

## Successes to Date, LED Lighting Savings and Co-Benefits

### Background

During building energy audits, lighting systems in a few buildings were found to have lamps at the end of rated life, with some already burnt out. This presented an opportunity to avoid investing more in energy inefficient lighting by retrofitting these systems as soon as possible. Lighting retrofits were, therefore, fast tracked for Shaw Centre, Harry Bailey Aquatic Centre, and Saskatoon Field House, as “Go-Early” Lighting Projects. Lakewood Civic Centre will also have some fixtures retrofitted during the scheduled November 26 to December 16, 2018 shut down. The following summarizes results from the three completed facilities:

- Avoided capital cost for maintenance resulting from fast tracking the lighting retrofit work is conservatively estimated at \$45,000 every 2 to 3 years. Maintenance costs are generally not being included in the payback period calculations for the EPC project’s retrofit measures; instead these operational savings enable spending on other pressing maintenance needs.
- Annual savings from avoided utility costs is estimated at \$134,000.
- Approximate lighting energy use reduction from the LED installations is 57%.
- Combined annual GHG savings of 760 tonnes of CO<sub>2</sub>e, equivalent to removing 165 cars from the road.
- Approximate cost of these retrofits is \$1,550,000 and the loan repayment term based only on utility cost savings is approximately 12 years. It is expected these new LED fixtures will operate for more than 20 years with little to no maintenance.
- Implementing projects through the EPC funding mechanism reduces pressure on facility maintenance/improvement funding sources such as operational maintenance budgets and the civic building comprehensive maintenance (CBCM) reserve.

### Shaw Centre Lighting Retrofit

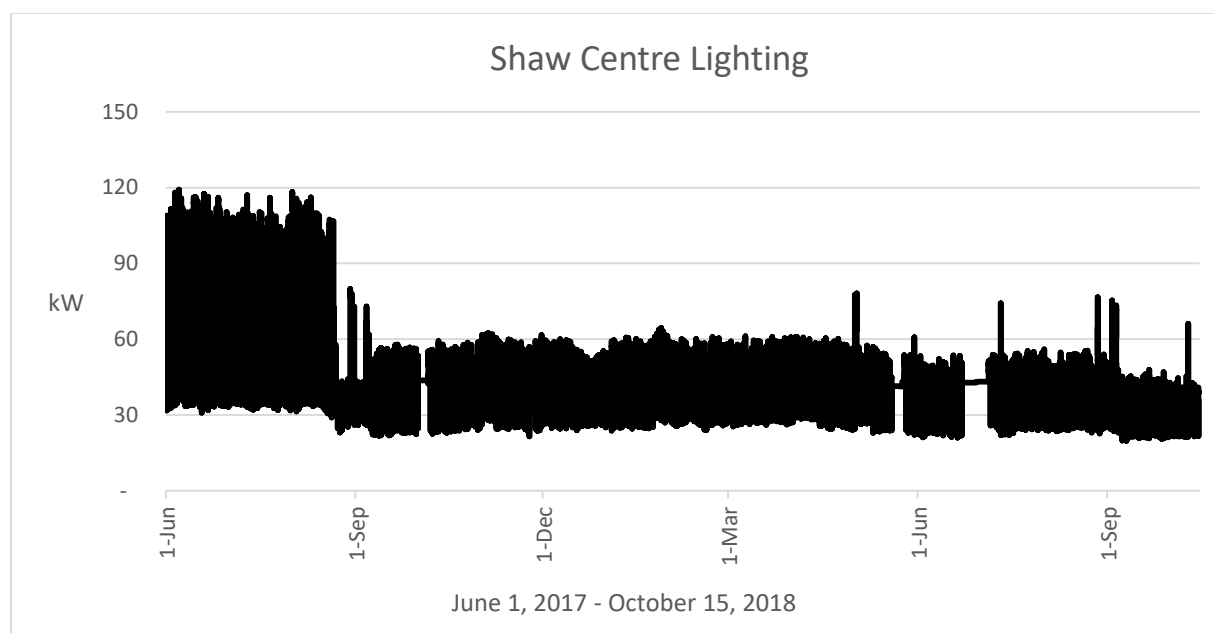
The Go-Early contract for Shaw Centre was divided into two phases to accommodate scheduling. All metal halide high intensity fixtures, florescent tube, pot light and incandescent fixtures were replaced with LED. Highlights of the project include:

- The facility lighting was enhanced to reliably meet competitive standards. The original metal halide type fixtures quickly degrade with age and require a high frequency of maintenance (much more frequent than normal practice, near their end of life, light output can be less than 50%) to maintain the required competition light levels. The new LED fixtures will maintain over 90% light output for at least 10 to 15 years. The LED fixtures have an overall life expectancy of 150,000 hours or more.
- Some fixtures were originally installed in very inaccessible locations resulting in a multitude of different types of motorized lifts in order to perform maintenance, including re-lamping. This resulted in darker areas in the facility as bulbs

burned out before they could be dealt with during a major shut down. The EPC project re-located these fixtures to more easily accessed locations.

