

Oregon State University

Fiscal Year 2009 Greenhouse Gas Inventory



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Oregon State
UNIVERSITY

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Definitions of Key Terms

(1) “**Carbon dioxide**” (CO₂) means the chemical compound containing one atom of carbon and two atoms of oxygen.

(2) “**Carbon dioxide equivalent**” (CO₂e) represents the quantity of a greenhouse gas multiplied by a Global Warming Potential (GWP) factor, relative to CO₂. This is the “standard unit” used to quantify various greenhouse gasses.

(3) “**Global Warming Potential factor**” (GWP) means the radiative forcing impact of one mass-based unit of a given greenhouse gas relative to an equivalent unit of carbon dioxide over a given period of time. For instance, methane (CH₄) has a GWP of 23, meaning that every gram of methane will trap 23 times as much solar radiation as a gram of CO₂.

(4) “**Radiative Forcing Index**” (RFI) is a multiplier designed to account for the effects on climate an emission source will cause in addition to the release of fossil carbon. The RFI is most commonly used for aviation emissions, where it accounts for the effects of releasing greenhouse gases at altitude. The Intergovernmental Panel on Climate Change (IPCC) has [estimated the RFI](#) multiplier for aviation at 2.0-4.0.

(5) “**Greenhouse gas**” (GHG) is any gas that contributes to anthropogenic global warming including, but not limited to, carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.

(6) “**Metric ton, tonne, or metric tonne**” (t) means one metric tonne (1000 kilograms) or 2204.62 pounds.

(7) “**Total emissions**” is the calculated sum of GHGs emitted due to OSU-related activities.

(8) “**Net emissions**” is the calculated sum of GHGs emitted minus renewable energy certificates, composting activities and carbon offsets.

(9) “**Renewable energy source**” means any source of energy that is replenished rapidly by natural processes. Renewable sources may include, but are not limited to, wind, solar, hydroelectric, biomass, geothermal, tidal or sea currents etc.

(10) “**Statewides**” refers to the inventory that analyzes emissions from statewide, legislatively-mandated OSU entities, specifically the Agricultural Experiment Stations (AES), Extension Service and the Forest Research Laboratory (FRL).

(11) “**Renewable Energy Certificate**” (REC) is a tradable certificate that represents a unit of energy produced by renewable energy sources. The owner of a REC can claim that they are using renewable energy equal to the amount of RECs owned.

(12) “**Bonneville Environmental Foundation (BEF)**” is a Portland-based non-profit which specializes in carbon offsets, mainly renewable energy credits (RECs). These credits increase the volume of clean, renewable energy that enters the electrical grid. OSU purchases RECs from BEF as part of the student renewable energy fee.

(13) “**Renewable energy fee**” refers to the student-approved initiative that directs \$8.50 per term per student towards the purchase of RECs. These RECs offset a large percent of OSU’s electrical consumption with additions of clean, renewable energy to the electrical grid.

(14) “**World Business Council for Sustainable Development (WBCSD)**” is a global association of business representatives that deals exclusively with business and sustainable development.

(15) “**Greenhouse Gas Protocol (GHGP)**” is an internationally-used accounting tool that allows business and governmental leaders to understand, quantify and manage greenhouse gas emissions. It provides a framework for nearly every greenhouse gas standard and program in the world. The WBCSD was an original partner in drafting and creating the GHGP.

(16) “**Intergovernmental Panel on Climate Change (IPCC)**” is a scientific body established to provide policymakers with an objective source of information on climate change. The IPCC performs no research nor does it monitor climate data; it instead offers analysis of research and climate data as an objective body with a broad range of views, expertise and wide geographical coverage.

(17) “**Clean Air-Cool Planet**” (CA-CP) is a non-partisan, non-profit organization that aims to find and promote solutions to global climate change. Their carbon calculator is used by many campuses for calculating emissions.

(18) “**American College and University Presidents Climate Commitment**” (ACUPCC) is an effort to encourage commitments from institutions of higher learning to neutralize greenhouse gas emissions and prioritize the research and education efforts aimed at stabilizing earth’s climate.

Definition Sources

Oregon Department of Environmental Quality: www.deq.state.or.us

Bonneville Environmental Foundation: www.greentagsusa.org

World Business Council for Sustainable Development: www.wbcsd.org

Greenhouse Gas Protocol: www.ghgprotocol.org

Intergovernmental Panel on Climate Change: www.ipcc.ch

Clean Air-Cool Planet: <http://www.cleanair-coolplanet.org/>

American College and University Presidents Climate Commitment:

<http://www.presidentsclimatecommitment.org/>

Executive Summary

Oregon State University (OSU) continues to demonstrate regional leadership and receive national attention for sustainability-related activities and initiatives. Part of the basis for this recognition is OSU President Ed Ray's April 2007 signing of the American College and University Presidents Climate Commitment. In part, the Climate Commitment requires inventorying greenhouse gasses every two years (OSU performs them annually). This Fiscal Year 2009 (FY09) OSU Greenhouse Gas (GHG) Inventory Report is an update and expansion of the [FY08](#) and [FY07](#) OSU GHG inventories, which themselves are expansions of a [CY04 inventory](#) commissioned by the Oregon University System.

The FY09 inventory provides:

1. A snapshot of OSU emissions: quantified greenhouse gas emissions resulting from OSU-related activities for the fiscal year ending June 30, 2009
2. Comparison with prior OSU inventories: a comparative analysis with FY07 and FY08 emissions
3. Guidance for future inventories: the methodology, successes, challenges and rationale of this expanded report provide a framework for future OSU reports.

Findings in Brief

- Total *gross* emissions of 148,018 metric tonnes (t) carbon dioxide equivalent (CO₂e), a **6.9% decrease** from FY08
 - o This decrease was mainly due to reductions in electricity and natural gas consumption, as well as reduced air travel.
- *Net* emissions of 98,676 t CO₂e, a **6.7% decrease** from FY08.
- Net emissions per full-time equivalent (FTE) student of 5.4 t CO₂e, a **6.8% decrease** from FY08.
- Net emissions per 1000 square foot of 14.1 t CO₂e, a **6.6% decrease** from FY08.
- Total gross and net (in parenthesis) emissions from
 - o Scope 1 sources: 37,372 (37,372) t CO₂e, mainly from fossil fuel combustion, refrigerants and agriculture;
 - o Scope 2 sources: 71,242 (22,084) t CO₂e, purchased electricity;
 - o Scope 3 sources: 39,404 (39,398) t CO₂e, which includes air travel, other university financed travel (personal mileage reimbursement, Athletics bus travel, etc.), commute, solid waste, and line losses due to the transmission and generation of electricity.

- Gross emissions from operations in Corvallis represent 95.8% of total university emissions.
- A 10.6% decrease in *actual* air travel emissions; a 41.0% decrease in *reported* air travel emissions vs. reported FY08 air travel emissions.
- Significant emissions sources include purchased electricity (29.5% of net emissions), combustion of natural gas and other stationary sources (32.7%), mission-related air travel (21.3%) and student, staff and faculty commute (9.2%).

Analysis in Brief

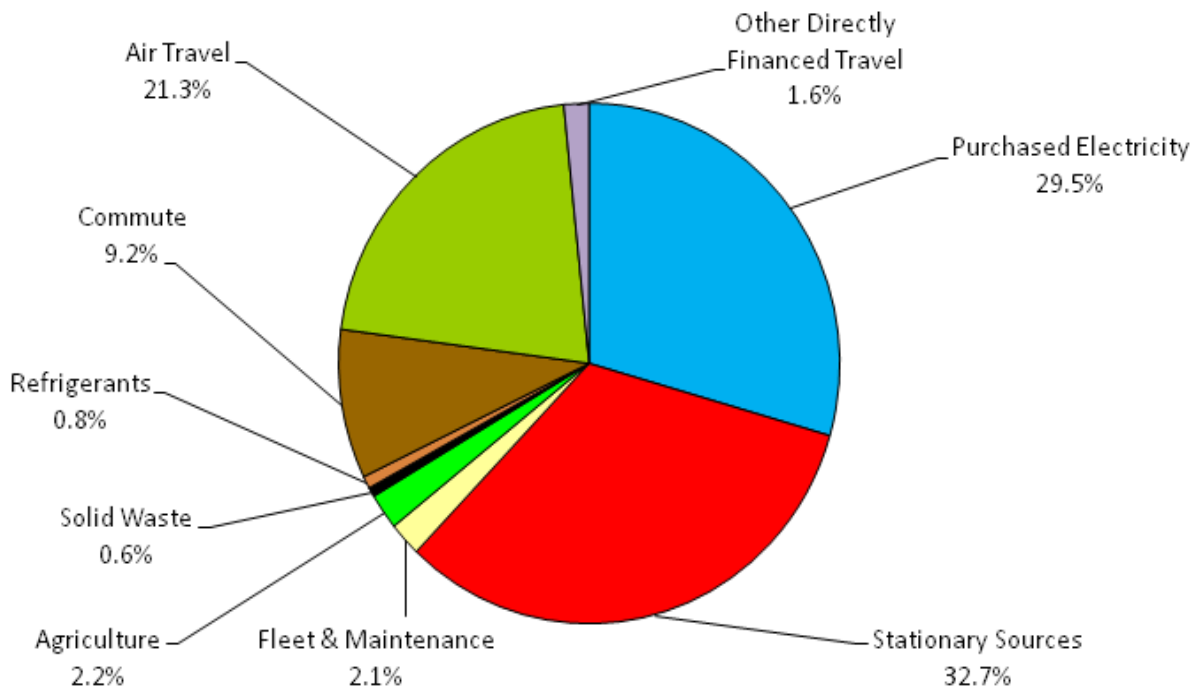
- Potentially significant emissions sources not included are:
 - o Long-distance student travel, including study abroad travel
 - o Lifecycle/embodied emissions
 - o Transportation and processing of materials to be recycled
 - o Water treatment and distribution
 - o Solid waste, commute and fleet emissions for Statewides, HMSC and OSU-Cascades
 - o Non-contract car rental
 - o Non- Travel Reimbursement Entry System (TRES) reimbursed travel
 - o Some OSU Athletics team travel

