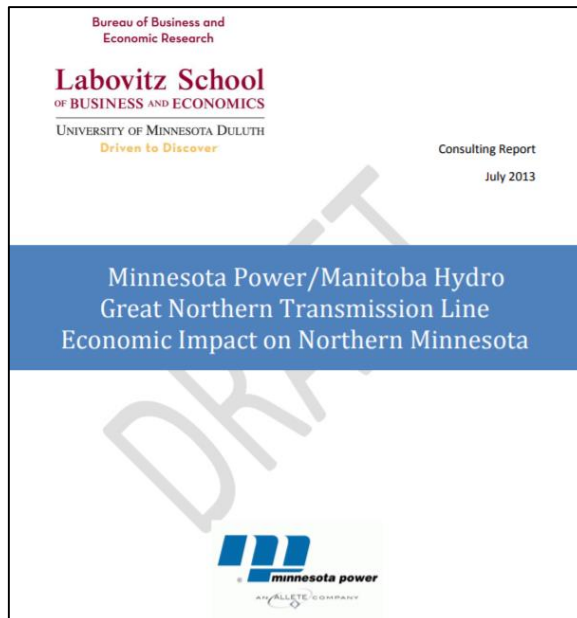


For GSS & GSM, LEI's analysis treats the diverted expenditure of each sector as a reduction of commodity purchases, excluding electricity which is held constant, using each industry's embedded spending pattern and does not assume any changes in employment, labour income or profitability.

- ▶ IFF (p.16) shows the possibility that increases of 8.7% could be required under a low export price case, which would increase the potential harm to GSS/GSM customers

Manitoba Hydro has not filed evidence on macroeconomic impacts of its development plan nor its current rate requests

- ▶ LEI's response to PUB/GSS-GSM-KAP -12 part b references an economic impact study of the Great Northern Transmission Line sponsored by Minnesota Power
- ▶ This assessment was conducted by an independent entity – the University of Minnesota Duluth Labovitz School's Bureau of Business and Economic Research (BBER)



