**OREGON INSTITUTE OF TECHNOLOGY**

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**CLIMATE ACTION PLAN**

**April 13, 2010**



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10. **Executive Summary**

The Oregon Institute of Technology (OIT) is a small (approximately 3,000 undergraduate students), public university located primarily in Klamath Falls, OR. OIT’s commitment to sustainability education and renewable technologies began in 1964, when the campus was designed based on maximizing the use of the area’s geothermal resources. In subsequent years, OIT became known for the Geo-Heat and Renewable Energy Centers that provide expertise and education on sustainable technologies both for the state and internationally.

Based on data that show an increase in global temperatures due to human-produced greenhouse gas (GHS) emissions, there is an urgent need to mitigate emissions from all sectors—public, private, non-profit, individual and population-based. Colleges and universities are in a unique position to not only reduce greenhouse gas emissions associated with operating large facilities, but also to use initiatives and efforts as part of an educational strategy to prepare students to be leaders in mitigating the causes and impacts of climate change. With OIT’s geothermal and solar resources, renewable energy engineering and other sustainability-related programs, it makes sense for OIT to commit to an aggressive plan for exceeding Oregon State requirements by becoming climate neutral by 2050.

This initial climate action plan has been composed for the OIT Klamath Falls campus. OIT’s Klamath Falls campus will achieve climate neutrality through a combination of conservation and retrocommissioning projects suggested by the consulting firm, McKinstry, in a 2009 report prepared for the Oregon University System; innovative renewable energy projects such as a “large” geothermal power plant and a solar concentrating facility; purchase of offsets for travel-related and other unmitigated emissions; and curricular, co-curricular, research, and public engagement activities. Through these efforts, OIT will be a leader in sustainable technologies and carbon emission reduction strategies in Southern Oregon by reducing its own emissions and by providing its graduates with essential skills and first-hand experience to influence GHG emissions reductions at their future places of employment. As this document is revised and updated in coming years, more detail will be provided on the emissions, programs and plans for the OIT satellite campuses.

1. **Introduction**

The global average temperature has increased approximately 1.4 degrees F in the last 100 years and is expected to rise 2.5-10.5 degrees F in the next 100 years (NASA, n.d.). The 2007 report from the United Nations Intergovernmental Panel on Climate Change (IPCC) found that “global warming is unequivocal” and is already resulting in significant and potentially irrevocable environmental changes across the planet (IPCC, 2007). The US National Oceanic and Atmospheric Administration (NOAA) (2009) reports that the current atmospheric concentration of the heat-trapping greenhouse gas (GHG), carbon dioxide (CO2), is 386 parts per million (ppm) and is a result of anthropogenic activities such as burning of fossil fuels, agriculture, industry, and production of energy; this is in comparison to the 280 ppm in the atmosphere between the 18th and 19th centuries.

Institutions of higher education have the potential to influence these trends by not only mitigating causes of climate change, but also educating and influencing current and future leaders on climate change mitigation technologies and practices. The American College and University Presidents Climate Commitment (ACUPCC) claims that “no other institution in society has the influence, the critical mass and the diversity of skills needed to successfully reverse global warming” (ACUPCC, n.d., ¶ 2). Through building a geothermally-heated campus in 1964, creating the Geo-Heat Center in 1975, and establishing the Oregon Renewable Energy Center (OREC) in 2001, the Oregon Institute of Technology (OIT) has been leading the state of Oregon in greenhouse gas emissions mitigation technologies for over 30 years. OIT also offers the Country’s first and currently only, Renewable Energy Engineering program supported by a location in Klamath Falls that provides extensive geothermal and solar resources.

On November 16, 2007, Interim President Dr. David Woodall signed the American College and University Presidents Climate Commitment (ACUPCC) and committed OIT to creating institutional structures to promote climate neutrality; completing annual greenhouse gas emissions inventories; developing a plan for becoming climate neutral and incorporating sustainability concepts into the curriculum; and tracking progress on goals and actions. In 2007, OIT’s greenhouse gas emissions totaled approximately 9,940 metric tons of carbon dioxide equivalent (MTCO2e). Through a combination of building retrocommissioning, conservation projects, renewable energy development, carbon offset purchases, tracking of greenhouse gas emissions, and academic programs that include teaching sustainability principles and practices, OIT will achieve climate neutrality by 2050. Climate neutrality is defined by the ACUPCC (2007) as “having no net GHG emissions, to be achieved by minimizing GHG as much as possible, and using carbon offsets or other measures to mitigate the remaining emissions. To achieve climate neutrality under the terms of the [ACUPCC] commitment, all Scope 1 and 2 emissions, as well as those Scope 3 emissions from commuting and air travel paid for by or through the institution, must be neutralized (p.29).” Scope 1, 2, and 3 emissions are defined in Section 4.1.

1. **Background**

**3.1 National and global issues in Climate Change**

NOAA scientist, James Hansen and colleagues (2008), established that in order to prevent the effects of climate change such as dramatic changes in weather trends, melting ice caps, rising sea levels, mass extinction of species, and human conflicts caused by increasingly limited resources, it is estimated that the atmosphere must return to pre-1990 levels—approximately 350 ppm of atmospheric CO2e. The Kyoto Protocol, the primary international greenhouse gas emission agreement, calls for reductions in emissions of 5% below 1990 levels between 2008 and 2012 (United Nations, 1998). Although the United States has not signed the Kyoto Protocol, many state, county, and city governments have set goals comparable to the Kyoto Protocol.

* 1. **Oregon State requirements**

The Oregon legislature established a goal to arrest greenhouse gas emissions growth in House Bill 3543 in 2007. The bill declares that Oregon greenhouse gas emissions will begin to be reduced by 2010, be reduced 10% below 1990 levels of emissions by 2020, and be reduced 75% below 1990 levels by 2050 (74th Oregon, 2007). Executive Order 06-02 requires all new state buildings and major renovations to meet the US Green Building Council’s Leadership in Energy and Environmental Design (LEED) program’s “Silver” standards (Office of the Governor, 2006). LEED encourages energy conservation, on-site renewable energy sources, and “green” power sources. Oregon Revised Statute (ORS) 276.900, State Energy Efficient Design (SEED), stipulates that State of Oregon facilities constructed or purchased by authorized state agencies must be designed, constructed, renovated and operated so as to minimize the use of nonrenewable energy resources and to serve as models of energy efficiency (State, 2010). In addition, the 2007 Oregon Legislature passed HB 2620 which requires that public entities spend 1.5% of the total contract price of a public improvement contract for new construction or major renovation of a public building on solar energy technology (State, 2010). Lastly, the Oregon University System (OUS) supports clean technologies and green energy investments that will create new jobs and ensure wise and sustainable management of Oregon’s natural resources (OUS, n.d.) and has supported all seven institutions in signing the ACUPCC.

