

July 29, 2022

Mr. Richard Buchan, Chair
Yukon Utilities Board
Box 31728
Whitehorse, Yukon Y1A 6L3

Dear Mr. Buchan:

Re: 2021 Low Water Reserve Fund ("LWRF") Report and Energy Reconciliation Adjustment ("ERA") Filing

This correspondence provides Yukon Energy Corporation's ("Yukon Energy" or "YEC") Annual Report summarizing Low Water Reserve Fund ("LWRF") and Energy Reconciliation Adjustment ("ERA") activities up to December 31, 2021 based on actual results. The filing of the annual report was delayed due to ongoing review of the 2021 GRA which was concluded with Yukon Utilities Board ("YUB" or "the Board") July 12, 2022 Order 2022-07. This order approved the LWRF Term Sheet which was necessary for completion of the report.

The LWRF Annual Report and ERA Filing has been prepared pursuant to the LWRF Term Sheet as approved by the Yukon Utilities Board ("YUB" or "the Board") Order 2022-07.

The following information is attached with this correspondence:

- **Attachment 1** – LWRF Calculations for 2021 and Balance Updates.
- **Attachment 2** – 2021 ERA Filing.
- **Attachment 3** – Update on 2022 Forecast Water Conditions.

A summary of each of the documents attached to this correspondence follows.

Attachment 1: LWRF Calculations and Balance as of December 31, 2021

Table 1-1 of Attachment 1 provides LWRF calculations for 2021 actuals and Table 1-2 of Attachment 1 provides a LWRF Continuity Schedule. The annual report with LWRF transfer calculations and balances for 2019 and 2020 were filed with the Board on April 8, 2021.¹

The Board in its Order 2022-03 approved the change in the LWRF balance cap from +/- \$8 million to +/- \$16 million. Board Order 2019-02 set Rider E to 0.00 cents/kW.h effective April 1, 2019. The LWRF balance is expected to continue to be within +/- \$16 million, and therefore no Rider E calculation is provided in this filing.

¹ The Board in its Order 2021-07 directed that LWRF 2019 and 2020 annual reports to be considered as part of YEC's 2021 GRA. The 2021 LWRF transfer calculations and balances were also provided as part of YEC's 2021 GRA Compliance Filing, May 12 revision, Tables 1.1-3c) and 1.1-3c) i).

In summary, the tables in Attachment 1 indicate as follows regarding the annual LWRP calculations and balance for 2021:

- Based on actual annual load for 2021, and the LWRP Term Sheet, the LTA thermal for 2021 is 78.306 GW.h with 60.184 GW.h LNG which is about 77% of LTA thermal generation (Table 1-1, L16b).²
- The actual thermal generation requirement for 2021 was 39.607 GW.h, including 18.122 GW.h diesel and 21.485 GW.h LNG (Table 1-1, L17).
- The resulting overall gap between LTA and actual thermal generation for the 2021 load equals -38.700 GW.h (Table 1-1, L18); all LNG.³ The resulting payment required to LWRP from YEC for 2021 is \$7.019 million (Table 1-1, L19).⁴
- LWRP balances [Table 1-2, Attachment 1]:
 - 2021 opening balance of -\$4.272 million [as filed with the Board on April 8, 2021 and reviewed as part of the 2021 GRA].
 - Incremental thermal generation charge at -\$7.019 million [YEC transfers to LWRP, as per Table 1-1, Attachment 1].
 - Add interest charged to the balance at \$0.003 million.
 - Closing balance on December 31, 2021 at \$2.744 million.

Attachment 2: 2021 ERA Filing

Attachment 2, Table 2-1 provides the 2021 actual ERA Filing and notes as follows:

- Approved wholesales for 2021 at 343.537 GWh compared to actual wholesales at 348.983 GWh. The Fish Lake generation adjustment at -1.113 GWh.⁵
- 2021 wholesales over GRA forecast results in added YEC costs of \$1.064 million [Table 2-1, D1] and added YEC revenues from increase in wholesale of \$0.803 million⁶ [Table 2-1, D2] requiring \$0.261 million ERA amount payable to YEC.