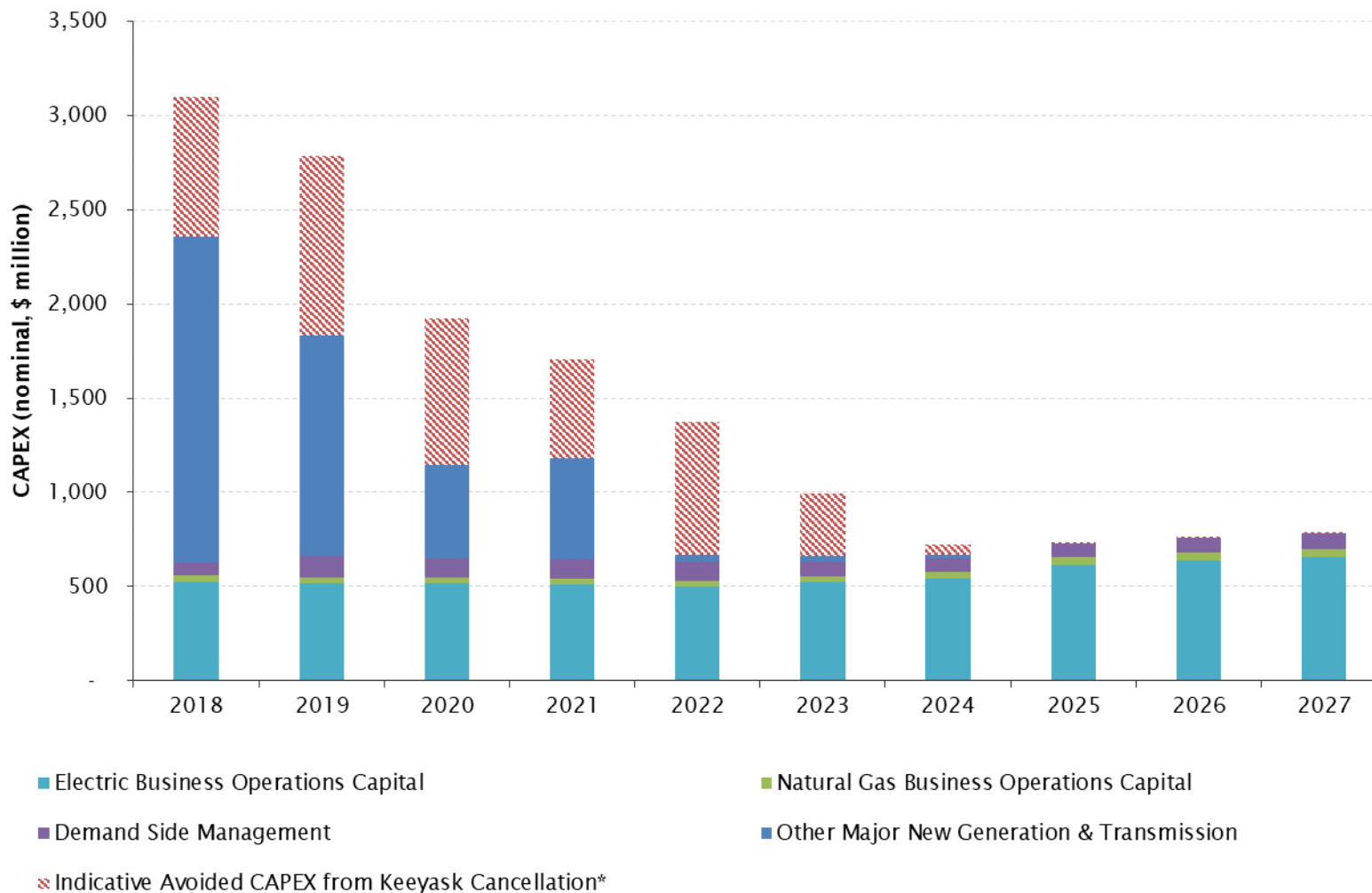
Study objectives

- To study the economic impact of development and construction of a hydroelectric transmission line on Northern Minnesota.
- To study the direct, indirect, and induced economic impacts from development and construction in the study area identified.
- To study the tax impacts for peak years.

Manitoba Hydro should be required to perform comprehensive macroeconomic analysis of large capital investments and rate impacts

Manitoba Hydro's proposed capital plan is a significant driver of proposed rate increases

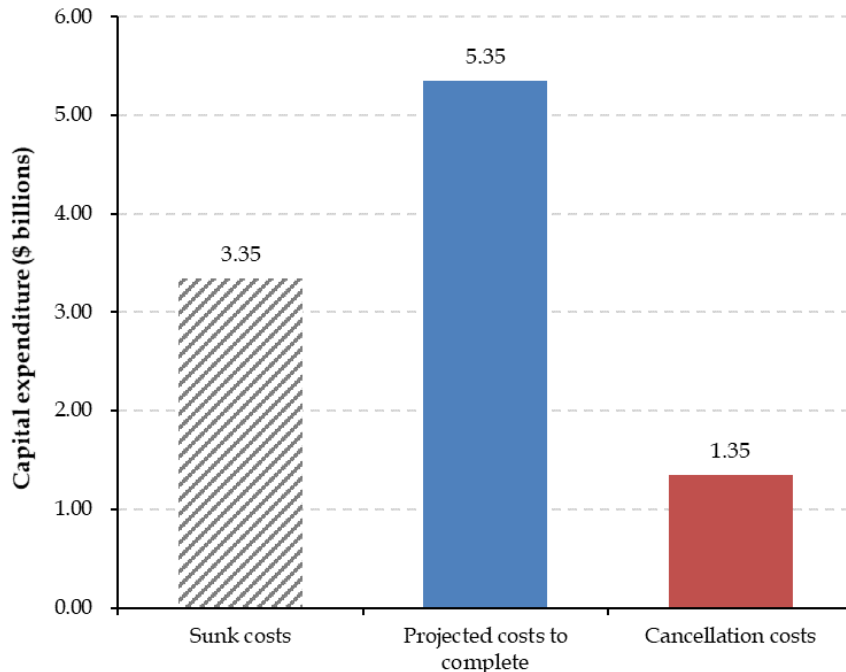
MH capital expenditure and DSM forecast (2018-2027)



