

CARBON FOOTPRINT REPORT

Calendar Years 2014 and 2015



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Cover photos (left to right):

Columbia South Shore Well Field Groundwater Pump Station, Electric Nissan Leaf and charging station, new LEED Maintenance Building at Interstate

Introduction

The Portland Water Bureau (PWB) continues to track and measure its carbon emissions annually in order to: 1) identify the best methods to collect, report, and confirm data on carbon emissions; 2) measure progress and evaluate trends in emissions and energy use; 3) determine which operations and functions have the highest carbon impact; and 4) assess opportunities for future emissions reductions.

This carbon footprint is for calendar years 2014 and 2015, and compares emissions in these years to previous annual emissions and a baseline year (former PWB carbon footprint reports are available from the [Sustainable Operations](#) webpage). PWB uses the baseline of calendar year 2007 for two reasons. First, PWB's emissions calculations only extend back to 2007. Second, PWB's carbon emissions are highly influenced by groundwater use, which can vary from year to year. Groundwater use in 2007 comprised 21% of total carbon emission in that year, so the baseline already factors in relatively high groundwater use to account for moderate inter-annual fluctuations.

Using calendar years instead of fiscal years (which begin on July 1) enables the bureau to keep the summer season groundwater use within the same carbon footprint report. While groundwater use to augment [summer supply](#) has historically begun after July 1 on average, groundwater use occurred in June 2007 and in June 2015. Groundwater use prior to July 1 may occur in future years, depending on weather and other water supply conditions.

The joint City of Portland and Multnomah County [2015 Climate Action Plan](#) and the City's [2030 Environmental Performance Objectives](#) set a goal for City (and County) operations to reduce carbon emissions by 53 percent, from Fiscal Year 06–07 levels, by 2030.

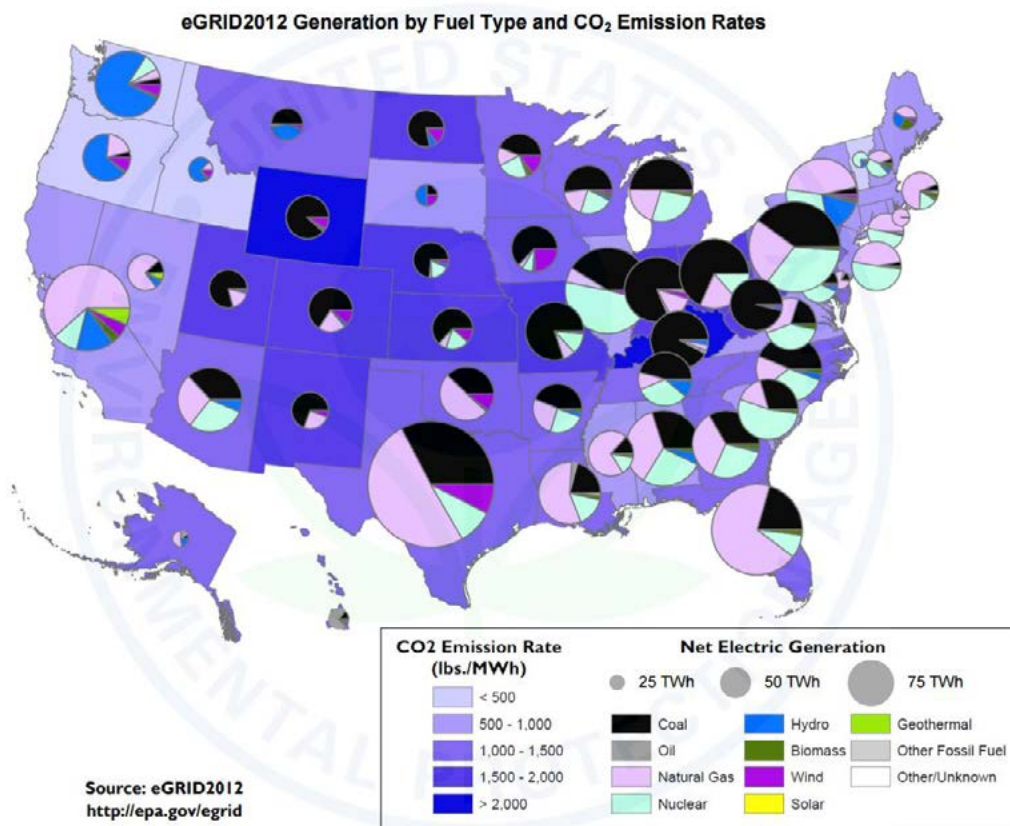
Methodology

PWB's carbon footprint report uses The Climate Registry's [General Reporting Protocol for the Voluntary Reporting Program](#) (GRP) methodology, updated as version 2.1 in January 2016. The Climate Registry (TCR) sets consistent and transparent standards to calculate, verify and publicly report organizational greenhouse gas emissions. While PWB is not a TCR member and does not report to the TCR registry, the bureau is voluntarily committed to providing accurate reporting of carbon emissions. PWB uses TCR's GRP methodologies to convert units of electricity, fuel, and natural gas consumed into metric tons of carbon dioxide equivalent (CO₂e). PWB internally records how data is collected and calculated in a *Carbon Footprint Data and Methods* document which was updated for 2015. PWB used the same GRP calculation methods for 2014 and 2015 as in the 2013 report. However, emissions factors are updated annually.

Metric Tons of Carbon Dioxide Equivalent (CO₂e)

1 metric ton of CO₂e is the unit of measure for all greenhouse gas emissions. Quantities of other greenhouse gases are converted into CO₂e units using global warming potentials established by the Intergovernmental Panel on Climate Change (IPCC).

