SUMMARY OF 2017-2019 ELECTRICAL USAGE AT MAPLE LEAF GOLF AND COUNTRY CLUB

"A Natural Resource Committee Project"

"MLG&CC A Proud Recipient of Two Audubon International Green Community Nature Awards".

Overview

The project is a Natural Resource Committee (NRC) initiative providing a descriptive summary and overview of electrical demand at Maple Leaf. The project objective is to describe usage patterns and provide analytical observations. The data is offered to the Finance Committee as a reference document for making possible cost saving recommendations to the Board of Directors. The study compiled all corporate electrical usage (kWh) from January 2017 until December 31, 2019 with individual and total costs being tabulated. Usage comparisons for pools and buildings were examined. The effect of temperature on pool costs is charted and a compilation of current air conditioners is included. Best approximation of certain electrical load centers is attempted; however, these calculations are based on assumptive information and cannot be fully quantified without knowing the actual time of use.

Electricity Consumption

Florida Power and Lighting (FPL) metered electrical consumption for Maple Leaf buildings and amenities from 2017-2019 were (1,144,429 kWh), (1,147,953 kWh) and (1,081,343 kWh). Monthly values are given in Table 1 with no data for street lighting which is not metered and billed as a fixed amount. The small decline in consumption is interesting but the trend may not be reliable. Although implementation of several electrical reduction measures has taken place (replacement lighting is LED, new air conditioners and building alterations) the reduction is not large enough to discount variability due to annual weather patterns.

Electrical Costs

Our average three-year electrical billing is $137,238 ± 4,306 which represents approximately $0.10/kWh. A 7-11 % portion of that cost is fixed fees (storm charge, surge protection charge, franchise charge, gross receipts tax surcharge) that would be non-recoverable in the event we obtain other sources of power. Table 1 ranks each metered operation based on percent total consumption. The Country Club is our single largest user at 23.9 %. Streetlights, swimming pools and the irrigation pumphouse use another 44.3%. The final 31.8 % is billed to the remaining buildings and operations. There is little difference in year to year usage, especially for larger consumers with many having less than 10 % variation.

Opinions on Cost Saving Measures

All pools have heat pumps. Heat pumps are projected to save 40 to 50 percent of the energy cost when compared to other energy sources. Solar blankets may be a consideration during winter months when 70% of heating costs are incurred. Based on information discussed later this report does not recommend using solar panels for heating pools. Previous reports advocate savings if solar panels were installed. Given the difference in opinion, the option of using solar heating will require additional study.

As they become non-operable air conditioners are replaced with newer models having higher SEER ratings. The capital program replacement rate is funded at a rate of 4-5/year. Presently fifteen of the thirty-five units are less than six years old.

Note: Seasonal Energy Efficiency Ratio (SEER) is an energy efficiency rating for air conditioners. The higher the SEER, the more efficient the unit.

Other thoughts include programmable thermostats, at costs up to $400 each. A major drawback is that the programmed settings are fixed while most building use is variable. Nighttime settings are typically 78-80 degrees which are monitored and set by security staff after 10 pm. Lighting and thermostat setting checks should be continued by Maple Leaf security personnel. Improperly set thermostats should be recorded and the last responsible user notified.

The notion to install motion sensor lights/photocells in buildings and washrooms at a costs range of $30-$150 has been recommended. Typically, sensors are effective in low traffic areas, which seems impractical here, especially during peak season. The latter situation predicts saving losses if the units are continually going on and off. We strongly recommend Implementing a resident education program to turn off lights and lower air conditioning requirements when buildings or equipment are not in use.

There have been several property upgrades that should reduce electrical costs. The Country Club 2019 renovations removed old windows/screens and replaced them with rated thermal panes and better insulation. The Proshop, Fitness and Woodworker buildings were re-shingled in 2020. Making significant investments in better insulation and thermal windows for buildings is thought to be one of the best ways to reduce energy consumption. We recommend adding a timer (6 am-9 pm) on the Country Club lake aerator.

Lighting costs are comparatively low relative to other expenditures. Upgrading replacement lighting to LED fluorescent is estimated to result in a 15% saving.

Currently, 45 % of sodium streetlights have been replaced with LED lamps, which reduces electricity but not cost. Each replaced sodium lamp eliminates an $80 ballast. All future building construction should install modern LED fixtures.

Equipment costs are projected to be $29,000. The single largest concentration of equipment is for food services with an estimated expense of $9500 ($16490-$7000). We recommend a more detailed electrical inspection of the Country Club/Sand Bar operations that would look at long-term replacement strategies and possible energy saving measures.

Pools

Although often referred to as “geothermal”, ground-source heat pumps (GSHPs) are technically not geothermal. Geothermal originates from heat retained within the Earth during the original formation of the planet. A ground-source heat pump uses shallow ground or ground water (typically starting at 10–12 °C or 50–54 °F) as a heat source. GSHPs circulate a carrier fluid (usually a mixture of water and small amounts of antifreeze) through closed pipe loops buried in the ground. Like a refrigerator or air conditioner, these systems use a heat pump to force the transfer of heat from the ground to the pool.

The 24,000-gallon Charlotte Center pool has three GSHPs, two 14 kW capacity units for the pool and one 12 kW for the spa. The energy source is water from the pond off tee box 15. In addition to the pool and spa electrical use, other electrical consumption includes, lighting (3 kW), hot water tanks (9 kW), sauna (6 kW), court lights for tennis and lawn bowling (20 kW) and a pump (4 kW). The laundry room has two washing machines (1 kW) and four dryers (22 kW) for a total of 65 kW. The pool building does not have air conditioning. The Charlotte pool is maintained at a higher temperature (88 ^{0}F) compared to the other pools which are kept at 84 ^{0}F. Spa temperatures are usually 103-104 ^{0}F. To estimate the pool and spa consumption, we used and subtracted the “nominal” kW consumption data of non-pool items obtained from published websites. The lawn bowling lights are rarely on (50 hr.) and tennis lights were estimated to be operational for 240 hours/yr. (2880 kWh). We strengthened our assumptions by comparison to the electrical demand of the Queensway pool and similar use buildings such as the arts/crafts and computer club. We concluded that a correction of 15 % from the total metered amount was a practical “adjustment” to determine the Charlotte Center pool electrical consumption.

Table1. Maple Leaf Monthly Electrical Usage 2017-2019 (kWh)

Meter	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual kw/h
ku33420														
queensway center	2019	6120	6000	6180	5100	5220	6060	7020	7860	6960	6120	5640	5280	73560
	2018	7020	8100	7260	6180	5580	7620	7560	7080	8220	6540	5280	5340	81780
	2017	8340	8160	8700	7620	6000	6480	5340	5880	8580	6780	7080	6720	85680
kcd2791	2019	4066	4097	4161	3970	4283	4086	5247	5544	3965	3972	3537	3684	50612
maintenance area	2018	2876	3152	4123	4435	5444	5917	5266	5288	5742	5793	4755	4530	57321
	2017	3621	3788	4026	5027	5558	5455	5377	5850	5861	5015	4206	3551	57335
acd2740	2019	2585	2590	2658	2954	3770	3909	3965	3926	2688	2492	2879	2635	37051
rampart office	2018	3040	2690	2414	2873	3270	3872	3956	4014	4038	3392	2825	2632	39016
	2017	2471	2350	2742	2768	3612	3392	3529	3809	2942	3106	2735	2876	36332
mv36147	2019	8160	8520	9600	11700	11640	6840	3420	2700	9660	9840	8580	6840	97500
irrigation pumphouse	2018	7560	9900	11400	2400	6120	21000	8820	11280	9000	12960	8940	6960	116340
	2017	8880	8460	9420	10740	11520	5580	10500	8280	2160	7680	10920	10200	104340
acd6678	2019	82	73	77	70	65	59	62	68	64	73	84	85	862
west post office	2018	84	74	79	74	64	70	58	61	42	76	83	90	855
kcd2786	2019	14110	11378	12609	8100	5664	5267	5780	5733	5894	7590	14071	16282	112478
laundry/pool-CC	2018	16018	12684	13217	7601	8213	4904	4433	4864	5407	7376	10595	14921	110233
	2017	14357	12750	13710	10172	7332	6749	5277	5217	6274	9263	12446	14784	118331
acd5843	2019	56	53	57	52	51	49	51	55	48	52	56	55	635
exit	2018	235	210	231	182	116	60	54	49	54	55	52	59	1357
kcd2789	2019	4482	5270	5705	1681	2594	2786	2363	2324	2123	2094	1810	2645	35877
charlotte center	2018	4734	5672	5315	1496	1612	2506	2575	2515	2803	2261	1911	2794	36194
	2017	4936	5257	5620	2079	2166	2273	2659	2596	2528	1730	1438	2583	35865

