REPORT TO
THE PUBLIC UTILITIES BOARD

CURTAILABLE RATE PROGRAM

APRIL 1, 2016 – MARCH 31, 2017

MAY 2017

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REPORT TO PUBLIC UTILITIES BOARD
CURTAILABLE RATE PROGRAM
APRIL 1, 2016 – MARCH 31, 2017

SUMMARY

The Curtailable Rate Program ("CRP") provides Manitoba Hydro with curtailable load which is available to maintain operating and contingency reserves, and which serves to minimize the disruption to firm customers in the event of loss of generation or transmission.

The three customers that participated in the CRP during the April 1, 2016 to March 31, 2017 period designated a total of 228 MW to Manitoba Hydro's reserves, and received credits on their electrical bills for their participation in the program totaling $6,259,835. There were eleven Option R curtailments initiated during this period.

In Order 73/15, issued on July 24, 2015, the PUB confirmed their acceptance of the modifications to the CRP Terms and Condition that had been previously accepted on an interim basis. The change in the definition of peak and off-peak hours became effective April 1, 2016 and the elimination of curtailment Options C and CE became effective as of July 31, 2016.

DESIGN AND APPLICATION OF THE CRP

Manitoba Hydro uses curtailable load, along with other measures, to maintain operating and contingency reserves and as a means of minimizing disruption to firm customers in the event of loss of generation or transmission.

Curtailable load provides reliability benefits to Manitoba Hydro all year round as curtailments for system emergencies can occur at any time. However, it has the greatest value during peak times as it is during peak periods that Manitoba Hydro's capacity surplus is the most vulnerable. Option A curtailable load in these hours increases the amount of surplus capacity available for sale in the export markets, while Option R load can allow Manitoba Hydro to meet its contingency reserve obligations at a lower cost. Please see Attachment 1 for a discussion of the estimated value of curtailable load to Manitoba Hydro.

Curtailable load provides risk mitigation benefits to the power system as it can be used to avoid shedding firm load and/or breach of North American Electric Reliability Council ("NERC") standards by Manitoba Hydro or the Midcontinent Independent System Operator-Manitoba Hydro Contingency Reserve Sharing Group ("MISO-MBHydro CRSG")[1]. Option R curtailable load allows Manitoba Hydro to meet reserve obligations thereby freeing up hydro generation for market transactions in the short-term opportunity energy market[2]. In this circumstance the benefits of having Option R available are dependent on Manitoba Hydro's water supply conditions as follows:

- High Water Supply - the generating capacity freed up for commercial use allows for increased hydraulic generation for export as idle generating units can be run to capture additional sales. Without Option R capacity in place, additional energy may be spilled. With Option R load, the additional energy may be generated and sold at peak prices.

- Average Water Supply - allows for additional hydraulic generation during peak hours that would otherwise be produced during off-peak hours (due to limited peak generating capability). In this case Manitoba Hydro captures the benefit of the price differential between peak and off-peak periods.

- Low Water Supply - does not provide any significant economic benefits because Manitoba Hydro has sufficient shut down generating units that could be run temporarily for operating reserve purposes without relying on Option R load reductions.

Manitoba Hydro does not initiate load curtailments in order to facilitate an opportunity spot market sale[3].

[1] The MISO-MBHydro CRSG is a NERC registered Contingency Reserve Sharing Group that has operated since January 1, 2010. The CRSG was established under the terms of the Amended MISO-Manitoba Hydro Coordination Agreement and executed on October 9, 2009.
[2] Opportunity export sales are sales of capacity and/or energy that are not backed by dependable energy and are incremental exports that arise from time to time as a result of water conditions that are better than the lowest historic levels.
[3] Spot market sales are sales that occur on a day ahead or real time basis. They are not considered to be a capacity sale.

The CRP Terms and Conditions allow Manitoba Hydro to reserve the right to limit the amount of total curtailable load used for maintaining operating and contingency reserves[4]. In accordance with the modifications to the CRP Terms and Conditions accepted by the PUB in Order 73/15, Option C was eliminated as of the sunset date (July 31, 2016), Option R has been capped at 50 MW, and Option A has been capped at 180 MW. Likewise, hours defined as Peak and Off-Peak have changed effective April 1, 2016.

2016/17 CRP OPERATIONS AND RESULTS

Curtailment Options:

Effective August 1, 2016, the CRP included three base curtailment options (A, R and E) and two combination options (AE and RE). Options vary depending on the minimum notice to curtail, the maximum duration per curtailment, the maximum daily hours of curtailment, the maximum number of curtailments per year, and the maximum annual hours of curtailment.

Three customers participated in the CRP during the April 1, 2016 to March 31, 2017 period. Prior to August 1, 2016 and the elimination of Option C, a total of 228 MW was designated to Manitoba Hydro's reserves, allocated as 80 MW Option AE, 67 MW Option A, 31 MW Option C and 50 MW Option R. With the elimination of Option C, load designated as Option A increased to 95 MW as of December 1, 2016. The total load designated to Manitoba Hydro's reserves is now 225 MW. The amount each customer designated as curtailable load in relation to their total load varies, impacting their curtailable credit, as shown on the following table.

[4] Per NERC Glossary of Terms, Operating Reserves refers to the reserves needed to protect Manitoba Hydro and its obligations to the MISO power system against Contingencies or Disturbances. These events are typically a result of loss of supply caused by sudden generating or transmission outages. Contingency Reserves are a component of Operating Reserves which are sufficient in magnitude and response to meet NERC Disturbance Control Standards. Contingency Reserves are comprised of Operating Reserves-Spinning and Operating Reserves-Supplemental. Curtailable load (also referred to as Interruptible Load) can be a source of Operating Reserves-Supplemental.

Summary of Curtailment Credit Data April 1, 2016 to March 31, 2017					
Customer	**Option(s)**	**CRP Load as % of Total Load**	**Average On-Peak MW**	**Average On-Peak LF**	**Average Monthly Credit**
1	A & R & E	78%	215.1	91.7%	$457,033
2	A	94%	25.2	93.7%	$53,262
3*	A	85%	20.7	80.1%	$34,073
	C	0%	0.7	74.7%	$0

* Customer 3 Option C - customer was operating below their protected firm load and therefore had no load available for curtailment.