Most of the calculations in this 2014 and 2015 report use the [2015 Climate Registry Default Emissions Factors](#), which were released in April 2015. However, *electricity* emissions factors in this report come from a U.S. Environmental Protection Agency (EPA) update to the [eGRID subregional emissions factors](#) for the Northwest, which were provided in October 2015 and are more recent than the 2015 Climate Registry default emissions factors. In the eGRID update, emissions factors for carbon dioxide, methane and nitrous oxide are *lower* compared to previous factors for the Northwest sub region, and significantly so in the case of carbon dioxide. The reason for this change is to account for the increased role of natural gas and wind in the regional energy mix, with coal playing a much smaller role. Combustion of natural gas emits less carbon emissions than combustion of coal. Figure 1 illustrates the current energy mix in Oregon and the Northwest compared to other regions.

Figure 1: Regional Fuel Mix (Source: EPA eGRID 2012)

While the new eGRID factors can technically be applied to carbon emissions calculations back to 2012, according to the EPA, PWB is only using the new electricity factors for 2014 and 2015 emissions.

As with previous PWB carbon footprint reports, emissions from the following sources are included (see Figure 2):

Scope 1 (direct emissions):

- Biodiesel, diesel, and gasoline fuels for vehicles and heavy machinery

Scope 2 (indirect emissions):

- Electricity for buildings and pump stations
- Natural gas for heating in buildings

Scope 3 (indirect emissions):

- Fuel for employee air travel

Because TCR does not provide a methodology to calculate Scope 3 air travel emissions, PWB again used the 2008 U.S. EPA Climate Leaders GHG Inventory Protocol: *Optional Emissions from Commuting, Business Travel and Product Transport* method to calculate airline emissions per passenger mile traveled in 2014 and 2015. Even though the emissions factors for air travel have not been updated since 2008, PWB air travel carbon emissions contribute less than one percent of total bureau emissions, so a change in airline emissions factors would not have a significant impact on the bureau's total carbon emissions. However, in a future carbon footprint report, PWB may explore and test the use of the **2014 Simplified Emissions Calculator** developed by the EPA to calculate air (and other) emissions moving forward.

A variety of significant emissions sources are excluded because the data are not readily available:

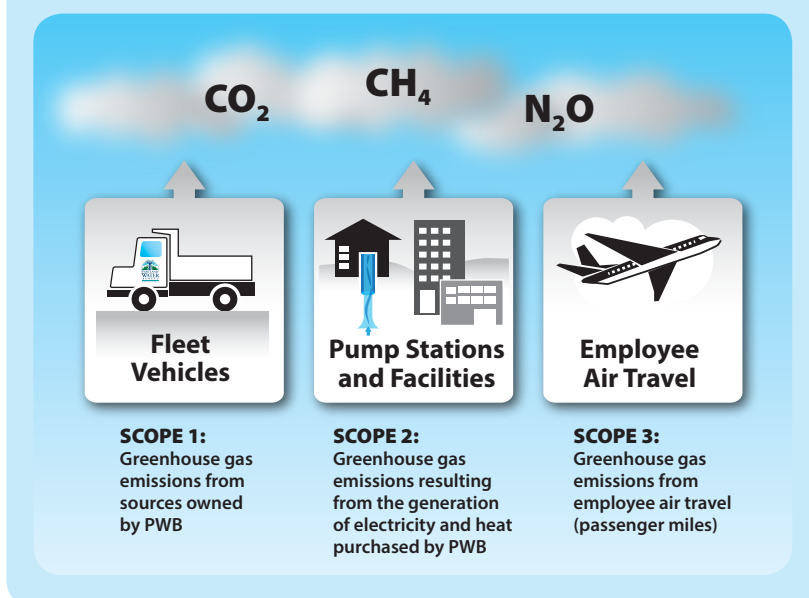
Scope 1:

- Fugitive emissions (e.g. HVAC systems, refrigeration, aerosols containing HFC's)
- Emissions from propane tanks

Scope 3:

- Emissions from employee commuting
- Supply chain emissions (solid waste collection and disposal; emissions from the manufacture, delivery, and disposal of purchased material [e.g. paper, pipe, concrete, chlorine gas]; and emissions from contracted construction work).

Figure 2: PWB Greenhouse Gas Emissions and Scope Definitions (Adapted from U.S. EPA)



Carbon Emissions: 2014 and 2015

PWB's total emissions for calendar 2014 were 8,004 metric tons of CO₂e, a 43 percent decrease from 2007 baseline emissions of 14,000 metric tons. In contrast, total emissions for calendar year 2015 were 13,965 metric tons of CO₂e, essentially the same as the 2007 baseline. The reasons for high 2015 emissions are described further below.

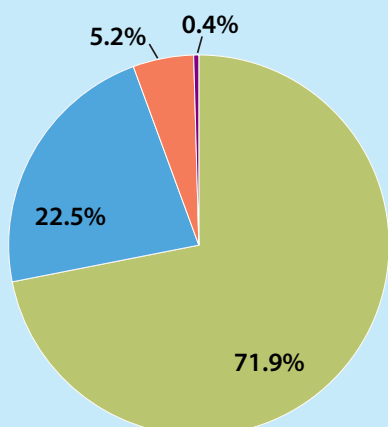
Table 1 and Figures 3 and 4 illustrate PWB's 2014 and 2015 emissions by source. In both years, electricity is clearly the largest source of emissions, followed by natural gas and fleet fuel use. Employee air travel emissions are very small percentage of total emissions. These source percentages are similar to previous PWB carbon footprint reports. However, in 2015 it is evident that the percentage of emissions from electricity use (83.5%) was significantly greater than 2014 (71.9%). This difference was due to the significantly higher groundwater use in 2015 as compared to 2014.

According to the City of Portland's 2015 Climate Action Plan, emissions for Multnomah County in 2013 were 10 metric tons of CO₂e per capita. Using this ratio, PWB's 2014 and 2015 emissions were equivalent to the average emissions of 800 and 1,397 Multnomah County residents, respectively.

