

EUGENE WATER & ELECTRIC BOARD  
2009 GREENHOUSE GAS INVENTORY

DECEMBER 2010

PREPARED BY GOOD COMPANY



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This inventory and other climate change related information is available online at:

[www.eweb.org/sustainability/climatechange](http://www.eweb.org/sustainability/climatechange)

Contact Felicity Fahy, EWEB's Sustainability Coordinator at [felicity.fahy@eweb.org](mailto:felicity.fahy@eweb.org) for more information.

Good Company provided technical assistance in the preparation of the inventory and drafted the report. For more information about Good Company's climate services contact Joshua Skov at [joshua.skov@goodcompany.com](mailto:joshua.skov@goodcompany.com).

The global and regional climate is changing—primarily due to human caused emissions of greenhouse gasses (GHGs). These changes present serious and credible environmental, economic and social risk to the Eugene Water & Electric Board (EWEB) and our customers.

As a first step in understanding our contribution and establishing benchmarks by which we can measure progress in reducing our emissions we have prepared this report — our first comprehensive corporate GHG inventory. In this report we begin to outline some of the risks posed by climate change and seek to assist the community in understanding the linkages between electricity use and the climate challenge we all face.

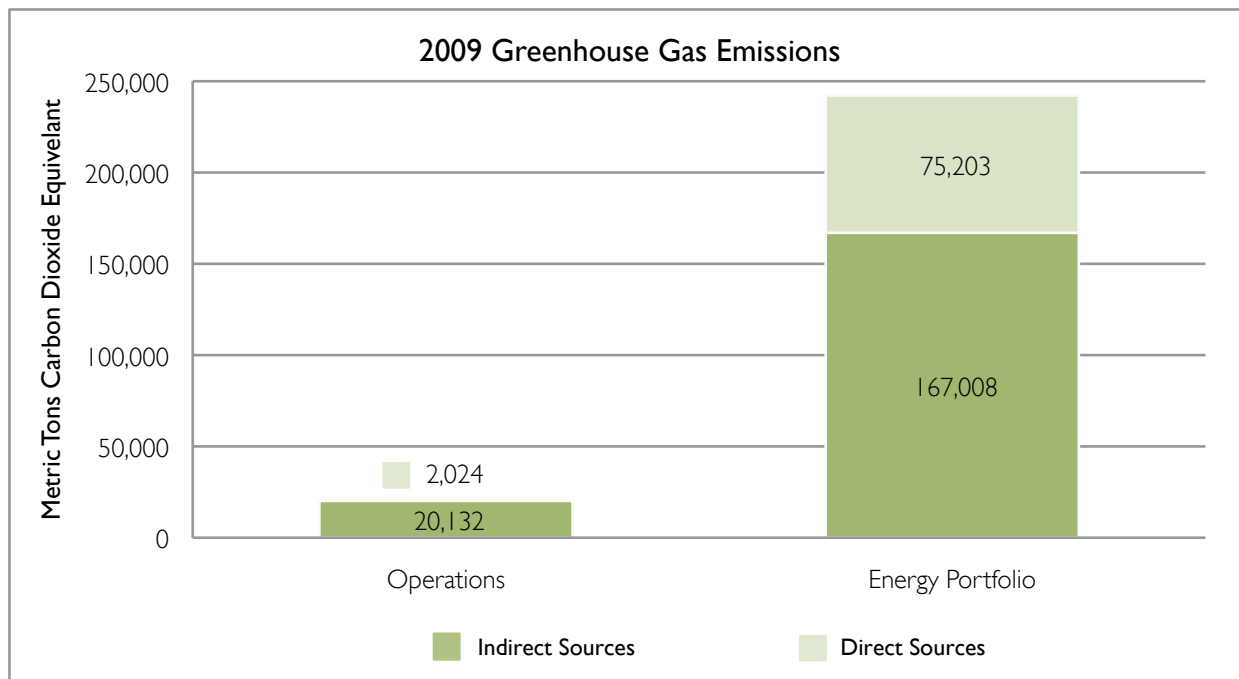
This report quantifies our GHG emissions in two parts. The first part, described in the *Operations Inventory* section, focuses on the emissions associated with EWEB’s core business operations such as building energy consumption, vehicle and equipment operation, and our supply chain. The second part, described in the *Energy Portfolio Inventory* section, focuses on the emissions associated with the combustion of fossil and biomass fuels for the generation of electricity and steam by EWEB’s owned and co-owned electric power resources, as well as by contracted resources.

In quantifying these emissions, we followed the guidelines of The Climate Registry’s *Electric Power Sector Protocol* and *General Reporting Protocol*. Per these guidelines we include both direct and indirect emission sources. Direct emissions are associated with the use of equipment and facilities owned or operated by EWEB, while indirect emissions are those emissions that result from EWEB’s activities and operations but occur from sources owned or controlled by another entity.

**EWEB’S OPERATIONS AND ENERGY PORTFOLIO CARBON FOOTPRINTS**

In 2009, EWEB’s operations emissions totaled approximately 22,150 metric tons of carbon dioxide equivalent (MT CO<sub>2</sub>e) and our energy portfolio emissions totaled approximately 242,000 MT CO<sub>2</sub>e (see Figure 1 below).

**Figure 1: EWEB 2009 GHG Emissions by Operations and Energy Portfolio**



Note: The total GHG emissions for Operations represented above include carbon calculations for electricity based on the utility-specific emissions factor. The Operations Inventory (beginning on p. 11, below) provides discussion and sensitivity analysis of the methodological issues associated with different emissions factors.

The larger emissions related to the generation, delivery and sale of electricity is to be expected given EWEB's unique role as the primary provider of electricity in the community. While our operations carbon footprint is modest relative to the energy portfolio carbon footprint, managing these emissions is still important and represents some of the most readily available opportunities for reducing our GHG emissions.

In contrast, many of the activities associated with the emissions in the energy portfolio are the result of decisions made over longer-term planning horizons. Despite these constraints, considering the effect our energy portfolio decisions have on GHG emissions remains imperative.

These totals include both anthropogenic and biogenic GHG emissions sources, with nearly 20% of our total emissions coming from biologically derived fuels such as biomass and biofuels. Biologically derived fuels have the potential to be climate neutral on a full life-cycle basis, depending on the feedstock material, agricultural practices, combustion technology and fossil fuels they displace. However, the life-cycle climate benefit of biologically derived fuels remains unresolved so we include our biogenic emissions in our emissions totals.

### SUMMARY OF PHYSICAL AND REGULATORY CLIMATE RISKS

EWEB faces two types of risks from climate change. First, we face *physical risks*, the potential disruptions and costs that will come with likely changes in regional patterns of temperature, precipitation and snowmelt. And second, we face *regulatory risks*, the potential effects of state, national or regional climate policies imposing a cost of carbon on GHG emissions.

In the Pacific Northwest, changes in precipitation patterns and the timing of spring snowmelts will alter historic patterns of hydroelectric generation that the region has come to rely on and threaten the health of the region's rivers and streams. At the same time, shifts in the regional climate will also influence patterns of demand for water and electricity. Proposed climate change legislation also poses challenges to EWEB as such regulations would likely lead to higher regional wholesale electricity prices and drive increased regional investments in renewables, energy efficiency, smart grid technology and the electrification of transportation.

### CALCULATING THE CARBON FOOTPRINT OF ELECTRICITY USE

EWEB's advice to customers preparing their own corporate greenhouse gas inventories is to follow the guidelines offered by The Climate Registry in the *General Reporting Protocol* and calculate the indirect emissions associated with their electricity consumption using *both* the regional emissions factor for the Northwest Power Pool, Oregon's U.S. Environmental Protection Agency's (EPA's) Emissions & Generation Resource Integrated Database (eGrid) subregion as well as EWEB's power supply portfolio average emissions intensity (see table below).

Anthropogenic Emissions Factors for Calculating Indirect Emissions Associated with Electricity Consumption		
Emissions Factor	Metric MTCO <sub>2</sub> e/MWh	Standard lbs. CO <sub>2</sub> e/MWh
Northwest Power Pool Regional Average	.409	902.2
EWEB Portfolio Average	.046	101.2

While EWEB's electric portfolio carbon intensity is low relative to the region as a whole, a result of our preferential access to Bonneville Power Administration hydroelectric resources and our own investments in renewable generation and energy efficiency and conservation, it is important to acknowledge the interconnected nature of the electricity grid.

EWEB sells surplus electricity generated into the regional wholesale market. Additional EWEB retail load means the decrease of EWEB sales into the wholesale market will likely be replaced by more carbon intense generation elsewhere. Conversely, additional conservation by EWEB customers means EWEB surplus electricity can displace generation at the regional emission factor. EWEB encourages customers to consider the broader regional impacts of incremental consumption and conservation decisions.

## **NEXT STEPS ON CLIMATE ACTION**

Now that we have completed our first comprehensive greenhouse gas inventory, our next step will be to develop a climate action plan that sets specific and meaningful emissions reduction targets and identifies the strategies for reaching these goals. The plan will also need to identify climate adaptation strategies for managing the impacts of the changing climate on EWEB operations and power portfolio.

The Earth's climate is changing and the impacts are already being felt locally. In the Pacific Northwest, changes in precipitation patterns and the timing of spring snowmelts will alter historic patterns of hydroelectric generation that the region has come to rely on and threaten the health of the region's rivers and streams. The same shifts in the regional climate disrupting rivers and streams will also influence patterns of demand for water and electricity.

The primary cause of these changes is human activity resulting in the emission of greenhouse gasses (GHGs). The most significant source of GHG pollution is carbon dioxide (CO<sub>2</sub>) from the burning of fossil fuels for energy supplies, transportation and industry. Other significant GHGs include methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), sulfur hexafluoride (SF<sub>6</sub>) and halocarbons (HFCs and PFCs).

In order to avoid the worst potential climate impacts on our economies, communities and the ecosystems we rely on, human-caused GHG pollution must be reduced significantly by mid-century—by more than 50% globally, and by as much as 95% in the world's wealthiest nations that are the largest emitters.

Meeting this challenge will require substantial shifts in how we consume energy—toward more efficient transportation, manufacturing, buildings and appliances—and where that energy comes from—toward safer, cleaner renewable energy sources like hydropower, the wind and sun. Moreover, climate change presents serious and credible environmental, economic and social risk to EWEB and our customers.

### THE ELECTRIC PORTFOLIO, CLIMATE RISK, AND EMERGING REGULATORY ISSUES

EWEB faces two types of climate risk related to our electric portfolio and our operations. First, we face *physical risks*, the potential costs and disruptions that will come with likely changes in regional patterns of temperature, precipitation and snowmelt. And second, we face *regulatory risks*, the potential effects of state, national or regional climate policies imposing a cost of on GHG emissions. For an electric utility—especially one that is overwhelmingly dependent on hydroelectric power resources—these risks are complex and intertwined.

#### **Physical Risks**

In the Pacific Northwest, changes to the climate will likely lead to warmer and wetter winters with more precipitation in the form of rain rather than snow, resulting in higher and more volatile stream flows in the winter months. Decreased snowpack and warmer temperatures will likely lead to earlier spring snowmelts, lower stream flows and higher water temperatures during the summer, increasing pressure on salmon and other migratory fish.

While increased winter stream flows could potentially result in increased hydroelectric generation, rapid increases and decreases in stream flows may decrease hydroelectric plant availability as operators are forced to manage increased debris flows. Lower summer stream flows will decrease hydroelectric generation—a situation that could be exacerbated by increased diversions for the benefit of fish and other wildlife.

Shifts in the regional climate will also influence patterns of demand for water and electricity. While milder winter temperatures may ease wintertime electricity demand, as our customers use less electricity for heating, warmer and drier summers will increase demand for both electricity and water, as our customers use more electricity for air conditioning and more water for irrigation.

#### **Regulatory Risks**

Potential state or federal regulations that would require electric utilities to track, manage and reduce GHG emissions associated with their power portfolios will include mechanisms that effectively put a price on GHG emissions (see Figure 2 on next page). The specific design and implementation details of these potential regulations will influence the range of carbon prices, but the expected outcome is increased prices for fossil fuel electricity generation leading to higher wholesale prices for power.

While EWEB's electric power portfolio appears both "low-carbon" and "surplus," and therefore at relatively low risk to increases in wholesale power prices, in fact EWEB has exposure to the regional marketplace both directly and indirectly. EWEB directly engages in the wholesale power market to manage price and volume risks and to sell

electricity in surplus of our retail obligations. EWEB also indirectly engages in the wholesale power market through our contract with the Bonneville Power Administration (BPA) who makes regional market purchases to meet the demand of its customers.

Moreover, efforts to curtail emissions from seemingly unrelated sectors, such as transportation, could have consequences for EWEB as these policies may accelerate the adoption of new technologies like plug-in electric vehicles.

**THE PORTFOLIO, THE ELECTRIC GRID AND THE CARBON CONSEQUENCES OF ELECTRICITY USE**

In addition to these risks, many of which will become apparent and understood only over several years, residential and business customers are interested in the “carbon footprint” of their electricity use. EWEB has an opportunity and responsibility to provide information on the impacts of electricity generation and use in order to enable our customers to make informed decisions.