- Dimming control was installed to control the pool area lighting and further extend the life and light output of the fixtures. The controls provide flexibility in operation and achieve greater energy savings, as peak competitive brightness is rarely required. As the LED lamps age, the dimming control can be reset to maintain required light levels, extending the usefulness of the LED system to its full rated life, estimated to be more than 20 years.

The following figure shows pre and post-retrofit energy use for lighting systems at Shaw Centre. This data is obtained through a sub-meter monitoring system (“CheckIt”) installed by the City of Saskatoon for improved energy management. Electrical load drops significantly in September 2017, after the pool lighting retrofits were completed. The data shows that the average hourly electrical load was 86 kW before the retrofit, and 45 kW after the Phase 1 retrofit. The average hourly electrical load then dropped to 36 kW when the lighting retrofit was completed for the remainder of the facility in September 2018. On average, the lighting energy use was reduced by 58%. Savings are attributable to not only more efficient light fixtures but also new lighting controls and operating procedures. This data is one example of the measurement, verification, and ongoing monitoring of savings that is built into the delivery of the project.



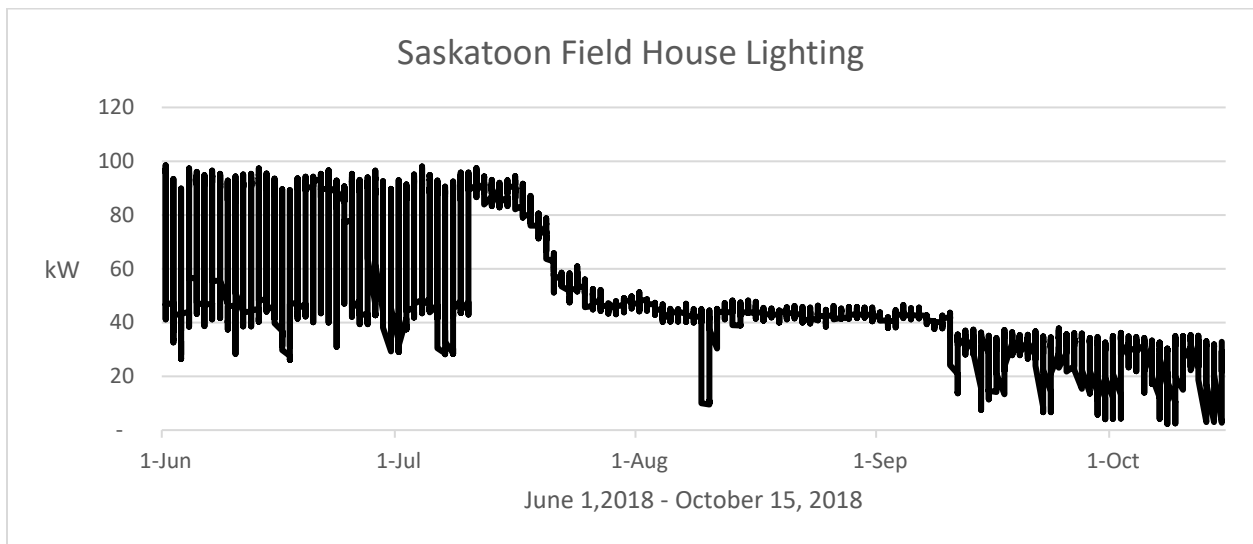
### Harry Bailey Aquatic Centre and Saskatoon Field House Lighting Retrofit