Attachment 3: Update on Forecast Water Conditions for 2022

Attachment 3 provides an update on forecast water conditions for 2022 and notes as follows:

² LNG is assumed to displace 90% of the expected long-term average thermal requirements, subject to not exceeding total thermal less estimated diesel at forecast load. Due to higher diesel generation in 2021, the LNG expected to displace about 78% of LTA thermal.

³ On long-term basis LNG is assumed to displace 90% and diesel 10% of the expected long-term average thermal requirements, subject to not exceeding total thermal less estimated diesel at forecast load. The diesel generation for 2021 was higher than 10%, therefore, for 2021 the LNG assumed at 78% and diesel at 22% of LTA thermal. Therefore, the expected diesel generation is equal to the actual diesel generation.

⁴ Based on 2021 GRA average fuel costs at \$0.1814 per kW.h for LNG and \$0.2051 per kW.h for diesel as approved by YUB in Order 2022-03.

⁵ YEC's 2021 GRA assumed Fish Lake generation at 3.628 GWh for 2021 based on information provided by AEY at the time of preparation of the GRA application. This forecast assumed that only one unit would be available in 2021. However, in 2021 actual year both Fish Lake units were in service generating 9.843 GWh. Therefore, Fish Lake expected generation for 2021 assumed at 8.730 GWh which is based on long-average generation as approved by YUB Order 2014-06. The variance, therefore, at -1.113 GWh [8.731-9.843].

⁶ The Rider J revenues are adjusted to reflect 2021 GRA Compliance Filing Rider J at 34.34%.

- **Aishihik Lake:** The elevation of Aishihik Lake, as of April 20, 2022, was 913.63m or 1.53m below Full Supply Level. This water level is 0.46m below the historic median level, largely due to Yukon Energy drawing down Aishihik to make room for historical high snowpack. With snowpack data above 200% of normal, the Aishihik watershed will experience higher than average spring inflows. This will allow Aishihik to recover to the Full Supply Line by Oct 2022. In 2023, it is expected that Aishihik will draw-down to 913.8m in May 2023.
- **Marsh Lake:** The elevation of Marsh Lake, as of April 20, 2022, was 653.84m, or 4cm above the Low Supply Line. With Marsh Lake snowpack at 134% of normal, Yukon Energy, as of March 21, 2022, has opened all Marsh Lake gates (almost two months early). In addition to opening all the gates, Yukon Energy has requested an emergency water license amendment to temporarily lower the licensed Low Supply Level to reduce likelihood of high-water levels in summer of 2022. In an effort to increase flows, Yukon Energy is also planning to draw down Schwatka Lake early May 2022. With these measures Yukon Energy forecasts to draft Marsh Lake down to about 10 cm below the LSL by May 2022. If the higher-than-average flows continue into the summer Yukon Energy forecast Marsh Lake could get up to 656.8m by the end of August 2022.
- **Mayo Lake:** The elevation of Mayo Lake, as of April 20, 2022, was 663.715m which is 0.29m below the mean lake level for April 20, 2022. Mayo Lake river ice formed early winter allowing Mayo Lake to ramp up to full generation. With Mayo Lake snowpack at 158% of normal, Mayo Lake is forecasted to reach Full Supply by mid-Summer 2022.
- The forecast generation for 2022 at approximately 550 GWh with about 43.5 GWh expected to be supplied from thermal generations which is much lower compared to the LTA thermal at about 91 GWh at this load level due to expected high inflows.

The LWRP Term Sheet, as approved by YUB Order 2022-07, requires the annual report to be filed with the Board for approval of the Board. Accordingly, YEC is seeking Board's approval of LWRP transfers as well as LWRP balances as provided in Attachment 1 of this filing.

YEC is also seeking Board's approval of the ERA calculations and \$0.261 million ERA payment from AEY to YEC for 2021.

If you have any questions regarding the above, please contact the undersigned.