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Meter	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual kw/h
acd2741	2019	1050	901	698	573	836	889	936	879	806	636	350	489	9043
rampart arts center	2018	927	823	556	366	381	702	751	796	822	502	437	438	7501
	2017	906	912	635	286	361	297	592	573	447	273	306	584	6172
kj47954	2019	10664	10410	10541	9119	10054	10066	9581	10147	9404	9425	10281	9659	119351
can-am/pool	2018	11514	9731	11127	8600	9268	10060	9751	10222	10544	10133	10958	11070	122978
	2017	11235	10223	11440	9353	9799	9531	9722	10544	10022	9115	10490	10401	121875
acd0827	2019	919	859	915	872	953	966	1039	1131	1011	1116	1041	1112	11934
guardhouse	2018	1034	914	954	866	912	955	957	969	1063	1031	955	1053	11663
acd6582	2019	2015	2447	2433	1911	1842	1915	1869	1838	1998	1849	2126	2472	24715
woodworkers	2018	1589	2208	1950	1311	1207	1530	1712	1670	1817	1669	1889	2363	20915
acd2742	2019	957	791	904	898	1026	1147	1183	1233	1092	1053	912	844	12040
library/comp club	2018	1118	878	832	826	849	1088	1124	1090	1166	957	1007	928	11863
	2017	1000	800	850	948	1533	1013	1205	1149	1069	891	791	894	12143
acd6581	2019	1579	1592	1774	1958	2206	2357	2333	2474	2604	2564	2062	1720	25223
proshop	2018	1694	1654	1615	1011	1216	1620	2147	2001	2220	2085	2021	1676	20960
	2017	1584	1546	1800	2037	2190	2114	2261	2383	2372	2085	2021	1756	24149
kt53417	2019	22680	23640	25680	25200	6120	20880	24840	23411	25735	28758	24051	23812	274807
country club	2018	23880	25920	26640	23400	24720	27840	26760	27000	27120	25440	24120	22320	305160
meter removed	2017	22200	23040	26520	24960	27840	28920	29400	30720	19760	26640	24840	25440	310280
kcd4784	2019	1510	1562	1713	1816	2157	2129	2577	2532	2205	2222	2317	1841	24581
fitness center	2018	1263	1888	1688	1774	1536	1931	1931	1924	2396	2294	2048	1434	22107
	2017	1866	1647	1761	1601	1538	1691	1878	1900	1683	1715	1952	1510	20742

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Meter	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual kw/h
acd6583	2019	975	895	1194	975	1048	979	840	921	895	948	938	1080	11688
fountain	2018	926	970	1028	987	1053	978	928	1057	1074	979	958	1019	11957
	2017	1036	1003	1047	1083	1092	1177	1078	986	995	935	992	1135	12559
acd6075	2019	0	0	0	0	0	0	0	0	0	0	0	0	0
lake aerator	2018	0	0	0	0	0	0	0	0	0	0	0	0	0
kcj1091	2019	12107	8147	8427	5940	4738	4366	5005	6084	4669	5188	9442	11511	85624
queensway pool	2018	6843	7520	11140	6801	6308	4017	3925	4326	4084	5043	7694	10940	78641
	2017	10042	9022	8975	6450	4701	4548	3862	3838	3508	7359	9251	10668	82224
kcd7221	2019	14329	7916	8547	5299	2947	2765	2965	2937	2769	3931	8340	10206	72951
country club pool	2018	14579	9185	12348	5988	6853	3771	3741	3385	3381	5725	9040	12279	93402
	2017	12948	10211	10944	7565	5343	5569	4670	4583	3526	6846	9191	12006	90275
unmetered	2019	fixed	fixed	fixed	fixed	fixed	fixed	fixed	fixed	fixed	fixed	fixed	fixed	
streetlights	2018	fixed	fixed	fixed	fixed	fixed	fixed	fixed	fixed	fixed	fixed	fixed	fixed	
Total	2019	11876	11332	11841	9449	8873	9229	8918	8833	9010	9682	10595	10335	1081343
Monthly	2018	12109	11551	12027	8773	9251	11055	9429	10743	9995	10340	10995	10916	1147953
Consumption	2017	12598	12465	12809	11319	10359	9713	9825	9864	9656	10165	11564	11696	1144429

Table 2. RANKED COMPARISON OF BILLED ELECTRICAL COSTS

Meter	Location	3 year average $	2019 annual costs $	2018 annual costs $	2017 annual costs $	% total usage	*standard deviation* %
kt53417	country club	32,862	30,432	33,793	34,360	**23.9%**	6.5%
unmetered	streetlights	12,603	12,667	12,539	-	**10.4%**	0.7%
kj47954	can-am & **pool**	13,444	13,217	13,619	13,497	**9.8%**	1.5%
kcd2786	laundry & **CC pool**	12,589	12,456	12,207	13,103	**9.2%**	3.7%
mv36147	irrigation pumps	11,745	10,797	12,883	11,554	**8.5%**	9.0%
kcj1091	**queensway pool**	9,099	9,482	8,709	9,105	**6.6%**	4.2%
kcd7221	**country club pool**	9,473	8,079	9,997	10,343	**6.9%**	12.9%
ku33420	queensway	8,897	8,146	9,056	9,489	**6.5%**	7.7%
kcd2791	maintenance	6,101	5,605	6,348	6,349	**4.4%**	7.0%
acd2740	rampart office	4,041	4,103	3,995	4,024	**2.9%**	1.4%
kcd2789	charlotte center	3,984	3,973	4,008	3,972	**2.9%**	0.5%
acd6582	woodworkers	2,527	2,737	2,317	-	**1.8%**	11.8%
acd6581	proshop	2,445	2,793	2,321	2,219	**1.8%**	12.5%
kcd4784	fitness center	2,419	2,722	2,448	2,087	**1.8%**	13.2%
acd6583	fountain	1,336	1,294	1,324	1,391	**1.0%**	3.7%
acd0827	guardhouse	1,307	1,322	1,292	-	**1.0%**	1.6%
acd2742	library/computer	1,233	1,333	1,314	1,051	**0.9%**	12.8%
acd2741	rampart center	839	1,001	831	684	**0.6%**	19.0%
acd5843	exit	110	70	150	-	**0.1%**	51.5%
acd6678	west post office	95	95	95	-	**0.1%**	0.0%
acd0921	parkettes 1&2	91	89	93	-	**0.1%**	2.6%
TOTAL ANNUAL COST		**137238**	**132460**	**139723**	**144572**		

Pools (cont'd)

The Can-Am pool (18,000 gallons) is heated with one 14 kW GSHP which draws heat energy from McCready lake. The Can-Am metered data in Table 1 includes electrical consumption to service the Can-Am building. We arrived at an estimated kWh Can-Am pool value using a rather complex method. We based our approach on the premise that pool electrical demands (kWhs) are concurrent and the between monthly kWh variations were quite small. We averaged the Queensway, Charlotte and County Club pools' monthly values and subtracted the Can-Am monthly average to produce a difference expressed as a percentage. We calculated a correction value by multiplying each Can-Am monthly value by the percent amount (*see Appendix: Can-Am pool worksheet*). "Adjusted kWh values" were then determined by subtracting the correction value from the monthly value. This produced a total loading of 88,111 kWh, a number that did not reconcile with the metered costs. The projected load would require the heat pump to operate 72% of the time in comparison to other heat pumps operating only 26% of the time. "***Final values"*** were computed by applying a 25% reduction to compensate for the 6,000-gallon difference in water volume. Upon review and consideration of kWh loads for pools and similar buildings we believe this is a best approximation of total consumption although some individual values will be imprecise.

