WHISTLER **ENERGY CONSUMPTION** AND **GREENHOUSE GAS** PERFORMANCE TRENDS

2016 ANNUAL REPORT

Corporate, Economic & Environmental Services Department
The Resort Municipality of Whistler | December 2017

THE PREMIER MOUNTAIN RESORT COMMUNITY
MOVING TOWARD A SUSTAINABLE FUTURE

WHISTLER

TABLE OF CONTENTS

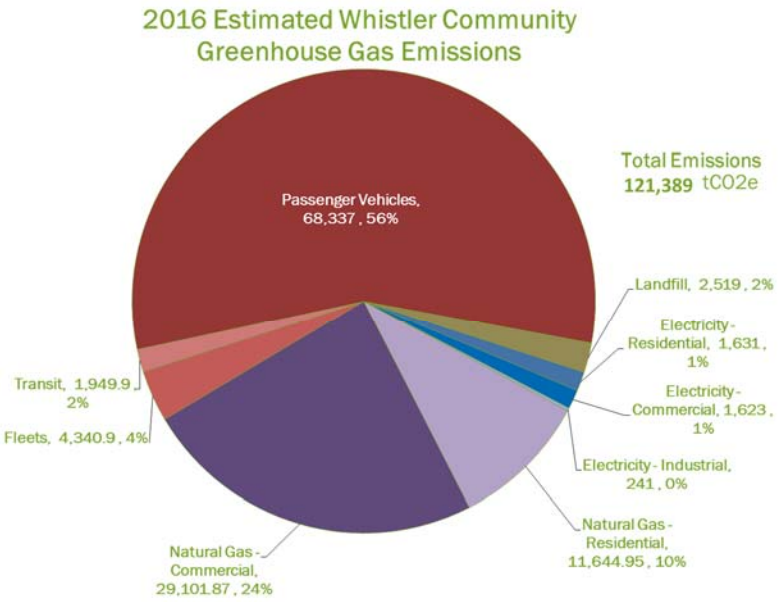
1 EXECUTIVE SUMMARY

As a tourism-focused mountain town, Whistler has long been concerned with the issue of climate change. The resort community has a special dependence on stable snow and weather patterns, making us very aware of our shared responsibility to manage greenhouse gas emissions, and even more sensitive to the reality of the potential impacts if we do not.

Since 2010, the primary purpose of this Annual Report has been to provide a summary of Whistler's energy and greenhouse gas (GHG) emissions performance for the previous year. The secondary purpose of this report includes a summary of the energy and emissions performance for the RMOW's internal corporate operations. This ongoing performance data forms the foundation for informed energy cost management and ongoing climate change mitigation efforts.

COMMUNITY-WIDE PERFORMANCE

2016 COMMUNITY GHG EMISSIONS: Greenhouse gas emissions in Whistler are made up of emissions from stationary sources (buildings and infrastructure systems), mobile sources (passenger vehicles, fleets, and transit), and emissions from landfilled wastes. Passenger vehicle transportation within Resort Municipality of Whistler (RMOW) boundaries continues to represent the largest share of the overall emission footprint at 56%, followed by natural gas consumption at 34% (primarily used for space and water heating).



The community of Whistler has committed to community-level greenhouse gas reductions of:

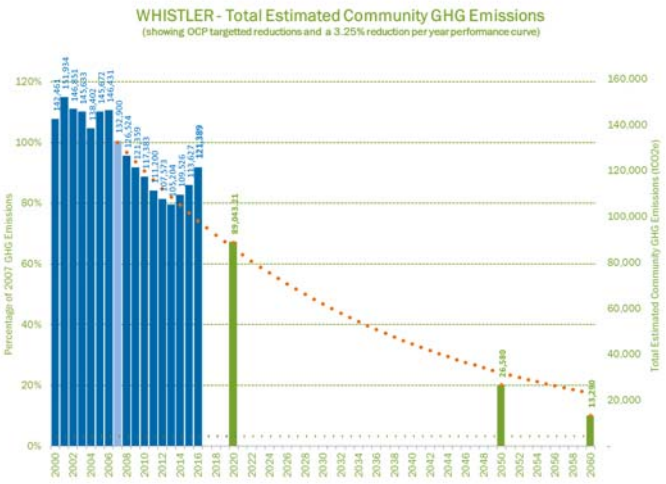
- **33% by 2020;**
- 80% by 2050; and
- 90% by 2060
  (each versus 2007 levels).

From 2008 until 2012, the community managed to remain on pace towards these targets, averaging annual reductions of approximately 3.8% per year – **however the 2014, 2015, and 2016 community results indicate that Whistler is no longer on pace to meet the community's 2020 target GHG reduction level.** These three most recent years averaged a 4.9% increase in total emissions per year and have eroded total GHG reductions from -20.8% in 2013 to now only -8.7% vs 2007 levels (i.e. giving up some of the early years' improvements).

Total community GHG emissions in 2016 were estimated to be **121,389 tCO2e**[1]. The 2016 level is approximately 8.7% lower than 2007 levels and 14.8% lower than 2000, but is **6.8% above the previous reporting year's level**.

[1] **Carbon dioxide equivalent** (or **CO_2e**) is the most common unit of measure for quantifying the amount of 'climate change impact' a given type and amount of greenhouse gas may cause, using the functionally equivalent amount or concentration of carbon dioxide (CO_2) as the reference.

However, from a GHG emissions intensity perspective, estimated 2016 **GHG emissions per population equivalent[2] decreased year over year by 5.3%** to 3.6 tCO2e/PE. This intensity is 30% lower than 2007 levels, and is **the lowest annual per capita** measure since detailed record keeping began in 2000.



Looking ahead, the key challenge for our community will be regaining the rate of reduction achieved over the first five years of the commitment period as further 'one-time changes' (such as the piped propane to natural gas conversion and the landfill cap and capture projects) are, for the most part, no longer readily available.

To achieve the Official Community Plan's 2020 GHG target, annual reductions of ~8,000 tonnes of CO2e would be required for each of the next four years (or approx. a 6.6% reduction each year). Unfortunately, this level of reduction is very unlikely and **the community's 2020 GHG emission reduction target will not be achieved.**

Despite the notable improvements in emission intensity (per population equivalent), from an overall perspective, Whistler still needs to reduce annual emissions by more than 30,000 tCO2e by the end of the 2020 year to meet its target – a reduction of approximately a quarter of our current annual emission levels.

2016 COMMUNITY ENERGY CONSUMPTION & EXPENDITURES: Community energy consumption since the base commitment year of 2007 has followed a somewhat similar pattern as community GHG emissions. While energy consumption peaked in 2010 (likely attributable to hosting the Games), 2011 through to 2014 showed small but consistent reductions in total energy consumption across the community. However, similar to the recent emissions trends, total energy consumption over the last few years has demonstrated significant year over year (YOY) increases.

Total community energy consumption in 2016 was estimated to be 3.22 million GJ (up approximately 3% from 2007 levels, and up 5.6% year over year).

Electricity is the most prevalent type of energy consumed in Whistler, at 41% of the total consumption, followed by vehicle fuels (~34%), and natural gas at 25% of total consumption.

The estimated annual **collective energy expenditure within Whistler has increased by more than $33 million since 2000 ($82 million vs. $49 million/yr).** Energy expenditures for residential buildings now total approximately $21 million/year, with commercial building expenditures totaling approximately $22 million on an annual basis (passenger vehicles and fleets make up the remainder). Total passenger vehicle estimated expenditures decreased to an estimated $34M/year due to declining fuel prices, but still represents an increase of approximately $7 million when compared to 2007 levels.

Finally, despite recent rate declines in natural gas and mobile fuels, over the long term it is expected that energy costs will continue to outpace inflation. So it is expected that the combined community expenditure will continue to rise faster than our collective ability to pay for it. This fact underscores the importance of increasing community-wide energy conservation and energy efficiency.

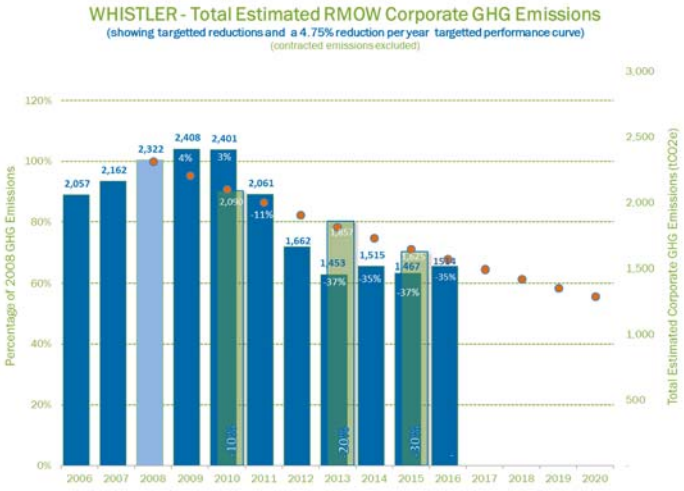
[2] The nature of Whistler being a tourism community means the number of people in Whistler on any given day is generally far greater than the population counts provided Canada Census or BC Statistics estimates. The total Population Equivalent is an estimate of the total number of people in Whistler on an average annualized basis. The indicator is often used in 'per capita' measures to normalize the data and make it comparable to other communities. More detail on the composition of the Population Equivalent can be found at: http://www.whistler2020.ca/whistler/site/genericPage.acds?instanceid=2985334&context=2985223

2016 CORPORATE OPERATIONS PERFORMANCE

2016 CORPORATE GHG EMISSIONS: The RMOW's Carbon Neutral Operations Plan sets the targets for total corporate GHG reductions as follows: 10% by 2010; 20% by 2013; and 30% by 2015 – all relative to 2008 levels.

Total corporate GHG emissions in 2016 were 1,514 tCO2e. This level of emissions is 3% above 2015 levels, but it is approximately 35% below the 2008 benchmark (the reference year for RMOW target setting).

As demonstrated in the chart to the right, corporate emissions are still below the 2015 annual GHG emission level targeted in the 2009 Carbon Neutral Operations Plan. Currently the RMOW does not have corporate targets beyond 2015, but 2016 levels are below the extrapolated reduction curve inferred by the Carbon Neutral Ops Plan targets.



On a division-by-division basis, the relative emissions footprint of corporate operations is as follows: **(46%) Infrastructure Services** — which includes roads crews, solid waste systems, the water utility, and the sewer utility; **(28%) Corporate and Community Services** — including bylaw, fire, Meadow Park Sports Centre, and other recreation programs; and **(25%) Resort Experience (REX)** — which includes village maintenance operations, horticulture, turf, and irrigation crews, parks and trails, as well as facility construction and maintenance operations.

GHG emissions across corporate operations are produced primarily from the combustion of mobile fuels (gasoline and diesels) at 49%, followed by natural gas at 42%, and electricity at 9%.

Increases in 2016 corporate emissions were primarily driven by increases in natural gas consumption across municipal office buildings and the WWTP. On the other hand, 2016 MPSC emission levels were 413 tCO2e or 59% lower than 2008 benchmark levels and 3% lower than 2015 levels.

2016 CORPORATE ENERGY CONSUMPTION & EXPENDITURES: Total corporate energy consumption decreased in 2016 by 3% year over year to 70,250 GJ/year. Electricity consumption makes up the greatest portion of total energy consumed across municipal operations at 66% of the total consumption, followed by natural gas (19%), and mobile fuels (15%).

While Resort Experience did not see any significant change in energy consumption in 2016, Infrastructure Services and Corporate and Community Services energy consumption decreased by 5% and 2% year over year respectively. However, Resort Experience's consumption levels are 10% below base year levels while Infrastructure Services' current consumption level is 8% higher than 2008 base year levels. Corporate and Community Services continues to demonstrate the largest consumption decrease, currently using 36% less energy than 2008 levels.

Overall, 2016 energy expenditures across municipal operations increased by 1% to ~$1.75M. This was primarily due to a ~9% increase in the total electricity expenditures, which makes up the largest portion of corporate energy expenditures (~$1.36M/year). By division, total energy expenses decreased by 1% for Infrastructure Services but increased for both Corporate and Community Services and Resort Experience by 1%, and 7% respectively.

COMMUNITY ENERGY & CLIMATE ACTION PLAN (CECAP) UPDATE

Section 5 of this Annual Report includes a detailed update on key RMOW- initiatives recommended within the CECAP. The update provides separate detail on mitigation (or energy and emission reduction) initiatives as well a sub-section on key initiatives related the climate adaptation initiatives. Details include 2018 priorities where possible, and reflect the high level progress as of Q3, 2017.

The updates demonstrate a wide range of activities have been undertaken, but it is also clear that emphasis for 2016/17 mitigation actions was—and continues to be—transportation-sector initiatives; and for adaptation initiatives, wildfire protection.

SUMMARY COMMENTS

The impact of changing climatic conditions (see CECAP for more detail) has the potential to substantially impact the Whistler community. Informed, strategic planning that considers and evaluates the impacts of the issues related to climate change and rising long term fuel costs can help to ensure that Whistler is best positioned to maintain its success into the future.

Accurate, detailed data is fundamental to these discussions; information such as that which is included in this report will continue to provide a strong basis for informed decision-making as our community measures its success, matures, evolves and thrives in the coming decades.

2 INTRODUCTION

Whistler's Vision is to be the *Premier Mountain Resort as we move toward sustainability*. Implied in this vision is a journey — an understanding that it will take continued commitment to get to our intended destination. The Whistler community also understands that on this journey we will have to find a way to do things more efficiently.

As a mountain town, Whistler has long been concerned with the issue of climate change. Our resort community has a special dependence on stable snow and weather patterns, making us very aware of our shared responsibility to manage greenhouse gas emissions, and even more sensitive to the reality of the potential impacts if we do not. Throughout our community, both private and public organizations understand that the integrity of functional natural systems is fundamental to the wellbeing of our community, and the viability of our economic engines.

Moreover, we now live in an era of climate responsibility and by extension this requires climate action; climate change is a certainty, as is human responsibility for it[3]. The IPCC concluded in 2016 that "**Human influence on the climate system is clear; and that limiting climate change will require substantial and sustained reductions of GHG emissions**." Reducing Whistler's greenhouse gas emissions is one of the most significant actions we can take as a community to take responsibility for our part in solving the climate crisis.

The primary purpose of this Annual Report is to provide a summary of Whistler's community-wide energy and greenhouse gas emissions performance over the past year (Section 3). The report includes detailed performance data, highlights key trends and insights, and benchmarks our performance against our Council-adopted Official Community Plan (OCP) targets. **It is the intent of this report to support and inform the strategic management of energy and climate-changing emissions across our community.**

The second part of this report (Section 4) includes a summary of the energy and emissions performance of the RMOW's internal corporate operations. Although corporate emissions represent less than 1.2% of the total community GHG emissions, RMOW staff have the greatest level of direct control over these corporate emissions, and as such, have the opportunity and responsibility to both lead by example, and demonstrate success.

For the first time, the 2016 Annual Report also includes a brief update on CECAP implementation initiatives that are led by the RMOW. This update and associated detail is included as Section 5 of this Report.

Finally, this is the 6th Performance Report that has been produced at this level of detail (2010, 2011, 2013, and 2014, and 2015 (included within the CECAP) are available at www.whistler.ca/climateaction).

2.1 BACKGROUND

Whistler is one of the few communities in BC that has a relatively long history of both setting emissions reductions targets and annually monitoring its GHG emissions footprint. This commitment is evident in our dedication to Integrated Community Sustainability Planning, long-term measurement and reporting of energy consumption and GHG emissions performance, the integration of energy and emission reduction goals into broader municipal policies and practices, and continued participation on provincial and national advisory committees.

[3] Climate Change 2013, The Physical Science Basis – Working Group 1 Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, IPCC, 2013. http://www.ipcc.ch/report/ar5/wg1/

2.1.1 Whistler2020: Our Community's Comprehensive Sustainability Plan

The Whistler community understands that sustainability is not just about the environment; that three integrated (not just balanced) concepts – ecological integrity, fiscal viability, and social justice – point to a larger strategy, and that these three concepts are not as strong in isolation as they are when considered together.

In 2005 the RMOW adopted Whistler2020, the community's comprehensive, long-term sustainability plan, as direction setting policy.

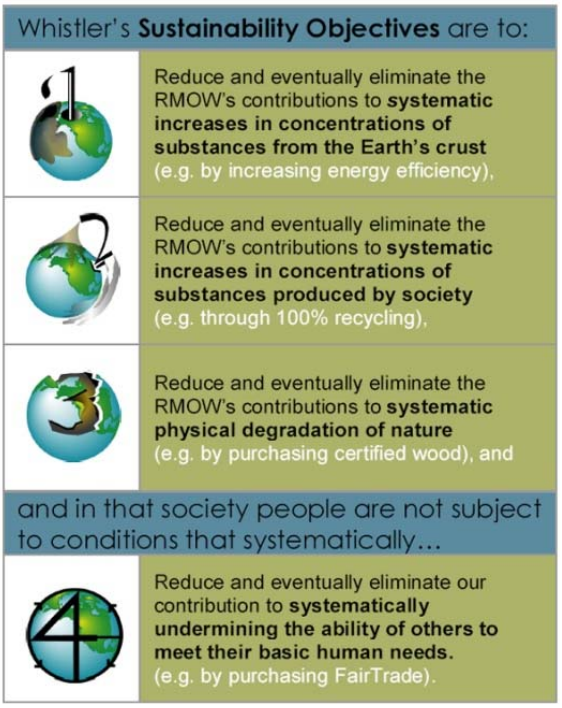
Whistler2020 is Whistler's Integrated Community Sustainability Plan, an expression of the community's vision as required by the Province of British Columbia. Whistler2020 is the product of thousands of voices across the resort community coming together to **articulate the vision of the resort community we aspire to be.**

The community vision articulated within Whistler2020 is organized around the following five priorities:

1. Enriching Community Life
2. Enhancing the Resort Experience
3. Ensuring Economic Viability
4. Protecting the Environment
5. Partnering for Success

Moreover, Whistler2020 imbeds and integrates four science-based Sustainability Objectives premised on the Natural Step principles (see box on the right) into the vision and the framework for making decisions. In this sense, these Sustainability Objectives act as a compass to help frame and guide decision-making and ongoing planning.

Working within the Whistler2020 framework, the community has aimed to steadily integrate the Sustainability Objectives are designed to broadly into all aspects of community planning and development strategies – from Energy and Transportation strategies, to Economic and Visitor Experience strategies. Through the application of the four shared Sustainability Objectives, our community is striving to integrate climate change mitigation into all community policies and operational practices.



Though climate change is viewed mainly as an environmental problem, it is much more than that.

2.1.2 Whistler's Community Energy Planning – A Brief History

Whistler committed to its first greenhouse gas emission reduction targets in 1997. In that year, Whistler Council endorsed the Kyoto Protocol target of having the community's emissions at 6% below 1990 levels by the year 2012. For municipal (corporate) emissions, Council also committed to being a part of the "20% Club", committing to reducing corporate emissions 20% below 1990 levels by 2012 — **two aspirations that the community of Whistler did not achieve**.

Following up on these commitments, the RMOW participated in the Federation of Canadian Municipalities' (FCM) Partners for Climate Protection (PCP) program. The PCP program was launched by FCM as an extension of ICLEI's (Local Governments for Sustainability) Cities for Climate Protection program in the United States. Partner cities become members in a network of municipalities that began working toward the achievement of the five management-based milestones of the program. The milestones were designed to create tools and processes that were easy to understand and implement, and also provide effective guidance for municipalities to take serious steps toward climate action.

To meet the commitments of the Partners for Climate Protection program process, the RMOW developed the first Integrated Energy, Air Quality, and Greenhouse Gas Management Plan in Canada in 2004.

FCM/ICELI Partners for Climate Protection

The five milestones of the Partners for Climate Protection program are:

1. Create a greenhouse gas emissions inventory and forecast;
2. Set an emissions reductions target;
3. Develop a local action plan;
4. Implement the local action plan or a set of activities; and
5. Monitor progress and report the results.

In 2007, the Resort Municipality of Whistler became the first community in Canada to complete all five milestones for both community and corporate emissions.

The recommended implementation scenario in the Integrated Energy Plan acknowledged that achieving our community target of 6% below 1990 levels would be very difficult to achieve by 2012. As such, the plan recommended a reductions scenario that would see Whistler's emissions at 9% below 2000 levels (but 22% above 1990 levels) by 2020. This was recommended in contrast to the forecasted *business as usual* (i.e. take no action) scenario that predicted Whistler community GHG emissions would rise to 92% above 1990 levels (47% above 2000) by the year 2020.

In September of 2007, at the Union of BC Municipalities (UBCM) conference in Vancouver, Whistler was one of original sixty-two[4] local governments in BC that signed on to the Province's voluntary BC Climate Action Charter. The Charter opens with the following statement, agreed to by all signatories, **"Scientific consensus has developed that increasing emissions of human caused greenhouse gases (GHG), including carbon dioxide, methane and other GHG emissions, that are released into the atmosphere are affecting the Earth's climate."[5]**

Currently approximately 180 BC communities have become signatories to the Charter. By signing, local governments agreed that:

5. In order to contribute to reducing GHG emissions:

   (a) **Signatory Local Governments agree to develop strategies and take actions to achieve the following goals:**

   (i) being carbon neutral in respect of their operations by 2012, recognizing that solid waste facilities regulated under the Environmental Management Act are not included in operations for the purposes of this Charter.

   (ii) measuring and reporting on their community's GHG emissions profile; and

   (iii) creating complete, compact, more energy efficient rural and urban communities(e.g. foster a built environment that supports a reduction in car dependency and energy use, establish policies and processes that support fast tracking of green development projects, adopt zoning practices that encourage land use patterns that increase density and reduce sprawl.)[6]

[4] The BC Climate Action Charter was eventually signed by more than 170 local governments across British Columbia.
[5] The British Columbia Climate Action Charter, Section 1
[6] The British Columbia Climate Action Charter. Section 5.

The charter is a voluntary agreement designed to bring local government support for the Province's broader overall climate action strategy of reducing emissions 33% (from 2007 levels) by 2020.

Enacted in 2008, Bill 27, *the Green Communities Act*, required local governments to include (among other things) greenhouse gas emission targets, policies and actions in their Official Community Plans and Regional Growth Strategies. In response to the *Green Communities Act*, the RMOW has integrated specific targets (discussed later in this report), policies, and actions within its Official Community Plan, and developed a Carbon Neutral Operations Plan.

In 2015 and 2016 staff undertook the process of updating the Whistler Integrated Energy Plan. Developed by a committee of more than 30 leaders from across the community, the new **Community Energy and Climate Action Plan (CECAP)** project updated the existing RMOW Integrated Energy, Air Quality and Greenhouse Gas Management Plan and set out new strategic directions for mitigating Whistler's contribution to climate change, included detailed 50 year climate projections for the Whistler area, and also recommended a series of adaptation strategies to prevent and minimize the likely impacts of 'locked-in' changes to future local climate regimes. The CECAP was endorsed by municipal Council on July 26, 2016 and is available online at: www.whistler.ca/climateaction.

Building on the background and contextual elements presented in Section 2, Section 3 details how the community of Whistler is progressing toward its energy and emission reduction goals, Section 4 presents similar performance data for RMOW corporate operations, and Section 5 provides a brief 2016/17 update on the RMOW-led, CECAP-recommended initiatives.

3 COMMUNITY PERFORMANCE

Since the year 2000, RMOW staff have tracked and compiled community energy consumption, energy expenditure and GHG emission data. At the community level, primary sources of data to support this inventory are accessed from local utilities (BC Hydro and FortisBC), as well as from local traffic counter data (both provincial and municipal) and annual RMOW waste and recycling performance tracking. Sections 3.1 and 3.2 of this report summarize the most current performance trends for 2016.

