2014 Energy Benchmarking Report
Performance of the Canadian Office Sector
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Table 1: Comparison of Ranges, Means, Medians, and Numbers of Buildings in the Top Quartile 19
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The REALpac 2014 Energy Benchmarking Report: Performance of the Canadian Office Sector (the “Report”) includes the results of the 2011, 2012 and 2013 REALpac Energy Benchmarking Surveys (the “Surveys”). The 2011 Survey results, included in REALpac’s 2012 Report and incorporated here for three-year trending, show 371 office buildings with data for the calendar year 2011. The 2012 and 2013 Surveys have 277 and 279 buildings worth of data, respectively, which indicates a decrease in participation yet the individual building metrics and Canada-wide trends illustrate new effort and enthusiasm for energy consumption measurement, monitoring, and improved performance.

As was done for the 2012 Report, all three years of data have been analyzed and compared to provide a comprehensive view of trends and patterns in building energy performance across Canada over time. The Report includes 2011 data that was analyzed in the last report and that data set has been enriched with new buildings added over the last year. The results of these analyses show that over the three-year period, much progress has been made overall, yet in shorter time frames, variations in building characteristics and energy use can still show an increase rather than a reduction at the asset level.

Looking back over the five years of the REALpac Energy Benchmarking Program, we can see the growth of interest and activity related to energy measurement and savings as well as the actual performance improvements at the building level. The continued acceptance of benchmarking performance over time is a testament to the heightened knowledge and level of sophistication organizations are bringing to the management of their assets’ resource use. REALpac will endeavour to support and advance these efforts in the future through the continuation of the Energy Benchmarking Program and the addition of a Water Benchmarking Program and Database as a complimentary initiative to our existing platform.
As the Energy Benchmarking Program has matured, REALpac has reviewed a growing number of buildings and related data each year. Although the population of the database has changed slightly from year to year with the same buildings not necessarily participating in every Survey, the Program continues to use a normalized approach to calculate each building’s annual energy use.

Consistent with the original study, normalization adjusts total energy consumption for variables such as building gross floor area, various energy sources, high intensity or exceptional energy use space types, plus occupant dependant variables (e.g. occupant density, vacancy, and operating hours). As described in the 2010 and 2012 Energy Benchmarking Reports and the REALpac Energy Normalization (the “Methodology”), the general impact of normalization is to adjust energy consumption downwards in most climates, thus producing a more “apples-to-apples” comparison of buildings with differing characteristics and tenant mixes. It is important to note that REALpac’s approach to normalization is based on best operating practices rather than average performance or processes as can currently be seen in the industry.

After review and revision in 2012, the Methodology provided four normalization “steps” or metrics, beginning with a non-normalized actual building energy use metric and ending with a fully normalized building energy use metric that accounts for weather, location, and building characteristic variations. The four metrics together provide a richer picture of the building energy use and present the users with more choice in how they compare their buildings. These metrics are listed and described below:

- Actual Building Energy Use (current year)
- Building Characteristic Normalized Building Energy Use for YYYY (current year)
- Weather Normalized Building Energy Use to Base Year 2009 (in building’s original location), and
- Location & Weather Normalized Building Energy Use to Toronto, ON (“Normalized Energy Use”).

Since this revision, REALpac has not made any significant changes in the normalization methodology or calculations. Further detail is provided in the Methodology document (currently v3.01), located on the REALpac website at realpac.ca > Industry Sustainability > Energy Benchmarking Program > Energy Normalization Methodology.

While the normalization approach tries to account for differences in building characteristics and tenant mix or space use, there is less control over the accuracy of the data from the source. The data, as provided to REALpac through the Database, has its own limitations as it is self-reported (by the landlord, property manager, or consultant) and it is unaudited. The data may not represent the market as a whole as it may be self-selected and could contain errors ranging from inaccurate inputs to misunderstood requirements to incomplete entries. REALpac strives to review and work with submitters to ensure the data is as accurate as possible but the ultimate responsibility for complete and up-to-date inputs lies with the users.

1 Only the Actual Building Energy Use metric and the Location & Weather Normalized Building Energy Use to Toronto, ON (“Normalized Energy Use”) metric are used in this report for the analysis and charts.
Buildings participating in the survey in 2011, 2012, and 2013, continue to be varied with both large and small office buildings participating each year, located in or near urban centers across Canada.