Yours truly,



Ed Mollard
Vice President, Finance and
Chief Financial Officer

ATTACHMENT 1: LWRf CALCULATIONS AND BALANCE UPDATES FOR 2021

Table 1-1: LWRf Calculations

Line No		2021	Notes
L1a	Diesel Fuel Cost per kW.h	20.507 cents/kW.h	
L1b	LNG Fuel Cost per kW.h	18.136 cents/kW.h	GRA Average Fuel cost
L1c	GRA YIS firm Load forecast	538,726 MW.h	
L1d	GRA LTA Thermal Generation forecast	85,930 MW.h	
Calculation of Thermal Cost to Charge (Refund) LWRf			
<i>Assumptions</i>			
L2	YEC Grid load	528,256 MW.h	Actual
L3	Fish Lake	9,843 MW.h	Actual
L4=L2+L3	Total Grid load	538,099 MW.h	
<i>Assumed Actual Generation Sources</i>			
L5	YECL Fish Lake	9,843 MW.h	Actual
L6	YEC Hydro	488,120 MW.h	assumed actual (L2-L7-L8)
L7	YEC Thermal	40,134 MW.h	Actual
	Diesel	18,588 MW.h	Actual
	LNG	21,545 MW.h	Actual
L7a	YEC Diesel/LNG charged to capital, RFID and maintenance	527 MW.h	Actual
L7a1	Diesel	466 MW.h	Actual
L7a2	LNG	61 MW.h	Actual
L7b=L7-L7a	YEC Net Diesel/LNG	39,607 MW.h	Actual
L7b1	Diesel	18,122 MW.h	Actual
L7b2	LNG	21,485 MW.h	Actual
L7b3=L7b1/L7b	Diesel % of total net thermal	46%	
L8	IPPs	2 MW.h	Actual
L9	Total Grid load	538,099 MW.h	
<i>LTA Expected Generation Sources</i>			
L10	AEY Fish Lake (expected)	8,730 MW.h	Note 1
L11	IPPs (expected)	2 MW.h	Note 2
L12=L9-L10-L11	YEC Grid load net of expected Fish Lake and Wind	529,367 MW.h	
L13=L12-L1c+L11	Load Variance	-9,357 MW.h	
L14	LTA Thermal Generation at Actual Load	78,306 MW.h	Estimated based on LTA Thermal Calculation Table [please see below]
L15=L7b/L14	Actual Thermal Generation as % of LTA Thermal Generation	51%	
L16=L14	Expected YEC Thermal Generation in Rates	78,306 MW.h	
L16a	Diesel	18,122 MW.h	Total thermal less LNG below.
L16b	LNG	60,184 MW.h	90% of total thermal, subject to not exceeding total thermal less estimated diesel (when L15>100%) or actual diesel (when L15<100%).
L17=L7b	YEC Net Thermal Generation	39,607 MW.h	
L17a=L7b1	Diesel	18,122 MW.h	
L17b=L7b2	LNG	21,485 MW.h	
L18=L17-L15	YEC Thermal Generation to be included in LWRf	- 38,700 MW.h	
L18a=L17a-L16a	YEC Diesel Generation to be included in LWRf	- MW.h	
L18b=L15b-L16b	YEC LNG Generation to be included in LWRf	- 38,700 MW.h	
L19=L1axL18a+L1bxL18b	Incremental YEC Thermal Generation Cost to Charge (Refund) LWRf (\$000s)	(\$7,019)	

Notes:

- YEC's 2021 GRA assumed Fish Lake generation at 3.628 GWh for 2021 based on information provided by AEY at the time of preparation of the GRA application. This forecast assumed that only one unit would be available in 2021. However, in 2021 actual year both Fish Lake units were in service generating 9.843 GWh. Therefore, Fish Lake expected generation for 2021 assumed at 8.730 GWh which is based on long-average generation as approved by YUB Order 2014-06.
- IPP generation as updated for YEC's 2021 GRA Compliance Filing for YUB Order 2022-03.