The 53,000-gallon Country Club pool is heated using three GSHPs (42 kW capacity) and has no other known metered users. The thermal energy source is McCready lake.

The 24,000-gallon Queensway pool is heated with two air-source heat pumps (28 kW capacity and another air-source heat pump (12 kW) heats the spa. Again, in this case there are no other known users on this meter.

The 2017-2019 cost data for pools is given in Table 2. Figure 1 represents the graphical electrical consumption versus average daily temperature data provided by FPL. The Charlotte pool adjustment value was a fixed amount and should not alter the temperature/electrical usage trend, however the variable correction applied to the Can-Am building would alter the trend data.

Pearson's correlation (r) is a measure of the strength and direction of association that exists between two continuous variables. A value of zero indicates no relationship between two variables while a value over 0.5 is considered strong. The Pearson coefficients for the Charlotte Center (-0.59) Queensway (-0.6) and Country club (-0.69) designate a negative relationship between daily temperature and electrical consumption. As shown in Figure 1 electrical demand for pools is low during the

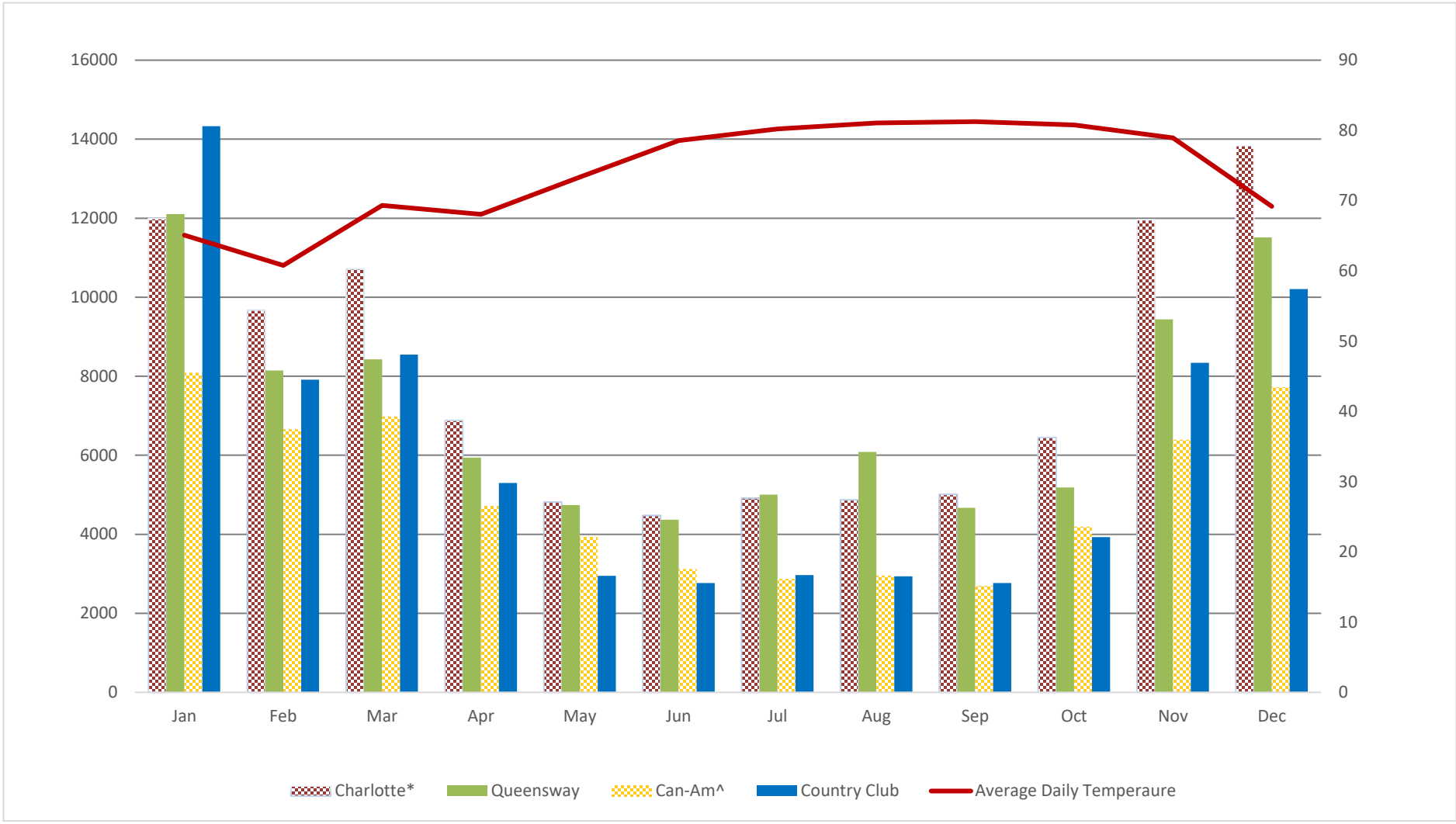


Figure 1. Adjusted* and Final ^ 2019 pool electrical usage data (kWh) vs daily average temperature.

summer months, hence, the observed statistical relationship that *as average daytime temperatures increase electrical consumption decreases*. Prior to adjustment for building usage the Can-Am Pearson coefficient (-0.38) did not support this relationship, as competing winter and summer demands countered each other. The Pearson correlation for Can-Am ***final values*** was -0.75, indicative of a strong correlation for power demand during the cooler months.

Despite inter-pool variables the three-year kWh between pool averages remain exceptional constant at less than two percent. The three-year average cost for each pool is, Country club-$9,473, Queensway-$9,099, Can-Am-$7,260 and Charlotte-$10,700 totaling $36,532 annually.

Pools consume most of their energy demand during winter months (October through March) exhibiting three-year averages of 2017 (74%), 2018 (68%) and 2019 (74%). Electrical demand during the summer period is thought to be for pump and spa requirements.

Table 2. Electrical Usage Data (kWh) for pools

2017 POOL DATA				
	Pool 1	Pool 2	Pool 3	Pool 4
temp	88	84	84	84
pool	CC	QU	CA	C-club
gallons	24000	24000	18000	53000
		kWh		
Jan	12203	10042	9134	12948
Feb	10838	9022	7011	10211
Mar	11654	8975	8119	10944
Apr	8646	6450	5185	7565
May	6232	4701	4115	5343
Jun	5737	4548	3167	5569
Jul	4485	3862	3123	4670
Aug	4434	3838	3291	4583
Sep	5333	3508	3083	3526
Oct	7874	7359	4346	6846
Nov	10579	9251	6984	9191
Dec	12566	10668	8912	12006
Metered amount	*118331*	*82224*	*121875*	*93402*
Adjusted and final kWh	100581	82224	*66471*	93402
Annual cost	**11138**	**9105**	**7288**	**10343**