Curtailable load can be designated as "Curtail to Protected Firm Load" or "Guaranteed Curtailment" with the exception of Option R which must be designated as "Guaranteed Curtailment". That is, the customer must agree to shed a specified amount of load in order to be compliant with the curtailment request.

Dependent on the curtailment option selected, Manitoba Hydro will curtail customers in response to system emergencies and to maintain operating reserves. Options A and R curtailments assist in securing operating and contingency reserves whereas Option E curtailments are initiated to meet firm energy requirements in the event that Manitoba Hydro expects to be short of firm energy supplies.

Implementation and Size of Curtailments:

There were 11 Option R curtailments during the April 1, 2016 to March 31, 2017 period, all of which were initiated in response to a contingency or disturbance event requiring deployment of Manitoba Hydro's supplemental reserves. All but four curtailments were initiated during peak hours. The curtailed customer did not use an alternative power source to supply their load during the curtailments.

Manitoba Hydro continues to communicate by telephone its curtailment requirements to customers on the program. This procedure is manageable and provides the additional security that curtailment(s) will be initiated by confirmation from an agent of the customer. Manitoba Hydro experienced no difficulties in communicating the 11 curtailments during this reporting period.

The following table summarizes the duration and load in MW of each curtailment.

April 2016 to March 2017	Option R	
	Hours Curtailed	MW
July 1, 2016	0.62	50
September 24, 2016	0.88	50
September 24, 2016	0.72	50
September 26, 2016	0.40	50
October 28, 2016	0.57	50
November 15, 2016	1.15	50
January 5, 2017	0.35	50
February 22, 2017	2.97	50
February 25, 2017	0.67	50
March 12, 2017	0.67	50
March 31, 2017	0.68	50
Total	**9.68**	**550**
Average	**0.88**	**50**

Reference and Reserve Discounts:

The discount available to a participating customer is called the "Reference Discount." The Reference Discount is related to the marginal value of capacity, and is adjusted on April 1 of each year by the inflation factor. The Reference Discount in effect for the reporting period April 1, 2016 to March 31, 2017 was $3.43 per kW/month, as approved by the PUB, on an interim basis, in Order 54/16 dated April 26, 2016. Option AE customers receive 100% of the discount, while Option A and R customers receive 70% of the discount or $2.40 per kW/month. Prior to its elimination on July 31, 2016, Option C customers received 40% of the discount or $1.37 per kW/month.

For curtailable load nominated as "Curtail to Protected Firm Load", the Reference Discount is calculated and credited to customers' bill each month as (A - B) x C x D where:

A = On-Peak Period Demand (kW)
B = Protected Firm Load (kW)
C = On-Peak Period Load Factor
D = Discount Amount

For curtailable load designated as a "Guaranteed Curtailment", the Reference Discount is calculated and credited to customers' bill each month as GC x D where:

GC = the customer's guaranteed curtailable load
D = Discount Amount

Customers selecting Curtailment Option R receive, in addition to the Reference Discount, a Reserve Discount for each curtailment initiated and successfully completed. The Reserve Discount represents the value of carrying contingency reserves and is calculated and credited to customers' bill for each successful curtailment as LR x Du x FD where,

LR = amount of load reduction (in kW) requested by Manitoba Hydro's System Control to the customer at the time of an Option R curtailment
Du = duration of the curtailment (in hours)
FD[5] = fixed discount amount, currently set at $0.04 per kWh

The following table illustrates the amount of the monthly Reference Discount Credit that each customer received from April 1, 2016 to March 31, 2017, as well as their monthly On-Peak Demand and On-Peak Load Factor.

Monthly Reference Discount Credit									
2016 to 2017	Customer 1 Options AE, R, A			Customer 2 Option A			Customer 3 Option A		
	On Peak MW	LF %	Discount Paid $	On Peak MW	LF %	Discount Paid $	On Peak MW	LF %	Discount Paid $
Apr	212.5	84.4%	$428,384	25.0	98.5%	$55,622			
May	208.6	90.2%	$449,662	25.0	68.9%	$38,911			
June	213.1	94.2%	$464,322	25.0	95.3%	$53,831			
Jul	211.7	87.5%	$440,046	25.3	95.1%	$54,339			
Aug	216.4	93.7%	$462,531	25.6	96.4%	$55,732			
Sep	215.6	83.6%	$425,495	25.3	97.5%	$55,740			
Oct	218.7	94.6%	$465,675	25.3	83.5%	$47,698			
Nov	219.1	93.1%	$460,337	25.0	97.6%	$55,130			
Dec	221.6	96.2%	$471,780	25.0	98.8%	$55,785	19.7	60.1%	$24,121
Jan	221.7	95.2%	$467,942	25.0	96.1%	$54,266	20.8	90.5%	$38,612
Feb	220.7	92.9%	$459,716	25.0	98.7%	$55,752	20.4	89.5%	$37,266

[5] The Fixed Discount amount is based on the value of carrying contingency reserves on Manitoba Hydro units.

Monthly Reference Discount Credit									
2016 to 2017	Customer 1 Options AE, R, A			Customer 2 Option A			Customer 3 Option A		
	On Peak MW	LF %	Discount Paid $	On Peak MW	LF %	Discount Paid $	On Peak MW	LF %	Discount Paid $
Mar	201.9	95.5%	$469,148	25.3	98.6%	$56,340	21.8	80.3%	$36,293
Average	**215.1**	**91.7%**	**$455,420**	**25.2**	**93.7%**	**$53,262**	**20.7**	**80.1%**	**$34,073**
Total			**$5,465,037**			**$639,147**			**$136,292**

The discounts shown for Customer 1 do not include the $19,360 credited in respect of the Option R Reserve Discount.