3.1 COMMUNITY GREENHOUSE GAS EMISSIONS

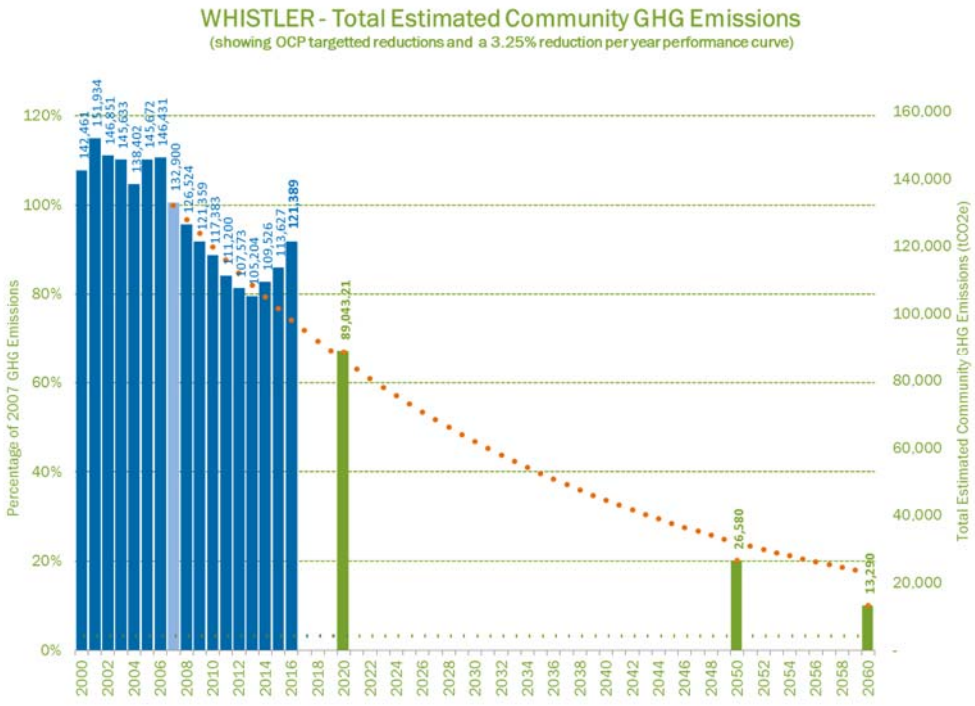
Section 3.1 deals specifically with GHG emissions at the community level. This section includes information on related Council-adopted targets, an overview of 2016 performance, as well as a short section on key associated insights and trends.

3.1.1 Community GHG Reduction Target

As previously stated, the *Provincial Green Communities Act* (Bill 27, 2008) requires all municipalities to adopt **targets**, policies and actions for the reduction of community-wide GHGs. As per the Whistler Official Community Plan, when compared to 2007 GHG emission levels, the community of Whistler has committed to community-level greenhouse gas reductions of: **33% by 2020, 80% by 2050[7]; and 90% by 2060**.

33% by 2020
80% by 2050
90% by 2060

If it was anticipated that the attainment of these targets would be achieved at a relatively consistent rate (or pace) over the coming decades, these targets translate into an **annual GHG reduction of approximately 3.25% per year (approx. 3,500 per year).** The following chart illustrates the potential achievement of this 'target' over time. The chart presents the adopted community targets (green bars), the historic community emissions levels (blue bars) as well as an indication of the approximate annual reductions that would be required to achieve the prescribed targets using a constant rate of improvement model (orange dots).



[7] 33% by 2020 and 50% by 2050 are identical to the Provincial targets set by the Government of BC.

As demonstrated on the previous chart, the community of Whistler managed to remain generally on pace towards its targets for the first six years of the commitment period. GHG emission reductions achieved during these first six years (2008-2011) were impressive – averaging more than 4,000 tonnes of reductions annually over the six year period.

It is worth noting, that the primary sources of the reductions over the first four years were generally **one-time** only events. These include:

1) the changes to Whistler's waste management processes;
   (i.e. landfill closure, landfill gas management, organics recycling and the switch to the advanced landfill management systems at Rabanco);
2) the switch from piped propane to piped natural gas across the community;
3) the changes brought about through the provincial low-carbon fuel standards for gasoline and diesel;
4) the decrease in GHG intensity (GHG/kWh) of BC Hydro supplied electricity; and
5) the reduction in diesel consumption associated with the hydrogen transit bus pilot project
   (Note that pilot project has since ended, resulting in an increase in transit diesel consumption in 2014 through 2016)

It is also important to note that the 7th year of the commitment period (2014) did not remain below the intended curve toward the 2020 adopted target (33% reduction vs. 2007). **The 2014 year-over-year emission levels not only did not decrease by the target 3,000-4,000 tonnes, but actually increased by 4,300 tCO2e (4%) and for the first time in the commitment period produced a level above the target curve.** Unfortunately this trend continued in both 2015 and 2016. Whistler's annual emissions are now estimated at 121,0389 tCO2e, which represents an average increase of over the last three years of approximate 5,300 tCO2e per year.

2016 community GHG levels are now estimated at 9% below the 2007 base year (rather than the targeted 25.7%). To achieve the OCP targeted 2020 GHG emission level, would require annual reductions of approx. 8,000 tonnes per year for the next three years. Unfortunately, this level of reduction is very unlikely and in staff's opinion**, the community's 2020 GHG emission reduction target will not be achieved.**

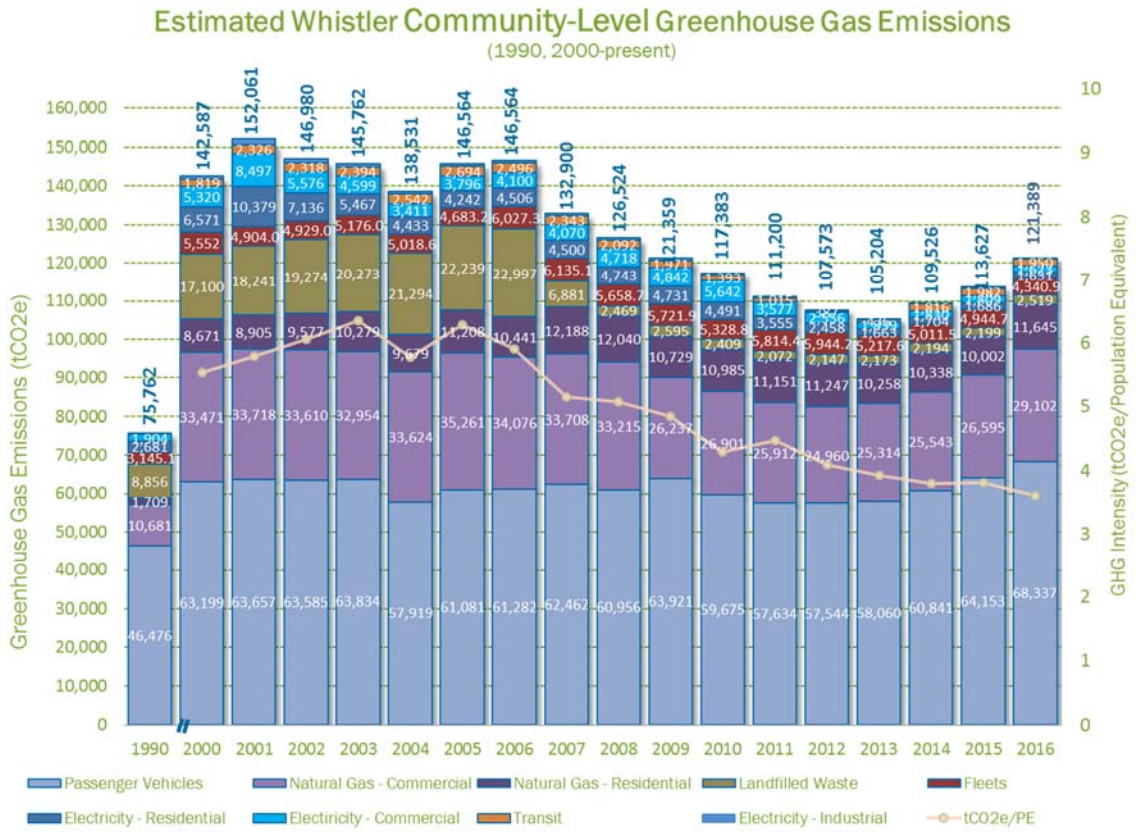
Looking ahead, the key challenge for our community will be regaining the rate of reductions achieved over the 2008-2013 period as further 'one-time changes' are, for the most part, no longer readily available. To regain a performance level consistent with the target curve presented above, additional reductions of 5,500 – 6,000 tonnes of CO2e would be required annually for the next 10 years.

Future GHG reductions will need to be primarily premised on ***actual energy conservation*** and ***increased efficiency*** rather **than *one-time technological or infrastructure changes in community systems*.** The required conservation or efficiency improvements will be particularly challenging for the community as historic performance assessments demonstrate the energy conservation gains have proven elusive over the past decade.

Current trends suggest that the opportunity for near term gains in GHG performance will need to come primarily from the transportation sector, and secondarily from improvements in fossil fuel-based space heating demands across both the commercial and residential sectors.

3.1.2 Community GHG Emission Performance

Total community emissions in 2016 were estimated to be **121,039 tCO2e**. This level is approximately 9% lower than 2007 levels, 15% lower than 2000, but **6.8% above 2015 levels** and well above our current community target levels.



However, from a GHG emissions intensity perspective, 2016 GHG emissions per population equivalent[8] decreased to 3.6 tCO2e/PE. This level is 5.3% below 2015 levels, 30% below 2007 levels, and the lowest annual per capita measure since detailed record keeping began in 2000. Stated another way, while total community emissions went up, the number of people in the resort (both residents and visitors alike) increased more, hence the ratio, or the emissions/person improved. This intensity improvement may suggest an increase in overall efficiency from a GHG perspective when the resort community is at higher levels of occupancy.

As noted above, the primary drivers of reductions in previous years have been the changes to the local waste management system (especially landfill gas capture); the switch from piped propane to piped natural gas, the BC Transit Hydrogen Transit Fleet pilot project (which has since ended), and more recently, the provincial low carbon fuel standards and the decreasing GHG intensity of BC Hydro electricity supply.

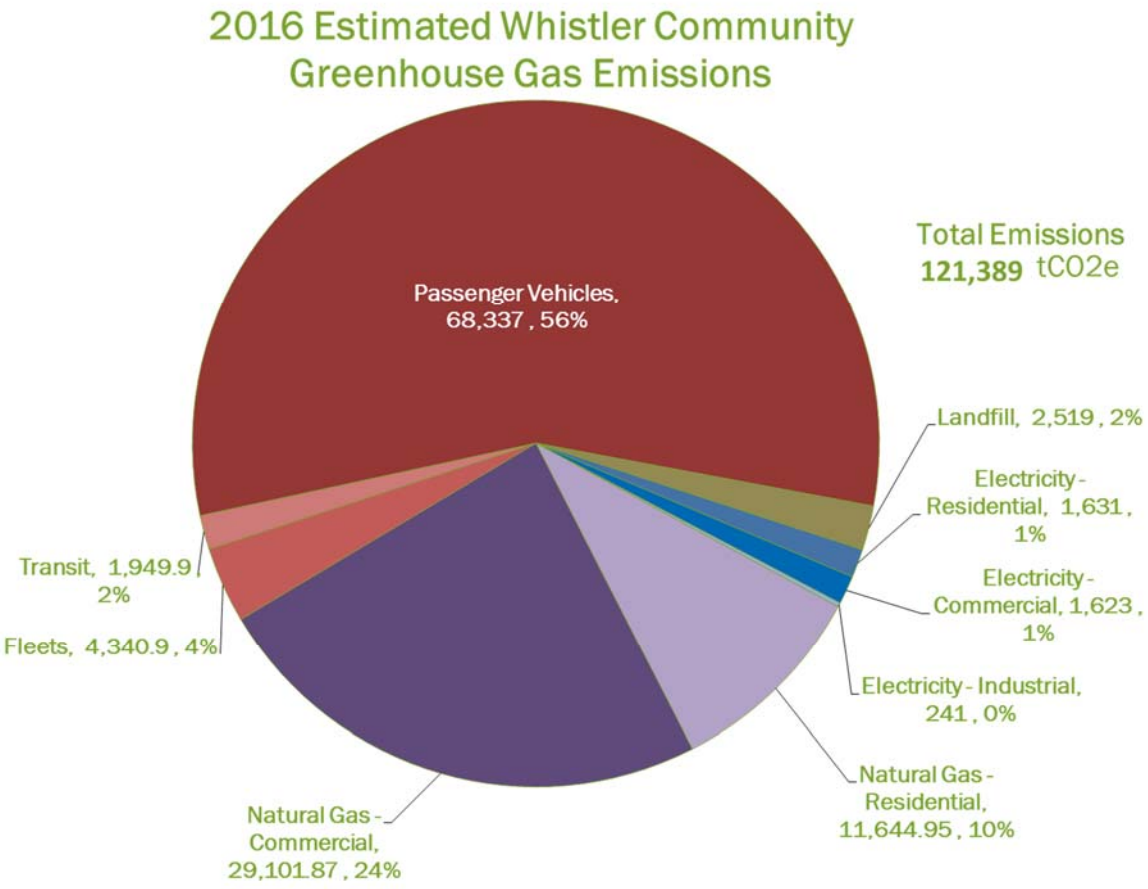
As further one-time, system level changes such as those noted above become less available to our community, Whistler will no longer achieve reductions without substantive 'energy conservation' or

[8] The nature of Whistler being a tourism community means the number of people in Whistler on any given day is generally far greater than the population counts provided Canada Census or BC Statistics estimates. The total Population Equivalent is an estimate of the total number of people in Whistler on an average annualized basis. The indicator is often used in 'per capita' measures to normalize the data and make it comparable to other communities. More detail on the composition of the Population Equivalent can be found at: http://www.whistler2020.ca/whistler/site/genericPage.acds?instanceid=2985334&context=2985223

potential switches to lower carbon energy sources (e.g. electrification of transportation) becoming core drivers of further emission reductions.

Distribution of Emissions

Greenhouse gas emissions in Whistler are made up of emissions from stationary sources (buildings and infrastructure systems), mobile sources (passenger vehicles, fleets, and transit), as well as emissions from landfilled wastes. The approximate share of each of these sources is presented in the following chart.



Passenger Vehicles

Passenger vehicle transportation within RMOW boundaries continues to represent the single largest share of the overall emission footprint at 56%, followed by natural gas consumption at 34% (primarily used for space and water heating).

Whistler Buildings - GHGs

The following two charts show the changes in greenhouse gas emissions from key segments of the community building inventory.

Residential GHG Emissions

Residential Natural Gas Emissions

Total natural gas based GHG emissions across the residential sector have increased 16% year over year. This increase is partially due to a slightly colder (but not colder than the 10 yr average) winter. 2016 heating degree days (HHDs are a measure of heating demand for a given season or year) increased 7.9% versus 2015, however 2015 was one of the warmest winters in the last 20 years.

Given that emissions per residential account increased by 11.6% - this is an increase that cannot easily be explained by simply a colder winter rationale. Previous winters with similar heating loads (i.e. ~3,900 HDDs), generally had lower gas consumption per account than in 2016.

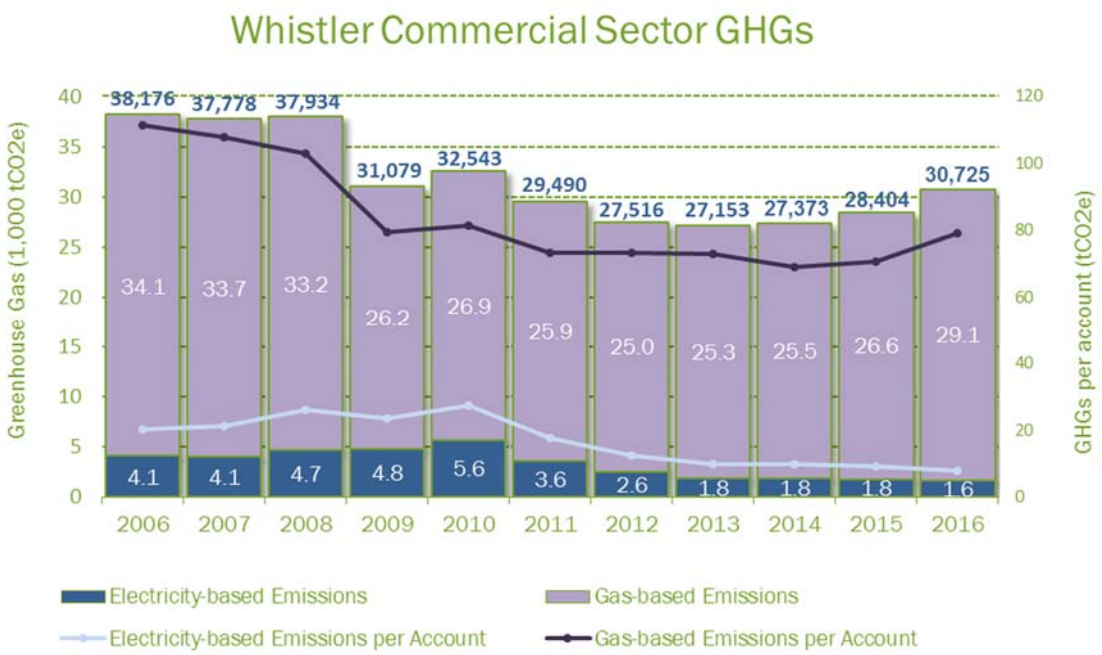
It is not clear what caused this incremental increase in per account consumption, but pricing signals (i.e. the new lower costs of natural gas) may be influencing resident behavior. On the other hand, it could also be attributable to more use of second-home or vacation properties than previous years. Regardless, current data does not support an 'increasing average space heating efficiency' hypothesis for the residential sector as a whole.

Residential Electricity Emissions

2016 electricity-based emissions decreased in the residential sector on both a total basis (-3%), as well as an emissions per account basis (-2.3%). While total residential electrical consumption increased in 2016 (+6%), the primary driver of decreasing electricity-based emissions over the past few years has been the reduction in system-wide BC Hydro GHG emissions intensities (i.e. the system-wide provision of lower carbon electricity to the community).

Finally, the total estimated energy use intensity of Whistler's residential sector appeared to increase by approximately 12.4% on a per m^2 basis in 2016. As above, this is an increase that cannot solely be attributed to a colder winter.

Commercial GHG Emissions



Commercial Sector Natural Gas Emissions

Commercial sector GHG emissions have decreased substantially since the conversion from propane to natural gas was finalized in 2009 (2009 commercial heating gas emissions declined by 25% versus 2005 levels). Commercial natural gas emissions remained relatively steady during 2011-2014 at approximately 27% lower than pre conversion 2007 levels. More recently however, 2016 levels experienced a substantial increase, rising 14% above the '11-14 average, and 9.3% year over year. This recent increase cannot be fully explained by a colder winter/increased heating load rationale as the '11-'14 winters were all colder than 2016. Rationale may be rooted in price signals leading to fuel switching (i.e. driven by the recently reduced delivered price of natural gas), by increased occupancy levels in the resort, or by a combination of both.

Commercial heating gas emissions per account increased 13% in 2016 to the highest level since 2010 (however, still considerably lower (17%) than pre-conversion levels).

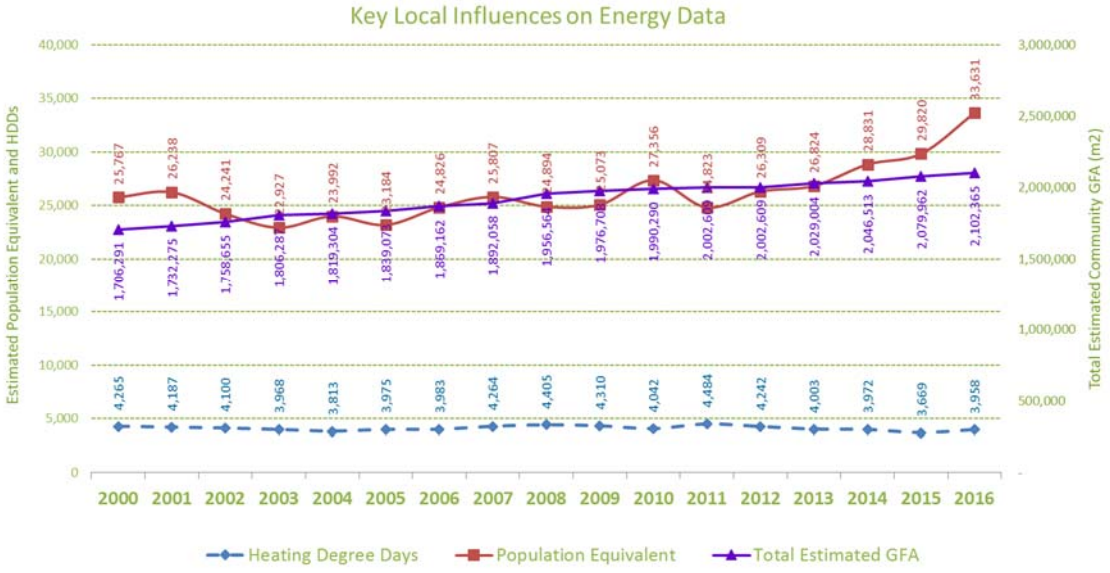
Commercial Sector Electricity Emissions

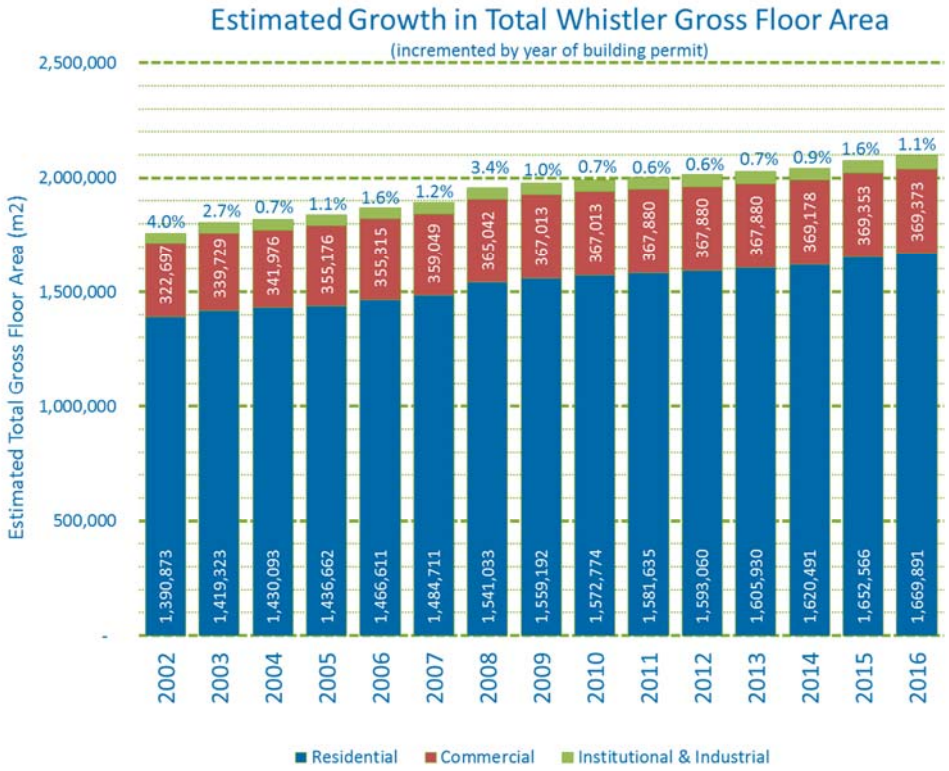
Commercial sector GHG emissions from electricity consumption peaked in 2010 (Olympic Games year). Since the Games year, total sector emission levels have decreased substantively. These reductions are partially driven by a drop in electrical consumption post Games (2016 commercial electrical consumption is 25% lower than 2010), but are primarily driven by decreasing GHG intensity levels across the BC Hydro system (i.e. reductions driven by forces outside of the community). In 2016, commercial electricity based emissions have decreased by almost 10% year over year. This is partially due to the further reduced GHG intensity levels across the BC Hydro system, as well as a 1% YOY drop in commercial consumption.

