
Presentation to JFC Board February 7, 2020

Originally slated for a board meeting, January 2, 2020.

There are three components to my presentation: background, observations and then recommendations.

Various iterations of this document are floating around the community, for feedback, but this one is the official updated version and I will leave a copy with Robin.

First off, I was requested to provide a summary of my qualifications (with relevance to this presentation):

25 years as an administrator at Douglas College, latterly in the Computing and Information Technology Department, focused on project management as well as daily infrastructure operations.

Relevant responsibilities:

- roughly 4,000 desktop desk-top computers, laptops and tablets,
- the operation of the Help Desk, including all communication to College staff and students regarding our operations, improvements, outages, etc.
- documentation of our systems and services.
- documenting our department's annual carbon footprint reductions.
- approximately 1,400 telephones, hundreds cell phones, 8 classroom-sized video-conferencing systems.
- 33 staff, via 4 direct reports and associated operating and capital budgets.

By way of disclosure, I have volunteered to do power use site surveys of both the Recycling Centre and the North-End Firehall. The latter is on-going.

With respect to the Health Centre I was requested to provide my assistance at various times to assist with power, internet and media technology issues. As a result, I have a sense of some of the issues the Board has been dealing with. Very few of my observations will be new – but hopefully my recommendations at the conclusion of this presentation will have some value.

The power and heating issues are inextricably linked. I have been informed that the original load analysis called for the batteries to provide approximately 25 kWh per day. As a reference, our house requires 8 - 10 kWh/day, so it looks like the load calculations need to be redone.

The power system in the winter is primarily required to run the boiler. Apparently, the boiler water temperature generally should not go below a certain temperature (18–60 degrees Celsius, depending on the boiler design), or the boiler piping may corrode. JFC itself can be as low as 10 C when unoccupied, without any danger of mold growth.

There are other loads not accounted for; such as the battery charger at the recycling center. The JFC battery system is being used to charge the Fire hall and Recycling Centre battery system. Two battery systems in series definitely require some integration planning. Another example would be when the fire department tries to use the dryer in the winter, this brings the battery system to its knees in short order.

It appears the original load calculations did not allow for the inevitable scope creep that has occurred: boiler electrical requirements, the elder cottage, Recycling Centre and the Firehall. As well, I am not aware of calculations or planning for the additional loads implied by construction of the new elder cottages.

The Firehall is not connected directly to the JFC but runs via the recycling Centre panel and sometimes directly from the battery/inverter system operated by the recycling Centre. The Recycling Centre battery system is completely inadequate to maintain these two organizations. The EU3000 generator is not capable of remote start. As of December 2019, the Fire chief did not have key access to even start this generator. As a result, the Firehall is at risk if the JFC system fails, or if the Recycling Centre is disconnected from JFC for any reason.

Off-grid, a winter power regime should be different from a summer one. On my last visit to the Centre, (Monday January 13) the video projector was on standby, various computers and networking components were operational or asleep, but not turned off. Exit lights were on even though the building was not occupied.

My recommendations to the infrastructure committee are:

- Install a sub-panel in the Centre for critical winter loads. Everything else goes off.
- Hire a professional heating expert to ascertain the true heating requirements of the entire system, including future buildings. They can evaluate the potential cost-benefit of a high – efficiency propane boiler to heat the JFC, as well as the recycling Centre and the Fire Hall. Hiring an outside expert will take the emotional aspect out of the discussion.
- Install a cloud-based remote control and monitoring system such as the Nest system so that, for example, the Nurse, for example, can heat and power up the Centre when she is on the ferry, via her cell phone or computer. This kind of system can potentially also remotely monitor/unlock exterior doors, monitor temperature, humidity, fire and CO2. It will also alert to power outages separately from the SMA remote monitoring system.
- Install a CO2 sensor in the LIAS office to protect Larry from fumes which appear to be seeping in at certain stages of the boiler operation.
- Run a real-world test of the boiler, with full wood load, to ascertain what happens when the power fails. In theory, a damper should automatically close and the water tank should be able to absorb the extra heat. Depending on the results, install additional fail-safe systems to avoid damage to the boiler plumbing and the electrical equipment in the service building.
- Hire a mechanical engineer to examine the resistance of the hot water tank to a failure mode that could flood the equipment room and potentially damage the batteries and electrical system. If the report identifies issues, hire qualified personnel to develop a remediation plan to minimize the potential risks. In any event, some systems should be put in place to protect the electrical systems in the service building from a leak in the boiler, the pipes or the tank. Generally, it is good practice to separate electrical and electronic systems from water systems.

- Improve the venting of the battery system. The box needs thermostatically controlled outside air. The nominal operating temperature for lead acid batteries is 25 degrees Celsius. The hotter the ambient temperature, the shorter their service lives.
- The automatic generator start and charging regime of the SMA system is known to be biased towards being grid-tied. Off-the-shelf SMA systems will only charge batteries to 80% state of charge and will shut down at 40% capacity without special programming. It would be good to know if the special programming was successfully applied to the JFC system, and that it also has firmware version R1.3 or later. Many SMA owners get around this “feature” by using external generator start and State of Charge control and monitoring systems, which is also my recommendation.

Lastly, there has been some discussion concerning installing a hydro turbine on nearby Hadley Creek. Doug Hopwood has apparently done quite a bit of research on this concept so he would best be able to address it. I am doubtful that, by itself, a hydro turbine on Hadley Creek will address the current power shortage at JFC.

The first and foremost approach is to reduce overall consumption and increase system efficiency.

Thank you

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