



2019

Strategic Energy Management Plan



DISTRICT OF
OAK  **BAY**

District of Oak Bay

7/5/2019

Table of Contents

1. OUR ORGANIZATION	2
1.1 Purpose	2
1.2 Key Performance Indicator	2
1.4 Facility Profile	3
2. OUR COMMITMENT	4
2.1 Energy Policy	4
2.2 Sustainability	5
2.3 Importance of Energy Management to the Municipality	5
2.4 Green House Gas Reduction Targets	6
2.5 GHG and Carbon Neutrality	6
2.6 Electrical Reduction Targets	8
2.7 Past and Projected Hydro Price Increases	9
2.8 Budget	9
3. UNDERSTANDING OUR SITUATION	10
3.1 Utility Consumption Cost	10
3.2 Electrical Consumption 2018	10
3.3 Natural Gas Consumption & Cost 2018	12
3.4 Gas and Diesel Usage 2007 - 2018	12
3.6 Recreation Centre Consumption History	14
3.7 Municipal Yearly Energy Consumption	16
3.8 Facility Energy Intensity	18
4. OUR ACTIONS	19
4.1 Previous Actions	19
4.2 Continual Optimization Program (COP)	19
4.3 Action 2017/18/19	20
4.4 Behavioral Changes	24
4.5 Looking To the Future	27
5. SENIOR MANAGEMENT APPROVALS	22
6. APPENDICES	23
6.1 Appendix A Stakeholders	23
6.2 Appendix B Energy Conservation to Date	24

1.1 Purpose

The District of Oak Bay plans to continue its quest for energy efficiency and work toward a more sustainable future.

The Strategic Energy Management Plan (SEMP) is a living document that will act as a template and a realistic plan for a more sustainable future. It will also help track progress as the municipality moves toward the energy reduction goal of lowering our electrical consumption by 1,600,000 kWh by the year 2020 over our 2011 levels.

This SEMF provides a current picture of the energy consumption and GHG emissions and will also show where we want to be in the future, as well as a plan to get there.

Reviews will be done periodically to compare the plans with achievements and to determine if adjustments need to be made to the approach.

Through a stronger commitment to Energy Management, we hope to heighten awareness of sustainability issues and inspire the community to follow our lead. Energy Management is also seen as an important positive step towards our Green House Gas Reduction (GHG) targets and is a vital part in maintaining a high user pay ratio; this is seen as the Parks and Recreation department's key performance indicator.

For this to be successful we will need to engage the Oak Bay Council, Parks & Recreation Commission, Staff and the Community.

1.2 Key Performance Indicator

Key Performance Indicator for Parks and Recreation

User Pay Ratio	Totals							2018 Intensity ekWh/m ²
	2013	2014	2015	2016	2017	2018	Area m ²	
Recreation Center	85%	86%	86%	90%	92%	93%	8112	246
Monterey Centre	66%	71%	71%	67%	66%	66%	2091	159
Henderson Centre	92%	95%	95%	93%	89%	90%	1524	159

As Oak Bay is a relatively small municipality, it is crucial that the Parks and Recreation department continue to maintain a high User Pay Ratio (UPR) in order to minimize the tax burden on its residents. The key performance indicator for the Parks and Recreation department is our UPR. We see reducing energy consumption as a very important part of keeping our operational costs as low as possible and a huge part in maintaining our high UPR.

1.4 Facility Profile

Municipal buildings vary considerably in size, function, and occupancy. Generally, they are multi-use and have a broad range of operating hours and number of users depending on the function, activity and time of year. In a number of cases, buildings are not staffed but have energy consumption (e.g. tennis bubbles and the Windsor Pavilion). The Monterey Centre has a large square footage to employee metric. The Recreation Centre, our largest multi-use facility, has approximately 40 full time staff, a large number of auxiliary staff and averages over 2500 visitors per day.

Normally “employee” energy intensity is used to establish a meaningful metrics and often gives useful comparison information. However in our case the facilities can be occupied by many different categories of users through a range of operating hours - volunteers, auxiliary employees, patrons and visitors. These all impact the density metric in an inconsistent, non-comparative manner.

For our purposes energy intensity becomes a much better tool for comparison.

Facility Profile 2018 (Jan – Dec) Hydro and Natural Gas						
Site	Number of full time Employees	Area (M ²)	2018	2018 Energy Cost	2018 Energy Intensity	Energy Intensity per Employee
			Energy Consumption ekWh			
Recreation Centre	40	16556	4,078,838	\$254,405	246	101,971
Monterey	8	2091	331,973	\$27,718	159	41,497
Henderson	7	1524	241,716	\$15,567	159	34,531
Tennis Bubbles	0	4300	726,087	\$35,621	168	N/A
Municipal Hall	21	1370	315,213	\$23,213	230	15,010
Public Works	41	1215	183,045	\$19,810	151	4,464
Police/Fire	57	920	195,103	\$20,161	212	3,423
Parks	13	772	119,815	\$11,984	155	9,216
TOTAL	187	28748	6,191,790	\$408,479	223	33,111



2. Our Commitment

2.1 Energy Policy

Purpose:

To provide broad corporate guidance in the development, implementation and review of programs, procedures and initiatives for energy conservation and greenhouse gas emissions in Oak Bay.

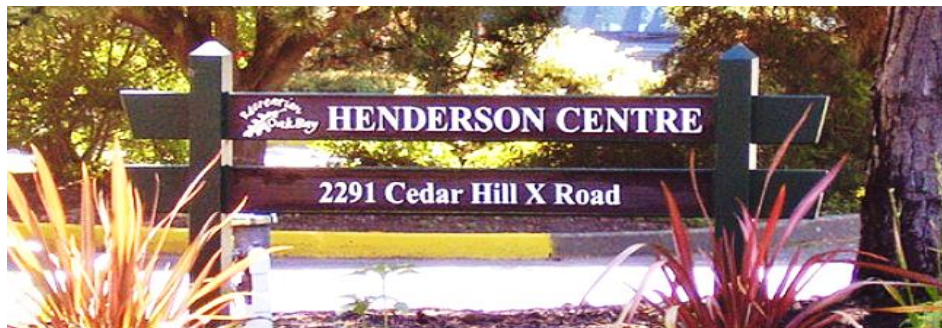
Policy:

The District of Oak Bay is committed to using energy resources to their highest economic efficiency while reducing consumption through wise and cost-effective energy management and the introduction of appropriate energy efficiency and renewable energy procedures and technologies.

The District has been successful in achieving significant reductions in energy consumption over the last twenty years, laying the groundwork for further work in this regard.

The objective of this policy is to incorporate both efficient use of energy and a culture of energy conservation in the planning and operation of municipal facilities and infrastructure. In achieving this objective, the District will:

- Develop and implement strategies to reduce energy use and greenhouse gas emissions thereby lowering operating costs and demonstrating the District's responsible use of energy.
- Continually seek out new and innovative technologies for energy efficiency for consideration.
- Monitor patterns of energy use within the District and energy savings from conservation initiatives, with the intent to continually optimize efficiencies.
- Collaborate in cross-departmental efforts to establish, monitor and achieve energy conservation goals.
- Empower employees to suggest, initiate and take part in energy conservation practices. Employees will be provided with information to help them better understand energy consumption and the means by which they can influence reductions through prudent use of resources.
- Track and communicate energy conservation results.
- Strive to achieve energy use reductions while maintaining a comfortable environment for facility occupants and customers.



2.2 Sustainability

Although at this time the municipality does not have an official Sustainability Policy, we do have an Official Community Plan (OCP). This plan is seen as a road map to the future for Oak Bay and addresses many issues related to sustainability.

The OCP includes a chapter entitled Climate Change and Energy. This chapter contains information relating to climate change adaptation and mitigation, along with energy objectives, policies and actions.

More information on the OCP can be found at - <https://www.oakbay.ca/municipal-hall/plans-reports/official-community-plan>

From the Oak Bay web site – Under Sustainability

Oak Bay is committed to principles of environmental sustainability and so policies and programs are periodically reviewed to ensure goals are being met. Many issues such as ocean waters, streams, and air quality are regional in nature; in these instances, most studies and reports are performed in alignment with other regional municipalities through the Capital Regional District (CRD) - these reports can be found on the [CRD Website](#).

More information on Oak Bay's commitment to sustainability can be found on the municipal web site below.

<https://www.oakbay.ca/municipal-hall/plans-and-reports/sustainability>

2.3 Importance of Energy Management to the Municipality

As a municipality, Oak Bay has a long history of understanding the importance of energy management. The energy improvements that have been made over the last three decades have helped to reduce the energy consumption of the Recreation Centre to less than half of what was used in 1993. This includes electricity, natural gas and propane. In fact the entire municipal electrical consumption is now significantly less than what the Recreation Centre alone used in 1993.

Through conservation, the Recreation Centre is now paying \$275,000 per year less than what we would be paying if we had not been involved in energy management. For our Recreation department this is a crucial part in managing our bottom line and is a major key to keep taxes and our admission costs as low as possible.

In regards to GHG emissions, thanks to more than three decades of conservation initiatives, GHG output has been reduced by 13,872 tonnes over our historical levels and we are now saving 1167 tonnes annually. This momentum has been a crucial step in working towards our municipal reduction targets of 33% over 2007 levels by 2020.