The number of buildings included in the 2011 data set totals 371 (over 131 million square feet of gross floor area), the 2012 data set there are 277 buildings represented (over 110 million square feet of gross floor area), and in 2013, 279 buildings are included (almost 109 million square feet). Although there was a drop-off in the number of buildings that participated between 2011 and 2012, the relative proportions of buildings in different locations and with different characteristics remained similar.

The following charts, Figures 1 through 5, illustrate the various characteristics of the data sets each year including the size, age, average weekly operating hours, vacancy rates, and occupant density variations of the buildings. Each figure contains two charts; the one on the left shows the number of buildings in each category, compared year-over-year, and the one on the right shows the relative percentage of the total data set contained in each category, compared year-over-year.
Figure 1: Building Size Comparison by Category and Year

Figure 1 shows the proportion of buildings in each the data set that fall into different size categories, based on the reported gross floor area, from small (less than 100,000 ft²) to large (over 1,000,000 ft²).

Although the absolute number of buildings in each size category decreased from 2011 to 2012, or stayed the same as in the largest size category, the most significant shifts over the three years can be seen in the under 100,000 ft² category (decrease of 3%) and the 250,000 ft² – 499,999 ft² category (increase of 3%). As in the 2012 Report, the largest size category represented each year from 2009 to 2013 is that between 100,000 ft² and 249,999 ft².
Figure 2: Building Age Comparison by Category and Year

As compared to 2011 and 2012, there are more buildings in the unreported category in 2013, possibly due to new user error or entry oversight, but this remains a small percentage as compared to the other categories. Looking at the relative percentage of buildings, an increase of 2% can be seen in those buildings built between 1990 - 1999 while other age categories remain stable or contract about 2% over the three-year period. As in the previous 2009 and 2010 data sets, the largest segment of the 2011, 2012, and 2013 data sets, both in number and percentage, is the group of buildings constructed between 1980 and 1989.
Figure 3: Occupant Density Comparison by Category and Year

Occupant density is calculated by dividing the number of occupants in the building by the gross floor area/1,000. This results in an occupant density metric expressed in occupants/1,000 ft².

Figure 3 presents the proportion of buildings in the data set that fall into different categories of occupant density, from less dense (2.3 occupants/1,000 ft²) to more dense (5.0 occupants/1,000 ft²).

Only 15 out of the 279 buildings in 2013 have an occupant density at or over 5.0 occupants/1,000 ft² and while this is less than is seen in the 2011 data set, the relative proportion has remained similar over the three years, between 7% and 5%. It is interesting to note that the category of the least density (below 2.3/1,000 ft²) has decreased in its proportionate share of the data set since 2009 (30%) and 2010 (24%) but varies within a 15% to 19% range over the last three years. The largest fluctuation and increase seen in percentage over the three years was in the 2.3 – 2.9 occupants/1,000 ft² category.
**Figure 4: Annual Vacancy Rate Comparison by Category and Year**

The figure illustrates the proportion of buildings in the data set that fall into different categories of annual tenant vacancy rates, from 0% vacancy (or unreported) to 20% vacancy for the year. The default vacancy rate in the Energy Normalization Methodology is 0%, thus those buildings that experienced a 0% vacancy rate for any year and those participants who chose not to enter their vacancy data are grouped together within the largest segment of buildings in **Figure 4**.

In 2013, 8% of the buildings reported a vacancy rate of 20% or more over the year as compared to 6% and 5% in 2011 and 2012, respectively. The largest proportionate increase seen was in the 0.01% - 4.9% vacancy rate category, which swung from 28% to 38% to 34% over the three years.
Over 65 hours / week
65 hours / week or Below

Figure 5: Average Weekly Operating Hours Comparison by Category and Year

Figure 5 shows the proportion of buildings in the data set that fall within different categories of average weekly operating hours. In the Methodology, weekly operating hours are defined as the number of hours per week that a building (or space within a building) is occupied by at least 75% of the tenant employees averaged over the year under review.