Changes since the FY2008 Inventory

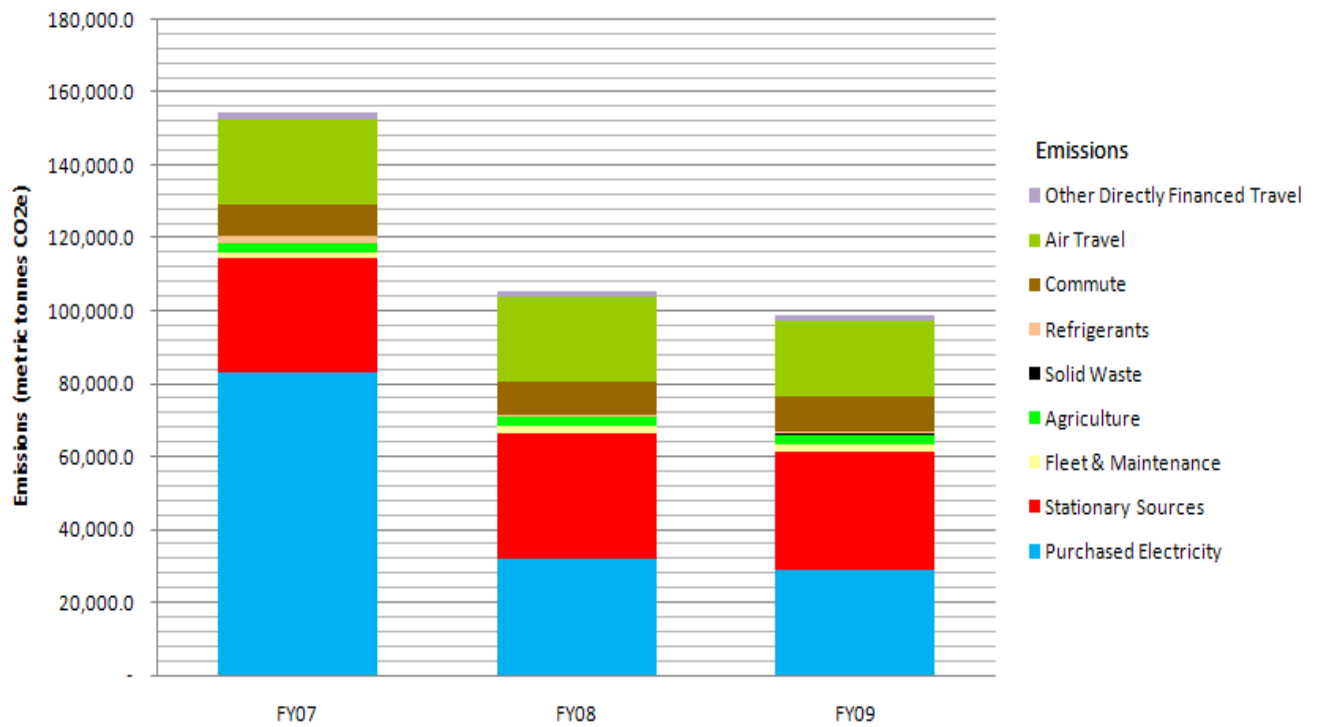
- Emissions sources included for the first time in FY09 are:
 - o Numerous propane consumers
 - o Multiple fertilizer application sites
- Calculations/methodology changes since FY08:
 - o Revision of air mileage calculations
 - o Pacific Power electricity generation mix revision

Please see the [Analysis of Data and Results](#) section for more details regarding these sources and improvements.

FY09 OSU Comprehensive Greenhouse Gas Emissions



Net Annual OSU Greenhouse Gas Emissions



Introduction

Oregon State University's third annual comprehensive greenhouse gas inventory reflects a continual improvement of data collection methods and analyses. This report contains fewer changes relative to the previous annual report issued for Fiscal Year 2008. Although not reflected in this shorter report, more than ever, constructing an inventory with the level of detail that follows is a monumental task.

In an effort to streamline the report format, the OSU Sustainability Office is moving to a reporting structure that highlights changes in methods from year to year. Rather than including text that largely remains static, the authors will, when appropriate, direct readers to past reports for specific details and references.

As was the case for the FY08 report, the science and methods behind best-practice inventory work is ever-evolving, making year-to-year comparisons complex. Greenhouse gas measurement is an increasingly important state and national issue. OSU's inventory processes exceed with a comfortable margin the strictest reporting requirements. Feedback is appreciated from any stakeholder on this document and the process used to create it. Please visit <http://oregonstate.edu/sustainability/climate> for details and updates.

Methodology

Overview

With operations as broad and far-reaching as Oregon State University's, the largest task in creating this FY09 inventory was data collection. Extensive data were gathered from central sources and from OSU entities across the state. Most large sources of GHG emissions are accounted for in their entirety. Omissions are described in the Boundaries section. This is the most complete inventory of OSU's GHG emissions performed to date.

The CA-CP calculator was chosen again for FY09 due to its focus on university and college campuses, ease of comparison with the FY07 and FY08 inventories and its endorsement by the ACUPCC, of which OSU is a signatory. Other reasons for selecting this tool can be found on page 12 of the [FY08 report](#).

Scope and Boundaries

Identifying scope and boundaries issues is a critical step in emissions reporting. While some connections to emissions sources – like electrical consumption – are direct, others, such as employee commuting or student air travel to and from the university, are not. In an effort to measure all emissions resulting from OSU

activity, the boundaries were drawn to be fairly broad: any emissions from an entity over which OSU has financial and/or operational control were included.

In the FY07 inventory, OSU emissions were aggregated in a single inventory. For the FY08 report, there were essentially six inventories:

- OSU Comprehensive (aggregated inventory of Corvallis, Cascades, HMSC and “Statewides”)
- OSU Corvallis main campus,
- OSU-Cascades Campus (Bend),
- Hatfield Marine Science Center (HMSC) (Newport),
- Statewide Public Services (“Statewides”) which include Agricultural Experiment Stations (AES), Extension Service and the Forest Research Laboratory (FRL) across the State of Oregon
- OSU Comparative

FY09 essentially mirrors the methodology and reporting structure of FY08; a separate inventory was created for the Corvallis main campus, Cascades Campus, HMSC and the “Statewides”. Emissions for these locations were aggregated into an OSU Comprehensive inventory. The OSU Comparative inventory was discontinued, as the above inventories better represent OSU’s financial and organizational structure and already provide annual comparability.

Unless otherwise noted, data comparing fiscal years and university-wide totals are drawn from the OSU Comprehensive inventory. Emissions sources like air travel and rental cars were attributed to OSU Corvallis unless otherwise noted.

Data Gathering and Management

As Oregon’s land, sea, space and sun grant institution, OSU facilities are spread throughout the state, requiring data from a large number of sources. Not all data were readily available or in a useable format. The need to balance timeliness with attaining trivial data resulted in some intentional omissions. Other emissions sources were omitted because of incomplete data and a limited ability to reliably extrapolate. Rationale for these omissions is discussed in further detail in the [FY08 inventory report](#).

Past Inventory Comparison

An important function of this FY09 inventory is the ability to compare with previous inventories. Data presented in this report reflect changes in emissions between FY08 and FY09 using the highest quality data and best calculation practices. For example, this FY09 report notes a 10.6% decrease in air travel emissions from FY08 to FY09. Using emissions data presented in the FY08 report, the decrease would be 41.0%. This difference was due to a data reporting miscommunication (see *Analysis of Data and Results* in the [Findings and Analysis chapter](#) for more information). In an effort to present the highest-

quality data using the latest calculation methods, past, current and future inventories may not be absolutely comparable for all source categories. Issues of comparison over time will continue to be noted in these reports.

Boundaries

Overview

In order to create the most realistic, accurate greenhouse gas inventory possible, this report's scope and boundaries expand beyond what is typically included in organizational inventories. Using terminology common to greenhouse gas reporting, most inventories examine a "Scope 1," which includes all direct emissions from sources owned or directly controlled by the subject organization. "Scope 2" sources which cover GHG emissions that result from importing or buying electricity, steam, heat or chilled water are also often included. "Scope 3" includes all other indirect sources of GHG emissions that result from organization activities from sources not owned or controlled by the organization. These scopes are defined by the World Business Council for Sustainable Development (WBCSD) and are used to ensure consistency and prevent double-counting or double-crediting. The President's Climate Commitment requires that signatories mitigate emissions only from Scope 1 and 2 sources, as well as commute and air travel from Scope 3. Most OSU peer institutions focus on these prescribed emissions sources. Our inventory aims to document all OSU emissions for which data exist, regardless of our mitigation responsibilities.

Omitted Emissions Sources and Credits

It was not possible to precisely inventory every emissions source or credit due to diverse university operations across the state and existing business practices and accounting methods not well suited for reporting the types of data needed. Those intentional omissions are discussed below. If emissions from a source are expected to contribute more than 1% to total emissions the source is considered significant; those that are not expected to contribute more than 1% are considered negligible and not included in this analysis.