However, defining the carbon consequences of electricity use is not as straightforward as it may seem. The *Energy Portfolio Inventory* section of this report quantifies the GHG emissions associated with EWEB’s owned, co-owned and contracted electric power resources. Yet, the GHG emissions of our electric power resource portfolio are not the same as the GHG emissions associated with local electricity use.

The resources in our portfolio are currently more than sufficient to meet the demand of EWEB’s retail electricity customers on an average annual basis. When available, excess power is sold to wholesale markets. Therefore, not all of the GHG emissions from EWEB’s full power portfolio are attributable to retail electricity sales.

Determining which of these power resources serve retail customers is not clear-cut. While certain BPA resources are intended to meet a portion of retail load obligations, under certain circumstances these resources actually exceed

**Figure 2: Selected Regulatory Initiative Related to GHG Emissions**

FEDERAL	<b>Current</b>
	<b>U.S. EPA Mandatory Reporting of Greenhouse Gases Rule</b> <ul style="list-style-type: none"> <li>Starts in 2011 for 2010 emissions for sources with more than 25,000 MTCO<sub>2</sub>e (anthropogenic) annually</li> </ul>
FEDERAL	<b>Emerging</b>
	<b>U.S. EPA Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule</b> <ul style="list-style-type: none"> <li>Starting in 2011 projects that substantially increase GHG emissions will require an air permit</li> <li>Targets largest emitters (e.g. power plants, refineries, etc. ≤ 75,000 short tons CO<sub>2</sub>e annually)</li> <li>No distinction between anthropogenic and biogenic sources</li> </ul>
REGIONAL	<b>Emerging</b>
	<b>California AB32 and Implementation of GHG Cap-and-Trade Rule</b> <ul style="list-style-type: none"> <li>2020 cap about 15% below 2012 levels (anthropogenic)</li> <li>Development coordinated with Western Climate Initiative</li> <li>Starting in 2012 electric power sector, including imported electricity, subject to cap</li> </ul>
OREGON	<b>Current</b>
	<b>Oregon DEQ Mandatory Greenhouse Gas Reporting Rules</b> <ul style="list-style-type: none"> <li>Sources with emissions ≤ 2,500 MTCO<sub>2</sub>e and all electricity suppliers (anthropogenic and biogenic)</li> </ul>
	<b>Emerging</b>
	<b>Oregon Low Carbon Fuel Standard</b> <ul style="list-style-type: none"> <li>Aims to reduce carbon intensity per unit of fuel energy by 10 percent from 2010 to 2020.</li> <li>Will likely allow fuel suppliers to buy credits from utilities that sell electricity for electric vehicles</li> </ul>
OREGON	<b>Oregon Transportation Greenhouse Gas Emissions Reduction Planning</b> <ul style="list-style-type: none"> <li>SB 1059 passed in 2010 aims to reduce GHGs from transportation by directing ODOT and ODLCD to coordinate with MPOs to develop strategy to meet statewide reduction goal of 75% by 2050</li> <li>Will likely be important driver in plug-in EV market development</li> </ul>
	<b>Community Climate and Energy Action Plan for Eugene</b> <ul style="list-style-type: none"> <li>Endorsed by Eugene City Council in September 2010</li> <li>Includes ≤ 70 recommendations for reducing community GHG emissions and fossil fuel consumption</li> <li>Many of the recommendation focus on building energy use and local development of renewable energy systems and specifically call on EWEB to make adjustments to programs and services</li> </ul>
LOCAL	

those obligations<sup>1</sup>. In 2009, EWEB's "Block" and "Firm Slice" purchases exceeded total retail obligations on an annual basis. However, at certain times of the year EWEB owned resources were used to meet retail demand. When a mix of resources that served retail customers is examined on an average annual basis we get a result that we know is not an accurate representation of what actually occurred through the course of the year.

Ideally, we would be able to calculate our retail system average grid carbon intensity by determining what resources were "on the grid" at shorter intervals of time. However, this level of detail was unavailable for calendar year 2009. Our implementation of a new energy trading, transaction and risk-management software platform holds some promise for gaining greater specificity in the makeup of our power resources for future GHG reporting.

Even if it were possible to track and assign the electricity output from different generating resources to our retail customers and calculate the average carbon intensity of power brought to retail load, it would still not fully reflect the carbon consequences of changes in electricity use. This is primarily because EWEB sells low carbon surplus energy into the regional wholesale electricity marketplace. If our customers use more electricity, for example, EWEB would sell less into the region and a higher carbon resource such as natural gas would likely replace our sale. Similarly, if our customers use less electricity, EWEB would sell more low carbon electricity into the region.

It also needs to be noted that EWEB is only one part of an interconnected regional electricity grid that covers most of western North America, from the Rocky Mountains to the Pacific coast. EWEB's retail customers benefit from this integrated system in a number of ways. This interconnected grid helps assure reliability by allowing the transfer of electricity from one part of the network to another in response to changes in supply (including integration of intermittent resources like wind power) and demand, or in response to planned or unplanned generation or transmission outages. This system also makes possible EWEB's participation in wholesale power markets, which provide revenue that subsidizes EWEB's retail electricity rates.

The carbon intensity of EWEB's complete portfolio is still meaningful to local customers as it represents EWEB's exposure to the regulatory and physical risks of climate change—after all it will be local ratepayers who ultimately will bear the financial burden of the costs associated with managing these risks.

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<sup>1</sup> EWEB's BPA contract differentiates between "Slice of the System" and "Block" purchases. The "Slice of the System" portion of the contract guarantees EWEB a fixed percentage (2.4%) of the electricity output of certain BPA resources, while the "Block" portion of the contract guarantees delivery of a certain amount of power that varies monthly. The output of EWEB's "Slice of the System" share under critical water conditions is also known as "Critical Slice." Under EWEB's 2001-2010 contract with BPA, EWEB's "Block" and "Critical Slice" purchases plus the firm output of certain EWEB-owned resources should be sufficient to meet EWEB's retail requirements.

The future of comprehensive carbon reduction policies remains ambiguous as decision makers sort out the relative merits of the various proposals. However, state and federal regulators are moving ahead with requirements for mandatory disclosure of GHG emissions. Additionally, hundreds of corporations, utilities and public agencies have chosen to voluntarily disclose their GHG emissions to the public, both to answer consumer questions and to make it possible to plan for future legislation that will regulate carbon emissions.

## MANDATORY REPORTING REQUIREMENTS

### *Oregon Mandatory GHG Reporting Rule*

The Oregon Department of Environmental Quality (DEQ) requires GHG reporting for a wide range of entities<sup>2</sup>. In general, the entities required to report are holders of air quality permits with at least one discrete permitted source emitting at least 2,500 metric tons of carbon dioxide equivalent (MT CO<sub>2</sub>e) annually. EWEB holds an air quality permit for the steam generating facility in downtown Eugene and filed our first report with Oregon DEQ in compliance with these rules in February 2010.

The Oregon DEQ has also proposed rules requiring electricity suppliers to begin annual reporting of prior year emissions beginning in 2011. While the draft rules under consideration would not require EWEB or other consumer-owned utilities to directly report total GHG emissions, they do require EWEB to report key pieces of information about our delivery of electricity to end users in Oregon. The draft rules require consumer utilities to report total purchases of electricity from the Bonneville Power Administration, GHG emissions associated with electricity generated by the utility, and total electricity purchases from other suppliers and the fuels used to generate that electricity if known.

### *U.S. EPA Mandatory Reporting Rule*

The U.S. EPA finalized mandatory GHG reporting guidelines in September 2009<sup>3</sup>. These rules require large emitters (greater than 25,000 MT CO<sub>2</sub>e at a single facility) to begin reporting GHG emissions on annual basis starting with 2010 calendar year emissions. EWEB is not subject to the U.S. EPA's reporting rules because it does not own a facility that meets the reporting threshold.

## VOLUNTARY REPORTING PROTOCOLS

The Climate Registry is a not for profit organization that sets consistent and transparent standards to voluntarily calculate, verify and publically report GHG emissions across North America. The Climate Registry builds on the accounting and reporting standards developed by the World Resource Institute and World Business Council for Sustainable Development. As of August 2010, more than 400 corporations, utilities and public agencies have joined the climate registry. These widely accepted GHG accounting protocols go beyond mandatory regulatory requirements by considering additional sources of GHG emissions, including mobile source emissions and some indirect emissions.

## EWEB'S GHG REPORTING APPROACH

In addition to meeting our regulatory obligations, EWEB has chosen to follow The Climate Registry's *General Reporting Protocol* and *Electric Power Sector Protocol*, in order to develop a more complete picture of the scale of our contribution to global climate change and to provide insight into those areas of opportunity available to limit that impact. As we gain better understanding of these reporting requirements, EWEB will consider formally joining and reporting our emissions via The Climate Registry.

In addition, in this report EWEB has gone beyond minimum reporting requirements and the typical boundaries of the voluntary reporting protocols to include as many additional emissions sources as possible that result from EWEB's activities but that occur from sources owned or controlled by another entity.

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<sup>2</sup> For more information on Oregon's reporting rules visit: [www.deq.state.or.us/aq/climate/reporting.htm](http://www.deq.state.or.us/aq/climate/reporting.htm).

<sup>3</sup> For more information on the EPA's reporting rules visit: [www.epa.gov/climatechange/emissions/ghgrulemaking.html](http://www.epa.gov/climatechange/emissions/ghgrulemaking.html).

## GREENHOUSE GAS ACCOUNTING REPORTING SCOPES

In GHG inventory protocols, emissions sources and activities are defined as either producing direct or indirect GHG emissions distinguished among three reporting scopes (see figure 3 below). The Climate Registry's *Electric Power Sector Protocol* and *General Reporting Protocol* define the reporting scopes as follows:

Scope 1 – Direct GHG emissions that originate from equipment and facilities owned or operated by a reporting entity. Typical activities that result in Scope 1 emissions include the stationary and mobile combustion of fossil fuels, and the release of refrigerants, a source of halocarbons (HFCs and PFCs).

For the electric power industry Scope 1 emissions also include fugitive emissions, such as the release of sulfur hexafluoride (SF<sub>6</sub>) from the operation of high voltage equipment used in electricity transmission and distribution equipment and process emissions associated with air pollution control devices.

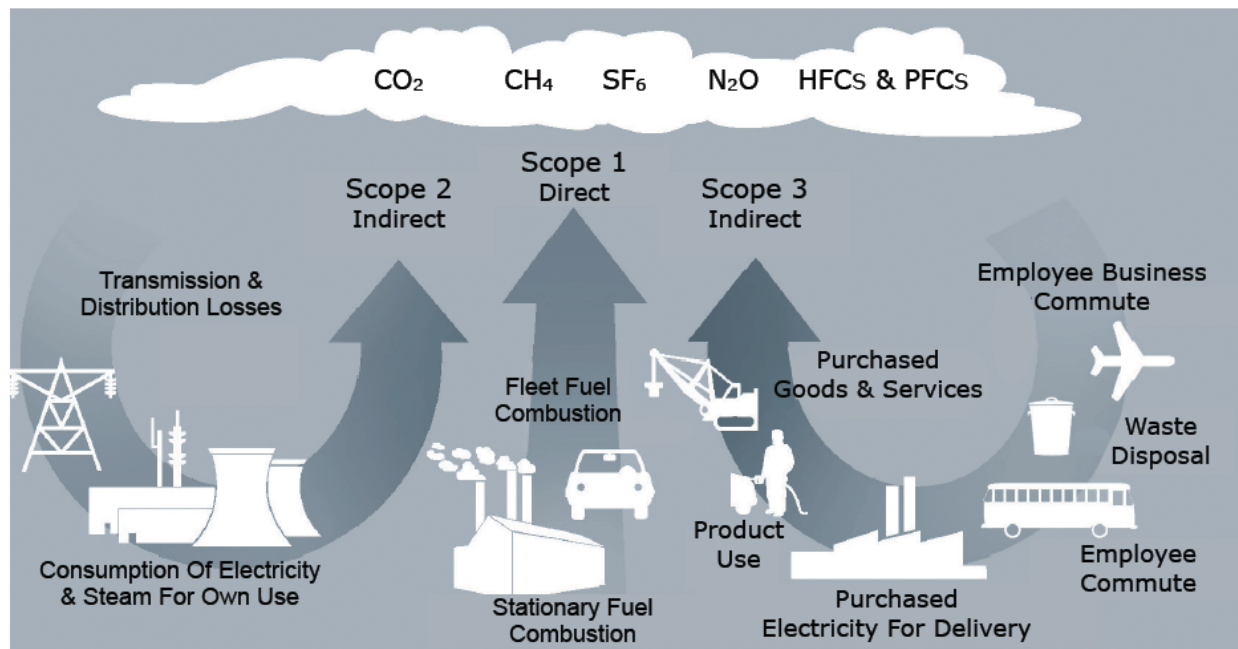
Scope 2 – Indirect GHG emissions associated with the purchase of electricity and steam for internal consumption.