LTA Thermal Calculations for 2021 for Line 14 in Table 1-1

		MWh
1	YEC Grid load net of expected Fish Lake and IPPs [Table 1-1, L12]	529,367
2	2021 WH2 and WH4 Uprates [2021 GRA, App 2.1, Table 2.1-1 note #7]	4,213
3=1-2	Load net of WH2 and WH4 Uprates	525,154
4=3 Rounded to Nearest Ten	Rounding to Nearest Ten	525,000
5	Expected LTA Thermal at Rounded Load [2021 GRA, App 2.1, Table 2.1-1]	78,181
6=3-4	Load above Rounded Load	154
7	LTA Thermal as % of Incremental Load [2021 GRA, App 2.1, Table 2.1-1]	81%
8=6*7	LTA Thermal above the Rounded Load	125
9=5+8	LTA Thermal Generation at Total Load	78,306

Table 1-2: LWRP Continuity Schedule

Line	Activity	2021 (\$000s)
A	Opening Balance ¹	(\$4,272)
<hr/>		
B	Incremental Diesel Generation Cost to Charge/(Refund) ² to LWRP	(\$7,019)
C=B	Total LWRP operation for YEC	
	YEC pays to LWRP	\$7,019
	YEC withdraws from LWRP	\$0
<hr/>		
D=A+C	LWRP Balance after Annual Operation	\$2,746
E	Interest on LWRP Balance ³	(\$3)
F=D+E	LWRP Balance after Interest charge	\$2,744
G	Rider E (Rebate)/Collections [January - December]	\$0
H=F+G	LWRP Ending Balance	\$2,744
I	LWRP Cap ⁴	+/-16000
J	LWRP Rebate/(Collections) Required	\$0

Notes:

1. Opening Balance is based on Table 2.1-2, Appendix 2.1 of April 8, 2021 Annual Filings for 2019-2020 and reflects 2020 Ending Balance.

2. Based on calculations in Table 1-1.

3. Per the March 11, 1996 letter recording the settlements [provided as Exhibit B-16 in the 2008/2009 GRA] the DCF fund is to attract interest based upon the short/intermediate term bond rates in which the Companies may invest the fund and any negative balances would only attract interest at the lowest short-term borrowing rate available to the Companies through a line of credit.

4. LWRP cap was increased to +/- \$16 million as per YUB Order 2022-03.

ATTACHMENT 2: 2021 ERA FILING

Table 2-1: ERA Determination for 2021

	2021	
A Wholesales Variance for AEY (MW.h)		
Actual wholesales	348,983	A1
GRA approved wholesales assuming Fish Lake LTA generation	343,537	A2 [See note 1]
Fish Lake generation adjustment (expected LTA less actual)	-1,113	A3 [See note 2]
Change in wholesales for ERA	6,559	A4=A1-A2-A3
B YEC Cost Impact per kW.h change in Wholesales		
Losses (%)	8.40%	B1 [Actuals]
Total YEC's actual generation net of secondary (MWh)	529,367	B2 [See note 2]
GRA approved firm load forecast (MWh)	538,726	B3 [See note 1]
YEC incremental generation relative to GRA approved (MW.h)	-9,359	B4=B2-B3
YEC's actual LTA Thermal Generation (MWh)	78,306	B5 [See note 2]
GRA LTA Thermal Generation (MWh)	85,930	B6 [See note 1]
YEC Incremental thermal generation relative to GRA approved (MWh)	-7,624	B7=B5-B6
Incremental thermal generation for incremental total generation (%)	81.45%	B8=B7/B4
Thermal Generation cost per GRA (\$/kW.h)	0.1837	B9 [See note 2]
YEC thermal cost change (\$/kWh wholesales)	0.1622	B10=B9*B8*(1+B1)
C YEC Revenue Impact per kW.h change in Wholesales		
Rate Schedule 42 Energy Charge (\$/kW.h wholesales)	0.08298	C1
Average YEC rider applicable to AEY retails (\$/kWh wholesales)	0.05360	C2 [See note 3]
D Net thermal cost impact on YEC (\$000)		
Wholesale Change: Cost Impact (YEC thermal generation costs)	1,064	D1=A4*B10
Wholesale Change: Revenue Impact (YEC revenues)	803	D2=A4*(C1+C2)+A3*C1
Cost change>revenue change ("Yes"=1, "No"=0)	1	D3=is D1>D2 (absolute)
ERA Charge (rebate) to AEY [Net added cost (cost saving) for YEC]	261	D4=D3*(D1-D2)

Notes:

1. Based on 2021 GRA.
2. Please see LWRP calculations in Table 1-1 for actual thermal generation numbers. Fish Lake generation adjustment of -1,113 MWh reflects the variance between the long-term average generation of 8,730 MWh and actual generation at 9,843 MWh.
3. The average Rider is estimated based on total Rider J revenues from AEY retail customers divided by wholesales net of Fish Lake adjustments. YEC Rider J revenues for 2021 are estimated based on 2021 GRA Compliance Filing Rider J rider.