The list of omitted sources includes:

Omitted Source	Expected Impact
Miscellaneous directly financed travel (some Athletics, non-TRES)	Significant
Water treatment and distribution	Significant
Long-distance student travel (travel abroad, to/from home)	Significant
<u>Additional</u> biological sequestration	Significant
Lifecycle/embodied emissions*	Significant
Off-campus vehicle use, commute and solid waste	Negligible
Incinerated waste – non-energy producing	Negligible
Recycled materials (transport and processing)	Unknown

*A [lifecycle greenhouse gas analysis](#) was performed by [Good Company](#) in August 2009 based on the Carnegie Mellon *Economic Input-Output Life-Cycle Assessment (EIO-LCA)* model. Quantifying emissions using FY08 expenditures for food, construction, retail goods, computers, paper, lab equipment and much more, Good Company found that OSU's emissions from the procurement of goods and services were estimated at nearly 85,000 t CO₂e, or more than 57% of gross FY09 emissions.

Findings and Analysis

Findings in Brief

OSU Comprehensive

- Total gross emissions were 148,018 t CO₂e for FY09.
- Net emissions totaled 98,854 t CO₂e for FY09.
- Total gross and net (net in parenthesis) emissions from
 - o Scope 1 sources: 37,372 (37,372) t CO₂e;
 - o Scope 2 sources: 71,242 (22,078) t CO₂e;
 - o Scope 3 sources: 39,404 (39,398) t CO₂e.

OSU Corvallis

- Total gross emissions were 141,678 t CO₂e, 95.8% of total OSU emissions.
- Net emissions totaled 92,514 t CO₂e.

Statewide Public Services

- Total gross emissions were 4,445 mt CO₂e, 3.0% of total OSU emissions.

Hatfield Marine Science Center

- Total gross emissions were 1,277 mt CO₂e, 0.7% of total OSU emissions.

OSU-Cascades

- Total gross emissions were 618 mt CO₂e, 0.4% of total OSU emissions.

Purchased electricity was the single greatest source of GHG emissions totaling 78,288 t CO₂e, or nearly 53% of total OSU gross emissions.

- Because of the student-supported and funded purchase of off-site renewable energy in the form of renewable energy certificates (RECs), net emissions from purchased electricity were 29,129 mt CO₂e, representing 29.5% of total net emissions. The approximate composition of these RECs was 40% wind, 40% biogas and 20% biomass; these averages fluctuate because of weather, market forces and varying load conditions.

Direct emissions from burning fossil fuels (natural gas, distillate oil #2 (diesel) and propane) account for 32.8% of net GHG emissions. Together with the emissions of purchased electricity, these two sources account for 62.3% of net emissions.

- Direct emissions decreased by 6.4% from FY08 to FY09.

Mission-related air travel accounted for 21.3% of net emissions and decreased by 10.6% from FY08.

- Emissions from mission-related air travel decreased by 41% from the value reported in the FY08 OSU GHG Inventory. A miscommunication on terms of travel (flight segments vs. tickets) led to over counting in the FY08 and FY07 reports of air miles flown and their resulting emissions. For a more detailed explanation of this decrease, see the Analysis of Results subsection of this section.

Institutional Comparison of Key Metrics

	'09 OSU Comprehensive	'08 OSU Comprehensive	'07 OSU Expanded	'09 University of Vermont	'08 University of Vermont	'07 University of Vermont	'08 Cornell University	'08 Utah State	'07 Utah State	'07 UC Davis	'07 Washington State
Net emissions per FTE enrolled (mt CO₂e)	5.4	5.8	8.6	5.7	5.9	6.3	15.6	7.0	7.3	13.2	5.9
Net emissions per 1000 square feet (mt CO₂e)	14.1	15.1	22.0	13.9	13.6	14.3	20.7	19.1	19.8	25.2	12.3

All comparative data are drawn from reports submitted by the institutions to the [ACUPCC Reporting System website](#).

Analysis of Data and Results

Air Travel:

New sources for FY09: No new air travel sources were added in FY09.

Calculations/data changes since FY08: Total emissions from air travel decreased by 10.6% between FY08 and FY09 when using updated calculation and data collection methods. However, compared to air travel emissions *reported* in the FY08 inventory, emissions decreased by 41%. Approximately 25% of this reduction in emissions resulted from the 10.6% decrease in air travel volume in FY09 compared to FY08.

The remainder of the decrease resulted from a miscommunication between the Sustainability Office and Azumano Travel. As shown in the Findings Table, extrapolations for total OSU air travel are based on flight segments (e.g., PDX-JFK-SEA-PDX equals 3 flight segments) and the associated mileage from a contracted travel agent. The miscommunication in question led to the number of OSU purchased *tickets* (PDX-JFK roundtrip, with stopover in SEA, equals 2 tickets) being reported instead of *flight segments*. This resulted in an overestimation of *miles flown per flight segment*, a variable used to extrapolate OSU air travel booked from contracted travel agents and the travel reimbursement department. This error caused an overestimation of air travel by approximately 34% for FY08 and 32% for FY07.

Uncertainty Analysis: In addition to data issues highlighted above, there is significant uncertainty for the calculation of emissions from air travel, due mostly to the unknown effects of emissions at altitude (represented by the Radiative Forcing Index). The RFI of 2.8 used by the CA-CP calculator is [supported by an](#)

[IPCC report on Aviation and Global Atmosphere](#). Compared to other air emissions calculators, CA-CP estimates are at the high end of the range. Depending on future refinement of calculation methodology, it is possible that OSU emissions from air travel will show modest additional decreases.

Commute - Student:

New sources for FY09: No new student commuting sources were added in FY09.

Calculations/data changes from FY08: FY09 Corvallis student headcount data were mistakenly used in calculating student commute mileage for the FY08 inventory. Headcount data from FY09 was reused for the FY09 inventory as no new or better data were available.

Uncertainty Analysis: Commuting is another source with high uncertainty due to reliance on data from an outdated transportation survey which may not accurately predict commute patterns. Unfortunately, the survey in question is the only data source available. In spring 2010, however, a new scientific survey will be conducted to assess OSU commuter patterns. Aside from data availability issues, assumptions needed to be made to simplify data collection and calculations. For example, efficiency of students' cars is unknown; the calculator used the US fleet average of 22.1 mpg.

Student headcount rather than FTE (both full-time and part-time students) more accurately represents commute patterns. Using the CA-CP methodology, full-time students are estimated to go to and from campus once per day. Part-time students are given the commute equivalent of one-half a full-time student. Clearly, this basic structure cannot possibly mimic the complex nature of student schedules. It is unknown whether actual emissions lie above or below the emissions reported here, but emissions from student commute could vary by $\pm 20\%$. Future, more frequent and far-reaching commute and survey data, if available, may decrease this uncertainty.

Mode split information collected in a 2003 survey describes the likely method in which commuters get to and from campus. These splits were used to calculate student commute emissions. However, there is a large portion of students living on campus who are not represented in the survey data. A sister survey was performed that gathered data on intra-campus travel but due to the structure of the calculator, mode splits cannot be differentiated for on and off-campus commuters. It is likely that emissions from student commute are lower than what is represented here by up to 20%.

Commute - Faculty/Staff:

New sources for FY09: No new faculty/staff commuting sources were added in FY09.

Calculations/data changes from FY08: FY08 HMSC faculty/staff commute data was reused for FY09 as the calculation methodology for HMSC commuting was lost during a personnel change. A survey, to be distributed in April 2010, will allow for more precise and replicable commute emissions calculations.

Uncertainty Analysis: Assumptions were made to simplify data collection and calculations. As with student commuting, estimated emissions from faculty and staff commute could change by $\pm 10\%$ depending on the actual efficiency of the fleet.

The CA-CP calculator does not allow for full-time and part-time headcount numbers to be added. Instead, FTE was used for faculty and staff. Both groups are estimated to make one trip to campus 235 days a year. Knowing the variety of schedules of staff and faculty (especially faculty), the range of uncertainty for this emission source is around $\pm 20\%$.

Staff and faculty FTE information provided by Institutional Research includes the Statewide Public Services and other non-Corvallis locations. However, commute distance and mode splits are likely quite different than those for Corvallis. No reliable commute data for these entities exist. Emissions from staff and faculty commute could change by as much as $\pm 15\%$.

Directly Financed Travel (excluding Air Travel):

New sources for FY09: Numerous bus vendors transporting Athletics teams were identified in FY09, resulting in an 86% increase in university financed bus travel. Emissions from these new vendors are estimated at 7.9 t CO₂e or 0.005% of total OSU emissions.

Calculations/data changes since FY08: Data provided for personal vehicle mileage reimbursement was understated by 32% for FY08. Emissions from directly financed travel in FY08 totaled 1,551 t CO₂e, while the FY08 report listed 1,148 t CO₂e.

Uncertainty analysis: There are still a number of emissions sources that are uncounted in this category. Emissions from non-Enterprise car rentals, and car, air and personal mile reimbursement for Athletics are significant unreported sources. Athletics team travel is difficult to analyze with the current system. Uncounted sources may increase emissions from this category by up to 30%.

Electricity:

New sources for FY09: No new electricity sources were added in FY09.

Calculations/Data changes since FY08: Emissions resulting from the generation, transmission and distribution of electricity decreased by nearly 8.0% in FY09 compared to FY08. While actual electricity consumption decreased by 0.4% the

majority of this decrease was due to the continual declines in the carbon intensity of Pacific Power's grid mix.

Uncertainty Analysis: While most OSU entities reported their utility information for the FY08 inventory, there were still a few outstanding groups that had not. Along with unknown sources, it is estimated that these groups comprise no more than 5% of total OSU emissions from electricity.