As can been seen in all data sets, the vast majority of buildings reported average weekly operating hours at or below 65 hours per week. As shown above, only 2% of the 2011 buildings reported having weekly operating hours greater than 65 hours per week, while that proportion increased to 10% in 2013.

For buildings with extremely high operating hours, only two buildings reported weekly operating hours over 75 hours per week in 2011 and in 2013, five buildings reported the same.
4.1 Building Characteristics

As was discussed in the 2010 and the 2012 Energy Benchmarking Report, energy performance has previously been analyzed in relation to building size\(^2\) and age of the building, yet re-analysis of these variables within the context of REALpac’s three data sets does not show strong correlations.

**Figure 6: Average Actual Energy Use vs. Average Normalized Energy Use by Building Size and Year**

<table>
<thead>
<tr>
<th>Gross Floor Area of Building</th>
<th>Average Energy Use Intensity in ekWh/ft(^2)/yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 100,000 ft(^2)</td>
<td>100,000 ft(^2) – 249,999 ft(^2)</td>
</tr>
<tr>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>

**Figure 6** shows both the actual and the normalized average energy use intensity, by building size category and by year of data.

Looking at energy use trends in general, it can be seen that both the average actual and normalized energy use have decreased from 2011 to 2013. When comparing size categories to each other, the average actual energy use is the highest in the 500,000 - 749,999 ft\(^2\) category in each year, similar to the trend shown in the 2012 Report, but no consistent trends are apparent for normalized energy use values. In the 2013 data, the actual energy use intensity (light orange bars) ranges from 35.0 to 26.6 ekWh/ft\(^2\)/yr with the lowest average intensity seen in the 750,000 ft\(^2\) - 999,999 ft\(^2\) category and the highest in the 500,000 - 749,999 ft\(^2\) category. The same pattern is not as consistent when looking at the normalized energy intensity use ranges for 2013 (dark orange bars) where the lowest intensity is in the same 750,000 ft\(^2\) - 999,999 ft\(^2\) category at 22.5 ekWh/ft\(^2\)/yr and the highest is in the Under 100,000 ft\(^2\) category at 28.2 ekWh/ft\(^2\)/yr.

Figure 7 shows both the actual and the normalized average energy use intensity, by building age category and by year of data. As seen in the figure above, general energy use trends show a slight increase then a dip as we move forward in time from the construction dates before 1960. When comparing age categories to each other, the highest energy use averages seen for both actual and normalized intensity are either in the 1960-1969 category (2011 and 2013) or in the 1970-1979 category (2012) with all metrics in buildings built after 1980 consistently lower than the corresponding metrics before 1980. In the 2013 data, the actual energy use intensity (light orange bars) ranges from 26.3 to 33.8 ekWh/ft²/yr with the lowest average intensity seen in the 1980-1989 category and the highest in the 1960-1969 category. Here, the same pattern can be seen in the normalized energy intensity use ranges (dark orange bars) where the lowest intensity is in the 1980-1989 category at 22.7 ekWh/ft²/yr and the highest is in the 1960-1969 category at 28.6 ekWh/ft²/yr.
4.2 National Trends

The Canada-wide data set of annual building energy intensity for 2013 shows the mean actual energy use intensity to be 29.5 ekWh/ft²/yr and while this intensity is higher than the BOMA BESI average intensity of 27.1 ekWh/ft²/yr for 2013, this is to be expected from a building population that may or may not be certified under a green building rating system.

The mean normalized energy use intensity in REALpac's 2013 data set is 25.5 ekWh/ft²/yr, only slightly higher than the lowest mean of all 5 years, 25.0 ekWh/ft²/yr seen in 2012.

Figure 8: Normalized Energy Use Intensity, Canada-wide Data Set for 2011

![Normalized Energy Use Intensity Graph]

In Figure 8, Figure 9, and Figure 10, the Canada-wide data set of annual normalized building energy intensity is illustrated for each year separately, followed by Figure 11, which compares both the average actual and average normalized energy use metrics by year. Table 1 displays a year-over-year comparison of building intensity ranges, means, medians, and numbers of buildings in the top quartiles and groups.
As described in a previous section, there are 371 buildings in the 2011 Canada-wide data set with the mean normalized energy use intensity above the median at 27.7 ekWh/ft²/yr. The top 25th percentile of this data set begins at 22.8 ekWh/ft²/yr and the bottom 75th percentile begins at 31.2 ekWh/ft²/yr (as indicated by the dashed lines in Figure 8).