For the electric power industry, Scope 2 emissions also include emissions associated with electricity purchased from other power generators “lost” over transmission and distribution systems<sup>4</sup>.

Scope 3 – All other indirect GHG emissions resulting from EWEB's activities that occur from sources owned or controlled by another entity. Typical activities that result in Scope 3 emissions include business travel, employee commute, embodied emissions in purchased goods and services, and emissions from landfilled solid waste.

For the electric power industry, Scope 3 emissions also include emissions associated with the generation of electricity purchased and delivered to end-users.

Figure 3: Greenhouse Gas Accounting Reporting Scopes



Source: WRI/WBCSD Greenhouse Gas Protocol, Corporate Accounting and Reporting Standard (Revised Edition), Chapter 4.

<sup>4</sup> A fraction of electricity in all transmission and distribution systems is “lost” due to electric resistance from the in the power lines transmitting the electricity.

## INVENTORY BOUNDARIES

This inventory estimates calendar year 2009 GHG emissions associated with EWEB's facility operations and energy generation portfolio in two parts.

The first part, described in the *Operations Inventory* section of this report, focuses on emissions associated with EWEB's core business operations at facilities located in the Eugene-Springfield, Oregon metropolitan area and EWEB's McKenzie River hydroelectric facilities. These facilities include EWEB's headquarters and operations center in downtown Eugene, the Hayden Bridge Filtration Plant, and various substations and pumping facilities located throughout Eugene and adjacent suburbs.

The *Operations Inventory* section does not include emissions associated with operational activities at EWEB's Stone Creek or Smith Creek Hydroelectric projects or at EWEB's co-owned electric power facilities as data on the day-to-day operation of these facilities was unavailable for reporting.

The second part, described in the *Energy Portfolio Inventory* section of this report, focuses on the emissions associated with the combustion of fossil and biomass fuels for the generation of electricity and steam at EWEB's owned, co-owned electric power resources and at contracted electric power resources.

## ANTHROPOGENIC AND BIOGENIC EMISSIONS

GHG reporting protocols differentiate between anthropogenic and biogenic sources of GHG emissions. Consistent with the reporting protocols, EWEB is reporting biogenic GHG emissions separately from anthropogenic GHG emissions.

Anthropogenic GHG emissions are those emissions associated with human activities (e.g. carbon dioxide emitted from combustion of fossil fuels) or are the result of natural processes that have been affected by human activities (e.g. methane emitted from the anaerobic decomposition of organic matter in solid waste landfills).

Biogenic GHG emissions are those carbon dioxide emissions associated with the combustion of non-fossilized, biologically based materials, such as biomass (e.g. wood waste) and biofuels (e.g. biodiesel). Carbon dioxide emissions from the combustion of these biologically derived fuels are generally considered climate neutral because they are a part of a naturally occurring biological carbon cycle. However, the actual carbon benefits of biologically based fuels—in terms of mitigating climate change—depend largely on the source of feedstock materials, the combustion technology and the fossil fuel it replaces.

GHG reporting protocols do not require an accounting of the full life-cycle impacts of biologically derived fuel or fossil fuel; they only require the reporting of emissions from combustion. At this time, EWEB is following the requirements of the reporting protocols and is only reporting biogenic and anthropogenic emissions from combustion. In the future, EWEB may consider evaluating the full life-cycle GHG emissions impacts associated with its fuel supply chains.

**OVERVIEW OF RESULTS**

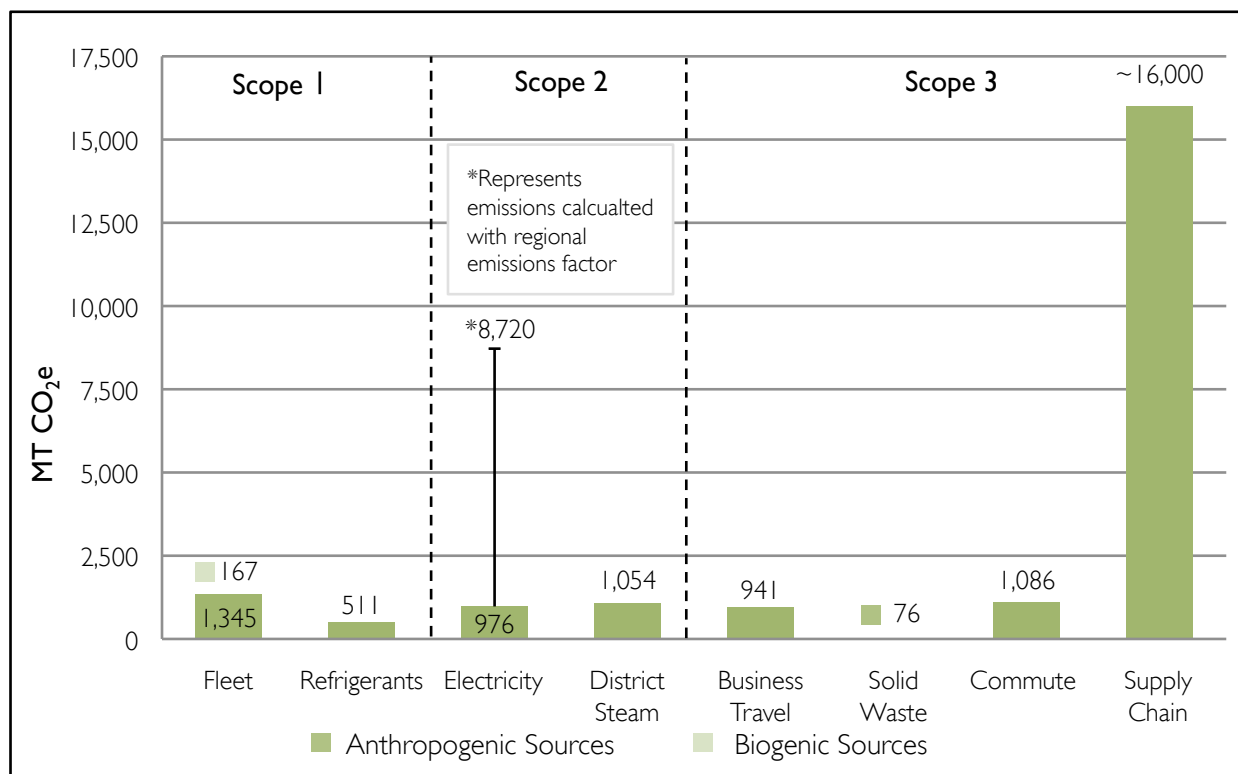
EWEB is one of the largest public works operations in the metropolitan area, with over 500 employees, nearly 500,000 square feet of building space, a fleet of more than 270 vehicles and pieces of equipment, and a wide range of built and natural infrastructure. In this capacity, EWEB has one of the larger operations' carbon footprint in the community.

In 2009, the largest single source of emissions associated with EWEB's operations was from our supply chain—those emissions embodied in purchased goods and services (see Figure 4 below). The next largest source of emissions depends on the selection of an appropriate emissions factor for the calculation of indirect emissions associated with internal electricity consumption.

When the indirect emissions associated with internal electricity consumption are calculated using EWEB's power resource average emissions factor this consumption translates into 976 MTCO<sub>2</sub>e, an amount roughly equivalent to other direct and indirect sources of emissions. However when calculated using the regional emissions factor this consumption translates into 8,720 MT CO<sub>2</sub>e, an amount considerably larger than other sources.

While EWEB does not have complete or direct control over all of our emission sources we can to varying degrees influence all sources by incentivizing change among our customers, employees, vendors and contracted electric power providers.

**Figure 4: 2009 Greenhouse Gas Emissions Associated with EWEB Operations**



The table below summarizes the sources of EWEB's operations emissions. For additional detail on the methods and assumptions underlying these calculations please refer to Appendix I: Data, Methods and Emissions Factors.

Scope	Emissions Category	GHGs (MT CO <sub>2</sub> e)	Description
Scope 1 (Direct Emissions)	Fleet	1,512	Emissions associated with the combustion of fuels for the operation of EWEB's vehicle and equipment fleet.
	Other fuels	1	Emissions associated with diesel fuel used in backup electricity generators at EWEB's McKenzie River hydroelectric projects. (not shown in figure 4)
	Refrigerants	511	Emissions associated with the fugitive release of refrigerants used in HVAC systems at EWEB's downtown headquarters buildings. Data for refrigerant use at EWEB's McKenzie River Hydroelectric Project were unavailable for reporting.
Scope 2 (Indirect Emissions)	Electricity	976 — EWEB emissions factor 8,720 — Regional emissions factor	Emissions associated with EWEB's self-consumed electricity usage. Per GHG accounting protocols, calculated using both EWEB's power resource portfolio average emissions factor and the Northwest Power Pool, Oregon's U.S. EPA's Emissions & Generation Resource Integrated Database (eGRID) Subregion emissions factor.
	District Steam	1,054	Emissions associated with EWEB's internal consumption of district steam for heating EWEB's headquarters facility buildings. The emissions from district steam consumption are estimated using an emissions factor derived for EWEB's district steam system. This total does not include emissions associated with EWEB's sale of steam to other customers.
Scope 3 (Indirect)	Business travel	941	Estimated emissions associated with air travel, travel involving employee-owned vehicles used for business purposes and rental vehicles. Data for all business travel including trips via bus or train were not available for reporting; therefore this total may represent an emissions undercount.
	Solid waste	76	Emissions associated with unsorted non-hazardous solid waste landfilled at the Lane County Short Mountain Landfill. Not included in this total are emissions from the landfilling of construction and demolition debris and treated power poles, or emissions associated with the incineration of hazardous waste (e.g. used motor oil).
	Commute	1,086	Estimated emissions associated with employee commute based on data and assumptions about mode of transportation and distance traveled. Not included in this total are emissions associated with customer or visitor trips to EWEB facilities.
	Supply Chain	~16,000	Estimated emissions embodied in purchased goods and services. Embodied emissions are those emissions associated with energy consumption in the manufacture and production of goods and services. Not included in this total are embodied emissions associated with three major capital improvement projects— the Hayden Bridge Filtration Plant upgrade, the Roosevelt Operations Center, and the Harvest Wind project.

## OPERATIONS INVENTORY SCOPE I EMISSIONS AND SOURCES

In 2009, EWEB's Scope I GHG emissions from fleet vehicle and equipment operation, and the fugitive release of refrigerants from HVAC systems totaled 2,024 metric tons of carbon dioxide equivalent (MT CO<sub>2</sub>e) (see figure 2 below). In addition to these Scope I anthropogenic emissions, EWEB emitted an additional 270 MT CO<sub>2</sub>e of biogenic GHG emissions from the combustion of biofuels in fleet vehicles and equipment. For a sense of scale, EWEB's total Scope I anthropogenic emissions are equivalent to the annual CO<sub>2</sub> emissions of 334 passenger vehicles<sup>5</sup>.

### Owned Fleet and Equipment

The primary source of direct Scope I emissions from EWEB's operations is from the combustion of fossil fuels to power fleet vehicles and equipment.

In 2009, EWEB's fleet was comprised of 274 fuel consuming vehicles and pieces of equipment. Of those, 107 vehicles and pieces of equipment consumed diesel fuel, 156 vehicles and pieces of equipment consumed gasoline, three ran on propane and eight were electric-powered. The fleet also had ten hybrid gasoline-electric vehicles in service in 2009.

Since January 1, 2009, Oregon law requires all gasoline sold in the state to be blended with 10% ethanol (E-10) and all highway use diesel fuel to be blended with 2% biodiesel (B-2) since October 1, 2009. The biogenic emissions associated with the use of these biofuels are reported separately. EWEB's 2009 anthropogenic GHG emissions from fleet and equipment operation total 1,345 MT CO<sub>2</sub>e. Biogenic emissions from fleet and equipment operation totaled 165 MT CO<sub>2</sub>e. The table below shows fuel consumption and emissions for EWEB's fleet by fuel type (totals may not sum due to rounding).

Fuel	Consumption (gallons)	Anthropogenic GHGs (MTCO <sub>2</sub> e)	Biogenic GHGs (MTCO <sub>2</sub> e)	Total GHGs (MTCO <sub>2</sub> e)
Gasoline with 10% Ethanol Blend	93,460	590	162	751
Diesel	47,698	567	-	567
Diesel with 2% Biodiesel Blend	15,899	185	4	189
100 % Biodiesel	250	-	2	2
Propane	617	4	-	4
<b>Totals</b>		<b>1,345</b>	<b>167</b>	<b>1,513</b>

### Refrigerants

The second largest source of Scope I emissions from EWEB's operations is from the fugitive release of refrigerants used in EWEB's heating ventilation and cooling (HVAC) systems at EWEB's headquarters buildings and fleet vehicle air conditioning systems.

Total 2009 GHG emissions from these fugitive releases were 511 MT CO<sub>2</sub>e. Data for refrigerant use at EWEB's McKenzie River Hydroelectric Project were unavailable for reporting.