The Pacific Power grid mix relies heavily on carbon-intensive fuels, with more than 65% of OSU electricity coming from coal in Wyoming and Utah, down from about 75% from coal sources in FY08. Using the regional or national grid mix for calculating emissions is less accurate than directly linking power consumption and production. Corvallis and OSU-Cascades campus electricity consumption results in increasing demand from largely non-renewable (coal) power plants.

Fertilizer:

New sources for FY09: Sources of fertilizer emissions not included in past inventories were the Dixon Recreation sports fields. Emissions from this new source are estimated at 2.8 t CO₂e or approximately 0.002% of total OSU emissions.

Calculations/data changes since FY08: No calculation or data changes were made for fertilizer in FY09.

Uncertainty analysis: There are still a number of known fertilizer sources that were not included in the FY08 inventory. Together with unknown sources, emissions resulting from fertilizer application could increase by 20% or more.

Fleet:

New sources for FY09: Sources of fleet emissions not counted in past inventories were fuel consumption of the HMSC research vessel the R/V Pacific Storm. Emissions from this new source are estimated at 142.3 t CO₂e or approximately 0.096% of total OSU emissions.

Calculations/data changes since FY08: Hatfield Marine Science Center reports the diesel consumption of its primary research vessel, the R/V Pacific Storm. While the fuel consumption was entered into the CA-CP calculator for FY08, the emissions were not included as part of the total, due to a calculator error.

Uncertainty Analysis: A number of sources of Fleet emissions, mostly from the Statewides, are uncounted. Emissions from these sources could increase emissions from the OSU fleet by 10-15%.

Propane:

New sources for FY09: A number of new propane consumers were discovered through Amerigas records. Emissions from these new sources are estimated at 2 t CO₂e or around 0.001% of total OSU emissions.

Calculations/data changes since FY08: No calculation or data changes were made for propane in FY09.

Uncertainty Analysis: The purchasing of propane by OSU departments is decentralized and no comprehensive record exists. While most large consumers are likely captured here, there is uncertainty in how many consumers were not captured. It is estimated that if all consumption of propane were to be recorded, total emissions from propane could increase by 25% or more.

Solid Waste:

New sources for FY09: No new solid waste sources were added in FY09.

Calculations/data changes from FY08: Reported emissions from solid waste increased by nearly 62% in FY09 compared to FY08. Campus Recycling and the Sustainability Office suspect that no significant increase in waste or waste hauling actually occurred in FY09. Irreversible data entry issues within Business Services' solid waste database may be the cause of this dramatic increase. Unfortunately, this database is the only data source for this category. As of January 2010, Campus Recycling began gathering more accurate and detailed data from OSU's waste hauler, Allied Waste.

Uncertainty Analysis: Since no solid waste information was collected for any other entity besides OSU Corvallis, mainly due to data availability issues, this emissions source will undoubtedly increase as information becomes available. It is likely actual emissions from solid waste are 10-15% higher than reported here.

Analysis of Data Quality

Due to varied data quality and completeness, assumptions and extrapolations were used for the following areas: mission-related air travel; student and faculty/staff commuting for the Corvallis and OSU-Cascades campuses; gasoline and diesel fleet; Enterprise rental car mileage; and animal information for Veterinary Medicine.

Areas requiring further investigation and enhanced recordkeeping include: mission-related air travel; Athletics travel; student/staff/faculty commuting; long-distance student travel (to/from home and school); auto mileage and commute information that includes Extension, Ag. Experiment Stations, the FRL, OSU-Cascades Campus and HMSC; backup generator fuel consumption; propane use; fertilizer use; car rentals that did not use Enterprise Rent-A-Car Company.

Future Action

New Reporting Requirements

The Oregon Department of Environmental Quality (DEQ) issued new reporting requirements in 2009. OSU is required to report fuel consumption from the central Heat Plant and Energy Center for calendar year 2009 to DEQ through an online reporting system. Using emissions coefficients similar to those used in CA-CP, emissions from these large sources can be quantified and tracked.

OSU Climate Plan

As awareness and demand for action around global climate change continues to grow, requests and requirements will come from the campus community, the community at-large, and local, state and federal governments. To respond to this increasing attention and to meet the requirements of the American College and University Presidents Climate Commitment, the OSU Sustainability Office created the [OSU Climate Plan](#) in September 2009.

The Plan develops goals, frameworks and strategic steps necessary for OSU to achieve climate neutrality (no net emissions) by 2025. Intermediate goals consist of halting the growth of emissions by FY10, reducing FY12 net emissions to 10% below 1990 levels, and reducing FY20 net emissions to 75% below 1990 levels. While reducing actual emissions are a central focus of the Climate Plan, outlining steps to further incorporate climate change awareness into education, engagement and research is also required by the ACUPCC and included in the Plan.

The Climate Plan speaks to applying a combination of three primary mitigation strategies:

- conservation and efficiency projects
- on-site renewable energy installations
- carbon offsets, renewable energy certificate purchases, and other off-site measures.

These strategies are not expanded upon in this FY09 report, nor will progress against them be reported this year. However, a detailed progress report will be included in the FY10 edition which will contain significant content additions relative to existing and previous GHG reports. Starting with FY10, the annual OSU greenhouse gas report will:

- Measure and report emissions for the past fiscal year
- Track and report progress made during the past fiscal year toward Climate Plan goals.

Processes and infrastructure are currently being developed to allow for accurate tracking of the Climate Plan's goals and strategies.

Creating a 1990 Baseline

Creating an **organizational baseline**, or reference emissions level, is critical to goal setting and tracking progress over time and across organizations. Although detailed measurement like the kind illustrated in this report didn't begin at OSU until 2007, it is still possible to create a baseline for years past.

Determining an appropriate baseline **year** is both critical and challenging. OSU selected Fiscal Year 1990 as its baseline year due to the prevalence of 1990 as a baseline for many state, federal and international climate initiatives.

However, using 1990 as a baseline year imposes considerable challenges, including low data quality and availability. Much of the data central to emissions calculations are simply not available for this time period. When data are available, quality and scope are often questionable. Emissions coefficients for sources like electricity and air travel from that time period are difficult to calculate. The combination of these factors makes estimating a 1990 baseline difficult.

OSU's 1990 baseline was calculated after analyzing a number of factors that correlate with emissions. They were: student enrollment FTE; faculty/staff FTE; gross square footage (GSF); natural gas use; and electricity use. Using a blend of historical data and estimations, FY90 emissions levels were calculated based on the rates of change of these factors.

Upon analysis of these factors, it was determined that emissions from electricity were best suited to use as a proxy for 1990 emissions. This is due to a number of reasons:

- Emissions from electricity comprised nearly 50% of OSU's gross emissions during the past three inventories
- The rate of consumption of natural gas and other heating fuels has closely mirrored the increase in electricity consumption; also, together, these sources account for nearly 75% of OSU's gross emissions
- The calculated emissions for 1990 based on electricity were "middle of the road" when compared with the other analyzed factors as well as other baseline estimations.

OSU's FY90 emissions are estimated to be 110,977 t CO₂e from all major sources now included in recent GHG inventories.

In the summer of 2009, OUS contracted with [Good Company](#) to provide an estimate of 1990 emissions from buildings (essentially all Scope 1 & 2 emissions) for the seven campuses. Using campus square footage, estimated emissions coefficients for the electrical grid in 1990, and energy intensity of buildings (based on a multi-year report for the Western United States), OSU's 1990 emissions from buildings were estimated at 49,855 t CO₂e.

Due to its limited scope, the Good Company estimate could not stand alone as the 1990 emissions baseline; no Scope 3 emissions (air travel, waste, commute, etc.) were included, and some Scope 1 and 2 sources (refrigerants, fleet, etc.) were also missing. However, it does provide some assurance that the 1990 baseline calculated by the OSU Sustainability Office is reasonable.

While a relatively sound estimate for 1990 emissions is important, an exact value for 1990 emissions cannot be calculated. The value of the 1990 baseline is to set a reference point for institutional emissions reductions goals.

Findings Table

Energy

<p>Purchased Electricity (Scope 2)</p>	<p>Corvallis Campus electricity usage for FY 2009 was 91,771,524 kWh.</p> <p>The 14 Agricultural Experiment Stations (AES) consumed 4,438,379 kWh.</p> <p>County Extension offices used 1,656,687 kWh.</p> <p>The Forest Research Lab at Peavy Arboretum used 111,451 kWh.</p> <p>Hatfield Marine Science Center used 1,971,623 kWh.</p> <p>OSU-Cascades Campus consumed 448,880 kWh.</p> <p>Four Extension offices (in Aurora, Hood River, Hermiston and Central Point) are covered in the AES data, as they are combined units of both Extension and AES and share facility space.</p> <p>The CA-CP calculator allowed for a grid mix specific to the electric utility. Using information from Pacific Power, the following grid mix was entered and used for the Corvallis Campus and the OSU-Cascades Campus:</p> <table border="1" data-bbox="815 926 1127 1199"> <thead> <tr> <th>Fuel</th> <th>% of total</th> </tr> </thead> <tbody> <tr> <td>Coal</td> <td>67.5%</td> </tr> <tr> <td>Natural Gas</td> <td>17.6%</td> </tr> <tr> <td>Hydro</td> <td>10.0%</td> </tr> <tr> <td>Wind</td> <td>2.9%</td> </tr> <tr> <td>Biomass</td> <td>1.3%</td> </tr> <tr> <td>Other</td> <td>0.8%</td> </tr> </tbody> </table> <p>The Statewides and HMSC inventories used the Pacific Northwest regional grid mix; the Statewides utilize a number of different utilities each with a different grid mix. The regional mix is the best way to account for this diversity. In future inventories, HMSC will attempt to determine the grid mix of its electrical utility.</p> <p>Total FY09 electricity usage for OSU: 100,650,042 kWh.</p>	Fuel	% of total	Coal	67.5%	Natural Gas	17.6%	Hydro	10.0%	Wind	2.9%	Biomass	1.3%	Other	0.8%
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<p>Natural Gas (Scope 1)</p>	<p>The Corvallis Campus consumed 5,786,280 therms of natural gas in FY09. Most of this was used at the central steam plant.</p> <p>The Agricultural Experiment Stations used a combined 72,290.7 therms.</p> <p>The Extension Service county offices used a total of 30,890 therms.</p> <p>Hatfield Marine Science Center consumed 4,736.8 therms.</p> <p>Cascade campus used 23,352 therms.</p> <p>Total FY09 consumption of natural gas for OSU was: 591,755 MMBtu</p>														