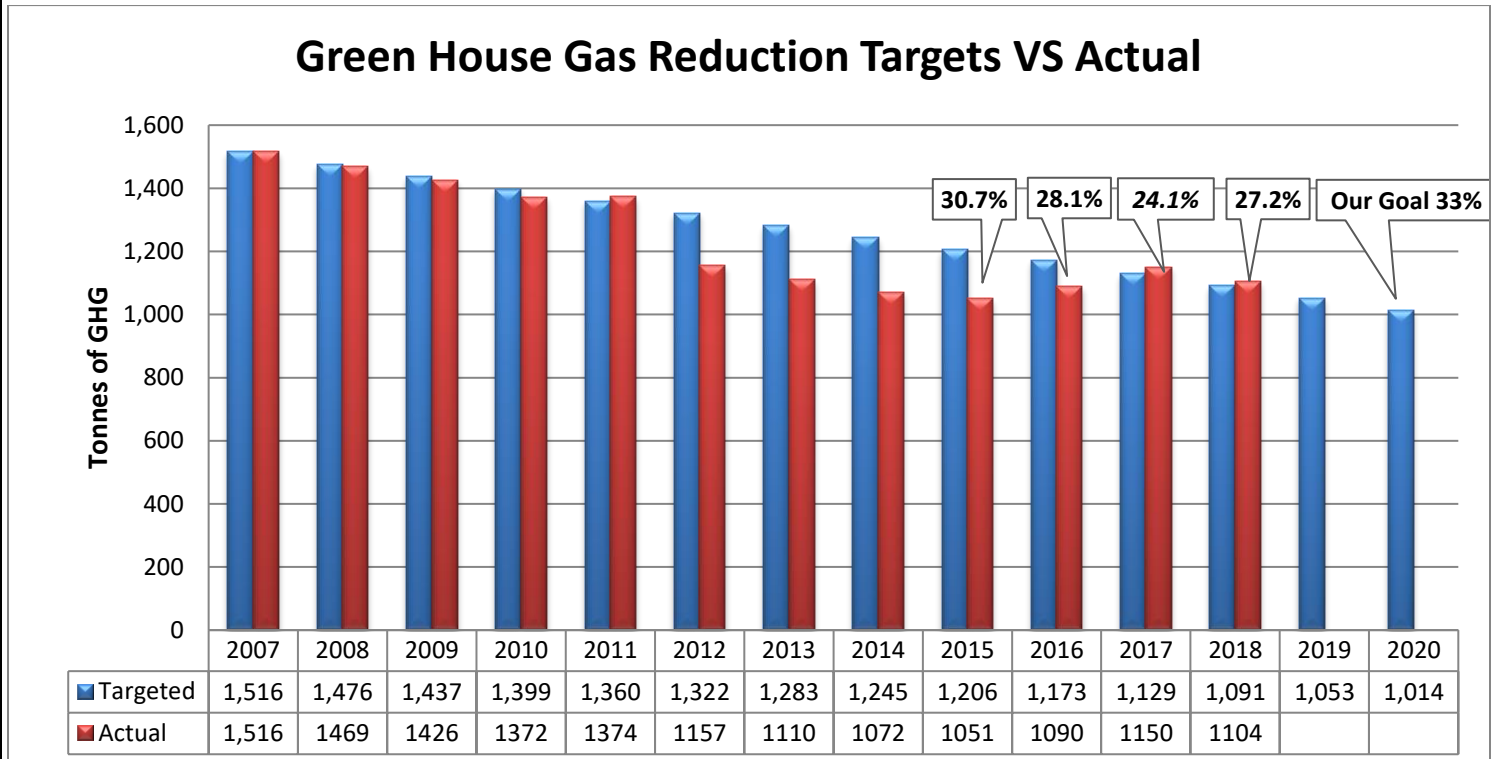
In 2017 the District of Oak Bay hit the 50% reduction mark on electrical consumption. Thanks to the many conservation projects that have taken place over the years the municipality lowered its consumption from historical levels of 8 to 9 million kWh down to 3,820,311 kWh as of the end of 2017.

We believe that leading by example will have a positive impact on the community and help to develop a culture of change in regards to energy conservation and sustainability issues.

2.4 Green House Gas Reduction Targets

Oak Bay has signed on to the Climate Action Charter and has adopted an aspirational target of 33% for GHG reductions by 2020 from our 2007 levels.

The chart below shows the reduction levels needed to achieve this goal and compares that to actual year end levels.



With projects completed over the last few years it is expected that this target will be met by the end of 2019.

- Emissions need to be reduced by 2.54% or 38.5 tonnes per year to make our municipal targets.
- Police department GHG emissions are exempt under the climate action charter.
- Cooler than normal weather and mechanical break downs have pushed natural gas consumption up over the last few years. This shows the importance of making sure there is a buffer that can insulate us from future negative impact events. The new energy recovery loop at the Rec. centre is expected to save over 180 tonnes of GHG per year and will help act as that buffer as we look to achieving our GHG goals.

2.5 GHG and Carbon Neutrality

There are two parts to what we are trying to achieve. The first part is to reduce carbon emissions (the chart above shows the positive results of Oak Bay's conservation efforts since 2007). Oak Bay adopted a working towards approach with regards to being carbon neutral. This meant instead of the municipality buying carbon offsets and being able to declare we are carbon neutral, the funds were kept by the municipality to work on their own carbon reduction projects. This approach was a great help in lowering the GHG that we emit.

The second part was to become carbon neutral. We know that it is very unlikely that we will ever be able to get rid of every GHG producing process within the municipality, but what we can do is balance our emissions by taking part in

projects that help reduce GHG in the municipality and elsewhere. This way we can become carbon neutral, even though we may still emit some GHG.

This is where our household organic waste composting program comes into the GHG equation. When organic waste is placed in the land fill it decomposes gradually over decades and creates a significant amount of methane due to the absence of oxygen. Because methane is 21 times more potent than carbon dioxide on a 100-year global warming potential basis, composting can reduce GHG emissions by over 90% in contrast to sending the same waste to the landfill.

We have been involved in household organics waste program for many years now and in 2018 Oak Bay sent 719 tonnes to be responsibly dealt with. This credited Oak Bay with 286 tonnes of GHG to be used against our emissions.

Yard waste is another way we help with GHG. By collecting it and having it dealt with in a GHG responsible way it is turned into excellent soil within 9 to 12 months. In 2018 Oak Bay diverted 2252 tonnes and we were able to claim 684 tonnes.

CRD industrial and commercial is a program that divides up the credits from industrial and commercial scraps collected throughout the CRD and apportions them to municipalities based on population.

Trenchless technologies are credits we get for relining old underground pipes instead of digging them up and replacing them. The credits are based on GHG saved from the trucking, digging and idling.

For Oak Bay these initiatives have helped us to be carbon neutral since 2016.

More information on Oak Bay's carbon neutrality can be found on the Oak Bay website under sustainability, CARIP Report.

<https://www.oakbay.ca/sites/default/files/CARIP%202018.pdf>

The insert below shows the carbon accounting for 2018. We can now carry over negative tonnes of GHG for future years.

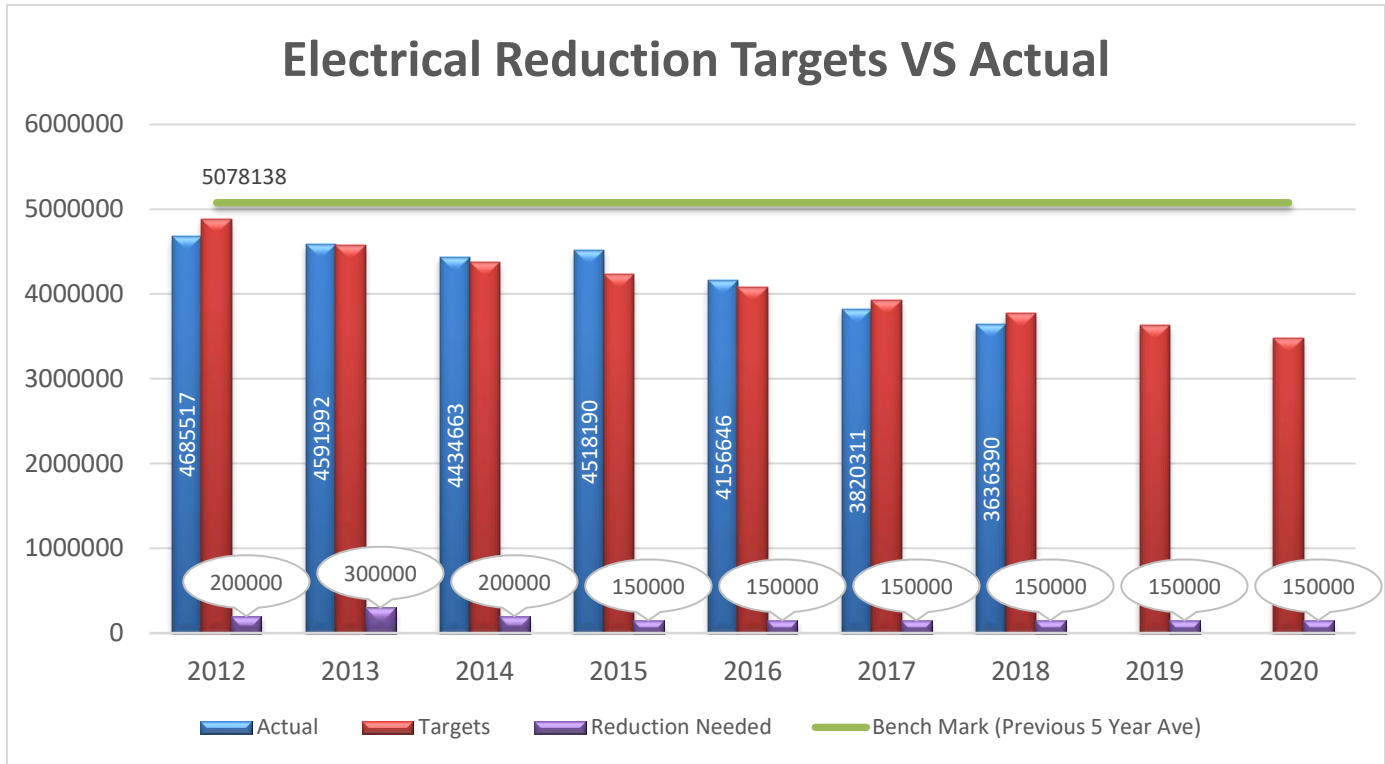
Source	Tonnes Claimed	Tonnes Diverted
GHG Produced	1104	
Yard Waste	-684	2252
Kitchen Organic	-286	719
Trenchless Tech	-193	
CRD Ind % Commercial	-192	
Total	-251	



2.6 Electrical Reduction Targets

In 2012 electrical reduction targets were established. The goal is to lower consumption by 1,600,000 kWh by 2020 and in doing so, protect the municipality from the burden of future hydro increases. Reducing electrical consumption also plays a key role in achieving our GHG reduction targets and together these targets will play an important role in Oak Bay's path to shrinking its carbon footprint.

This graph shows municipal electrical reduction targets along with the progress made so far. The base line is the average for the five previous years.



This strategy would serve to only keep our electrical bills at 2012 levels. This was based on estimated increases from BC Hydro, shown on the next page. These increase estimates underline the importance of taking action and ensuring that we continue to work towards these targets and goals.