## OPERATIONS INVENTORY SCOPE 2 EMISSIONS AND SOURCES

EWEB's Scope 2 emissions, those emissions associated with self-consumed electricity and district steam, totaled 2,030 MT CO<sub>2</sub>e; the equivalent to the annual CO<sub>2</sub> emissions of 388 passenger vehicles<sup>6</sup>.

<sup>5</sup> Equivalencies are based on Based on the U.S. EPA's Greenhouse Gas Equivalencies Calculator available on-line at: <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>.

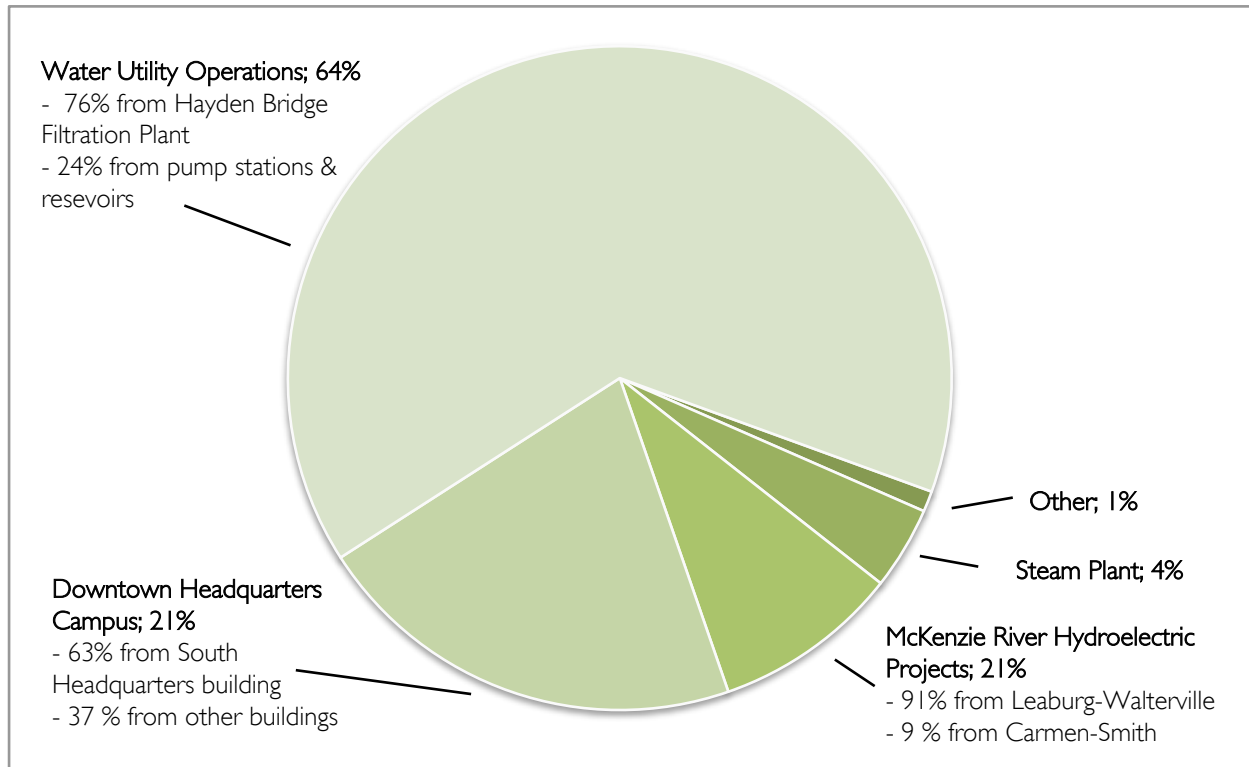
<sup>6</sup> When emissions associated with electricity consumption are calculated using the regional emissions factor EWEB's Scope 2 emissions total 9,774 MTCO<sub>2</sub>e.

### Internal Electricity Consumption

EWEB consumes electricity in our own buildings and facilities for a variety of purposes including building and security lighting, information technology equipment, pumping, fish screens, lighting and heating. In 2009, EWEB consumed a total of 21,336,065 kilowatt-hours of electricity.

The largest share of this electricity consumption (64%) is from the operation of water utility facilities (see figure 5 below). Of these facilities, the Hayden Bridge Filtration Plant electricity consumption accounts for the majority (76%) of emissions. The Hayden Bridge Filtration Plant consumes electricity in the course of pumping raw water from the McKenzie River and the conversion of this raw water into clean, safe drinking water.

Figure 5: EWEB Internal Electricity Consumption by Facility

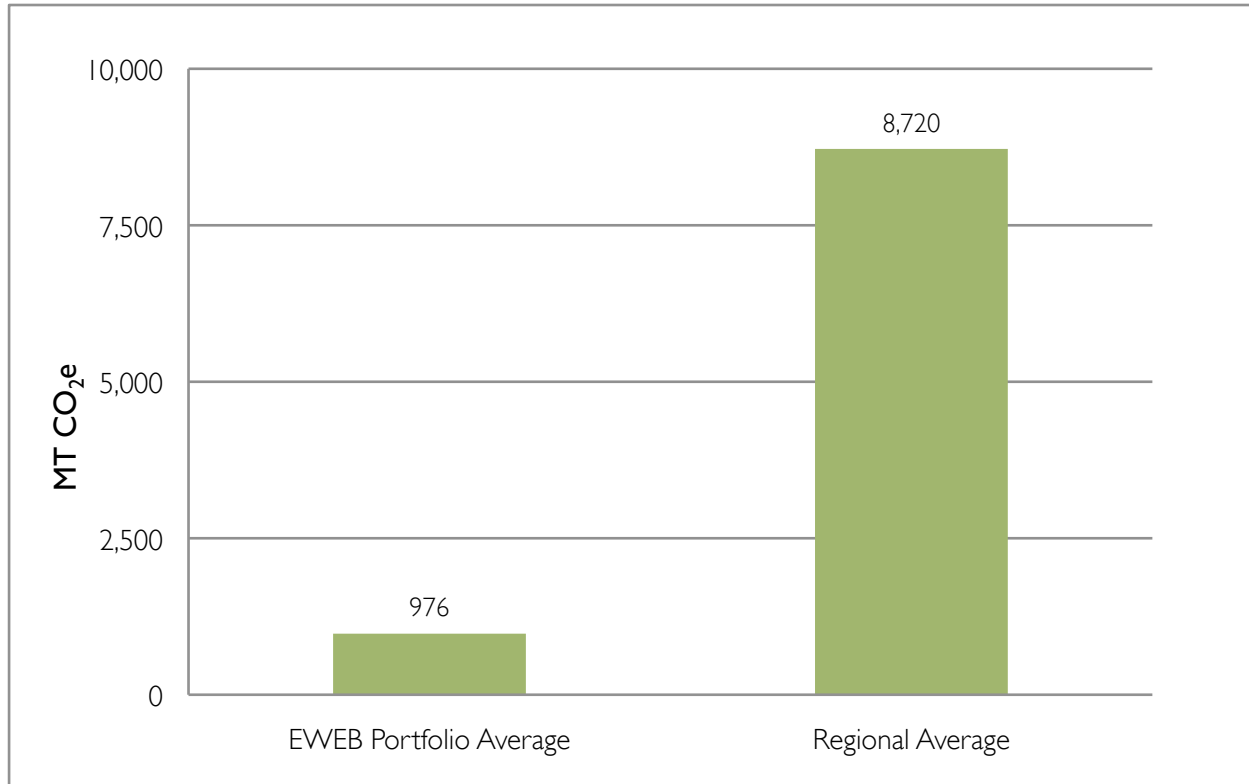


The next largest share of emissions associated with electricity consumption (21%) is from the operation of buildings and facilities at EWEB's downtown Eugene headquarters. Of these buildings the South Headquarters Administration Building, which houses most EWEB departments and the Information Services Data Center, accounts for most of the electricity consumption.

The third largest share of emissions associated with electricity consumption (9%) is from the operation of equipment and buildings at EWEB's McKenzie River hydroelectric projects. Most of this consumption is associated with the operation of motors and pumps for fish screens at the Leaburg-Waltermville project.

Using EWEB's power resource average emissions factor this consumption translates into 976 MTCO<sub>2</sub>e, an amount roughly equivalent to other direct and indirect sources of emissions. However when calculated using the regional emissions factor this consumption translates into 8,720 MT CO<sub>2</sub>e (see figure 6 below), roughly an order of magnitude greater. This difference underscores the importance of considering both utility-specific and regional emissions factors when conducting a GHG inventory. The context provided by the regional number suggests that marginal changes in internal electricity consumption can translate into meaningful climate action.

Figure 6: 2009 Greenhouse Gas Emissions Associated with EWEB Internal Electricity Consumption



These totals do not include emissions associated with EWEB's sale of electricity to wholesale and retail customers. For an accounting of the total emissions associated with EWEB's electricity portfolio please refer to our *Energy Portfolio GHG Inventory*.

#### **Internal Steam Consumption**

EWEB consumes steam produced by our own District Steam Plant to heat the buildings and facilities at the downtown Eugene campus. In 2009 the emissions associated with the consumption of this steam totaled 1,054 MT CO<sub>2</sub>e. No information regarding the distribution of this consumption among these facilities was available for reporting.

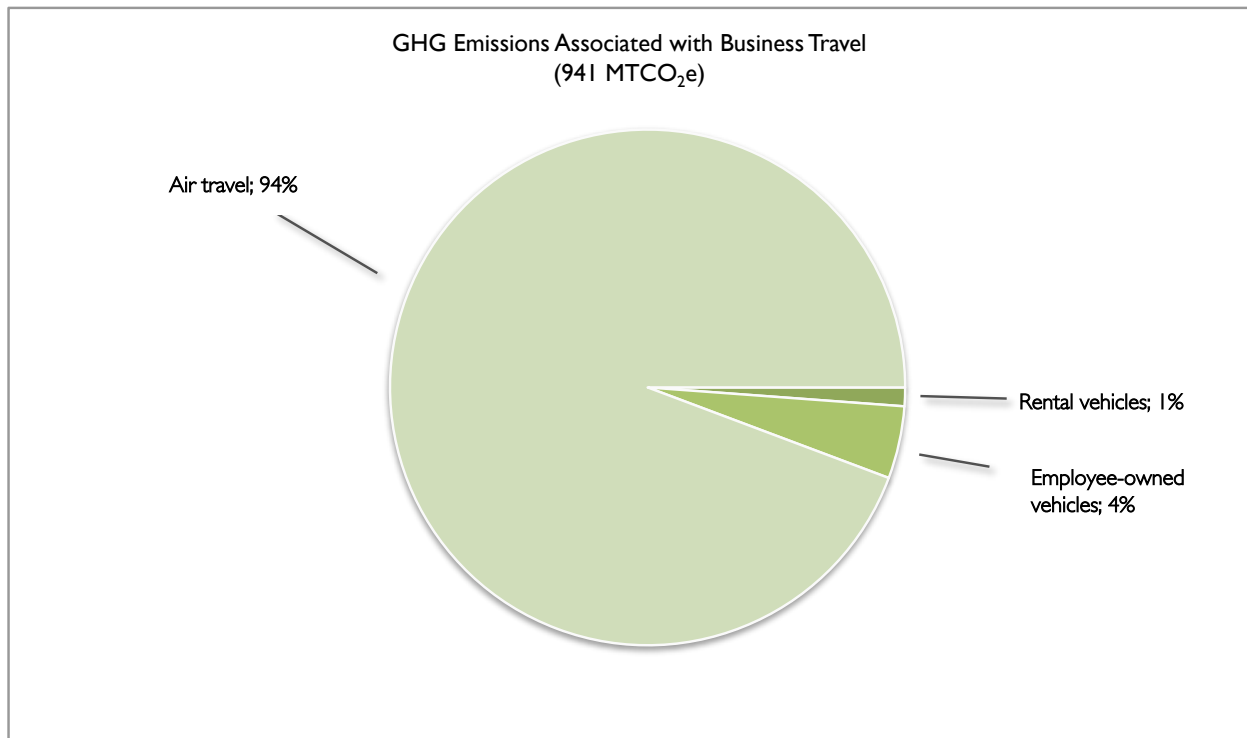
This total does not include emissions associated with EWEB's sale of steam to other customers. For an accounting of the total emissions associated with EWEB's total steam production please refer to our *Energy Portfolio GHG Inventory*.

#### **OPERATIONS INVENTORY SCOPE 3 EMISSIONS AND SOURCES**

Scope 3 emissions, those emissions related to EWEB's operations but outside of our direct control, approximately totaled 18,125 MT CO<sub>2</sub>e; the equivalent to the annual CO<sub>2</sub> emissions of 3,466 passenger vehicles.

#### **Business Travel**

In the performance of their job responsibilities, EWEB employees must occasionally travel out of town on business. Employees make use of a variety of transportation modes to complete these trips including cars (employee-owned and rentals) and air travel. In 2009, EWEB employees travelled nearly 906,000 miles via car and airplane. It is estimated that the GHG emissions associated with EWEB's business travel in 2009 was 941 MT CO<sub>2</sub>e. The overwhelming majority (94%) of the emissions from business travel are from air travel (see chart below).



