JETSON Consulting Engineers Limited

DSM Report

By: Elroy Switlishoff

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Subject: FortisBC Industrial Demand Side Management Incentives

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INTRODUCTION

This report documents the incentives available from FortisBC for an industrial Demand Side Management (DSM) opportunity at Zellstoff Celgar's pulp mill in Castlegar, BC compared against similar incentives if the project was located in BC Hydro's service territory.

SYSTEM

Trims and broken sheets from the #1 pulp machine are collected in the #1 PM couch pit, repulped with added water and pumped to a storage pit by a pump driven by a 150 HP motor. The motor/pump combination runs continuously and at full speed. The level of material in the couch pit is controlled by a variable position valve ("throttling valve") on the outlet of the pump. The normal control mode is to keep the level of material in the couch pit within a given range by modulating the position of the throttling valve.

The normal operating conditions for this pump require very little pumping capacity when only the trim is going into the couch pit. The volumetric flow requirement under normal conditions is less than 20 liters/second. When a break occurs and full sheet is going into the pit the pump must deliver its rated output of 210 liters/second. If the system operates for long periods of time in the normal range, energy savings can be realized by replacing the constant speed motor/pump/valve system with a variable speed motor/pump system.

OPERATION and OPPORTUNITY

The operation during 2015 was examined for the energy savings opportunity (data in spreadsheet "PM#1 Couch Pump 2015 Operation.xlsx"). Normal operation is represented by an output to the throttling valve of between 45% and 55%. The system operated in this range for 6082 hours in 2015. Furthermore, the system was operating below this range for an additional 806 hours. The system was operating above the normal range for only 655 hours and at 90% output or higher for only 229 hours. This demonstrates that significant energy savings were available for almost 6900 hours by operating a variable speed system in 2015, which was considered a typical operating year.

The energy consumption over a normal period (approximately 50% output to the throttling valve continuously over 3 days) was measured as an average of 67.2 kWh/hour. The peak energy consumption at full output was measured as 113.1 kWh/hour. The ratio between normal and maximum energy of 0.59 suggests the system is normally running at around 10% capacity as indicated by typical standard pump curves. This compares well with the ratio of normal to maximum volumetric flows of 0.95.

The energy consumption for normal operation for a system driven by a variable speed drive, motor and pump is estimated at approximately 30% of the maximum amount, or 34 kWh/hour. The estimated energy savings under normal (or below normal) operating conditions then are 33.2 kWh/hour for 6900 hours per year for a total of 229 MW.h per year. There will be additional energy savings for operation above normal operating conditions. At FortisBC's Rate Schedule 31 energy rate of $55.16 per MW.h, anticipated cost savings would amount to $12,632 per year, and the project would have an expected life of at least 15 years.

The capital cost of the variable speed drive, motor and pump conversion has been estimated at $150,000 (AACE[1] Class 4).

BC HYDRO INCENTIVE

An example of BC Hydro's industrial incentive program at transmission supply levels is provided at the following link: https://www.bchydro.com/powersmart/business/programs/project-incentives/transmission.html#sample

Utilizing the same methodology as the BC Hydro example, Zellstoff-Celgar's project yields the following analysis:

Pre-incentive calculation

Without any project incentives, this project would pay for itself in approximately 15.2 years.

Project costs	$150,000
Projected annual savings	$9,847*
Payback period	15.2 years

Incentive calculation

(determined by the lowest of the two calculations below)

1. 75% of the project cost ($150,000 × 75% = $112,500)
2. **The total lifespan electricity savings multiplied by the eligible incentive rate**. 229 MWh/yr × 15 years × $25.68/MWh** = $88,211**

Therefore, this project is capped at the total lifespan electricity savings – in this case, $88,211.

After incentive
With a project incentive of $88,211, the project costs are reduced and the payback period dropped to approximately six years, while there will be continued savings on energy costs for 15 years.

Project costs after incentives	**$61,789**
Payback period	**6.3 years**
Lifespan electricity savings	**$147,705***
Power Smart Project Incentive	**$ 88,211**
Total project savings	**$235,916**

* Based on 229 MWh per year at BC Hydro's typical rate savings of $43/MWh that was used for a project with 10 years persistence in the example. Rate is for example only and does not factor in taxes or net present value (NPV).

** The base incentive rate is $45/MWh, and factoring in the same net present value (NPV) ratio that BC Hydro used for a project with a10 year persistence, gives a rate of $25.68/MWh.

[1] Association for the Advancement of Cost Engineering International

FORTISBC INCENTIVE

Zellstoff Celgar appears to meet the eligibility requirements for FortisBC's industrial DSM program as described on the following webpage:
https://www.fortisbc.com/Rebates/RebatesOffers/IndustrialOptimizationProgramPS/Pages/default.aspx

Zellstoff Celgar is a FortisBC electricity customer on Rate Schedule 31, consumes over three GW.h of electricity annually, owns its facility, and has a project that will provide energy savings of more than 50,000 kWh per year. However, as described in Section 6.3 of FortisBC's Industrial Optimization Program Participant Guide[2], electricity customers are not eligible for the Technology Implementation offer that is available to gas customers:

> "Please note: FortisBC electricity customers are not eligible to participate in the Technology Implementation offer of the Industrial Optimization Program. However, you may be eligible for incentives for electricity ECMs through the Custom Business Efficiency Program. For details, contact your FortisBC Technical Advisor or visit fortisbc.com/CBEP."

Instead, FortisBC's electricity customers appear to be eligible for a rebate capped at the lesser of[3]:

- fifteen cents per kilowatt-hour annual electrical savings;
- 50% of the installed energy savings measure cost for existing construction;
- the amount sufficient for Applicant to achieve a two-year simple payback.

In this case, the estimated energy savings of 229 MW.h/year would yield a potential rebate of $34,350 (valued at 15 cents per kilowatt-hour of annual electrical savings), or less than 40% of what would be available under a program similar to BC Hydro's.

Furthermore, it appears that FortisBC would reduce this rebate further because FortisBC did not supply all of Zellstoff Celgar's electricity requirements, and the full amount of the 229 MW.h annual energy savings would not come solely from the energy supplied by FortisBC to Zellstoff Celgar.[4] In this case, Zellstoff Celgar's mill load in 2015 was 362.6 GW.h, of which 16.7 GW.h was supplied by FortisBC. It is unclear how FortisBC would determine how much of a reduction it could expect in its electricity supply to Zellstoff Celgar as a result of this energy savings project. It would be administratively burdensome to determine the amount of energy savings to attribute to this project during those periods when Zellstoff Celgar is purchasing electricity from FortisBC, and FortisBC has not provided any methodology for that determination. If, for instance, FortisBC used a simple pro rata reduction based on the ratio of FortisBC supplied energy to total mill load, the incentive would be reduced to $1,582, or approximately 1.8% of what would be available under a program similar to BC Hydro's.

[2] https://www.fortisbc.com/Rebates/RebatesOffers/Documents/16-177.3_Industrial_Opt_ParticipantGuide_Web.pdf
[3] https://www.fortisbc.com/Rebates/RebatesOffers/CustomBusinessEfficiencyProgram/Pages/CustomBusinessEfficiencyProgramTAndC.aspx
[4] Exhibit B-16, ICG IR 2.9.1