2018 POOL DATA				
	Pool 1	Pool 2	Pool 3	Pool 4
temp	88	84	84	84
pool	CC	QU	CA	C-club
gallons	24000	24000	18000	53000
		kWh		
Jan	13615	6843	9361	14579
Feb	10781	7520	6673	9185
Mar	11234	11140	7897	12348
Apr	6461	6801	4768	5988
May	6981	6308	3892	6853
Jun	4168	4017	3343	3771
Jul	3768	3925	3133	3741
Aug	4134	4326	3191	3385
Sep	4596	4084	3243	3381
Oct	6270	5043	4832	5725
Nov	9006	7694	7296	9040
Dec	12683	10940	9486	12279
Metered amount	*110233*	*78641*	*122978*	*90275*
Adjusted kWh	93698	105980	*67114*	90275
Annual cost	**10376**	**8709**	**7354**	**9997**

2019 POOL DATA				
	Pool 1	Pool 2	Pool 3	Pool 4
temp	88	84	84	84
pool	CC	QU	CA	C-club
gallons	24000	24000	18000	53000
		kWh		
Jan	**12487**	**12107**	**8670**	**14329**
Feb	**10070**	**8147**	**7139**	**7916**
Mar	**11159**	**8427**	**7481**	**8547**
Apr	**7169**	**5940**	**5056**	**5299**
May	**5013**	**4738**	**4222**	**2947**
Jun	**4661**	**4366**	**3345**	**2765**
Jul	**5115**	**5005**	**3078**	**2965**
Aug	**5074**	**6084**	**3167**	**2937**
Sep	**5216**	**4669**	**2893**	**2769**
Oct	**6717**	**5188**	**4494**	**3931**
Nov	**12453**	**9442**	**6845**	**8340**
Dec	**14410**	**11511**	**8277**	**10206**
Metered amount	*112478*	*85624*	*119351*	*72951*
Adjusted kWh	95606	85624	*64666*	72404
Annual cost	**10588**	**9482**	**7137**	**8079**

Adjusted kWh — Can-Am (CA) and Charlotte (CC) usage adjusted for other contributions

			3 yr. average		std	% variation	Capacity (gal)	Pearson Correlation (r) vs Average Daily Temperature 2019	
Charlotte	Center	CC	113681	96629	410	0.36%	24000	-0.59	-0.59
Queensway		QU		82163	342	0.42%	24000	-0.59	-0.6
Can-Am		CA	121401	66084	182	0.61%	18000	-0.38	-0.75
Country	Club	C-club		85543	1080	1.26%	53000	-0.69	-0.69

Final values

unadjusted

adjusted

Community Buildings

Charlotte Centre

The area of the Charlotte Center is ≈ 3,400 square feet, consisting of the main room (1,560 sq. ft.), washrooms and hallway (300 sq. ft.) and two arts and craft rooms (950 sq. ft. and 540 sq. ft.). Lighting is estimated at 4.4 kW and other high-power consumption equipment includes, three air conditioners (18 kW), four kilns (14 kW), refrigerator, stove, microwave oven, ice machine, water fountain and water heater (7 kW). During the winter season the main hall acts as a club house for lawn bowling and tennis and is regularly booked for resident activities such as parties, cards, Merrymakers, and darts.

Can-Am

The building is open year-round and accommodates club meetings, information meetings, bingo, cards, and billiards. The overall area of the Can-Am building is approximately 7,500 sq. ft. The main hall is 4,700 sq. ft., realty office, washrooms, and hallway 1,400 sq. ft., billiard room 1,100 sq. ft. and communications/195 office is 340 sq. ft. The Can-Am has five air conditioners (43 kW) and major electrical equipment that include two refrigerators, two electrical ranges, fanhood, ice machine, microwave oven, water heater, photocopier, water fountain, electronic and audio/visual equipment (23 kW). Lighting is a mixture of retrofit LED fluorescent lamps with a projected wattage of 6.2 kW and the billing may include shuffleboard lighting. The reported monthly kWhs (Table 3) is the residual amount after subtracting the calculated “final” Can-Am pool data.

Queensway

The Queensway building is 8,400 sq. ft. which includes a main seating area of 4,000 sq. ft., a small communication room (135 sq. ft.) and the remaining capacity taken up by the entrance way, four washrooms, small bar area, a stage and three storage areas.

The 370 sq. ft. kitchen houses two warming ovens, two microwaves, two small refrigerators, industrial dishwasher, small chest freezer and a large 96 sq. ft. walk-in cooler and a 120-gallon hot water tank for a total of 22 kW. The building has five air conditioners with 53 kW capacity.

The Queensway building is lit with 220 modern type LED fluorescent tube lamps which have a dimming option. The stage has 16 LED pot lights and a bank of 18

theatrical spotlights (rarely used). The lighting has an estimated maximum electrical load of 4.2 kW.

Country Club and Sandbar

The Country Club building is a year-round use central community building with an area of 11,000 sq. ft. The main 4,000 sq. ft. dining room features a stage and bar and boasts a superior acoustic/sound system complemented by theatrical lighting. The dining area hosts numerous professional entertainers, the Merrymakers, the parks' Diversity band, holiday celebrations and televised sporting events. There are separate washrooms and corporate offices that occupy 1,800 sq. ft.

Another 2,600 sq. ft. is taken up by the Sandbar restaurant of which 900 sq. ft. is an enclosed veranda seating area, 400 sq. ft. for interior seating at the lunch bar area and an additional 850 sq. ft. for the outside deck area. There is 270 sq. ft. for separate washrooms.

The Sandbar and Country Club food and beverage services utilize electric ranges, fryers, two large fume hoods, three dishwashers, two walk-in coolers, numerous small refrigerators/freezers, two large drink coolers, a walk-in freezer and six other refrigerating equipment of varying size. There are two gas and one electric hot water tank. Corporate offices have two small refrigerators, a few computers, TVs, and a photocopier. There is a 200 sq. ft. communication (audio/visual) room. The building equipment is rated at 62 kW capacity.

Metered electrical use includes the demand for charging golf carts and the McCready lake aerator which operates on a 5 HP pump. There are eight air conditioners with 62 kW capacity. Country Club lighting includes 65 LED pot lights and a stage area with 8 theatrical spotlights. The offices are a mixture of 30 fluorescent T-8 and LED tubes. The Sandbar seating area and washrooms have 44 LED fluorescent lamps, the kitchen has a mixture of 40 T-8's and the veranda have 11 fan lights. The estimated electrical demand for lighting is 4.1 kW.

Operational and Club Buildings

Computer Club/Library

The computer/library facility is a 1,334 sq. ft. fabricated building purchased second hand in 2009. The building was divided into two $\cong$ 667 sq. ft. sections to accommodate each function. There is one shared washroom. The building has two air conditioners with 12 kW capacity.

Rampart Arts and Craft Center

The arts and craft facility are a fabricated 1,566 sq. ft. building. Purchased and installed as a temporary replacement in 2006, the structure is now permanent. There is a washroom, small kitchen with a microwave and coffee maker. The building has two air conditioners with 12 kW capacity.

Rampart Offices/Conference Center

The Rampart office structure purchased in 2008 is a manufactured 2,100 sq. ft. building which functioned as a bank just outside of Maple Leaf on Kings Highway. A 600 sq. ft. portion of the building is used as a conference center. There is a small kitchenette area with a microwave, refrigerator, and coffee makers. The remaining space consists of a common area and four offices which accommodate the golf and ground staff. The main electrical equipment consists of a refrigerator, hot water tank, two small refrigerators, printers, computers, and a photocopier. The building has three main air conditioners (19 kW) and a small internal air conditioner in the conference center.

Maintenance Building (*Rampart area*)

The maintenance building occupies 6,800 sq. ft. and houses the maintenance, pool, and irrigation staff. Half of the building (3,000 sq. ft.) is for equipment repair with the remaining portion used for parts storage and construction projects. The work areas contain two metal bench lathes, reel grinders, hydraulic truck lift, drill presses, table saws, gas pumps, biosolids station, pressurized water, and other electrical equipment with projected electrical demand of 28 kW. There is an upper floor area (2500 sq. ft.) used primarily for storage. Two small offices receive air conditioning from an incredibly old 5-ton unit and working areas have about 4 kW of T8 fluorescent lighting.