* 1. **ACUPCC**

Interim President Dr. David Woodall signed the American College and University Presidents Climate Commitment (ACUPCC) on November 16, 2007. The ACUPCC, modeled after the US Mayor’s Climate Protection Agreement, is an effort to make campuses “more sustainable and address global warming by garnering institutional commitments to reduce and ultimately neutralize greenhouse gas emissions on campus” (ACUPCC, n.d. p.1). As an ACUPCC signatory, within two years of signing the document, OIT is obligated to develop an institutional plan for becoming climate neutral. The document must include the following:

1. A target date for achieving climate neutrality as soon as possible.
2. Interim targets for goals and actions that will lead to climate neutrality.
3. Actions to make climate neutrality and sustainability a part of the curriculum and other educational experiences for all students.
4. Actions to expand research or other efforts necessary to achieve climate neutrality.
5. Mechanisms for tracking progress on goals and actions.

This document fulfills the ACUPCC requirements for the institutional plan.

* 1. **The History of Sustainability at OIT**

OIT has been actively participating in sustainability efforts and education since the Geo-Heat Center began operating in 1974. The efforts of the Geo-Heat Center to provide resources and information about geothermal capacity-building were complimented by the legislative establishment of the Oregon Renewable Energy Center at OIT in 2001. Since that time, there have been numerous initiatives and groups working to make sustainability a more integral part of all campus operations. The Sustainability Task Force, for example, convened in 2006 in preparation for the Strategic Planning Initiative, 2017. As a result of the Task Force’s White Paper, sustainability was included in OIT’s Strategic Plan for 2017: “OIT will be in the forefront of the higher education sustainability movement in the areas of campus operations, academics, and community involvement. OIT will develop campus operations that utilize and model the greatest degree of sustainability possible. OIT will make sustainability an educational priority; key concepts will be integrated into all levels of the curriculum and community” (OIT, 2007).

A Sustainability Plan was created in 2008 to support OIT’s sustainability mission and defined goals in Plan Administration, Monitoring, and Reporting, Academics, Community (OIT Campus), Energy, Facilities, Food, Greater Community, Landscape, Procurement, Research, Transportation, Waste, and Water. Annual assessments are conducted to track progress in each category. The goal of Facilities Services is defined as enhancing “the educational experience of OIT students through fiscally responsible and environmentally sustainable practices that conserve resources and reduce pollution and waste” (Wittmer, 2008, p. 20). At the same time, and with the assistance from the OUS, greenhouse gas emissions inventories were conducted for years 1990, 2004, 2005, 2006, 2007, and 2008 in compliance with ACUPCC requirements.

As of May 2010, OIT will also be a charter member of the Sustainability, Tracking, and Rating System (STARS) created by the Association for the Advancement of Sustainability in Higher Education (AASHE). STARS will serve as an annual tracking and reporting tool for progress in the areas of Education and Research; Operations; and Planning, Administration, and Engagement.

1. **Campus Emissions**
   1. **Introduction**

The Intergovernmental Panel on Climate Change (IPCC) defines greenhouse gases (GHGs) as “gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of thermal infrared radiation emitted by the Earth’s surface, the atmosphere itself, and by clouds” (IPCC, 2007). Water vapor (H2O), carbon dioxide (CO2), nitrous oxide (N20), methane (CH4) and ozone (O2) are the primary greenhouse gases in the Earth’s atmosphere. Other greenhouse gases are entirely human-made, such as the halocarbons and other chlorine and bromine containing substances. The Kyoto Protocol and the ACUPCC require six categories of GHGs to be tracked and reported: carbon dioxide (CO2), nitrous oxide (N20), sulfur hexafluoride (SF6), methane (CH4), hydroflurocarbons (HFCs), and perfluorocarbons (PFCs). For calculation and discussion, it is standard for all greenhouse gas emissions to be converted to a carbon dioxide equivalent (CO2e).

Greenhouse gases are often discussed in terms of their “global warming potential” or GWP. The United States Environmental Protection Agency (EPA) defines GWP as “the cumulative radiative forcing effects of a gas over a specified time horizon resulting from the emission of a unit mass of gas relative to a reference gas.” For example, the reference gas, CO2 has a GWP of 1, whereas methane (CH4) has a GWP of approximately 25, and HFC-134a, a common refrigerant, has a GWP of 1,430.

Many reporting organizations, including The Climate Registry and the ACUPCC, differentiate greenhouse gas emissions according to three scopes.

* Scope 1 emissions are direct GHG emissions occurring from sources that are owned or controlled by the institution. These can include emissions from stationary and mobile combustion, process emissions, and fugitive emissions (such as fertilizer and refrigerants).
* Scope 2 emissions are indirect GHG emissions that are a consequence of activities that take place within the organizational boundaries of the institution, but that occur at sources owned or controlled by another entity. These include emissions from purchased electricity, purchased heating and cooling, and purchased steam.
* Scope 3 emissions are all indirect emissions not covered in Scope 2. This category can include emissions that result from commuting, air travel, solid waste disposal (including recyclables), waste water treatment, embodied emissions, and other sources.

The Oregon Institute of Technology has set a goal of climate neutrality by 2050. The interim target is in accordance with Oregon State requirements to reduce GHG emissions to 10% below 1990 levels by 2020. Although the State of Oregon only requires reduction of GHG emissions to 75% below 1990 levels by 2050, OIT has committed to exceeding that requirement by being climate neutral by 2050.

* 1. **Methodology**

The first step in every greenhouse gas emissions report and climate action plan is to define boundaries. All GHG inventories conducted thus far for OIT have included only the buildings, population and travel related to the Klamath Falls campus. Future GHG inventories will encapsulate OIT’s other campuses, including those in Portland and Seattle. For this reason, OIT’s Climate Action Plan is a living document—one that will be revised and updated on a regular basis.

Greenhouse gas tracking and reporting for the OIT Klamath Falls campus began in 2004 through an Oregon University System contract with the Good Company based out of Eugene, OR. The Good Company assessed GHG emissions at each OUS institution for the 2004 fiscal year (FY). In 2008, an OUS contract with Sightlines, a knowledge and data consulting company, was expanded to include collection and synthesis of greenhouse gas data for fiscal years 2004 through 2008. Although Sightlines presented data using their own graphing and presentation standards, they used version 5.0 of the Clean-Air Cool-Planet carbon calculator to calculate the equivalent carbon dioxide (CO2e) emissions for fiscal years 2004 through 2008.