Data for business trips via bus or train were not available for reporting; therefore this total may represent an emissions undercount. Emissions associated with employee travel in EWEB-owned vehicles are reflected in the Scope 1 fleet summary above.

### ***Employee Commute***

In the course of their commute to and from work, EWEB employees utilize a variety of transportation modes including single occupancy vehicles, carpools, vanpools, public transit, bicycling and walking. A recent employee commute survey found that on an annual average basis 79% of EWEB's employees commute via single occupancy vehicle, 8% carpool, 2% utilize public transportation and 12% walk, bike or use some other mode of transportation to get to work.

It is estimated that the GHG emissions associated with EWEB's employee commute in 2009 was 1,086 MT CO<sub>2</sub>e, of which the overwhelming majority (95%) were associated with single occupancy vehicle trips.

### ***Solid Waste***

The anaerobic decomposition of organic matter in solid waste landfills is significant source of anthropogenic methane (CH<sub>4</sub>) emissions. Methane emissions are of particular concern because they are 21 times more potent than carbon dioxide emissions.

In 2009, EWEB sent 293 short tons of unsorted non-hazardous solid waste to be landfilled at the Lane County Short Mountain Landfill. The Short Mountain Landfill captures fugitive methane emissions and in collaboration with the Emerald People's Utility District combusts it to produce electricity.

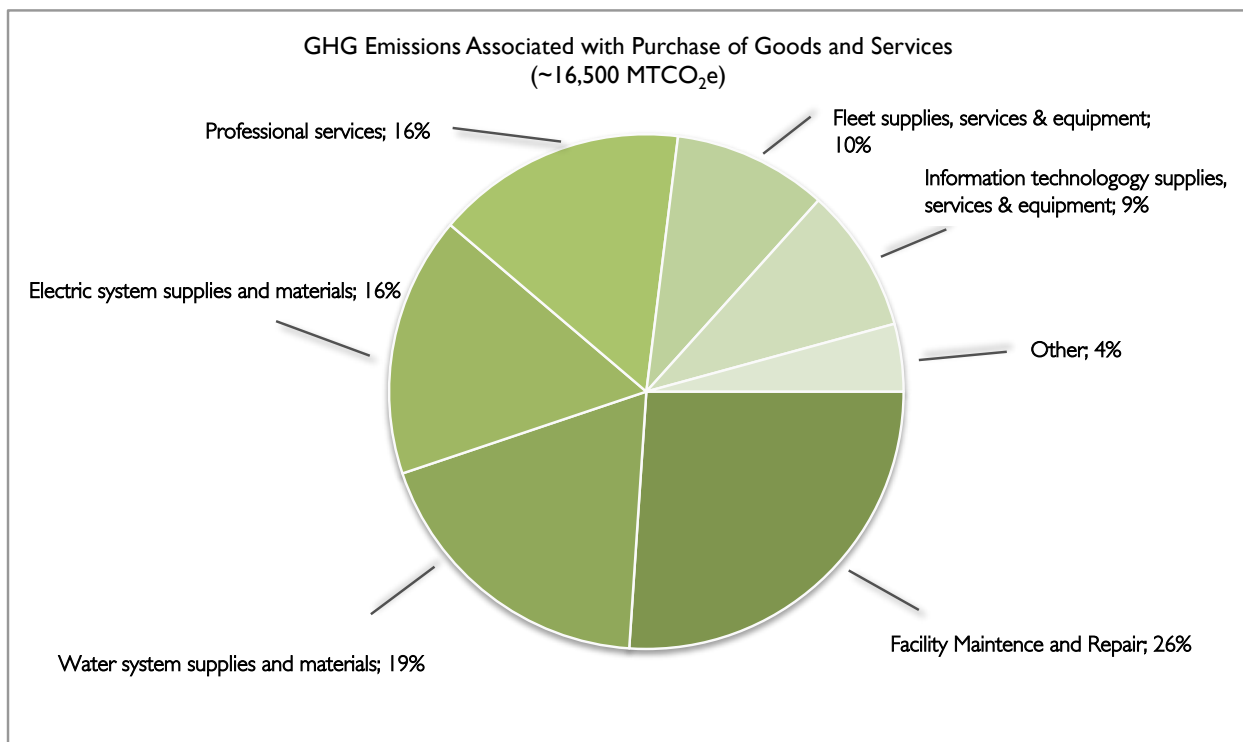
It is estimated that the GHG emissions associated with the volume of waste EWEB's landfilled solid waste in 2009 was 76 MT CO<sub>2</sub>e. Not included in this total are emissions from the landfilling of construction & demolition debris and treated power poles or emissions associated with the incineration of hazardous waste (e.g. used motor oil).

## Supply Chain

An often-overlooked source of GHG emissions is those embodied in the goods and services purchased by an organization. Embodied emissions are the upstream GHG emissions associated with raw material extraction, production and manufacture, and transportation of goods and services.

While the responsibility for embodied emissions in purchases is not equal to the responsibility for emissions produced directly by EWEB operations and owned equipment (such as the combustion of fossil fuels), the embodied emissions are clearly shared, as the responsibility for the activities is in the hands of both vendors (who control the production processes directly) and EWEB (who purchases and relies on these goods and services).

It is estimated that the embodied emissions from EWEB's purchase of goods and services in 2009 totaled approximately 16,500 MT CO<sub>2</sub>e (see chart below). By far, this category of emissions is the largest relative to other direct and indirect operational emissions sources. Indeed, embodied emissions are nearly twice as large as the next largest category of emissions (purchased electricity; 8,760 MT CO<sub>2</sub>e).



The category of purchased goods and service with the largest associated embodied emissions is facility maintenance and repair (26%). This category includes expenditures related to the upkeep and maintenance of EWEB's electric, water and steam utility infrastructure such as tree trimming, building repairs, janitorial services, and concrete and asphalt repair.

The category of purchased goods and services with the next largest share of embodied emissions is water system supplies and materials (19%). This category includes expenditures for water utility operations such as water treatment chemicals and supplies, and steel and plastic transmission and distribution pipe.

The professional services and electric system supplies and materials categories were the next largest contributor to supply chain emissions (16% each). The professional services category includes contracted technical and specialized services such as architecture and engineering, accounting, printing, advertising, legal, real estate, insurance and management-consulting employment. The electric system supplies and materials category includes electric distribution equipment such as cabling and wiring, transformers, relay and switchgear, and meters.

The fleet supplies, services and equipment category accounted for 10% of embodied emissions. Included in this category are vehicle and equipment purchases as well as repair parts and maintenance charges. Excluded from this category are fuel purchases.

The information technology supplies, services and equipment category accounted for 9% of supply chain emissions. Included in this category are computer hardware, software and support service contracts.

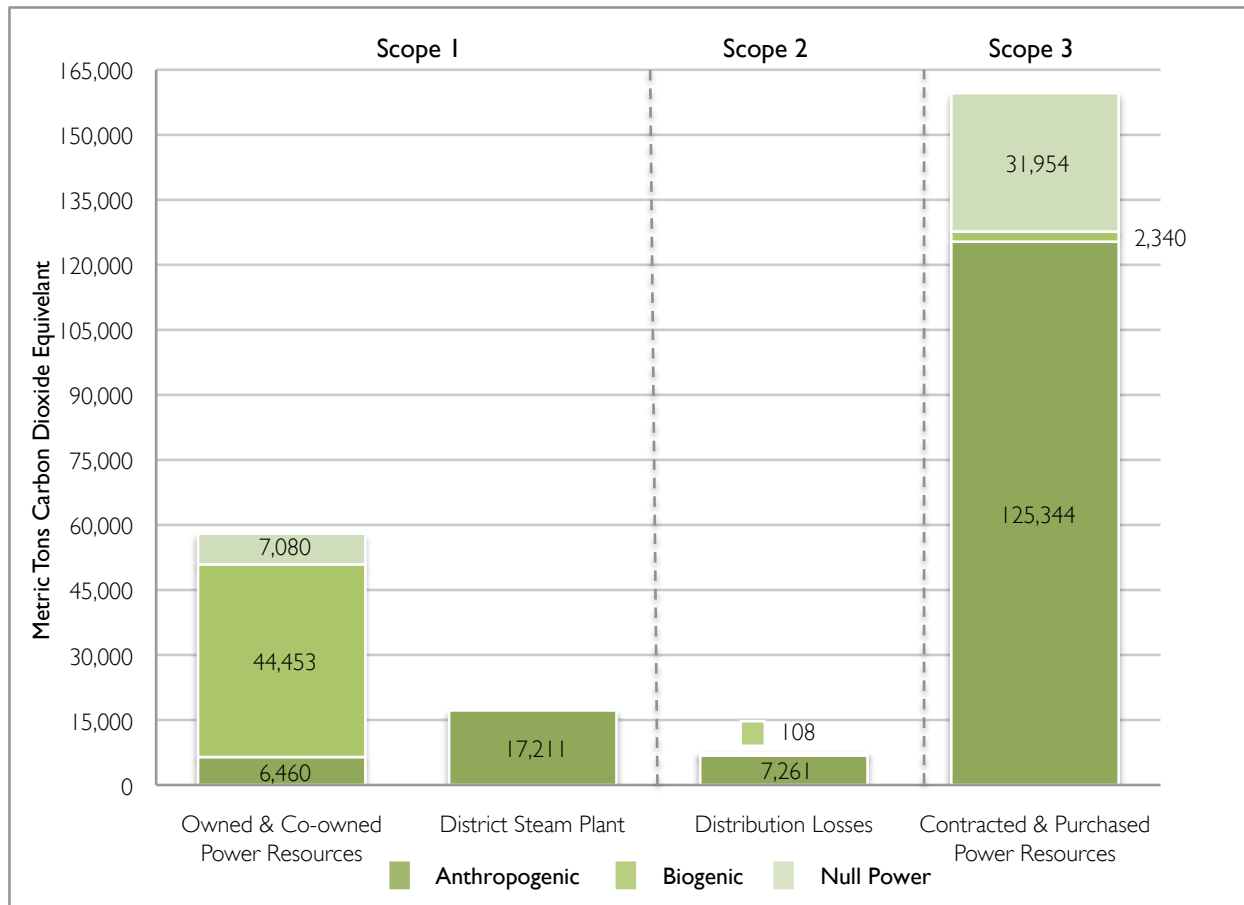
Expenditures omitted from the supply chain analysis and therefore not included in the embodied emissions total include several capital improvement projects, such as the Hayden Bridge Filtration Plant upgrade, the Roosevelt Operations Center and the Harvest Wind project. These projects were excluded because insufficient data was available to accurately report associated emissions. This results in a significant understatement of supply chain GHG emissions. For a sense of scale, the total expenditures included total \$43.9 million while the excluded capital expenditures total more than \$57.8 million.

In future years, EWEB may consider conducting project-specific life-cycle GHG inventories for major capital improvement projects. Such an approach will enable the organization to better identify emission reduction opportunities associated with these long-lived major capital improvement projects.

**OVERVIEW OF RESULTS**

As the primary provider of electricity in the community, EWEB has the responsibility of reliably meeting the demands of our customers at a reasonable and prudent cost. While we assist our customers in using energy efficiently and seek to acquire power from environmentally sensitive sources, electricity generation is EWEB's largest source of GHG emissions.

In 2009, the overwhelming majority of GHG emissions from EWEB's energy portfolio were associated with contracted electric power resources (see graph below). The next largest source of GHG emissions was from null power sales of owned, co-owned and contracted electric power resources<sup>7</sup>. EWEB's co-owned biomass cogeneration facilities were also a significant emissions source.



<sup>7</sup> Null power refers to electricity generated by a qualifying renewable resource that is unbundled from its associated Renewable Energy Certificate (REC) and sold separately and where the REC is not retired or reserved. RECs are tradable environmental commodities that represent the renewable attributes associated with the generation of electricity from qualifying renewable energy resources. RECs may be retired to show compliance with a renewable portfolio standard or participation in a voluntary green power program, sold or traded to another entity, or placed in a reserve account in order to withdrawal the REC from circulation without retiring it. When the underlying electricity from a qualifying renewable resources is sold to an end user but the associated REC is not retired or reserved, the electricity can no longer be considered renewable or "zero carbon." The assignment of a carbon equivalency to this null power is necessary to avoid double counting because the associated RECs could theoretically be sold to other entities who could, under the current conventions of GHG reporting protocols, utilize them to reduce the emissions associated with their own resale or purchase of electricity. If both entities claimed the "zero carbon" attributes this would result in double counting of the benefits.

## ENERGY PORTFOLIO SCOPE I EMISSIONS AND SOURCES

In 2009, EWEB's Scope I anthropogenic GHG emissions from owned and co-owned electric power facilities totaled 6,460 MT CO<sub>2</sub>e. The anthropogenic GHG emissions associated with the District Steam Plant resulted in 17,211 MT CO<sub>2</sub>e.