The discount shown for Customer 3 is for Option A only. No discount was paid under Option C as the customer was operating below their protected firm load and therefore had no load available for curtailment.

CONCLUSION

The CRP continues to assist Manitoba Hydro in fulfilling its commitment of carrying, deploying, and re-establishing contingency reserves to meet its obligations with the MISO-MBHydro CRSG and to maintain compliance with NERC Standards. The program also assists in minimizing disruption to Manitoba Hydro's firm customers.

ATTACHMENT 1

ESTIMATE OF THE VALUE OF CURTAILABLE LOAD TO MANITOBA HYDRO

The value of curtailable load to Manitoba Hydro is related to an estimate of the marginal cost of firm, long-term capacity. Over the long term, a representative value for capacity can be developed by estimating the annual carrying cost (includes finance and depreciation costs but not operating/fuel costs) of the lowest cost resource required to provide capacity to Manitoba Hydro, which is a simple cycle combustion turbine (SCCT). In 2005 the annual carrying cost of a SCCT was estimated to be $78 per kW per year, or $6.50 per kW per month, evaluated at load. It was proposed that this cost would escalate at the rate of inflation. This cost was subsequently reviewed in 2012 and was found to be appropriate going forward. This approach has the advantage of providing a clear transparent value, which is also stable over time and is consistent with the approach that is utilized to evaluate the benefits of other resource options, such as DSM, that may have a capacity component.

Curtailable load is less valuable than a generation resource such as a SCCT. The SCCT can provide more flexibility in dispatch and also has the capability to deliver for longer time periods during extended emergency situations. Once in place, a SCCT can be relied upon as a permanent, long-term resource, unlike curtailable load which can be terminated with a notice period of one year. Curtailable load normally has more value in the summer months, when it can assist in supporting seasonal capacity exports, and in the peak winter months, when it may add reliability to the Manitoba Hydro system. Curtailable load will provide more winter reliability benefits in years in which there is little capacity surplus on the system. When there is a significant capacity surplus on the Manitoba Hydro system, curtailable load provides less winter value than it would otherwise under more constrained conditions. The value of reliability benefits in a single year is not easily determined, which is why longer-term levelized values are used to infer the benefits of curtailable load.

The economic benefits of curtailable load can vary considerably year to year for a number of reasons. In the case of Option R, the economic benefits derived from this option will vary depending on water conditions and short term energy prices. Changes to the installed generation capacity and forecast load in the export market will influence the value of capacity resources and can vary in the near term. Use of a longer-term levelized value maintains stability in CRP pricing, therefore sheltering the CRP customer from these sources of variability.

As described above, curtailable load is less valuable than a SCCT because it has limited dispatchability, is not sustainable in reducing load over longer periods, and is not guaranteed to exist in the long term. Therefore, in order to reflect these factors, curtailable load is assigned a long-term levelized value that is 42% of the annual carrying cost of a SCCT. After consideration of inflation subsequent to the 2011 base year, this yields an estimate of benefits for the year beginning April 1, 2016 of $3.43 per kW/month, which is referred to as the "Reference Discount". This value would apply to the curtailable rate option that provides the most value to Manitoba Hydro, that being Options AE and RE, for which the discount is set to return 100% of the estimated value of curtailable load to the customer. Other options provide less flexibility and are accordingly worth less to Manitoba Hydro. These have been priced to reflect their lesser value to Manitoba Hydro but still to return the full estimated value of that option to the customer.

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SUMMARY

The Curtailable Rate Program ("CRP") provides Manitoba Hydro with curtailable load which is available to maintain operating and contingency reserves, and which serves to minimize the disruption to firm customers in the event of loss of generation or transmission.

The three customers that participated in the CRP during the April 1, 2015 to March 31, 2016 period designated a total of 228 MW to Manitoba Hydro's reserves, and received credits on their electrical bills for their participation in the program totaling $6,139,490. During this period, 16 Option R curtailments were initiated.

On July 24, 2015 the Public Utilities Board of Manitoba ("PUB") issued Order 73/15 approving electricity rates effective August 1, 2015. This Order also confirmed their acceptance of the modifications to the CRP Terms and Conditions that had been accepted by the PUB on an interim basis in Order 43/13, including the elimination of curtailment Options C and CE and the change in the definition of peak and off-peak hours which had yet to be implemented. CRP customers have been notified of the final changes and their implementation date.

DESIGN AND APPLICATION OF THE CRP

Manitoba Hydro uses curtailable load, along with other measures, to maintain operating and contingency reserves and as a means of minimizing disruption to firm customers in the event of loss of generation or transmission.

Curtailable load provides value to Manitoba Hydro all year round as curtailments for system emergencies can occur at any time of the year. However, it has the greatest value during peak times as it is during peak periods that Manitoba Hydro's capacity surplus is the most vulnerable. Options A and C curtailable load in these hours increases the amount of capacity for sale in the export markets, while Option R load can allow Manitoba Hydro to meet its contingency reserve obligations at a lower cost. Please see Attachment 1 for a discussion of the estimated value of curtailable load to Manitoba Hydro.

Curtailable load provides risk mitigation benefits to the power system as it can be used to avoid shedding firm load and/or breach of North American Electric Reliability Council ("NERC") standards by Manitoba Hydro or the Midcontinent Independent System Operator-Manitoba Hydro Contingency Reserve Sharing Group ("MISO-MBHydro CRSG")[1]. Option R curtailable load allows Manitoba Hydro to meet reserve obligations thereby freeing up hydro generation for market transactions in the short-term opportunity energy market[2]. In this circumstance the benefits of having Option R available are dependent on Manitoba Hydro's water supply conditions as follows:

- High Water Supply - the generating capacity freed up for commercial use allows for increased hydraulic generation for export as idle generating units can be run to capture additional sales. Without Option R capacity in place, energy would be spilled. With Option R load, the additional energy generated can be sold at on-peak prices.

- Average Water Supply - allows for additional hydraulic generation during on-peak hours that would otherwise be produced during off-peak hours (due to limited on-peak generating capability). In this case Manitoba Hydro captures the benefit of the price differential between on and off-peak periods.