In February of 2009, OIT hired an energy analyst to analyze and report GHG emissions as part of its ACUPCC commitment. The OIT energy analyst began working with Sightlines and the Oregon University System to verify previously acquired data and to continue tracking ongoing GHG emissions. GHG tracking methodology includes working with OIT facilities and business office staff and using the Clean-Air Cool-Planet carbon calculator. Facilities and business office staff have been and continue to remain key in tracking GHG-related data. The OIT facilities office tracks electricity and natural gas consumption, waste production data, refrigerant and fertilizer use, and water consumption data. Table 4.1 outlines data tracked, how it has been tracked prior to the climate action plan, and the proposed plan for tracking it in the future.

Table 4.1. OIT GHG Data Collection Methodologies.

|  |  |  |
| --- | --- | --- |
| **Data** | **Previous methodology (prior to 2010)** | **Future methodology (2010 onward)** |
| Electricity and Natural Gas | Values taken from physical bills and recorded in electronic form by facility services business manager. Direct-digital-controls (DDC) records tracked by heating-ventilation-air conditioning (HVAC) engineer | Values taken from on-line bills by energy analyst, DDC records tracked by HVAC engineer and sent to energy analyst |
| Fertilizers | Aggregated from bills by facilities services business manager | Aggregated from bills by facilities services business manager and sent to energy analyst |
| Refrigerants | Tracked by HVAC engineer and reported to facility services business manager | Tracked by HVAC engineer and reported to energy analyst |
| Solid Waste | Aggregated from facilities bills by facility services business manager | Aggregated from facilities, college union and student housing waste management bills by recyclemania/sustainability coordinator and energy analyst |
| Water (well and waste) | Well water records kept by co-gen engineer; waste water records aggregated from bills by facility services business manager | Well water records kept manually by co-gen engineer and entered electronically by energy analyst; waste water records aggregated from physical bills and entered electronically by energy analyst |
| Air travel | Air travel expenditures collected from business office and OIT travel agent (Jackson Travel) | Air travel mileage collected and recorded by business office, sent to energy analyst and cross referenced with Jackson Travel |
| Campus fleet fuel use | Recorded by facility services fleet mechanic and reported to facility services business manager | Recorded by facility services fleet mechanic and reported to energy analyst |
| Faculty/Staff/Student Commuting | Estimated from a commuting survey designed by OIT Civil Engineering Professor | Appropriate methodology needs to be established by energy analyst and OIT Business Office |
| Procurement | Procurement is tracked by OUS Business office but tracking system is not helpful for tracking embodied emissions | Appropriate methodology needs to be established by Energy Analyst and either OIT or OUS Business Offices |

Data obtained in collaboration with facilities services and business office staff is aggregated by the energy analyst on a fiscal year basis and entered into the Clean-Air Cool-Planet (CACP) carbon calculator. This tool was specifically designed for higher education institutions by the Clean-Air Cool-Planet organization, a science-based, non-partisan, non-profit organization. More information on this organization and tool can be found at the following website: [www.cleanair-coolplanet.org](http://www.cleanair-coolplanet.org).

In order to convert electricity used (kWh) to a carbon dioxide equivalent, a conversion factor is used that is derived from the sources of energy (coal, hydro, wind, geothermal, etc.) that make up a utility’s grid portfolio. The OIT Klamath Falls campus is served by Pacific Power, a subsidiary of PacifiCorp. Pacific Power’s grid portfolio is comprised of approximately 67.5% coal, 10% hydro, 17.6% natural gas, 1.3% biomass, and 2.9% wind, which results in a conversion factor of 0.923 kg CO2e per kWh. The US EPA has also developed regional conversion factors. The Northwest Power Pool region is comprised of a greater amount of hydroelectric energy in comparison to that of Pacific Power’s, which results in a NWPP conversion factor of 0.331. As utilities continue to decrease the amount of coal-related energy in their portfolio, emissions will decrease not only for the utility, but for the customers who demand the electricity. This is not to say, however, that solar, wind and hydroelectric are the panacea of emissions problems. For example, large hydroelectric dams on the Klamath River have resulted in significant environmental problems concerning native fish species, Native American peoples, and farmers. Reducing emissions in the most benign manor possible will depend primarily on the reduction of electricity use.

* 1. **Emissions, trajectories, and goals**
     1. **Current emissions**

In FY 2008, OIT’s Klamath Falls campus emitted 10,848 metric tons of carbon dioxide equivalent (MTCO2e). This represents a 9.1% increase from FY 2007 total greenhouse gas emissions. Emissions by source are displayed in Table 4.2 and Figures 4.1 and 4.2. Emissions associated with fertilizer use (for campus grounds maintenance) are not visible in Figures 4.1 and 4.2 due to the fact that they make up a very small percentage (0.01% in FY 08) of the total emissions.

Table 4.2. OIT Klamath Falls Campus GHG Emissions by Source (MTCO2e) for 2004-2008.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Source** | **FY 04** | **FY 05** | **FY 06** | **FY 07** | **FY 08** |
| **Scope 1** |  |  |  |  |  |
| Refrigerants | 124 | 124 | 124 | 124 | 124 |
| Agriculture (Fertilizer) | 2 | 0 | 2 | 1 | 1 |
| Campus Fleet | 74 | 63 | 50 | 56 | 70 |
| **Scope 2** |  |  |  |  |  |
| Purchased Electricity | 6,411 | 6,973 | 6,607 | 7,212 | 7,968 |
| Purchased Natural Gas | 80 | 100 | 98 | 93 | 108 |
| **Scope 3** |  |  |  |  |  |
| Air Travel | 320 | 1,358 | 1,602 | 1,549 | 1,688 |
| Solid Waste | 37 | 37 | 37 | 35 | 38 |
| Student Commuters | 575 | 572 | 547 | 534 | 541 |
| Faculty Commuters | 291 | 305 | 320 | 335 | 311 |
| **Total Gross Emissions** | **7,914** | **9,532** | **9,387** | **9,940** | **10,848** |

Figure 4.1. OIT Klamath Falls Campus GHG emissions by category for 2004-2008.

Figure 4.2. OIT Klamath Falls Campus GHG emissions by category for FY 2008.

It is important to note that Table 4.2 and Figures 4.1 and 4.2 do not include embodied emissions, or the emissions produced during the course of raw material extraction and production and transportation of goods and services, up to the point of retail (Good Co., 2009a). Emissions associated with long-distance student travel and with travel associated with study-abroad trips are also not included.

In 2009, the Good Company conducted an analysis for the OUS to approximate embodied emissions at each OUS institution for FY 2008. The Good Company estimated that embodied emissions associated with OIT for FY 2008 were 7,208 MTCO2e (Good Co., 2009a). If it were assumed that these embodied emissions grew by 2% each year for years 2004 through 2008, the embodied emissions in 2004 would have been 6,648 MTCO2e. Table 4.3 and Figure 4.3 show the 2008 embodied emissions estimated by the Good Company and the embodied emissions in FY 2004-2008, back-calculated by assuming a 2% growth rate.