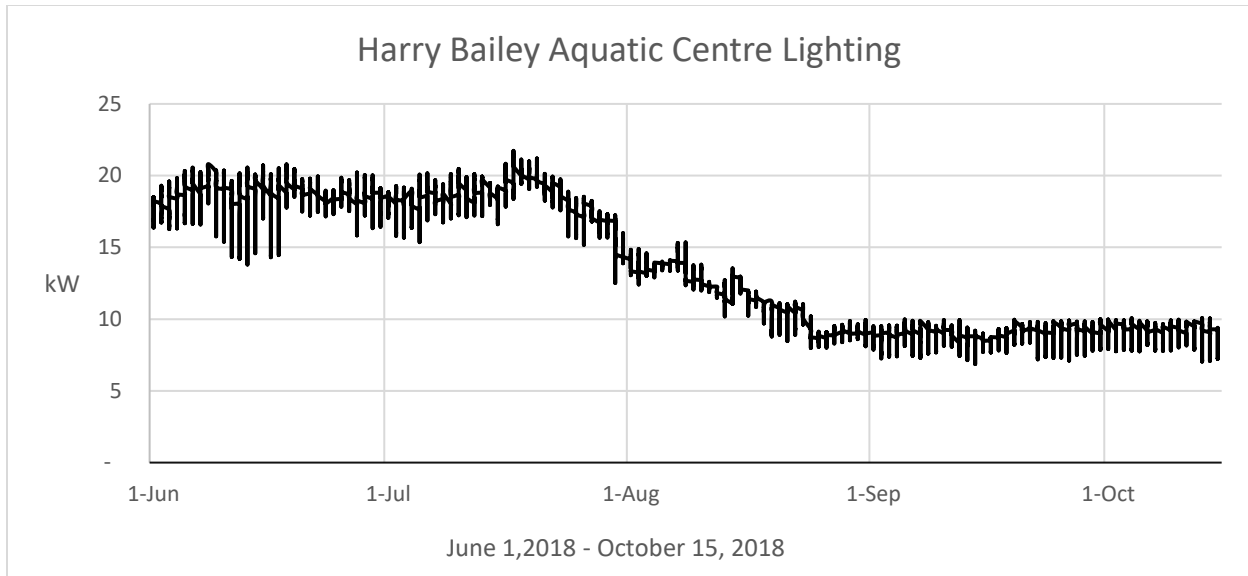
A scheduled shut-down period at Harry Bailey Aquatic Centre provided an opportunity for an immediate LED retrofit, rather than wait another 3 years for the next shut-down. The Saskatoon Field House had lamps that required immediate attention. LED retrofits

were, therefore, fast tracked for these two facilities as well. Highlights of these projects include the following:

- Light levels were enhanced to meet a higher level of competitive standards for the Field House track, and generally improve overall lighting at both facilities.
- Barrier Free Accessibility lighting needs were addressed at the Field House.
- Dimming control was installed at both facilities in the pool & track areas, achieving the same benefits as described for the Shaw Centre.
- Dimming control was installed in some meeting rooms and fitness rooms, resulting in improved rental appeal and functional use of the space.
- Occupancy control was installed where appropriate to further enhance energy savings and occupant comfort/health.

The charts below show energy use for approximately 1 month before and 2 months after the LED and lighting control retrofits were installed. On average, the lighting energy use was reduced by 61% for Saskatoon Field House, and 52% for Harry Bailey.





### Co-Benefits of Lighting Retrofits

The benefits of the Go-Early Lighting Projects go beyond achieving energy savings and reduced maintenance costs. Some of the co-benefits of LED lighting upgrades include the following:

- Instant on/off capability
  - LEDs provide instant illumination once they are switched on. This means that during power outage the lights will come back instantly, whereas metal halide fixtures typically require a 15-minute warm up period.
- Dimming controls and occupancy sensors
  - Dimmable controls have pre-set “scenes” making it easy for operators to adjust light levels to suit needs that change throughout the day. Occupancy sensors allow further energy savings through auto on/off control.
- Increased space marketability
  - Improved lighting level, consistency, and dimmable control have enhanced the marketability of lease tenant and rental space. Dimming control provides adjustability for meeting room screen projection, and other tenant needs.
- Increased occupant productivity & comfort levels
  - Better space lighting can increase comfort levels and therefore, increase employee productivity. Staff and patrons at Shaw, Harry Bailey, and Field House have provided positive feedback indicating that they perceive the space to be brighter.
- Standardized lighting and controls
  - Building operators and electricians who maintain multiple civic facilities will also have an easier time managing the operation and maintenance

procedures of the new lighting and controls at civic facilities. Ongoing training requirements will also be reduced due to standardization.

- Longer lasting equipment
  - Aside from longer life span of LEDs, the new lighting fixtures for the leisure pool and competition pool at Harry Bailey and Shaw Centre are specifically designed to be used in natatoriums as they are very sturdy and corrosion-resistant in a pool environment.
- Increased safety at premises
  - Lighting levels were improved in some exterior areas around the buildings where low light levels had been identified in a crime prevention through environmental design (CPTED) site review during the EPC project planning.