Undertaking #7 at Page 333, lines 4-8

To update the levelized cost of capacity for a 12-megawatt diesel plant to provide an apples-to-apples comparison to the battery.

Yukon Energy Response:

As reviewed below, on an apples-to-apples comparison the new diesel plant option has a higher cost today than the rented diesel option as an alternative to the BESS Project.

The Application (footnote 30) estimates the levelized cost of capacity (LCOC) for new greenfield diesel at approximately $186/kW-year (2022$), based on Midgard estimate (2019$) of capex and fixed opex for a 12.5 MW diesel plant at Takhini assuming YEC weighted average cost of capital (WACC) at 9.42%, escalated for inflation at 2% per year to 2022.

The Midgard estimate for the 12.5 MW new diesel included 5 units, each 2.5 MW, with a capital cost (2019$) of $2.6 million per MW and O&M non-fuel fixed O&M cost (2019$) of $64,500 per MW. The assumed diesel plant life was 40 years. The assumed plant location at Takhini meant that this new diesel LCOC did not include any property tax[1].

Updated LCOC for New Diesel

To update the LCOC for a new diesel plant within Whitehorse City limits for an apples-to-apples comparison to the BESS Project, Whitehorse property tax is included[2] and YEC's 2021 GRA WACC at 4.794% is also assumed. The updated new diesel plant LCOC is $212/kW-year (2022$), based on 2019$ LCOC of $199.8/kW-year escalated at 2% per year to 2022. This LCOC is marginally higher than the comparable (2022$) rented diesel LCOC of $211/kW-year including infrastructure capital (footnote 19 in Application), and 5% higher than the rented diesel LCOC at $200.9/kW-year excluding infrastructure capital (equivalent to the rented diesel cost assumed in Table 4-3 in the Application).[3]

Updated Table 4-3 Assuming New Diesel rather than Rented Diesel is Displaced

Column E in Table 4-3 in the Application assesses the annual impact on YEC revenue requirement if BESS avoids the need for 4 rented diesel units, i.e., column E shows the annual rented diesel capital and fixed O&M cost that is avoided by the BESS. Table 1 below adjusts column E in Table 4-3 to enable an apples-to-apples comparison of new

[1] The plant location is outside the Whitehorse city limits and not subject to City of Whitehorse property taxes.
[2] Midgard's estimate in a separate study of new diesel fixed O&M with Whitehorse property tax is at least $91,000/MW (2019$).
[3] Table 4-3 in column E assumes rented diesel cost of $168.9/kW in year 1, escalating at 4% per year for the next 20 years. The LCOC of $200.9/kW in year 1 escalated at 2% per year (assumed overall inflation) yields an equivalent net present value cost of $22.65 million over the BESS 20-year life.

diesel and rented diesel, assuming BESS is selected in preference to a new diesel in Whitehorse.

For this new comparison, the new diesel cost is based on the LCOC of $212/kW-year, with property tax – however, YEC ownership of new diesel results in revenue requirement assessment on the same basis as the BESS (with capital costs being depreciated and return each year on the mid-year rate base balance).

- Table 1 assumes 7.2 MW of new diesel is avoided by use of BESS (this facilitates comparison with 4 rented diesel units – however, given the assumed 2.5 MW new diesel units, the true avoided cost would be higher if 3 new diesel units are avoided (total 7.5 MW)).

- The year 1 new diesel avoided cost of $2.132 million reflects a 2022$ capital cost of $2.759 million per MW, with approximately $0.069 million/MW annual depreciation, annual 4.794% return on declining mid-year rate base (approximately $0.131/MW in year 1), and approximately $0.097/MW year 1 fixed O&M (2022$) escalating at 2% inflation each year.

- Table 1 new diesel costs in year 20 reflect the fact that new diesel is only half way through a 40 year life at that time. The revenue requirement assessment approach used in Table 1 allows the analysis to isolate impacts on ratepayers over these first 20 years.

In summary, if new diesel is assumed to be the alternative for comparison with BESS, the NPV ratepayer savings over 20 years for new diesel capital and fixed O&M costs at $27.47 million (see Table 1) is $4.82 million higher than the equivalent ratepayer savings for rented diesels as the alternative at $22.65 million (see Table 4-3 in Application). As a result, the overall ratepayer benefit from the BESS Project would increase from $12.68 million NPV with rented diesel (Table 4-3 in Application) to $17.50 million NPV with new diesel.