Table 4.3. OIT Klamath Falls Campus GHG Emissions by Source, Including Embodied Emissions, (MTCO2e) for 2004-2008.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Source** | **FY 04** | **FY 05** | **FY 06** | **FY 07** | **FY 08** |
| **Scope 1** |  |  |  |  |  |
| Refrigerants | 124 | 124 | 124 | 124 | 124 |
| Agriculture (Fertilizer) | 2 | 0 | 2 | 1 | 1 |
| Campus Fleet | 74 | 63 | 50 | 56 | 70 |
| **Scope 2** |  |  |  |  |  |
| Purchased Electricity | 6,411 | 6,973 | 6,607 | 7,212 | 7,968 |
| Purchased Natural Gas | 80 | 100 | 98 | 93 | 108 |
| **Scope 3** |  |  |  |  |  |
| Air Travel | 320 | 1,358 | 1,602 | 1,549 | 1,688 |
| Solid Waste | 37 | 37 | 37 | 35 | 38 |
| Student Commuters | 575 | 572 | 547 | 534 | 541 |
| Faculty Commuters | 291 | 305 | 320 | 335 | 311 |
| **Total Gross Emissions** | **7,914** | **9,532** | **9,387** | **9,940** | **10,848** |
| Embodied Emissions | 6,648 | 6,784 | 6,923 | 7,064 | 7,208 |
| **Total + Embodied Emissions** | **14,562** | **16,316** | **16,310** | **17,003** | **18,056** |

Figure 4.3. OIT Klamath Falls Campus GHG Emissions for 2004-2008, Including Embodied Emissions

* + 1. **Emissions trajectory**

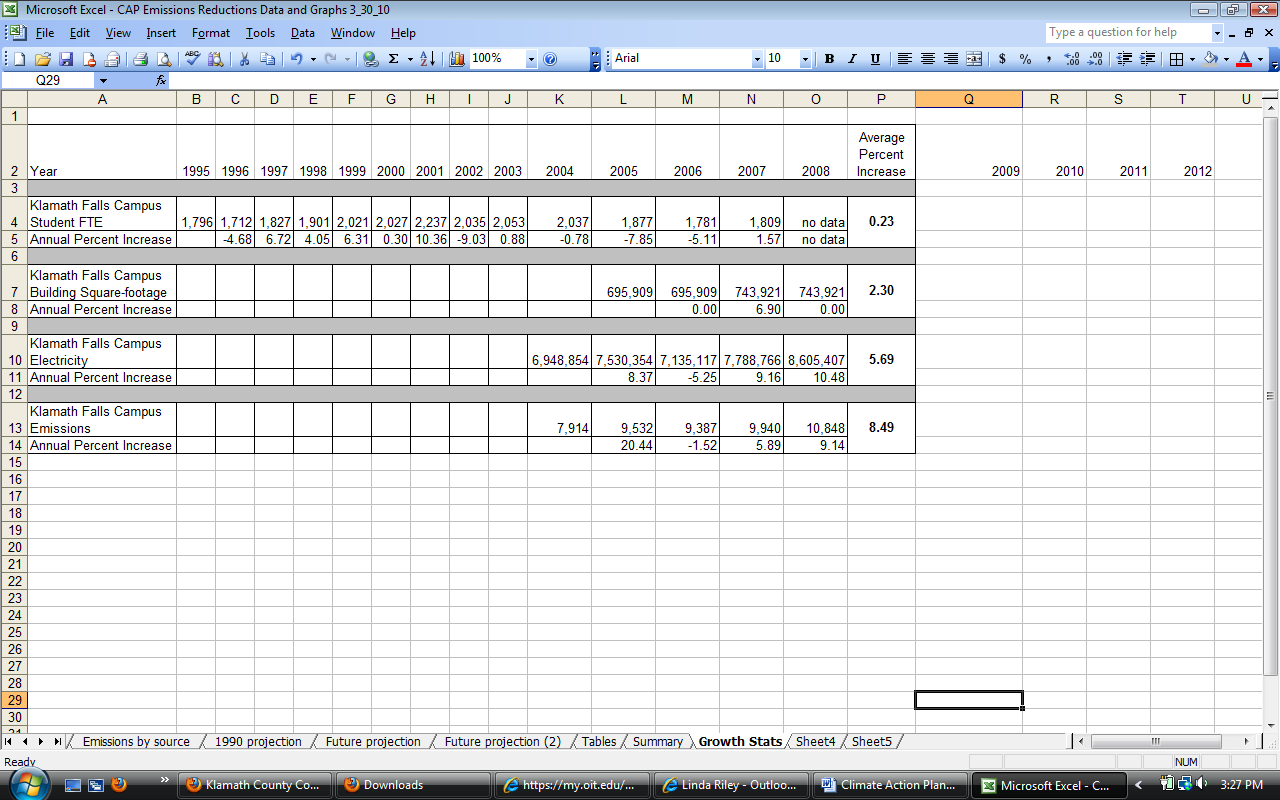
The State of Oregon established carbon reduction goals based on 1990 levels of CO2e; however, many organizations and utilities rarely have data extending back to 1990, making it difficult to establish a numeric baseline for 1990 emissions. Although utility data for OIT’s Klamath Falls campus were not available for 1990, an analysis by the Good Company resulted in a 1990 GHG emission estimate for OIT of 2,146 MTCO2e (Good Co., 2009b). This estimate only included emissions related to electricity and natural gas use in 1990. In addition, the Good Company used the Northwest Power Pool (NWPP) conversion factor (versus the Pacific Power factor) to convert kWh to MTCO2e. For these reasons, this 1990 estimate is probably lower than what was actually emitted. Finally, the Good Company estimated a 20% error on either side of this 1990 emissions value.

Using this estimate and the 2004 emissions measured by Sightlines, analysis revealed that OIT Klamath Falls campus emissions grew, on average, 9% each year between 1990 and 2004, or 27% total from 1990 to 2004. This rate of growth is shown in Figure 4.4.

Figure 4.4. OIT Klamath Falls Campus GHG Emissions from 1990 through 2008.

The rate of emissions growth from 1990 to 2004 corresponds closely with the rate of growth observed between 2004 and 2008 of 8.5%. The increase in emissions observed over the last 18 years can be attributed to growth in campus square footage, increases in faculty, staff and student numbers, increases in air travel, and a variety of other factors. In the summer of 2009, OIT finished two major capital projects, the Village for Sustainable Living, and the Martha Anne Dow Center for Health Professions. If OIT does not add any additional square footage in the next decade, it is unlikely that CO2e emissions would continue to increase at a rate of 9%. OIT also finished a major renovation project on the Owens building in the summer of 2009, and replaced the roofs on Boivin and Semon Halls. These renovations have increased the efficiency of existing buildings, an improvement that should result in a minor reduction of emissions. Table 4.4 shows growth in various sectors of the university. These trends were used to estimate a future emissions growth rate of 4% each year. In other words, the emissions in each consecutive fiscal year is projected to be equal to the previous year’s emissions plus 4% of the previous year’s emissions. This results in a “business-as-usual” (bau) projection with an exponential increase in emissions, similar to growth projections for population.

