ATTACHMENT 2.1-1: LOW WATER RESERVE FUND (LWRF) TERM SHEET

The DCF Term Sheet as approved in Appendix A to Board Order 2015-01 is hereby updated and revised in compliance with Board Order 2018-10, which directed that the Low Water Reserve Fund replace the then existing Diesel Contingency Fund ("DCF"). The DCF fund amount was last approved for December 31, 2016. All funds in the DCF as at January 1, 2017 are transferred to the LWRF as at that date. Aside from interest and Rider E rebates, no payments into or out of the LWRF occurred in 2017 (Board Order 2018-10 directed that 2017 test year revenue requirement reflect actual grid loads and grid generation).

PURPOSE & FUNCTION:

The Low Water Reserve Fund ("LWRF") operates to smooth customer rate changes from thermal (diesel, LNG and other thermal) generation cost impacts caused by fluctuation of hydro or wind generation due to changes in water conditions or changes in wind conditions.[1] Thermal generation costs not related to changes in water or wind conditions are not included in LWRF determinations, including thermal generation costs due to equipment failure, force majeure, capital projects, or planned maintenance events.

Yukon Energy Corporation (YEC) manages the LWRF as a ratepayer "trust fund". The Fund is only to be used for variations from long-term average (LTA) water and wind availability as determined in accordance with this Term Sheet.[2]

LONG-TERM AVERAGE (LTA):

The annual expected LTA thermal generation requirements for the 2018 GRA test year are determined based on LTA hydro and wind generation conditions[3] [including LTA in ATCO Electric Yukon's (AEY's) Fish Lake hydro generation] at the test year forecast firm load on the Yukon Integrated System (YIS) and Table 2.1-1.[4]

a. Table 2.1-1 is adopted for 2018 load and generation conditions to determine annual expected YEC thermal generation based on long-term average YEC hydro generation at YEC grid loads (net of expected wind and expected Fish Lake generation) ranging from 400 to 450

[1] Appendix A to Board Order 2015-01, section 2.1.1.4, page 11.

[2] Appendix A to Board Order 2015-01, section 2.1.1.4, page 14. The Board directed as follows: "Any application to utilize the fund in some other fashion will require the closing of the fund, the refunding of any balances to customers, and the direction for YEC to use short-term forecasts for its hydro generation in future GRAs."

[3] LTA hydro generation under any set of assumed grid generation load and grid generation capacity and licence conditions is determined in the 2017/2018 GRA based on the then-current YECSIM power benefit model calculations based on 35 years of water record for the interconnected grid and updated reservoir and generation station water flow requirement changes as noted in Appendix 3.4 of the Application. As load grows a portion of the load growth is currently served (on average) by increased hydro output and the remainder by increased average thermal generation (diesel or LNG).

[4] Unless otherwise noted, AEY Fish Lake generation based on long-term average as approved by the Board Order 2014-06 at 8.73 GW.h and the last approved YEC wind generation (wind generation ceased to be available in 2017). The Fish Lake long-term average generation for 2012 and 2013 was at 4.38 GW.h due to unavailability of Unit #1. YEC's 2017/2018 GRA compliance filing assumes Fish Lake hydro long term average generation of 8.39 GW.h for 2018, based on information provided by AEY, and no wind generation capability.

GW.h/year, assuming the mine loads connected as forecast in the GRA approved compliance filing for 2018.

b. Table 2.1-1 provides (below the table) an example of the determination of LTA YEC diesel generation at the actual 2018 grid load of 447.153 GW.h (net of expected wind and expected Fish Lake generation).

YEC will provide the Board, for review and approval, an update to Table 2.1-1 when required in future to address material changes in LTA hydro system capability due to changes in loads, installed capacity, licensing/permits or other factors.

LWRF THERMAL SAVINGS (COSTS):

YEC thermal generation savings (excess) are calculated on an annual basis for the LWRF based on the variance between actual thermal generation[5] and LTA thermal generation at the actual YIS load; in compliance with Board Order 2019-04, this information is then used to determine what actual thermal generation would have been with only the forecast load in order to assign to the LWRF thermal cost changes at the forecast load due to changes in water conditions.

Table 2.1-2 provides an example year-end LWRF determination based on 2018 GRA forecasts and actual results.