- Low Water Supply - does not provide any significant benefits because Manitoba Hydro has sufficient shut down generating units that could be run temporarily for operating reserve purposes without relying on Option R load reductions.

Manitoba Hydro does not initiate load curtailments in order to facilitate an opportunity spot market sale[3].

The CRP Terms and Conditions allow Manitoba Hydro to reserve the right to limit the amount of

[1] The MISO-MBHydro CRSG is a NERC registered Contingency Reserve Sharing Group that has operated since January 1, 2010. The CRSG was established under the terms of the Amended MISO-Manitoba Hydro Coordination Agreement and executed on October 9, 2009.

[2] Opportunity export sales are sales of capacity and/or energy that are not backed by dependable energy and are incremental exports that arise from time to time as a result of water conditions that are better than the lowest historic levels.

[3] Spot market sales are sales that occur on a day ahead or real time basis. They are not considered to be a capacity sale.

total curtailable load used for maintaining operating and contingency reserves[4]. As noted in the following section, per Order 73/15 Manitoba Hydro reduced the amount of Option A and Option R load available to customers and eliminated Options C and CE (as of the sunset date of July 31, 2016).

CHANGES TO TERMS AND CONDITIONS

All CRP customers have been notified by letter of the changes to the CRP Terms and Conditions. Manitoba Hydro has implemented the following changes to the CRP Terms and Conditions that were accepted by the PUB in Orders 43/13 and 73/15:

- elimination of curtailment Options C and CE (sunset date of July 31, 2016);
- a reduction in the amount of Option A and Option R load available to customers. The load cap for Option A is 180 MW, contingent on Option C curtailable load switching to Option A. Should Option C load revert to firm service, the cap for Option A will be reduced to 150 MW. The load cap for Option R is 50 MW;
- change in hours defined as Peak and Off-Peak to be effective April 1, 2016 to correspond to a potential time-of-use rate offering;
- removal of the monthly variation to nominate curtailable or firm load;
- exclusion from the program after a customer's 2nd failure to curtail in a 12 month period; and
- the condition that customers who have switched from Curtailable to Firm service may switch back to Curtailable after one year.

2015/16 CRP OPERATIONS AND RESULTS

Curtailment Options:

With the above-noted changes, effective August 1, 2016, the CRP will include three base curtailment options and two combinations. Options vary depending on the minimum notice to curtail, the maximum duration per curtailment, the maximum daily hours of curtailment, the maximum number of curtailments per year, and the maximum annual hours of curtailment.

[4] Per NERC Glossary of Terms, Operating Reserves refers to the reserves needed to protect Manitoba Hydro and its obligations to the MISO power system against Contingencies or Disturbances. These events are typically a result of loss of supply caused by sudden generating or transmission outages. Contingency Reserves are a component of Operating Reserves which are sufficient in magnitude and response to meet NERC Disturbance Control Standards. Contingency Reserves are comprised of Operating Reserves-Spinning and Operating Reserves-Supplemental. Curtailable load (also referred to as Interruptible Load) can be a source of Operating Reserves-Supplemental.

The three customers that participated in the CRP during the April 1, 2015 to March 31, 2016 period designated a total of 228 MW to Manitoba Hydro's reserves, allocated as 80 MW Option AE, 67 MW Option A, 31 MW Option C and 50 MW Option R. The amount each customer designated as curtailable load in relation to their total load varies, impacting their curtailable credit, as shown on the following table.

Summary of Curtailment Credit Data
April 1, 2015 to March 31, 2016

Customer	Option(s)	CRP Load as % of Total Load	Average On-Peak MW	Average On-Peak LF	Average Monthly Credit
1	A, R, E	79%	212.4	93.2%	$458,974
2	A	94%	25.0	94.0%	$52,650
3*	C	0%	2.1	67.5%	$0

* Customer 3 was operating below their protected firm load and therefore had no load available for curtailment.

Curtailable load can be designated as "Curtail to Protected Firm Load" or "Guaranteed Curtailment" with the exception of Option R. Load designated under Option R must be nominated as a Guaranteed Curtailment. That is, the customer must agree to shed a specified amount of load in order to be compliant with the curtailment request.

Dependent on the curtailment option selected, Manitoba Hydro will curtail customers in response to system emergencies and to maintain Planning and Operating Reserves. Options A, C and R curtailments assist in securing operating and contingency reserves whereas Option E curtailments are initiated to meet firm energy requirements in the event that Manitoba Hydro expects to be short of firm energy supplies.

Implementation and Size of Curtailments:

There were 16 Option R curtailments during the April 1, 2015 to March 31, 2016 period, all of which were initiated in response to a contingency or disturbance event requiring deployment of Manitoba Hydro's supplemental reserves. All curtailments except for the December 25, 2015 curtailment were initiated during peak hours. The curtailed customer did not use an alternative power source to supply their load during the curtailments.

Manitoba Hydro continues to communicate by telephone its curtailment requirements to customers on the program. This procedure is manageable and provides the additional security that curtailment(s) will be initiated by confirmation from an agent of the customer. Manitoba Hydro experienced no difficulties in communicating the 16 curtailments during this reporting period.

The following table summarizes the duration and load in MW of each curtailment.

April 2015 to March 2016	Option R	
	Hours Curtailed	MW
May 10, 2015	0.73	50
May 17, 2015	0.97	50
June 4, 2015	0.22	50
June 28, 2015	0.60	50
July 3, 2015	0.80	50
July 12, 2015	0.82	50
July 12, 2015	0.47	50
July 25, 2015	0.57	50
July 29, 2015	0.70	50
August 4, 2015	0.53	50
August 5, 2015	0.47	50
August 12, 2015	2.93	50
September 6, 2015	0.42	50
December 25, 2015	0.73	50
January 24, 2016	1.18	50
March 14, 2016	0.87	50
Total	**13.01**	**N/A**
Average	**0.81**	**50**

Reference and Reserve Discounts:

The maximum discount available to a participating customer is called the "Reference Discount." The Reference Discount is related to the marginal value of capacity, and is adjusted on April 1 of each year by the inflation factor. The Reference Discount in effect for the reporting period April 1, 2015 to March 31, 2016 was $3.40 per kW/month, as approved by the PUB, on an interim basis, in Order 44/15 dated April 23, 2015 and approved as final in Order 73/15 dated July 24, 2015. Option AE customers receive 100% of the discount, while Option A and R customers receive 70% of the discount or $2.38 per kW/month. Option C customers receive 40% of the discount or $1.36 per kW/month.