Table 4.4. Various growth metrics for the OIT Klamath Falls Campus.



This bau projection is based on past measurements of growth and incorporates cumulative effects. Although a non-cumulative approach might need to be used in a revised bau scenario, the previous six years of data (1990 and 2004-08) do not indicate that a significant investment in conservation measures has resulted in a more modest growth rate. In other words, if a high investment in conservation measures had been part of the previous 18 years of growth, one might expect to observe a smaller growth rate during this time. However, there is no indication that any action in the previous 18 years has resulted in a more linear (average) growth rate that would lead to the prediction that the growth in the next 32 years would be similarly linear.

Jevons’ paradox describes a similar scenario. In his book, *The Coal Question*, William Jevons presents the idea that technological progress that increases the efficiency with which a resource is used, tends to increase the rate of consumption of that resource (Jevons, 1866). Arguments can be made counter to this idea and certainly there are examples where this has not been the case; it is simply stated here to substantiate the proposal that in the case of emissions, growth with cumulative effects is realistic, even when conservation measures are implemented.

**4.3.3 Emissions reduction timeline**

The cumulative-effects business-as-usual scenario was used to analyze possible mitigation projects and scenarios and to compare them with the State of Oregon emissions reduction goals of:

* 10% reduction below 1990 levels by 2020, and
* 75% reduction below 1990 levels by 2050.

Figure 4.5 shows an estimate of OIT’s Klamath Falls Campus emissions through 2050, and the emissions reductions associated with the mitigation strategies. The Kyoto Protocol (KP) emissions reduction target of 5% below 1990 levels by 2012 is also displayed in Figure 4.5.

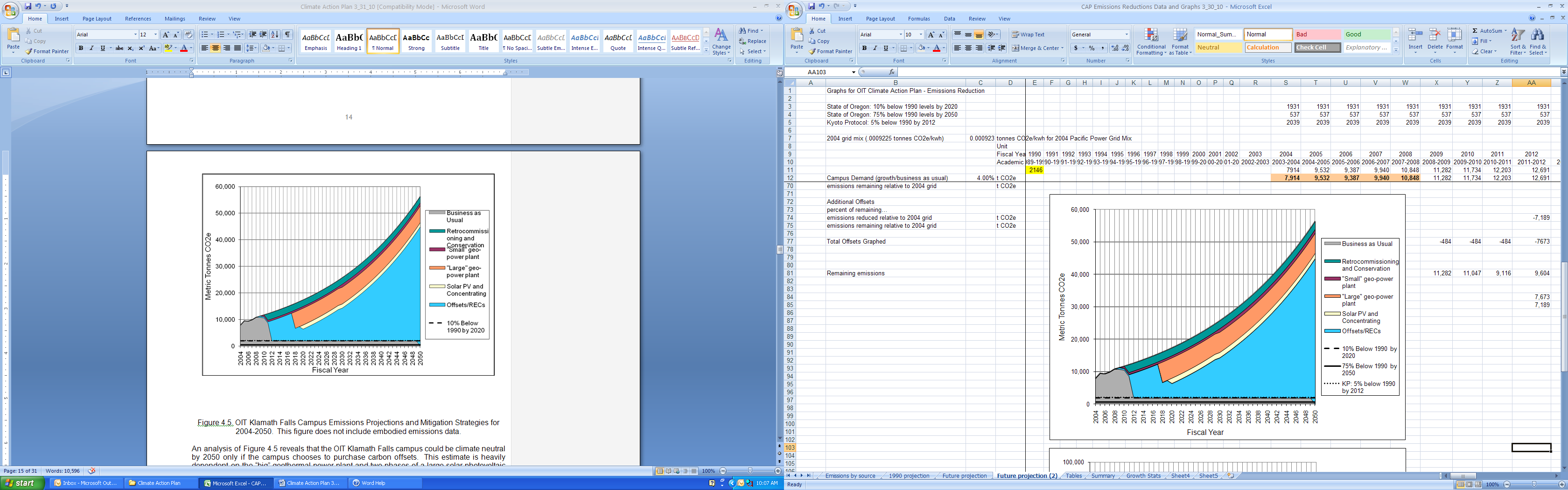


Figure 4.5. OIT Klamath Falls Campus Emissions Projections and Mitigation Strategies for 2004-2050. This figure does not include embodied emissions data but does take cumulative effects into account.

An analysis of Figure 4.5 reveals that the OIT Klamath Falls campus could be climate neutral by 2050 only if the campus chooses to purchase carbon offsets. This estimate is heavily dependent on the “large” geothermal power plant and two phases of a solar photovoltaic and solar concentrating project. The “large” geothermal power plant, a planned 1 megawatt (MW) power plant (versus the existing “small” 280 kW plant), currently has funds appropriated for a construction start date of Spring, 2011. Funding for the solar project, however, is much less secure, and its implementation may depend on changing state energy tax credits. Emissions reductions due to retrocommissioning and conservation were quantified by McKinstry, a design/build/analysis engineering company hired by the OUS to conduct a high-level building commissioning analysis. McKinstry estimated an average life span of 15 years for their recommended commissioning and conservation measures; thus, it is assumed after a period of 15 years, additional investments will be required to maintain the reduction in emissions. These mitigation strategies are discussed in greater detail in Section 5.

Embodied emissions were initially excluded from the emissions analysis due to the difficulty associated with tracking this category of emissions. Figure 4.6 shows estimated CO2e projections through 2050 with the addition of embodied emissions. In this scenario, embodied emissions are assumed to grow at an annual rate of 4%. In both scenarios (with and without embodied emissions), it is apparent that it will be difficult for OIT to achieve and *maintain* climate neutrality without the purchase of offsets. To do so, OIT would have to cut its population growth, increase conservation, and invest in renewable energy projects. In every case, it is advantageous for OIT to concentrate first on conservation through retrocommissioning, then renewable energy projects, and finally the purchasing of offsets. The feasibility and process of offset purchasing is being investigated by the OIT Sustainability Office.