Oak Bay is on track to achieve its electrical goal. As of yearend 2018 electrical consumption has been lowered by 1,441,748 kWh from the base line of 5,078,138 a drop of 28% in just 7 years.

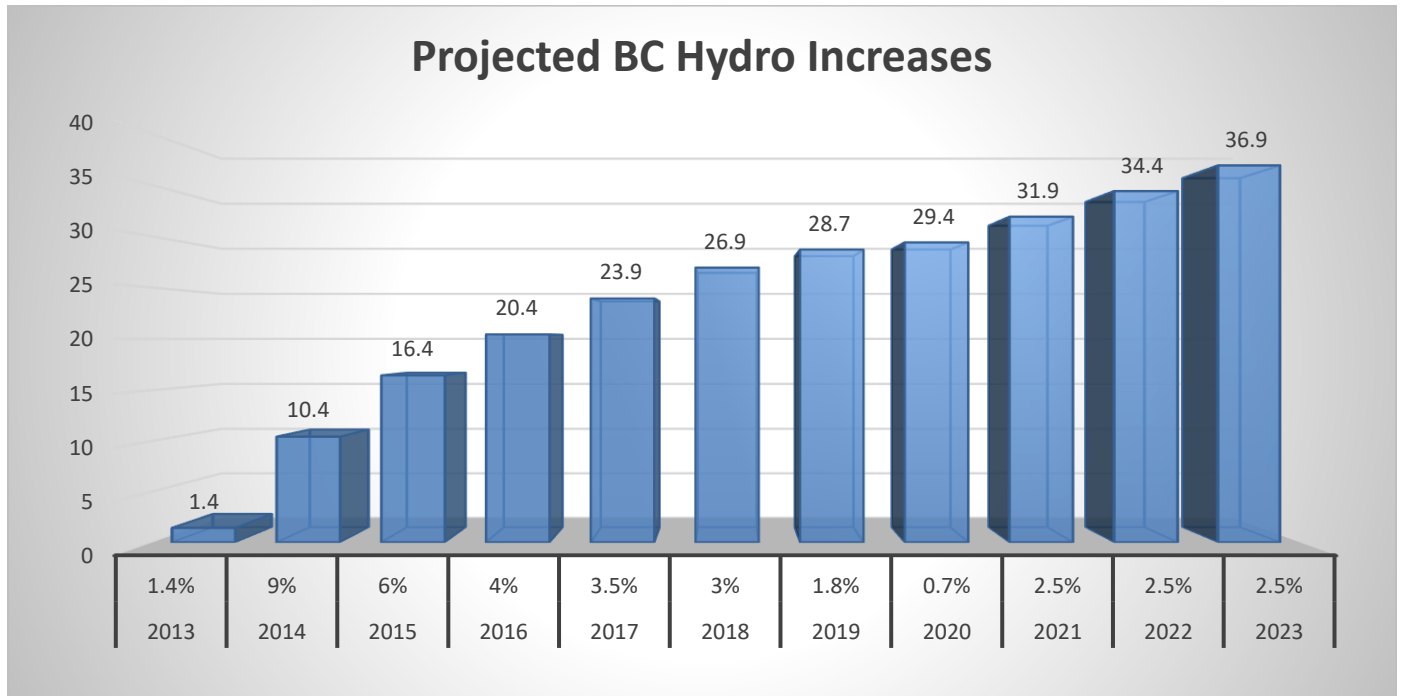
The bad news is that even with all the good work we have done in the past our costs are going up. In 2012 we paid \$358,796 for 4,685,517 kWh of electricity and in 2018 we paid \$402,678 for 3,636,390 kWh. If we had not been involved in energy conservation during that time the 2018 bill would have been \$482,872.

It's important to note that plug load growth is a constant factor to remember, as new devices are added future load growth will need to be controlled or balanced with additional savings for us to meet these targets.

- By making energy conservation part of our business strategy, we can keep energy costs at a manageable level while playing a responsible role toward protecting the environment.

2.7 Past and Projected Hydro Price Increases

The following graph shows projected and past BC Hydro increases from 2013 to 2023 and underscores the importance of working towards our municipal goals to reduce electrical consumption.



The five years from 2008 to 2012 also saw increases of 29.1%, this adds up to a 15 year total increase of 66%.

2.8 Budget

We have, to date, identified energy reducing projects and found funding as a capital project. The municipality has, in most cases, permitted the incentives received from these projects to be reinvested in other energy efficient projects. As of Feb 2019 we have approximately \$17,000 from this funding source.

Council has approved the creation of a reserve account to fund future projects that will assist in reducing GHG throughout the District. Starting in 2013, the funds received from the annual CARIP grant have been added to this fund. This year this grant comes in at about \$34,000.

In 2012 Oak Bay established a Climate Action Reserve and has been adding \$35,000 per year since that time. We now have \$245,000 in this reserve fund.

Oak Bay has a long history of taking advantage of grants and incentives. In fact to date Oak Bay has received, over the years, close to \$600,000 from BC Hydro. This was for energy studies, incentives and to fund the energy manager's position. Oak Bay has also received \$43,900 from NRCan, \$25,697 from Fortis BC and \$668,069 from the Strategic Priorities Fund to help with the new energy recovery loop.

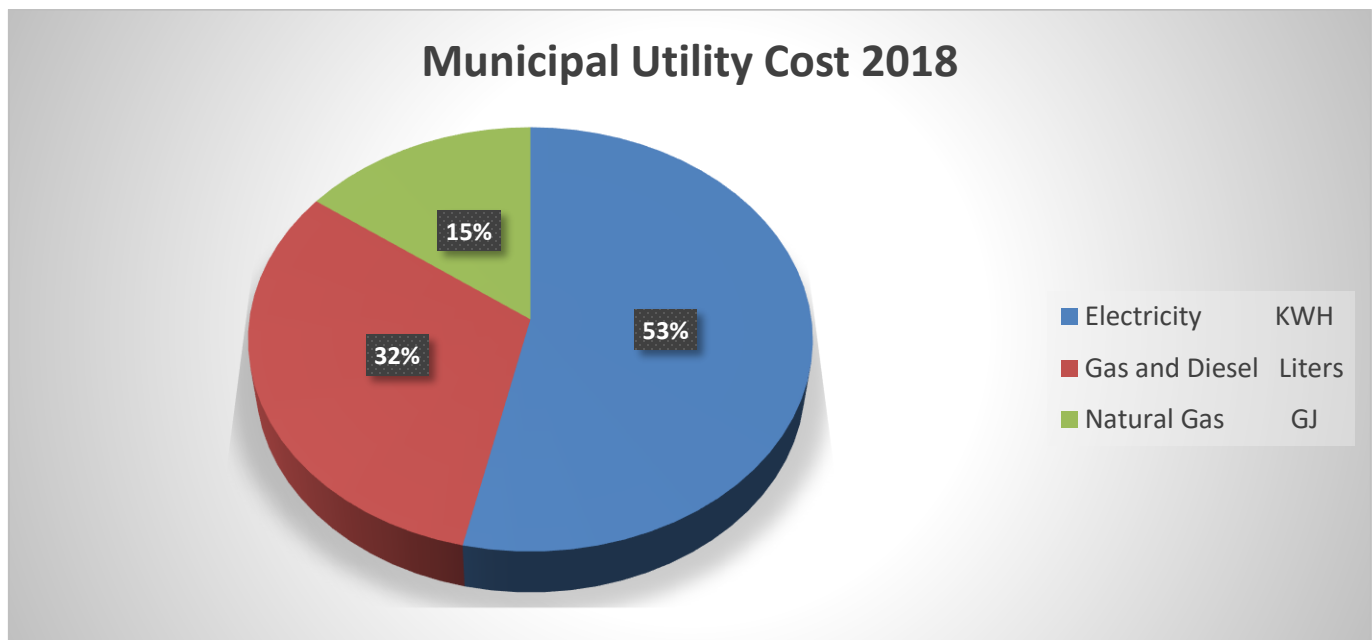
These funding sources have help make energy conservation "business as usual" and are a big help in reaching our conservation targets and goals.

3. Understanding Our Situation

3.1 Utility Consumption and Cost

Municipal Utilities (Jan – Dec 2018)	Consumption Unit	Costs \$	Percent %	GHG Tons
Electricity KWH	3,636,390	\$ 402,677.75	53%	38.8
Gas and Diesel Liters	193,136	\$ 237,707.00	32%	434.8
Natural Gas GJ	11,489	\$ 112,154.00	15%	577.9
Total		\$ 752,538.75	100%	1051.5

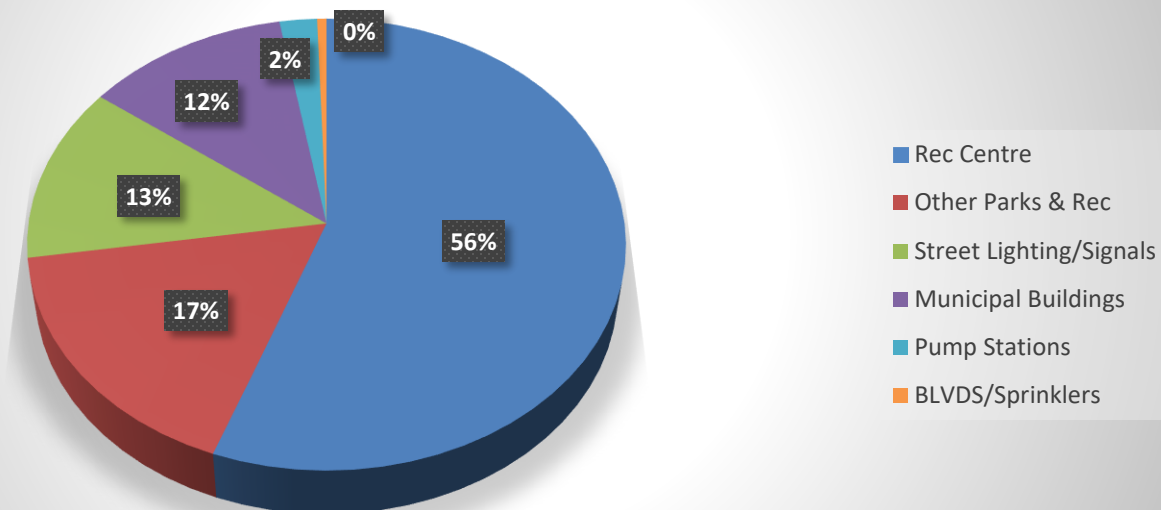
- GHG totals include police department related emission. Does not include contracted trucking.