For curtailable load nominated as "Curtail to Protected Firm Load", the Reference Discount is calculated and credited to customers' bill each month as (A - B) x C x D where:

A = On-Peak Period Demand (kW)
B = Protected Firm Load (kW)
C = On-Peak Period Load Factor
D = Discount Amount

For curtailable load designated as a "Guaranteed Curtailment", the Reference Discount is calculated and credited to customers' bill each month as GC x D where,

GC = the customer's guaranteed curtailable load
D = Discount Amount

Customers selecting Curtailment Option R receive, in addition to the Reference Discount, a Reserve Discount for each curtailment initiated and successfully completed. The Reserve Discount represents the value of carrying contingency reserves and is calculated and credited to customers' bill for each successful curtailment as LR x Du x FD where,

LR = amount of load reduction (in kW) requested by Manitoba Hydro's System Control to the customer at the time of an Option R curtailment
Du = duration of the curtailment (in hours)
FD[5] = fixed discount amount, currently set at $0.04 per kWh

The following table illustrates the amount of the monthly Reference Discount Credit that each customer received from April 1, 2015 to March 31, 2016, as well as their monthly On-Peak Demand and On-Peak Load Factor.

[5] The Fixed Discount amount is based on the value of carrying contingency reserves on Manitoba Hydro units.

Monthly Reference Discount Credit									
2015 to 2016	Customer 1 Options AE, R, A			Customer 2 Option A			Customer 3 Option C		
	On Peak MW	LF %	Discount Paid $	On Peak MW	LF %	Discount Paid $	On Peak MW	LF %	Discount Paid $
Apr	212.9	94.1%	$460,092	24.8	96.4%	$53,321	0.7	73.5%	$0
May	212.9	93.5%	$457,881	24.8	85.1%	$47,068	16.0	5.2%	$0
June	212.6	92.9%	$455,598	24.8	94.7%	$52,391	0.7	72.3%	$0
Jul	208.6	92.5%	$454,112	24.9	77.4%	$43,083	0.7	78.4%	$0
Aug	211.2	93.8%	$459,077	25.0	97.4%	$54,531	0.7	73.6%	$0
Sep	213.0	95.1%	$463,717	25.0	97.8%	$54,783	0.7	73.0%	$0
Oct	212.7	93.6%	$458,099	25.3	98.1%	$55,615	0.8	74.1%	$0
Nov	212.6	90.4%	$446,610	25.3	86.7%	$49,109	0.8	74.4%	$0
Dec	213.1	94.3%	$460,708	24.8	98.9%	$54,704	0.8	76.1%	$0
Jan	212.9	94.0%	$459,657	25.0	98.9%	$55,371	1.2	55.7%	$0
Feb	213.0	95.0%	$463,318	25.3	98.2%	$55,666	0.8	74.9%	$0
Mar	212.8	89.3%	$442,804	25.3	99.1%	$56,154	0.7	78.4%	$0
Avg	**212.4**	**93.2%**	**$458,974**	**25.0**	**94.0%**	**$52,650**	**2.1**	**67.5%**	**$0**
Total			**$5,481,674**			**$631,796**			

The discounts shown for Customer 1 do not include the $26,020 credited in respect of the Option R Reserve Discount.

CONCLUSION

The CRP assists Manitoba Hydro in fulfilling its commitment of carrying, deploying, and re-establishing contingency reserves to meet its obligations with the MISO-MBHydro CRSG and to maintain compliance with NERC Standards. The program also assists in minimizing disruption to Manitoba Hydro's firm customers.

ATTACHMENT 1

ESTIMATE OF THE VALUE OF CURTAILABLE LOAD TO MANITOBA HYDRO

The value of curtailable load to Manitoba Hydro is related to an estimate of the marginal cost of firm, long-term capacity. Over the long term, a representative value for capacity can be developed by estimating the annual carrying cost (includes finance and depreciation costs but not operating/fuel costs) of the lowest cost resource required to provide capacity to Manitoba Hydro, which is a simple cycle combustion turbine (SCCT). In 2005 the annual carrying cost of a SCCT was estimated to be $78 per kW per year, or $6.50 per kW per month, evaluated at load. It was proposed that this cost would escalate at the rate of inflation. This cost was subsequently reviewed in 2012 and was found to be appropriate going forward. This approach has the advantage of providing a clear transparent value, which is also stable over time and is consistent with the approach that is utilized to evaluate the benefits of other resource options, such as DSM, that may have a capacity component.

Curtailable load is less valuable than a generation resource such as a SCCT. The SCCT can provide more flexibility in dispatch and also has the capability to deliver for longer time periods during extended emergency situations. Once in place, a SCCT can be relied upon as a permanent, long-term resource, unlike curtailable load which can be terminated with a notice period of one year. Curtailable load normally has more value in the summer months, when it can assist in supporting seasonal capacity exports, and in the peak winter months, when it may add reliability to the Manitoba Hydro system. Curtailable load will provide more winter reliability benefits in years in which there is little capacity surplus on the system. When there is a significant capacity surplus on the Manitoba Hydro system, curtailable load provides less winter value than it would, for example, around the 2023/24 time period, when the requirement to add generation to serve domestic customers may be expected to occur with 2013 planning assumptions and base demand side management program assumptions. The value of reliability benefits in a single year is not easily determined, which is why longer-term levelized values are used to infer the benefits of curtailable load.