EWEB also delivered electricity from owned and co-owned renewable resources without retiring or reserving the associated Renewable Energy Certificates (RECs) resulting in additional anthropogenic emissions totaling 7,080 MT CO<sub>2</sub>e. For a sense of scale, EWEB's total Scope I anthropogenic emissions are equivalent to the annual GHGs emissions of more than 16,000 passenger vehicles.

In addition to these anthropogenic emissions, EWEB was responsible for 44,453 MT CO<sub>2</sub>e of biogenic GHG emissions associated with the combustion of biologically-derived fuels at owned and co-owned electric power facilities. Biologically derived fuels have the potential to be climate neutral on a full life-cycle basis depending on the feedstock material, agricultural practices, combustion technology and fossil fuels they displace. However, the life-cycle climate benefit of biologically derived fuels remains unresolved. In the future, EWEB may consider evaluating the full life-cycle GHG emissions impact associated with its biologically derived fuel supplies.

### ***Steam Plant***

The largest source of EWEB's Scope I anthropogenic emissions is the combustion of fossil fuels to produce steam for EWEB's district heating steam plant that serves customers in downtown Eugene. The facility primarily consumes natural gas but also utilizes a small quantity of diesel fuel and waste transformer mineral oil. In 2009 the steam plant emitted 17,211 MT CO<sub>2</sub>e.

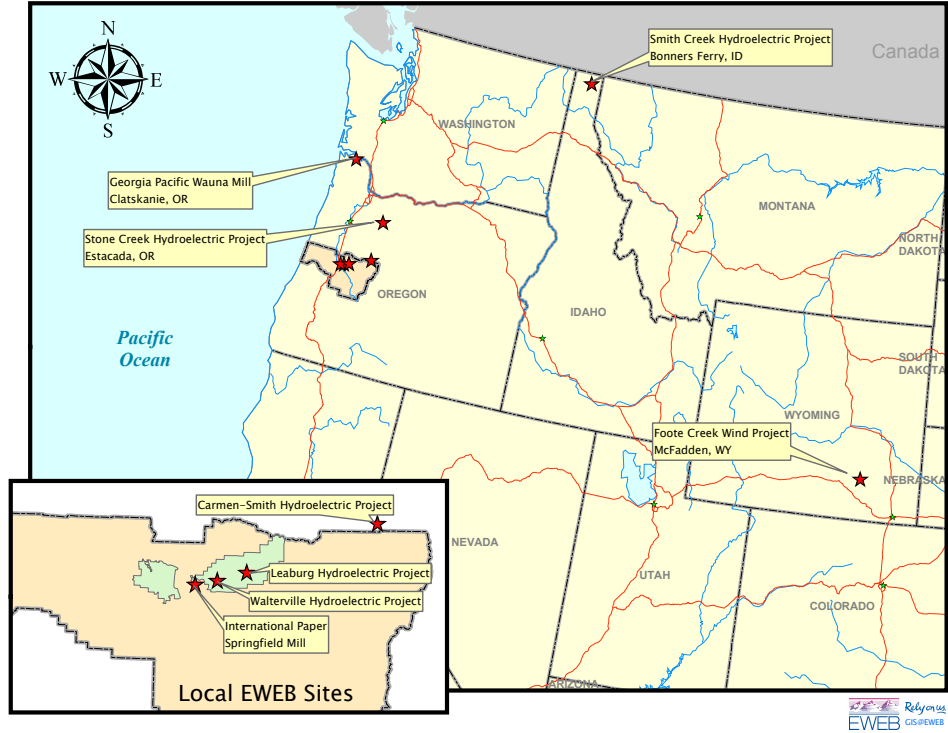
Faced with rising operating costs, an eroding customer base, and an aging and increasingly inefficient steam distribution system, in 2008 EWEB initiated the process for decommissioning our steam utility. EWEB is committed to completing this transition in a socially, environmentally and financially responsible manner within the next few years.

The decommissioning of EWEB's steam plant will eliminate a major source of scope I GHG emissions. However, EWEB recognizes that many of our customers will continue to rely on natural gas as an alternative heating source. The decommissioning of the steam plant will still result in a net decrease in GHG emissions since the replacement systems, such as high efficiency boilers, will be more efficient than the current steam system. In future reporting EWEB will seek to quantify the net reduction in GHG emissions from the steam plant decommissioning.

### ***Owned and Co-owned Electric Power Plants***

The next largest source of direct emissions is from the combustion of fossil fuels in owned and co-owned electricity generation. These are emissions from the combustion of natural gas and other fossil fuels at EWEB's co-owned International Paper Springfield Mill and Georgia-Pacific Wauna Mill cogeneration facilities.

While these emissions make up a large share of EWEB's total direct anthropogenic emissions, on a metric ton per megaWatt hour basis these emissions are considerably less carbon intensive than the regional resource mix (see the Generation and Power Delivery Metrics section below). The relatively low anthropogenic carbon intensity of these facilities is attributable to the fact that both make substantial use of biologically derived fuel inputs, as well as being combined heat and power (CHP) facilities.



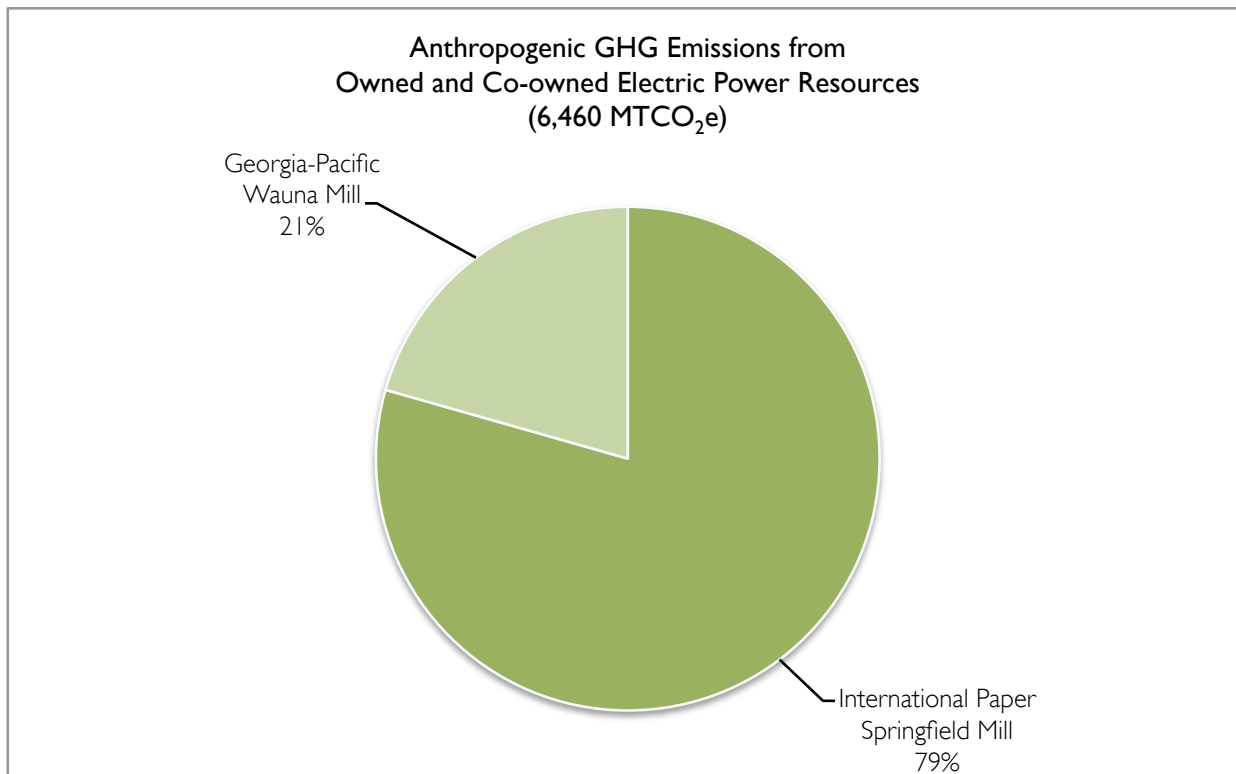
**Location of EWEB owned & co-owned electric generation sites**

The carbon intensity of a megaWatt-hour of electricity produced at a CHP facility is lower than one generated at a conventional thermal power plant because the CHP facility is designed to make more efficient use of energy inputs. At a CHP facility the heat produced from the combustion of fuels is utilized for both electricity production and other thermal processes at the facility. A conventional thermal power plant by contrast only produces electricity.

Most of the primary energy used to power EWEB's CHP facilities are from biomass by-products leftover from other processes that occur at the mills. The International Paper Springfield facility utilizes leftover pulping liquors and the Georgia Pacific Wauna Mill utilizes wood waste and non-toxic paper mill sludge. These byproducts are considered biogenic sources of GHG emissions<sup>8</sup>.

For 2009, the Scope I biogenic emissions from these facilities totaled 44,453 MT CO<sub>2</sub>e. The Scope I anthropogenic emissions from these facilities totaled 6,460 MT CO<sub>2</sub>e (see chart below).

<sup>8</sup> U.S. EPA. *Mandatory Greenhouse Gas Reporting Rule*.



#### ***Fugitive Emissions of Sulfur Hexafluoride***

Sulfur Hexafluoride (SF<sub>6</sub>) is an extremely potent GHG with a global warming potential 23,900 time that of carbon dioxide—making it the most potent of all the gases that cause global warming. Sulfur Hexafluoride is commonly used by electric utilities in high voltage transmission systems in circuit breakers, switches and insulation.

EWEB is a partner in the U.S. EPA's SF<sub>6</sub> Emission Reduction Partnership for Electric Power Systems, a collaborative effort between the electric power industry and EPA to identify and implement cost-effective solutions to reduce SF<sub>6</sub> emissions.

EWEB has 4,540 pounds of SF<sub>6</sub> in use in transmission and distribution equipment yet has had no fugitive emissions of SF<sub>6</sub> since 1999.

#### **ENERGY PORTFOLIO SCOPE 2 EMISSIONS AND SOURCES**

EWEB's Scope 2 anthropogenic emissions, those emissions associated with purchased electricity generated from the combustion of fossil fuels "lost" over transmission and distribution systems, totaled 7,261 MT CO<sub>2</sub>e— the equivalent to the annual GHG emissions of 1,388 passenger vehicles.

#### ***Transmission and Distribution Losses from Purchased Power***

As a result of the physical properties of electric distribution systems such as electrical resistance, a small amount of electricity placed on EWEB's transmission and distribution systems dissipates from the power line conductors and system equipment.

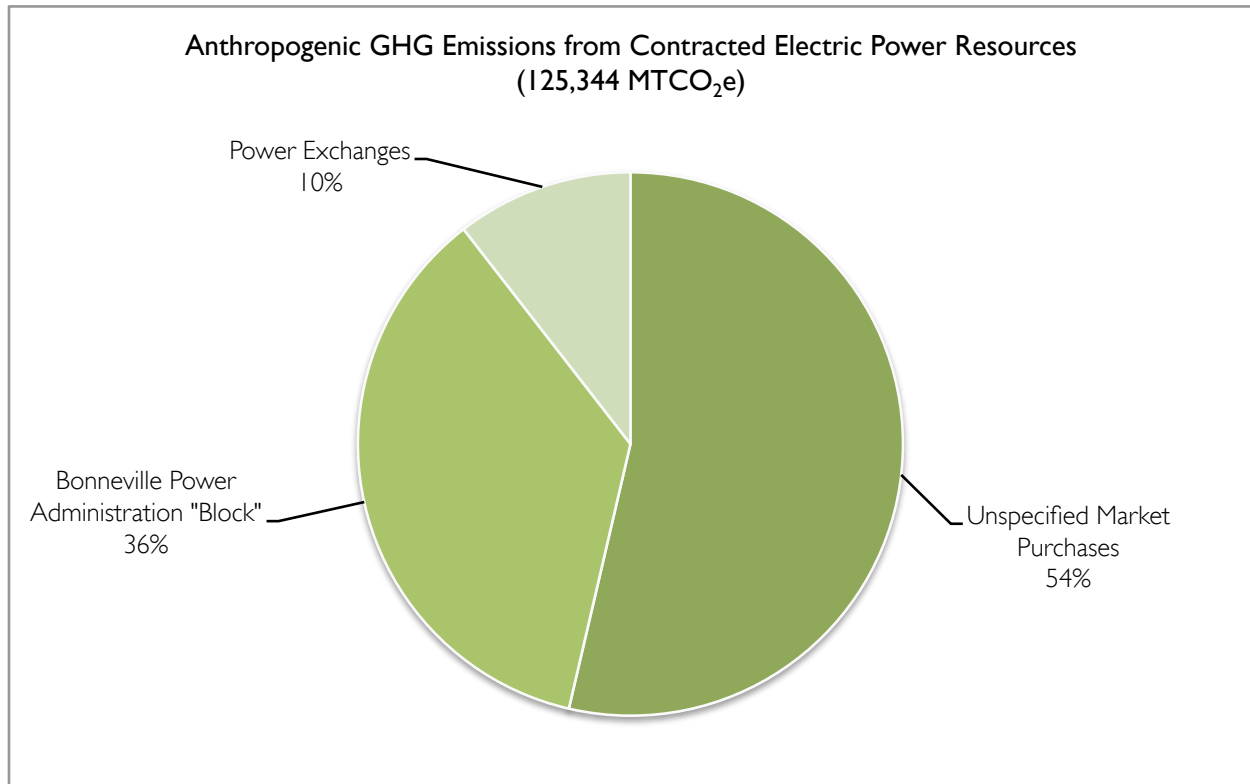
In 2009, the anthropogenic emissions associated with the portion of purchased electricity (other direct sources of emission are already reported under Scope 1) from these line losses resulted in a total of 7,261,MT CO<sub>2</sub>e.