Starting with YEC fiscal year 2018, costs for YEC thermal generation savings (excess) are calculated so that YEC's final fiscal year expense for the total expected thermal generation (i.e., YEC expense after all transfers) is 90% LNG and 10% diesel, subject to the constraint (when setting LWRF based on actual load) that the LNG share of any transfer into or out of the LWRF cannot exceed 100%. Fuel costs for this calculation are based on the last approved average cost of LNG and diesel fuel for YEC per kWh based on the most recent YEC GRA.[6] The LWRF example in Table 2.1-2 reflects these requirements based on fuel prices in the 2017/18 GRA, with adjustments to comply with Board Orders 2019-04 and 2019-08[7].

Non-fuel O&M costs related to YEC thermal generation are not included in the LWRF calculations at this time. YEC will review and report on this at its next GRA.

QUANTUM & CAP:

The Board in Order 2015-01 approved a "cap" for the DCF of +/- $8 million as an acceptable balance between frequency of rider applications and ability to handle

[5] Actual thermal generation excludes thermal generation charged to capital projects, RFID, or maintenance. Costs for actual thermal generation are charged separately for diesel and LNG generation based on the last approved average cost of fuel for YEC per kW.h based on the most recent YEC GRA.

[6] YEC's 2017/2018 GRA includes average LNG fuel cost at 14.668 cents per kW.h and average diesel fuel cost at 26.333 cents/kW.h, and assumes that 90% of LTA thermal is supplied by LNG and 10% by diesel (average blended price of 15.058 cents per kW.h).

[7] Actual diesel as a share of the estimated actual thermal generation for the forecast load is assumed to be the greater of 10% (as per the GRA forecast) and the actual diesel generation percentage of actual year-end YEC firm generation.

material (drought) changes in hydro availability. This cap is retained for the LWRF in YEC's 2017/18 GRA compliance filing.

In any year when the balance in the LWRF falls outside of the approved LWRF cap range at fiscal year end, YEC shall apply to the Board for approval of a rate rider to dispense with the balance that is outside of that range within 60 days of the fiscal year end.

The refund (when LWRF balance exceeds the approved maximum cap level) or collection (when LWRF balance is below the approved minimum cap level) is to be made by way of a rate-rider to customers over next 12 month period. YEC may apply and the Board may approve the longer/shorter refund/collections period depending of the amount of refund/collections required. The rider is applicable for all retail and industrial firm sales in Yukon for both YEC and AEY.

INTEREST: The Fund is to attract interest based upon the short/intermediate term bond rates in which YEC may invest the Fund and any negative balances would only attract interest at the lowest short-term borrowing rate available to YEC through a line of credit.

QUARTERLY & ANNUAL REPORTING: An annual report is required to be filed with the Board detailing additions and deletions to the Fund and a forecast of water conditions for the next year. The annual report to the Board is also to include a proposed rate rider to refund/collect any amount that exceeds the approved cap. The Board will direct YEC on the additions and deletions to the Fund, and on any proposed rate rider.

Quarterly reports regarding the LWRF calculations and LWRF balance updates will be provided to the Board based on interim determinations prior to a fiscal year end. The quarterly LWRF calculations will be based on forecast loads for the year at the time of calculation as the LWRF table calculates the expected diesel amount based on annual load, not quarterly.

Any interim determinations prior to a fiscal year end will only be placeholders; only the year end determinations will in fact have ongoing relevance for accounting and rate riders.

Table 2.1-1: 2018 Expected LTA Generation with Minto Load Shape Change

Line Number	YEC Grid Load Net of Wind (GWh)	YEC Hydro Generation (GWh)	YEC Thermal Generation (GWh)	Increase in Load (GWh)	Increase in Thermal Generation (GWh)	Thermal as % of Increased Load
	Column A	Column B	Column C	Column D	Column E	Column F = E/D
1	400.0	391.135	8.865			
2	405.0	394.564	10.436	5.0	1.572	31%
3	410.0	397.834	12.166	5.0	1.730	35%
4	415.0	400.909	14.091	5.0	1.924	38%
5	420.0	403.769	16.231	5.0	2.140	43%
6	425.0	406.404	18.596	5.0	2.365	47%
7	430.0	408.818	21.182	5.0	2.587	52%
8	435.0	411.027	23.973	5.0	2.791	56%
9	440.0	413.062	26.938	5.0	2.965	59%
10	445.0	414.965	30.035	5.0	3.096	62%
11	450.0	416.794	33.206	5.0	3.171	63%

Notes:

1. "YEC Grid Load" is annual YEC generation load on the Integrated Grid, excluding actual less expected Fish Lake hydro generation.
2. The thermal generation and increase for the added load are based on a polynomial equation derived from "YECSIM" - the simulation model developed for the Integrated Grid by KGS Group.