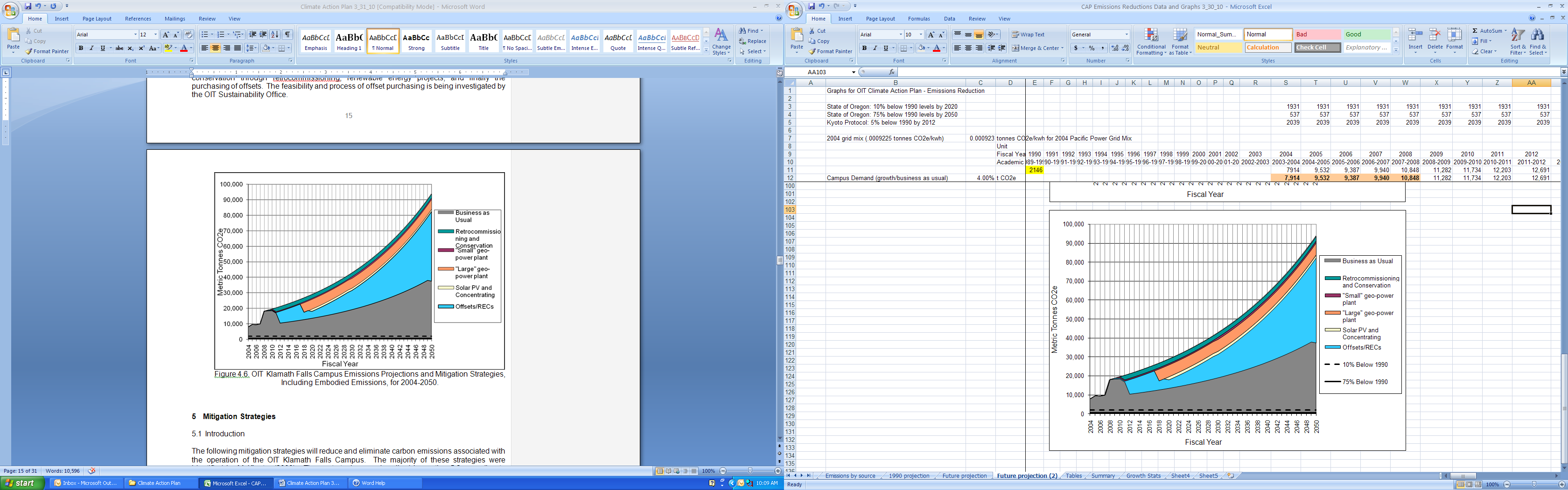


Figure 4.6. OIT Klamath Falls Campus Emissions Projections and Mitigation Strategies, Including Embodied Emissions, for 2004-2050.

1. **Mitigation Strategies**
   1. **Introduction**

The following mitigation strategies will reduce and eliminate carbon emissions associated with the operation of the OIT Klamath Falls Campus. The majority of these strategies were identified by McKinstry (2009). These strategies are described in section 5.2 according to Scope 1, 2 and 3 emissions categories. Section 5.3 contains a discussion regarding the financing of these strategies and a table of the estimated costs and implementation dates associated with each strategy. Figure 5.1 shows OIT’s emissions by scope in FY 2008.

Figure 5.1. OIT’s emissions by scope in FY 2008, with and without embodied emissions.

* 1. **Mitigation strategies by scope**

**Scope 1 Emissions**

As stated by the ACUPCC (2007, p.30), Scope 1 emissions are “direct GHG emissions from sources the institution owns or controls.

**Strategy 1: Reduce emissions associated with fleet vehicles**

In fiscal year 2008, 0.6% of OIT’s GHG emissions resulted from the burning of fossil fuels by institution-owned transportation devices such as cars, trucks, tractors and buses. Because these emissions make up such a small percentage of OIT’s overall emissions, their reduction is not a high priority. However, OIT feels that they should not be ignored, as required upgrades will not only result in more reliable vehicles, but also a reduction in GHG emissions. Reducing the emissions from this Scope 1 category would entail reducing miles driven and upgrading to more fuel efficient and/or alternative-energy vehicles or devices. A few OIT fleet vehicles are used to carry landscape and maintenance equipment around campus. While some of these vehicles are electric, more electric maintenance vehicles could be used to replace current gasoline or diesel vehicles. Additionally, alternative-energy fleet vehicles could be used by OIT’s Renewable Energy Engineering Program for student research and projects. The OIT energy analyst will work with fleet maintenance staff to identify opportunities for vehicles replacement.

**Strategy 2: Reduce emissions associated with refrigerants and fertilizer**

In fiscal year 2008, 1.1% of OIT’s emissions resulted from the use of refrigerants for heating and cooling systems, and 0.00007% from fertilizer for campus grounds maintenance. These emissions constitute the smallest portion of overall emissions, and are therefore low on the emissions mitigation priority list. However, in the future, it may be possible to switch from a refrigerant with a higher GWP to one with a lower GWP or eliminate the need for refrigerants entirely by switching to different cooling systems. It may also be feasible for OIT to switch from petroleum based fertilizers to more natural types of fertilizers, thus reducing the emissions associated with fertilizers. Efforts to incorporate native and xeriscape landscapes in campus planning may also reduce fertilizer use.

**Scope 2 Emissions**

As stated by the ACUPCC (2007, p. 30), “Scope 2 emissions are indirect GHG emissions that are a consequence of activities that take place within the organizational boundaries of the institution, but that occur at sources owned or controlled by another entity.” The majority of OIT’s Scope 2 emissions result from electricity purchased from Pacific Power. OIT’s other Scope 2 emissions are those related to the purchase of natural gas. Because OIT is heated using 192° F water, it is only necessary for OIT to purchase a small amount of natural gas for science laboratories and the Marketplace kitchen. It is important to note that there is no natural gas back-up heating system for the Klamath Falls campus. The strategies below outline opportunities to reduce Scope 2 emissions.