On the basis of capital costs alone, cancellation of Keeyask and replacement with gas is more economic

- ▶ NREL Annual Technology Benchmark present value capital cost of CCGT in 2035 is \$1,223.98/kW places a \$0.9 billion (\$2.2 billion with cancellation) price tag on a Keeyask-sized gas plant
- ▶ In terms of Canadian dollars per kW, the capital cost of a new CCGT and cancelling Keeyask is \$3,166.43/kW whereas the \$5.4 billion unspent Keeyask budget is the equivalent of \$7,700.72/kW

Keeyask projected costs to complete



Capital cost comparison

Combined cycle gas comparison	
Capital cost of CCGT in 2035 [\$2015/kW]	\$941.16
Current capital cost [\$2017/kW]	\$979.18
CAD: USD exchange rate (Jan 23, 2018)	0.8
Converted current capital cost [CAD/kW]	\$1,223.98
Keeyask cancellation cost [CAD billion]	1.35
Installed capacity [MW]	695
Cancellation cost [CAD/kW]	\$1,942.45
Capital cost of CCGT (incl. Keeyask cancellation) [CAD/kW]	\$3,166.43

Keeyask capital cost	
Budget unspent [CAD billion]	5.35
Installed capacity [MW]	695
Capital cost of budget unspent [CAD/kW]	\$7,700.72

Domestic need for Keeyask has been repeatedly deferred

Timeline for revised Keeyask need dates

June 2014	Domestic need date confirmed as 2024 in NFAT
July 2015	Keeyask serving export market until 2030 in PUB Order 73/15
Sept 2016	Need may not arise until 2034 (BCG analysis); subsequently affirmed as 2034/35 in PUB/GSS-GSM-KAP-7
Sept 2017	Projected peak load growth revised from 1.2% to 0.9% (MH16-Update)

Benefits of gas

- ▶ An additional key factor is granularity – natural gas plants can be built in smaller sizes, with their online dates better synchronized with load
- ▶ Additional gas construction costs can be delayed and staged more easily than those for Keeyask
- ▶ This additional optionality is valuable, particularly in a situation where load is falling and technologies are changing rapidly
- ▶ Canadian gas displaced from US markets will be economically priced
- ▶ Even if the actual need date is in the mid- 2030s, the decision on whether to build the new plants could be delayed until at least 2030
- ▶ It is unclear whether current demand forecasts fully factor in the impact of the proposed and project rate increases on suppressing demand

Courageous decisions have been made elsewhere to downsize, cancel or mothball a large capital project to protect ratepayers

► Projects can also be downsized from their initial plans

- Nestor Kirchner and Jorge Cepernic hydropower projects was reduced from 1,740 MW to 1,290 MW due to cost considerations and potential savings of up to US \$1.3Bn

V.C. Summer Nuclear Expansion



- South Carolina Electric & Gas (“SCE&G”) and Santee Cooper suspended construction on July 31, 2017
- The project began in 2009 with a \$6.3Bn budget, but recorded a sunk cost of \$14Bn and another \$11Bn for completion by the time it was suspended in 2017
- Although SCE&G sought to recover \$4.9Bn in abandoned investment over a 60 year amortization period

Bellefonte Nuclear Plant



- Tennessee Valley Authority (“TVA”) mothballed the facility after the estimated construction cost increased from \$4.9Bn in 2011 to \$8.7Bn in 2013
- With sunk costs of \$8.1M, TVA sold the plant to Nuclear Development LLC to sell the unfinished plant for \$111M
- The TVA seeks to recover \$6 billion in costs at an amount of \$237M per year until fully recovered, subject to annual TVA Board approval

Tazi Twe Hydroelectric Plant



- In September 2017, SaskPower announced the deferral of the Tazi Twe hydroelectric plant due to lower demand projections in northern Saskatchewan
- Construction began in 2012 and costs \$34M to date
- In their 2017-18 Q2 report (released November 2017), SaskPower recognized a \$30M loss as a result of the project deferral