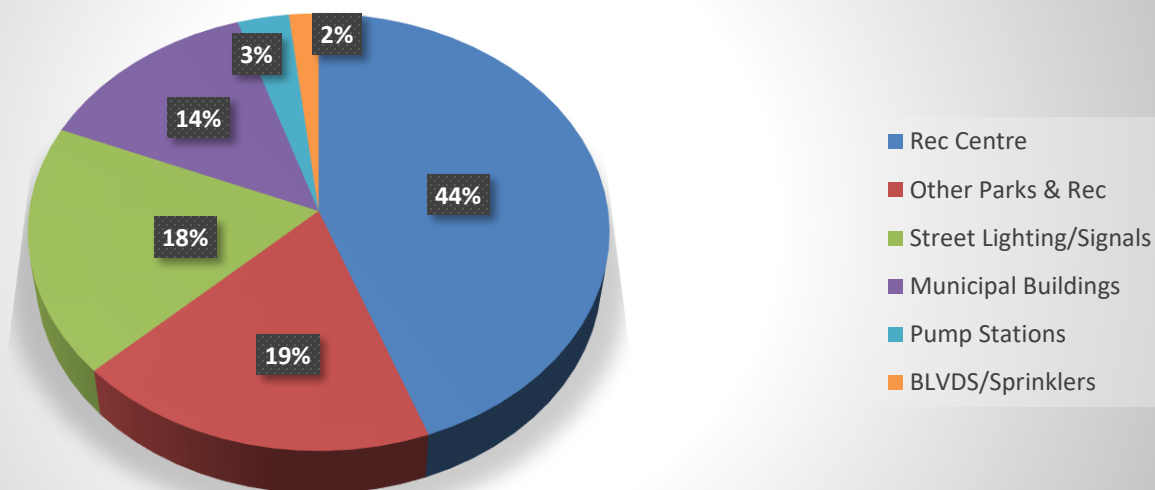
3.2 Electrical Consumption 2018

Municipal Electrical Usage 2018					
Sites	Consumption kW/h	%	Cost 2018	%	
Rec Centre	2023005	56%	\$178,715	44%	
Other Parks & Rec	616564	17%	\$74,536	19%	
Street Lighting/Signals	457571	13%	\$74,332	18%	
Municipal Buildings	438394	12%	\$55,161	14%	
Pump Stations	80773	2%	\$12,690	3%	
BLVDS/Sprinklers	20083	0%	\$7,243	2%	
Totals	3636390	100%	\$402,677	100%	

Municipal Electrical Consumption 2018



Municipal Electrical Cost 2018

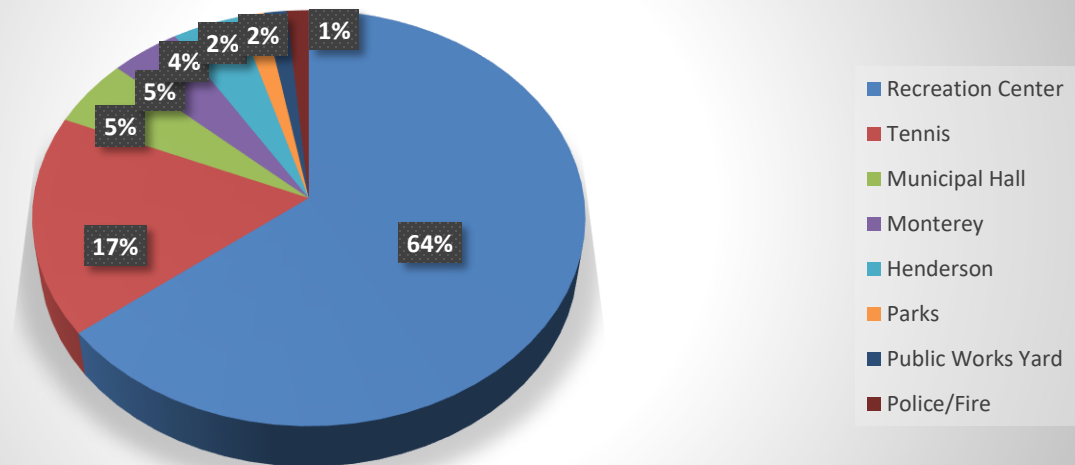


- The rate class for the Rec Centre has volume discounts built in and accounts for the big difference in percent of consumption to the cost paid.
- The 49 accounts associated with the boulevard/sprinkler tend to use very little electricity yet still have built in monthly charges, this accounts for the high cost to consumption ratio.

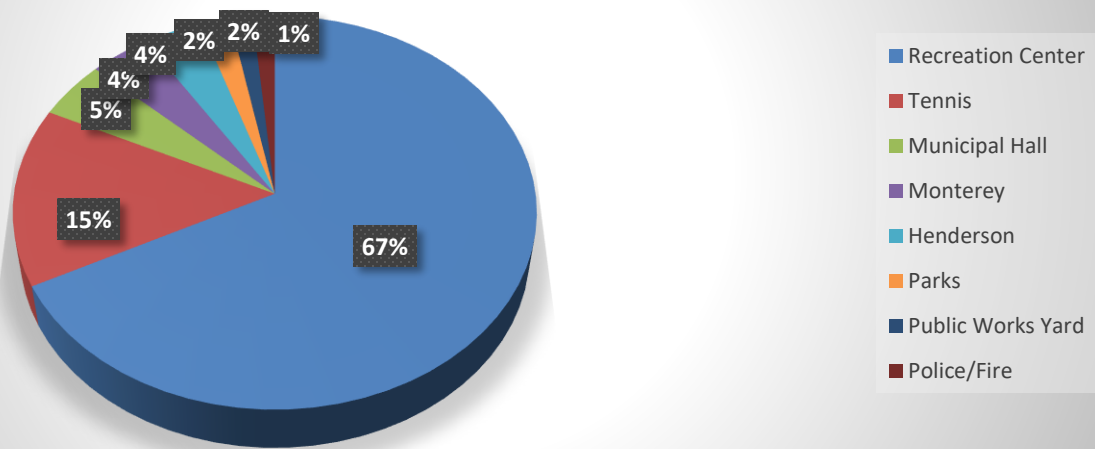
3.3 Natural Gas Consumption & Cost 2018

Site	Consumption GJ	Percentage	Cost 2018	Percentage
Recreation Center	7401	64%	\$75,690.00	67%
Tennis	1959	17%	\$16,450.00	15%
Municipal Hall	606	5%	\$5,356.00	5%
Monterey	511	5%	\$4,559.00	4%
Henderson	491	4%	\$4,393.00	4%
Parks	195	2%	\$2,308.00	2%
Public Works Yard	167	2%	\$1,725.00	2%
Police/Fire	161	1%	\$1,673.00	1%
Totals	11490	100%	\$112,154.00	100%

Municipal Natural Gas Consumption 2018



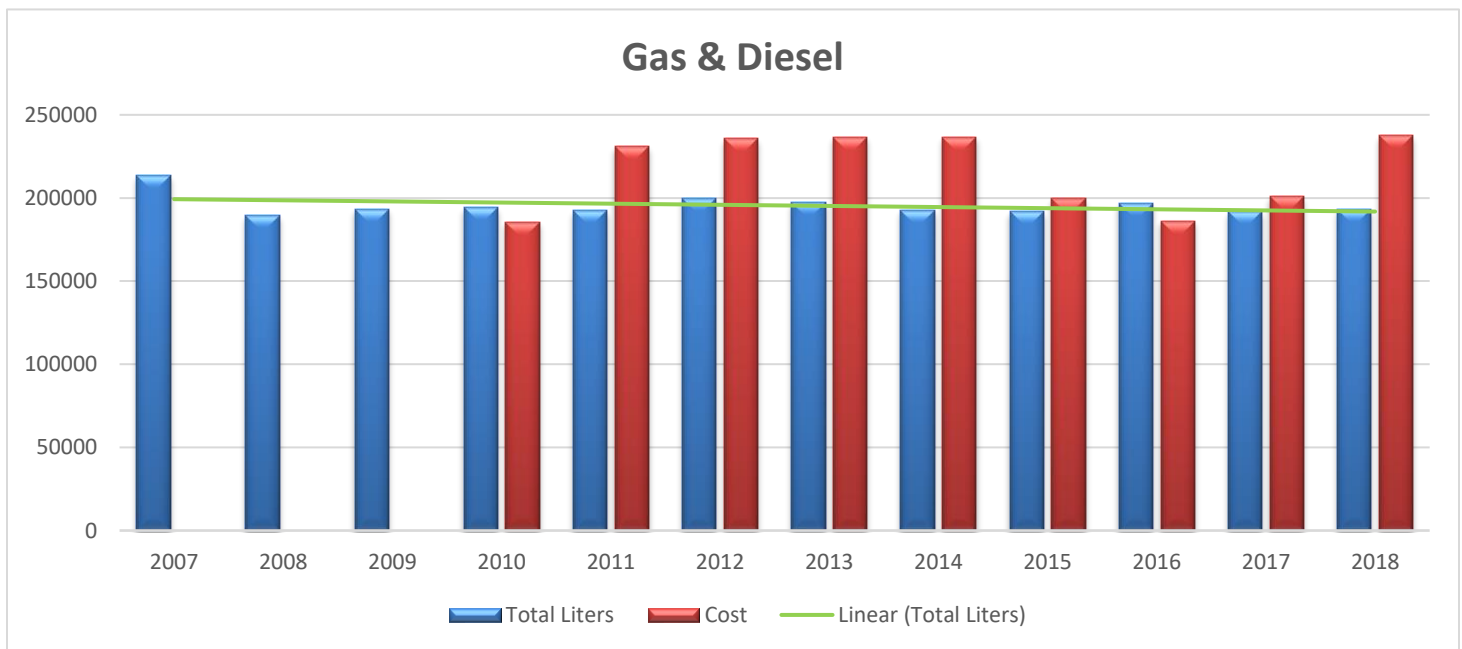
Municipal Natural Gas Cost 2018



Note the commodity prices differ at some buildings based on a Fortis rate structure based on consumption.