Table 1. CO₂e Emissions for Calendar Years 2014 and 2015 (in metric tons)

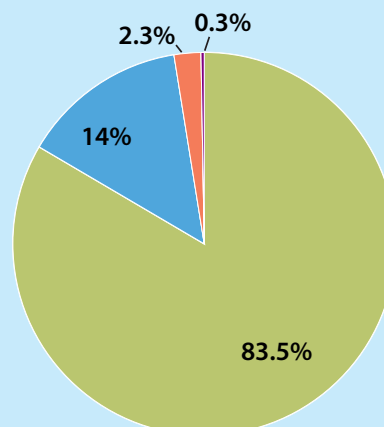
Emissions Source	2014 CO ₂ e (Metric Tons)	2014 Emissions Percentage	2015 CO ₂ e (Metric Tons)	2015 Emissions Percentage
Electricity	5,755	71.9%	11,654	83.5%
Fleet Fuel	1,801	22.5%	1,957	14.0%
Natural Gas	413	5.2%	316	2.3%
Employee Air Travel	35	0.4%	38	0.3%
Total Annual CO₂e Emissions	8,004	100%	13,965	100%

Figure 3. PWB CO₂e Emissions for Calendar Year 2014
Total Emissions: 8,004 Metric Tons of CO₂e



Electricity: 5,755 MT
Fleet Fuel: 1,801
Natural Gas: 413 MT
Employee Air Travel: 35 MT

Figure 4. PWB CO₂e Emissions for Calendar Year 2015
Total Emissions: 13,965 Metric Tons of CO₂e



Electricity: 11,654 MT
Fleet Fuel: 1,957 MT
Natural Gas: 316 MT
Employee Air Travel: 38 MT

Historical Trends

Table 2 depicts PWB's energy and fuel use trends by source for the baseline year 2007 compared to the years 2011-2015. Table 3 shows the corresponding carbon emissions by source. In general, energy use and carbon emissions have trended downwards (with occasional annual fluctuations) from the 2007 baseline. However, 2015 stands out as having the highest electricity use of all years including the baseline year: 2015 electricity use was 38% higher than electricity use in 2007.

Table 2. Energy and Fuel Use

Energy and Fuel Use Category	Baseline 2007	2011	2012	2013	2014	2015
Electricity (kWh) ^a	27,727,113	23,335,253	22,520,834	18,173,351	18,961,318	38,395,933
Fleet Fuel (gallons) ^b	286,407	239,557	242,105	224,338	212,663	231,952
Natural Gas (therms) ^c	65,914	64,024	67,707	62,441	77,630	59,379
Employee Air Travel (air miles)	577,237	322,974	212,965	98,833	126,715	138,928

^a kWh is kilowatt hours

^b Fleet fuel includes B5 and B20 biodiesel, and E10 gasoline

^c Natural gas is used solely for heating

Table 3. CO₂e Emissions

CO ₂ e Emissions (MT) by Source	Baseline 2007	2011	2012	2013	2014	2015
Electricity	11,420	9,138	8,411	6,787	5,755	11,654
Fleet Fuel	2,117	1,976	2,078	1,916	1,801	1,957
Natural Gas	352	357	360	332	413	316
Employee Air Travel	111	55	36	27	35	38
Total	14,000	11,526	10,885	9,062	8,004	13,965

Carbon Emissions by Source: 2014 and 2015

The following sections compare PWB's 2014 and 2015 carbon emissions by source against previous years and the 2007 baseline.

Electricity Use

PWB's annual carbon emissions are mostly dependent on the amount of electricity used in a given year. Despite the fact that water moves from the Bull Run Watershed to town primarily by gravity, PWB requires electricity to pump water to higher elevations for customers in the West Hills of Portland, and to pump groundwater from deep aquifers in the **Columbia South Shore Well Field** when needed. Other less significant electricity uses include lighting in PWB office buildings and other facilities.

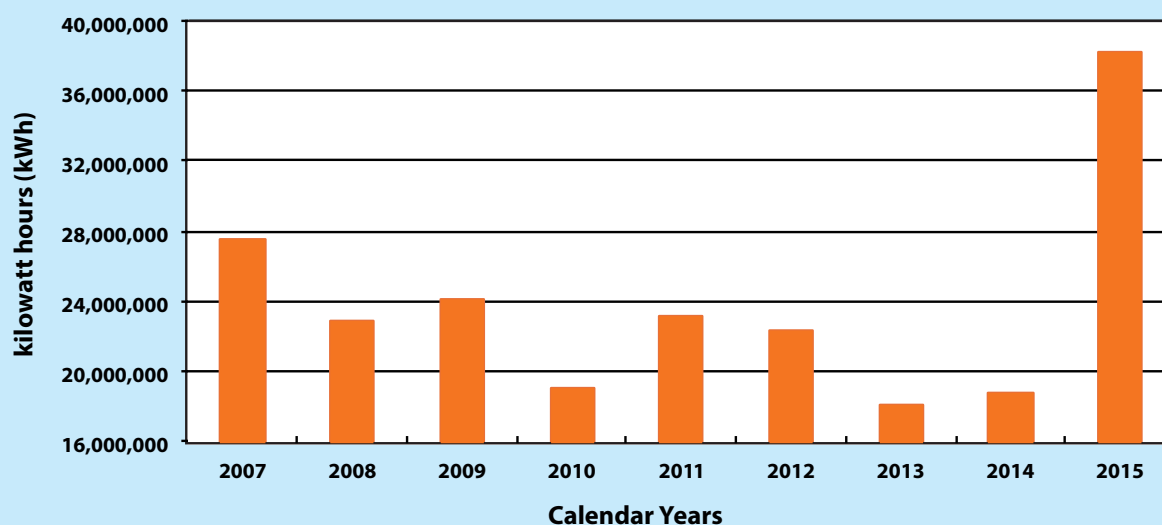
Table 4 and Figure 5 demonstrate that PWB kilowatt hours (kWh) of electricity use and associated emissions were higher in 2007 than in subsequent years, with the notable exception of 2015. Electricity emissions in 2014 were 49 percent lower than the baseline, but 2015 emissions were 2 percent higher than baseline emissions. As described in the Methodology section above, the Northwest emissions factors for electricity decreased significantly in 2015 to account for the change in regional energy sources. The calculated carbon emissions would therefore have been even *higher* in 2015 if not for the change in emissions factors.