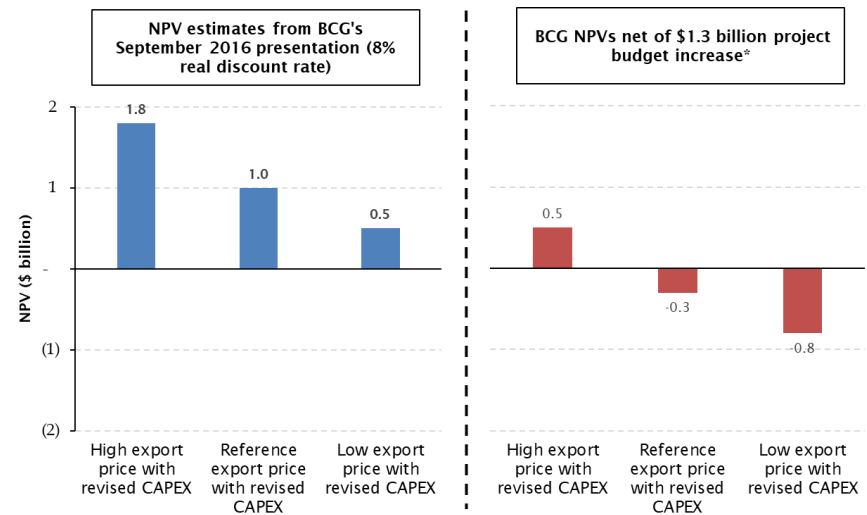
Removal of escalation and interest costs does not change conclusion that the benefits of Keeyask are negligible

- ▶ **Removing escalation and interest as suggested by MH still results in a negligible value for Keeyask**
 - The escalation and interest reduction amounts to \$0.2 billion
 - This conclusion holds even in a high export price case with revised CAPEX

Calculation of incremental escalation and interest costs

\$Billion	Mitigated schedule ¹	Current approved budget (2016\$) ²	Variance
Generation Station	5.2*	5.948	0.748
Generation Outlet Transmission (GOT)	0.2	0.202	0.002
Escalation @ CPI	0.2	0.249	0.049
Interest (including Interest on Equity)	1.6	1.749	0.149
Contingency		0.578	0.578
Total	7.2	8.726	1.526
Escalation & incremental interest	1.8	1.998	0.198

Revised BCG NPV estimates after budget increase less escalation and interest



Note: Generation Station in the Mitigated schedule budget includes "Spend to date excl interest" and "Generation Station (to-go)."

Sources: (1) BCG Bipole III, Keeyask and Tie-Line Review, (2) Manitoba Hydro PUB MFR 122 (Revised)

MH's use of a 4.4% real discount rate is not appropriate as it is not matched to the risk of the Keeyask project

- ▶ **The refreshed analysis in Section 2.5.4 of MH's Tab 2 presents NPV results only under a 4.4% WACC scenario**
- ▶ **The discount rate should be matched to the risk of the project being considered, rather than to the nature of the investor**
- ▶ **The risk profile of Keeyask is very different from that of Manitoba Hydro as a whole**
 - A large proportion of Keeyask output will be merchant for the foreseeable future exposing the asset to substantial market risk
 - The plant is only partially built, and may suffer additional schedule delays and cost overruns
- ▶ **Important to consider IRR, WACC and ROE when deciding on the real discount rate**
 - The high capital cost per kW and long gestation period for large-scale hydro projects like Keeyask suggests an appropriate IRR target would be 12% or above, determined using BCG's study (p.561)
 - This is in line with US Renewable Power Producers, which record a nominal pre-tax WACC of approximately 7.5% and a nominal ROE of 12% (p. 558)
 - Given Keeyask's additional construction risk relative to the US Renewable Power Producers, this would increase the nominal pre-tax WACC to 9-10%
 - Adjusted to real by deducting 1.7% results in a real discount rate of 7.3%-8.3%

MH's analysis does not address three of LEI's concerns: estimating how termination costs would change if Keeyask were to be mothballed as opposed to cancelled; examining whether the project could be brought online in phases; and investigating whether Keeyask could be separated from MH into a private or public-private partnership