3. The model calculates expected hydro plant generation for each load scenario. It incorporates, on a weekly time step, 35 "water years" on record (1981-2015) and 20 "load years" (each examines a different hypothetical scenario to evaluate generation under different sequences of the recorded water years), of which 13 load years (load years 7-19) are used for the final averaging (this removes results distorted by starting or ending year volumes). "Hydro Generation" is long-term average hydro generation as estimated by YECSIM.

4. The simulation model results used for this table assume the current operation rule in effect at Aishihik Lake (i.e., 10-year rolling average spring elevation no lower than 913.7 m), current Mayo Lake operation rule (no additional storage, impact of sedimentation at the outlet of Mayo Lake) and restricted Mayo GS winter flows.
5. The simulation model results are based on the 2018 forecast load distributions, and requires modifications when new mines or industrial loads are connected [or disconncted from] to the grid.
6. This table assumes max load at 450 GW.h and minimum load at 400 GW.h. If the load exceeds these limits then the table needs to be updated.
7. Numbers are subject to rounding.

2018 Update Example

Expected YEC Diesel Generation for the YEC generation at 447,153 MWh (net of expected wind and Fish Lake hydro)

Step 1. Find the closest load from Column A that is less than 447 GW.h = 445 GW.h (Line 10).

Step 2. Find the thermal generation from Column C = 30.035 GW.h (Line 10).

Step 3. Find the difference between the given load (447.153 GW.h) and load from Step 1 (445 GW.h) = 2.153 GW.h

Step 4. Apply the percentage from Column F (Line 11, 63%) to the difference from Step 3 (2.53 GW.h) = 1.356 GW.h

Step 5. Add numbers from Step 2 (30.035 GW.h) and Step 4 (1.356 GW.h) = 31.391 GW.h

The expected diesel generation at 447.153 GW.h load is 31.391 GW.h.

Table 2.1-2: LWRF Analysis – 2018 Year End

	LWRF Compliance with Board Order 2019-08	Year end LWRF Deferral Account
		2018
	Actual Outcomes	GW.h
1	**GRA Forecast LTA Thermal Generation**	16.355
2	**Actual Thermal Generation***	35.955
3	**Change in Thermal Generation (2-1)**	19.599
4	**Forecast Load**	420.26
5	**Actual Load**	447.15
6	**Load Variance (5-4)**	26.889
7	**LTA Thermal Generation at Actual Load (see Table 2.1-1)**	31.391
8	**Actual Thermal Generation as % of LTA Thermal Thermal Generation at Actual Load (2/7)**	114.54%
9	**Estimated Actual Thermal Generation at Forecast Load (8 x1)**	18.733
10	**Thermal Generation Change due to Water Changes****	
10a	**At Forecast Load (9-1)**	2.378
10b	**At Actual Load (2-7)**	4.563
10c	**Water Change impact borne by YEC (10b-10a)**	2.186
11a	**Actual Diesel Generation**	6.183
11b	**Actual Diesel Generation as percentage of total Actual Thermal Generation (11a/2)**	*17.20%*
12a	**Estimated Actual Thermal Generation at Forecast Load - Diesel (9-12b)**	3.221
12b	**Estimated Actual Thermal Generation at Forecast Load - LNG*****	15.511
13	**YEC Thermal Generation to be included in LWRF (10a)**	2.378
13a	**YEC Diesel Generation to be included in LWRF(12a-1*0.1)**	1.586
13b	**YEC LNG Generation to be included in LWRF (12b-1*0.9)**	0.792
14	**Incremental YEC Thermal Generation Cost to Charge (Refund) LWRF ($000s) (diesel at $0.26333/kWhxrow 13a + LNG at $0.14668/kWh*row 13b)**	**$534**

* Actual Thermal for Generation excludes RFID, capital and maintenance thermal.

** Negative is charge to YEC for water>LTA; positive is credit to YEC for water<LTA.

*** 90% of total thermal (row 9), subject to not exceeding total thermal less estimated diesel forecast load (row 11b*row7*0.9).