3.4 Gas and Diesel usage 2007 to 2018

Gas and Diesel				
Year	Gas Liters	Diesel Liters	Total Liters	Cost
2007	118858	94615	213472	
2008	114360	75294	189633	
2009	108278	85074	193352	
2010	111969	82333	194302	\$ 185,558
2011	102044	90401	192445	\$ 231,195
2012	103697	96146	199843	\$ 235,836
2013	99564	97653	197217	\$ 236,820
2014	95266	97470	192736	\$ 236,613
2015	95689	96306	191995	\$ 199,638
2016	95979	100612	196591	\$ 186,146
2017	96276	95654	191930	\$ 201,164
2018	98003	95133	193136	\$ 237,707



On April 1, 2019, B.C.'s carbon tax rate rose from \$35 to \$40 per tCO₂e. The tax rate will increase each year by \$5 per tonne until it reaches \$50 per tonne in 2021. This will again add a significant increase to the gas and diesel costs for 2019 and beyond.

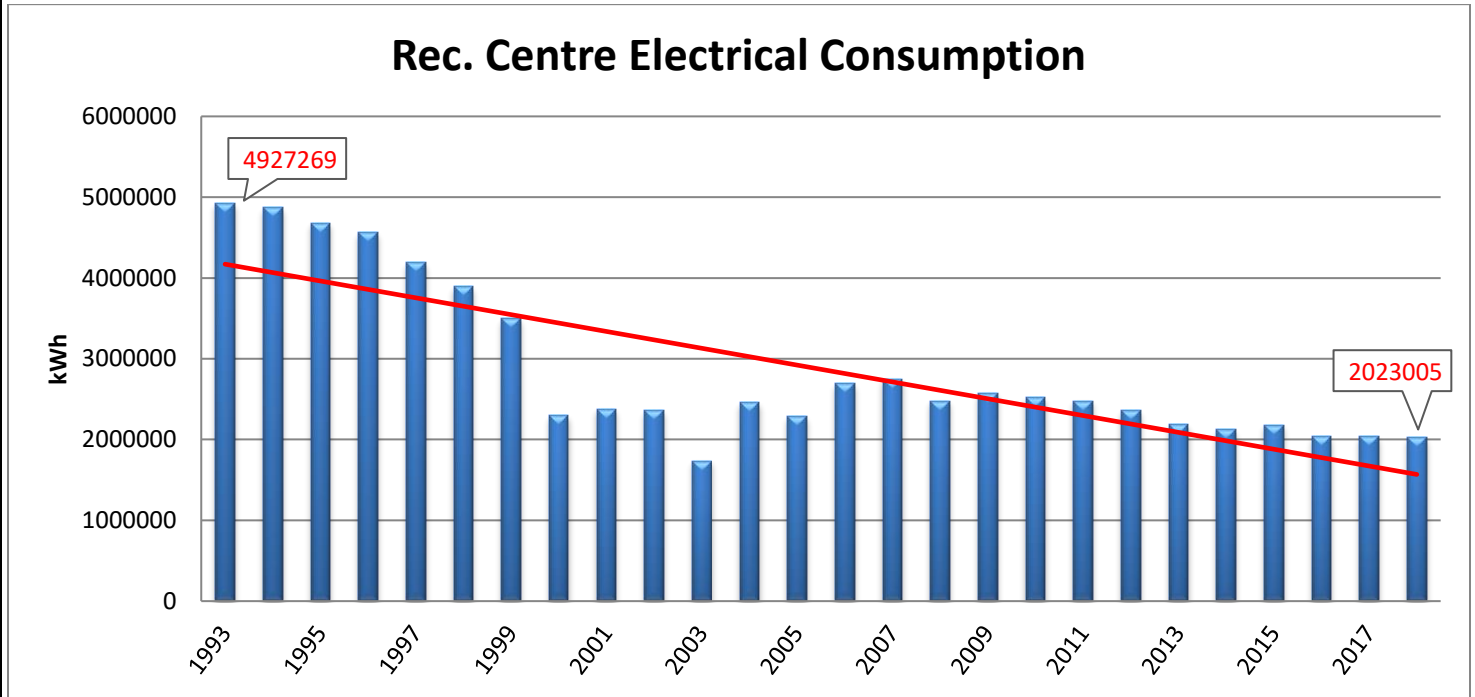
The good news is that the Carbon Tax that the Municipality pays, (not only for gasoline and diesel but natural gas and other fuel products), during the year comes back to us in the form of a Carbon Credit, as long as we continue to be part of the Climate Action Revenue Incentive Program (CARIP). For 2018 Oak Bay will be receiving \$34,472.

At this point we are still looking for a good long term plan to reduce our dependence in this area.

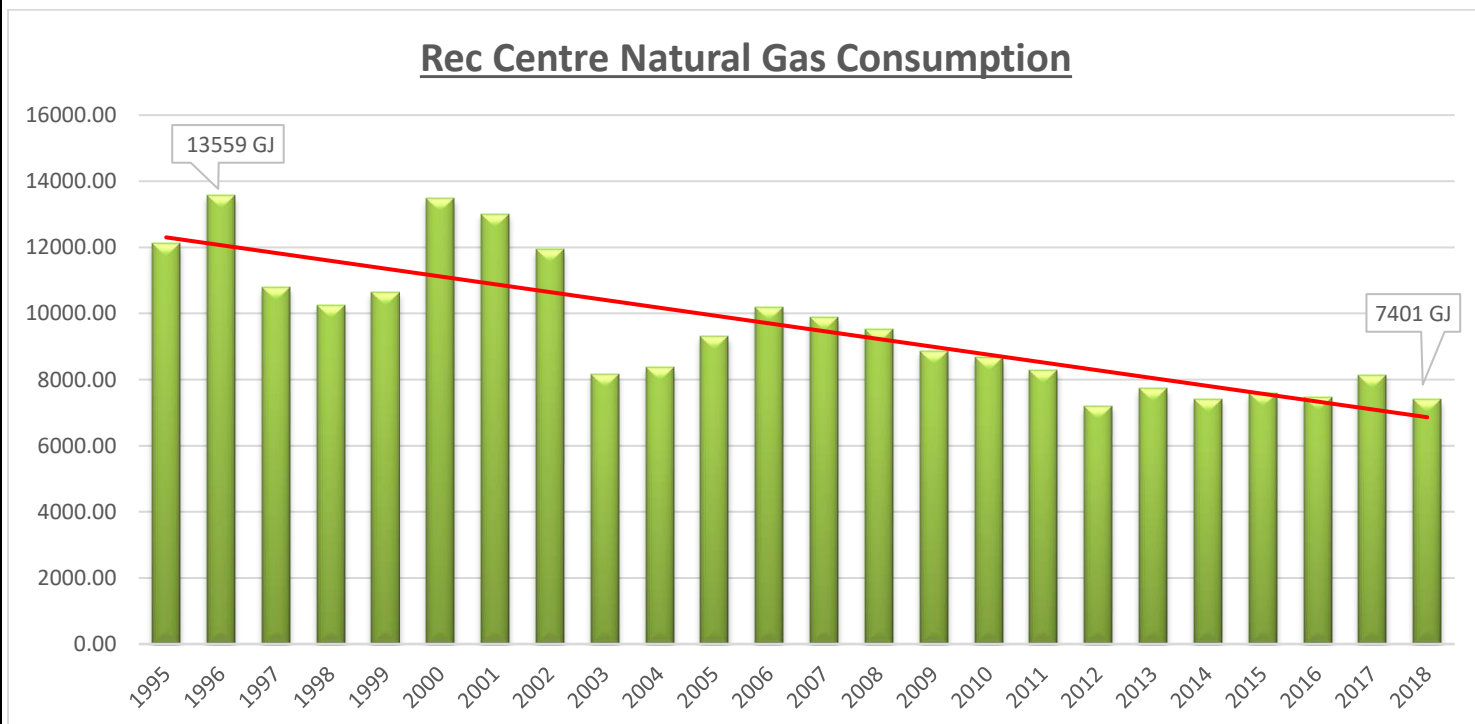
3.6 Recreation Centre Consumption History

The Recreation Centre represents the largest user of hydro and natural gas in the municipality.

The following chart shows the drop in electrical consumption over the last 25 years. The Recreation Centre now consumes **59 % less** than what it did in 1993. That's enough electricity to power 277 homes for a year.



The Recreation Centre's Natural Gas consumption is now down by 45% over historical levels. 1996 used 13,559 GJ that is now down to 7,401 GJ a savings of 6,158 GJ. That is equivalent to 310 tonnes of GHG.



In 2003 the heat load for the main pool was changed from natural gas to an electrical process that uses waste heat from the new pool dehumidifier.

Recreation Centre renovations and no summer ice due to sub floor heating problems account for dip in consumption for 2003 to 2005.

In 2016 a REALice system was installed in the ice rink saving the need to use hot water for flooding the ice and enabling the slab temperature to be set warmer than before.

Unfortunately colder than normal weather and key mechanical problems have contributed to higher than expected consumption over the last part of 2016 and through to the first part of 2018.