MH's argument that average growth in O&A costs have kept pace with inflation does not indicate that cost levels are appropriate

- ▶ MH's O&A costs contribute approximately 27.12% to the total revenue requirement included in PCOSS
- ▶ UMS highlights that MH has not focused on "driving improvement" in asset management

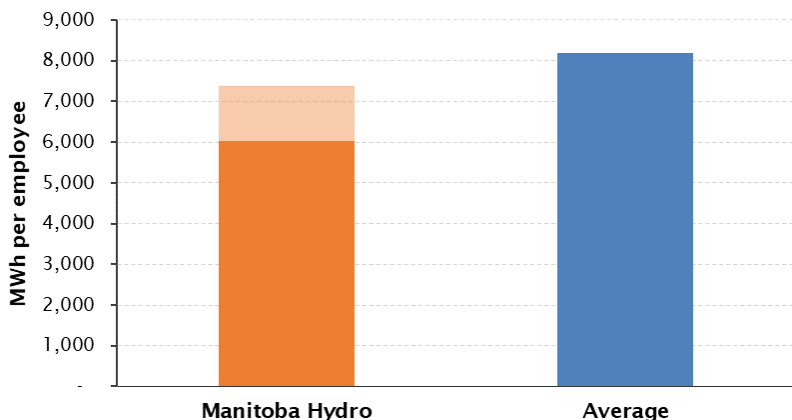
Key performance indicators

- ▶ The purpose of the presentation is to demonstrate that further analysis is necessary rather than to suggest that the results are exhaustive and conclusive
- ▶ Removing 1,000 employees claimed not involved with daily electric utility operations from the previous KPI analysis still places MH's operational efficiency below industry averages across all four metrics
 - 600 Centra Gas employees acquired by Manitoba Hydro in 1999 – though actual number of gas employees likely much lower today
 - 400 staff associated with the construction of Keeyask and Bipole III

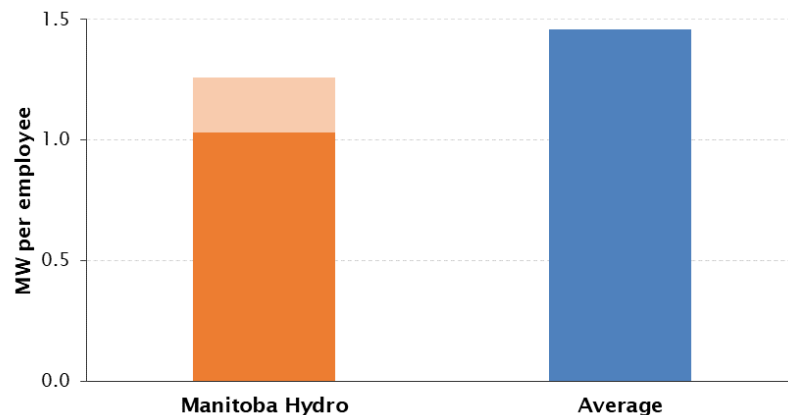
Metric	MH Original	MH Improvement	Industry Average
Total MWh of throughput per employee	6,030 MWh/employee	7,367 MWh/employee	8,194 MWh/employee
Installed MW of capacity per employee	1.03 MW/employee	1.26 MW/employee	1.46 MW/employee
Kilometers of wires per employee	15.71 km/employee	19.20 km/employee	20.20 km/employee
Customers per employee	104 customers/employee	127 customers/employee	218 customers/employee

Adjusting KPIs for the number of Centra Gas and construction-related staff underscore the need for cost benchmarking