Steam and Chilled water purchased	N/A – no steam or chilled water is purchased from outside sources.
On-campus cogeneration (Scope 1)	The new Energy Center cogeneration facility is currently under construction and is expected to be cogenerating in 2010. Its effect on GHG emissions will be accounted for starting with the GHG inventory of FY10.
Residual oils (#5, #6) and Distillate oils (#1, #2, #3, #4) (Scope 1)	<p>The Corvallis Campus used 66,048 gallons of distillate oil #2 (diesel) primarily at the central steam plant when natural gas supply was curtailed. Backup generators accounted for 1,317 gallons of the total, though this figure may be incomplete. Further recordkeeping is necessary.</p> <p>Agricultural Experiment Stations used 5,692 gallons of diesel #2 for heating.</p> <p>Extension Service consumed 8,140 gallons of diesel #2.</p> <p>HMSC used 1,311 gallons.</p> <p>Total FY09 consumption of distillate oil #2 (diesel) for non-transportation uses was: 82,508 gallons</p>
Propane (Scope 1 & 3)	<p>Total documented propane use at the Corvallis Campus was 15,445 gallons, used mainly for heating, backup generator priming and forklifts. Purchasers of propane are scattered throughout campus and there is no centralized recordkeeping. Propane vendor Amerigas was contacted directly this year, simplifying reporting for OSU staff as well as discovering numerous previously-untracked consumers of propane.</p> <p>Agricultural Experiment Stations used 16,401 gallons of propane for heating, forklifts and backup generators.</p> <p>The Extension Service used 4,524 gallons.</p> <p>HMSC used 24 gallons of propane.</p> <p>Total FY09 consumption of propane: 36,370 gallons.</p>
Incinerated Waste	The Veterinary Medicine Animal Isolation Lab (VMAIL) facility on the Corvallis Campus incinerated 23,594 lbs of waste in FY09. VMAIL was not included because the CA-CP calculator is set up only for incinerators producing electricity.
Coal	N/A – no coal is directly consumed by OSU.
Solar / Wind / Biomass	For the period in question, Kelley Engineering Center is the only location on the Corvallis Campus with photovoltaic (PV) solar generation. The estimated FY09 output was 2300 kWh. This amount was not applied to this inventory as the energy produced reduced the building's electricity use.
	Data sources : Roger Admiral, Director of Forestry Operations; Mac McGuire, Landscape Machinery Maintenance, Facilities Services; Carson Oil; Lisa Plagmann, VMAIL; Maryann Bozza, Project Manager, HMSC; numerous staff contacts at Extension county offices and Ag. Experiment Stations.

Transportation

<p>Fleet and Maintenance (Scope 1)</p>	<p>Gasoline</p> <p>Fossil fuels used in transportation are reported separately from fuels used in stationary sources. OSU has a fuel pump located at the Motor Pool that fills maintenance and fleet vehicles. Total volume dispensed from the tank in FY09 was 108,459 gallons.</p> <p>There is also a credit card system that allows individuals on business trips to fill fleet vehicles wherever they wish. The credit card system recognized 88,399 gallons in purchases.</p> <p>OSU also received deliveries of 370 gallons of gasoline from Carson Oil. This fuel was primarily used in landscape equipment and vehicles.</p> <p>Hyslop farms received 1,276 gallons of gasoline in FY09. The fuel was primarily used in farm vehicles.</p> <p>Hatfield Marine Science Center used 2,948 gallons of gasoline for their fleet.</p> <p>Diesel</p> <p>On the Corvallis Campus, diesel is primarily used in the small diesel fleet run by the Motor Pool as well as in the Campus shuttles. The shuttles are fueled off-campus by First Student, the contracted service provider.</p> <p>Reported diesel use in the fleet was 4,486 gallons.</p> <p>The shuttles used 4,973 gallons of diesel in FY09.</p> <p>HMSC also uses diesel for their research vessels and fleet vehicles. The only ship fuel information available was for the R/V Pacific Storm. Total FY09 diesel consumption for HMSC was 14,122 gallons.</p> <p>Total gasoline in FY09: 201,452 gallons</p> <p>Total diesel used in mobile sources: 26,331 gallons.</p> <p>Data sources: Justin Fleming, Motor Pool Manager; Brian Maxwell, First Student; Carson Oil; Maryann Bozza, HSMC; Gena Conner, Carson Oil.</p>
<p>Directly Financed Travel (Scope 3)</p>	<p>In FY09, 3.19 million miles were reimbursed by Travel Reimbursement.</p> <p>OSU also contracts rental cars through Enterprise Rent-a-Car. Enterprise reported OSU accounts driving 759,137 miles in FY09.</p> <p>OSU Athletics charters buses to provide short- and long-distance transportation to its teams. Using a medium-length route with a known distance and typical cost, an extrapolation was made using bus charter payment information.</p> <p>A one-way trip to Portland Airport from the Corvallis Campus is 98 miles. The standard one-way rate to the airport is \$440 per bus. Total bus expenditures were calculated to be \$299,961. Assuming this rate of \$4.50/mi is representative of all chartered bus travel, Athletics' chartered busses drove 66,658 miles in FY09.</p> <p>In FY09, a reported 3,948,280 car miles were directly financed by OSU.</p> <p>A total of 66,658 bus miles were financed by OSU.</p>

	<p>Data sources: Justin Fleming, Motor Pool Manager; Stacie Carey, Enterprise Rent-a-Car; Jacque Bruns, OSU Athletics.</p>														
<p>Commute (Scope 3)</p>	<p>This inventory relied on a 2003 commute survey commissioned by OSU. Data from the Travel Survey Report offer the following mode split:</p> <table border="1" data-bbox="685 365 1269 638"> <thead> <tr> <th>Mode Split</th> <th>% of total</th> </tr> </thead> <tbody> <tr> <td>Bike</td> <td>10%</td> </tr> <tr> <td>Walk</td> <td>25%</td> </tr> <tr> <td>Bus</td> <td>3%</td> </tr> <tr> <td>Single occupancy vehicle (SOV)</td> <td>56%</td> </tr> <tr> <td>Carpool</td> <td>5%</td> </tr> <tr> <td>OSU shuttle</td> <td>2%</td> </tr> </tbody> </table> <p>It is assumed each person made one trip to campus per day. Students and staff/faculty were counted separately in the calculator. The Registrar's office indicated there are 146 teaching days per year (excluding summer) and that number was used for commuting days for students. Staff and faculty were counted at 235 commute days per person per year.</p> <p>An average commute distance of 5 miles was used and based jointly on the 2003 OSU commute survey, and a 2003 Portland State University GHG inventory estimated commute distance of 7.5 miles. While Corvallis is a much smaller community, many students commute from outside the area. More accurate information on commuting distances is needed to definitively determine commute emissions. This estimated distance was also applied to the OSU-Cascades Campus. While the estimation is reasonable, further commuting studies should be performed to better model commute patterns there.</p> <p>Staff and faculty FTE provided by Institutional Research include OSU-Cascades Campus, AES, Extension and the FRL. Commute distance and mode splits are most likely different from those of Corvallis Campus, yet no reliable commute data exists for these auxiliaries.</p> <p>Summer students were not included in commute calculations.</p>	Mode Split	% of total	Bike	10%	Walk	25%	Bus	3%	Single occupancy vehicle (SOV)	56%	Carpool	5%	OSU shuttle	2%
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	<p>Data sources: Robert Monasky, Campus Planner, Facilities Services; Patty McIntosh, Planning Manager, Facilities Services; Steve Edwards, Institutional Research</p>														
<p>Air Travel (Scope 3)</p>	<p>OSU primarily uses two travel agents: Teel's Travel Planners and Azumano Travel. Both provided significant amounts of information, as well as advice and guidance. Air travel is reimbursed by OSU's Travel Reimbursement office.</p> <p>Azumano Travel provided a report detailing all OSU activity booked through their firm and included mileage, number of trip segments and cost. Teel's Travel provided total number of trip segments booked by their firm for OSU groups. OSU Travel Reimbursement provided a similar list. All of these reports included non-packaged, non-tour Athletics travel.</p> <p>Since Azumano had a complete report of mileage and number of segments, and both Teel's and Travel Reimbursement provided number of segments, we could extrapolate using Azumano's mileage information.</p>														

Company	# of flights	% of total
Azumano	12,666	57.3%
Teel's Travel	7,998	36.2%
Travel Reimbursement	1,434	6.5%
	22,098	100.0%

The extrapolation and calculation are as follows:

Azumano booked 14,566,435 miles for OSU.

$$\frac{12,666 \text{ Azumano flights}}{14,566,435 \text{ Azumano miles}} = \frac{22,098 \text{ total flights}}{\text{x total miles}}$$

$$\text{x} = 25,413,634 \text{ total miles}$$

Both Teel's and Azumano stated that approximately 5% of flights will not appear in their records due to the way a couple of airlines (notably JetBlue and Southwest) ticket. One final extrapolation is needed:

$$\text{Total OSU air mileage} = (1/.95) * 25,413,634 = 26,751,193 \text{ miles}$$

All air travel emissions were applied to the OSU Corvallis Campus inventory due to lack of specific data for non-Corvallis sites.