MEMO

From: Kevin Maxwell
To: Andrew Hall
Date: 20 April, 2022
Pages: 6
Subject: 2022 Water Availability Forecast

2 Miles Canyon Rd
Box 5920
Whitehorse, YT Y1A 3A1
Phone: (867) 393-5313
Fax: (867) 393-5322
www.yukonenergy.ca

Dear Mr. Hall,

1.0 Reservoir Water Levels

The historic and forecast reservoir water levels for the three Yukon Energy reservoirs Aishihik, Marsh and Mayo are shown in Figures 1-3. In addition to the figures a description of the current elevations relative to historical elevations are discussed below. These figures show actual water elevation to April 20, 2022 and the expected forecasted elevation based on average historic inflows¹ for the balance of the year shown with the orange dotted line. Historic water levels for each reservoir are shown in grey:

- The solid grey line shows the median historic water level
- The light grey shaded area shows the Min-Max range of water levels
- The medium grey shaded area shows the 25th-75th percentile water level

The following trends can be observed with the current water levels:

Aishihik Lake: The elevation of Aishihik Lake, as of April 20, 2022, was 913.63m or 1.53m below Full Supply Level. This water level is 0.46m below the historic median level (grey line in figure 1), largely due Yukon Energy drawing down Aishihik to make room for historical high snowpack. With snowpack data above 200% of normal, the Aishihik watershed will experience higher than average spring inflows. This will allow Aishihik to recover to the Full Supply Line by Oct 2022. In 2023, we expect that Aishihik will draw-down to 913.8m elevation in May 2023.

Marsh Lake: The elevation of Marsh Lake, as of April 20, 2022, was 653.84m, or 4cm above the Low Supply Line. With Marsh Lake snowpack at 134% of normal, Yukon Energy, as of March 21, 2022, has opened all Marsh lake gate (almost 2 months early). In addition to opening all the

¹ Marsh Lake and Aishihik Lake also includes a Hydrotel high inflow based on current snow conditions shown as a red dotted line.