The economic benefits of curtailable load can vary considerably year to year for a number of reasons. In the case of Option R, the economic benefits derived from this option will vary depending on water conditions. Export market conditions can also impact the value of curtailable load to Manitoba Hydro. In the MISO market, current supply and demand conditions for capacity resources can cause variability in the near term value of capacity resources. Use of a longer-term levelized value maintains stability in CRP pricing, therefore sheltering the CRP customer from these sources of variability.

As described above, curtailable load is less valuable than a SCCT because it has limited dispatchability, is not sustainable in reducing load over longer periods, and is not guaranteed to exist in the long term. Therefore, in order to reflect these factors, curtailable load is assigned a long-term levelized value that is 42% of the annual carrying cost of a SCCT. After consideration of inflation subsequent to the 2011 base year, this yields an estimate of benefits for the year beginning April 1, 2015 of $3.40 per kW/month, which is referred to as the "Reference Discount". This value would apply to the curtailable rate option that provides the most value to Manitoba Hydro, that being Options AE and RE, for which the discount is set to return 100% of the estimated value of curtailable load to the customer. Other options provide less flexibility and are accordingly worth less to Manitoba Hydro. These have been priced to reflect their lesser value to Manitoba Hydro but still to return the full estimated value of that option to the customer.

REPORT TO
THE PUBLIC UTILITIES BOARD

CURTAILABLE RATE PROGRAM

APRIL 1, 2014 – MARCH 31, 2015

January 2016

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REPORT TO PUBLIC UTILITIES BOARD
CURTAILABLE RATE PROGRAM
APRIL 1, 2014 – MARCH 31, 2015

SUMMARY

This Curtailable Rate Program ("CRP") provides Manitoba Hydro with curtailable load which is available to maintain operating and contingency reserves, and which serves to minimize the disruption to firm customers in the event of loss of generation or transmission.

The three customers that participated in the CRP during the April 1, 2014 to March 31, 2015 period designated a total of 228 MW to Manitoba Hydro's reserves, and received credits on their electrical bills for their participation in the program totaling $5,937,358. During this period, ten Option R and one Option A curtailments were initiated.

Manitoba Hydro's 2015/16 & 2016/17 GRA, filed on January 16, 2015, sought confirmation that the PUB accepts as final the proposed modifications to the CRP that were accepted on an interim basis in Order 43/13. On July 24, 2015, the PUB issued Order 73/15 finalizing the proposed changes to the CRP.

DESIGN AND APPLICATION OF THE CRP

Manitoba Hydro uses curtailable load, along with other measures, to maintain operating and contingency reserves and as a means of minimizing disruption to firm customers in the event of loss of generation or transmission.

Curtailable load provides value to Manitoba Hydro all year round as curtailments for system emergencies can occur at any time of the year. However, it has the greatest value during peak times as it is during peak periods that Manitoba Hydro's capacity surplus is the most vulnerable. Options A and C curtailable load in these hours increases the amount of capacity for sale in the export markets, while Option R load can allow Manitoba Hydro to meet its contingency reserve obligations at a lower cost. Please see Attachment 1 for a discussion of the estimated value of curtailable load to Manitoba Hydro.

Curtailable load provides risk mitigation benefits to the power system as it can be used to avoid shedding firm load and/or breach of North American Electric Reliability Council (NERC) standard by Manitoba Hydro or the Midcontinent Independent System Operator-Manitoba Hydro

Contingency Reserve Sharing Group (MISO-MBHydro CRSG)[1]. Option R curtailable load allows Manitoba Hydro to meet reserve obligations thereby freeing up hydro generation for market transactions in the short-term opportunity energy market[2]. In this circumstance the benefits of having Option R available are dependent on Manitoba Hydro's water supply conditions as follows:

- High Water Supply - the generating capacity freed up for commercial use allows for increased hydraulic generation for export as idle generating units can be run to capture additional sales. Without Option R capacity in place energy would be spilled. With Option R load, the additional energy generated can be sold at on-peak prices.

- Average Water Supply - allows for additional hydraulic generation during on-peak hours that would otherwise be produced during off-peak hours (due to limited on-peak generating capability). In this case Manitoba Hydro captures the benefit of the price differential between on and off-peak periods.

- Low Water Supply - does not provide any significant benefits because Manitoba Hydro has sufficient shut down generating units that could be run temporarily for operating reserve purposes without relying on Option R load reductions.

Manitoba Hydro does not initiate load curtailments in order to facilitate an opportunity spot market sale[3].

The Terms and Conditions of the CRP allow Manitoba Hydro to reserve the right to limit the amount of total curtailable load used for maintaining operating and contingency reserves[4]. In

[1] The MISO-MBHydro CRSG is a NERC registered Contingency Reserve Sharing Group that has operated since January 1, 2010. The CRSG was established under the terms of the Amended MISO-Manitoba Hydro Coordination Agreement and executed on October 9, 2009.

[2] Opportunity export sales are sales of capacity and/or energy that are not backed by dependable energy and are incremental exports that arise from time to time as a result of water conditions that are better than the lowest historic levels.

[3] Spot market sales are sales that occur on a day ahead or real time basis. They are not considered to be a capacity sale.

[4] Per North American Electric Reliability Council (NERC) Glossary of Terms, Operating Reserves refers to the reserves needed to protect Manitoba Hydro and its obligations to the Midcontinent Independent System Operator power system against Contingencies or Disturbances. These events are typically a result of loss of supply caused by sudden generating or transmission outages. Contingency Reserves are a component of Operating Reserves which are sufficient in magnitude and response to meet NERC Disturbance Control Standards. Contingency Reserves are comprised of Operating Reserves-Spinning and Operating Reserves-Supplemental. Curtailable load (also referred to as Interruptible Load) can be a source of Operating Reserves-Supplemental.

previous GRA's, Manitoba Hydro had proposed to reduce the amount of Option A and Option R load available to customers while eliminating Options C and CE entirely. The PUB gave its final approval of these changes to the Terms and Conditions of the CRP in Order 73/15.