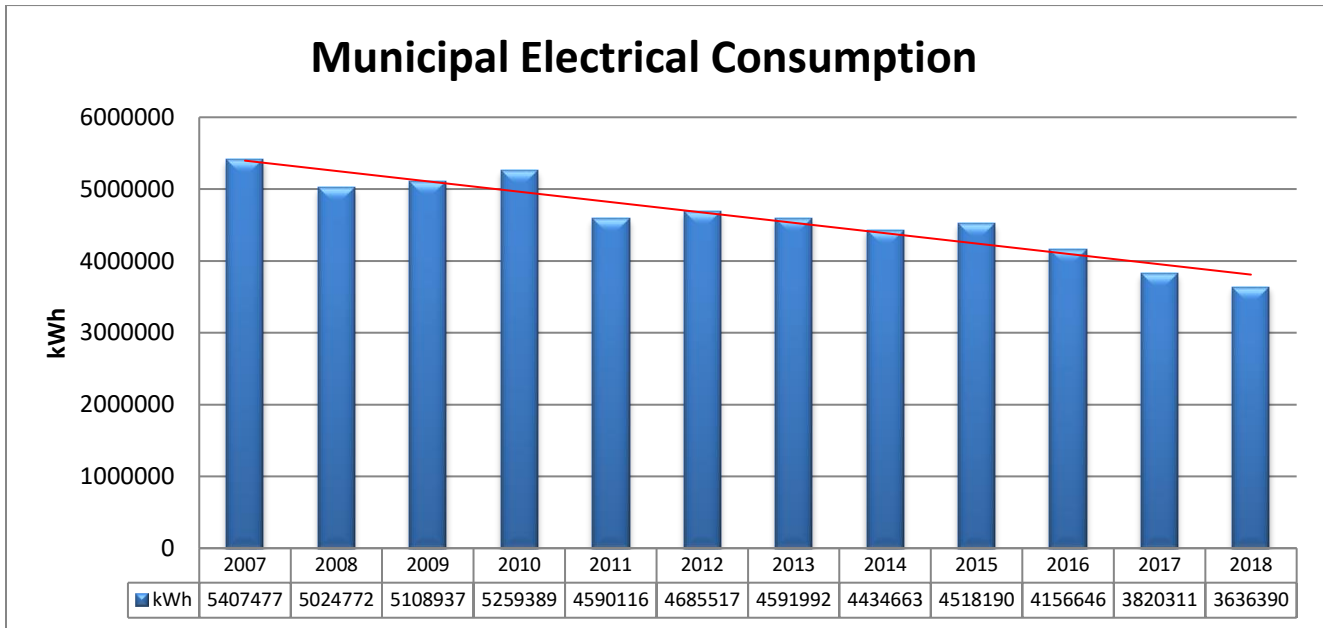
The new energy recovery loop is expected to dramatically reduce the Rec Centre's and the Tennis Bubbles dependence on natural gas.

❖ **In 2013 the Oak Bay Recreation Centre hit the 50% reduction mark for combined energy savings.**

When we added the 57% electrical savings with the 43% Natural Gas savings, and convert to ekWh, we saw savings of more than 50% over our historical energy consumption levels. This does not include the \$10,000 propane bill we eliminated when we converted to an electric Zamboni. This represented a major milestone in our conservation efforts.

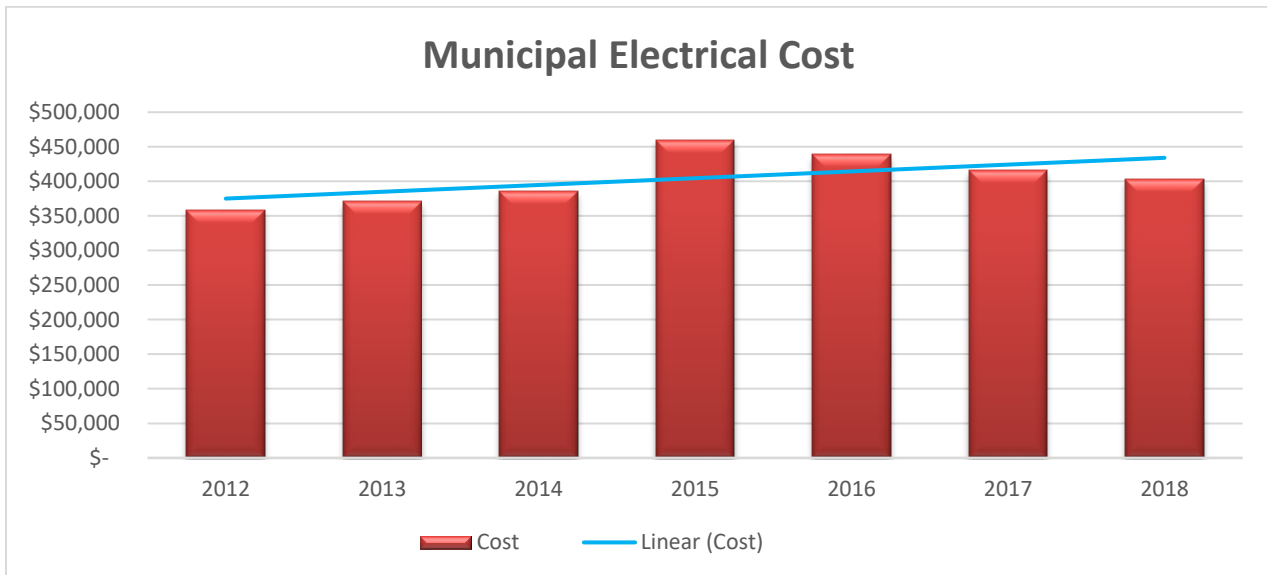


3.7 Municipal Yearly Energy Consumption



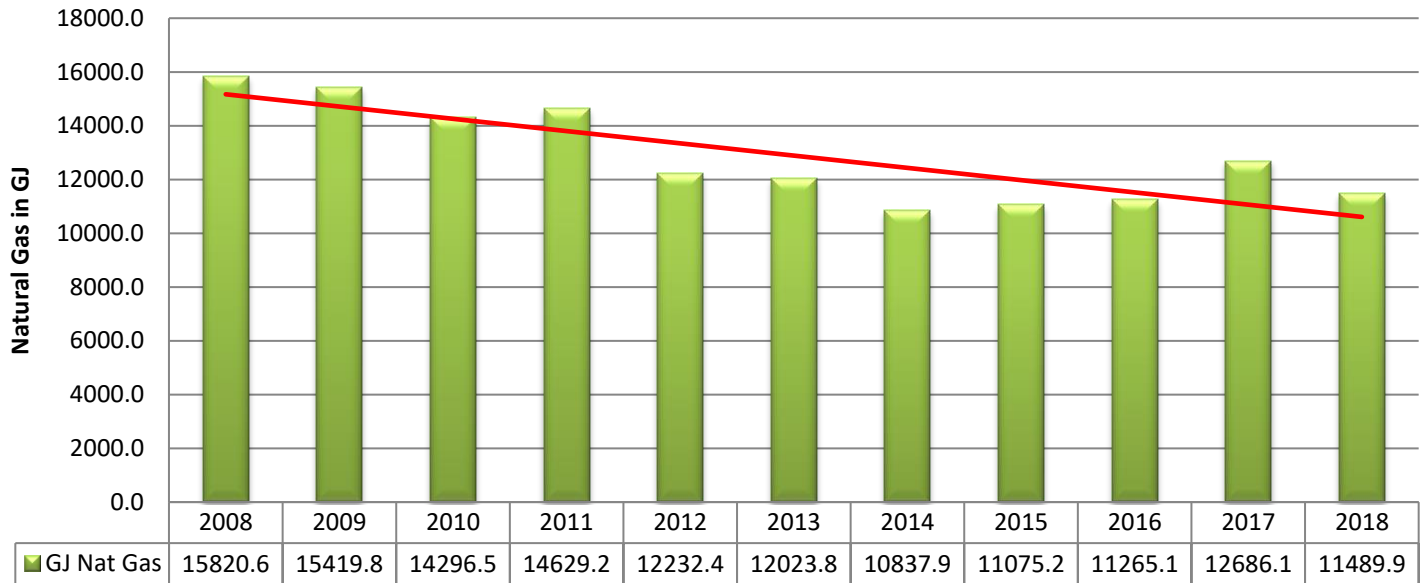
The Municipality has reduced consumption by 1,771,087 kWh since 2007, a 33 % drop.

The entire municipality now uses 1,290,879 kWh less electricity than what the Rec Centre alone used in 1993.



Unfortunately, as we see above, the costs just keep going up, the estimate looks close to 66% from 2013 to 2023. Our original reduction strategy was based on lowering consumption at a rate that would keep our costs level and even though we are ahead of schedule with our conservation efforts, the increases have outpaced our efforts and we continue to see the cost increase.

Municipal Natural Gas Consumption



In 2018 Oak Bay used 4331 GJ less than 2008, a 27 % drop. This has been a huge help in lowering GHG emissions.

In November 2010 Henderson Centre changed its heating load from oil to natural gas by adding a new high efficient boiler. With this change and a colder than normal year, we see a spike in consumption for 2011.

In 2012 a tankless hot water system was installed at Henderson Centre, removing the need for the new boiler to run during the summer months.

2012 marks the beginning of our energy awareness campaign. Although the weather was slightly warmer and we did do a few capital projects, the savings were far beyond what can be attributed to just those items. The remaining savings were clearly from staff changes in attitudes towards energy usage.

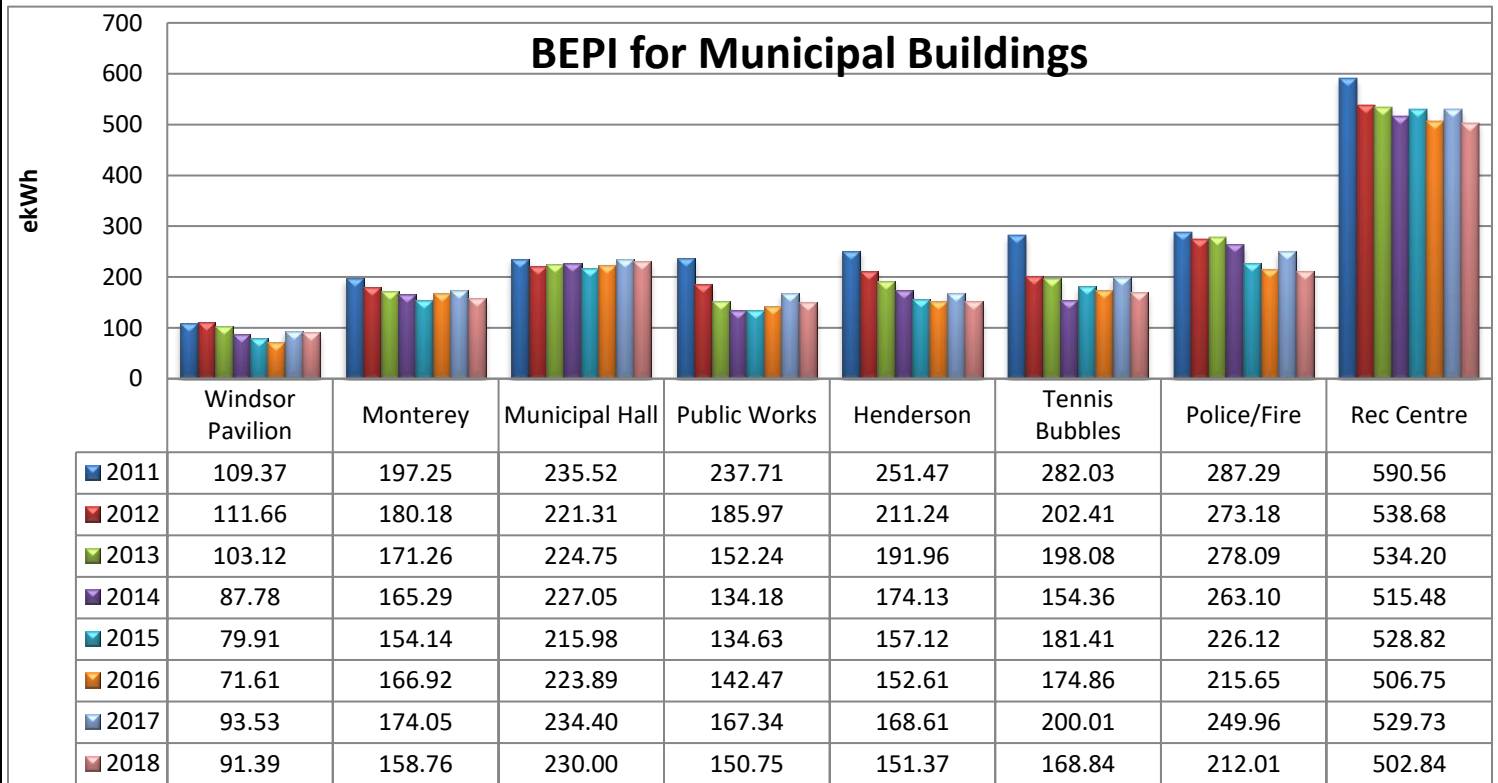
Cooler than normal weather and mechanical issues at the Rec Centre have pushed consumption up over the last few years.

