CITY OF
YELLOWKNIFE

YELLOWKNIFE
Aquatic Centre

Concept Design Report
November 2020

Appendix E:
Energy Modeling Report

EnerSys

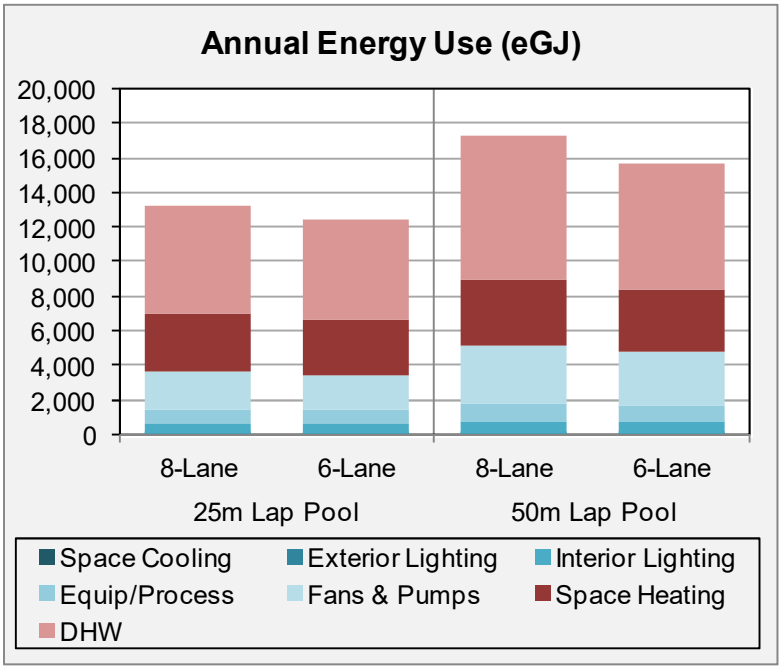
30 October 2020

Melani Korver
Taylor Architecture Group (TAG)
3502 Raccine Road
Yellowknife, NT X1A 3J2
melani@tagyk.com

RE: Yellowknife Aquatic Centre (YAC) Concept Design Energy Performance Estimation – Update

Melani,

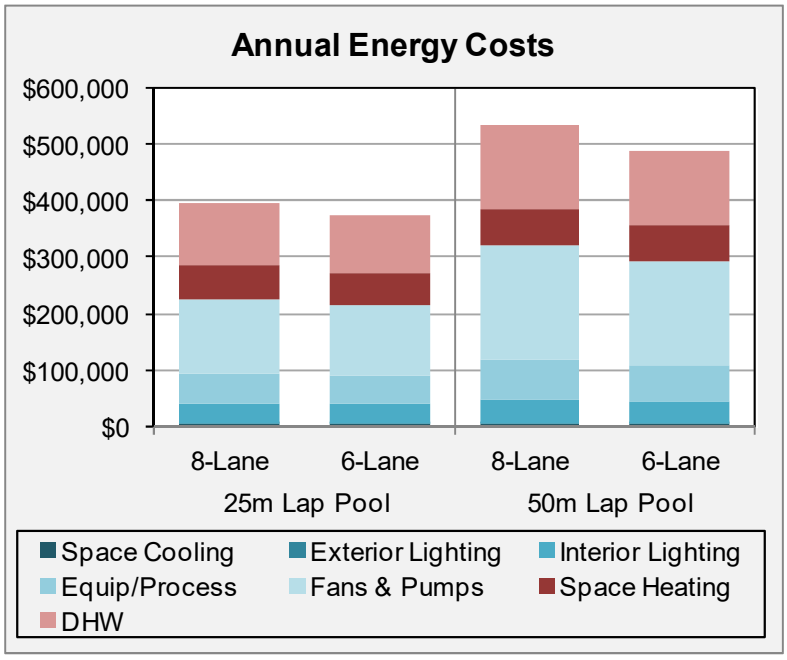
We have completed updating the energy modelling of the Yellowknife Aquatic Centre preliminary designs – for the 25m and 50m lap pool concepts, with 8-lane and 6-lane lap pool option each. This was in support of providing an early estimate as to the energy use and cost for the four options.



The adjacent figure provides the comparative annual energy use for the two options. The blue shaded end-uses are served by electricity and the red represent the biomass requirements from a nearby district heating system. At about 17,300 and 15,700 GJ per year for the respective 8-lane and 6-lane lap pool options, the 50m pool design was estimated to use about 31% and 26% more energy than the corresponding 25m pool options, at 13,200 and 12,500 GJ per year for the respective 8-lane and 6-lane lap pool options.

As expected, the 6-lane lap pool options used less energy than for the 8-lane options – for all the major end-uses. For the 25m lap pool design, the 6-lane

option used 6% less energy than for the 8-lane option, while the 50m design used 10% less energy for its 6-lane option.



The 50m pool's utility costs were similarly higher than for the 25m pool – although not by a proportional amount due to the differences between the relative cost of electricity and biomass used for heating. The adjacent figure shows the relative cost, distinguished by end-use and energy source. At current utility rates, the 50m pool's annual energy costs were estimated at $534,100 and $486,500 for the respective 8-lane and 6-lane options, versus $394,500 and $373,400 for the same options for the 25m pool design. This equated to about $139,600 (35%) and $113,100 (30%) higher costs for the respective 50m design options.

Given the smaller natatorium and lap pool water volume, the 6-lane lap pool options resulted in lower energy bills than for the 8-lane options. For the 25m lap pool design, the 6-lane option provided for $21,100 (6%) lower energy costs than for the 8-lane option. The 50m design's 6-lane option provided for an estimated $47,600 (10%) lower energy costs than for its 8-lane option.

While the energy use and costs for the 50m pool design ranged between 26% to 35% higher than for the 25m pool design, the 50m 8-lane and 6-lane pool options were only 16% and 13% larger than for the 25m options. This may infer that the larger pool design provides for disproportionately higher relative energy use, but the size of the natatoriums really drives energy use. The 8-lane lap pool natatorium floor area for the 50m design was 44% larger than for the corresponding 25m pool natatorium, while the 6-lane natatorium was 39% larger for the 50m design. Associated water heating and process loads (pumps, filtration, etc.) are not quite proportional to the natatorium size since they both have the same water features, which especially influences energy use, but there still is a significant relationship between pool size and energy use. Hence, this largely explains why the 50m pool provides for the seemingly disproportionate increase in energy use in comparison to relative total floor areas.

Energy use and costs were based on the Preliminary Design Brief and further information provided by TAG, combined with assumptions we adapted from other similar aquatic facilities. The attached listing of preliminary model characteristics summarizes the key aspects and assumptions applied for the concept modelling. Actual facility energy use and costs can vary widely depending on a number of factors, such as building occupancy and operation schedules, design and program particulars (e.g., use of water features has a high influence), weather variations, utility rates, and maintenance issues. Hence, we cannot guarantee the degree to which future estimates or actual performance will align with the estimate provided at this conceptual stage.

Don't hesitate to let me know if you have any questions and/or require anything further.

Regards,

Curt Hepting, P.Eng.
EnerSys Analytics Inc.

ATCH: YAC Concept Model Characteristics_rev1.pdf

File: YKA Concept Energy Performance-30Oct2020.docx