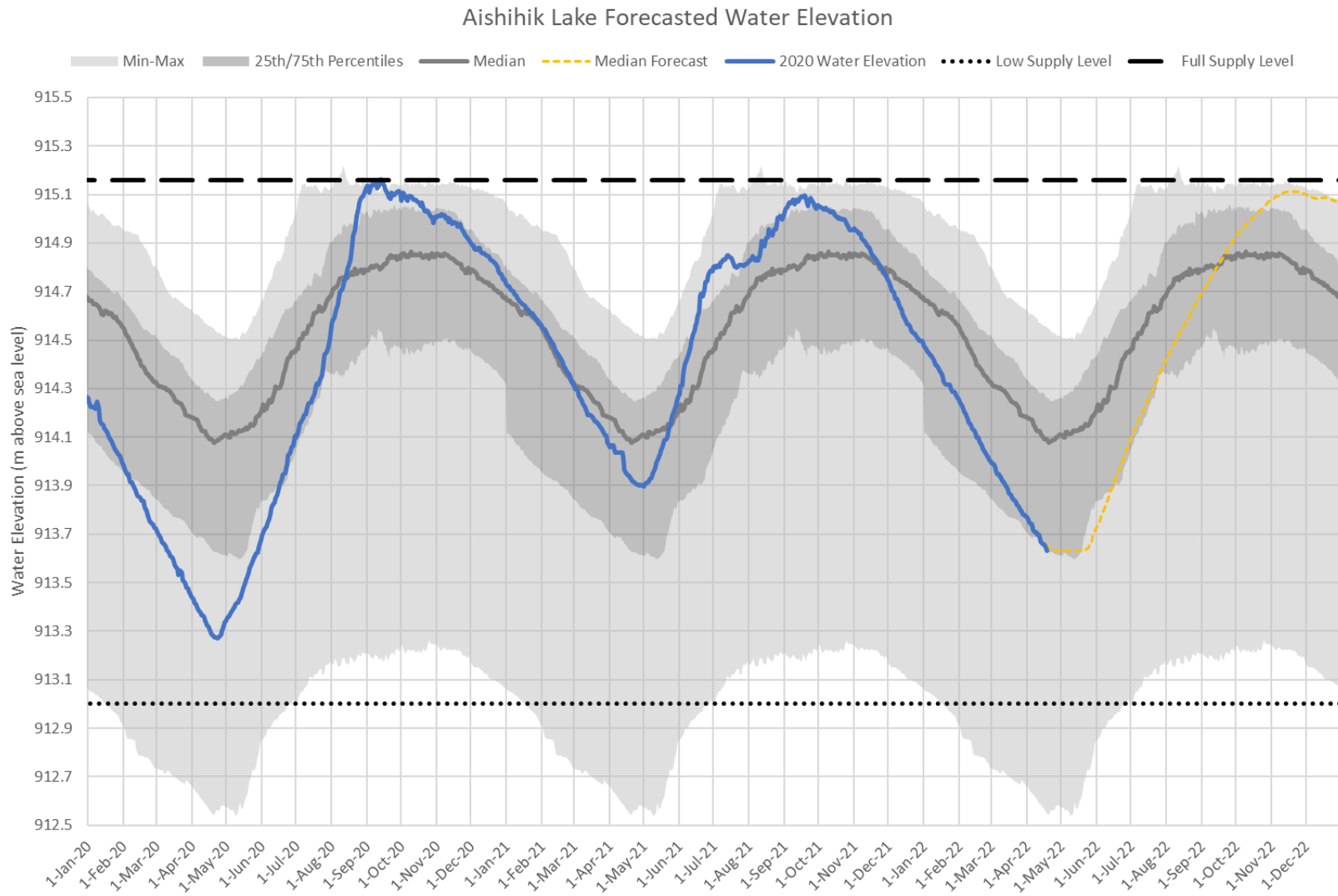
Attachment 3: Update on Forecast Water Conditions for 2022

gates, Yukon Energy has requested an emergency water license amendment to temporarily lower the licensed Low Supply Level to reduce likelihood of high-water levels in summer of 2022. In an effort to increase flows, Yukon Energy is also planning to draw down Schwatka Lake early May 2022. With these measures Yukon Energy forecasts to draft Marsh Lake down to about 10 cm below the LSL by May 2022 as shown in the red dotted line on the graph. If the higher-than-average flows continue into the summer Yukon Energy forecast Marsh Lake could get up to 656.8m by the end of August 2022.

Mayo Lake: The elevation of Mayo Lake, as of April 20, 2022, was 663.715m which is 0.29m below the mean lake level for April 20, 2022. Mayo Lake river Ice formed early Winter allowing Mayo Lake to ramp up to full generation. With Mayo Lake snowpack at 158% of normal, Mayo Lake is forecasted to reach Full Supply Line mid-Summer 2022.