Woodworkers

The woodworkers building is 1,800 sq. ft. The woodworking portion is 1,058 sq. ft and the remaining 730 sq. ft. contains an enclosed post office with a walkway veranda.

The woodworker electrical invoices include electrical use for the nearby tennis court lights (12 kW), interior lights 3.3 kW, air conditioner (6 kW) and 62 kW of capacity for 2 drill presses, 2 table saws, 4 lathes, grinders, sander, interior air conditioner, 4 high vacuum air handlers, 1 joiner, 2 band saws, jig saw and 2 air compressors.

Proshop

The Proshop is open year-round and has an area of 3,400 sq. ft. The golf portion of the building occupies 2,300 sq. ft., accounting office 800 sq. ft. and the washrooms take up 270 sq. ft. The only significant electrical equipment is air conditioning (19 kW, includes starter shack) and a hot water heater. Operations are open year-round and require the use of computers, printers, and a photocopier. The building is primarily illuminated using 1.8 kW of LED track lighting.

Fitness Center

The building occupies 2,100 sq. ft. of which 500 sq. ft. is for washrooms and showers. There are 5 large fitness machines (5.5 kW), two air conditioners 9.6 kW capacity and a hot water tank.

Ancillary Operations

The remaining park infra-structure includes a 1,150 sq. ft. chemical storage facility, a 1,000 sq. ft. building used by the Fire and other clubs for storage, the 240 sq. ft. west post office and the 35 sq. ft. front guardhouse. The guardhouse has a 3-ton air conditioner (6 kW) and 3 boom barriers (1 KW), there is a compressor at the Fire hall and the only other electrical fixtures are lighting. The golf course washrooms, lake aerators and streetlights are connected to the streetlight grid and are not metered.

The laundry/change room facilities at the Charlotte pool are 380 sq. ft. There are showers, washrooms, two washing machines and four clothes dryers. The meter is also hooked up to the tennis and lawn bowling sports lighting. The electrical capacity is estimated at 65 kW.

Electrical Demand in Community Buildings

A graphical presentation of electricity demand in community buildings is displayed in Figure 2. The Queensway and Charlotte Center buildings are used on a seasonal basis (November through May), while the Can-Am and Country Club operate year-round, however washrooms and showers remain open year-round. The Charlotte Center has a noticeable decline in electric usage during the summer months. Our explanation for this is that after April the pottery kilns are not in use. The reason given for not seeing summer declines in electrical demand at the Queensway is that no major adjustment to air conditioner settings are made due to high summer humidity and the building's large air volume. Overall electrical demand in community buildings is almost steady state based on their three-year averages. Average annual costs for the Country Club are $ 32,862 ± 6.5%, Queensway, $8,897 ± 7.7%, Charlotte Center, $3,984 ± 0.5% and Can-Am $6,184* ± 1.5% (* $13,444 *less final pool value $7,260*). The variability in the monthly three-year average demands (table 3) are Country Club, 6.4 %, Queensway, 8.4%, Charlotte, 31% and adjusted Can-Am 10.1 %. The 2019 Country club May value is low because of meter replacement. The highest demands are during our peak season from November to the end of March.

Electrical Demand in Club and Operational Buildings

A graphical presentation of electricity demand for club and operational buildings is illustrated in Figure 3 and summarized in Table 3. Year-round buildings electrical use was Maintenance (55,089 kWh), Rampart office (37,466 kWh), Proshop (23,444 kWh) and Guardhouse (11,799 (kWh) representing 10.1 % of total usage. Graphic data indicates consumption increases about 30 % during the summer months. There is a small dip in the 2019 Proshop April-May demand that corresponds to the golf course being closed for renovations. Variation in annual demand, 7%, 1.4% 1.5%, 1.6% (Table 1) and monthly demand 13.3%, 14%, 13%, 5.8% are not substantial.

Electrical demands in smaller seasonal buildings for Fitness (22,477 kWh); Woodworkers (22,815 kWh); Library/Computer (10,561 kWh) and Arts & Crafts (9,026 kWh) represent 5.1 % of total electrical use. Smaller buildings have greater variability between years (11.8%-19%) and between months (10.7%-15.6%).

Table 3. Average (2017-2019) Monthly Maple Leaf Building Electrical usage (kWh)

	Country Club	Queensway	final Can-Am	Maintenance	Rampart office	Charlotte	Pro shop	Fitness center	Woodworkers	Guardhouse	Rampart Lib/comp	Rampart arts	west PO
Jan	22920	7160	2083	3521	2699	4717	1619	1546	1802	977	961	1025	83
Feb	24200	7420	3180	3679	2543	3819	1597	1699	2328	887	805	897	74
Mar	26280	7380	3264	4103	2605	5547	1730	1721	2192	935	770	722	78
Apr	24520	6300	4021	4477	2865	1752	1669	1730	1611	869	737	562	72
May	19560	5600	5631	5095	3551	2124	1871	1744	1525	933	980	682	65
Jun	25880	6720	6601	5153	3724	2522	2030	1917	1723	961	954	758	65
Jul	27000	6640	6573	5297	3817	2532	2247	2129	1791	998	1046	884	60
Aug	27044	6940	7088	5561	3916	2478	2286	2119	1754	1050	1059	847	65
Sep	24205	7920	6917	5189	3223	2485	2399	2095	1908	1037	994	806	53
Oct	26946	6480	5000	4927	2997	2028	2245	2077	1759	1074	815	622	75
Nov	24337	6000	3534	4166	2813	1720	2035	2106	2008	998	713	554	84
Dec	23857	5780	1485	3922	2714	2674	1717	1595	2418	1083	725	667	88
Total kWh	*296749*	*80340*	*55318*	*55089*	*37466*	*34398*	*23444*	*22477*	*22815*	*11799*	*10561*	*9026*	*859*
(%) Deviation	6.4	8.4	36	13	14	32	13	11	12	5.8	14	16	12
Area (sq. ft.)	11000	8400	7500	6500	2100	3400	3400	2100	1800	135	1334	1566	240
Air conditioning (tons)	42	30	21	5	10	9	10	6	3	3	6	6	0

Electrical Cost Estimates

After removal of known costs for streetlights, pumphouse, west post office, fountain, parkette lights, exit and the projected pool costs we are left with a residual balance of $74,728 to cover costs for air conditioning, lighting and equipment use. Unfortunately, no accurate expense can be given for these individual utilities if the hours of operation are not measured.

To provide some cost assessment a mass balance approach was applied by data extrapolation of the billings, wattage demand, predicted time use and web information citing nominal equipment cost/use values. See (*Appendix; Best Approximation of Electrical Costs worksheet*) for the compiled data.

Park buildings have 35 air conditioners (Table 4) with a total capacity rating of 270 kW. Based on concurrent electrical costs for lighting and equipment we projected air conditioning costs in the order of $38,000/year. This cost equates to annual hours of operation between 500 and 2400 hours with larger non-seasonal buildings exhibiting greater use.

Lighting fixtures are either incandescent, standard fluorescent light tubes, compact fluorescent bulbs (CFL) or light emitting diodes (LEDs). Maple Leaf has over 1,400 various types of these light bulbs in our buildings with a calculated wattage of 40 kW. Presently the light replacement program uses LED where possible. Most buildings have older T-8 and T-12 fluorescent bulbs which give off less heat than incandescent ones and yield between 50 and 100 lumens per watt. Replacement of fluorescent fixtures with LED is a better energy saver but on older fixtures the replacement bubs still use existing ballasts. Presently about forty percent of incandescent and fluorescent light bulbs in buildings have been replaced with LED fixtures. When major renovations are being performed the choice is to install new LED fixtures as done in the Queensway, Country Club and Proshop buildings. The initial downside of LED is cost but expenditures should be recovered over time. New fluorescent LED lighting does not require a ballast.