The lowest normalized building energy use intensity in the data set is at 8.7 ekWh/ft²/yr and the highest is at 68.6 ekWh/ft²/yr. There are 50 buildings with normalized energy use intensities at or below 20.0 ekWh/ft²/yr and there are 93 buildings in total with energy use performance within the top quartile, below 22.8 ekWh/ft²/yr.

**Figure 9:** Normalized Energy Use Intensity, Canada-wide Data Set for 2012

As shown in Figure 9, there are 277 buildings in the 2012 Canada-wide data set with the mean normalized energy use intensity above the median at 25.0 ekWh/ft²/yr. The top 25th percentile of this data set begins at 20.0 ekWh/ft²/yr and the bottom 75th percentile begins at 28.4 ekWh/ft²/yr (as indicated by the dashed lines).

The lowest normalized building energy use intensity in the data set is at 8.3 ekWh/ft²/yr and the highest is at 77.6 ekWh/ft²/yr. There are 70 buildings with normalized energy use intensities at or below 20.0 ekWh/ft²/yr, aligned with the fact that there are 70 buildings in total with energy use performance within the top quartile (below 20.0 ekWh/ft²/yr).
As can be seen in Figure 10, there are 279 buildings in the 2013 Canada-wide data set with the mean normalized energy use intensity above the median at 25.5 ekWh/ft²/yr. The top 25th percentile of this data set begins at 20.3 ekWh/ft²/yr and the bottom 75th percentile begins at 29.1 ekWh/ft²/yr (as indicated by the dashed lines in Figure 10).

The lowest normalized building energy use intensity in the data set is at 8.5 ekWh/ft²/yr and the highest is at 84.4 ekWh/ft²/yr. There are 67 buildings with normalized energy use intensities at or below 20.0 ekWh/ft²/yr. In addition, there are 70 buildings in total with energy use performance within the top quartile, below 20.3 ekWh/ft²/yr.
Figure 11: Average Actual and Normalized Energy Use Intensity, Canada-wide, by Year

As seen in the 2012 Energy Benchmarking Report, both the average actual and average normalized energy use trends show a move towards greater reductions in all office buildings across Canada, year-over-year. While a larger absolute reduction was seen in the normalized energy use year-over-year from 2011 to 2013 as compared to the actual energy use, the difference between the 2011 and 2012 normalized metrics was even greater, presenting a 9.7% decrease on the data set averages. As the normalization methodology standardizes for variations in weather and building characteristics, it can be stated that the three-year trend in normalized energy use points to a true trend and directionality in the office building industry towards even deeper energy conservation measures and higher performance at the property level.

As in the previous Report, there was a slight increase in the average normalized use from 2012 to 2013, similar to the increase seen from 2010 to 2011, which may be due to the addition of new buildings to the Survey that have yet to start down the path of reducing energy use, a consequence of the changing mix of building submissions each year, or be caused by a combination of multiple factors at the property level or the asset management level.
In looking more closely at the data sets in 2012 and 2013, it can be seen that 239 buildings have input data in both years, thus they are not “new” to benchmarking. Comparing this sub-group, the 2012 buildings had a normalized energy use of 24.5 ekWh/ft²/yr on average while those same buildings had a normalized energy use average of 25.5 ekWh/ft²/yr in 2013. This 1.0 ekWh/ft²/yr increase was not seen uniformly across the dataset, of course, as some buildings have reduced their energy use over 25% over the year yet some buildings have increased their energy use more than 30% in the same period.

Continuing from the previous Report is the hidden but more inspiring trend of a shift in the distribution of high performing buildings within the data sets. Year after year, there are more buildings performing at lower and lower energy intensities yet the mean or median values do not illustrate this properly. In 2009, more than half of the buildings in the Canada-wide data set performed better than 28.0 ekWh/ft²/yr yet in 2013, more than half of the buildings performed better than 24.0 ekWh/ft²/yr. In the highest performing buildings, there is a greater shift seen in energy reductions over time. For example, only 7% of the data set was at 20.0 ekWh/ft²/yr normalized intensity or below in 2009, then 13% of the data set could be seen below this mark in 2011, and now 24% of the data set is at 20.0 ekWh/ft²/yr or below for 2013. This shift demonstrates that there is still room for improvement within high performing buildings and those buildings which have worked hard to reduce their energy use significantly in past years are not stopping at a certain floor but are pushing past performance levels once thought to be realistically unattainable.