Table 4. Electricity Use and CO₂e Emissions

	Baseline 2007	2011	2012	2013	2014	2015
Electricity (kWh)	27,335,981	23,335,253	22,520,834	18,173,351	18,961,318	38,395,933
CO ₂ e Emissions (MT) ^a	11,420	9,138	8,411	6,787	5,755	11,654

^a Electricity emissions factors for 2014 and 2015 are lower than previous years due to updated EPA eGRID data for the WECC Northwest subregion. Updates occurred in Fall 2015 and can be applied back to 2012. However, PWB is not changing the electricity carbon emissions for 2012 or 2013 and has only applied the new factors to 2014 and 2015 emissions.

Figure 5: PWB Electricity Use 2007-2015



Groundwater Use in 2015

The primary reason for higher than average 2015 electricity use and associated emissions can be attributed directly to the amount of groundwater pumped in 2015. PWB pumped 5.8 billion gallons (5,800 million gallons) of groundwater during the summer of 2015 to supplement supply from the Bull Run (Table 5). This was the largest amount of groundwater that the bureau has ever used since the development of the well field. Groundwater emissions alone accounted for as much as 42% of the total annual carbon emissions, more than any of the previous eight years.

Table 5: Electricity Use and Emissions from Groundwater Pumping

	Baseline 2007	2011	2012	2013	2014	2015
Groundwater pumped for water supply (MG) ^a	1,870	1,320	1,075	30	120	5,800
Electricity (kWh)	6,953,454	5,653,653	4,460,452	902,795	946,179	19,299,025
CO ₂ e Emissions (MT)	2,905	2,214	1,666	337	287	5,858
Percentage of Total Carbon Emissions	21%	19%	15%	4%	4%	42%

^a MG is million gallons

The groundwater wells in the Columbia South Shore Well Field were first activated on June 11, 2015 to augment supply due to scheduled work on Conduit 4. Scheduled annual maintenance also took place during this period. The wells were then switched off on June 30, 2015. Groundwater was later used to augment supply from July 16 to November 4, 2015 which was the longest Bull Run reservoir drawdown period in PWB's historical record at 132 continuous days (PWB **Summer Supply Update**, November 13, 2015).

Record-breaking weather conditions in the Northwest were the main driver of PWB's high use of groundwater. Because 2015 was the second warmest winter on record for Oregon, most of the precipitation fell as rain rather than snow, leading to historically low winter and spring snowpack (**Natural Resources Conservation Service Oregon Basin Outlook Report, April 2015**). These "snow drought" conditions, coupled with warmer than average summer temperatures and dry soil moisture conditions, led to low summer streamflows.

Climate change in the Northwest is expected to increase the likelihood of years similar to 2015, with warmer winter temperatures, low snowpack, and warmer and lower summer streamflows (Dalton et al., 2013). This may mean that PWB will rely on groundwater more frequently or for longer periods of time, which could result in higher electricity use and higher associated carbon emissions in future years. For more information on anticipated climate impacts to the city's drinking water system, see: <https://www.portlandoregon.gov/water/climatechange>.

While most of the electricity use in 2015 was due to elevated groundwater pumping, the warmer spring and summer temperatures also caused more **cooling degree days** in Portland in 2015 compared to 2014 (**Weather Underground Weather History for KPDx**). Cooling degree days indicate use of building air-conditioning systems, so warm summer air temperatures will have also contributed to higher annual electricity use in PWB's buildings.

CO₂e per Million Gallons of Water Produced

PWB's **gravity-fed and unfiltered water system** has a relatively small carbon footprint per unit of drinking water compared to other water utilities. The EPA estimates an average of 0.0015 kWh per gallon to convey surface water in the U.S. (**U.S. EPA, 2008**). This estimate includes pumping raw water, filtration, treatment, and distribution. PWB's comparable estimate for 2014 was 0.0005 kWh per gallon (one-third of the EPA estimate), and 0.0010 kWh per gallon in 2015 (just over two-thirds of the EPA estimate, and higher than the 2007 baseline of 0.007 kWh per gallon).

PWB emitted 0.22 metric tons of CO₂e per million gallons of water produced in 2014 and 0.38 metric tons of CO₂e per million gallons of water produced in 2015 (Table 6). The 2015 value is the same as the baseline year of 2007. While the amount of total water produced and the carbon emissions were similar for both years, the proportion of Bull Run water in 2015 was less than in 2007, while the proportion of groundwater was significantly higher. As mentioned above in the Methodology section, emissions in 2015 would have been higher if not for a change to regional electricity emissions factors.

Table 6. CO₂e Emissions per million gallons of water

	Baseline 2007	2011	2012	2013	2014	2015
CO ₂ e Emissions (MT)	14,000	11,526	10,885	9,062	8,004	13,965
Total Water Produced (MG)	37,068	35,371	35,720	35,802	36,884	36,879
Bull Run (MG)	35,198	34,020	34,645	35,772	36,764	31,079
Groundwater (MG)	1,870	1,320	1,075	30	120	5,800
CO₂e Emissions (MT/MG)	0.38	0.33	0.30	0.25	0.22	0.38

Renewable Energy

Portland City Council Resolution 36983 directs City bureaus to purchase 100% renewable power. To date, PWB has purchased **Green-e** certified Renewable Energy Certificates (RECs) to comply with the resolution. A REC represents the property rights to the environmental, social, and other non-power qualities of renewable electricity generation (**EPA Green Power Partnership**). A REC, and its associated attributes and benefits, can be sold separately from the physical electricity (electrons) generated from a renewable power source. *Green-e* certification is the highest standard for independent and verified RECs.