Emissions per account have followed patterns similar to that described above and commercial electricity-base GHG emissions per account are now at the lowest level since detailed reporting began almost 15 years ago.

The following three charts provide additional detail regarding the primary influences on energy consumption and emissions trends over time. These trends are useful for the exploration of possible explanations for observed change over time. It is however important to note that Whistler's **GHG emission reduction targets are set at total emission levels** – i.e. targets are not at set at per-capita, or per-ft^2 intensity levels, as only total emissions levels have an influence overall climate impacts.

Intensity measures do help provide insights as to the factors are driving changes in performance, but it is only the total parts-per-million (ppm) of carbon in the atmosphere that defines and shapes the impacts of climate change. It is for this reason that Whistler chose to set total emission targets rather than emission intensity targets.





BC Hydro Emission Factor Comparison (tCo2e/GWh)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
		47%	65%	41%											
3 year rolling average	40.7	34.7	23.7	24.7	26.3	24.7	26.0	25.3	25.3	19.0	13.7	10.0	10.7	10.7	9.7

*estimated, final 2015 value yet to be confirmed

3.1.3 Key Community GHG Performance Insights

Total GHG Emissions

- 56% of all estimated community-level emissions (~68,000 tonnes annually) are produced by passenger vehicle transportation within municipal boundaries. The passenger vehicle sector provides a critically important opportunity for future community emission reductions.
- For the third year in a row, emission levels have risen year over year (+7,762 tCO2e), confirming the fact that **the community is no longer on a path to achieve its 2020 OCP emission reduction goals.**
- **However, emissions per population equivalent achieved the lowest level on record in 2016 (3.61 tCo2e/pe).**
- The lack of additional, significant one-time changes (i.e. low hanging fruit like the propane to natural gas conversion project) will make future progress toward our 2020 target much more difficult.

Commercial Buildings GHG Emissions

- Total commercial emissions, and emissions per commercial account both increased—8% and 9% respectively—from the 2015 record lows.
- Collectively, commercial building emissions have decreased by 19% from the 2007 year. Unfortunately, the sector has given back some ground in this respect as it was more than 30% below 2007 in 2014. The sector is now no longer on target to meet its share of the 2020 target (-33%). See page 17 for more detail.

Residential Buildings GHG Emissions

- Total residential GHGs have dropped from 2007 levels by 20% (primarily due to the shift to natural gas from propane, and the decrease in BC Hydro GHG intensity – collectively the use of cleaner fuels).
- Unfortunately, 2016 emission levels have slipped below target reduction pace for the sector and the sector is no longer on pace to meet its share of the 2020 reduction target. See page 17 for more detail.
- The primary source of emissions across the residential inventory remains natural gas consumption (~86%).
- The shift to natural gas (from propane), and the decreasing GHG-intensity of BC Hydro electricity are the primary reasons for the strong GHG reductions in this sector. It should be noted that current energy consumption across the sector has only decreased by 2% since 2007 (highlighting the role that cleaner fuels have contributed to the 20% GHG reduction noted above).

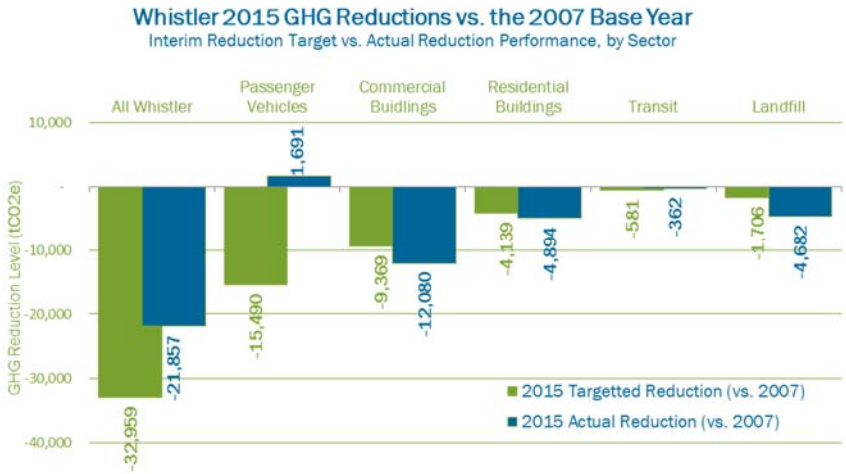
Transportation GHG Emissions

- Low carbon fuel standards have helped to mitigate the emissions from both gasoline and diesel consumption (5% ethanol blend in gasoline, and 4% biodiesel blend in diesel).
- Estimated total vehicle kilometers travelled (VKT) in Whistler (locals and visitors combined) has continued to increase over the last 10 years
- The average fuel efficiency of BC registered vehicles has only improved by ~3-5% over the last 10 years. This change has slowly reduced emission levels per kilometer driven from 2000 levels, but not by enough to cause sector-wide reductions in total estimated emissions. Moreover, recent trends indicate that lower gasoline prices may be contributing to an increase in the purchase of light duty trucks and SUVs, and a concurrent decrease in smaller passenger vehicle – a trend that works counter to the increased efficiencies noted above.
- The new fuel standards and the increases in vehicle efficiency are still far too small to move passenger vehicle emissions to the targeted reduction levels discussed in Section 3.1.1 above. Much more efficient vehicles, fuel switching to lower carbon fuel sources, and/or a significant decrease in VKT per person will be required to catalyze required emission reductions in this sector.

- **Estimated passenger vehicle emissions have remained at a relatively constant level since 2007 base year, and even increasing by approximately +10% in 2016 (vs. the -25.7% interim 2016 target level). This difference (21,930 tCO2e in unmet reductions) represents the single largest reason why the community is failing to maintain interim GHG target reduction levels.**

Looking Ahead

- As previously noted, the key challenge for the community moving forward, will be regaining the rate of reduction achieved over the first five years of the commitment period. This is due to the fact that further 'one-time changes' are, for the most part, no longer readily available.
    - Future reductions will need to be primarily premised on actual energy conservation and efficiency rather than one-time technological changes in community systems (i.e. primarily by driving less, and secondarily by reducing fossil fuels consumed by buildings)
    - As seen in the chart 2016 below, the greatest need (and opportunity) for ongoing emission reductions is in the **passenger vehicle sector**
    - Note that the 2015 chart is also included below for reference and comparison.



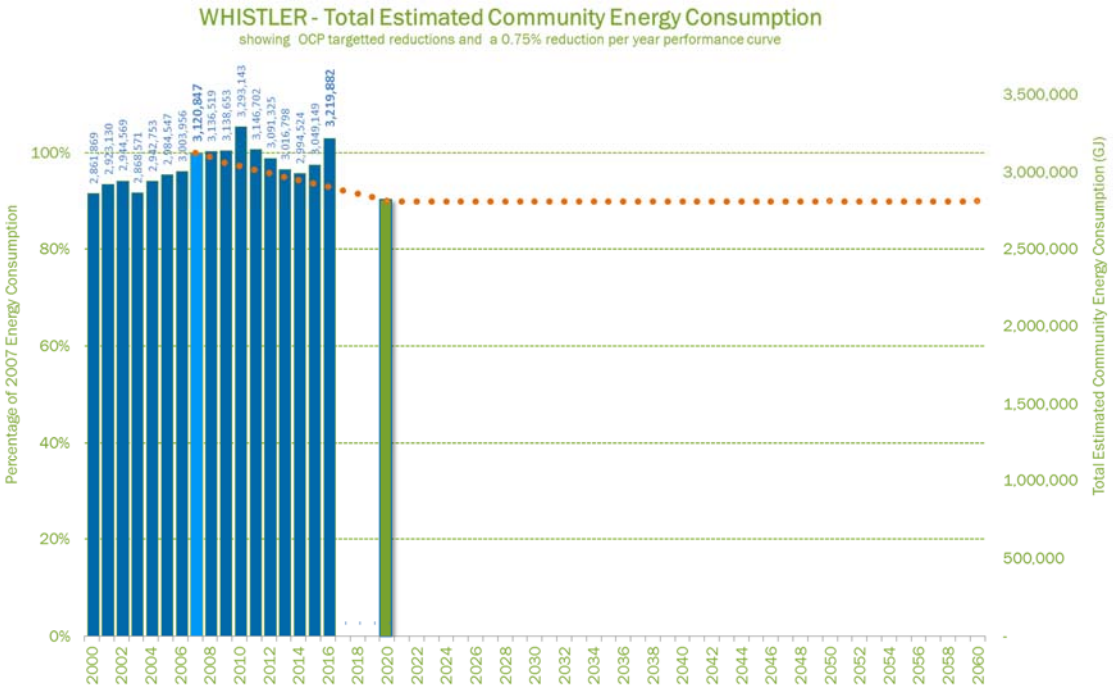
3.2 COMMUNITY ENERGY CONSUMPTION

Section 3.2 deals with energy consumption and energy expenditures at the community level. This section includes information on related targets, an overview of 2016 performance, as well as a short section on key associated insights and trends.

3.2.1 Community Energy Reduction Target

OCP Amendment Bylaw 1983, 2011 includes the Objective: '*Make Energy Conservation the Core Strategy and Highest Priority for Achieving Our Greenhouse Gas Emission Reduction Goals'*. To this end, the OCP Amendment Bylaw also includes a community-scale energy reduction target: "***The municipality will lead a community-wide effort to reduce total energy consumption to a level 10% lower than 2007 by 2020***".

This proposed policy introduces Whistler's first comprehensive **energy** reduction target – and one of the first by a local government in BC. Similar to the chart in Section 3.1.1 above , if it is assumed that this energy reduction target will achieved at a consistent pace over the next decade, this target translates into a 0.75% annual energy consumption reduction over the target period (2011 – 2020). A visual presentation of this rate of reduction is included below for clarity.



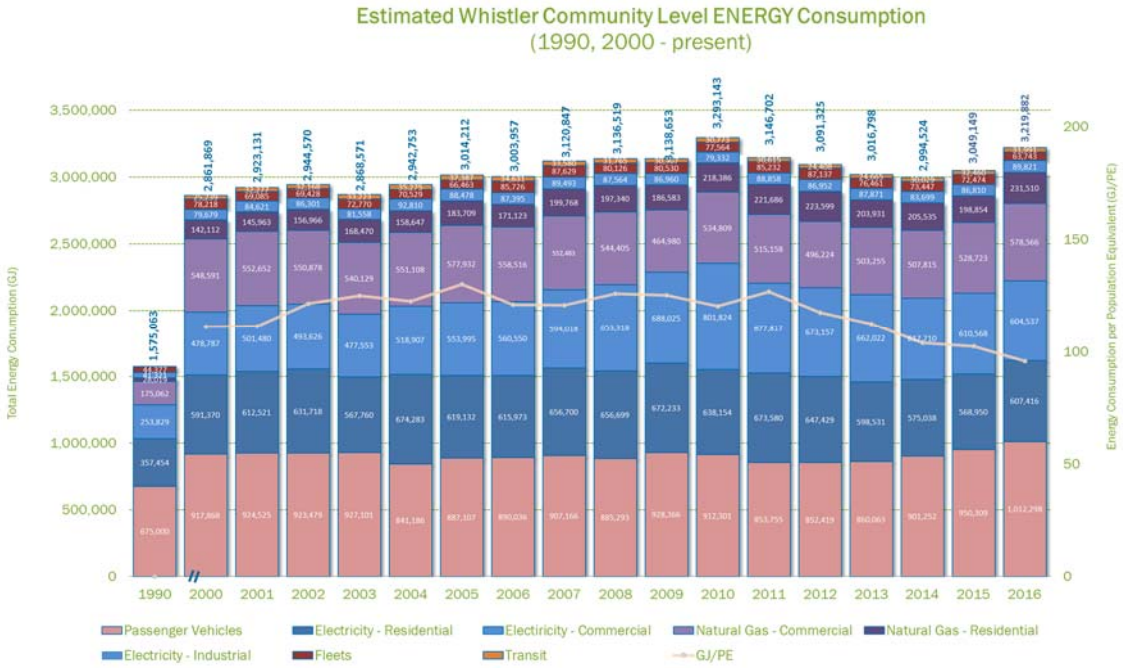
As evidenced in the chart above, while there are similarities, historic energy consumption has not followed the same trajectory as community GHG emissions. **In fact, the 2010, 2011 and 2016 energy consumption levels are the three highest years of energy consumption ever recorded in Whistler.** Community-wide energy consumption did decrease at an average rate of -2.5% between 2011 and 2014 and the community was quite close to being on-track to meet OCP targeted levels. However, reductions reversed in 2015 and has continued to increase through 2016, thereby moving the community significantly off pace for the proposed 2020 target.

Currently, Whistler's total energy consumption is approximately 300,000 GJ higher than projected target levels for 2016 (i.e. 3% higher than 2007 levels, rather than 7% below).

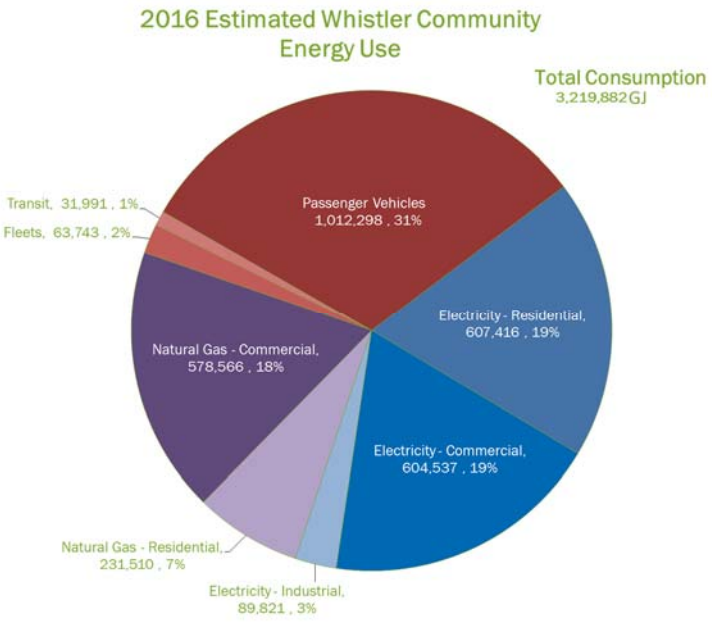
3.2.2 Community Energy Consumption Performance

Energy consumption in Whistler includes consumption from stationary sources (buildings and infrastructure), as well as mobile sources (passenger vehicles, fleets, and transit). Total community energy consumption in 2016 was estimated to be **3.2 million GJ** (up 3.7% from 2007 levels, and 5.8% above 2015 levels).

Energy consumption per population equivalent (95.7 GJ/pe) decreased in 2016 to the **single best performance level since detailed reported began in 2000** (-6.4% YOY and 27% below peak levels in 2005).



The 2016 total energy consumption was the second highest year on record and approx. 3.2% higher than the 10 year average. Unfortunately, despite the lower per population equivalent consumption, recent total consumption trends (past two years) suggest that it is unlikely for the community to meet its 2020 proposed energy consumption target (see Section 3.2.1)



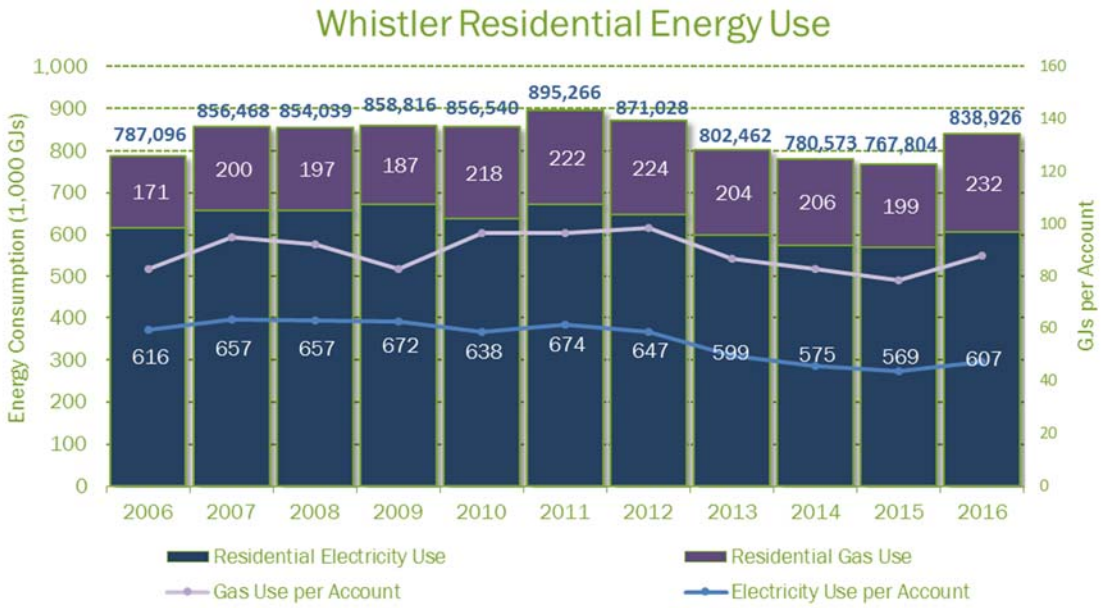
Electricity is the most prevalent type of energy consumed in Whistler at 41% of the total consumption (slightly down from previous year), followed by vehicle fuels (~34%), and natural gas at approximately one quarter of total consumption. It is worth noting that due to the fact that different energy sources have differing carbon content, GHG emissions are much more heavily associated with consumption of fossil fuels (i.e. gasoline, diesels, and natural gas). This fact accounts for the differences in relative proportions depicted in this chart as compared the similar chart presented in Section 3.1.2.

In 2016, there was a substantive increase in the consumption of natural gas (~83,000 GJ, +4,200 tCO2e) as well as an increase in electricity consumption (~35,000 GJ, +100 tCO2e). Additionally, there was a small decrease in fleet vehicles consumption (down ~9,000 GJ, -600 tCO2e). Passenger vehicle usage increased substantially by ~62,000 GJ, which corresponded with a 4,000 tCO2e increase in GHG emissions.

Whistler Buildings – Energy Consumption

Total energy consumption across Whistler's buildings is presented in the following two charts.

Residential Building Energy Consumption



Residential electricity consumption increased in 2016 in both total terms, and on a per account basis. Total 2016 residential energy consumption was the highest since 2012 at 838,926 GJ (up 1.7% versus the average of the previous 5 years). This change reflects increases in both electricity and gas consumption across the residential sector and cannot be explained by weather-induced heating demands, as 2016 was warmer than the average of the previous five seasons. This increase is more likely a function of the increasing size of the residential sector (2016 had approximately 3.6% more residential GFA[9] than the average of the last 5 years), or an increased use of vacation properties and second homes in the residential sector vs. previous levels.

Residential Natural Gas

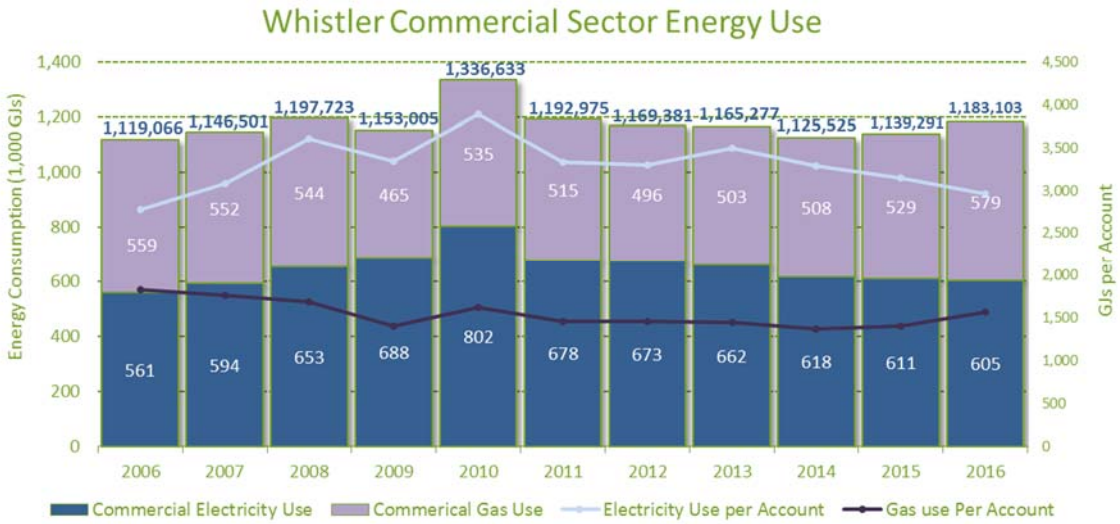
2016 natural gas consumption per account is 2% below the 10 year average consumption levels. However, 2016 levels increased substantially from 2015 levels (+16%) in total, and increased by 11% on a per-account basis.

Residential Electricity

Residential electricity consumption increased by 6.8% in total, and by 7.7% on a per-account basis. 2016 per-account electricity levels were 16% lower than the average of the last 10 years, and the estimated residential sector total energy use intensity[10] (EUI) for 2016 was 8% lower than the average of the last 10 years despite the fact that 2016 was only 4.3% than the average of the previous 10 years. This fact is potentially suggestive that the sector is slowly improving in collective (avg) energy efficiency levels.

[9] Page 16 shows a graphic representation of this growth in gross floor area (GFA)
[10] EUI measures the estimated energy use per area of developed indoor space (i.e. GJ/m2)

Commercial Building Energy Consumption



2016 results indicated that there has been a 3.8% increase year over year in total building energy consumption by the commercial sector.