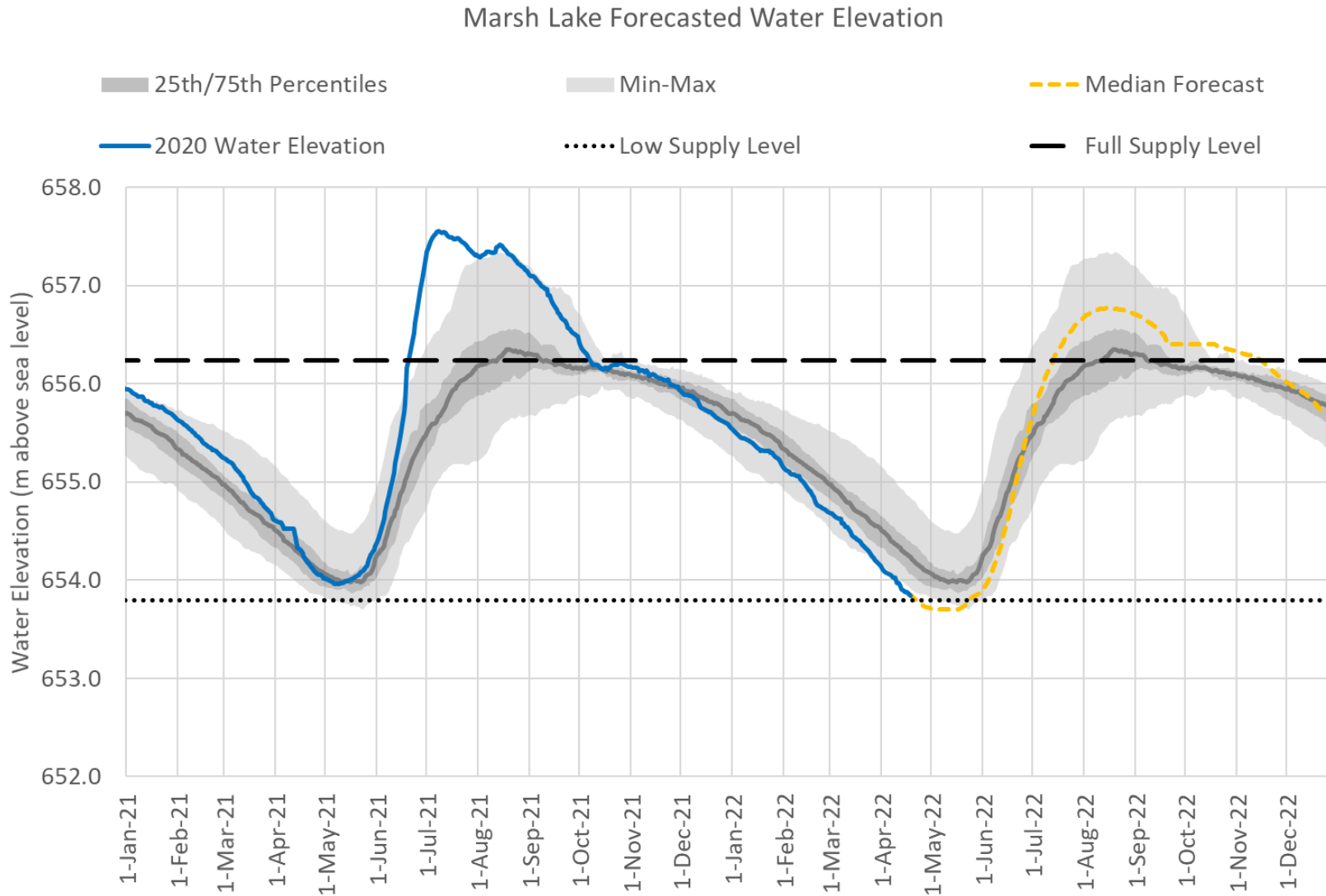
Attachment 3: Update on Forecast Water Conditions for 2022