<table>
<thead>
<tr>
<th>Data Set Range</th>
<th>Mean Normalized Energy Use Intensity</th>
<th>Median Normalized Energy Use Intensity</th>
<th>Number of Buildings at the 25th Percentile or Lower</th>
<th>Number of Buildings at or Below 20.0 ekWh/ft²/yr</th>
<th>Proportion of Data Set at or Below 20.0 ekWh/ft²/yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011 8.71 - 68.63</td>
<td>27.67</td>
<td>26.77</td>
<td>93</td>
<td>50</td>
<td>13% of data set</td>
</tr>
<tr>
<td>2012 8.33 - 77.62</td>
<td>24.98</td>
<td>23.30</td>
<td>70</td>
<td>70</td>
<td>25% of data set</td>
</tr>
<tr>
<td>2013 8.47 - 84.37</td>
<td>25.52</td>
<td>23.63</td>
<td>70</td>
<td>67</td>
<td>24% of data set</td>
</tr>
</tbody>
</table>
In this 2014 Report, we are introducing a new analysis of the energy intensity metrics as compared to LEED or BOMA BESt certification levels achieved in individual buildings. As this is a recently introduced analysis, only the 2013 data will be discussed below.

Figure 12: Normalized Energy Use Intensity, Green Building Certification Comparison for 2013

Figure 12 above, highlights the mean national normalized intensity in 2013 with a red bar and the mean of each group of buildings, being either High Level Green Certification or Low/No Level Green Certification, with a blue bar. All of the buildings reporting to have a LEED Certification (any type, all levels) or a BOMA BESt Certification Level 3 or 4 are captured in the High Level Green Certification group and all other buildings are captured in the Low/No Level Green Certification group.

In the 2013 data set, 119 buildings reported having a LEED Certification (any type, all levels) or a BOMA BESt Certification Level 3 or 4 and the mean of this group is 23.8 ekWh/ft²/yr, falling below the 2013 national average. Conversely, the remaining 160 buildings with BOMA BESt Level 1 or 2 or no certifications shows a mean of 26.8 ekWh/ft²/yr.

To note, some of the buildings in the Low/No Certification group have very low energy intensities and some in the High Certification group have higher intensities, which illustrates the point that not all high performing buildings are certified and that some lower performing buildings can achieve certification. It must also be noted that some of the Low/No Certification buildings could be included in the certified group but since the specific certification field in REALpac's Energy Benchmarking Database is not required, some participants may not have completed it or updated it. We hope to continue to collect green building certification data in future Surveys in order to reveal possible relationships between green building certifications and energy use consumption trends in office buildings.
4.3 Regional Trends

Even with the decrease in the total number of buildings in recent Surveys, the relative proportion of buildings located in the various regions remains consistent. The charts in Figure 13 illustrate the proportion of buildings that can be found in provinces/geographic regions such as British Columbia, the Prairie Region (Alberta, Manitoba, and Saskatchewan), Ontario, and Quebec. As was the case in the 2012 Report and notwithstanding the drop in building participation, the vast majority of buildings in the 2013 data set are located in Ontario (55%) followed by a the next significant proportion which are located in the Prairie Region (22%).

Figure 13: Regional Distribution Comparison by Category and Year
The following three charts exhibit the normalized annual energy use intensity of buildings within British Columbia, the Prairie Region, and Ontario separately and include data compared over three years.