## ENERGY PORTFOLIO SCOPE 3 EMISSIONS AND SOURCES

The largest source of GHG emissions associated with EWEB's energy portfolio is from electricity purchased from other electric power generators. The Scope 3 anthropogenic emissions from contracted resources totaled 125,344 MT CO<sub>2</sub>e—the equivalent to the annual GHG emissions of 23,966 passenger vehicles. In addition, EWEB also delivered purchased electricity from renewable resources without retiring or reserving the associated Renewable Energy Certificates (RECs), resulting in additional anthropogenic emissions totaling 31,954 MT CO<sub>2</sub>e. In addition to these anthropogenic emissions, EWEB was responsible for 2,340 MT CO<sub>2</sub>e of biogenic GHG emissions associated with the purchase of electricity from other electric power generators.

### *Contracted Electric Power Resources*

In addition to generating electricity at facilities it owns and co-owns, EWEB purchases electricity from a number of other regional power producers including the Bonneville Power Administration (BPA) which supplies EWEB with approximately 70% of the total electricity in our electric power resource portfolio. In 2009, the anthropogenic emissions from purchased power totaled 125,344 MT CO<sub>2</sub>e. Most of these emissions come from unspecified market purchases and power deliveries under EWEB's BPA "Block" contract (see chart below).



While it's commonly thought that the electricity produced in our region primarily comes from local hydroelectric resources, in fact the regional power grid power encompasses a broad geographic area and includes significant fossil fuel resources. The generation resource mix for our region—which includes Washington, Oregon, Idaho, Utah, western Montana, western Wyoming, most of Nevada and a small part of Northern California—is 48.6% hydroelectric, 33.4% coal, 10.8% natural gas and 3.2% nuclear with the remaining 4% coming from biomass, wind and other resources.

The largest share of EWEB's Scope 3 emissions, and the single largest contributor to EWEB's energy portfolio anthropogenic carbon footprint, is from EWEB's unspecified market purchases from these regional resources. At most times of the day and year EWEB's own generation and long-term power contracts are sufficient to meet EWEB's customer power demands. However, at certain times of the day and year EWEB purchases and delivers power from

the regional marketplace. These purchases are referred to as “unspecified” since the purchases cannot be tracked back to a specific generator. In 2009 these unspecified market purchases accounted for 67,222 MT CO<sub>2</sub>e, 54% of EWEB’s Scope 3 anthropogenic emissions and 34% of EWEB’s total energy portfolio anthropogenic emissions.

EWEB’s “Block” power purchases from BPA are the next largest share of Scope 3 anthropogenic emissions. EWEB’s purchases from BPA are actually differentiated between “Slice of the System” and “Block” purchases, with each product comprised of specific BPA resources. The “Slice of the System” product primarily consists of hydroelectric resources with some nuclear power. For the purposes of this inventory it is assumed that the “Slice of the System” resources have no anthropogenic or biogenic GHG emissions.

The “Block” product primarily consists of hydroelectric (80.1%) and nuclear resources (8.7%) but also includes a significant percentage of unspecified regional market purchases (11%) with the remainder (0.2%) from biomass and natural gas resources. BPA’s unspecified regional market purchases are the largest contributor to anthropogenic GHG emissions associated with EWEB’s “Block” purchases—which total 44,975 MT CO<sub>2</sub>e. EWEB’s “Block” purchases from BPA also account for the 2,340 MT CO<sub>2</sub>e of Scope 3 biogenic emissions.

EWEB also has power exchange agreements with other regional utilities to take delivery of electricity at one point in time in exchange for an equivalent amount of electricity delivered to the regional utility at a latter point of time. These power exchanges account for 13,147 MT CO<sub>2</sub>e of Scope 3 anthropogenic emissions (10% of the total).

As with some of EWEB’s owned and co-owned renewable resources, EWEB also delivers electricity from contracted renewable resources while retaining the associated RECs. These unretired RECs account for 31,954 MT CO<sub>2</sub>e of GHG emissions.

## GENERATION AND POWER DELIVERY METRICS

In addition to guidance in the reporting of gross emissions associated with each emissions scope, the *Electric Power Sector Protocol* provides guidance on the reporting of several generation and power delivery metrics.

### *Anthropogenic Power Generation Metrics*

This metric represents the tons of direct CO<sub>2</sub> equivalent emissions from fossil fuel combustion for electricity generation per megaWatt hour of generated electricity from fossil fuel energy<sup>9</sup>. The metric is reported for each of EWEB's owned and co-owned electric power resource in the table below.

Facility	Anthropogenic MT CO <sub>2</sub> e/MWh
International Paper Springfield Mill Cogeneration Project	0.07716
Georgia-Pacific Wauna Mill Cogeneration Project	0.01653
Carmen-Smith Hydroelectric Project	0
Leaburg-Waltermville Hydroelectric Project	0
Smith Creek Hydroelectric Project	0
Stone Creek Hydroelectric Project	0
Foot Creek Wind Project	0
All EWEB Owned and Co-owned Resources	0.00920
North West Power Pool	0.41152

### *Biogenic Power Generation Metrics*

This metric represents the tons of direct CO<sub>2</sub> equivalent emissions from biologically derived fuels per megaWatt hour of electricity generated from biologically derived fuel energy. The metric is reported for each of EWEB's owned and co-owned electric power resource that utilize biologically derived fuels in the table below.

Facility	Biogenic MT CO <sub>2</sub> /MWh
International Paper Springfield Mill Cogeneration Project	0.41428
Georgia-Pacific Wauna Mill Cogeneration Project	0.34453

### *Retail and Wholesale Power Delivery Metrics*

The reporting of retail and wholesale power delivery metrics are voluntary under the *Electric Power Sector Protocol*. The retail and wholesale power delivery metrics represents the tons of direct and indirect CO<sub>2</sub> equivalent emissions from electricity generation and purchases per megaWatt hour (MT CO<sub>2</sub>e/Mwh) delivered to retail customers and wholesale customers respectively.

At this time, EWEB is choosing to report a "System Average Anthropogenic GHG Intensity" that reflects the average GHG intensity of all of our retail and wholesale power deliveries, rather than report separate power delivery metrics for each wholesale and retail product.

<sup>9</sup> While the *Electric Power Sector Protocol* only calls for reporting CO<sub>2</sub> emissions for power generation metrics, EWEB also includes CH<sub>4</sub> or N<sub>2</sub>O emissions in our reporting of these metrics in order to more fully report on our GHG emissions.

EWEB’s advice to customers preparing their own corporate greenhouse gas inventories is to follow the guidelines offered by The Climate Registry in the *General Reporting Protocol* and calculate the indirect emissions associated with their electricity consumption using *both* the regional emissions factor for the Northwest Power Pool, Oregon’s U.S. EPA’s Emissions & Generation Resource Integrated Database (eGrid) subregion as well as EWEB’s power supply portfolio average emissions intensity (see table below).

Anthropogenic Emissions Factors for Calculating Indirect Emissions Associated with Electricity Consumption		
Emissions Factor	Metric MTCO <sub>2</sub> e/MWh	Standard lbs. CO <sub>2</sub> e/MWh
Northwest Power Pool Regional Average	.409	902.2
EWEB System Average Anthropogenic GHG Intensity	.046	101.2

While, EWEB’s electric portfolio carbon intensity is low relative to the region as a whole, a result of our preferential access to Bonneville Power Administration hydroelectric resources and our own investments in renewable generation and energy efficiency and conservation, it is important to acknowledge the interconnected nature of the electricity grid and the benefits EWEB’s retail customers derive from this system. By calculating and reporting the indirect emissions associated with electricity consumption using both a utility-specific and regional emissions factor, one acknowledges this interdependence.

**Metrics updates**

EWEB will undertake regular greenhouse gas inventories of its operations and power portfolio emissions and will report that information to its customers and community.

This inventory follows The Climate Registry's *General Reporting Protocol and Electric Power Sector Protocol*, which provide the highest-consensus guidelines for minimum reporting. However, these protocols only require the reporting of Scopes 1 and 2 emissions. These inventories have gone further to include several shared emissions categories from Scope 3. Including Scope 3 emissions presents a more accurate picture of an organization's carbon footprint and better illustrates the potential regulatory and financial risks associated with carbon emissions. While EWEB may not have complete or direct control over all Scope 3 emissions, it can influence all emissions sources to varying degrees.

Overwhelmingly, the direct and indirect emissions reported in this inventory are from either the stationary or mobile combustion of fossil and biologically derived fuels. The combustion of these fuels results in the emission of carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O). Each of these gasses has an associated global warming potential (GWP)<sup>10</sup>. The GWP compares the ability of one mass unit of a particular gas to affect global warming relative to CO<sub>2</sub>. This inventory accounts for these varying GWPs by reporting emissions in terms of metric tons of carbon dioxide equivalent (MT CO<sub>2</sub>e). The calculation of total MT CO<sub>2</sub>e from this combustion is represented in the equation below.

$$\text{MT CO}_2\text{e} = \text{MT CO}_2 + (\text{MT CH}_4 * \text{GWP}_{\text{CH}_4}) + (\text{MT N}_2\text{O} * \text{GWP}_{\text{N}_2\text{O}})$$

The quantity of each gas released during fuel combustion is based on the mass or volume of fuel combusted per year (in gallons for liquid fuels or in standard cubic feet for gaseous fuels), the fuel's high heating value (mmBTU per applicable unit of measure) and the fuel's specific emissions factor (kg CO<sub>2</sub>, CH<sub>4</sub> or N<sub>2</sub>O per mmBTU). The values used for high heating value and fuel specific emissions factors are from values published by The Climate Registry that in turn are based on the U.S. EPA Mandatory Greenhouse Gas Reporting Rule. The calculation of the quantity of each GHG emitted is represented in the equation below.

$$\text{MT GHG} = 1 \times 10^{-3} * \text{Quantity of Fuel} * \text{Higher Heating Value} * \text{Emissions Factor}$$

In addition to accounting for direct and indirect combustion emissions the inventory also seeks to account for the fugitive release of three other greenhouse gasses— sulfur hexafluoride (SF<sub>6</sub>), perfluorocarbons (PFCs) and hydrofluorocarbons (HFCs). In the case of fugitive emissions, the calculation of carbon dioxide equivalencies is derived by multiplying the quantity of fugitive emissions by the appropriate GWP.

Detailed information about the methods, data and assumptions is provided for each source and is described below.

## OPERATIONS INVENTORY SCOPE I

### *Owned Fleet and Equipment*

EWEB's Fleet Supervisor, provided fuel consumption data for EWEB-owned fleet and equipment operation. Every time fuel is added to a vehicle or equipment fuel tank, that quantity is recorded in a log maintained by the motor pool. This log was used to summarize annual fuel consumption by fuel type. Propane consumption is based on vendor billing. Not included in this total are off-site fuel purchases for EWEB-owned vehicles as the data was unavailable.

Oregon's 2% biodiesel blending requirement came into effect on October 1, 2009. In order to estimate the quantity of biodiesel consumed between the effective date of this requirement and the end of the year, annual diesel consumption was multiplied by .05% (2% times 3/12ths of a year).

Oregon's 10% ethanol mandate came in to effect January 1, 2009. In order to derive the quantity of ethanol consumed, the total gasoline fuel quantity was multiplied by the 10% blending requirement.

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<sup>10</sup> The Global Warming Potentials for each greenhouse gas accounted for in this inventory are from The Climate Registry's General Reporting Protocol, which in turn are based on the U.S. EPA Mandatory Greenhouse Gas Reporting rule.

Higher heating values and emissions factors for gasoline, diesel, biodiesel, ethanol and propane published by The Climate Registry were then used to calculate total emissions.

### ***Refrigerants***

Estimated fugitive refrigerant losses from HVAC systems and fleet vehicle air conditioning systems are based on invoices provided by service providers and estimates from EWEB's facility manager, Nicholas Holmes. Global warming potentials published by The Climate Registry were then used to calculate total emissions.

## **OPERATIONS INVENTORY SCOPE 2**

### ***Electricity***

Monthly meter readings at EWEB owned buildings and facilities, accessed via EWEB's internal database systems, were used to determine the total amount of electricity consumed. Some EWEB lighting facilities are unmetered so in order to estimate electricity consumption at these facilities an assumption about the daily hours of operation was made.