**Strategy 3: Retro-commissioning, consolidated use and energy conservation**

**(McKinstry (2009) report)**

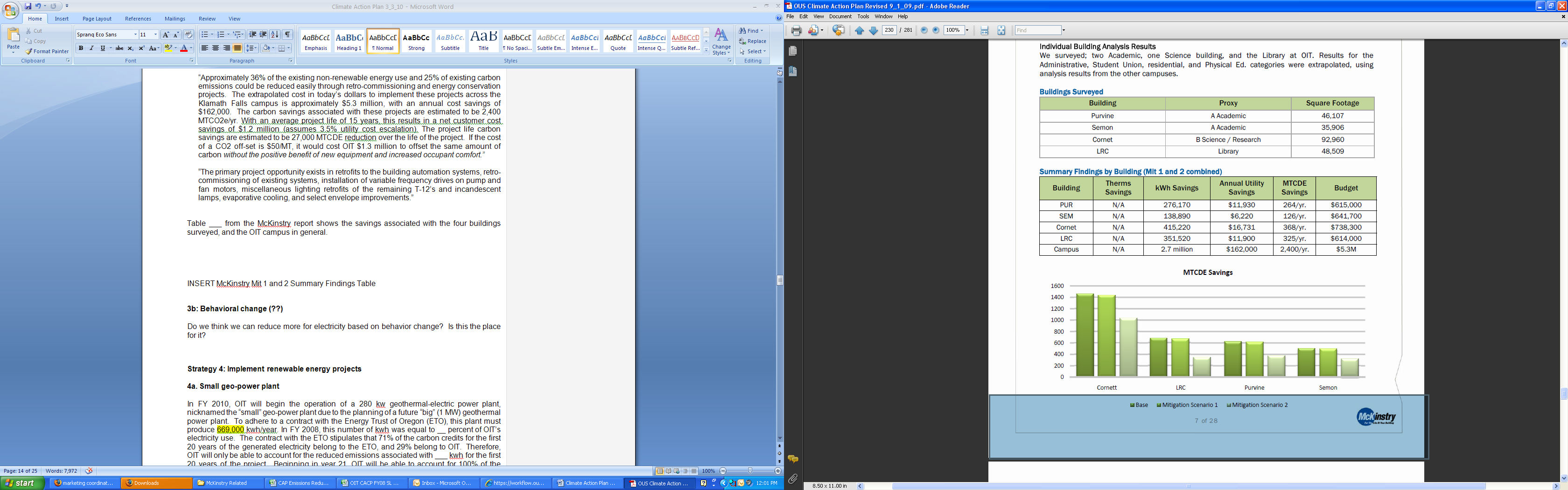
In 2009, McKinstry was hired by the Oregon University System to conduct a high-level building commissioning analysis and to identify opportunities for carbon reduction. McKinstry inspected four buildings at OIT: Cornett Hall, Semon Hall, Purvine Hall, and the Learning Resource Center (LRC), and used data from these buildings and other buildings in the OUS to extrapolate a carbon reduction estimate for the entire Klamath Falls campus.

“Approximately 36% of the existing non-renewable energy use and 25% of existing carbon emissions could be reduced easily through retro-commissioning and energy conservation projects. The extrapolated cost in today’s dollars to implement these projects across the Klamath Falls campus is approximately $5.3 million, with an annual cost savings of $162,000. The carbon savings associated with these projects are estimated to be 2,400 MTCO2e/yr. With an average project life of 15 years, this results in a net customer cost savings of $1.2 million (assumes 3.5% utility cost escalation). The project life carbon savings are estimated to be 27,000 MTCO2e reduction over the life of the project. If the cost of a CO2 off-set is $50/MT, it would cost OIT $1.3 million to offset the same amount of carbon *without the positive benefit of new equipment and increased occupant comfort* (McKinstry, 2009, p.5).*”*

“The primary project opportunity exists in retrofits to the building automation systems, retro-commissioning of existing systems, installation of variable frequency drives on pump and fan motors, miscellaneous lighting retrofits of the remaining T-12 florescent lamps and incandescent lamps, evaporative cooling, and select envelope improvements (McKinstry, 2009, p.5).”

Table 5.1 from the McKinstry report (2009, p. 7) shows the savings associated with the four buildings surveyed, and the OIT campus in general. A complete list of McKinstry’s suggested retro commissioning and conservation projects with associated cost, kWh savings, annual cost savings, project life, MTCO2e reduction, and project lifetime cost savings is in Appendix A.

Table 5.1. Projected kWh, Utility, and MTCO2e Savings from Retro Commissioning Projects (McKinstry, 2009, p.7).



**Strategy 4: Implement renewable energy projects**

**4a. “Small” geo-power plant**

In FY 2010, OIT began operation of a 280 kW geothermal-electric power plant, nicknamed the “small” geo-power plant due to the planning of a future “large” (1 MW) geothermal power plant. This small geo-power plant will generate enough electricity to run the pumps that are required to operate the geothermal heating system on campus – approximately 550,400 kWh/year.

In addition, the small geo-power plant will generate electricity that will be sold back to Pacific Power. The contract that describes this agreement was crafted with the aid of the Energy Trust of Oregon (ETO). To adhere to this contract, OIT’s small geo-power plant must produce 669,000 kWh/year. In FY 2008, this number of kWh was equal to approximately seven percent of OIT’s total electricity use. The contract with the ETO stipulates that, for the first 20 years, 71% of the carbon credits associated with the 669,000 kWh of generated electricity can be claimed by the ETO, and 29% can be claimed by OIT. Therefore, OIT will only be able to claim 194,010 kWh of the extra electricity produced and 179 MTCO2e of reduced emissions for the first 20 years of the project. If additional electricity above the expected 669,000 kWh is generated, the split will be the same: 71% ETO, 29% OIT (Energy Trust of Oregon, 2010).

Beginning in year 21, OIT will be able to claim 100% of the “extra” electricity generated (the electricity above that required to run the pumps), or a minimum of 669,000 kWh and 617 MTCO2e. The metric tons of carbon dioxide equivalent in this scenario have been calculated based on the 2004 Pacific Power grid portfolio of 0.000923 metric tons CO2e per kilowatt-hour. If Pacific Power’s grid portfolio consists of cleaner energy in 20 years, OIT will be able to account for emissions reductions beyond the projected 617 MTCO2e. This additional reduction would apply to any Scope 2 emission source that relates to electricity provided by an external utility.

**4b. “Large” geo-power plant**

OIT plans to begin installation of a 1 megawatt (MW) geothermal-electric power plant in the Summer of 2011. This plant would be installed on a 5,310 ft. well that was drilled in 2009. The water from this well is approximately 196° F; the flow rate is estimated at 2,000 gallons per minute. Financing strategies will affect both the amount of electricity OIT will be able to use to replace current electricity from the grid and when OIT will be able to account for this electricity. For the purposes of this initial plan, it has been estimated that OIT will be able to claim 6,816,000 kWh per year beginning in 2013, resulting in an annual emissions reduction of 6,288 MTCO2e.

**4c. Large photovoltaic (pv) and solar concentrating project**

In 2009, the Oregon University System developed a proposal for a system-wide solar photovoltaic and solar concentrating project, in which the electricity generated would be shared among the seven OUS institutions. The OIT portion of this project (also discussed in the McKinstry report), sized at 1.7 MW, is estimated to supply 18% of OIT’s electricity demand, or 1,737,634 kWh of electricity. OIT is expected to be able to claim the electricity generated in 2020.

**Strategy 5: Purchase Blue Sky power and Green the Grid**

In 2009, OIT began purchasing 437 blocks, or 43,700 kWh of Blue Sky power from Pacific Power per month. This is equivalent to 524,400 kWh per year. Blue Sky is Pacific Power’s renewable energy program, which invests rate-payers’ contributions to renewable energy projects. The annual emissions reduced through the purchase of this renewable energy are equal to 484 MTCO2e. By supporting programs like Blue Sky, OIT is essentially helping to change Pacific Power’s energy portfolio to include “cleaner” (less coal) sources of energy. In the long-term, this will decrease the conversion factor OIT uses to convert kWh to MTCO2e, thereby lowering OIT’s emissions.