With the new energy recovery loop now up and running we are expecting significant savings in years to come.



3.8 Facility Energy Intensity

These charts show the Building Energy Performance Index (BEPI). The area of each of our buildings is compared to its energy consumption; we can then see how their performance compares to each other and how they compare to other similar buildings.



The unfortunate part is that all our buildings vary so much in when and how they were built, as well as how and what they are used for. Therefore in Oak Bay we need to look a lot harder at the variables before we can label a building a good or poor performer. For example, it's easy to see that the Windsor Pavilion has the best BEPI, this is Oak Bay's newest building and its function is not energy intensive.

The worst performing building is the Rec Centre, however it's important to note that buildings with indoor pools are generally considered to be 5 times more energy intensive than conventional buildings. This along with the arena and other high energy intensive equipment tend to push recreation centers into a class of their own.

The significance of this BEPI chart is to show that most of the municipality's buildings have greatly improved their energy performance over the last few years. This shows that we are definitely on the right path to lowering consumption. In fact, when comparing Oak Bay's municipal buildings to a recent benchmarking exercise done by Prism Engineering, all of Oak Bay's buildings rank below, or well below, the median line for similar municipal buildings around the province.

BEPI information is also used to compare building energy usage to weather. Heating Degree Days (HDD) are compared to the building BEPI to show performance improvements over the years. In our case all building with the exception of the municipal hall show consistent improvement.

Year	2011	2012	2013	2014	2015	2016	2017	2018
HDD	2864.3	2729.3	2711.9	2404.3	2247.1	2317	2667.7	2458.4

4. Our Actions

4.1 Previous Actions

Over the years Oak Bay has been involved in many energy saving projects resulting in impressive conservation numbers. The project list, found in Appendix B on page 24, shows the projects, estimated savings, and an adjustment for the price increases over the years to show actual savings.

From this project list we can account for the following in savings, as of yearend 2018. I have also included the projects done in early 2019.

- \$2,883,397 in actual savings and \$2,117,535 in avoided cost for a total savings of \$5,000,932
- \$465,096 in yearly savings.
- 13872.3 Tonnes of GHG reduced to date and 11,735 Tonnes of GHG per year.
- 3,399,313 kWh of electricity and 11,735 GJ of natural gas.

It is important to note that the actual savings Oak Bay has accomplished are beyond what can be accounted for on the project list. The Recreation Centre alone has lowered its electrical consumption by 2,738,618 kWh over the last 20 years. The remaining savings can be attributed to behavioral and procedural changes; also many of these projects exceeded their estimated savings.

In 1993 the Rec Centre used 4,927,269 kWh of Hydro at a cost of \$157,645 and paid .032 cent per kWh. If no changes had been made, that consumption would cost us \$482,872 in 2018, instead of the actual \$178,715 paid. That's \$304,157 in avoided cost.

The electrical reduction at the Rec Centre over the last 20 years is equivalent to powering 277 homes each year.

The GHG emissions the municipality has reduced over its historical levels are equivalent to removing 248 average passenger cars from the road and you would need a 1,373 acres forest to sequester this amount of carbon each year.

- Please refer to the full list of past projects in appendix B on page 23.

4.2 Continual Optimization Program (COP)

The Recreation Centre was part of a BC Hydro sponsored program called COPs. This program searched for improvements in efficiencies within our building management system and sets out to optimize their performance. It started with a one year monitoring stage (April 2014 to April 2015), during this time we were unable to be involved in energy upgrades to this building. Improvements were then made based on the study's findings saving an estimated 108,245 kWh of electricity, 730 GJ of natural gas, \$25,151 and 38 tonnes of GHG. Coaching sessions continued for several years but unfortunately this program has now ended. However the lessons learned will be invaluable to staff in the years to come.



4.3 Actions in 2017/18/19

Projects - In 2017/18/19, the following projects were completed saving \$102,075 Dollars, 590,665 kWh of Electricity, 3664 GJ of natural gas and 190.37 tonnes of GHG per year.

Recent Projects	All Oak Bay Annual Savings									
	Location	Year	Description	Cost	Incentive	Payback	\$	GJ	kWh	GHG
Street Lighting	2017		Phase 2 LED Street Lights	\$ 126,588	\$ 29,988	4.48	\$21,565	0	227,000	2.4
Henderson	2017		Henderson Parking Lot	\$ 1,400		3.9	\$ 363	0	4,030	0.0
Monterey	2017		Gary Oak Lighting Pool Overhead LED	\$ 18,252		46.0	\$ 397	0	4,415	0.1
Rec Centre	2018		Lights	\$ 6,927		4.39	\$ 1,578	0	14,349	0.2
Rec Centre	2018		Tennis Bubble LED Lights	\$ 53,135		4.27	\$ 12,451	0	113,191	1.1
Street Lighting	2019		Phase 3 LED Street Lights	\$ 110,000		4.37	\$ 25,190	0	229,000	2.4
Rec Centre	2019		Energy Recovery Loop	\$ 763,135	\$668,069	2.54	\$ 37,320	3664	- 33,153	184.0
Rec Centre	2019		Pool Change room Lights	\$ 1,355		1.04	\$ 1,300	0	14,454	0.0
Henderson	2019		Gym LED Upgrade	\$ 4,000		2.09	\$ 1,911	0	17,379	0.2
			Total	\$1,084,792	\$698,057	3.79	\$102,075	3664	590,665	190.4

4.4 Behavioral Changes

- **Energy Reports** – Reports are sent out quarterly to building managers that compare each building’s consumption with the previous years and shows how they are doing in relation to average temperature and the trends of the other buildings. Other energy related information is passed on in these reports.
- **Attitude** – It’s clear from the energy reports that we are seeing the results of a changing attitude towards energy use. Almost all areas have seen improvement in their consumption.
- **Programming and controls** – There have been a long list of changes and improvements to controls and programming. Examples are refinements to heating controls, lighting timers and motion sensors in many areas, exhaust fans now on a timer in the pool area, humidity set point changes and many more.
- **Employee Awareness** – Over the years Oak Bay has worked with BC Hydro’s Out Reach program, have had bi-monthly newsletters, were part of a Social Media Pilot project, had several awareness campaigns and had an energy team for many years. For now these initiatives have come to a stop as we wait for the next energy champions to step forward. However the lasting effects of these programs can clearly be seen in the conservation numbers and in our employee’s attitudes.

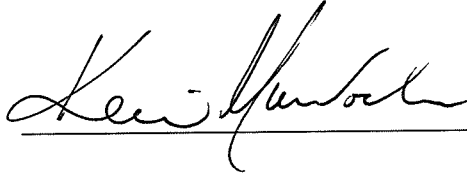
4.5 Looking to the Future

As we look for future energy saving, it’s clear that the more you look the more you see. Since the 2012 walk through energy study many exciting energy saving opportunities have come to light and in most cases have been dealt with. Some items however still remain on the list but in most cases the cost vs payback are not as desirable. Others are on the radar but require more investigation and in some cases a little engineering.

- **New Energy Study** - The next big step to reducing our energy consumption is to do a new energy study. Our last study was completed in 2012 and although there are a few items left to be dealt with the costing and the technologies are now out of date. A new study will produce an up to date list of savings opportunities with up to date cost and saving numbers. This would then be a big part of our road map for future savings.
- **Solar Voltaic Panels** – With the price of this technology coming down substantially over the last few years. We have completed a feasibility study and are looking to install a system that would deliver 100,000 kWh per year. This system will cost about \$350,000 and be mounted on the Rec Centre roof. A system like this would offset the additional power required for the new energy recovery loop and give us a buffer within our electrical goals to add future items without negatively affecting our energy targets. As this project has a long payback it is hoped that funding becomes available in the way of a grant.
- **Lighting opportunities 10 Watt LED** – The recent upgrade to the swimming pool change room lighting highlights a great new lighting opportunity. 25 watt florescent tubes were replaced with 10 watt LED tubes saving over 1400 kWh of electricity. This retrofit could be replicated on all our florescent lighting throughout our municipal buildings, however, in some areas the ballast will need to be replaced. In this case the payback would be extended from 1 year to 3 to 5 years based on run time.
- **Arena & ISF Lighting** – When these lights were last replaced there were no viable LED options for these high bay fixtures. Now it's conceivable that these areas could be lit with about half the energy. The other concern is that the kind of lighting currently being used is no longer supported. Therefore, as fixtures fail in the future we will need to find a suitable substitute to spot replace failed fixtures until a full change out is completed.
- **Rec. Centre lobby lighting** – Each 2x2 fixture has 3 – 25 watt Compact Florescent tubes. There are now replacements that could dramatically reduce their consumption but unfortunately they are relatively new to the market and are quite expensive. It is recommended that this project be kept on the radar until the costs are more reasonable.
- **Heat pumps for Monterey** – The Monterey centre is heated by a combination of natural gas and electric baseboard, with the Palm court having a small heat pump. The plan is to add three to four heat pumps. This would eliminate the need to use natural gas for heating purposes and eliminate the inefficient baseboard heat. This will be a big help with our GHG targets, lower heating cost and a big boost on the maintenance end by replacing older equipment with new state of the art equipment. This project needs to be fully priced and a solution to the full electrical panels needs to be found.
- **The fleet** – The gasoline and diesel used by our public work crew is a major issue if we plan to reduce our GHG emissions any lower than about 35%. Most of the larger GHG saving opportunities in our buildings are behind us, therefore future savings will need to at least in part involve changes in this area. Research into this issue will need to be done to come up with a plan for the future.
- **New Technology** - This is the big hope for the future, as technology improves, more and more opportunities will become available. A few years ago many of the projects that we are now saving a lot of money on seemed like just a dream. The truth is we don't know what the future will bring, but we should make sure that we are in a good position to take advantage of them when future opportunities arise. We can do this by taking the time to look for these opportunities and by coming up with a funding plan to ensure we can move forward in a timely manner.