Commercial Natural Gas & Electricity

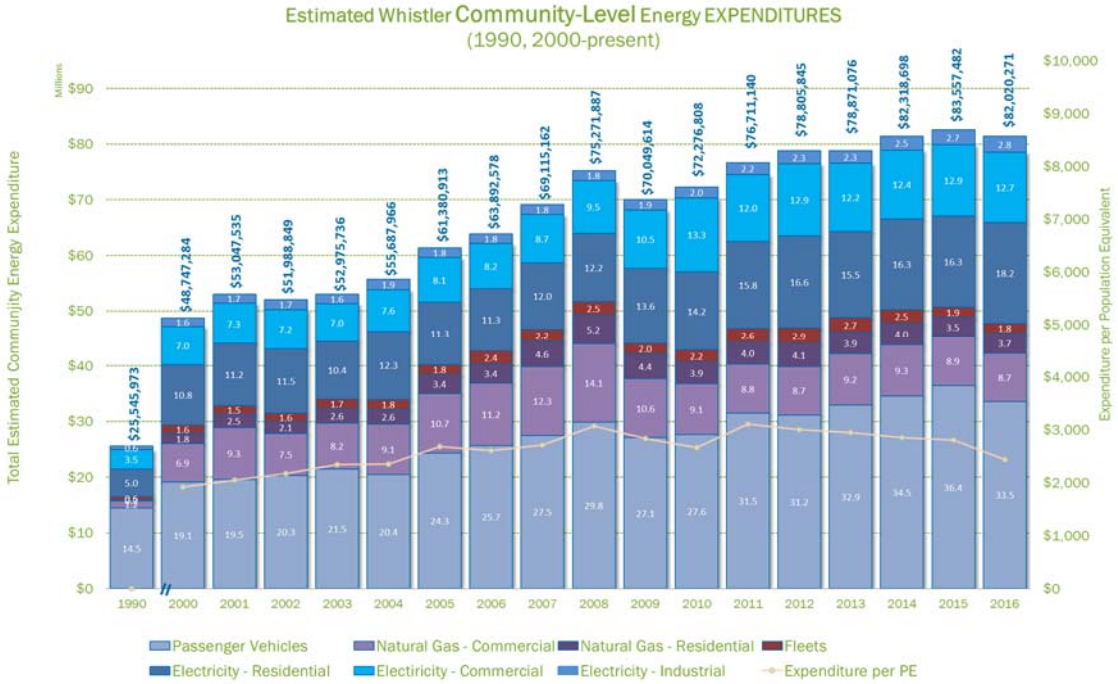
The period from 2003 through to 2009 saw a significant shift in commercial energy consumption trends. This period saw decreases in propane use at the same time as roughly equal increases in electricity use across the sector. In sum, energy consumption was little changed, but the 'fuel-shift' did lead to lower overall GHG emissions. The primary reason for this shift was likely attributable be the increased use of hybrid electric/gas boilers for space and water heating loads in the large hotel sector (i.e. a fuel shift from natural gas/propane to electricity for space and water heating loads in the commercial sector).

By 2010 60% of all energy consumed in the commercial sector was electricity (up from 47% in 2003). As previously noted, this shift had favourable impacts from a GHG perspective (and to a lesser extent, financial), even as total energy consumption remained relatively constant. Since 2010, the electricity share of the commercial energy consumption has decreased steadily. The 2016 electricity share has dropped to 51% suggesting a shift back toward natural gas for space and water heating may be occurring in these same facilities. This shift back toward natural gas is generally well correlated with the reductions in Whistler natural gas rates that have been phased in through the standardization of the gas rates across the entire FortisBC service area. Response to these changing price signals appear to be moderating commercial sector total energy costs, but increasing commercial sector GHG emissions.

Electricity consumption per account in the commercial sector decreased in 2016 by 5.7% versus 2015, and is now 11% lower than the average of the previous 10 years. On the other hand, natural gas consumption per account increased 12% in 2016, and is now approximately 2% higher than the average of the previous 10 year period.

Energy Expenditures

The estimated annual collective energy expenditure within Whistler[11] has increased by more than $33 million between 2000 and 2016 ($82 million vs. $49 million). Increases in energy rates have levelled for the last couple of years (with the exception of BC Hydro), somewhat bucking the historic trend toward a increases in excess of the rate of inflation. This levelling—and even rate reductions—in both mobile fuels and natural gas has significantly moderated the rise in total community energy expenditures. When and if the rates regain more historical increases, total expenditures should be expected to climb relatively quickly. This fact underscores the importance of increasing both energy conservation and energy efficiency across the community. It is quite likely that a total expenditure of $100 million could be reached before the year 2025.

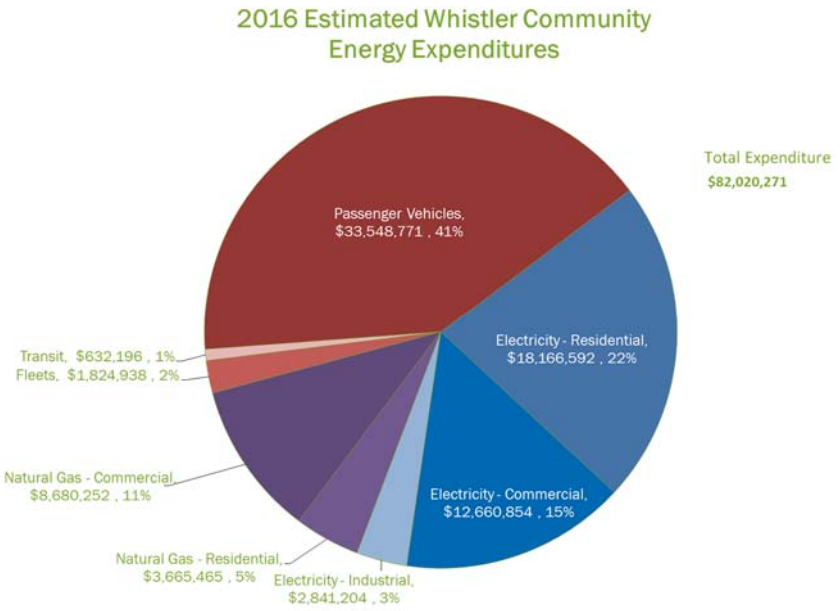


Energy expenditures for buildings (both commercial and residential) had remained relatively constant since 2008 at approximately $42-44 million/year with electricity expenditures increasing by a margin nearly equal to the drop in natural gas expenditures. 2016 expenditure levels have increased marginally to a total of approx. $46 million per year.

Fuel prices for gasoline increased markedly in 2012 and 2013, resulting in significant increases in total passenger vehicle estimated expenditures (2013: $35M vs. 2009: $25.5M). However, gasoline prices dropped in the latter half of 2014, and have remained low through 2016 which has resulted in relatively constant estimated expenditures for the passenger vehicle sector despite increasing consumption levels.

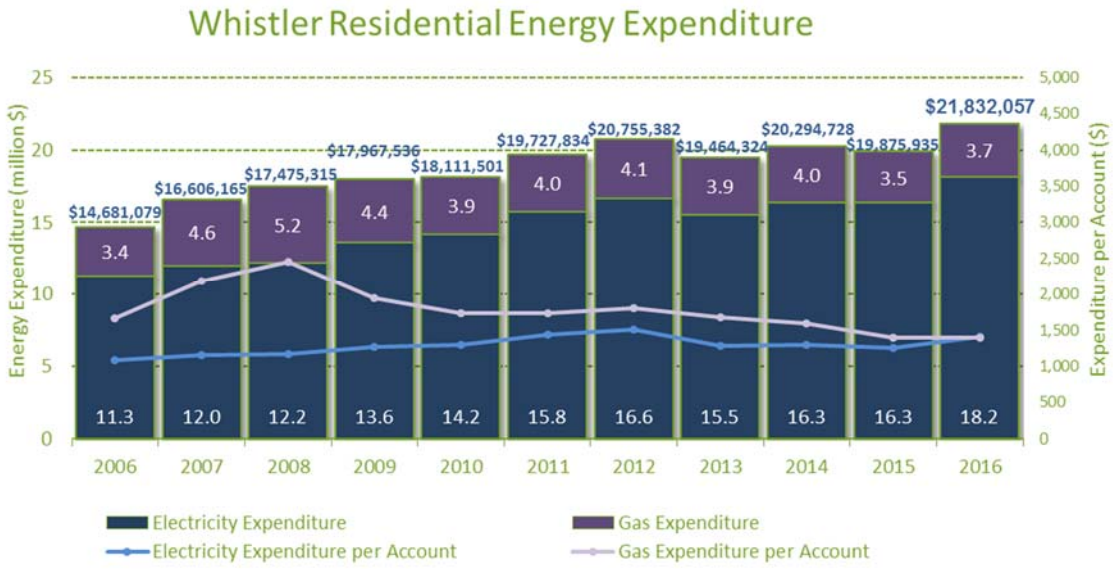
[11] Note that this number includes an estimate of the consumption of gasoline for all vehicle kilometres travelled within Whistler's municipal boundaries. As such it includes a portion (i.e the portion within municipal boundaries) of the incurred costs of energy consumption associated with both visitors arriving by automobile, as well as commuting employees from neighbouring communities.

The final two charts in this section present the ten-year trend in cumulative energy expenditures across Whistler's key building inventory. Despite the decrease in the price of natural gas, total expenditures in the residential sector continued to demonstrate a generally upward trend. As of 2016, residential expenditures total almost $22 million/year, and commercial expenditures were slightly above $21 million.



Historic rate escalation for electricity averages approximately 3-5% per annum. However, given the relatively recent British Columbia Utilities Commission (BCUC) amalgamation ruling, the delivered rate of natural gas has decreased 30-40% over the last three years. 2016 is the final year of the three-year phase in of lower FortisBC Whistler rates, so further substantive rate reductions are not expected in future years.

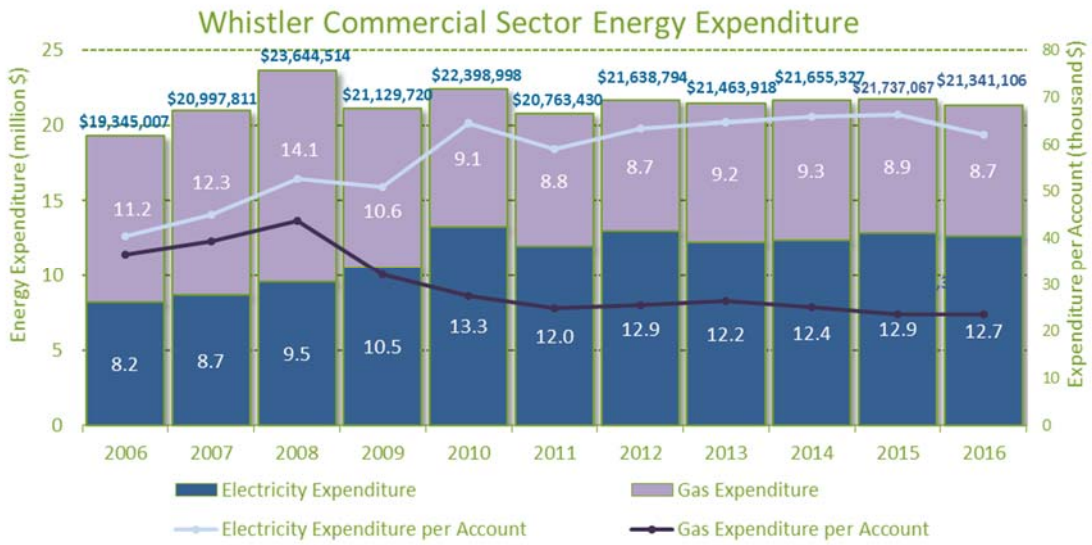
Residential Building Energy Expenditures



Residential building expenditures decreased in 2013 for the first time in a decade due to a reduction in total energy consumption across this sector. Residential expenditures have since regained a generally rising trend (2014-2016) despite declining consumption in '14 and '15. This is due to the fact that rates have increased (primarily electricity) by a margin in excess of the percent reduction in recent consumption levels.

In 2016, expenditures increased significantly seemingly due to a combination of increased rates, increased consumption, increased heated floor space in the community, and increased occupancy levels in the resort.

Commercial Building Energy Expenditures



Total commercial energy expenditures have remained relatively constant since 2012. This seems to be due to a combination of slightly decreased energy consumption of the sector, and a shift away from electricity to natural gas in the large accommodation sector energy users.

3.2.3 Power Down - Residential Energy Assessment Rebate Program

The Residential Energy Assessment Rebate Program offers Whistler homeowners $250 towards an Energuide for Homes home energy evaluation - a service which normally cost between $300 and $450. Since the program began in August, 2014, approximately 220 new and existing homes have been assessed through this program

Although the current sample size is relatively small, staff have been evaluating the results of these assessments and will continue to update the program and associated policies to maximize the efficiency benefits for both new and existing homes targeted through the program.

3.2.4 Key Community Energy Consumption & Energy Expenditure Performance Insights

Total Energy Consumption

- Total community energy consumption increased in each of the last two years. 2016 levels were 3.7% above 2015 levels and 2016 is now at the second highest annual level on record.
- Community energy consumption trends were on track to meet 'proposed' OCP targeted levels between 2011 and 2014, however 2015 and 2016 are now far above the required pace to meet 2020 goals.
- Current community energy consumption levels (3.22 million GJ/yr) is approximately 14% higher than the 2020 target in the RMOW's 2003 Integrated Energy Plan.
- **Energy consumption per population equivalent is now at the lowest level since detailed reporting began (95.7 GJ/pe vs. the 130 GJ/pe in 2005).** This represents a 26% reduction in energy consumption per person over an 11 year time frame.

Residential Energy Consumption

- 2016 residential energy consumption increased YOY in both total terms, as well as on a per account basis.
- The estimated residential sector energy use intensity (EUI) for 2016 was 8% lower than the average EUI of the last 10 years.

Commercial Consumption

- 2016 commercial consumption levels have increased by 3.8% year over year and are approximately equivalent to the 10 year average for the sector.
- There appears to be a continuing shift from electricity consumption to natural gas in the commercial sector. This has helped to moderate total commercial sector energy expenditures, but has increased the GHG emissions from the sector.

Passenger Vehicles

- Despite some increases in vehicle fuel efficiencies, estimated energy consumption associated with passenger vehicles has steadily increased since 2013. In 2016, there was a 6% year over year increase in estimated energy consumption within the sector. This trend is the primary reason that GHGs within this sector have lagged so far behind all other sectors with respect to meeting the reduction targets.

Total Energy Expenditures

- Though overall consumption levels increased, low mobile fuel and natural gas rates have combined to make 2016 the first year since 2009 that demonstrated a drop in total estimated energy expenditures ($82M/yr).
- Despite a 6% increase in passenger vehicle fuel consumption, total passenger vehicle expenditures decreased by approximately 8% year over year ($36.3M to $33.5M).
- Declining natural gas rates contributed to slightly lower total natural gas expenditures in 2016, despite 9% increase in consumption.

Residential Building Sector Expenditures

- 2016 residential electricity expenditures increased year over year, making 2016 the highest annual residential electricity expenditure on record ($18.2M/yr, and increasing to approx. $1,400 per account)
- Total residential gas expenditures increased to $3.7M/year in 2016, and remained relatively steady an estimated annual cost of $1,400 per account.

Commercial Building Sector Expenditures

- Total 2016 commercial energy expenditures remained steady at an estimated $21.5M.
- Both total, and per-account, commercial electricity expenditures decreased year over year
- Total natural gas expenditure decreased, but per account commercial expenditures remained steady (suggesting a slightly smaller number of accounts consuming more per account).

Looking Ahead

- The data suggests that there is some improved energy efficiency in the residential sector (on per area basis), but more years of consistent trend data is required to confirm. Opportunities exist to catalyze further gains in this sector, especially with new homes.
- The commercial sector has made progress toward decreased energy expenditures across its collective inventory. However, this reduction may have the net effect of increasing GHGs as it seems to be founded on an increasing shift to natural gas use away from electricity.

4 CORPORATE PERFORMANCE

Initiated as part of the 2004 RMOW Integrated Energy, Air Quality, and GHG Management Plan, detailed energy and emission inventories are now compiled, assessed, and shared with key operations staff across the organization on a regular basis. Energy consumption, emissions, and expenditures are tracked independently by fuel type (gasoline, diesels, electricity and natural gas) for each division, department, and workgroup across all corporate operations.

The primary purpose of these inventories is to provide the basis for identifying energy conservation opportunites, assessing energy performance across key municipal building assets, and structuring business case assessements for potential upgrades and efficiency retrfofits. Additionally, these inventories are designed to satisfy Council-adopted commitments to external programs such as the Partners for Climate Protection program and the BC Climate Action Charter, as well as the internal commitments in the RMOW Integrated Energy Plan, the new CECAP, the RMOW Carbon Neutral Operations Plan, and the Whistler Offical Community Plan.

As a means of comparison to community-wide emissions, RMOW corporate emissions represent approximately 1.25% of the total community estimated emissions. Despite this relatively small share of overall emissions, the RMOW has recognized and accepted the need for leadership in carbon and energy management across the organization.

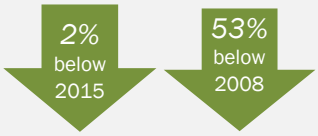
Further, the historic upward pressure on energy rates (over the long term energy rates rise faster than the rate of inflation) makes it clear for all organizations that energy consumption should be tracked, managed and ultimately reduced as a fiscal strategy, not just an environmental one.

4.1 KEY CORPORATE INSIGHTS and SUMMARY

Total corporate GHG emissions in 2016 were **1,514 tCO2e**, which is **3% higher than the 2015 level**, but approximately **35% below the benchmark 2008 level** (the reference year for RMOW target-setting).

Infrastructure Services

...increased emission levels by 6% year over year (YOY) and is 13% lower than 2008 benchmark levels.



Corporate and Community Services

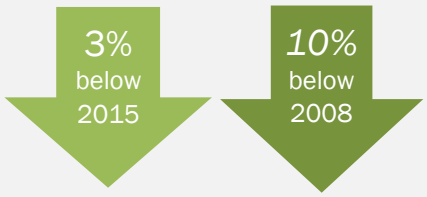
...emission levels decreased by 2% YOY, which means that current levels are now 53% below their corresponding 2008 benchmark level.

Resort Experience (REX)

...increased annual emissions by 5% in 2016 to a level that is now approximately 37% lower than 2008 levels.

GHG emissions are still markedly lower than the 2008 base year and are below the level targeted in the 2009 Carbon Neutral Operations Plan. However, if emissions continue to decrease at a rate below the targeted reduction rate of 4.75% or even increase as they did this year, it will be difficult for the RMOW to continue meeting desired reduction rates. Total energy consumption in 2016 did decrease YOY by 3% and is now 10% below 2008 levels but also included significant YOY increases in the consumption of natural gas and mobile fuels, which have high GHG intensities. In fact, the overall YOY reduction in energy consumption is solely attributable to a decrease in electricity consumption, which is much less consequential for GHG emissions. Energy expenditures increased by 1% year over year and are now 4% higher than 2008 levels. This is largely due to the increasing cost of electricity and has been partially mitigated by the decreasing cost of natural gas.

2016 Total Corporate Energy Use



2016 Total Corporate Energy Expenditures

4.2 CORPORATE GREENHOUSE GAS EMISSIONS

Section 4.2 deals specifically with greenhouse gas emissions associated with RMOW corporate operations. This section includes information on related targets, an overview of 2016 performance results, as well as a short section on key associated insights and trends.

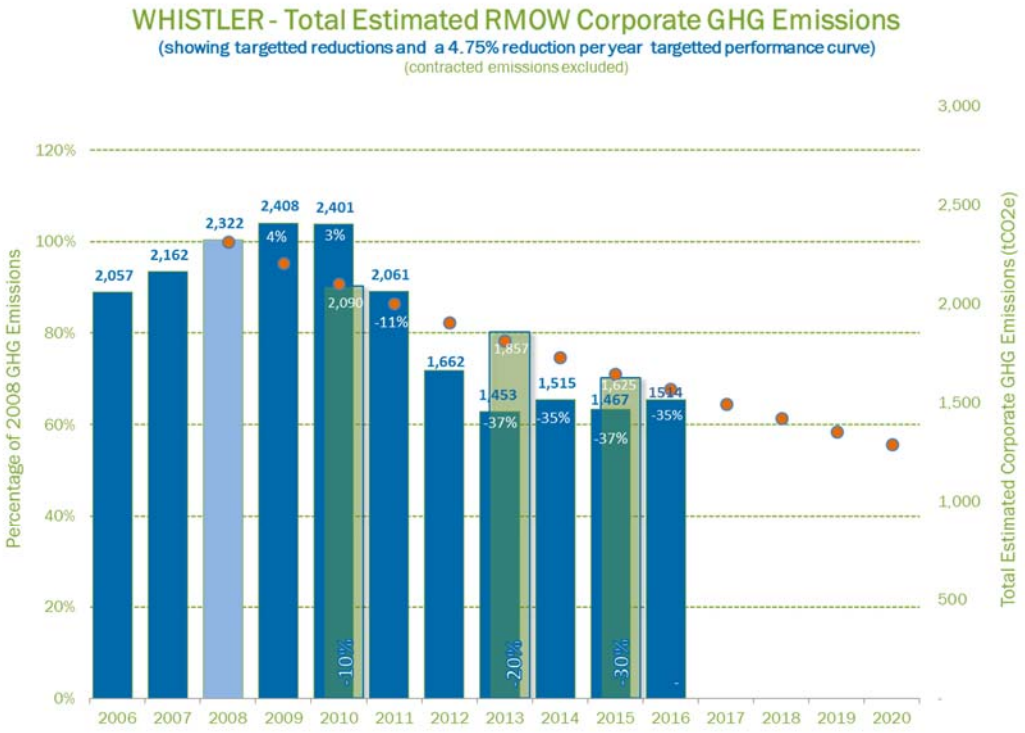
4.2.1 Corporate GHG Reduction Targets

The RMOW's 2009 Carbon Neutral Operations Plan sets the targets for total corporate GHG reductions as follows:

- 10% by 2010
- 20% by 2013
- 30% by 2015

(all relative to **2008** levels)

The following chart presents these targets graphically (green bars), the historic corporate emissions levels (blue bars) as well as an indication of the annual reductions that would be required to achieve the prescribed targets using a constant rate of improvement model at approximately -5% (orange dots).

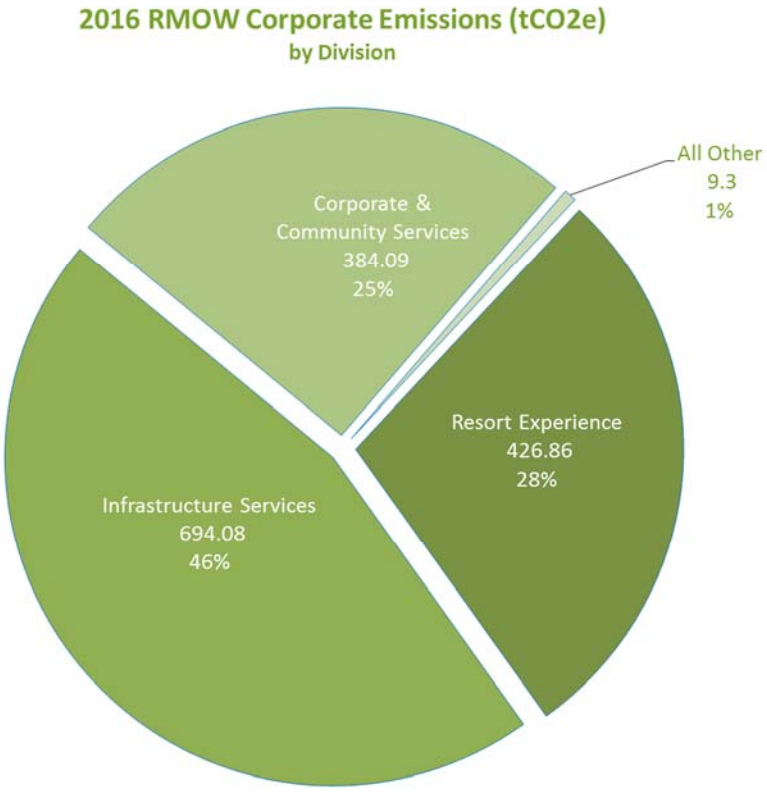


As demonstrated in the chart above, RMOW corporate emissions reduced substantively between 2010 and 2013. Between 2013 and 2014, emissions increased by 4%. However, this level of emissions was still ~220 tCO2e below the 2014 target curve. In 2015, this trend reversed and emissions decreased again by 3%, which was still 7% below the target level. In 2016, emissions once again increased by 3% year over year and are now only 4% below the target curve level.