Assumptions: Travel booked through Azumano is representative of all OSU travel.

For each away game, the OSU Football team charters an Airbus 320 to take the team from Eugene, OR to the game destination. Using the 2009 schedule and Webflyer.com, an airport distance calculator, the calculated distance flown by chartered Football jets was 6,464 miles.

The European Environmental Agency¹ has fuel burn rates for numerous jetliners. It is estimated that for a 2,482 mile flight, an A320 will burn 11,608 kg of jet fuel.

The following calculations were made separate from the CA-CP calculator, as it is not equipped to accurately calculate emissions resulting from an dedicated jet flight:

$$\frac{11,608 \text{ kg fuel}}{2482 \text{ mi}} \times \frac{1 \text{ gal jet fuel}^2}{3.06 \text{ kg fuel}} \times \frac{21.095 \text{ lb CO}_2^2}{1 \text{ gal jet fuel}} \times \frac{1 \text{ mt}}{2205 \text{ lbs}} = \frac{0.0146 \text{ t CO}_2}{\text{mi}}$$

$$\frac{0.0146 \text{ t CO}_2}{\text{mi}} \times 6,464 \text{ miles} = 94.5 \text{ t CO}_2 \times 2.8 \text{ RFI} = 264.6 \text{ t CO}_2\text{e}$$

Emissions resulting from chartered football air travel are reported under the Directly Financed Travel category.

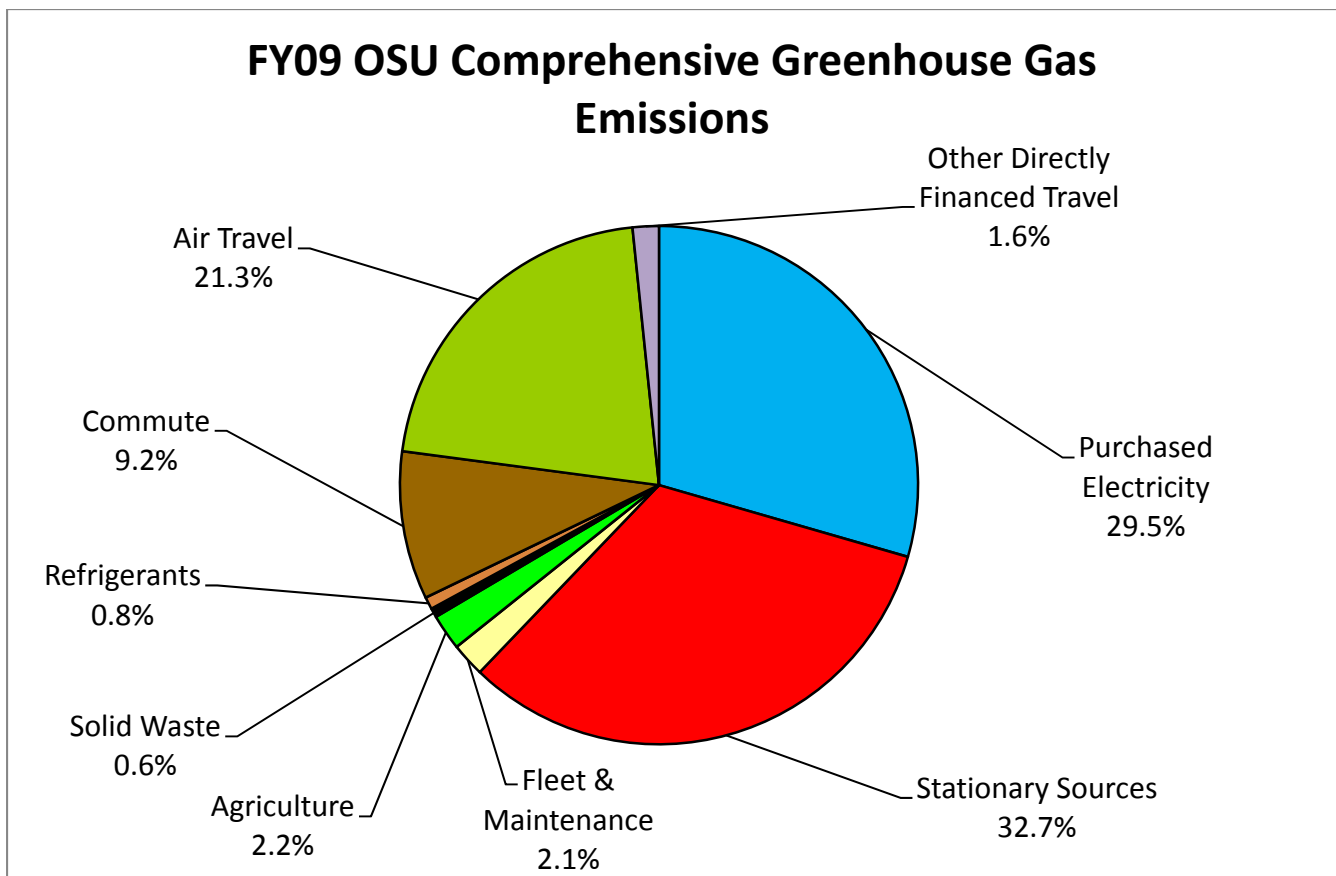
Data sources: Brad Teel, President, Teel's Travel Planners; Tony Fuerte, Corporate Accounts Manager, Azumano Travel; Julie Stratton, Business Affairs; Webflyer.com; ¹ - European Environmental Agency Emission Inventory Guidebook <http://www.eea.europa.eu/publications/EMEPCORINAIR4>; ² - Energy Information Agency <http://www.eia.doe.gov/oiaf/1605/coefficients.html>