Figure 14: Normalized Energy Use Intensity for British Columbia, by Year

Figure 14 highlights the mean normalized energy intensity for the Canada-wide data set in 2013 (red bar) and the mean normalized energy intensity for each year in British Columbia (blue bars). For all three years, the mean in British Columbia has been above the national mean, starting at 32.6 ekWh/ft²/yr in 2011, then lowering to 29.0 ekWh/ft²/yr in 2012, and then lowering again slightly in 2013 to 28.5 ekWh/ft²/yr.
Figure 15: Normalized Energy Use Intensity for the Prairie Region, by Year

Figure 15 highlights the mean normalized energy intensity for the Canada-wide data set in 2013 (red bar) and the mean normalized energy intensity for each year in the Prairie Region (blue bars). As in the British Columbia data set, the mean in the Prairie Region has been above the national mean each year, yet not much higher in absolute terms. In 2011, the mean was 30.1 ekWh/ft²/yr, and then decreased to 27.5 ekWh/ft²/yr in 2012, followed by a marginal decrease in 2013 to 27.3 ekWh/ft²/yr.
Figure 16: Normalized Energy Use Intensity for Ontario, by Year

Figure 16 highlights the mean normalized energy intensity for the Canada-wide data set in 2013 (red bar) and the mean normalized energy intensity for each year in Ontario (blue bars). The Ontario data set contrasts with both British Columbia and the Prairie Region sets because it is much larger in number each year and the provincial mean has been below the national mean in two out of the past three years. The movement of the mean is also different given that in 2011, the mean was 25.7 ekWh/ft²/yr, and then decreased to 23.0 ekWh/ft²/yr in 2012, yet increased again in 2013 to 24.3 ekWh/ft²/yr.
Figure 17: Average Normalized Energy Use by Region and Year

Figure 17 comparatively illustrates trends in average normalized energy use in each region.
As was done in the 2010 and 2012 Energy Benchmarking Reports, analysis of electricity use and natural gas use has been performed for each region and is compared over the three-year period.

**Figure 18** displays the average actual electricity use intensity in each region and shows a matching gap between higher intensity each year in Quebec as compared to the other regions. For all years, Quebec shows a higher average intensity than any other region at 28.2, 26.4, and 24.4 kWh/ft², in 2011, 2012, and 2013, respectively. Ontario’s range of intensities is second highest to Quebec at 21.4, 20.4, and 19.7 kWh/ft², in 2011, 2012, and 2013, respectively. British Columbia overlaps with the Ontario range with British Columbia starting at 20.8 kWh/ft² in 2011, then lowering to 19.0 kWh/ft² in 2012, and then to 18.7 kWh/ft² in 2013. The Prairie Region moves from a slightly lower intensity in 2011 of 18.4 kWh/ft², to 17.7, and 16.5 in 2012 and 2013, respectively.

To note, the overall trend observed in this chart is a steady reduction in electricity use, yet the values reported are not weather normalized and will be influenced by weather variations, specifically variations in cooling degree days between years, potentially resulting in increases and/or decreases in use.
Figure 19: **Average Natural Gas Use Intensity by Region and Year**

Figure 19 displays the average natural gas use intensity (in m$^3$/1,000 ft$^2$) in each region and indicates, as per both previous reports, a large inconsistency between the intensity of natural gas use in the Prairie Region as compared to British Columbia, Ontario, and Quebec. For all years, Quebec shows a lower average intensity than any other region at 261, 320, and 418 m$^3$/1,000 ft$^2$, in 2011, 2012, and 2013, respectively. Ontario’s range of intensities is second lowest to Quebec at 703, 545, and 671 m$^3$/1,000 ft$^2$, in 2011, 2012, and 2013, respectively. Overlapping with Ontario is British Columbia. British Columbia starts at 825 m$^3$/1,000 ft$^2$ in 2011, then drops to 623 m$^3$/1,000 ft$^2$ in 2012, and then drops further to 567 m$^3$/1,000 ft$^2$ in 2013. The Prairie region has by far the greatest natural gas use intensity, shifting from a much higher intensity in 2011 of 1,504 m$^3$/1,000 ft$^2$, to 1,392, then down slightly to 1,361 in 2012 and 2013, respectively.

To note, the trends observed in this chart are partially reductions and partially increases in average natural gas use across the country, from 2011 to 2013. However, as in Figure 18, the values reported are not weather normalized and will integrate weather variations in the different regions, specifically variations in heating degree days between years, into perceived increases and/or decreases in use.
4.4 City Center Trends

Although each of the Energy Benchmarking Surveys completed to date have collected data on buildings from across Canada, most of those buildings are located in major city centers. All three of the following data sets are sufficiently large as to provide meaningful breakouts and analysis of sub-regional and city center data. Figures 21 through 24 illustrate the trends in the normalized energy use intensity data for the Greater Toronto Area (GTA), Calgary, and the Greater Vancouver Regional District (GVRD).