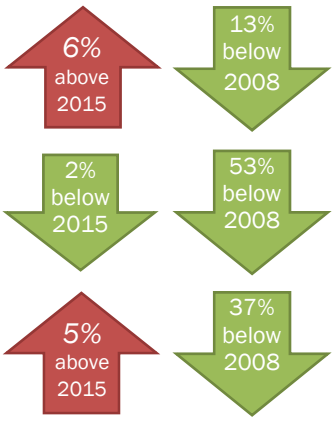
4.2.2 Corporate GHG Performance

Total direct corporate GHG emissions in 2016 were **1,514 tCO2e**, which is 3% higher than the 2015 level, and 35% below the benchmark 2008 level (the reference year for RMOW target setting). As demonstrated by the previous chart, this level of emissions is ~4% lower than the emissions target for 2016

On a division-by-division basis, the relative emissions footprint of corporate operations is primarily associated with the following three divisions: (46%) **Infrastructure Services** (which includes roads crews, solid waste systems, the water utility as well as the sewer utility); (28%) **Resort Experience** (which includes village maintenance operations, horticulture, turf, and irrigation crews, parks and trails, and facility construction and maintenance operations); and (25%) **Corporate and Community Services** (including bylaw, fire, Meadow Park Sports Centre, and other recreation programs);. The relative contributions from each division are shown below.



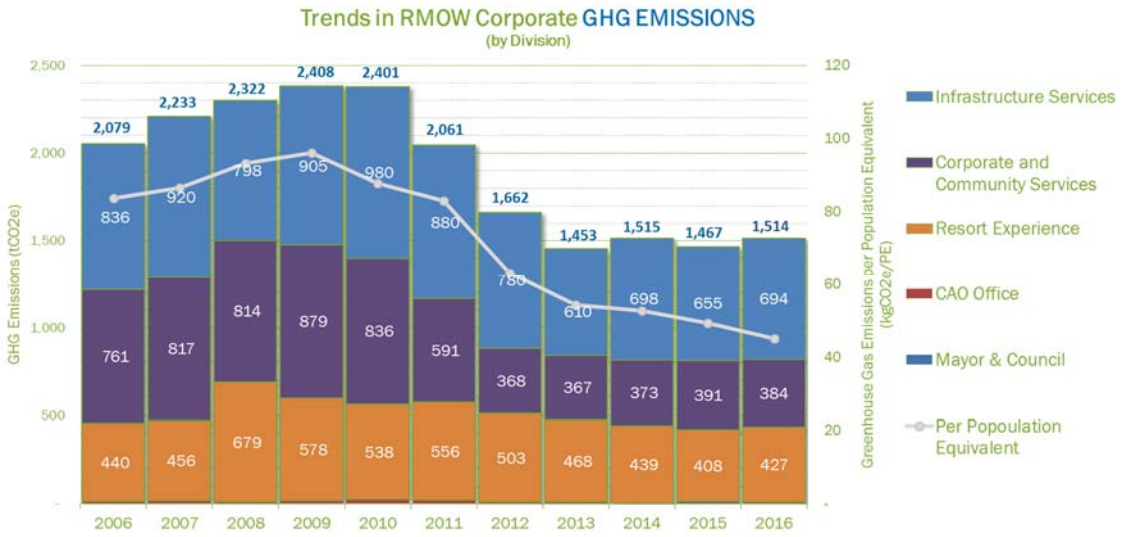
2016 Corporate GHG emissions by organizational Division are presented below.



- **Infrastructure Services**
  emission levels **increased** by 6% year over year (YOY), which puts 2016 levels at 13% lower than 2008 benchmark levels.

- **Corporate and Community Services**
  emission levels **decreased** by 2% YOY, which means that current levels are 53% below their corresponding 2008 benchmark level.

- **Resort Experience** (REX)
  emission levels **increased** by 5%, making current levels now approximately 37% lower than 2008 levels.

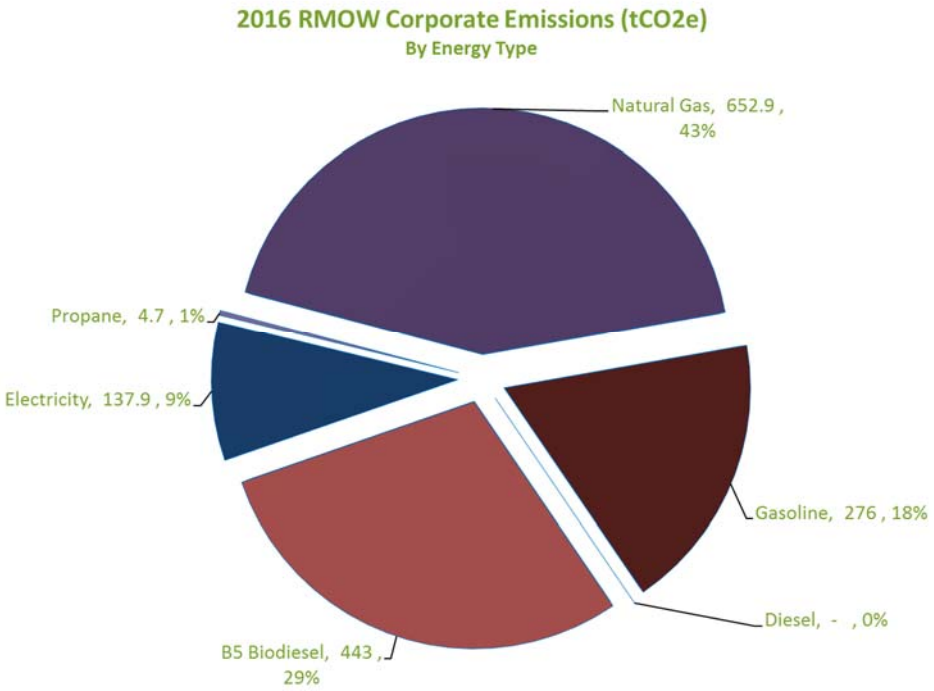


As seen in the chart above, infrastructure services is largest source of increased emissions, which coincidently was the primary source of reductions in 2015 (this volatility seems to be primarily associated with the emissions from the road crew, and may be related to changing demands in snow clearing activity).

Overall, the largest source of GHG reductions over the last decade has clearly been the energy retrofits at MPSC (Corporate and Community Services) – especially the installation of the geo-exchange and solar hot water systems.

Distribution by Fuel Type

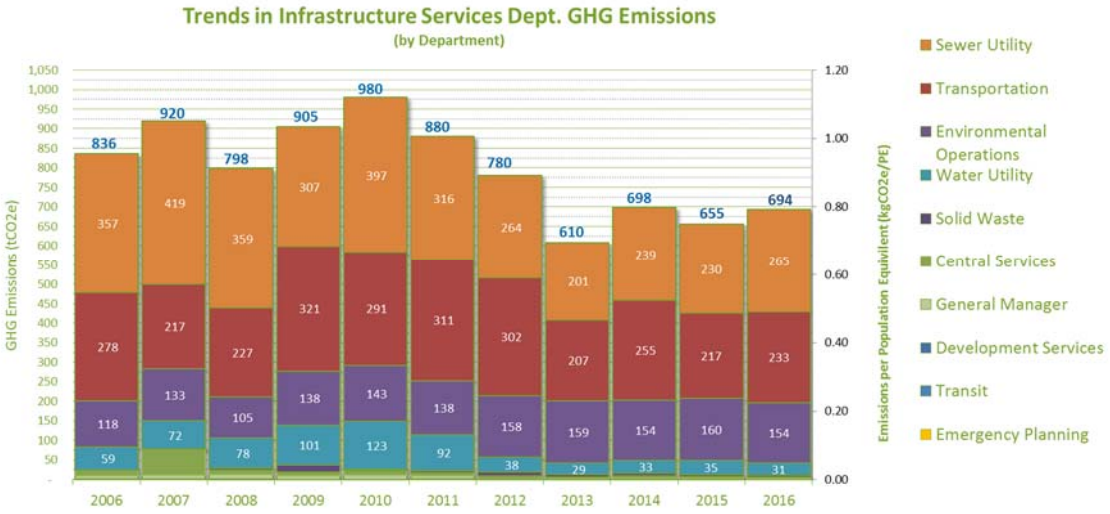
Seen as a whole, corporate emissions come from two primary sources – 47% from mobile sources (gasoline and diesels), and 53% stationary sources (natural gas and electricity). The relative shares of each of these energy types are presented below.



4.2.3 Divisional Trends

Infrastructure Services

Changes in Infrastructure Services emission levels over the last ten years are presented below:



Infrastructure Services' GHG emission trends by key functional area:

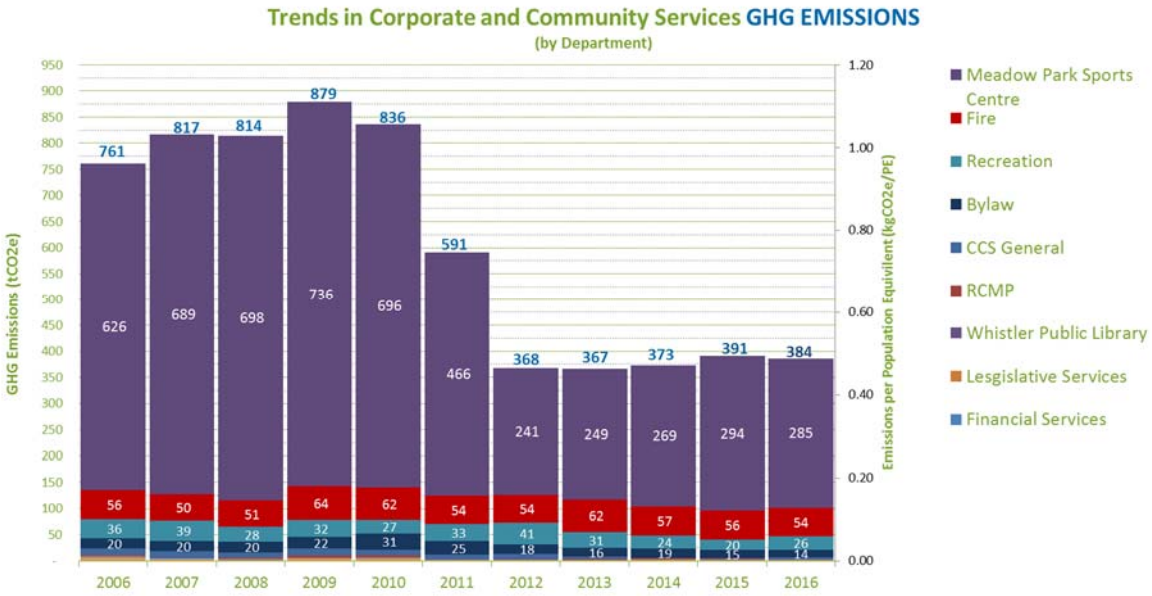
2016	Sewer	Transport.	Env. Ops	Water	TOTAL
YOY	15%	7%	-4%	-12%	6%
vs. 2008	-26%	3%	46%	-60%	-13%

Key Insights

- WWTP emissions (Sewer Utility) increased on a year over year basis and are 94 tCO2e (26%) lower than the 2008 benchmark level. In 2013, emissions associated with the WWTP reached an all-time low of 201 tCO2e and 2015 emissions were the second lowest ever recorded. However, 2016 emissions have returned to 2012 levels
- Mobile emissions from the transportation (roads) department saw a year over year increase of 16 tCO2e. This is at least partially the result of a higher than average snow clearing year. The current emission levels for the transportation department are now 3% higher than 2008 benchmark levels.
- Environmental Operations emissions decreased year over year, which now puts it 49 tCO2e (47%) higher than the 2008 benchmark levels. The overall increase since 2008 is mostly due to the increased amount of mobile fuel use in the utilities workgroup.

Corporate and Community Services

Changes in Corporate and Community Services emission levels over the last ten years are presented below:



Corporate and Community Services GHG emission trends by key functional area:

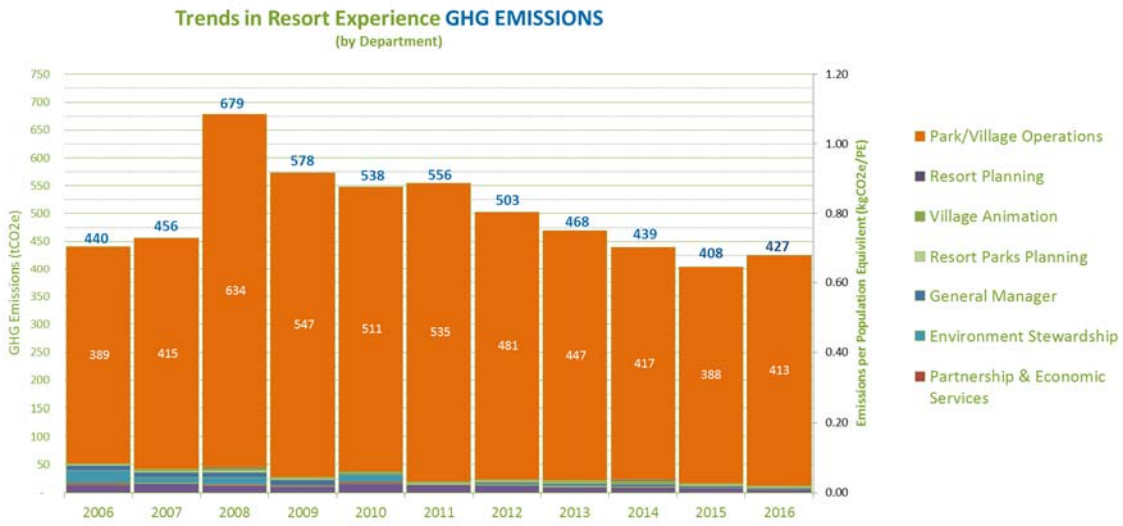
2016	MPSC	Fire	Rec	Bylaw	TOTAL
YOY	-3%	-4%	31%	-7%	-2%
vs. 2008	-59%	6%	-8%	-29%	-53%

Key Insights

- The primary driver of reduced emissions within this division was MPSC. With a 9 tCO2e reduction year over year, 2016 MPSC annual emissions are now 413 tCO2e lower than 2008 benchmark levels.
- The Fire department's emissions have increased compared to 2008 benchmark levels, however the scale of this change is small in total terms (3 tCO2e for 2016).
- Recreation emissions increased by 6 tCO2e year over year, which was primarily due to an order of magnitude increase in X-Country snow grooming.

Resort Experience (REX)

Changes in REX emission levels over the last ten years are presented below.



As the emissions from the REX division are overwhelmingly associated with the Parks/Village Operations functional area, a more detailed breakdown is included in the table below.

Park/Village Operation dept. GHG emission trends by key functional area are demonstrated below along with the total Park/Village Operations and REX trends:

2016	P/Vops	V.Maint.	Land S	Parks &T	FC & M	TOTAL
YOY	6%	-6%	5%	2%	9%	5%
vs. 2008	-39%	21%	43%	5%	-36%	-40%

Key Insights

- Facility Construction & Maintenance (FC&M) emissions represent by far the largest emission share of this division. The FC&M increase (22 tCO2e) came primarily from increased natural gas use at buildings such as the Public Works Yard, the Public Safety Building, as well as the Olympic Plaza washrooms and associated outdoor fire pit.
- Increases in emissions in Landscaping Services and Parks & Trail Maintenance are relatively small, with no more than ~3 tCO2e increases year over year in each department. However, Landscape Services and Parks & Trail Maintenance, as well as Village Maintenance, are all above 2008 benchmark levels.

4.2.4 Key Corporate GHG Emission Performance Insights

Overall

- RMOW corporate emissions are up 3% YOY but are 35% lower than the 2008 benchmark year and 4% lower than the emissions target for this year.
- Large reductions in GHG emissions in previous years were largely due to upgrades at Meadow Park Sports Centre, a decrease in BC Hydro's emission factor for electricity, and also a reduction in consumption across divisions, specifically in Infrastructure Services. However, since many of the larger retrofit projects were completed in previous years, much of the current change in emissions results from changes in fuel use for operational demands. In 2016, fuel use for operational demand increased, and without a major retrofit project to offset this increase, there was a subsequent increase in overall RMOW emissions.

Divisional Insights

- Infrastructure Services' emissions increased by 6% year over year, mainly as a result of increased natural gas consumption (+15%) at the WWTP, and an increase in the Transportation department's mobile fuel use, which is largely due to a 28% increase in winter road maintenance diesel use. Despite these increases, current levels in this division are currently 13% lower than 2008 benchmark levels.
- Corporate and Community Services emissions decreased by 2% year over year. More importantly however, there has been a 53% decrease in emissions since the 2008 base year, mainly due to upgrades at MPSC.
- The REX division saw an emissions increase in 2016 (+5%) and the majority of this was due to an increase in stationary natural gas use (+14%) in Facilities, Construction & Maintenance
- Municipal buildings with the lowest intensity of GHG emissions include the following: (all expressed as kgCO2e/ft2/year)
  - *Lost Lake Passivhaus: 0.07*
  - *Spruce Grove Field House 0.16*
  - *Whistler Public Library 0.21*[12]

4.3 CORPORATE ENERGY CONSUMPTION

Section 4.3 deals specifically with the energy consumption associated with RMOW corporate operations. This section includes information an overview of 2016 performance levels, and a short section on key associated insights and trends.

4.3.1 Corporate Energy Consumption Reduction Targets

The RMOW does not currently have any formally adopted targets for corporate energy consumption. The existing RMOW Integrated Energy, Air Quality and GHG Management Plan did, however, include recommended corporate energy consumption targets for 'consideration'. These recommended energy consumption targets for municipal operations were: year 2010 (64,000 GJs), and year 2020 (55,000 GJs).

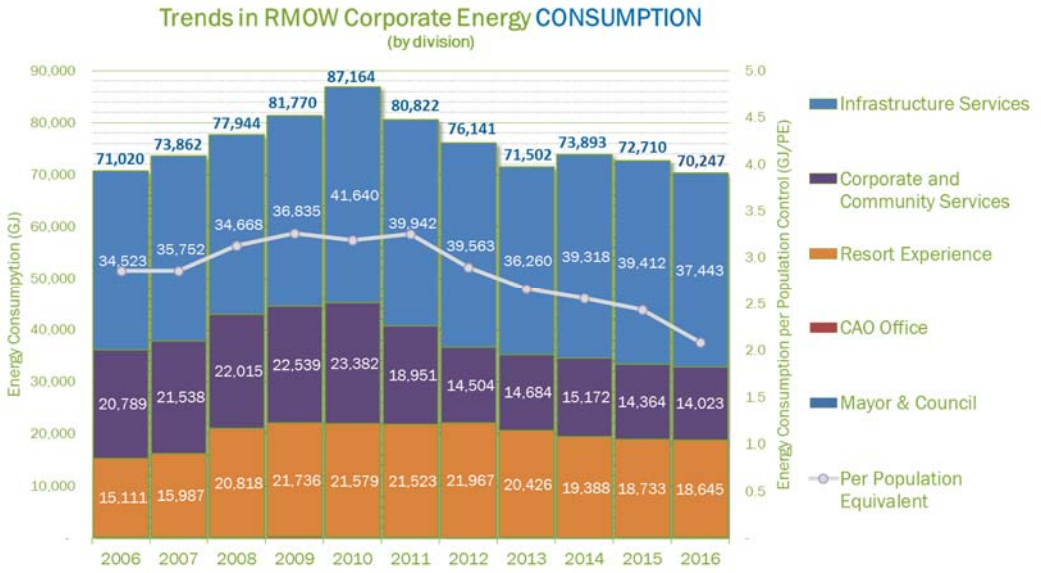
The RMOW Carbon Neutral Operations plan does not include formal targets but rather recommends ongoing commitment to energy conservation as both (a) the primary strategy for reducing corporate GHG emissions, and (b) an important means of controlling ongoing utility and fuel costs across corporate operations.

[12] For reference, Maurice Young Arts Centre emits 2.1 kgCO2e/ft2/year

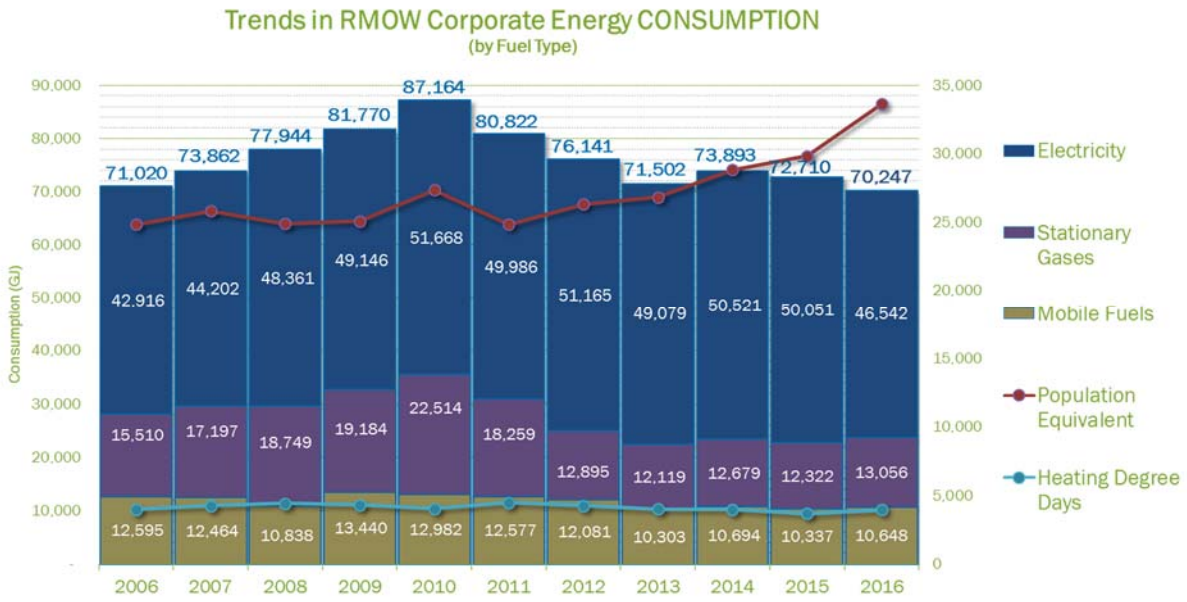
4.3.2 Corporate Energy Consumption Performance

Total corporate energy consumption decreased in 2016 by 3.4% to **70,247 GJ/year**. This is still above the 2010 target recommended within the RMOW Integrated Energy Plan (64,000 GJ/year), and considerably higher than the upcoming 2020 target (55,000 GJ). At the same time, 2016 corporate energy consumption per population equivalent continued to be very near historic lows.