The amount of RECs PWB purchases is based on *actual* (not predicted) electricity use during a given Fiscal Year. PWB starts with total annual electricity use, and then subtracts electricity generated by PWB's Vernon micro-hydro facility, and an additional five percent for renewable energy already generated or purchased by the two electric utilities that supply power to PWB – Portland General Electric (PGE) and Pacific Power.

PWB RECs purchased to date are as follows:

- 17,803 MWh to represent actual electricity use during fiscal year 2012-2013
- 16,528 MWh to represent actual electricity use during fiscal year 2013-2014
- 19,865 MWh to represent actual electricity use during fiscal year 2014-2015
- PWB also purchased 348 MWh of RECs in 2015 to earn the LEED Green Power credit for the bureau's two new Interstate buildings. This amount represents 35 percent of the predicted electricity use for both buildings over their first two years of occupancy (i.e., 2014-2016 for the Stores Warehouse and 2015-2017 for the Maintenance building).

LEED Interstate Renovation Project

PWB has completed construction of two new buildings as part of the **Interstate Renovation Project**. Over 300 PWB staff are based at these two buildings. The Shops and Stores Warehouse was constructed in 2014 and hosts a 78 kW rooftop solar array that contributes to meeting the electricity needs of both buildings. The Maintenance Office Building was constructed in 2015 and hosts a green roof and a small solar thermal array that provides for 50% of the building's domestic hot water needs. Both buildings were designed to use 30 percent less energy than buildings built to standard code. PWB received over \$90,000 in incentives from the Energy Trust of Oregon for energy efficient features in these buildings.



Shops and Stores Warehouse and Maintenance Office Building, Interstate

Over the last eight years, PWB has invested in installing renewable energy at bureau facilities. Table 7 lists the renewable energy generation capacity from these solar arrays and a micro-hydro project. In total the bureau has helped to generate 400 kW of renewable energy, which reduces the amount of fossil fuel energy required from the electric grid.

Table 7. Renewable Energy Capacity	Energy Generation Capacity (kW)
Groundwater on the Slough Array ^a	267.54
Groundwater Treatment Building Solar Array ^b	9.80
Meter Shop Solar Array ^c	12.24
Powell Butte Solar Array ^d	7.92
Vernon Micro-Hydro Turbine ^e	25.00
Shops and Stores Warehouse Solar Array ^f	78.00
Total	400.50
PWB Renewable Goal	400

^a Generating since December 2009 - This array is owned by a third-party.

^b Generating since May 2012

^c Generating since June 2010

^d Generating since December 2012

^e Generating since September 2012

^f Generating since August 2014

In addition to solar and micro-hydro generation, the Bureau of Hydroelectric Power owns two large hydropower facilities at the Bull Run dams. This hydropower contributes to the region's renewable energy mix. These facilities are operated by PGE, and generated 94,457,000 million kWh of renewable hydropower in 2014, and 67,179,000 million kWh in 2015 (Table 8). The generation in 2015 was well below historical averages due to a dry winter season with minimal snowpack and lower streamflows in the Bull Run Watershed.

Table 8. Bull Run Hydropower Generation

Hydropower Facility ^{a, b, c}	Calendar Year				
	2011	2012	2013	2014	2015
PHP Powerhouse No. 1 (kWh)	54,900,000	65,745,000	54,063,000	57,754,000	39,428,000
PHP Powerhouse No. 2 (kWh)	40,088,000	35,404,000	5,845,000	36,703,000	27,751,000
Total Hydropower Generated (kWh)	94,988,000	101,149,000	59,908,000	94,457,000	67,179,000

^a The decrease in 2013 hydropower production for Powerhouse No. 2 was due to the construction of a selective intake structure in Reservoir 2 to comply with water temperature requirements for fish in the Bull Run River. During construction, the North Tower water intake (which passes water through Powerhouse No. 2) was shut down for most of 2013, resulting in lower power generation for the year.

^b In 2014 both powerhouses generated totals that were above the historical averages.

^c In 2015 both powerhouses generated totals that were well below the historical averages. This was due to the warm winter that led to a significantly lower snowpack in the Bull Run Watershed that was then coupled with a very dry period from February through October.

Fleet Fuel Use

The amount of maintenance and construction work that takes place in a given year continues to influence the number of vehicle miles traveled and the amount of fuel used. As shown in Table 9, PWB vehicles drove almost 1.3 million miles in 2014 and 1.45 million miles in 2015. Available data for miles driven only account for vehicles with canceiver chips that link to a vehicle's odometer and digitally record fuel use and mileage through the City's fleet database; some equipment, like backhoes, do not have odometers, so miles traveled (or hours operated) are underreported. As in previous years, heavy-duty trucks traveled the most miles and consumed the most fuel, followed by light-duty trucks and vans.

Table 9. Miles Traveled, Fuel Used, and Inventory by Vehicle Class in 2014 and 2015

Vehicle Class ^a	Miles (2014)	Gallons (2014)	# of Vehicles	Miles (2015)	Gallons (2015)	# of Vehicles
Passenger vehicles and Minivans	122,415	3,900	25	119,211	4,006	26
SUVs	301,004	16,270	39	270,709	15,600	39
Light-duty trucks and vans	386,232	37,991	81	421,936	42,113	88
Heavy-duty trucks ^b	476,352	92,564	112	633,287	138,322	135
Non-odometer vehicles and External fuel tanks ^c	0	38,489	64	0	30,309	67
Total	1,286,003	189,214	321	1,445,143	230,350	355

^a Miles traveled by vehicles with broken canceivers are not included, but fuel use from these vehicles is included. Twelve vehicles had broken canceivers in both 2014 and 2015. There were several data errors for fuel use in 2014 that underreport the actual amount of fuel use.