Per The Climate Registry's General Reporting Protocol the emissions from electricity usage were estimated using both EWEB's power resource portfolio average emissions factor and the Northwest Power Pool, Oregon's U.S. EPA's Emissions & Generation Resource Integrated Database (eGRID) Subregion emissions factor.

### ***Internal Steam Consumption***

Metered steam consumption readings at EWEB's headquarters facility, accessed via EWEB's internal database systems, were used to determine the total amount of district steam used for heating EWEB's headquarters facility buildings.

The emissions from district steam consumption are estimated using an emissions factor derived for EWEB's district steam system (total GHGs divided by kilopounds of steam generated by steam plant).

## **OPERATIONS INVENTORY SCOPE 3**

### ***Business Travel***

Data for air travel by EWEB employees during 2009 were obtained from EWEB's travel agency, Azumano Travel. Azumano provides EWEB's an annual summary of air miles travelled for trip booked through the agency. It should be noted that not all EWEB business flights are booked through Azumano Travel—some flights may be booked directly when a lower fare is available. Therefore, the amount of airline travel and the associated greenhouse gasses should be regarded as conservative.

An estimate of business miles traveled in rented vehicles was developed by multiplying the number of days EWEB rented a vehicle by the state average miles driven per day for vehicles rented by public agencies. The number of days EWEB rented vehicles was obtained from Azumano Travel. The state average miles driven per day in rented vehicles for public agencies was provided by the Oregon Cooperative Procurement Program. The quantity of fuel combusted was in turn calculated by multiplying vehicle miles by the U.S. fleet average gasoline passenger car fuel efficiency.

By examining travel reimbursement forms, which EWEB employees are required to submit in order to receive reimbursement for expenses incurred, it was possible to develop an estimate of business miles traveled in employee-owned vehicles. The quantity of fuel combusted was in turn calculated by multiplying vehicle miles by the U.S. fleet average gasoline passenger car fuel efficiency.

### ***Solid Waste***

Data on the quantity and type of non-hazardous solid waste generated by EWEB during 2009 was taken from the organization's 2009 *Waste Assessment* provided by the Environmental Management Department. The *Waste*

Assessment estimates the quantity of solid waste generated based on assumptions about the number and volume of waste containers and the frequency of collection from all facilities, as well as historical container usage.

EWEB's non-hazardous solid waste is transported to the Lane County Short Mountain Landfill. The Short Mountain Landfill managed methane emissions in 2009 through recovery and electricity generation. Estimated GHG emissions associated with this landfill management technique were calculated using emission factors published by the U.S. EPA<sup>11</sup>.

Not included in this report are emissions from the landfilling of construction and demolition debris and treated power poles or emissions associated with the incineration of hazardous waste (e.g. used motor oil). The GHG emissions associated with the disposal of these waste streams are small relative to the emissions from unsorted solid waste due to the nature and quantity of the materials. Also excluded from this report is an estimate of the beneficial life-cycle emissions reductions associated with EWEB's recycling programs.

### **Employee Commute**

GHG emissions associated with employee commute are based on estimates of the number of passenger miles and fuel efficiency by commute mode. While the emission estimates provide a useful sense of scale, the estimates are less precise than estimates in other sections of this study because of the methodology underlying the estimates of passenger miles.

A survey of EWEB employees' commuting patterns was conducted in April 2010 and the results of that survey were used in developing the GHG emissions estimates for the employee commute. Responses were received from 216 employees, slightly less than 40% of EWEB's total employee population. Respondents to the survey provided information about their mode of transportation, home zip code, work schedule and vehicle fuel efficiency. Average trip distance by zip code was determined using Google maps. Employee counts by zip code were provided by EWEB's Human Resources Department.

The survey results were utilized to determine the distribution of commute mode by zip code. Where the survey results did not provide sufficient data to determine commute mode for a particular zip code (e.g. no survey response) an assumption was made that the commute mode distribution was the average of all survey respondents.

To calculate passenger miles by zip code, the survey average number of annual workdays was multiplied by the number of employees residing in the zip code by the modal split and then by the average trip distance. To estimate the number of carpool passenger miles this quantity was then divided by the survey average number of carpool passengers. All passenger miles for each zip code by mode were then summed to yield total passenger mile by transportation mode.

Fuel consumption for single occupancy vehicles and carpooling were then estimated by multiplying the number of passenger miles by the survey average fuel efficiency to yield fuel consumption. Fuel consumption was then multiplied by standard emissions factors to yield estimated GHG emissions. Fuel consumption from bus transit was estimated using a similar approach but used a bus transit fuel efficiency factor. No GHG emissions were assigned to the walk, bike and other transit modes.

### **Embodied Emissions in Purchased Goods and Services**

For estimating the emissions associated with the production of goods and services purchased by EWEB, this analysis relied on Economic Input-Output Life-Cycle Analysis (EIO-LCA), a public-domain tool developed by Carnegie Mellon University.<sup>12</sup>

The EIO-LCA tool provides an estimate of the quantity of greenhouse gasses generated per dollar of expenditures for the goods or services produced within 428 industrial sectors of the U.S. economy. For each product category, the tool takes into account the entire supply chain involved in the production of the goods and services and estimates the

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<sup>11</sup> U.S. EPA. 2006. *Solid Waste Management And Greenhouse Gases: A Life-Cycle Assessment of Emissions and Sinks, 3rd Edition*. Available at: <http://www.epa.gov/climatechange/wycd/waste/SWMGHGreport.html>

<sup>12</sup> Carnegie Mellon University Green Design Institute. 2008. *Economic Input-Output Life Cycle Assessment (EIO-LCA), US 2002 Industry Benchmark Model*. Available at: <http://www.eiolca.net>.

greenhouse gasses generated at each stage of production up to the point of purchase. For example, the supply chain for a piece of furniture would extend from the impacts of mining ore for any metal components or harvesting timber for any wood components to the impacts of activities at the product's final assembly point.

This report relies upon data from EWEB's accounting system to portray the expenditures made by EWEB in 2009 for goods and services from outside sources. EWEB's accounting system organizes expenditure data by "resource code", which provides the initial basis for grouping expenditures into categories of activities that can be analyzed by the Carnegie Mellon model.

A significant issue confronted in the analysis was that the accounting data is structured to meet EWEB's established information needs rather than the requirements of an EIOCLA analysis. In order to group expenditures into useful categories for the EIOCLA analysis, resource code transaction ledgers were examined to determine the most frequent type of expenditures and a qualitative assessment was made regarding the most suitable EIOCLA category to assign to those transactions. In some cases, EWEB's resource codes had clear analogs in the EIOCLA database but certain resource codes captured a variety of goods and services. In those cases where EWEB's resource codes captured a range of goods and services rough estimates of the distribution of categories of goods and services were made and dollar values were assigned accordingly. For example, "Resource Code 604: Equipment" included transactions for the purchase of both new motor vehicles as well as heavy-duty construction equipment.

It was also necessary to identify and exclude certain transactions so as to avoid double counting emissions (e.g. fuel purchase for fleet vehicles and equipment accounted for elsewhere in the inventory). Transfer payments such as employee salaries, payroll taxes, and employee health benefits were also excluded.

Additionally, expenditures from several capital improvement projects, such as the Hayden Bridge Filtration Plant upgrade, the Roosevelt Operations Center and the Harvest Wind project were not included as insufficient data was available to accurately report associated emissions. This results in a significant understatement of supply chain GHG emissions. For a sense of scale, the total expenditures included total \$43.9 million while the excluded capital expenditures total more than \$57.8 million.

Given the limitations in the data and in the EIOCLA model, it is essential to regard the GHG estimates for this part of the report as a sense of scale estimate rather than an exact calculation of the quantity of associated emissions. Nevertheless, given the magnitude of the estimated GHG emissions associated with purchased goods and services, the implications of the purchasing activity are serious and compelling.

## **ENERGY PORTFOLIO INVENTORY SCOPE I**

### ***Steam Plant***

Data on the quantity and type of fuels combusted at EWEB's District Steam Plant were obtained from EWEB's 2009 Mandatory Greenhouse Gas Report filed with the Oregon Department of Environmental Quality. EWEB's Mandatory Greenhouse Report lists natural gas and diesel fuel as the fuels combusted at the steam plant. However EWEB also combusted a small quantity of waste transformer oil, a petroleum derived mineral oil consisting in large part of naphtha. The quantity of transformer oil combusted was included in the reported total of diesel fuel combusted. Since, naphtha is slightly less carbon intensive than diesel fuel this may represent a slight over reporting of EWEB's GHG emissions.

### ***Owned and Co-owned Electric Power Resources***

No fuel use is associated with electricity generation at EWEB's owned and co-owned hydroelectric and wind power resources, therefore these sources do not have any associated GHG emissions.

Data on the proportion and type of fuels combusted at EWEB's co-owned International Paper Springfield Mill and Georgia Pacific Wauna Mill were obtained from these facilities' 2009 mandatory GHG reports filed with the Lane Regional Air Resource Protection Authority and the Oregon Department of Environmental Quality, respectively<sup>13</sup>.

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<sup>13</sup> The Mandatory Greenhouse Gas Reports include all emissions units at each facility but only some of these units are associated with the production of electricity and only these units are reflected in this reporting. It could be argued that without the existence

Since data on turbine and boiler efficiency was unavailable, EWEB departed from the *Electric Power Sector Protocol* in our approach to calculating the emissions associated with electricity production at these facilities. Rather than use the efficiency allocation method recommended by the *Electric Power Sector Protocol*, this analysis instead relied on contract heat rates (BTUs/kWh), a representation of the thermal energy input (measured in British Thermal Units or BTUs) per unit of electricity produced (measured in kilowatt hours or kWh), to yield an estimate of the total heat input used for electricity production.

In turn this value was multiplied by the percentage of fuel energy input per fuel source to calculate the quantity of each fuel used for electricity production and the associated emissions. Since EWEB is a co-owner at each of these facilities, the emissions reported are prorated based on EWEB's equity share in the project.

The treatment of unretired RECs is not addressed in the *Electric Power Sector Protocol*. The protocol does however provide guidance on the adjustment of power delivery metrics based on a utilities purchase of RECs. The protocol allows a utility to take credit for the purchase of RECs and displace an equivalent amount of power from their actual power mix with the zero emissions attributes of the associated RECs. This inventory conversely assumed that null power deliveries would need to be adjusted in order to avoid double counting of the GHG benefits of RECs. Null power sales were assigned the grid average emissions factor for the Northwest Power Pool, Oregon's subregion in the U.S. EPA's Emissions & Generation Resource Integrated Database (eGRID). This emissions factor (.409 MT CO<sub>2</sub>/MWh) is the average emissions rate for all electric generators supplying power to the regional electric grid—or MT CO<sub>2</sub>e per megaWatt-hour.

## ENERGY PORTFOLIO SCOPE 2

### *Transmission and Distribution Losses*

The calculation of emissions associated with transmission and distribution losses from purchased electricity is based on a transmission and distribution (T&D) loss factor multiplied by the total quantity of emissions associated with purchased electricity delivered to EWEB's local transmission and distribution system. The T&D loss factor is a percentage calculated by dividing the quantity of unaccounted for power delivered to the local distribution by all power delivered to the local transmission and distribution system. For a description of the methods used to determine the total quantity of emissions associated with purchased electricity delivered to EWEB's local transmission and distribution system please see the Scope 3: Contracted Electric Power Resources methods description below.

## ENERGY PORTFOLIO SCOPE 3

### *Contracted Electric Power Resources*

As noted previously, EWEB acquires substantial electric power resources from long-term power contracts (e.g. the BPA "Block" product), unspecified market purchases and power exchanges.

Per the *Electric Power Sector Protocol*, the emissions associated with unspecified market purchases and power exchanges are calculated using emissions factor for the Northwest Power Pool, Oregon's subregion in the U.S. EPA's Emissions & Generation Resource Integrated Database (eGRID). This emissions factor is the average emissions rate for all electric generators supplying power to the regional electric grid—or MT CO<sub>2</sub>e per megaWatt-hour.

The BPA's "Slice of the System" product primarily consists of hydroelectric and nuclear resources but also includes some renewable resources, including one geothermal and one biomass project. The biomass project is EWEB's co-owned Georgia Pacific Wauna Mill cogeneration project—the electricity output from which is dedicated to the BPA through 2016. Since EWEB has already reported our share of the Scope 1 emissions from this project and BPA could not provide detailed information on the relative output of each of the "Slice of the System" resources, for the purpose of this inventory it is assumed that "Slice of the System" purchases have no associated emissions.

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of the other mill components electricity production would not be feasible and that EWEB is responsible for a share of these other emissions, especially those associated with the mills' pollution control devices. EWEB will explore these issues in future reporting.

Emissions associated with BPA “Block” purchases were calculated based on a reported fuel mix for non-slice resources provided by BPA. The emissions factors per MWh for each fuel type reported in this disclosure were based on default values recommended by the *Electric Power Sector Protocol*. In the case of BPA’s “Other” category this analysis assumes the Northwest Power Pool regional emissions factor per MWh.