The caps have been beneficial to both Manitoba Hydro and curtailable customers by ensuring the value of curtailable load does not depreciate, which would result in lower discounts paid to customers making the program less attractive to them.

2014/15 CRP OPERATIONS AND RESULTS

Curtailment Options:

The CRP consists of four base curtailment options and three combinations. Options vary depending on the minimum notice to curtail, the maximum duration per curtailment, the maximum daily hours of curtailment, the maximum number of curtailments per year, and the maximum annual hours of curtailment.

The three customers that participated in the CRP during the April 1, 2014 to March 31, 2015 period designated a total of 228 MW to Manitoba Hydro's reserves, allocated as 80 MW Option AE, 67 MW Option A, 31 MW Option C and 50 MW Option R. The amount each customer designated as curtailable load in relation to their total load varies, impacting their curtailable credit, as shown on the following table:

Summary of Curtailment Credit Data
April 1, 2014 to March 31, 2015

Customer	Option(s)	CRP Load as % of Total Load	Average On-Peak MW	Average On-Peak LF	Average Monthly Cr.
1	A, R, E	82%	205.0	91.7%	$448,041
2	A	93%	22.6	90.3%	$46,739
3*	C	0%	18.4	39.2%	$0

* Customer 3 was operating below their protected firm load and therefore had no load available for curtailment.

Curtailable load can be designated as "Curtail to Protected Firm Load" or "Guaranteed Curtailment" with the exception of Option R. Load designated under Option R must be nominated as a Guaranteed Curtailment. That is, the customer must agree to shed a specified amount of MW in order to be compliant with the curtailment request.

Dependent on the curtailment option selected, Manitoba Hydro will curtail customers to meet reliability obligations only. Options A, C and R curtailments assist in securing operating and contingency reserves whereas Option E curtailments are initiated to meet firm energy requirements in the event that Manitoba Hydro expects to be short of firm energy supplies.

Implementation and Size of Curtailments:

There were ten Option R and one Option A curtailments during the April 1, 2014 to March 31, 2015 period, all of which were initiated in response to a contingency or disturbance event requiring deployment of Manitoba Hydro's supplemental reserves. The following table summarizes the duration and load in MW of each curtailment.

April 2014 to March 2015	Option A		Option R	
	Hrs	MW	Hrs	MW
April 15, 2014			0.75	50
April 15, 2014			0.37	50
April 18, 2014			0.43	50
June 18, 2014			1.27	50
July 15, 2014	0.85	118		
July 21, 2014			0.48	50
August 8, 2014			0.43	50
August 9, 2014			3.83	50
September 7, 2014			0.78	50
December 15, 2014			2.12	50
December 17, 2014			3.02	50
Total	**0.85**	**N/A**	**13.48**	**N/A**
Average	**0.85**	**118**	**1.35**	**50**

All curtailments were initiated during peak hours. The curtailed customers did not use an alternative power source to supply their load during the curtailments.

Manitoba Hydro continues to use telephone to communicate curtailment requirements to customers on the program. This procedure is manageable and provides the additional security that curtailment(s) will be initiated by confirmation from an agent of the customer. Manitoba Hydro experienced no difficulties in communicating the 11 curtailments during this reporting period.

Reference and Reserve Discounts:

The maximum discount available to a participating customer is called the "Reference Discount." The Reference Discount is related to the marginal value of capacity, and is adjusted on April 1 of each year by the inflation factor. The Reference Discount in effect for the reporting period April 1, 2014 to March 31, 2015 was $3.36 per kW/month, as approved by the PUB, on an interim basis, in Order 46/14 dated April 28, 2014. Option AE customers receive 100% of the discount, while Option A and R customers receive 70% of the discount or $2.35 per kW/month. Option C customers receive 40% of the discount or $1.34 per kW/month.

For curtailable load nominated as "Curtail to Protected Firm Load", the Reference Discount is calculated and credited to customers' bill each month as (A - B) x C x D where:

A = On-Peak Period Demand (kW)
B = Protected Firm Load (kW)
C = On-Peak Period Load Factor
D = Discount Amount

For curtailable load designated as a "Guaranteed Curtailment", the Reference Discount is calculated and credited to customers' bill each month as GC x D where,

GC = the customer's guaranteed curtailable load
D = Discount Amount

Customers selecting Curtailment Option R receive, in addition to the Reference Discount, a Reserve Discount for each curtailment initiated and successfully completed. The Reserve Discount represents the value of carrying contingency reserves and is calculated and credited to customers' bill for each successful curtailment as LR x Du x FD where,

LR = amount of load reduction (in kW) requested by Manitoba Hydro's System Control to the customer at the time of an Option R curtailment
Du = duration of the curtailment (in hours)
FD[5] = fixed discount amount, currently set at $0.04 per kWh

[5] The Fixed Discount amount is based on the value of carrying contingency reserves on Manitoba Hydro units.

The table below illustrates the amount of the monthly Reference Discount Credit that each customer received from April 1, 2014 to March 31, 2015, as well as their monthly On-Peak Demand and On-Peak Load Factor.

Monthly Reference Discount Credit									
2014 to 2015	Customer 1 Options AE, R, A			Customer 2 Option A			Customer 3 Option C		
	On Peak MW	LF %	Discount Paid $	On Peak MW	LF %	Discount Paid $	On Peak MW	LF %	Discount Paid $
Apr	194.8	93.8%	$453,398	24.5	97.9%	$52,865	0.6	41.6%	$0
May	195.2	90.2%	$440,614	24.5	99.2%	$53,454	21.6	29.7%	$0
June	200.2	89.7%	$438,752	24.6	92.8%	$50,402	30.0	56.6%	$0
Jul	196.4	96.3%	$462,386	0.1	51.5%	$0	21.7	51.5%	$0
Aug	206.9	93.5%	$452,324	24.8	80.8%	$44,169	21.7	80.8%	$0
Sep	206.4	84.2%	$419,163	24.6	97.9%	$53,171	21.2	80.0%	$0
Oct	206.6	89.0%	$436,102	24.8	93.0%	$50,813	19.7	8.5%	$0
Nov	210.6	97.3%	$465,895	24.6	92.8%	$50,380	20.8	5.7%	$0
Dec	212.5	92.0%	$447,059	24.6	95.5%	$51,841	0.9	71.9%	$0
Jan	212.2	96.7%	$463,711	24.6	98.4%	$53,410	21.1	3.7%	$0
Feb	206.1	81.3%	$408,456	24.8	85.2%	$46,562	21.1	25.4%	$0
Mar	212.0	96.1%	$461,670	24.8	98.5%	$53,802	20.2	15.5%	$0
Total	**2,460.0**	**91.7%**	**$5,349,530**	**271.1**	**90.3%**	**$560,868**	**220.4**	**39.2%**	**$0**

The discounts shown for Customer 1 do not include the $26,960 credited in respect of the Option R Reserve Discount.