Electrical building lighting wattage represents only 14 % of the electrical demand for air conditioning at a projected annual cost of $6,673 (*excludes sport lights*). The resultant hours, i.e. “the estimated hours the lights were in use” based on our mass balance assignments ranged from 600 to 3,600 hours depending on the building.

The tabulation of Maple Leaf equipment 305 kW capacity was acquired through direct inspection and reference to website information. Areas having extensive electrical equipment include the Woodworkers 62 kW, Country Club 62 kW, Pumphouse 43 kW, Maintenance 28 kW, Can-Am 23 kW, Queensway 22 kW and Charlotte Center 22 kW. However, capacity alone is not indicative of cost, for example the pumphouse uses 8.5% of the total electrical demand to irrigate community and golf course grounds.

After removal of the pumphouse expenditure the cost to operate the remaining equipment is $29,991. The Country Club is the largest cost center at $16,490, not unanticipated given the equipment required for food services. However, included in that cost estimate is $2,200 for golf cart charging, $2,900 for continuous operation of the lake pump aerator (5 HP) and $1,900 for corporate office operations.

Electrical Costs for Ancillary Operations

The chemical storage facility lighting demand and the draw for the Fire hall building is included in the metered maintenance building amount. The west post office uses less than 0.1% of consumption and the guardhouse 1.6 %. The golf course washroom and lake aerators on holes 5, 11 and 12 are connected to the streetlight grid and are not an extra cost. The costs for the laundry, change room facilities and sport lights at the Charlotte pool where calculated to be $1,888 a year. The aerator on meter acd6075 was added to the streetlight grid. The meter was removed in 2020.

Solar Power

There is an impetus to switch to solar power primarily to decelerate climate change. Presently most electricity is produced using coal, gas, oil, or nuclear materials as the energy source. These energy sources all have significant environmental waste disposal or emission problems. To our knowledge there is no hydroelectric production in Florida. The stated premium residential solar installation (SunPower) is a 19 panel 355W configuration generating 10,400 kWh/year based on the ***PVWatts Calculator*** for our location. The estimated installation cost of such a system is over $10,000 and the panels require over 350 sq. ft. of space. There are generous government and state rebates for homeowners, but corporate rebates take the form of tax incentives or tax breaks. Eligibility for corporate rebates are unclear and not intuitive.

A previous report indicated that the addition of a solar grid on the Queensway roof could reduce the heating expense by 50 %. We could not duplicate this value based on the information available in the report. The three-year average electrical use of a pool at Maple Leaf is above 80,000 kWh/year. Based on this demand our research

indicates an installation cost approaching $80,000 and a requirement of over 2700 sq. ft. of space for the panels. This cost represents 10 years of our present metered billings. Other factors to consider are that solar panels are rated to lose about 0. 5% of their efficiency/yr., can require replacement of batteries and invertors after 10 years, and are problematic for hurricane insurance.

Currently FPL produces approximately 1,250 megawatts of solar energy using 18 existing solar plants and other smaller installations. In 2019 FPL started construction of 10 more solar energy centers across Florida. Each new solar plant will have a capacity of 74.5 megawatts. Implementation of 3 million more solar panels keeps FPL on track to meet its "30-by-30" plan to install more than 30 million panels by 2030.

The NRC opinion would be that Maple Leaf is better off allowing FPL to produce solar power, and we continue to look at more efficient methods of reducing consumption using heat pumps and energy efficient equipment, especially air conditioners.

Acknowledgements:

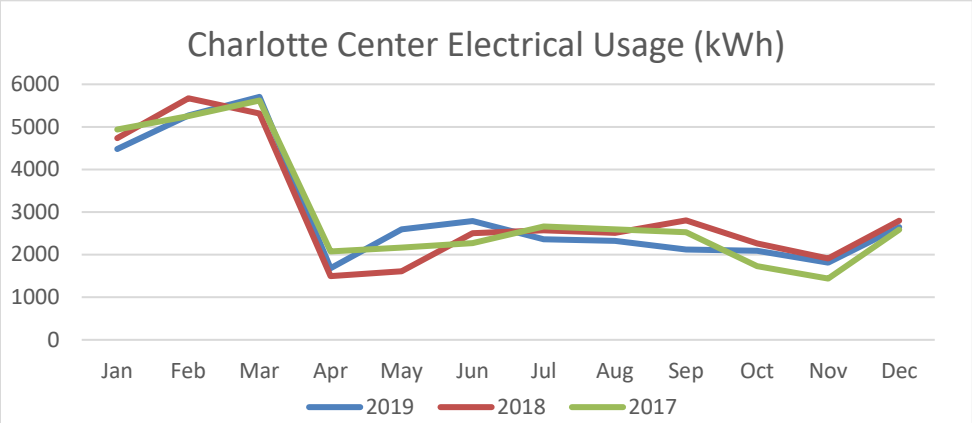
Our thanks to Tammy Eugenius, Kelly Koolstra, Pam Thompson, Wade Osborn, and Mike Griffin for providing valuable information and time to NRC in the preparation of this report.

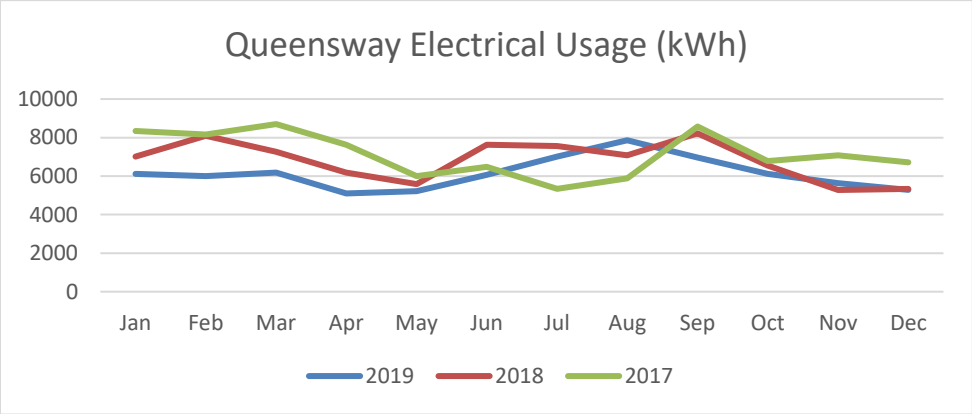
THIS REPORT IS AVAILABLE ON THE NRC WEBPAGE

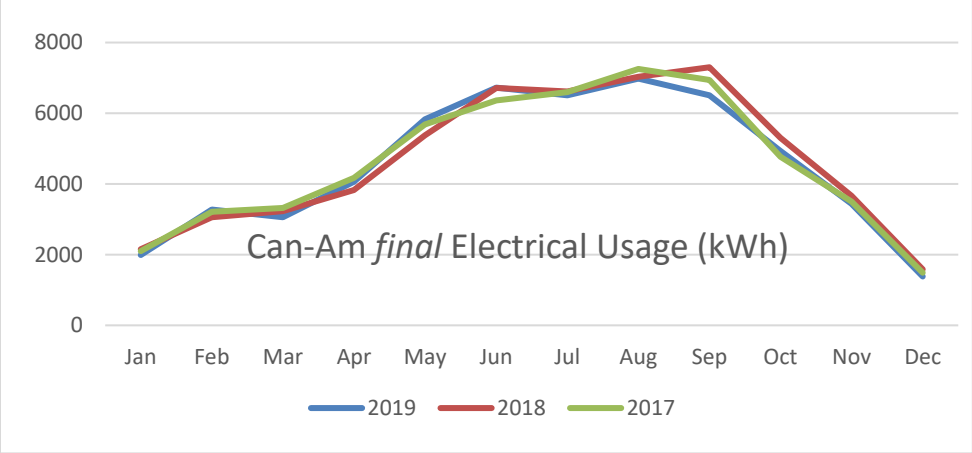
Table 3. Air Conditioning Units at Maple Leaf 2020