The ten-year trends in corporate energy consumption are presented below:

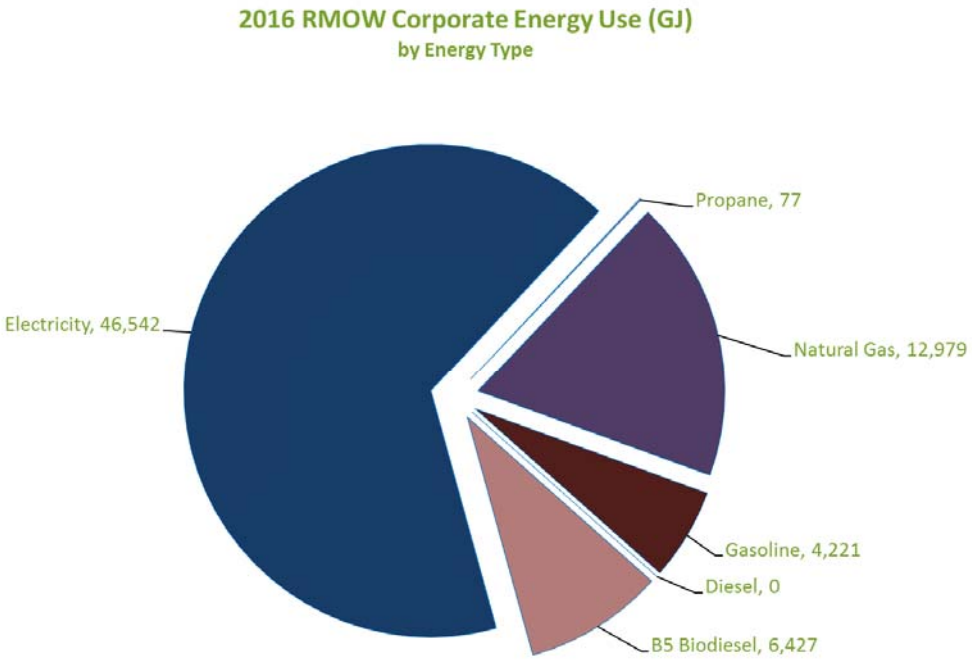


If the corporate energy consumption is subdivided by fuel type rather than by organizational division, the ten-year trends appear as follows:

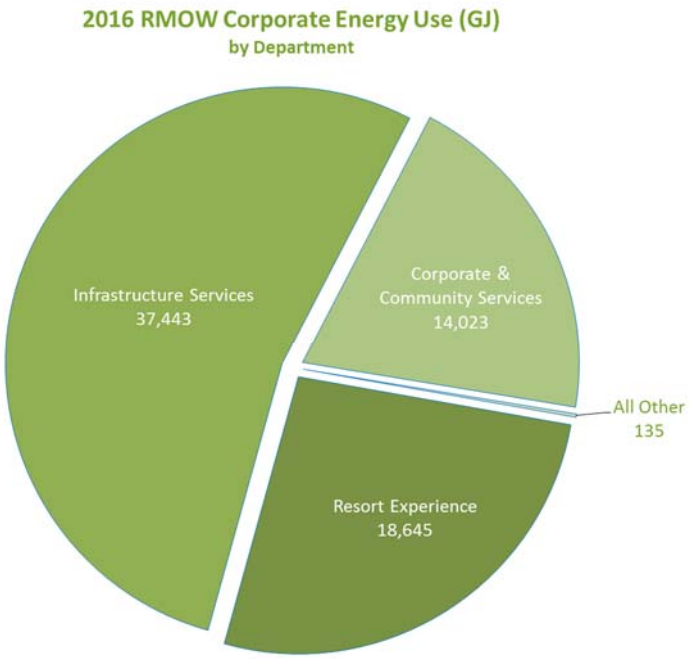


Electricity consumption makes up the greatest portion of total energy consumed across municipal operations at 66% of the total consumption, followed by natural gas (19%), and mobile fuels (15%).

A more detailed breakdown of 2016 corporate energy consumption, presented by energy type, is included below:



Finally, 2016 energy consumption by division is included for reference below:

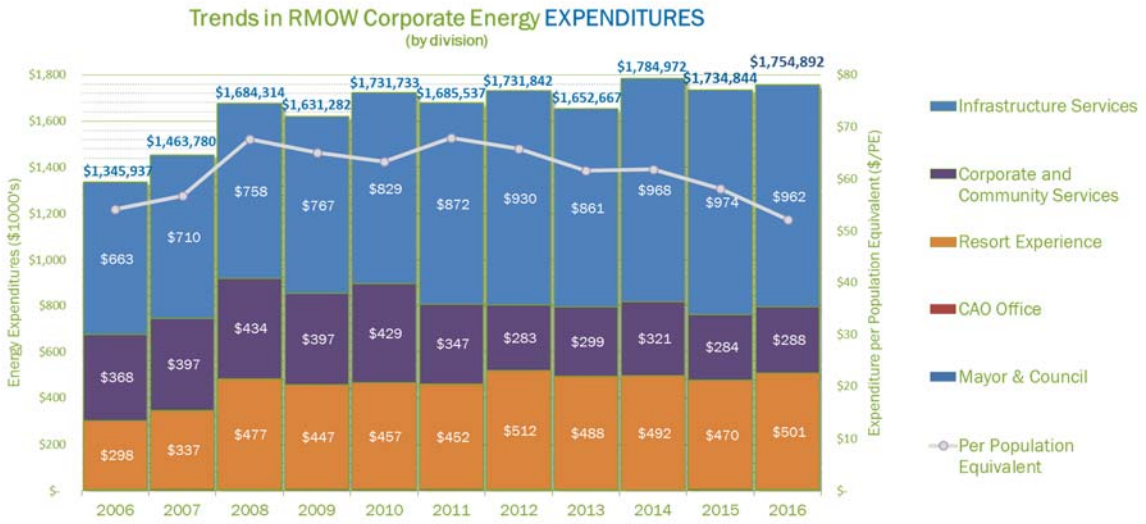


Corporate Energy Expenditures

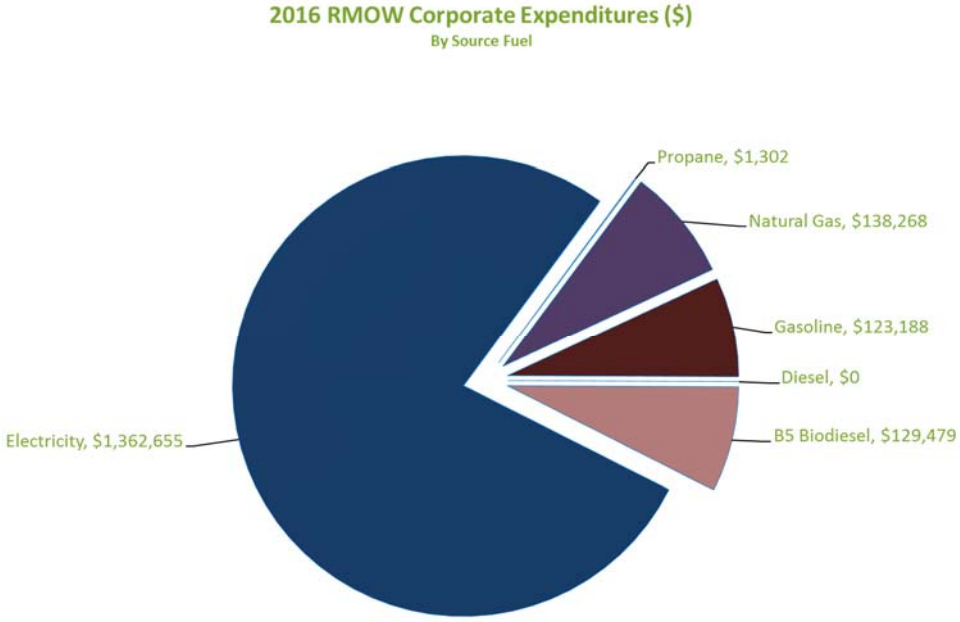
Total 2016 corporate energy expenditure increased by approximately 1% to a total of ~$1.75 million. Note that the 1% increase in expenditures is concurrent with a 3.4% decrease in consumption which demonstrates the impact of energy rate changes on total expenditures over time.

Further conservation will be the key to controlling future expenditures at a level consistent with current levels given that long term trends in energy rate inflation (duly noting the exception of recent natural gas rate changes and low mobile fuel prices) generally exceed the Consumer Price Index (CPI).

The ten-year trends in total corporate energy expenditure are presented below:



2016 corporate energy expenditures by fuel type are presented in the following chart:



4.3.3 Performance of Key Corporate Buildings

Across its operations, the RMOW has made investments into energy efficiency and green building technologies for more than a decade. The benefits of these initiatives vary according to the project, but include reduced GHG emissions, reduced energy consumption, decreased energy expenditures, healthier buildings and decreased materials and resources within the construction process. For the purposes of this report, an update on energy consumption, expenditure and emissions is provided for key buildings across RMOW operations.

Whistler Public Library

Whistler Public Library (WPL) opened in 2008 as Whistler's first LEED Gold certified building. The building has won numerous awards, including BC Wood Works award for innovative hemlock construction methods, as well as the Lieutenant-Governor Award in Architecture.

Energy performance at the WPL indicates that the building is operating at more than 60% better than the Model National Energy Code for Buildings (MNECB). At this level of performance (~746 GJ/yr.), annual utility costs are approximately $23,000 less than had the building been built to typical building code standards (MNECB) at the time.

Spruce Grove Field House

In 2001, the RMOW chose to install a geo-exchange heat pump instead of a gas furnace at SGFH. The incremental cost of the GHX equipment was $126,350, however the system was forecast to reduce operating costs by $21,800/year thereby producing an expected simple pay back (SPB) period of 5.8 years and an internal rate of return (IRR) on invested capital of 16.5%.

Actual annual reductions in energy costs have averaged $20,700 since the installation of the GHX equipment, producing a SPB of 6.1 years (IRR of 15.5%). As of 2008, the incremental cost of the GHX system had been fully recovered and annual utility savings continue to run at approx. $18,000/year versus the forecasted gas-powered furnace baseline. 2016 annual energy costs at SGFH were less than $10,000 ($1.67/ft2/year; 164 kWh/m2/year). Annual GHG emissions from SGFH were 0.97 tCO2e (emissions with a gas furnace were forecasted at 56-67 tCO2e/year).

Meadow Park Sports Centre

In 2010, a $930,000 energy system upgrade was installed at MPSC. The new system incorporated both evacuated tube solar technology and a vertical loop geo-exchange bore field. The system design employs the solar panels to pre-heat the domestic hot water loads directly, while the heat pumps draw heat from the ground (70 boreholes at 155' depth) to serve the various pool loads within the building (lap pool, leisure pool & hot tub). Utility cost reductions that were anticipated as a result of these upgrades were estimated at $115,000 - $130,000/ year (SPB: 6.5 – 7.8 years; IRR: 10% - 13%), with annual GHG reductions forecasted at 300-350 tCO2e/year.

While the finalization of the project construction and commissioning phases was delayed until mid-2011, the system is now fully functional and working well. In 2016, annual energy expenditures at MPSC were $243,073, which is 2.5% higher than 2015 expenditures. However, 2016 expenditures were still 36% ($136,000) lower than 2008 base year expenditures (before the renovation). The year over year increase is largely due to the increased cost of electricity.

Lost Lake PassivHaus

The $1.5 million project was the result of partnership between the RMOW, the Austria Passive House Group (APG) and Sea-to-Sky Consulting. A grant from the Whistler Blackcomb foundation was also instrumental to the realization of this project. The Passive House (PH) approach to construction uses radically improved building envelope design and components to achieve dramatic reductions in building energy consumption of approx. 90% compared with standard Building Code construction. This energy usage translates into has less than half of the energy consumption of a Platinum LEED house – Canada's current high standard for "green"

building. The small amount of heating energy which is still needed in a Passive House can then be supplied via the ventilation system air flows. Passive houses are well established in Europe with well over 17,000 existing passive units; approximately 4,000 of these are in Austria.

In partnership with BC Hydro, the RMOW tracked the LLPH from Jan of 2011 to Dec '12 using a real time Energy Management Information System (EMIS energy consumption at). At the end of the pilot project, the results showed that all building heating loads (including hot water) consumed 2,922 kWh (11.7 kWh/m2/yr), and all other loads in the building combined for a total of 15,156 kWh (60 kWh/m2/yr) – both values well inside the limits allowable within the rigorous passive house certification protocol.

The bottom line is that over the course of an entire year, it cost only about $250 to provide all the heat required by this 2,700 ft2 building (a typically built building in our climate would consume approx. ten times this amount).

4.3.4 Key Corporate Energy Consumption Performance Insights

Energy Consumption

Overall

- Corporate energy consumption deceased in 2016 to 3.4% lower than it was in 2015 and this level is approximately 7,697 GJ lower than 2008 benchmark levels.

Divisional Insights

- Corporate and Community Services saw a year over year decrease of energy consumption (2.4%). Infrastructure Services saw a year over year decrease of 5% relative to 2015 levels. Energy consumption by Resort Experience was nearly equal to 2015 levels.
- Despite its reduction in 2016, Infrastructure Services' consumption level is still 8% higher than 2008 base year levels.
- Resort Experience's consumption levels have decreased to 10% below base year levels, while Corporate and Community Services continue to see the largest consumption decrease, currently sitting at 36% less energy use compared to 2008.

Energy Expenditures

Overall

- Overall 2016 energy expenditures across municipal operations increased by 1% year over year to ~$1.75M. Current expenditures have increased by approximately $70,000 (4%) from benchmark 2008 levels.
- Electricity represents approximately $1.36M/yr of the total corporate energy expenditure.

Divisional Insights

- Corporate and Community Services' energy expenses increased year over year by 1.35%. However, CCS's expenditures are still nearly $150,000 lower than benchmark 2008 levels, primarily related to savings achieved at MPSC.
- Year over year, Resort Experience saw an increase in expenditures of 6.5% relative to 2015 levels. Infrastructure Services saw a decrease in expenditure of 1%. The increase in Resort Experience expenditure is due to the increased cost of electricity.
- Upgrades in energy efficiency across the operation have yielded solid, expected returns on investment. However, without further investments in additional energy efficiency and conservation across the operation, continued increases in energy expenses are likely.

5 CECAP IMPLEMENTATION UPDATES

The CECAP was developed to update the 2004 Integrated Energy, Air Quality and GHG Emissions Plan, and to respond to the critical fact that Whistler was not on target to meet its GHG reduction targets as articulated in the Official Community Plan (Bylaw No 1021, 1993). The CECAP was designed to include a formal adaptation plan to ensure increased community resilience to projected local climate changes over time. Detailed CECAP modelling and associated analyses projected the following key climate changes for Whistler over the next 25 to 55 years:

1. Increase in the frequency and intensity of heavy rain events.
2. Longer, hotter and drier summers.
3. Milder winters, with increased precipitation falling as rain near valley bottom, while snow pack at higher elevation sees limited change.

The CECAP attempts to articulate a vision of a resilient, lower carbon Whistler and confirms community targets for the reduction of GHG emissions, and the stabilization of community energy consumption as well as builds a foundation for significant increases in the use of renewable energy over time.

The Plan was collaboratively developed with a Community Advisory Group (CAG), an internal staff content expert team, and led by a cross-departmental project management team. There were also several opportunities for public and stakeholder input to be integrated into the plan. The CECAP establishes a series of emission reduction and climate adaptation objectives, and includes priority recommended actions designed to reduce GHG emissions and to increase Whistler's resilience in the face of climate change.

The effective implementation of these measures will better position Whistler to meet the challenges of a changing climate, reduce community dependence on fossil fuels, and decrease collective energy-related expenditures. Key recommended **energy and GHG reduction initiatives** range from support for expanding access to mass transportation services and growing electrification of transportation, to reducing emissions related to solid waste management and to homeowner and commercial sector incentives for improving the energy efficiency of Whistler's built environment. Key recommended **adaptation initiatives** included range from renewing our integrated storm water management, expanded water conservation and wildfire protection plans, to increasing access to weather independent attractions in the valley and increasing communication and engagement around climate and energy related issues.

The CECAP outlines the targeted implementation timelines, lead organization and general resource implications for each of the recommended actions. For each of the recommended 'Reduction Actions', the CECAP also includes an estimated energy and emissions reduction potential for each identified action.

The following section provides highlights of the RMOW's 2017 implementation progress related to the CECAP, as well as providing anticipated RMOW priorities for the 2018 work plan where possible.

5.1 REDUCTION/MITIGATION INITIATIVES

Consistent with the fact that the majority of Whistler's GHG emissions come from the passenger vehicle sector, a great deal of internal effort has been applied to **transportation sector reductions**. Highlights of these CECAP recommended initiatives include:

#	Recommended Action	Updates
6.1.1.2	Investigate raising the target for the number of employees, especially full-time employees, living locally (i.e. > than the current 75%)	• Significant work on resident and employee housing was undertaken in 2017. The final report of the Mayor's Task Force on Resident Housing will be presented to Council before year end, and will include the Task Force's top priorities for improving resident housing affordability and access across the community.
6.1.2.1	Work with regional passenger carriers and provincial regulatory bodies to encourage greater frequency and more affordable choices for regional bus travel	• RMOW staff have responded to referrals on this issue and made specific requests for encouraging better flexibility for motor carriers that would allow them to respond to passenger's needs. Work continues.
6.1.2.2	Support the expansion, promotion and increased convenience of mass transportation services between Vancouver and Whistler	• RMOW currently working with BC Transit and Ministry of Transportation staff on funding framework for a Regional Transit system. Work will continue in 2018.
6.1.2.3	Develop a public realm with improved multi-modal integration and comfortable, convenient transition areas – Bus Loop/taxi loop	• Gateway Loop Upgrade Project is expected to be completed within two months and will provide a significant improvement to the arrival experience in Whistler.
6.1.2.4	Advance a community-based social marketing research project to determine the key perceived barriers and benefits of increased use of mass transit transportation. Based on the associated results, develop and execute targeted community-based social marketing campaign and other relevant, practical solutions to increase use of mass transit	• A first portion of the social marketing research has been completed and target groups identified. A winter transportation social marketing campaign is currently being coordinated by the TAG Communications Sub-committee (WB, TW, WC, and RMOW) and materials are expected to start rolling out in the next few weeks.
6.1.2.6	Continue to pass the infrastructure, maintenance, congestion, environmental and land costs of road and parking infrastructure onto users.	• User pay parking has been implemented for high-demand periods at all municipal parking areas.
6.1.2.8	Strategically expand transit system service levels and frequency where possible and affordable	• 1,000 additional Transit service hours were added in 2017, and 6,500 more are being built into the 2018 transit schedule. Funding for a portion of these hours is being linked to the Community Transportation Initiatives fund established by the Day Lot Parking Committee.
6.1.3.1	Prioritize the recommendations of and regularly update the Whistler Transportation Cycling Plan and the Whistler Recreational Cycling Plan in planning for the pedestrian and bicycle network.	• REX is continuing progress on legitimizing bicycle use on portions of the valley trail that are within municipal road right-of-ways (legally described as sidewalks).
6.1.4.1	Support the development of, and increased access to, reduced-carbon mobile fuel options such as natural gas, appropriate biofuels, and electrical charging stations across the community.	• Led the finalization of the Level III DC Fast Charger installation at the Conference Centre Underground (w BC Hydro and Plug In BC), and continue to monitor and upgrade the 10 existing level II public EV chargers across the community, as well as liaise with private EVSE providers.
6.1.4.2	RMOW to aggressively advance the average fleet GHG and energy efficiency of the municipal vehicle fleet.	• Each new vehicle purchase is viewed through the lens of providing the most efficient vehicle that can reliably perform the required tasks.
6.1.4.9	Invest in electric vehicle integration across municipal fleet	• As above.
6.1.4.12	Explore opportunities to effectively support and encourage the development of a new car coop/sharing program in Whistler, in addition to promoting ride-share and carpool programs.	• Carpool options for Lots 4 & 5 will be available beginning December 15, 2017, and WB intends to pilot a carpool incentive program for 1 or more of their skier parking lots in 2018.

RMOW implementation highlights of key stationary energy (buildings) and solid waste-related CECAP recommended initiatives include:

#	Recommended Action	Updates
6.2.1.5	Continue to optimize performance outcomes of the Cheakamus Crossing DES and apply learning to future projects	• Work on improving the performance of home heating systems in Cheakamus Crossing is on-going. Optimizing the performance of the DES heating loop is also in progress with fine-tuning the operation of new condensing natural gas boilers at the WWTP.
6.2.2.1	Support the trades, sub-trades, developers and building community with programs and initiatives designed to increase the uptake of energy efficient residential building designs, programs and technologies in Whistler.	• Continued to offer and promote the Power Down incentive program to provide $250 incentives off of the price of third party energy assessments of both new building plans, as well as existing homes. Continuing in 2018.
6.2.2.3	Explore the feasibility for requiring energy modeling for new residential buildings and significant renovations at building permit phase.	• Significant work done with Province, BC Hydro and others to prepare for the introduction of the Building Act and related BC Energy Step Code regulation. CEES and Building department to engage the community on higher energy performance regulations and advance a Whistler Step Code policy in 2018.
6.3.1.4	Support provincial building code extensions and other tools that maximize the extent that local building regulation can require or support increased energy efficiency or renewable energy systems in local development and construction.	• As above
6.4.1.1	Support the implementation of a strong SLRD Solid Waste Management Plan - with strong targets and actions, regional collaboration, and continued avoidance of waste/garbage incineration as part of the Plan.	• New Waste Diversion Bylaw adopted in fall 2017 that will compel all Whistler businesses to divert recyclables and organics from the landfill waste stream.
6.4.1.2	Support the expansion of local compost diversion programs (marketing, education, pricing, infrastructure, etc...)	• as above
6.4.1.6	Evaluate and support implementation of efficient and convenient methods of collecting solid waste, recyclables and compost for people utilizing preferred methods of transportation.	• Transport of waste and/or recyclables on local transit now permitted as a pilot project (with some limitations)
6.4.1.8	Implement standardized SLRD signage across Whistler to improve recycling and composting rates.	• Pilot project in 2017 tested signage (and a separate compost bin) in the streetscape realm at Celebration Plaza and Skiers Plaza. RMOW public facing waste bins (library and Meadow Park) and internal waste bins at other municipal facilities have standardized signage.
6.4.2.2	Encourage the use of the Re-Build-It Centre and Re-Use it Centre for the reuse of building materials, products and to support community services.	• Supporting the relocation, expansion and improvement of both facilities.

Implementation highlights of key identified 'enabling' initiatives include:

#	Recommended Action	Updates
6.5.1.1	Create a 'Climate Leadership Committee' as a select committee of Council	• Not initiated. Committee and task force priorities and resources dedicated to Transportation and Housing initiatives in 2017.
6.5.1.2	Create a Climate Action Coordinator position on municipal staff to lead the coordination and implementation of this CECAP and related energy and climate management responsibilities at the RMOW.	• Not initiated. CECAP-related work program (as updated on pages 42-45) spread across the organization and executed by existing staff resources.
6.5.2.1	Lobby the Provincial government for further systematic increases in the BC Carbon Tax...	• Letters sent. New provincial government announced that carbon tax increases are planned for 2018.
6.5.3.3	Continue to meet municipal carbon neutral commitments through the purchase of locally and regionally sourced high quality, externally verified offset products (i.e. Cheakamus Community Forest).	• The RMOW has maintained its carbon neutral status every year since 2010. Annual offset purchases are now 100% sourced from the Cheakamus Community Forest.