5. Senior Management Approvals

By signing below, Oak Bay's senior management acknowledges receipt and approval of the Strategic Energy Management Plan.



Kevin Murdoch, Mayor



Lou Varela, Chief Administrative Officer

6 Appendices

6.1 Appendix A

Stakeholders – The main stakeholders are;

- 18000 Residents and Taxpayers in Oak Bay.
- Oak Bay Council and the parks and Recreation Commission.
- BC Hydro.
- Fortis BC
- All Departments within the District of Oak Bay

List of Energy Team

Stakeholders – Energy Team			
Name	Title	Area	Contact Info
Mary Kucera	Marketing	Parks & Recreation	mkucera@oakbay.ca
Ray Herman	Director of Parks and Recreation	Parks & Recreation	rherman@oakbay.ca
Ken Olson	Energy Manager	Olson Energy Management	kolson.emc@gmail.com
Simon Vickers	Tennis Program Supervisor	Recreation Centre	svickers@oakbay.ca
Caroline Lawrence	Sports (Arena) Coordinator	Recreation Centre	clawrence@oakbay.ca
Barry Russell	Maintenance Henderson	Henderson Centre	brussell@oakbay.ca

Energy Volunteers

Stakeholders - Volunteers			
Name	Title	Area	Contact Info
Debbie Carter	Director of Financial Services	Municipal Hall	dcarter@oakbay.ca
Jim Pearson	Facility Operation Coordinator	Recreation Centre	jpearson@oakbay.ca
Mandi Krieger	Human Resources	Parks & Recreation	mkrieger@oakbay.ca
Garrett Matthews	Electrician	Public Works	gmatthews@oakbay.ca
Steve Meikle	Manager, Recreation and Cultural Services	Recreation Centre	smeikle@oakbay.ca

6.2 Appendix B

Energy Projects to Date

Project	Year	Cost	Incentives	KWH Saved	GJ Saved	GHG Saved	Yearly Savings at time of install	Adjusted Savings in 2018 Cost	Comment	Savings to date without inflation	Savings with cost increases included	GHG saved to date
Solar Heating System	1985				795	40	\$4,000	\$8,745	Federal Grant	\$132,000	\$272,558	1320.0
Pool underwater Lights	1985			109,500	0	2.73	\$1,083	\$9,855	1000W to 500W	\$35,739	\$180,204	90.1
Natural Gas conversion	1994	\$53,700				350	\$25,952	\$3,850	From Oil at 4.96 GJ in 94	\$596,896	\$1,199,022	8050.0
Energy upgrade	1996	\$161,013	\$51,158	569,177	1,000	50.3	\$23,779	\$62,657	Inc. Mont & Hend Used from Memorial Arena	\$523,138	\$1,378,454	1107.0
Low E ceiling Arena	2002	\$2,000		142,857	0	3.57	\$7,000	\$12,857		\$112,000	\$203,710	57.1
Arena Pony Pump	2002	\$2,700		91,836	0	2.3	\$4,555	\$8,265		\$72,880	\$130,952	36.8
Power Factor Correction	2004				0		\$1,524	\$1,524		\$21,336	\$21,336	
Subfloor Heat Project	2006			89,686	0	2.24	\$4,000	\$8,072	From Electric to Waste	\$48,000	\$72,017	26.9
Lighting Fire/police	2009		\$3,637	52,344	0	1.3	\$2,977	\$6,543	Lighting retrofit	\$26,793	\$51,754	11.7
Condenser Project	2009			33,074	0	0.83	\$1,700	\$2,977		\$15,309	\$26,561	7.5
Work truck 4 cyl	2009				0	0.9	\$500	\$600		\$4,500	\$4,900	8.1
Lighting Public Works	2009		\$4,078	31,558	0	0.79	\$1,893	\$2,840		\$17,037	\$33,295	7.1
Energy Upgrade	2010	\$351,674	\$155,603	492,529	2,435	185.24	\$63,406	\$71,113	Mont, Hend, & Rec Centre	\$507,248	\$580,556	1481.9
Boiler Henderson	2010	\$83,000	\$7,422		364	49.6	\$5,282	\$4,004		\$42,256	\$40,888	396.8
Electric Zamboni	2011	\$128,075			0	19.6	\$10,000	\$10,000	Include Trade in	\$70,000	\$70,000	137.2
Tennis Lights	2011	\$41,199	\$25,388	161,000	0	3.54	\$13,806	\$16,100	From 1000W to 575W	\$96,642	\$132,825	24.8
Lighting Municipal Hall	2011		\$6,109	43,970	0	1.1	\$3,737	\$4,397		\$26,159	\$36,274	7.7
Insulation 3 Court Bubble	2011	\$30,140			647	33	\$8,100	\$7,117	3 Court	\$56,700	\$53,054	231.0
LED Lights Bleachers	2011	\$2,100	\$1,263	10,687	0	0.23	\$556	\$962		\$3,892	\$6,679	1.6
Other lighting projects	2011	\$856	\$642	13,905	0	0.31	\$723	\$1,251	Kitchen, washrooms etc	\$5,061	\$8,692	2.2
DHW Henderson	2012	\$9,762			150	7.55	\$2,250	\$1,650	Boiler is now off all summer	\$13,500	\$10,500	45.0

Energy Study	2012	\$5,000			0				Projects for 2013 and future			
Compressor upgrade	2012	\$35,740		83,300	0	1.8	\$5,498	\$7,495	M Series	\$32,988	\$43,899	10.8
Lighting Arena & ISF	2012	\$49,655	\$37,395	98,039	0	2.44	\$5,883	\$8,823	Lighting was increased	\$37,992	\$51,470	14.6
LED Pool underwater	2013	\$10,500	\$3,000	89,177	0	2.25	\$6,332	\$8,026	Jun-13	\$31,660	\$40,710	11.3
Occupancy & Mezz	2013	\$3,200	\$1,000	27,824	0	0.69	\$1,976	\$2,504	Jun-13	\$9,880	\$12,702	3.5
LED Windsor & Mont	2013	\$1,259		21,206	0	0.4	\$1,506	\$1,909	Nov-13	\$7,530	\$11,297	2.0
4 Court Insulation	2013	\$40,000			776	39.6	\$9,700	\$8,536	Sep-13	\$48,500	\$45,008	198.0
Rec Occupancy Sensors	2014	\$438.00		12,867	0	0.1	\$952	\$1,158		\$3,808	\$5,258.0	0.4
Hall Vent & Heat Opt	2014	\$5,750		18,213	38	72.9	\$2,604	\$2,057		\$10,416	\$8,961.0	291.6
Henderson DDC	2014	\$18,795		15,646	186	9.6	\$4,759	\$3,454		\$19,036	\$15,284.0	38.4
C.O.P. Rec. Centre	2015	\$67,750	\$17,000	108,245	730	38	\$25,151	\$17,772		\$75,453	\$60,695.0	114.0
Phase 1 LED Street Lights	2016	\$147,000	\$59,083	242,984	0	2.6	\$20,727	\$21,869	Phase 1 and Pilot	\$56,999	\$60,139.8	5.2
Lighting Rec Centre	2016	\$45,373	\$19,793	87,312	0	1	\$7,505	\$7,858	Fitness, Etc.	\$18,763	\$20,897.0	2.8
REALice	2016	\$35,000	\$17,048	150,446	950	49.7	\$22,050	\$23,990		\$55,125	\$59,975.0	124.3
Monterey Parking Lot	2016	\$2,500		11,266	0	0.1	\$822	\$1,014		\$2,055	\$2,535.0	0.3
Phase 2 LED Street Lights	2017	\$126,588	\$29,988	227,000	0	2.4	\$21,565	\$22,700		\$32,348	\$34,050.0	3.6
Henderson Parking Lot	2017	\$1,400		4,030	0	0.04	\$363	\$383		\$545	\$574.0	0.1
Mont. Gary Oak Lighting	2017	\$18,252		4,415	0	0.05	\$397	\$419		\$596	\$629.0	0.1
Pool Overhead LED Lights	2018	\$6,927		14,349	0	0.15	\$1,578	\$1,578	7 in 2016, 11 in 2018	\$789	\$789.0	0.1
Tennis Bubble LED Lights	2018	\$53,135		113,191	0	1.08	\$12,451	\$12,451		\$11,828	\$11,828.0	1.0
Phase 3 LED Street Lights	2019	\$110,000		229,000	0	2.44	\$25,190	\$25,190				
Energy Recovery Loop	2019	\$763,135	\$668,069	-33,153	3664	184	\$37,320	\$37,320				
Pool Change room Lights	2019	\$1,355		14,454	0	0.1	\$1,300	\$1,300				
Henderson Gym Lighting	2019	\$4,000		17,379		0.2	\$1,911	\$1,911				
Totals		\$2,418,971	\$1,107,676	3,399,313	11,735	1166.77	\$404,363	\$465,096		\$2,883,397	\$5,000,932	13872.3