Figure 1: Aishihik Lake Elevations



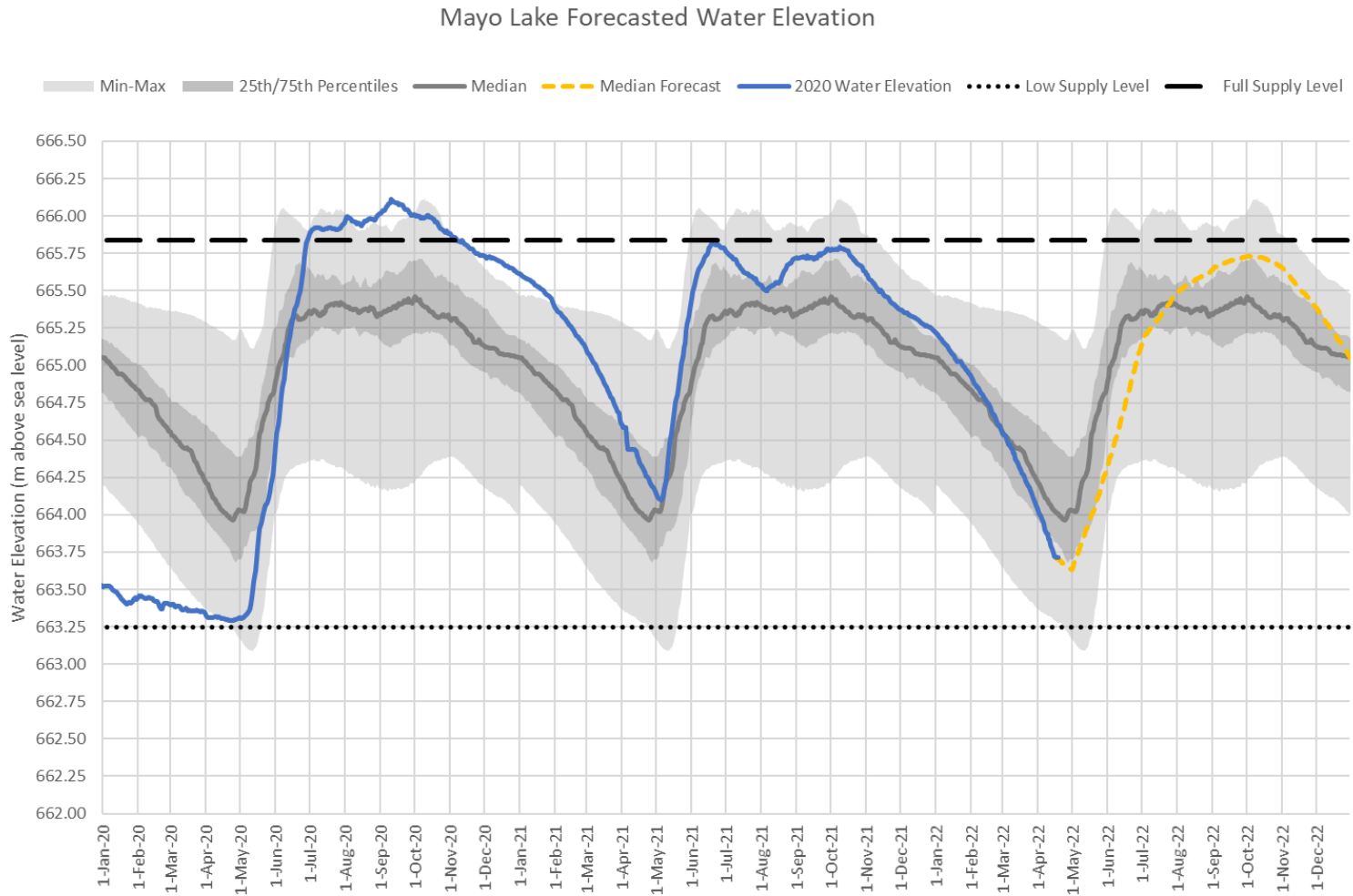
Attachment 3: Update on Forecast Water Conditions for 2022

Figure 2: Marsh Lake Forecasted Elevations



Attachment 3: Update on Forecast Water Conditions for 2022

Figure 3: Mayo Lake Forecasted Elevations Mayo Lake Forecasted Elevations



Attachment 3: Update on Forecast Water Conditions for 2022

2.0 2022 Generation Forecast

The present 2022 total Yukon Energy grid generation forecast is 550 GWh. Of the 550 GWh 259.5 GWh will come from Whitehorse generation, 178.5 GWh will come from Aishihik generation, 66.2 GWh will come from Mayo Generation, 10.6 GWh will come from Diesel generation and 32.8 GWh will come from LNG generation, and 2.4 GWh will come from SOP. Yukon Energy forecast 92.1% of the energy in 2022 will be from renewable sources and 7.9% from Thermal. Yukon Energy always optimizes the system to maximize Hydro generation with the goal to minimize thermal generation.

Regards,



Recoverable Signature

X Kevin Maxwell

Kevin Maxwell

Signed by: Kevin Maxwell

Kevin Maxwell
Resource Planner
Yukon Energy Corporation