Other Major Sources

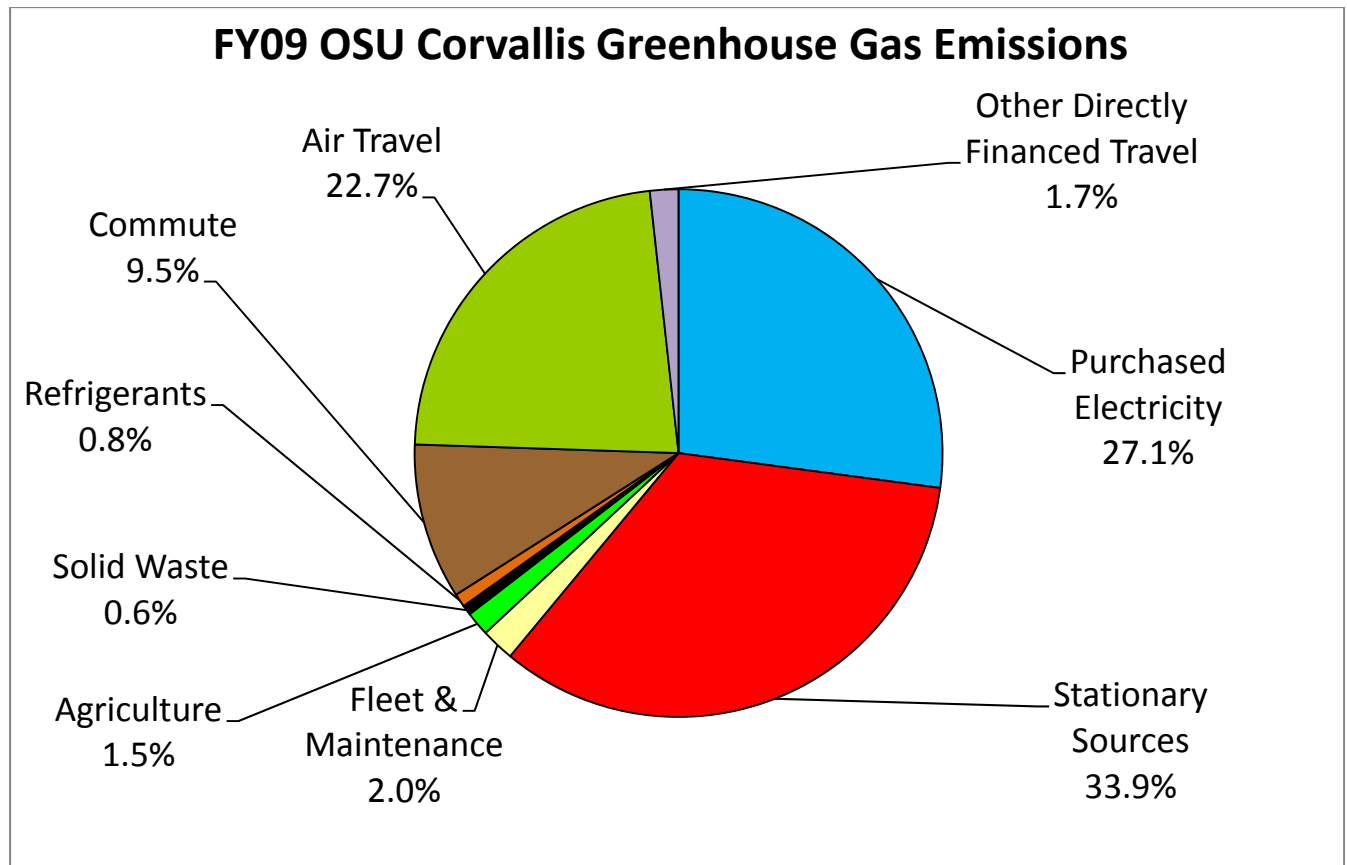
<p>Solid Waste (Scope 3)</p>	<p>Total weight of solid waste sent to Coffin Butte Landfill in FY09: 7,188,000 million lbs. (3,594 tons).</p> <p>Coffin Butte recovers methane and produces power, but it is unknown how much methane produced could be attributed to OSU waste.</p> <p>No solid waste information was available for the Statewides, HMSC or OSU-Cascades Campus.</p> <p>Data source: Pete Lepre, Campus Recycling Manager</p>																																																																								
<p>Animals and Agriculture (Scope 1)</p>	<p>Animals Animals are raised and cared for at several OSU facilities. Their totals are displayed in the table below.</p> <table border="1" style="width: 100%; border-collapse: collapse; margin: 10px 0;"> <thead> <tr> <th style="text-align: left;">Type</th> <th style="text-align: center;">Animal Science</th> <th style="text-align: center;">Union Station</th> <th style="text-align: center;">Burns Station</th> <th style="text-align: center;">Vet Med</th> <th style="text-align: center;">Total</th> </tr> </thead> <tbody> <tr> <td>Dairy Cows</td> <td style="text-align: center;">229</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> <td style="text-align: center;">229</td> </tr> <tr> <td>Beef Cattle</td> <td style="text-align: center;">170</td> <td style="text-align: center;">280</td> <td style="text-align: center;">311</td> <td style="text-align: center;">0.1</td> <td style="text-align: center;">761</td> </tr> <tr> <td>Horses</td> <td style="text-align: center;">26</td> <td style="text-align: center;">2</td> <td style="text-align: center;">5</td> <td style="text-align: center;">5.4</td> <td style="text-align: center;">38</td> </tr> <tr> <td>Poultry</td> <td style="text-align: center;">1,300</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> <td style="text-align: center;">1,300</td> </tr> <tr> <td>Sheep</td> <td style="text-align: center;">951</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> <td style="text-align: center;">0.1</td> <td style="text-align: center;">951</td> </tr> <tr> <td>Swine</td> <td style="text-align: center;">13</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> <td style="text-align: center;">0.1</td> <td style="text-align: center;">13</td> </tr> <tr> <td>Goats</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> <td style="text-align: center;">0.1</td> <td style="text-align: center;">0</td> </tr> </tbody> </table> <p>The College of Veterinary Medicine provided the number of treatment days for each type of animal. This annual total was divided by 365, giving a yearly equivalent for each type. One category, 'large animals' was determined to be mostly llamas and alpacas. Because the Clean Air-Cool Planet calculator had no category or emissions factor for camelids, these animals were categorized as sheep because of their size and type of digestion system.</p> <p>Emissions from animals kept at the Burns and Union stations were reported under the Statewides inventory. Emissions from Animal Science and Vet Med were reported under the OSU Corvallis Campus inventory.</p> <p>Fertilizer</p> <table border="1" style="width: 100%; border-collapse: collapse; margin: 10px 0;"> <thead> <tr> <th style="text-align: left;">Location</th> <th style="text-align: center;">Weight (lbs)</th> <th style="text-align: center;">% Nitrogen</th> </tr> </thead> <tbody> <tr> <td>Burns</td> <td style="text-align: center;">800</td> <td style="text-align: center;">45%</td> </tr> <tr> <td>Union</td> <td style="text-align: center;">18,000</td> <td style="text-align: center;">45%</td> </tr> <tr> <td>Dairy</td> <td style="text-align: center;">6,000</td> <td style="text-align: center;">40%</td> </tr> <tr> <td>Corvallis Grounds</td> <td style="text-align: center;">3,200</td> <td style="text-align: center;">20%</td> </tr> <tr> <td>Soap and Berry Creek</td> <td style="text-align: center;">44,250</td> <td style="text-align: center;">40%</td> </tr> <tr> <td>Ag. Exp. Stations</td> <td style="text-align: center;">139,905</td> <td style="text-align: center;">31%</td> </tr> <tr> <td>Total</td> <td style="text-align: center;">212,155</td> <td style="text-align: center;">34%</td> </tr> </tbody> </table> <p>Fertilizer application on OSU grounds is inadequately tracked. Even so, this emissions source is likely small. Emissions from fertilizer applied to Burns, Union and AES grounds were reported in the Statewides inventory. Emissions from the</p>	Type	Animal Science	Union Station	Burns Station	Vet Med	Total	Dairy Cows	229	-	-	-	229	Beef Cattle	170	280	311	0.1	761	Horses	26	2	5	5.4	38	Poultry	1,300	-	-	-	1,300	Sheep	951	-	-	0.1	951	Swine	13	-	-	0.1	13	Goats	-	-	-	0.1	0	Location	Weight (lbs)	% Nitrogen	Burns	800	45%	Union	18,000	45%	Dairy	6,000	40%	Corvallis Grounds	3,200	20%	Soap and Berry Creek	44,250	40%	Ag. Exp. Stations	139,905	31%	Total	212,155	34%
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	<p>Dairy, Corvallis Campus grounds and the Soap Creek and Berry Creek cattle ranches were reported in the OSU Corvallis Campus inventory.</p> <p>Data sources: Nora Ross, Asst. to the Chair, Animal Science Dept.; Debrah Rarick, Asst. to the Dean, College of Veterinary Medicine; Tim DelCurto, Superintendent, Union Station; Norm Brown, OSU Landscape</p>														
<p>Refrigerants (Scope 1)</p>	<p>Refrigerants can be powerful greenhouse gases and their tracking is required by the EPA. Small amounts can escape during typical equipment use or in cases of equipment failure. The following table outlines the type and amount of refrigerants used for FY09:</p> <table border="1" data-bbox="803 569 1151 867"> <thead> <tr> <th>Refrigerant</th> <th>Weight (lbs)</th> </tr> </thead> <tbody> <tr> <td>CFC-12</td> <td>100</td> </tr> <tr> <td>HCFC-22</td> <td>241.25</td> </tr> <tr> <td>HFC-404A</td> <td>6.5</td> </tr> <tr> <td>R-409A</td> <td>9</td> </tr> <tr> <td>MP 39</td> <td>12.5</td> </tr> <tr> <td>R-22</td> <td>86</td> </tr> </tbody> </table>	Refrigerant	Weight (lbs)	CFC-12	100	HCFC-22	241.25	HFC-404A	6.5	R-409A	9	MP 39	12.5	R-22	86
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<p>Offsets (green tags, RECs, composting etc.)</p>	<p>Data source: Greg Riutzel, Refrigeration Mechanic, Facilities Services</p> <p>Renewable Energy Credits (RECs) Total offsets for FY09: 66,782 MWh. RECs were purchased with student fee and self-directed public purpose charge money. All offsets were applied to the OSU Corvallis inventory.</p> <p>Offsets with Additionality Approximately 15 tons of waste is composted by various campus entities. The Organic Growers Club, Crop and Soil Sciences Department and the Student Sustainability Initiative compost dairy solids, pre-consumer food waste from campus dining centers and landscape debris. OSU's waste hauler, Allied Waste, has indicated intent to accept greater amounts of food waste from the dining centers. OSU-based waste composted offsite by a third party such as Allied Waste will not be counted as an offset by OSU. The benefit of this type of composting is instead realized in the reduced reported weight of landfill solid waste.</p>														

MODULE	FY09 OSU-Comprehensive							
WORKSHEET	Emissions Summary							
UNIVERSITY	Oregon State University							
	2009	Energy Consumption	CO2	CH4	N2O	eCO2	% change from FY08	
		MMBtu	kg	kg	kg	Metric Tonnes		
Scope 2	Purchased Electricity	959,644.5	70,859,755.9	1,423.9	1,179.4	71,241.6	-7.9%	
Scope 1	Stationary Sources	606,094.9	32,225,846.4	3,272.8	71.5	32,322.3	-6.4%	
	Fleet & Maintenance	28,828.2	2,030,029.2	366.5	127.9	2,076.3	12.6%	
	Refrigerants	-	-	-	-	755.1	0.0%	
	Agriculture	-	-	79,461.4	1,318.3	2,217.8	-6.7%	
Scope 3	Faculty / Staff Commuting	32,938.0	2,311,011.7	455.9	157.2	2,545.5	0.2%	
	Student Commuting	91,689.3	6,433,156.0	1,269.0	437.6	6,591.9	2.1%	
	Air Travel	105,399.7	20,693,910.7	203.8	234.2	21,032.5	-10.6%	
	Other Directly Financed Travel	22,414.9	1,572,266.2	312.1	107.5	1,611.3	3.9%	
	Solid Waste	-	-	25,101.0	-	577.3	61.5%	
	Scope 2 T&D Losses	94,909.9	7,008,107.7	140.8	116.6	7,045.9	-7.9%	
Offsets	Additional					(5.8)	0.0%	
	Non-Additional					(49,158.1)	-7.2%	
Totals	Scope 1	634,923.1	34,255,875.7	83,100.7	1,517.7	37,371.5	-5.4%	
	Scope 2	959,644.5	70,859,755.9	1,423.9	1,179.4	71,241.6	-7.9%	
	Scope 3	347,351.7	38,018,452.4	27,482.6	1,053.2	39,404.4	-6.4%	
	All Scopes	1,941,919.3	143,134,084.0	112,007.2	3,750.2	148,017.5	-6.9%	
	All Offsets					(49,163.9)	-7.2%	
						Net Emissions:	98,853.7	-6.7%