5.2 ADAPTATION INITIATIVES

Consistent with both 2017 Council Priorities and the key findings of the CECAP vulnerability and risk assessments, primary focus of the Adaptation activities in 2017 were related to wildfire protection. Highlights of key CECAP recommended initiatives related to minimizing wildfire threats include:

#	Recommended Action	Updates
8.5.1.1	Continue to implement the Community Wildfire Protection Plan, including emphasis on public education and engagement.	• CWPP and RMOW Wildfire Protection Strategy are being implemented. Firesmart Coordinator providing public education and engagement such as Firesmart property assessments, community chipper days and attending strata and neighbourhood meetings.
8.5.1.2	Prioritize the implementation of the landscape-level wildfire management plan for the Cheakamus Community Forest (CCF) area.	• The RMOW and CCF signed a Memorandum of Understanding regarding fuel thinning projects within the CCF area. Callaghan FSR continued in 2017and Cheakamus Lake FSR scheduled for 2018/19.
8.5.1.3	Increase municipal and collaborative efforts around wildfire prevention with key corridor partners (i.e. MFLNRO, Sea to Sky fire rescue services, SLRD, Vancouver Coastal Health).	• RMOW, CCF and FLNRO coordinating on fuel thinning projects (Cheakamus Lake Road, Callaghan FSR, Alpine Meadows/CCF5). Coordinated with SLRD and Lil'wat Nation to FireSmart Wedge Crossing informal camping area.
8.5.1.4	Continue to review and update pre-incident and emergency response plans and communication protocols for wildfire situations.	• Planning, monitoring and response protocols updated with WFRS, WB, BC Wildfire Service, Blackcomb Helicopters, etc. Corridor-wide evacuation plan scheduled for 2018.
8.5.1.5	Develop private property wildfire risk reduction guidelines and implement through municipal policy and/or procedures.	• FireSmart Property Assessment template developed based on FireSmart Canada guidelines and related municipal policies, and integrated with Planning Department referral process.
8.5.1.6	Review existing and consider more restrictive campfire and backyard fire bans and increase the enforcement of fire bans and ticketing/fines for offences during high fire risk periods.	• Will be part of an overall 2018 Fire Bylaw review. Enforcement handled by career staff doing campfire patrols during periods of extreme hazard and through partnership with Bylaw staff, RCMP and Provincial CO's, based on locations and land ownership.
8.5.1.7	Consider creating Development Permit Areas for wildfire protection.	• Anticipated in 2018 as part of the OCP update process.

The following table highlights relevant updates on CECAP-recommended initiatives related to congestion on Hwy 99, damage from heavy rain events, ensuring adequate water supply, enhancing weather-independent tourism opportunities as well as minimizing threats to ecosystems, biodiversity and the CCF:

#	Recommended Action	Updates
8.5.2.1	Facilitate, develop and promote alternative and mass transportation options to and from Whistler.	• RMOW currently working with BC Transit and Ministry of Transportation staff on funding framework for a Regional Transit system. Earliest implementation would be fall 2019. See additional updates in Mitigation section (p. 42)
8.5.3.1	Continue to conduct annual assessments of significant waterways to identify and mitigate high risk flood locations while respecting in-stream and riparian habitat regulations.	• A significant risk assessment of all RMOW waterways began in 2017 (with a contribution from federal emergency program funding).
8.5.4.1	Continue to update and prioritize implementation of the Comprehensive Water Conservation and Supply Plan focused on municipal conservation and infrastructure improvements, in addition to relevant regulations, policies and enforcement. The plan should be updated as needed to include or consider best practices in water conservation and supply management.	• Work has started on updating Whistler's Water Conservation Bylaw.
8.5.4.2	Enhance public engagement, communications and social marketing initiatives to optimize water	• Stakeholder outreach will continue in early 2018.

#	Recommended Action	Updates
	conservation efforts and emergency preparedness related to water shortages.	
8.5.3.5	Review and adapt as appropriate emergency planning protocols for extreme weather occurrences and related impacts, in consideration of projected climate changes	• Emergency planning protocols are constantly being updated, improved and expanded. Specific work is underway to improve evacuation protocols, internal communication systems, as well as critical infrastructure management in light of potential new emergencies – with a focus on wildfire threat.
8.5.4.3	Explore opportunities to improve municipal irrigation systems to maximize efficiency.	• Significant upgrades done in 2016, and further refinements to systems and policies undertaken in 2017.
8.5.5.2	Explore possibilities to secure additional appropriate waterfront areas for parks and recreation as needed (according to carrying capacity research) to support long-term growth in summer visitation, while preserving the environmental values of new site(s).	• Parkhurst land acquisition completed.
8.5.5.3	Continue to advance both cultural tourism development and the expansion of complementary learning and education initiatives.	• New Manager, Cultural Planning & Development role created at RMOW. Dedicated work plan developed and rolled out in 2017.
8.5.7.1	Improve invasive species management efforts related to increasing pressures associated with a changing climate.	• RMOW engages Sea to Sky Invasive Species Council to identify, monitor and control priority invasive species on municipal lands, and to deliver public education.

6 CLOSING COMMENTS

The impact of changing climatic conditions – especially reliable snow patterns – has the potential to substantially impact Whistler's primary economic engine – tourism. Informed, strategic planning that considers and evaluates the impacts of the issues related to climate change and rising fuel costs can help to ensure that Whistler is best positioned to maintain its success into the future.

Energy management as sound fiscal management is seen as a key priority by leading organizations both across our community, and beyond. As such, RMOW staff are committed to tracking corporate and community level energy consumption, expenditures, and associated greenhouse gas emissions on an annual basis. Moreover, the Whistler community is vocally concerned about both effective energy management and the ongoing mitigation of our local contributions to global climate change, and they continue to tell us so across a variety of community engagement channels.

Accurate, detailed data is fundamental to these discussions; information like that which is included within this report will continue to provide a strong basis for informed decision-making as our community measures its success, matures, evolves, and thrives in the coming decades.

Finally, emissions from our corporate and community inventories are not the only emissions related to the activities of our community – as a community premised on destination tourism, there are significant emissions associated with the travel to, and from Whistler. While precise data on the scale of these emissions is difficult to quantify, the research undertaken during the creation of our existing Integrated Energy, Air Quality and GHG Emissions Management Plan did endeavor to estimate the approximate level of these emissions. By using visitor point-of-origin data from Tourism Whistler research and applying typical distance-based emission factors for various travel modes, a total estimate of 'inter-community' estimated GHG emissions was calculated for the year 2000. Assuming a relatively stable point-of-origin mix, and then applying total annual visitation numbers, inter-community travel emissions have been coarsely estimated for each year from 2001 through 2016. In approximate terms, inter-community travel emissions likely represent 5-10 times the total footprint included within Whistler's community inventory. Given its scale and relation to our community economic engines, this is an issue that should not be overlooked within Whistler's (or any similar community's) ongoing discussions of climate mitigation and adaptation approaches.

APPENDICES

A	Whistler Updated 2016 Community Energy & Emissions Inventory
B	RMOW 2016 Corporate Energy & Emissions Inventory
C	Summary of Emission Factors
D	Summary of Corporate Carbon Neutral Commitment • RMOW Carbon Footprint • Verified Emission Reductions (VERs)

WHISTLER

Community Energy & Greenhouse Gas Inventory 2000-present

			Stationary Energy Use (Buildings)								Mobile Energy Use								Waste	Grand Totals			Intensity Performance		
			Electricity				Propane/Natural Gas			All Buildings	Fleet Usage					Transit			Passenger Vehicles						
			residential	commercial	industrial (sm com)	subtotal	residential	commercial	subtotal	Building Total	gasoline	E5 gasoline	E10 gasoline	diesel(s) subtotal	subtotal	B4 biodiesel	diesel	subtotal	gasoline	Landfill				GHG Intensity (tCO2e/PE)	Energy Intensity (GJ/PE)	Expenditure Intensity (GJ/PE)
1990 (estimated)	Consumption	litres					1,106,750.5	6,914,949.0	**8,021,699.5**	**8,021,699.5**	470,647.0		728,573.7	**1,199,220.7**					***19,284,750.0***			Consumption	1990 (estimated)	n/a	n/a	n/a
		kWH	99,292,687	70,508,160	11,478,073	**181,278,919**				**181,278,919.2**															
	Energy	GJ	357,453.6	253,829.4	41,321.1	**652,604**	28,019.0	175,062.0	**203,081.0**	**855,685.1**	16,473.5		27,904.0	**44,377.5**		-			**675,000.0**			1,575,063	Energy			
	(27) GHG	tCO2e	2,680.9	1,903.7	309.9	**4,895**	1,709.49	10,680.87	**12,390.4**	**17,284.9**	1,134.3		2,010.9	**3,145.1**					**46,476**	8,855.7		75,762	GHG			
	Expenditure	approx. $	$ 4,964,634	$ 3,525,408	$ 573,904	**$ 9,063,946**	$ 198,375	$ 1,239,439	**$ 1,437,813**	**$ 10,501,759**	$ 296,508		$ 284,144	**$ 580,651**			$ -		**$ 14,463,563**			$ 25,545,973	Expenditure			
2000	Consumption	litres					5,613,424.0	21,669,345.0	**27,282,773.1**	**27,282,773.1**	764,536.6		1,343,525.5	**2,108,063.3**		658,990.3	**658,990.3**		***26,223,488.8***			Consumption	2000	5.53	111.1	$ 1,915
		kWH	164,269,458	132,996,400	22,133,057	**319,398,916**				**319,398,916.0**															
	Energy	GJ	591,370.0	478,787.0	79,679.0	**1,149,838**	142,112.0	548,591.0	**690,707.1**	**1,840,544.6**	26,760.1		51,456.4	**78,217.7**		25,239.0	25,239.0		**917,868.0**			2,861,869	Energy			
	(40) GHG	tCO2e	6,570.8	5,319.9	885.3	**12,776**	8,670.52	33,470.58	**42,141.1**	**54,917.1**	1,842.5		3,708.1	**5,551.9**		1,818.8	**1,818.8**		**63,199**	17,100.3		142,587	GHG			
	Expenditure	approx. $	$ 10,808,930	$ 6,982,311	$ 1,598,007	**$ 19,389,250**	$ 1,776,400	$ 6,857,388	**$ 8,633,839**	**$ 28,023,089**	$ 573,402		$ 1,007,644	**$ 1,581,048**		$ 599,681	**$ 599,681**		**$ 19,143,147**			$ 49,346,965	Expenditure			
2001	Consumption	litres					5,765,538.5	21,829,756.5	**27,595,295.1**	**27,595,295.1**	664,838.8		1,196,214.2	**1,861,052.6**		842,759.3	**842,759.3**		**26,413,689.2**			Consumption	2001	5.80	111.4	$ 2,051
		kWH	170,144,631	139,299,908	23,505,964	**332,950,504**				**332,950,504.5**															
	Energy	GJ	612,520.6	501,479.6	84,621.5	**1,198,623.6**	145,963.0	552,652.1	**698,619.3**	**1,897,242.9**	23,270.5		45,814.4	**69,085.1**		32,277.3	**32,277.3**		**924,525.3**			2,923,131	Energy			
	(61) GHG	tCO2e	10,378.8	8,497.3	1,433.9	**20,310**	8,905.48	33,718.35	**42,623.8**	**62,933.8**	1,602.3		3,301.6	**4,904.0**		2,326.0	**2,326.0**		**63,657**	18,240.6		152,061	GHG			
	Expenditure	approx. $	$ 11,195,517	$ 7,313,245	$ 1,697,131	**$ 20,205,895**	$ 2,466,775	$ 9,339,820	**$ 11,806,667**	**$ 32,012,562**	$ 531,871		$ 956,971	**$ 1,488,843**		$ 766,911	**$ 766,911**		**$ 19,546,130**			$ 53,814,446	Expenditure			
2002	Consumption	litres					6,200,157.0	21,759,689.5	**27,959,846.8**	**27,959,846.8**	662,834.3		1,206,987.2	**1,869,821.2**		839,903.2	**839,903.2**		**26,383,793.4**			Consumption	2002	6.06	121.5	$ 2,176
		kWH	175,477,178	137,118,356	23,972,522	**336,568,058**				**336,568,057.8**															
	Energy	GJ	631,717.8	493,626.0	86,301.1	**1,211,646.7**	156,966.0	550,878.2	**707,849.0**	**1,919,495.7**	23,200.4		46,227.0	**69,427.6**		32,167.9	**32,167.9**		**923,478.9**			2,944,570	Energy			
	(41) GHG	tCO2e	7,136.1	5,576.1	974.9	**13,687**	9,576.79	33,610.13	**43,186.9**	**56,874.0**	1,597.4		3,331.3	**4,929.0**		2,318.1	**2,318.1**		**63,585**	19,273.8		146,980	GHG			
	Expenditure	approx. $	$ 11,546,398	$ 7,198,714	$ 1,730,816	**$ 20,475,931**	$ 2,134,738	$ 7,491,944	**$ 9,626,746**	**$ 30,102,677**	$ 556,781		$ 1,013,869	**$ 1,570,651**		$ 764,312	**$ 764,312**		**$ 20,315,521**			$ 52,753,161	Expenditure			
2003	Consumption	litres					6,654,565.0	21,335,108.5	**27,989,673.9**	**27,989,673.9**	605,513.2		1,346,646.2	**1,952,158.9**		867,463.3	**867,463.3**		**26,487,279.0**			Consumption	2003	6.36	125.1	$ 2,345
		kWH	157,711,048	132,653,721	22,654,960	**313,019,729**				**313,019,729.3**															
	Energy	GJ	567,759.7	477,553.4	81,557.8	**1,126,872.2**	168,470.0	540,129.3	**708,604.6**	**1,835,476.8**	21,194.0		51,575.9	**72,769.9**		33,223.4	**33,223.4**		**927,101.1**			2,868,571	Energy			
	(35) GHG	tCO2e	5,467.3	4,598.7	785.4	**10,851**	10,278.67	32,954.32	**43,233.0**	**54,084.3**	1,459.3		3,716.7	**5,176.0**		2,394.2	**2,394.2**		**63,834**	20,273.4		145,762	GHG			
	Expenditure	approx. $	$ 10,377,387	$ 6,964,320	$ 1,635,688	**$ 18,977,397**	$ 2,569,168	$ 8,236,972	**$ 10,806,220**	**$ 29,783,617**	$ 538,907		$ 1,198,515	**$ 1,737,423**		$ 789,392	**$ 789,392**		**$ 21,454,696**			$ 53,765,128	Expenditure			
2004	Consumption	litres					6,266,556.5	21,768,771.5	**28,035,328.2**	**28,035,328.2**	568,827.3		1,321,678.3	**1,890,505.0**		921,024.2	**921,024.2**		**24,032,686.4**			Consumption	2004	5.77	122.7	$ 2,356
		kWH	187,300,944	144,140,916	25,780,616	**357,222,478**				**357,222,478.0**															
	Energy	GJ	674,283.3	518,907.3	92,810.2	**1,286,003.2**	158,647.0	551,108.1	**709,759.9**	**1,995,763.1**	19,910.0		50,619.6	**70,529.5**		35,274.8	**35,274.8**		**841,186.1**			2,942,753	Energy			
	(24) GHG	tCO2e	4,432.8	3,411.3	610.1	**8,454**	9,679.35	33,624.15	**43,303.5**	**51,757.8**	1,370.9		3,647.8	**5,018.6**		2,542.0	**2,542.0**		**57,919**	21,294.0		138,531	GHG			
	Expenditure	approx. $	$ 12,324,402	$ 7,567,398	$ 1,861,360	**$ 21,753,164**	$ 2,617,676	$ 9,093,284	**$ 11,711,038**	**$ 33,464,201**	$ 540,386		$ 1,255,594	**$ 1,795,981**		$ 838,132	**$ 838,132**		**$ 20,427,783**			$ 56,526,098	Expenditure			
2005	Consumption	litres					7,256,505.5	22,828,318.5	**30,084,824.7**	**30,084,824.7**	510,643.0		1,268,684.9	**1,779,327.2**		976,181.8	**976,181.8**		**25,344,653.5**			Consumption	2005	6.29	130.0	$ 2,686
		kWH	171,981,194	153,887,410	24,577,249	**350,445,855**				**350,445,855.1**															
	Energy	GJ	619,132.2	553,994.6	88,478.1	**1,261,607.1**	183,709.0	577,932.1	**761,647.1**	**2,023,254.2**	17,873.4		48,590.0	**66,463.1**		37,387.3	**37,387.3**		**887,107.2**			3,014,212	Energy			
	(25) GHG	tCO2e	4,242.2	3,795.9	606.2	**8,644**	11,208.44	35,260.74	**46,469.2**	**55,113.5**	1,230.6		3,452.9	**4,683.2**		2,694.3	**2,694.3**		**61,081**	22,239.0		145,811	GHG			
	Expenditure	approx. $	$ 11,316,363	$ 8,079,089	$ 1,774,477	**$ 21,169,932**	$ 3,398,617	$ 10,691,744	**$ 14,090,472**	**$ 35,260,403**	$ 510,643		$ 1,278,998	**$ 1,789,642**		$ 888,325	**$ 888,325**		**$ 24,330,867**			$ 62,269,238	Expenditure			
2006	Consumption	litres					6,759,358.5	22,061,380.0	**28,820,738.9**	**28,820,738.9**	565,016.0		1,721,901.3	**2,286,916.9**		904,215.0	**904,215.0**		**25,428,317.1**			Consumption	2006	5.90	121.0	$ 2,607
		kWH	171,103,625	155,708,346	24,276,391	**351,088,364**				**351,088,363.6**															
	Energy	GJ	615,973	560,550.0	87,395.0	**1,263,920**	171,123	558,516.0	**729,644.2**	**1,993,564.3**	19,776.6		65,949.1	**85,725.7**		34,631.0	**34,631.0**		**890,035.6**			3,003,957	Energy			
	(26) GHG	tCO2e	4,505.7	4,100.3	639.3	**9,245**	10,440.54	34,076.12	**44,516.7**	**53,762.0**	1,361.7		4,665.6	**6,027.3**		2,495.6	**2,495.6**		**61,282**	22,997.0		146,564	GHG			
	Expenditure	approx. $	$ 11,258,619	$ 8,174,688	$ 1,752,755	**$ 21,186,065**	$ 3,422,460	$ 11,170,319	**$ 14,592,884**	**$ 35,778,949**	$ 598,917		$ 1,832,110	**$ 2,431,029**		$ 822,836	**$ 822,836**		**$ 25,682,600**			$ 64,715,413	Expenditure			
2007	Consumption	litres					7,890,836.0	21,823,078.5	**29,713,915.5**	**29,713,915.5**	556,073.0		1,764,194.8	**2,320,267.3**	318,923.0	557,856.0	**876,779.0**		**25,917,732.6**			Consumption	2007	5.15	120.9	$ 2,710
		kWH	182,416,681	165,005,013	24,859,169	**372,280,866**				**372,280,865.8**															
	Energy	GJ	656,700	594,018.0	89,493.0	**1,340,214**	199,768	552,483.0	**752,257.7**	**2,092,471.4**	19,463.0		68,166.4	**87,629.2**	12,214.6	21,365.6	**33,580.2**		**907,166.0**			3,120,847	Energy			
	(25) GHG	tCO2e	4,499.6	4,070.1	613.2	**9,183**	12,188.23	33,708.04	**45,896.3**	**55,079.2**	1,340.1		4,795.0	**6,135.1**	803.7	1,539.7	**2,343.4**		**62,462**	6,881.0		132,900	GHG			
	Expenditure	approx. $	$ 12,019,650	$ 8,671,541	$ 1,796,579	**$ 22,487,773**	$ 4,586,515	$ 12,326,270	**$ 16,912,809**	**$ 39,400,583**	$ 622,802		$ 1,618,980	**$ 2,241,783**	$ 322,112	$ 507,649	**$ 829,761**		**$ 27,472,797**			$ 69,944,924	Expenditure			
2008	Consumption	litres					7,794,930.0	21,503,997.5	**29,298,928.3**	**29,298,928.3**	612,787.0		1,532,087.3	**2,144,874.0**	829,336.3		**829,337.9**		**25,292,816.3**			Consumption	2008	5.08	126.0	$ 3,068
		kWH	182,416,484	181,477,164	24,323,468	**388,217,118**				**388,217,118.0**															
	Energy	GJ	656,699	653,317.7	87,564.5	**1,397,584**	197,340	544,405.0	**741,751.4**	**2,139,335.9**	21,448.0		58,677.5	**80,125.7**	31,763.2		**31,764.8**		**885,292.8**			3,136,519	Energy			
	(26) GHG	tCO2e	4,742.8	4,718.4	632.4	**10,094**	12,040.09	33,215.18	**45,255.3**	**55,348.9**	1,476.8		4,181.7	**5,658.7**	2,089.9	-	**2,091.5**		**60,956**	2,469.0		126,524	GHG			
	Expenditure	approx. $	$ 12,230,106	$ 9,536,689	$ 1,799,666	**$ 23,566,465**	$ 5,245,209	$ 14,107,825	**$ 19,353,061**	**$ 42,919,526**	$ 680,194		$ 1,826,642	**$ 2,506,837**	$ 1,111,311	$ -	**$ 1,111,313**		**$ 29,845,523**			$ 76,383,200	Expenditure			
2009	Consumption	litres					7,370,028.5	18,366,710.0	**25,736,739.1**	**25,736,739.1**	540,164.3		1,609,032.8	**2,149,196.4**	808,540.0		**808,540.0**		**26,523,412.3**			Consumption	2009	4.84	125.2	$ 2,832
		kWH	186,880,727	191,271,019	24,174,852	**402,326,601**				**402,326,601.2**															
	Energy	GJ	672,233	688,025.2	86,959.9	**1,447,221**	186,583	464,980.0	**651,568.9**	**2,098,790.1**	18,906.2		61,624.1	**80,530.0**	30,966.7		**30,966.7**		**928,365.8**			3,138,653	Energy			
	(25) GHG	tCO2e	4,730.5	4,841.7	611.9	**10,184**	10,729.3	26,236.9	**36,966.2**	**47,150.4**	1,301.8		4,420.4	**5,721.9**	1,970.7	-	**1,970.7**		**63,921**	2,595.0		121,359	GHG			
	Expenditure	approx. $	$ 13,600,503	$ 10,503,548	$ 1,886,736	**$ 25,990,792**	$ 4,367,033	$ 10,626,172	**$ 14,993,226**	**$ 40,984,018**	$ 512,886		$ 1,498,829	**$ 2,011,715**	$ 970,248	$ -	**$ 970,248**		**$ 27,053,881**			$ 71,019,862	Expenditure			
2010	Consumption	litres					8,626,247.0	21,124,955.5	**29,751,202.5**	**29,751,202.5**	538,507.6		1,533,063.3	**2,071,570.9**	552,933.0		**552,933.0**		**26,064,433.7**			Consumption	2010	4.29	120.4	$ 2,663
		kWH	177,406,854	222,907,154	22,054,198	**422,368,206**				**422,368,206.0**				-			-								
	Energy	GJ	638,154	801,824.3	79,331.6	**1,519,310**	218,386	534,809.0	**753,195.0**	**2,272,505.1**	18,848.2		58,715.6	**77,563.8**	21,177.1		**30,773.0**		**912,300.8**			3,293,143	Energy			
	(25) GHG	tCO2e	4,491	5,642	558	**10,691**	10,984.82	26,900.89	**37,885.7**	**48,577**	1,272.4		4,056.4	**5,328.8**	1,393.4	-	**1,393.4**		**59,675**	2,409		117,383	GHG			
	Expenditure	approx. $	$ 14,195,359	$ 13,280,245	$ 1,963,823	**$ 29,439,427**	$ 3,916,142	$ 9,118,753	**$ 13,034,895**	**$ 42,474,322**	$ 565,433		$ 1,608,753	**$ 2,174,186**	$ 580,580	$ -	**$ 580,580**		**$ 27,628,300**			$ 72,857,387	Expenditure			