^b Heavy construction equipment is categorized with Heavy-duty trucks and/or non-odometer vehicles, depending on equipment.

^c 265 MT of biofuel CO₂ were emitted in 2014 from the use of B99 biodiesel and E10, in addition to the 1,801 metric tons of fuel CO₂e emissions. 311 MT of biofuel CO₂ were emitted in 2015 from the use of B99 biodiesel and E10, in addition to the 1,957 metric tons of fuel CO₂e emissions. CO₂ emissions from biofuels are "biogenic" in origin and are reported separately from fossil fuel emissions based on international greenhouse gas protocols (see 2012 Carbon Footprint for more information).

Table 10 and Figure 6 illustrate that total fleet fuel use in gallons has remained much lower than the baseline year. While the total volume of fuel used has varied over time, total gasoline use has continued to decrease. This is in part due to improvements in the efficiency (miles per gallon) of passenger vehicles which primarily use gasoline. Additionally, the bureau owns some hybrid and diesel passenger vehicles and SUVs which further reduce the amount of gasoline used. Fuel use carbon emissions in 2014 were 15 percent lower than in 2007, while 2015 fuel use emissions were just under 8 percent lower.



Water Bureau Utility Truck

Vehicles that use the most fuel and emit the most carbon (heavy-duty trucks) are primarily used to dig and haul earth during construction and maintenance activities, which are essential tasks to provide and maintain service to customers. Transport of crew members in light-duty trucks also uses fuel, although a much smaller amount than the large trucks. It is therefore unlikely that fuel emissions will decrease significantly in the next few years because of the type of work being done, and because there are currently limited options in the market for more efficient heavy and light duty trucks and vans. Reduction of idling times and more efficient driving practices may be the only opportunity in the short-term to modestly decrease the fleet's fuel use.

Table 10. Fleet Fuel Use (Gallons) and CO₂e Emissions

Fuel Type	Baseline 2007 ^d	2011	2012	2013	2014	2015
Diesel (ULSD) ^a	69,315	131,953	145,838	133,546	124,635	142,790
Gasoline (E10) ^b	154,146	72,913	69,889	66,310	63,862	59,888
Biodiesel (B99) ^d	62,946	34,691	26,378	24,482	24,166	29,274
Total Gallons	286,407	239,557	242,105	224,338	212,663	231,952
Total CO₂e Emissions (MT) ^c	2,117	1,976	2,078	1,916	1,801	1,957

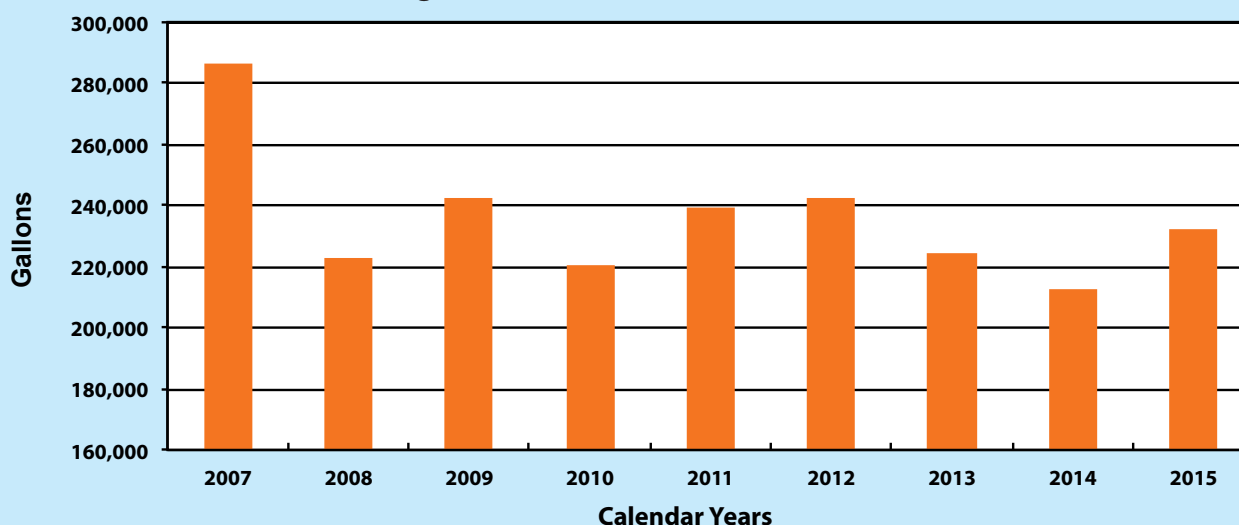
^a ULSD is ultra-low sulfur diesel

^b Gasoline contains 10% ethanol (E10)

^c 265 MT of biofuel CO₂ were emitted in 2014 from the use of B99 biodiesel and E10, in addition to the 1,801 metric tons of fuel CO₂e emissions. 311 MT of biofuel CO₂ were emitted in 2015 from the use of B99 biodiesel and E10, in addition to the 1,957 metric tons of fuel CO₂e emissions. CO₂ emissions from biofuels are "biogenic" in origin and are reported separately from fossil fuel emissions based on international greenhouse gas protocols (see 2012 Carbon Footprint for more information).

^d The bureau's biodiesel (B99) use decreased significantly after the baseline year of 2007 because this fuel type was causing engine warranty problems in certain vehicle types. The bureau stopped using B99 in these vehicles. Over the last several years, the blend of biodiesel used per vehicle is lower (either 5% or 20%).