Terms and Conditions:

Manitoba Hydro proposed modifications to the Terms and Conditions of the CRP as part of its 2012/13 & 2013/14 GRA. The revisions included:

- a reduction in the amount of Option A and Option R load available to customers;
- elimination of curtailment Options C and CE;
- change in hours defined as Peak and Off-Peak to correspond to a potential time-of-use rate offering;
- removal of the monthly variation to nominate curtailable or firm load; and
- exclusion from the program after a customer's 2nd failure to curtail in a 12 month period.

In Order 43/13, dated April 26, 2013, the PUB accepted the proposed revisions on an interim basis. Subsequent to the receipt of that Order, Manitoba Hydro, in its letter dated May 15, 2013, informed the PUB of the difficulty of implementing, on an interim basis, a change in the defined Peak and Off-Peak hours and the elimination of Option C and CE, and proposed that these changes be deferred until such time that they can be finalized by the PUB. Manitoba Hydro also advised that it would implement the other changes to the CRP accepted by Order 43/13, including the reduction to the global subscription cap on Option A, but only to the extent that Option C load can still be accommodated. The PUB, in letter dated June 25, 2013, confirmed Manitoba Hydro's proposed approach.

Manitoba Hydro's 2015/16 & 2016/17 GRA, filed January 16, 2015, sought confirmation that the PUB accepts as final the proposed modifications to the CRP that were accepted on an interim basis in Order 43/13. On July 24, 2015, the PUB issued Order 73/15 finalizing the proposed changes to the CRP.

The Terms and Conditions have protected Manitoba Hydro's contingency reserves and provided operating reserves that satisfy the requirements of NERC and the MISO-MB Hydro CRSG.

CONCLUSION

The CRP assists Manitoba Hydro in fulfilling its commitment of carrying, deploying, and re-establishing contingency reserves to meet its obligations with the MISO-MBHydro CRSG and to maintain compliance to NERC Standards. The program also assists in minimizing disruption to Manitoba Hydro's firm customers.

ATTACHMENT 1

ESTIMATE OF THE VALUE OF CURTAILABLE LOAD TO MANITOBA HYDRO

The value of curtailable load to Manitoba Hydro is related to an estimate of the marginal cost of firm, long-term capacity. Over the long term, a representative value for capacity can be developed by estimating the annual carrying cost (includes finance and depreciation costs but not operating/fuel costs) of the lowest cost resource required to provide capacity to Manitoba Hydro, which is a simple cycle combustion turbine (SCCT). In 2005 the annual carrying cost of a SCCT was estimated to be $78 per kW per year, or $6.50 per kW per month, evaluated at load. It was proposed that this cost would escalate at the rate of inflation. This cost was subsequently reviewed in 2012 and was found to be appropriate going forward. This approach has the advantage of providing a clear transparent value, which is also stable over time and is consistent with the approach that is utilized to evaluate the benefits of other resource options, such as DSM, that may have a capacity component.

Curtailable load is less valuable than a generation resource such as a SCCT. The SCCT can provide more flexibility in dispatch and also has the capability to deliver for longer time periods during extended emergency situations. Once in place, a SCCT can be relied upon as a permanent, long-term resource, unlike curtailable load which can be terminated with a notice period of one year. Curtailable load normally has more value in the summer months, when it can assist in supporting seasonal capacity exports, and in the peak winter months, when it may add reliability to the Manitoba Hydro system. Curtailable load will provide more winter reliability benefits in years in which there is little capacity surplus on the system. When there is a significant capacity surplus on the Manitoba Hydro system, curtailable load provides less winter value than it would, for example, in the period around the 2023/24 time period, when the requirement to add generation to serve domestic customers may be expected to occur with 2013 planning assumptions and base demand side management program assumptions. The value of reliability benefits in a single year is not easily determined, which is why longer-term levelized values are used to infer the benefits of curtailable load.

The economic benefits of curtailable load can vary considerably year to year for a number of reasons. In the case of Option R CRP, the economic benefits derived from this option will vary depending on water conditions. Export market conditions can also impact the value of curtailable load to Manitoba Hydro. In the MISO market, current supply and demand conditions for capacity resources can cause variability in the near term value of capacity resources. Use of a longer-term levelized value maintains stability in CRP pricing, therefore sheltering the CRP customer from these sources of variability.

As described above curtailable load is less valuable than a SCCT because it has limited dispatchability, is not sustainable in reducing load over longer periods, and is not guaranteed to exist in the long term. Therefore in order to reflect these factors, curtailable load is assigned a long-term levelized value that is 42% of the annual carrying cost of a SCCT. After consideration of inflation subsequent to the 2011 base year, this yields an estimate of benefits for the year beginning April 1, 2014 of $3.36 per kW/month, which is referred to as the "Reference Discount". This value would apply to the curtailable rate option that provides the most value to Manitoba Hydro, that being Options AE and RE, for which the discount is set to return 100% of the estimated value of curtailable load to the customer. Other options provide less flexibility and are accordingly worth less to Manitoba Hydro. These have been priced to reflect their lesser value to Manitoba Hydro but still to return the full estimated value of that option to the customer.