WHISTLER

Community Energy & Greenhouse Gas Inventory 2000-present

			Stationary Energy Use (Buildings)							Mobile Energy Use								Waste	Grand Totals			Intensity Performance		
			Electricity				Propane/Natural Gas		All Buildings	Fleet Usage					Transit			Passenger Vehicles						
			residential	commercial	industrial (sm com)	subtotal	residential	commercial	subtotal	Building Total	gasoline	E5 gasoline	E10 gasoline	diesel(s) subtotal	subtotal	B4 biodiesel	diesel	subtotal	gasoline	Landfill					
2011	Consumption	litres					8,756,597.0	20,348,741.0	29,105,338.0	29,105,338.0	557,119.7			1,716,283.0	2,273,402.7	393,617.0		393,617.0	24,391,767.1			Consumption	2011	4.48	126.8	$ 3,107
		kWH	187,255,325	188,433,060	24,702,582	400,390,967				400,390,967.0				-	-			-								
	Energy	GJ	673,580	677,817	88,858	1,440,255	221,686	515,158	736,844.0	2,177,099.3	19,499.6			65,732.8	85,232	15,075.3		30,615	853,755		3,146,702	Energy				
	(19) GHG	tCO2e	3,555	3,577	469	7,601	11,150.81	25,912.45	37,063.3	44,665	1,316.4			4,498.1	5,814.4	1,014.7	-	1,014.7	57,634	2,072	111,200	GHG				
	Expenditure	approx. $	$ 15,752,532	$ 11,978,744	$ 2,183,542	$ 29,914,818	$ 3,975,302	$ 8,784,686	$ 12,759,988	$ 42,674,806	$ 646,259			$ 1,924,696	$ 2,570,955	$ 413,298	$ -	$ 413,298	$ 31,465,379		$ 77,124,438	Expenditure				
2012	Consumption	litres					8,832,160.5	19,600,848.0	28,433,008.5	28,433,008.5	381,728.0	22,659.0	153,790.5	1,765,046.0	2,323,223.5		142,777.3	142,777.3	24,353,602.2			Consumption	2012	4.09	117.5	$ 3,002
		kWH	179,985,206	187,137,582	24,172,706	391,295,494				391,295,494.0				-	-			-								
	Energy	GJ	647,429	673,157	86,952	1,407,538	223,599	496,224	719,823.0	2,127,360.7	13,360.8	793.1	5,382.8	67,600.4	87,137		5,468.3	24,408	852,419		3,091,325	Energy				
	(14) GHG	tCO2e	2,458	2,556	330	5,343	11,247.03	24,960.07	36,207.1	41,551	901.9	53.5	363.4	4,625.4	5,944.2	-	387.2	387.2	57,544	2,147	107,573	GHG				
	Expenditure	approx. $	$ 16,649,189	$ 12,948,995	$ 2,333,465	$ 31,931,649	$ 4,106,193	$ 8,689,799	$ 12,795,991	$ 44,727,640	$ 480,977	$ 22,660	$ 193,776	$ 2,208,181	$ 2,905,594	$ -	$ 171,333	$ 171,333	$ 31,172,611		$ 78,977,178	Expenditure				
2013	Consumption	litres					8,055,274.5	19,878,572.5	27,933,847.0	27,933,847.0	255,029.0	11,884.1	165,424.9	1,601,288.0	2,033,626.0	167,439.9		167,439.9	24,571,994.9			Consumption	2013	3.92	112.5	$ 2,949
		kWH	166,391,496	184,042,131	24,428,104	374,861,731				374,861,731.0				-	-			-								
	Energy	GJ	598,531	662,022	87,871	1,348,423	203,931	503,255	707,186.0	2,055,609.5	8,926.2	416.0	5,790.0	61,328.6	76,461	6,412.9	-	24,665	860,063		3,016,798	Energy				
	(10) GHG	tCO2e	1,663	1,839	244	3,746	10,257.73	25,313.73	35,571.5	39,317	602.6	28.1	390.9	4,196.1	5,217.6	436.1	-	436.1	58,060	2,173	105,204	GHG				
	Expenditure	approx. $	$ 15,538,193	$ 12,248,824	$ 2,328,291	$ 30,115,308	$ 3,926,131	$ 9,215,094	$ 13,141,225	$ 43,256,533	$ 341,739	$ 15,925	$ 216,707	$ 2,113,700	$ 2,688,070	$ 221,021	$ -	$ 221,021	$ 32,926,473		$ 79,092,097	Expenditure				
2014	Consumption	litres					8,118,632.5	20,058,692.5	28,177,325.0	28,177,325.0	251,219.7	11,491.0	167,689.2	1,524,360.4	1,954,760.2	697,357.8		697,357.8	25,748,771.6			Consumption	2014	3.80	103.9	$ 2,855
		kWH	159,860,437	171,723,384	23,268,258	354,852,079				354,852,079.0				-	-			-								
	Energy	GJ	575,038	617,710	83,699	1,276,446	205,535	507,815	713,350.0	1,989,796.3	8,792.9	402.2	5,869.2	58,382.3	73,447	26,708.5	-	30,029	901,252		2,994,524	Energy				
	(10) GHG	tCO2e	1,704	1,830	248	3,782	10,338.41	25,543.09	35,881.5	39,664	593.6	27.2	396.2	3,994.5	5,011.5	1,816.5	-	1,816.5	60,841	2,194	109,526	GHG				
	Expenditure	approx. $	$ 16,339,324	$ 12,357,013	$ 2,463,536	$ 31,159,873	$ 3,955,404	$ 9,298,314	$ 13,253,718	$ 44,413,591	$ 336,634	$ 15,398	$ 217,870	$ 1,911,338	$ 2,481,241	$ 920,512	$ -	$ 920,512	$ 34,503,354		$ 82,318,698	Expenditure				
2015	Consumption	litres					7,854,733.0	20,884,558.5	28,739,291.5	28,739,291.5	253,829.9	16,822.6	163,836.7	1,495,229.0	1,929,718.3	760,820.6		760,820.6	27,150,329.9			Consumption	2015	3.81	102.3	$ 2,802
		kWH	158,168,151	169,738,001	24,133,174	352,039,326				352,039,326.0				-	-			-								
	Energy	GJ	568,950	610,568	86,810	1,266,329	198,854	528,723	727,577.0	1,993,905.5	8,884.2	588.8	5,734.4	57,266.5	72,474	29,139.1	-	32,460	950,309		3,049,149	Energy				
	(10) GHG	tCO2e	1,686	1,809	257	3,752	10,002.36	26,594.77	36,597.1	40,349	599.7	39.7	387.1	3,918.1	4,944.7	1,981.8	-	1,981.8	64,153	2,199	113,627	GHG				
	Expenditure	approx. $	$ 16,340,740	$ 12,850,267	$ 2,656,990	$ 31,847,997	$ 3,535,195	$ 8,886,800	$ 12,421,995	$ 44,269,992	$ 312,211	$ 20,692	$ 163,968	$ 1,404,895	$ 1,901,765	$ 1,004,283	$ -	$ 1,004,283	$ 36,381,442		$ 83,557,482	Expenditure				
2016	Consumption	litres					9,144,645.0	22,853,357.0	31,998,002.0	31,998,002.0	253,829.9	-	160,861.7	1,517,335.2	1,932,026.8	748,564.3		748,564.3	28,921,354.6			Consumption	2016	3.61	95.7	$ 2,439
		kWH	168,861,748	168,061,189	24,970,147	361,893,084				361,893,084.0				-	-			-								
	Energy	GJ	607,416	604,537	89,821	1,301,774	231,510	578,566	810,076.0	2,111,849.7		-	5,630.3	58,113.2	63,743	28,669.7	-	31,991	1,012,298		3,219,882	Energy				
	(10) GHG	tCO2e	1,631	1,623	241	3,496	11,644.95	29,101.87	40,746.8	44,242		-	380.1	3,960.8	4,340.9	1,949.9	-	1,949.9	68,337	2,519	121,389	GHG				
	Expenditure	approx. $	$ 18,166,592	$ 12,660,854	$ 2,841,204	$ 33,668,650	$ 3,665,465	$ 8,680,252	$ 12,345,716	$ 46,014,366	$ 294,443	$ -	$ 159,655	$ 1,370,840	$ 1,824,938	$ 632,196	$ -	$ 632,196	$ 33,548,771		$ 82,020,271	Expenditure				

APPENDIX B

RMOW Energy and GHG Emissions Assessment - 2016

By Division, Department, and Worksgroup - showing potential carbon carbon costs related to 'neutrality' commitment

Division	Dept.	Workgroup	Organizational Unit	Totals						
					cost ($)	mobile fuels (Litres)	mobile fuels (GJ)	stationary gas (GJ)	Electricity (GJ)	Total Energy Use (GJ)	GHGs (tCO2e)
1100			**Mayor & Council**	$	2,152	1,855.5	64.3	-	-	64	**4.38**
	1101		Mayor & Council	$	2,152	1,855.5	64	-	-	64	4.38
				$	-	-	-				-
1200			**CAO Office**	$	2,430	2,094.8	71	-	-	71	**4.95**
	1201		Administrator	$	2,415	2,082.2	71	-	-	71	4.92
	3100		Human Resources	$	15	12.6	0	-	-	0	0.03
				$	-	-	-				-
5000			**Resort Experience**	$	500,582	80,467.3	2,923	3,952	11,770	18,645	**426.86**
	5100		General Manager	$	1,420	1,224.0	42	-	-	42	2.89
	1401		Partnership & Economic Services	$	-	-	-	-	-	-	-
	5200		Resort Parks Planning	$	649	647.2	22	-	-	22	1.45
	1402		Village Animation	$	770	769.1	27	-	-	27	1.73
	5400		Resort Planning	$	434	373.8	13	-	-	13	0.88
	5300		Park/Village Operations	$	494,317	74,463.5	2,715	3,952	11,770	18,437	413.05
	7200		Building Dept.	$	2,539	2,537.3	88	-	-	88	5.78
	8300		Environment Stewardship	$	453	452.5	16	-	-	16	1.07
				$	-	-	-				-
6000			**Infrastructure Services**	$	961,977	165,729.8	5,951	4,058	27,434	37,443	**694.08**
	6100		General Manager	$	737	730.9	25	-	-	25	1.64
	6200		Development Services	$	117	100.6	3	-	-	3	0.24
	6400		Transportation	$	149,588	91,427.2	3,428	-	1,619	5,047	233.04
	6500		Central Services	$	1,835	1,822.4	63	-	-	63	4.16
	6600		Environmental Operations	$	35,109	63,480.6	2,314	-	-	2,314	153.59
	8200		Water Utility	$	324,076	17.8	1	-	10,427	10,428	30.94
	8300		Sewer Utility	$	368,460	8,035.9	112	4,058	13,645	17,815	265.02
	6600		Solid Waste	$	81,921	-	-	-	1,743	1,743	5.16
	6800		Transit	$	-	-	-	-	-	-	-
	6800		Emergency Planning	$	133	114.5	4	-	-	4	0.28
				$	-	-	-				-
7000			**Corporate & Community Services**	$	287,751	45,599.1	1,639	5,045	7,339	14,023	**384.09**
	7100		CCS General	$	71	70.7	2	-	-	2	0.17
	2200		Lesgislative Services	$	490	422.6	15	-	-	15	1.00
		2221	Corporate Economic & Environmental Services								
	2300		Financial Services	$	488	421.1	15	-	-	15	0.99
	2400		Fiscal Planning	$	-	-	-	-	-	-	-
	2500		Information Technology	$	677	628.7	22	-	-	22	1.45
	4100		Bylaw	$	16,237	5,978.9	207	-	289	496	14.31
	4300		Fire	$	21,310	21,571.4	808	-	-	808	53.68
	5800		Meadow Park Sports Centre	$	243,073	4,465.9	155	5,045	7,050	12,250	285.10
	4200		RCMP	$	-	-	-	-	-	-	-
	5500		Whistler Public Library	$	535	534.5	19	-	-	19	1.26
	5700		Recreation	$	4,870	11,505.3	397	-	-	397	26.14
				$	-	-	-				-
				$	1,754,892	295,746.5	10,648	13,056	46,542	70,247	1,514.37
			All Other		4,582.3		135.3	-		135.3	9.3
										bio tCO2e	32.33

APPENDIX C – Summary of Emission Factors

Summary of Emission Factors

based on 2012 BC Best Practices Methodology for Quantifying GHG Emissions, BC Ministry of Environment (Sept, 2012)

Stationary Emissions

Source Fuel	TOTAL (Petro)		Key Conversion	
	t CO2e/GJ	tCO2e/litre		
Natural Gas	0.0503	n/a		
Propane	0.0610	0.001544	0.025310	GJ/litre
Diesel (B0)	0.0728	0.002790	0.038300	GJ/litre

Mobile Emissions

Light Duty Vehicles

Source Fuel	TOTAL (Petro)		TOTAL (Bio)		TOTAL (All)		Key Conversion	
	t CO2e/GJ	tCO2e/litre	t CO2e/GJ	tCO2e/litre	t CO2e/GJ	tCO2e/litre		
Gasoline (E0)	0.0709	0.00248	0.00000	0.0000	0.0709	0.002483	0.03500	GJ/litre
E5 Gasoline	0.0675	0.00236	0.00319	0.0001	0.0707	0.002436	0.03500	GJ/litre
E10 Gasoline	0.0641	0.00224	0.00638	0.0001	0.0705	0.002389	0.03500	GJ/litre
Diesel (B0)	0.0713	0.00273	0.00000	0.0000	0.0713	0.002732	0.03830	GJ/litre
B4 Diesel (RLCFR)	0.0685	0.00262	0.00275	0.0001	0.0713	0.002722	0.03830	GJ/litre
B5 Diesel	0.0678	0.00260	0.00343	0.0001	0.0712	0.002720	0.03830	GJ/litre
B10 Diesel	0.0643	0.00246	0.00687	0.0002	0.0711	0.002707	0.03830	GJ/litre
B20 Diesel	0.0572	0.00219	0.01373	0.0003	0.0710	0.002681	0.03830	GJ/litre
Propane	0.0605	0.00153	0.00000	0.0000	0.0605	0.001532	0.02531	GJ/litre
Natural Gas	0.0562		0.000000	0.0000	0.0562		0.05379	GJ/kg

Light Duty Trucks (incl. SUVs & Minivans)

Source Fuel	TOTAL (Petro)		TOTAL (Bio)		TOTAL (All)		Key Conversion	
	t CO2e/GJ	tCO2e/litre	t CO2e/GJ	tCO2e/litre	t CO2e/GJ	tCO2e/litre		
Gasoline (E0)	0.0720	0.00252	0.00000	0.0000	0.0720	0.002519	0.03500	GJ/litre
E5 Gasoline	0.0685	0.00240	0.00319	0.0001	0.0717	0.002471	0.03500	GJ/litre
E10 Gasoline	0.0650	0.00228	0.00638	0.0001	0.0714	0.002422	0.03500	GJ/litre
Diesel (B0)	0.0713	0.00273	0.00000	0.0000	0.0713	0.002733	0.03830	GJ/litre
B4 Diesel (RLCFR)	0.0685	0.00262	0.00275	0.0001	0.0713	0.002722	0.03830	GJ/litre
B5 Diesel	0.0678	0.00260	0.00343	0.0001	0.0713	0.002720	0.03830	GJ/litre
B10 Diesel	0.0643	0.00246	0.00687	0.0002	0.0712	0.002707	0.03830	GJ/litre
B20 Diesel	0.0572	0.00219	0.01373	0.0003	0.0710	0.002681	0.03830	GJ/litre
Propane	0.0605	0.00153	0.00000	0.0000	0.0605	0.001532	0.02531	GJ/litre
Natural Gas	0.0562		0.000000	0.0000	0.0562		0.05379	GJ/kg

Heavy Duty Vehicles

Source Fuel	TOTAL (Petro)		TOTAL (Bio)		TOTAL (All)		Key Conversion	
	t CO2e/GJ	tCO2e/litre	t CO2e/GJ	tCO2e/litre	t CO2e/GJ	tCO2e/litre		
Gasoline (E0)	0.0672	0.00235	0.00000	0.0000	0.0672	0.002352	0.03500	GJ/litre
E5 Gasoline	0.0640	0.00224	0.00319	0.0001	0.0672	0.002235	0.03500	GJ/litre
E10 Gasoline	0.0607	0.00212	0.00638	0.0001	0.0671	0.002117	0.03500	GJ/litre
Diesel (B0)	0.0708	0.00271	0.00000	0.0000	0.0708	0.002712	0.03830	GJ/litre
B4 Diesel (RLCFR)	0.0680	0.00260	0.00275	0.0001	0.0708	0.002722	0.03830	GJ/litre
B5 Diesel	0.0673	0.00258	0.00343	0.0001	0.0707	0.002720	0.03830	GJ/litre
B10 Diesel	0.0638	0.00244	0.00687	0.0002	0.0707	0.002707	0.03830	GJ/litre
B20 Diesel	0.0568	0.00218	0.01373	0.0003	0.0705	0.002681	0.03830	GJ/litre

Off Road Vehicles

Source Fuel	TOTAL (Petro)		TOTAL (Bio)		TOTAL (All)		Key Conversion	
	t CO2e/GJ	tCO2e/litre	t CO2e/GJ	tCO2e/litre	t CO2e/GJ	tCO2e/litre		
Gasoline (E0)	0.0675	0.00236	0.00000	0.0000	0.0675	0.002361	0.03500	GJ/litre
E5 Gasoline	0.0642	0.00225	0.00319	0.0001	0.0674	0.002243	0.03500	GJ/litre
E10 Gasoline	0.0609	0.00213	0.00638	0.0001	0.0673	0.002125	0.03500	GJ/litre
Diesel (B0)	0.0785	0.00301	0.00000	0.0000	0.0785	0.003007	0.03830	GJ/litre
B4 Diesel (RLCFR)	0.0754	0.00289	0.00275	0.0001	0.0782	0.002722	0.03830	GJ/litre
B5 Diesel	0.0746	0.00286	0.00343	0.0001	0.0781	0.002720	0.03830	GJ/litre
B10 Diesel	0.0707	0.00271	0.00687	0.0002	0.0776	0.002707	0.03830	GJ/litre
B20 Diesel	0.0630	0.00241	0.01373	0.0003	0.0767	0.002681	0.03830	GJ/litre

APPENDIX D –Summary of 2016 Corporate Carbon Neutral Commitment

RMOW Energy and GHG Emissions Assessment - 2016

By Division, Department, and Worksgroup - showing potential carbon carbon costs related to 'neutrality' commitment

				Totals	
Division	Dept.	Workgroup	Organizational Unit	GHGs (tCO2e)	carbon cost ($) (not GST)
1100			**Mayor & Council**	**4.38**	$ 109.50
	1101		Mayor & Council	4.38	$ 109.50
				-	
1200			**CAO Office**	**4.95**	$ 123.75
	1201		Administrator	4.92	$ 123.00
	3100		Human Resources	0.03	$ 0.75
				-	
5000			**Resort Experience**	**535.76**	$ 13,393.88
	5100		General Manager	2.89	$ 72.25
	1401		Partnership & Economic Services	-	$ -
	5200		Resort Parks Planning	1.45	$ 36.25
	1402		Village Animation	1.73	$ 43.25
	5400		Resort Planning	0.88	$ 22.00
	5300		Park/Village Operations	521.96	$ 13,048.88
	7200		Building Dept.	5.78	$ 144.50
	8300		Environment Stewardship	1.07	$ 26.75
				-	
6000			**Infrastructure Services**	**880.73**	$ 22,018.13
	6100		General Manager	1.64	$ 41.00
	6200		Development Services	0.24	$ 6.00
	6400		Transportation	298.07	$ 7,451.63
	6500		Central Services	4.16	$ 104.00
	6600		Environmental Operations	153.59	$ 3,839.75
	8200		Water Utility	30.94	$ 773.50
	8300		Sewer Utility	272.33	$ 6,808.25
	6600		Solid Waste	109.67	$ 2,741.75
	6800		Transit	9.81	$ 245.25
	6800		Emergency Planning	0.28	$ 7.00
				-	
7000			**Corporate & Community**	**384.10**	$ 9,602.50
	7100		CCS General	0.17	$ 4.25
	2200		Lesgislative Services	1.00	$ 25.00
	2300		Financial Services	0.99	$ 24.75
	2400		Fiscal Planning	-	$ -
	2500		Information Technology	1.45	$ 36.25
	4100		Bylaw	14.31	$ 357.75
	4300		Fire	53.68	$ 1,342.00
	5800		Meadow Park Sports Centre	285.10	$ 7,127.50
	4200		RCMP	-	$ -
	5500		Whistler Public Library	1.26	$ 31.50
	5700		Recreation	26.14	$ 653.50
				-	
				1,809.91	$ 45,247.75

Verified Emission Reduction (VERs)

2010 – 2012 Carbon Neutrality: The RMOW has purchased and retired Verified Emission Reduction credits equal to its entire corporate carbon footprint for every year between 2010 and 2012 inclusive. A summary is provided below:

Year	VERs	Project	Certification Standard	Registry	Vendor
2010	1,145 tonnes	Mare Monastir Wind Farm, Turkey	Gold Standard – project reference: GS368	GS APX Registry	Offsetters Clean Technology Inc.
	1,145 tonnes	Sun Select Aldegrove Biomass Boiler, British Columbia	ISO 14064-3 and CDM additionality tool	Markit Registry	Offsetters Clean Technology Inc.
2011	1,063 tonnes	Mare Monastir Wind Farm, Turkey	Gold Standard – project reference: GS368	Markit Registry	Offsetters Clean Technology Inc.
	1,063 tonnes	Sun Select Aldegrove Biomass Boiler, British Columbia	ISO 14064-3 and CDM additionality tool	Markit Registry	Offsetters Clean Technology Inc.
2012	973 tonnes	Mare Monastir Wind Farm, Turkey	Gold Standard – project reference: GS368	Markit Registry	Offsetters Clean Technology Inc.
	974 tonnes	Sun Select Aldegrove Biomass Boiler, British Columbia	ISO 14064-3 and CDM additionality tool	Markit Registry	Offsetters Clean Technology Inc.
2013	1,617 tonnes	Cheakamus Community Forest, British Columbia	BC Emission Offsets Regulation using the BC Forest Carbon Offset Protocol	Markit Registry	Cheakamus Community Forest
2014	1,805 tonnes	Cheakamus Community Forest, British Columbia	BC Emission Offsets Regulation using the BC Forest Carbon Offset Protocol	Markit Registry	Cheakamus Community Forest
2015	1,751 tonnes	Cheakamus Community Forest, British Columbia	BC Emission Offsets Regulation using the BC Forest Carbon Offset Protocol	Markit Registry	Cheakamus Community Forest
2016	1,810 tonnes	Cheakamus Community Forest, British Columbia	BC Emission Offsets Regulation using the BC Forest Carbon Offset Protocol	Markit Registry	Cheakamus Community Forest

2013 - 2016 Carbon Neutrality: The RMOW has purchased VERs from the Cheakamus Community Forest (CCF) to offset 2013 - 2016 corporate emissions. More information about the project can be found on the Cheakamus Community Forest (CCF) website (http://www.cheakamuscommunityforest.com/ccf-projects/)

RMOW staff are confident in the benefits of supporting a local offset project, the co-benefits associated with the project approaches, and the independent, third party rigour that is being applied to the CCF project.

Consistent with our commitments in both the UBCM Climate Action Charter, and the RMOW Carbon Neutral Plan, the RMOW remains committed to achieving carbon neutrality with respect to all corporate operations. All RMOW departments have been charged internally for the costs associated with the RMOW carbon neutrality commitments. All departments continue to use the price signals that these costs imply ($25/tCO2e) to improve financial decision making and preference cost-effective projects and initiatives that are capable of continuously reducing carbon emissions, and decreasing carbon costs across corporate operations. Note that consistent with Provincial policy, the carbon neutral commitment of the RMOW includes an estimate of the contracted emissions associated with 'traditional services of local government' (eg. any contracted snow clearing in the Village, solid waste collection contracts etc...)

See Appendix D above for more detail.

THE RESORT MUNICIPALITY OF WHISTLER

Host Mountain Resort
2010 Olympic and Paralympic
Winter Games

4325 Blackcomb Way
Whistler, BC Canada V0N 1B4
www.whistler.ca

TEL 604 932 5535
TF 1 866 932 5535
FAX 604 935 8109