Building	**Manufacturer**	**Year**	**Size** *tons*	**Rating**
Charlotte Center	Rheem	2015	3	
	Rheem	2015	2	
	Lennox	2016	4	
Can-AM	Lennox-5	2016	5	
	Rheem-4	2006	5	
	Heil-6	2014	5	13 seer
	Rheem-com	2006	3	13 seer
	Lennox-am3	2017	3	14 seer
Queensway	American Standard	2007	5	
	Trane		5	15 seer
	Trane	2018	10	14 seer
	American Standard	2007	5	
	Trane	2018	5	
Country Club	Lennox	2015	4	
	Heil	2014	5	
	Heil	2014	5	
	Carrier	2001	4	
	Rheem	2016	15	
	Lennox	2016	5	14 seer
	Rheem	2010	4	
Proshop	Weather King	2006	4	
Accounting	Fujitsu	2018	3	
Starter shack	Fujitsu	2017	3	
Rampart Arts Center	Bard	2018	3	15 seer
	Bard		3	
Library/Computer	Bard	2017	3	14 seer
	Bard		3	
Maintenance	Rheem	old	5	
Fitness Center	Rheem	2014	3	14 seer
	Amerstar	2006	3	13seer
Rampart offices	Bard	2016	3	
	Bard		4	
	Marvaire	2015	3	
Guardhouse	Fujitsu	2017	3	
Woodworkers	Ameristar		3	

Figure 2. Electrical Usage (kWh) in Community Buildings







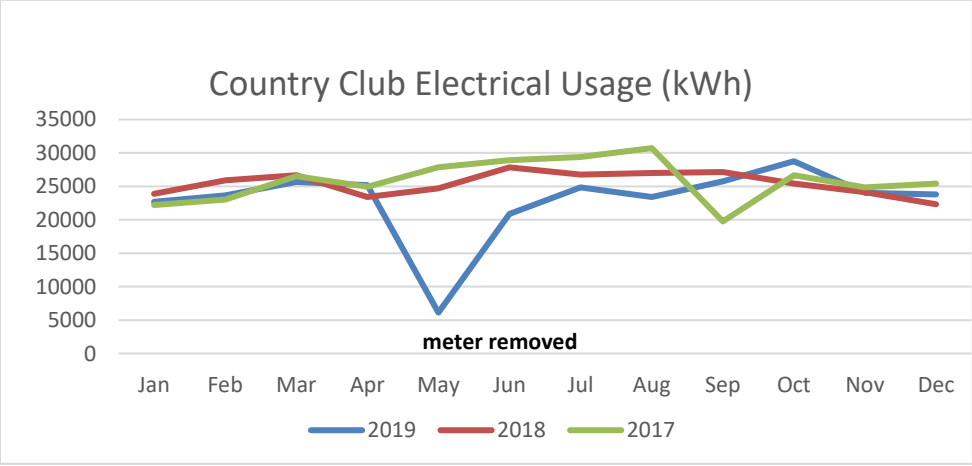
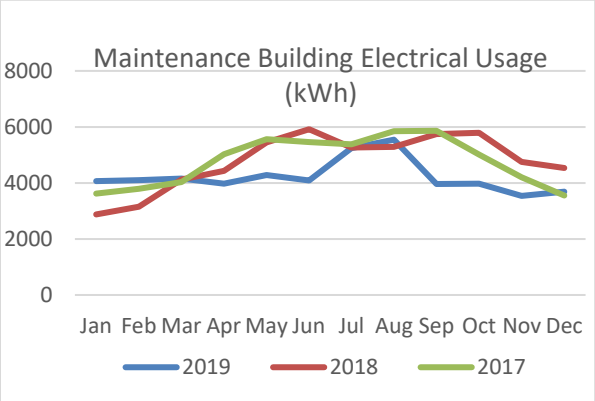
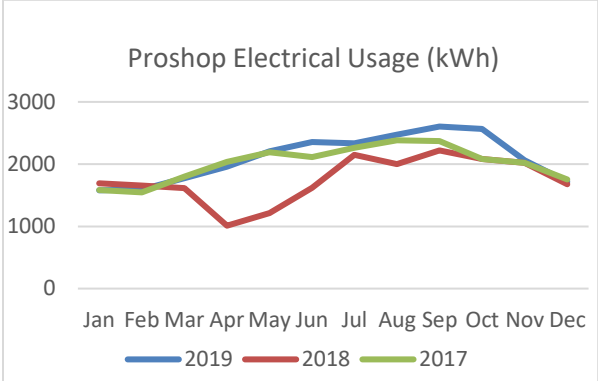
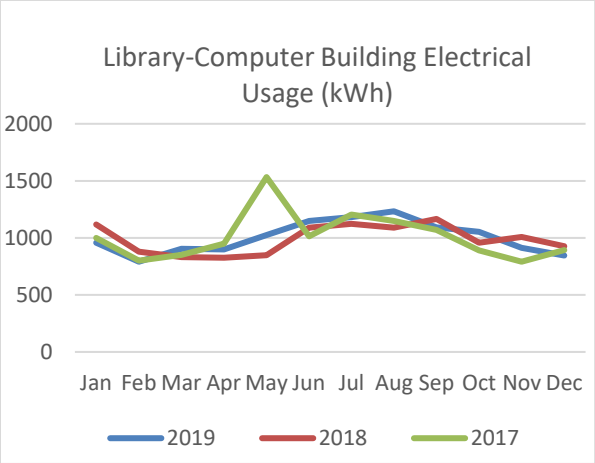
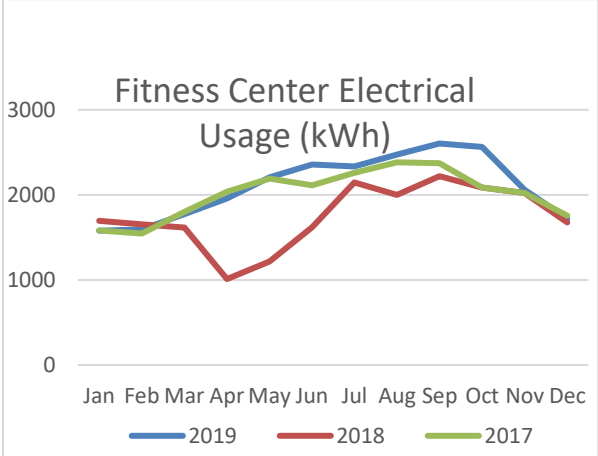