Table 1: Adjusted Table 4-3 - Annual Ratepayer Impact from BESS (20 MW/ 40 MWh) with 7.2 MW New Diesel Avoided

BESS 20 MW/40 MWH at KDFN selected site — New Diesel (7.2 MW) - Revenue Requirement approach - Property Tax

$000	BESS Annual Costs ($000)				BESS Annual Savings ($000)				Net Annual Ratepayer Savings (Costs) ($000)
	Annual Capital Cost	Annual Operating Cost [excl. recharging]	Annual Net Recharging Cost [15% return loss plus 3% idling loss]	Total Annual Costs	Net Avoided Diesel Costs	Annual Savings from Operating Reserve Use	Annual Savings from Peak Shifting	Total Annual Savings	
	A	B	C	D=A+B+C	E	F	G	H=E+F+G	I=H-D
Year 1	$1,530	$652	$82	$2,264	$2,132	$1,125	$11	$3,268	$1,004
Year 2	$1,492	$665	$84	$2,240	$2,123	$1,147	$11	$3,281	$1,040
Year 3	$1,454	$678	$85	$2,217	$2,113	$1,170	$11	$3,294	$1,077
Year 4	$1,416	$691	$87	$2,194	$2,104	$1,193	$11	$3,308	$1,115
Year 5	$1,378	$704	$89	$2,171	$2,094	$1,217	$12	$3,323	$1,153
Year 6	$1,340	$717	$91	$2,148	$2,086	$1,242	$12	$3,339	$1,191
Year 7	$1,302	$731	$92	$2,126	$2,077	$1,267	$12	$3,356	$1,230
Year 8	$1,264	$745	$94	$2,104	$2,069	$1,292	$12	$3,373	$1,269
Year 9	$1,226	$759	$96	$2,082	$2,061	$1,318	$12	$3,391	$1,309
Year 10	$1,189	$774	$98	$2,061	$2,054	$1,344	$13	$3,411	$1,350
Year 11	$1,151	$789	$100	$2,040	$2,047	$1,371	$13	$3,431	$1,391
Year 12	$1,113	$804	$102	$2,019	$2,040	$1,398	$13	$3,451	$1,432
Year 13	$1,075	$820	$104	$1,999	$2,033	$1,426	$13	$3,473	$1,475
Year 14	$1,037	$835	$106	$1,978	$2,027	$1,455	$14	$3,496	$1,517
Year 15	$999	$851	$108	$1,959	$2,021	$1,484	$14	$3,519	$1,560
Year 16	$961	$868	$111	$1,939	$2,016	$1,514	$14	$3,544	$1,604
Year 17	$923	$885	$113	$1,920	$2,011	$1,544	$15	$3,569	$1,649
Year 18	$885	$902	$115	$1,902	$2,006	$1,575	$15	$3,596	$1,694
Year 19	$847	$919	$117	$1,884	$2,002	$1,606	$15	$3,623	$1,739
Year 20	$810	$937	$120	$1,866	$1,998	$1,638	$15	$3,652	$1,786
NPV	**$16,318**	**$10,147**	**$1,286**	**$27,751**	**$27,468**	**$17,612**	**$167**	**$45,247**	**$17,496**

Notes:

1 2021 assumed as Year 1. Capital costs (Table 3-4) and operating costs (Table 3-5) each escalated 2% for one year inflation.
2 YEC WACC at 4.794% per 2021 GRA (real WACC with 2% inflation at 2.739%) is used for all net present values (NPVs).
3 Annual Capital Cost includes depreciation (20 year life) and return on mid-year rate base at YEC WACC of 4.794%.
4 Annual Net Recharging Cost assumes diesel generation for N-1 dependable capacity and operating reserve recharge losses, 75% LNG and 25% hydro for other recharge losses (peak shifting saving already addresses these losses), and hydro for idling losses.
5 Avoided New Diesel Costs assumes LCOC of $212,010 per MW (2022$) and 7.2 MW of dependable capacity.