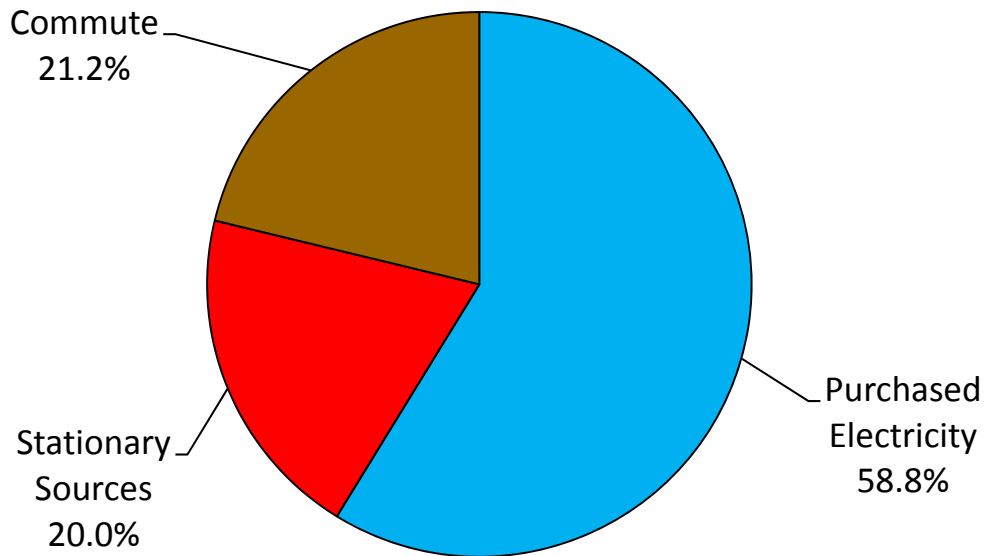


MODULE	FY09 OSU-Corvallis							
WORKSHEET	Emissions Summary							
UNIVERSITY	Oregon State University							
	2009	Energy Consumption	CO2	CH4	N2O	eCO2	% Change from FY08	
		MMBtu	kg	kg	kg	Metric Tonnes		
Scope 2	Purchased Electricity	915,228.6	67,194,728.8	1,376.1	1,103.0	67,552.9	-8.0%	
Scope 1	Stationary Sources	589,255.6	31,282,153.9	3,164.4	67.8	31,375.0	-6.4%	
	Fleet	26,332.4	1,850,232.6	352.6	122.1	1,894.5	14.3%	
	Refrigerants	-	-	-	-	755.1	0.0%	
	Agriculture	-	-	52,006.4	585.2	1,369.4	-0.5%	
Scope 3	Faculty / Staff Commuting	32,638.9	2,290,026.1	451.7	155.8	2,346.5	0.0%	
	Student Commuting	90,163.6	6,326,108.3	1,247.9	430.3	6,482.2	2.2%	
	Directly Financed Air Travel	105,399.7	20,693,910.7	203.8	234.2	21,032.5	-10.6%	
	Other Directly Financed Travel	22,414.9	1,572,266.2	312.1	107.5	1,611.3	3.9%	
	Solid Waste	-	-	25,101.0	-	577.3	61.5%	
	Scope 2 T&D Losses	90,517.1	6,645,632.5	136.1	109.1	6,681.1	-8.0%	
Offsets	Additional					(5.8)	0.0%	
	Non-Additional					(49,158.1)	-7.2%	
Totals	Scope 1	615,588.0	33,132,386.5	55,523.4	775.1	35,394.0	-5.2%	
	Scope 2	915,228.6	67,194,728.8	1,376.1	1,103.0	67,552.9	-8.0%	
	Scope 3	341,134.1	37,527,943.8	27,452.6	1,036.9	38,730.9	-6.4%	
	All Scopes	1,871,950.8	137,855,059.2	84,352.1	2,915.0	141,677.7	-6.9%	
	All Offsets					(49,163.9)	-7.2%	
						Net Emissions:	92,513.8	-6.7%



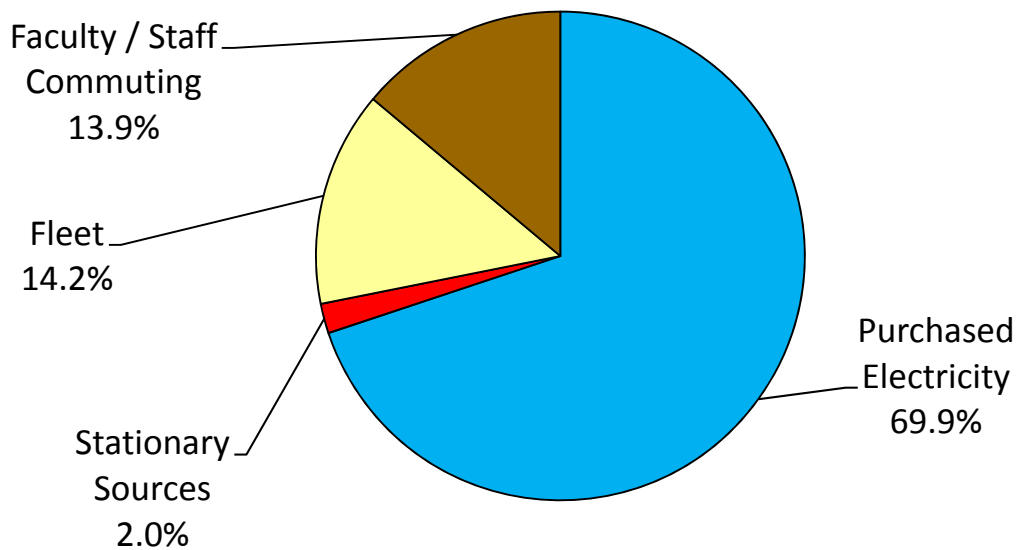
MODULE	FY09 OSU-Cascades						
WORKSHEET	Emissions Summary						
UNIVERSITY	Oregon State University						
	2009	Energy Consumption	CO2	CH4	N2O	eCO2	% Change from FY08
		MMBtu	kg	kg	kg	Metric Tonnes	
Scope 2	Purchased Electricity	4,476.6	328,668.1	6.7	5.4	330.4	3.3%
Scope 1	Stationary Sources	2,335.2	123,195.2	12.3	0.2	123.6	15.1%
Scope 3	Faculty / Staff Commuting	299.1	20,985.6	4.1	1.4	21.5	35.7%
	Student Commuting	1,525.7	107,047.7	21.1	7.3	109.7	0.0%
	Scope 2 T&D Losses	442.7	32,505.6	0.7	0.5	32.7	3.3%
Totals	Scope 1	2,335.2	123,195.2	12.3	0.2	123.6	15.1%
	Scope 2	4,476.6	328,668.1	6.7	5.4	330.4	3.3%
	Scope 3	2,267.6	160,539.0	25.9	9.2	163.9	4.3%
	All Scopes	9,079.4	612,402.2	45.0	14.9	617.8	5.7%
Net Emissions:						617.8	5.7%

FY09 OSU-Cascades Greenhouse Gas Emissions



MODULE	FY09 OSU-Cascades						
WORKSHEET	Emissions Summary						
UNIVERSITY	Oregon State University						
	2009	Energy Consumptio	CO2	CH4	N2O	eCO2	% Change from FY08
		MMBtu	kg	kg	kg	Metric Tonnes	
Scope 2	Purchased Electricity	4,476.6	328,668.1	6.7	5.4	330.4	3.3%
Scope 1	Stationary Sources	2,335.2	123,195.2	12.3	0.2	123.6	15.1%
Scope 3	Faculty / Staff Commuting	299.1	20,985.6	4.1	1.4	21.5	35.7%
	Student Commuting	1,525.7	107,047.7	21.1	7.3	109.7	0.0%
	Scope 2 T&D Losses	442.7	32,505.6	0.7	0.5	32.7	3.3%
Totals	Scope 1	2,335.2	123,195.2	12.3	0.2	123.6	15.1%
	Scope 2	4,476.6	328,668.1	6.7	5.4	330.4	3.3%
	Scope 3	2,267.6	160,539.0	25.9	9.2	163.9	4.3%
	All Scopes	9,079.4	612,402.2	45.0	14.9	617.8	5.7%
Net Emissions:						617.8	5.7%

FY09 OSU Hatfield Marine Science Center Greenhouse Gas Emissions



MODULE	FY09 OSU-Statewides						
WORKSHEET	Emissions Summary						
UNIVERSITY	Oregon State University						
	2009	Energy Consumption	CO2	CH4	N2O	eCO2	% Change from FY08
		MMBtu	kg	kg	kg	Metric Tonnes	
Scope 2	Purchased Electricity	30,280.1	2,529,473.9	31.1	53.8	2,546.1	-6.0%
Scope 1	Stationary Sources	14,030.4	795,508.0	93.6	3.4	798.7	-5.9%
	Agriculture	-	-	27,455.0	733.1	848.5	-15.2%
Scope 3	Scope 2 T&D Losses	2,994.7	250,167.8	3.1	5.3	251.8	-6.0%
Totals	Scope 1	14,030.4	795,508.0	27,548.6	736.5	1,647.1	-10.9%
	Scope 2	30,280.1	2,529,473.9	31.1	53.8	2,546.1	-6.0%
	Scope 3	2,994.7	250,167.8	3.1	5.3	251.8	-6.0%
	All Scopes	47,305.2	3,575,149.7	27,582.8	795.7	4,445.1	-7.9%
Net Emissions:						4,445.1	-7.9%

FY09 OSU Statewides Greenhouse Gas Emissions