Figure 6: PWB Fuel Use 2007-2015



Natural Gas Use

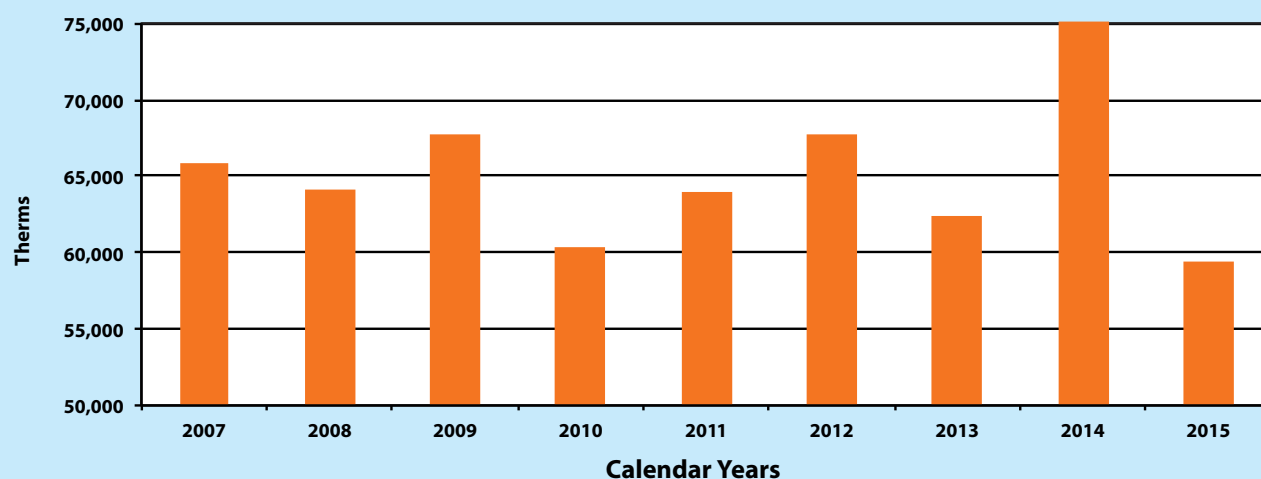
PWB uses natural gas to heat office buildings and other facilities. Weather is a large factor in determining the amount of natural gas used for heating in a given year. As can be seen in Table 11 and Figure 7, natural gas use in therms and associated carbon emissions were much lower in 2015 than in previous years mainly because Portland experienced much warmer than average winter temperatures, as mentioned above. There were more **heating degree days** in 2014 than in 2015 ([Weather Underground Weather History for KPDx](#)).

Table 11. Natural Gas Use and CO₂e Emissions

	Baseline 2007	2011	2012	2013	2014	2015
Natural Gas (therms)	65,914	64,024	67,707	62,441	77,630	59,379
CO ₂ e Emissions (MT) ^a	360	357	360	332	413	316

^a The 2007 and 2012 reports used different methodologies and emissions factors which is why carbon emissions in those two years are the same, but natural gas therms are different. PWB has used TCR's methodology since 2011.

Figure 7: PWB Natural Gas Use 2007-2015



Additionally, the natural gas heating system at the old Maintenance office structure was replaced by more efficient heating systems in the new LEED-designed Maintenance Building constructed in 2015. Emissions from natural gas were almost 15 percent higher in 2014 and 12 percent lower in 2015, compared to the baseline. Future natural gas use will most likely be lower than in 2014 due to the more efficient heating systems, even during cooler than average winters.

Employee Air Travel

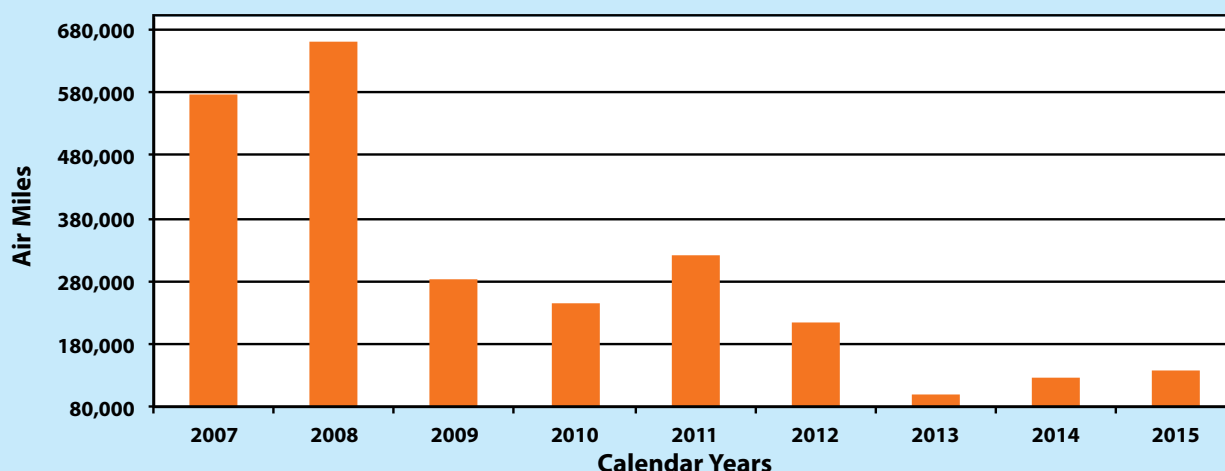
As depicted in Table 12 and Figure 8, air miles traveled and emissions remain significantly lower than the baseline year and are just a small portion of total PWB emissions. Air travel emissions in 2014 and 2015 were 78 and 76 percent lower than 2007, respectively.

Table 12. Employee Air Miles and CO₂e Emissions

	Baseline 2007	2011	2012	2013	2014	2015
Air Miles ^{a b}	577,237	322,974	212,965	98,833	126,715	138,928
CO ₂ e (MT)	111	55	36	27	35	38

^a PWB air miles may be slightly under-represented due how air mile reports are compiled by an external travel agency.