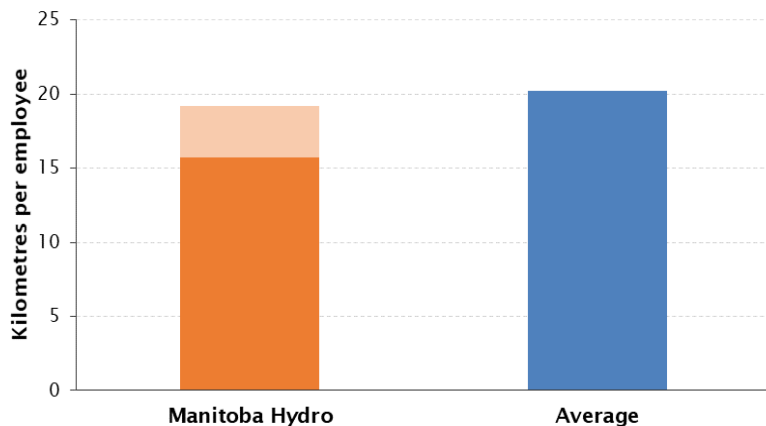
Total MWh of throughput per employee



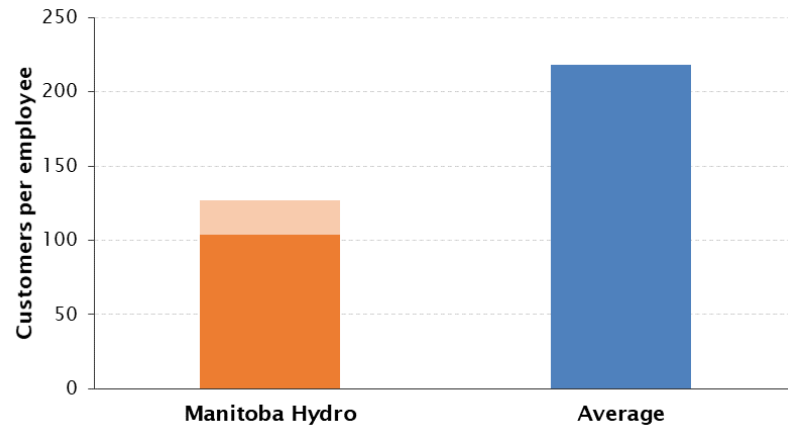
Installed MW of capacity per employee



Kilometers of wires per employee



Customers per employee



Improvements in operational efficiency due to the adjusted employee count is shaded in pale orange.

LEI's previously submitted analysis includes MH's planned elimination of 900 full-time equivalent employees, as part of its Voluntary Departure Program ("VDP") launched in April 2017.

MH yet to articulate its long term vision for how it sees the energy industry changing over the long term and the impact on its role



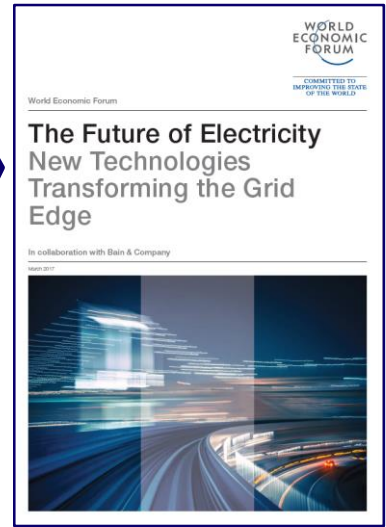
Executive survey shows Distributed Energy Resources (“DERs”) perceived as the most disruptive trend facing utilities today

1. Internet of Things (“IoT”)
2. Artificial intelligence
3. Cloud-based services
4. Blockchain
5. Advanced analytics
6. Augmented and virtual reality
7. Energy as service



1. New business models
2. More customer-centric
3. Storage
4. Grid modernization
5. DER
6. Solar power
7. Load defection
8. Renewable cost decline
9. Growth in natural gas-fired power
10. Decline of coal

1. Electric vehicles
2. Distributed generation
3. Distributed storage
4. Energy efficiency
5. Demand response
6. Smart meters,
7. Internet of Things
8. Other forms of digitization



Evidence does not include discussion of how current capital investments are consistent with vision for utility of the future

Sources: Public Utilities Fortnightly. State & Future of the Power Industry. 2017; Deloitte. Disrupting The Utility: Tech Trends 2017 and The Utility Industry. 2017; Utility Dive. The Top 10 Trends Transforming The Electric Power Sector. 2015; World Economic Forum. The Future of Electricity New Technologies Transforming the Grid Edge. 2017