Figure 20: City Center Distribution Comparison by Category and Year

As is the case for 2009 and 2010 data, the proportion of buildings located in the GTA in 2011, 2012, and 2013 is consistently more than both Calgary and the GVRD combined. In 2013, there are 132 buildings in the GTA data set (47% of total), 37 buildings in the Calgary data set (13% of total), and 43 buildings in the GVRD data set (15% of total).
Figure 21: Normalized Energy Use Intensity for the Greater Vancouver Regional District, by Year

Figure 21 shows the mean national normalized intensity in 2013 with a red bar and the mean GVRD data sets each year in blue. In 2011, the mean was 32.7 ekWh/ft²/yr, and then decreased to 29.2 ekWh/ft²/yr in 2012, followed by a marginal decrease in 2013 to 28.7 ekWh/ft²/yr.

In the 2013 data set, the lowest normalized building energy use intensity is at 11.1 ekWh/ft²/yr and the highest is at 84.4 ekWh/ft²/yr with the top 25th percentile of the GVRD data set beginning at 21.5 ekWh/ft²/yr and the bottom 75th percentile beginning at 34.3 ekWh/ft²/yr.

There are eight buildings with a normalized energy use intensity at or below 20.0 ekWh/ft²/yr and there are 10 buildings with energy use performance within the top quartile, below 21.5 ekWh/ft²/yr.
Figure 22 shows the mean national normalized intensity in 2013 with a red bar and the mean Calgary data sets each year in blue. In 2011, the mean was 31.1 ekWh/ft²/yr, and then decreased to 28.5 ekWh/ft²/yr in 2012, followed by another small decrease in 2013 to 28.4 ekWh/ft²/yr.

In the 2013 data set, the lowest normalized building energy use intensity is at 18.5 ekWh/ft²/yr and the highest is at 44.46 ekWh/ft²/yr with the top 25th percentile of the Calgary data set beginning at 22.7 ekWh/ft²/yr and the bottom 75th percentile beginning at 34.3 ekWh/ft²/yr.

There are two buildings with normalized energy use intensity at or below 20.0 ekWh/ft²/yr and there are nine buildings with energy use performance within the top quartile, below 22.7 ekWh/ft²/yr.
**Figure 23: Normalized Energy Use Intensity for the Greater Toronto Area, by Year**

- **2011 Normalized Building Energy Use**
- **2012 Normalized Building Energy Use**
- **2013 Normalized Building Energy Use**
- **2013 National Mean Energy Use**
- **Greater Toronto Area Mean Energy Use, by Year**

*Figure 23* shows the mean national normalized intensity in 2013 with a red bar and the mean GTA data sets each year in blue. In 2011, the mean was 26.4 ekWh/ft²/yr, and then decreased to 23.2 ekWh/ft²/yr in 2012, followed by an increase in 2013 to 24.5 ekWh/ft²/yr.

In the 2013 data set, the lowest normalized building energy use intensity is at 8.5 ekWh/ft²/yr and the highest is at 61.7 ekWh/ft²/yr with the top 25th percentile of the GTA data set beginning at 19.4 ekWh/ft²/yr and the bottom 75th percentile beginning at 27.7 ekWh/ft²/yr.

There are 35 buildings with a normalized energy use intensity at or below 20.0 ekWh/ft²/yr and there are 33 buildings with energy use performance within the top quartile, below 19.4 ekWh/ft²/yr.
Figure 24: Average Normalized Energy Use by City Center and Year

Figure 24 comparatively illustrates trends in average normalized energy use in each city center.
4.5 High Intensity or Exceptional Space Type Trends

Over the five years of the Survey, more and more participants have reported having sub-metered high intensity space types (e.g. data center, retail) or exceptional space types within their buildings. The comparison of the number of buildings and percentage of the data sets with such exceptional space types in the past three years is displayed in Table 2.