^b While the bureau used the 2008 EPA air emissions calculation methodology in 2012, it used different emissions factors from the U.K.'s DEFRA agency. For 2013, 2014 and 2015, the bureau shifted back to using the 2008 EPA emissions factors. This explains the discrepancy in air emissions between 2012 and 2015.

Figure 8: PWB Air Miles Traveled 2007-2015


Employee Commuting and Work-Related Transit

PWB does not calculate Scope 3 carbon emissions from employee commuting or work-related transit in the carbon footprint, and instead monitors trends in enrollment in the City-sponsored Trip Reduction Incentive Program (TRIP). TRIP offers subsidized monthly or annual transit passes and carpool parking, and monthly incentives to employees who bike or walk to work. Table 13 shows that transit use is popular among employees, although it's not clear if the increase in enrollment in passes is statistically significant (there may be some small discrepancies in how year to year TRIP data were previously calculated).

Table 13. TRIP Program Participation

	2010	2011	2012	2013	2014	2015
Trimet/C-Tran passes (bus, MAX, streetcar)	196	178	199	168	269	300
Carpool	20	11	6	11	3	4
Bike/Walk incentive	49	50	58	65	53	63
Total	265	239	263	244	325	367
Total Employee Participation (%) ^a	42%	39%	43%	42%	58%	65%

^a Percent participation for calendar years 2014 and 2015 is based on 564 FTE in FY 2014-2015

PWB also continues to offer free transit tickets in both the Portland Building and Interstate office buildings (Table 14). These tickets are used only for work-related travel, and help reduce the bureau's Scope 3 emissions.

Table 14. Work-Related Transit Use

	2011	2012	2013	2014	2015
Portland Building TriMet Tickets Distributed ^{a, b}	193	123	178	66	282
Interstate TriMet Tickets Distributed ^c	168	198	268	230	260
Total Trimet Tickets Distributed	361	321	446	296	542

^a Only June through December tickets (6 months) were recorded for 2014 in the Portland Building

^b Portland Building tickets are 2.5 hour tickets, so round-trip travel typically requires two tickets. Therefore the number of tickets may have been under-reported in some years.

^c Interstate tickets are all-day tickets.

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Appendix

This appendix is modeled after the Standard Disclosures from the Global Reporting Initiative's **G4 Sustainability Reporting Guidelines**, specifically the Organizational Profile. PWB reports the standard information below to provide context about PWB size and operations.

Name of organization

Portland Water Bureau, City of Portland, Oregon

Sustainable Operations and Sustainability Vision

A fundamental aspect of PWB's mission is to be a responsible steward of the public's fiscal and natural resources. Through **sustainable operations**, the bureau saves energy, reduces costs, eliminates waste and becomes more efficient.

Primary products, services, and markets served

PWB produces drinking water from a surface water supply (the **Bull Run Watershed** located in the Mt. Hood National Forest), and a secondary backup groundwater supply (**the Columbia South Shore Well Field**). The well field consists of 26 groundwater wells that pump water from three aquifers located in a five square-mile area on the south shore of the Columbia River.

Operational structure of the organization, including main divisions

Employees are organized into seven groups: Administration, Customer Service, Engineering, Finance and Support Services, Maintenance and Construction, Operations, and Resource Protection and Planning.

Number of employees

564.1 FTE employees in FY 2014-2015 and 566.85 FTE employees in FY 2015-2016.

Location of organization's headquarters

PWB operates out of two main facilities, the Portland Building in downtown Portland, and the Interstate facility located 2.4 miles from the Portland Building on the east side of the Willamette River. The majority of PWB employees work out of these two facilities. A much smaller number of employees are located in or near the Bull Run Watershed at Sandy River Station, Lusted Hill treatment facility, or the Headworks facility.

Number of buildings and properties owned or managed

The bureau owns, and has developed asset management plans for 50 facilities, 38 pump stations, several reservoirs, and numerous valves, wells, conduits, distribution mains, hydrants, roads, service lines, meters, tanks and transmission mains. PWB's assets are valued at \$7.6 billion.

Number of vehicles operated in 2014 and 2015

2014: 321

2015: 355

Significant changes during the reporting period (such as location of or changes in operations, including facility openings, closings, and expansions)

During 2014 and 2015, construction was underway for two new LEED-designed buildings as part of the Interstate Renovation Project: the Shops and Stores Warehouse and the Maintenance Office Building. These buildings are now fully occupied.

Quantity of products or services provided (water)

During FY 2014-2015, PWB produced an average of 101 million gallons of drinking water per day (Table A-1).

Table A-1. Total Annual System Production Data (by Fiscal Year)

Category	Fiscal Year				
	10-11	11-12	12-13	13-14	14-15
Average Annual Production in MGD ^a	98	97	101	98	101

^a MGD is million gallons per day

Breakdown of sales

Retail customers: In FY 2014-2015, PWB directly served over 183,300 retail accounts (including single and multi-family residential customers, and commercial and industrial accounts). Total retail population served was 588,365.

Wholesale customers: In FY 2014-2015 PWB's wholesale customers served an estimated population of 370,400.

See **FY 2014-15 Demand and Consumption Information** for more information.

Average water use per retail customer

During FY 2014-2015, residential customers used an average of 54 gallons of water per capita per day. Commercial and industrial customers used an average of 1,390 gallons per service per day (Table A-2).

Table A-2. Average Water Use for Residential and Commercial Accounts (by Fiscal Year)

Category	10-11	11-12	12-13	13-14	14-15
Residential Customers (gallons per capita) ^a	55	55	55	52	54
Commercial, Industrial, Institutional Accounts ^{b, c}	1,350	1,380	1,350	1,330	1,390

^a Gallons per capita from 10-11 to 14-15 reflect updated residential population estimates from PSU Population and Research Center forecasts that occurred in 2014

^b Average daily consumption per service in gallons

^c Adjusted to exclude fire line services

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