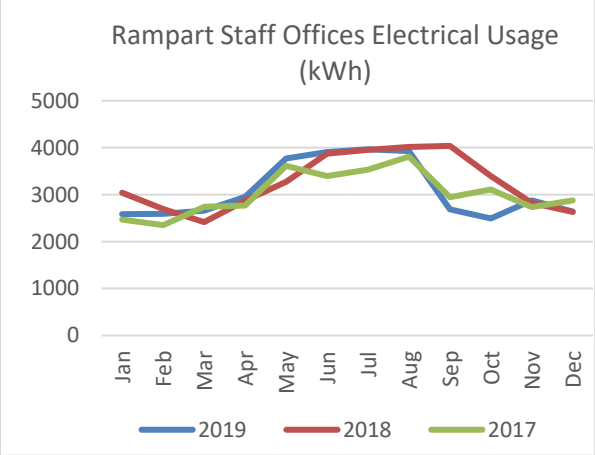
FIGURE 3. OPERATIONAL BUILDINGS

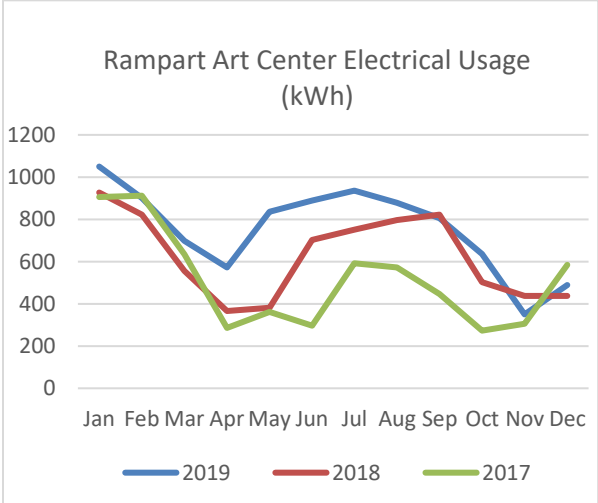












APPENDIX

WORKSHEETS

FOR

SUMMARY OF 2017-2019 ELECTRICAL USAGE AT MAPLE LEAF GOLF AND COUNTRY CLUB

APPENDIX: SUMMARY OF 2017-2019 ELECTRICAL USAGE AT MAPLE LEAF GOLF AND COUNTRY CLUB

CAN-AM POOL WORKSHEET

	3 yr. average pool data			Can-AM pool kWh										Final Values		
	CC	QU	C-club	3 pool	Can-Am	diff	percent	2017	2018	2019	2017	2018	2019	2017	2018	2019
	kWh			average				kWh correction			Adjusted values			kWh		
Jan	12604	9664	13952	12073	11138	-936	-8.4%	-944	-967	-896	12179	12481	11560	9134	9361	8670
Feb	10430	8230	9104	9255	10121	867	8.6%	875	833	891	9348	8898	9519	7011	6673	7139
Mar	11202	9514	10613	10443	11036	593	5.4%	615	598	566	10825	10529	9975	8119	7897	7481
Apr	7331	6397	6284	6671	9024	2353	26.1%	2439	2243	2378	6914	6357	6741	5185	4768	5056
May	6009	5249	5048	5435	9707	4272	44.0%	4312	4079	4424	5487	5189	5630	4115	3892	4222
Jun	4794	4310	4035	4380	9886	5506	55.7%	5308	5603	5606	4223	4457	4460	3167	3343	3345
Jul	4389	4264	3792	4148	9685	5536	57.2%	5558	5574	5477	4164	4177	4104	3123	3133	3078
Aug	4481	4749	3635	4288	10304	6016	58.4%	6156	5968	5924	4388	4254	4223	3291	3191	3167
Sep	4980	4087	3225	4097	9990	5893	59.0%	5912	6219	5547	4110	4325	3857	3083	3243	2893
Oct	6865	5863	5501	6076	9558	3481	36.4%	3320	3691	3433	5795	6442	5992	4346	4832	4494
Nov	10515	8796	8857	9389	10576	1187	11.2%	1177	1230	1154	9313	9728	9127	6984	7296	6845
Dec	13030	11040	11497	11855	10377	-1479	-14.3%	-1482	-1578	-1376	11883	12648	11035	8912	9486	8277
	adjusted															

The average of 2017-19 monthly kWh values for Charlotte, Queensway, and Country Club pools. Adjusted Charlotte values are 85 % of original amounts.

(diff): Difference between the 3-pool average and the Can-Am 3-yr average to approximate kWh usage of Can-Am building.

Percent: Difference expressed as a percent of the Can-Am total kWh.

Corrected values: Calculated as the product of the monthly annual Can-Am kWh and the corresponding percent.

Adjusted values: The projected kWh used by the pool after compensating for the difference.

Final values: Values adjusted for pool volume. Can-Am pool volume 18,000 gallons vs 24,000 gallons. Amounts are 75 % of adjusted value.

APPENDIX: SUMMARY OF 2017-2019 ELECTRICAL USAGE AT MAPLE LEAF GOLF AND COUNTRY CLUB

LIGHTING WORKSHEET

Location	**Lighting hours**				# lamps	wattage	cost/hr.
daily hours	12 hr.	8 hr.	6 hr.	4 hr.			
annual hours	*4380*	*2920*	*2190*	*1460*			
country club	$ 1,810	$ 1,207	$ 905	$ 603	166	4132	$ 0.41
can-am center	$ 2,747	$ 1,831	$ 1,374	$ 916	224	6272	$ 0.63
queensway center	$ 1,831	$ 1,221	$ 915	$ 610	220	4180	$ 0.42
maintenance area	$ 1,752	$ 1,168	$ 876	$ 584	125	4000	$ 0.40
rampart office	$ 1,990	$ 1,327	$ 995	$ 663	142	4544	$ 0.45
charlotte center	$ 1,938	$ 1,292	$ 969	$ 646	158	4424	$ 0.44
proshop	$ 788	$ 526	$ 394	$ 263	36	1800	$ 0.18
woodworkers/p.o.	$ 1,430	$ 953	$ 715	$ 477	102	3264	$ 0.33
fitness center	$ 894	$ 596	$ 447	$ 298	68	2040	$ 0.20
guardhouse	$ 112	$ 75	$ 56	$ 37	8	256	$ 0.03
library/comp club	$ 841	$ 561	$ 420	$ 280	60	1920	$ 0.19
rampart arts	$ 920	$ 613	$ 460	$ 307	75	2100	$ 0.21
laundry room	$ 429	$ 286	$ 215	$ 143	35	980	$ 0.10
				totals	1419	39912	

lights are 14 % of AC

APPENDIX: SUMMARY OF 2017-2019 ELECTRICAL USAGE AT MAPLE LEAF GOLF AND COUNTRY CLUB

Best Approximation of Concurrent Electrical Costs

Building	AC	Lighting	Equipment	Actual	AC	Lighting	Equipment
		kW		cost		**projected**	
Charlotte Center	18	4.1	22	**$ 3,984**	**$ 2,100**	**$ 545**	**$ 1,339**
					1200	**1200**	
Can-AM	43	6.2	23	**$ 6,184**	**$ 3,970**	**$ 963**	**$ 1,250**
					1500	**1500**	
Queensway	53	4.2	22	**$ 8,897**	**$ 6,680**	**$ 915**	**$ 1,304**
					1300	**2200**	
Country Club	62	4.1	62	**$ 32,863**	**$ 14,870**	**$ 1,500**	**$ 16,490**
					2400	**3600**	
Proshop	19	1.8	10	**$ 2,445**	**$ 1,735**	**$ 260**	**$ 450**
					900	**1400**	
Rampart Arts Center	12	2.1	3.9	**$ 839**	**$ 599**	**$ 135**	**$ 105**
					500	**600**	
Library/Computer	12	1.9	4.9	**$ 1,233**	**$ 758**	**$ 180**	**$ 295**
					600	**900**	
Maintenance	9	4.0	28	**$ 6,101**	**$ 1,425**	**$ 876**	**$ 3,800**
					1500	**2200**	
Fitness Center	10	2.0	7.9	**$ 2,419**	**$ 1,250**	**$ 299**	**$ 870**
					1300	**1500**	
Rampart offices	19	4.5	7.6	**$ 4,041**	**$ 2,802**	**$ 549**	**$ 690**
					1500	**1200**	
Guardhouse	6	0.3	0.2	**$ 1,307**	**$ 876**	**$ 81**	**$ 350**
					1400	**2700**	
Woodworkers	6	19	62	**$ 2,527**	**$ 997**	**$ 549**	**$ 990**
					1600	**800**	
Laundry room	0	21	45	**$ 1,888**	**-**	**$ 440**	**$ 1,448**
						1300	
TOTALS	**270**	**72**	**305**	**$ 74728**	**$ 38,062**	**$ 7,283**	**$ 29,381**
		Includes sport lamps			***Resultant hours of operation***	**Resultant hours of operation**	