<table>
<thead>
<tr>
<th>Space Type</th>
<th>Year</th>
<th>Number of Buildings</th>
<th>Percent of Total Data Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Center</td>
<td>2011</td>
<td>45</td>
<td>12%</td>
</tr>
<tr>
<td></td>
<td>2012</td>
<td>45</td>
<td>16%</td>
</tr>
<tr>
<td></td>
<td>2013</td>
<td>50</td>
<td>18%</td>
</tr>
<tr>
<td>Call Center</td>
<td>2011</td>
<td>3</td>
<td>1%</td>
</tr>
<tr>
<td></td>
<td>2012</td>
<td>3</td>
<td>1%</td>
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<tr>
<td></td>
<td>2013</td>
<td>1</td>
<td>0%</td>
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<tr>
<td>Retail</td>
<td>2011</td>
<td>30</td>
<td>8%</td>
</tr>
<tr>
<td></td>
<td>2012</td>
<td>31</td>
<td>11%</td>
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<td></td>
<td>2013</td>
<td>39</td>
<td>14%</td>
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<tr>
<td>Other</td>
<td>2011</td>
<td>21</td>
<td>6%</td>
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<tr>
<td></td>
<td>2012</td>
<td>17</td>
<td>6%</td>
</tr>
<tr>
<td></td>
<td>2013</td>
<td>21</td>
<td>8%</td>
</tr>
<tr>
<td>Enclosed Parking</td>
<td>2011</td>
<td>205</td>
<td>55%</td>
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<tr>
<td></td>
<td>2012</td>
<td>177</td>
<td>64%</td>
</tr>
<tr>
<td></td>
<td>2013</td>
<td>174</td>
<td>62%</td>
</tr>
</tbody>
</table>

In 2013, 62% of the buildings reported having enclosed parking, up from 47% in 2009 and 55% in 2011. In addition, three buildings entered sub-metered electricity data for this space type in 2013, while five did in 2011 and only two buildings did so in 2009.

Data centers (the area and corresponding sub-metered electricity use) have been reported in 18% of the buildings submitted for 2013, which has risen from the 12% seen in 2011 and 2009. Call centers have kept their relative representation close to 1% each year and retail spaces have seen their proportion get larger from 8% to 14% over the three years.
As shown in Figure 25, the ranges for electricity use in high intensity energy use space types can be wide for some categories and the mean intensities for each space type may vary over the years. The annual energy use intensity for data centers runs between 27.7 and 1,721.3 kWh/ft²/yr with a mean intensity of 356.1 kWh/ft²/yr for the 2011 data set but the range contracts in the 2013 data set and runs from 15.5 to 1,041.1 kWh/ft²/yr but with a similar mean intensity of 333.4 kWh/ft²/yr. The annual energy use intensity for retail spaces for 2011 covers 4.5 to 97.7 kWh/ft²/yr and has a mean of 44.4, but the range expands in 2012 then contracts again in 2013 with a low of 8.8 and a high of 123.3 kWh/ft²/yr with a mean of 46.1 kWh/ft²/yr. Other space types can include, but are not limited to, restaurants, fitness centers, or medical centers and although the range in electricity use intensity has spread over the three years, the mean has fallen slightly from 2011 to 2013, from 187.7 to 78.2 kWh/ft²/yr. The range for other space types in 2013 runs between 8.8 and 436.0 kWh/ft²/yr.
REALpac’s Energy Benchmarking Program has made a significant impact on the commercial office sector over the past five years. It has provided a path toward actively measuring and benchmarking energy use in buildings, generated lively debate around relative vs. absolute energy performance metrics, and filled a gap in the marketplace where there once was a lack of comparable, Canada-wide benchmarking data available.

After five years of recording trends and watching the industry evolve in their management of building energy consumption, it is gratifying to see the direction of the overall trend is toward energy use reductions. The hidden but more inspiring trend seen in the distribution of high performing buildings within the data sets gives us further insight into what “top performance” means. REALpac is pleased to be involved in the advancement of the industry and will continue to support green initiatives and energy efficient practices in commercial buildings through the running of the Energy Benchmarking Program and the addition of a Water Benchmarking Program and Database as a complimentary initiative to our existing platform.
## 2014 Energy Benchmarking Report

Performance of the Canadian Office Sector

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**REALpac**

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