**Strategy 6: Reduce remaining Scope 2 emissions through offsets**

OIT will need to develop a system for purchasing offsets for emissions that cannot be reduced through retrocommissioning, conservation, or renewable energy projects. The OIT Sustainability Office and OIT Sustainability Student Interns are investigating offset options.

**Scope 3 Emissions**

Scope 3 emissions entail all indirect emissions not covered in Scope 2. These include emissions associated with commuting, air travel, solid waste, and embodied emissions. Prior to 2010, OIT only estimated, tracked and reported emissions associated with commuting, air travel, and solid waste. In 2009, the Good Company was hired by the OUS to estimate embodied emissions--those associated with the extraction, production and transportation of purchased materials or goods--for each OUS institution. As discussed in Section 4.3.1, the embodied emissions estimated for OIT in FY 08 equaled 7,208 MTCO2e. Because this level of embodied emissions makes up such a large percentage of OIT’s emissions (Figure 5.1), it is difficult to ignore. Unfortunately, embodied emissions are also very difficult to track, and are not yet required to be tracked by any reporting institution. In fact, the ACUPCC does not require embodied emissions tracking as part of the Climate Commitment. Therefore, as of the date of this document, OIT has devoted very little time to developing strategies that would reduce embodied emissions.

In addition to embodied emissions, institutions have the opportunity to track and report waste-water emissions as part of the ACUPCC. OIT plans to track the emissions associated with waste water in FY 2011.

**Strategy 7: Reduce non-commuter, travel-related emissions**

Emissions associated with travel make up an unusually large percentage of the total GHG emissions because OIT has comparatively low Scope 1 and 2 emissions (Figure 4.2 and 5.1). In part, this high level of emissions is due to the fact that the OIT Klamath Falls campus is located in a rural area in Southern Oregon, meaning that OIT faculty and staff must either fly or drive long distances to attend meetings, conferences, and special events. Improvements in telecommunications technology and tightened budgets, however, will likely reduce travel-related emissions. Faculty and administrative staff are already encouraged to minimize travel and to utilize available teleconferencing options.

When travel is necessary, faculty and staff are encouraged to use train and rental car options rather than flying. The majority of travel-related emissions are from travel to and from OIT’s Portland campus. Traveling by Amtrak is an option, as is renting a car and carpooling, if possible. There are several ways to encourage this lower-emissions behavior. First, the OIT community should be educated about travel-related GHG emissions and the large percentage that the emissions comprise in the campus’s overall footprint. Secondly, a mandatory carbon offset policy would require calculation of expected emissions due to travel and purchase of offsets for the emissions to be included in the travel authorization and budget processes. This would serve several purposes; there would be an incentive to reduce the cost of the offsets by choosing lower-emitting travel options and there would be a built-in offset strategy for released emissions. A Student Sustainability Intern has been researching travel offset options and is preparing a proposal to bring to Administrative staff for review.

**Strategy 8: Reduce emissions associated with commuter transportation**

OIT provides free bus passes for students, staff, and faculty in order to encourage use of the public transportation system in Klamath Falls. A carpool incentive program was piloted spring term 2009 to gauge the success of this type of program. Program response was very positive and this type of program could be used to promote alternative transportation to reduce emissions associated with commuter transportation. Additionally, a Student Sustainability Intern is investigating the possibility of a student sustainability fee. Income from the fee program could be used to purchase offsets for an approximated amount of emissions caused by student commuter related emissions and a faculty/staff donation program could be used to offset the rest. Further investigation into these offset schemes will be critical for achieving climate neutrality by 2050.

**Strategy 9: Reduce emissions associated with solid waste disposal and recycling**

OIT participates in the annual Recyclemania contest as a medium for community education about waste disposal and campus recycling programs and to encourage increases in recycling and decreases in waste production. OIT also began composting organic waste produced by the Marketplace (food services) through a local farming business, considerably reducing waste produced by the College Union. The composting program also creates ties with the local community and the compost is used to grow food that can be purchased by the Marketplace.

* 1. **Financial Analysis**
     1. **Costs**

Costs associated with mitigation strategies will vary greatly depending on the project, the time line, and the financing options available. Until further analysis of each of the mitigation strategies can be conducted, it is difficult to estimate associated costs. When conducting a financial analysis for each of the mitigation strategies, it will be important to consider the current market cost of CO2e offsets.

The McKinstry (2009) report included a cost analysis for the general scenarios investigated. This information is presented below:

Retrocommissioning and Conservation Projects:

McKinstry estimated an extrapolated cost in today’s dollars to implement the commissioning and conservation projects of $5.3 million, resulting in an annual cost savings of $162,000. The carbon savings from implementing these projects was estimated to be 2,400 MTCO2e/yr. With an average life of 15 years, this results in a net savings of $1.2 million (assumes 3.5% utility cost escalation). The project life carbon savings are estimated to be 27,000 MTCO2e over the life of the project. If the cost of a CO2 off-set is $50 per metric ton, it would cost OIT $1.3 million to off-set the same amount of carbon *without the positive benefit of new equipment and increased occupant comfort.*

Renewable Energy Projects:

Working with OUS, McKinstry estimated the implementation cost of a large solar photovoltaic and concentrating system to be 12.7 million, saving OIT $122,000/yr and 1,600 MTCO2e/yr.

The “large” geothermal power plant is estimated to cost $12 million. This cost includes the drilling of the well, professional services and administration, testing and infrastructure to support the power plant, and the power plant construction.

Offsets and Renewable Energy Certificates (RECs):

The cost of offsets ($/tonne CO2e) and RECs ($/MWh) can vary greatly. A 2007 study by the Massachussetts Institute of Technology (MIT) estimated that one metric ton of CO2e in 2025 could vary between $18 and $79 depending on enacted legislation (Paltsey, Reilly, Dacoby, Gurgel, Metcalf, et al, 2007). According to Carbon Solutions Northwest (CSN), the price of one REC ranges from $5 - $10 in Washington and Oregon, can cost up to $20 in California, and as much as $60 in Massachusetts (CSN, n.d.). Currently, Oregon State University is paying approximately $5 per MTCO2e to offset a portion of its emissions. If OIT were to offset a 2008-level of emissions (10,848 MTCO2e) it would cost a total of $54,240 each year, assuming a constant price of $5 per MTCO2e.

* + 1. **Financing Strategies**

There are numerous financing strategies available for supporting mitigation projects outlined in this report. Financing strategies vary greatly in level of complexity and feasibility. Often, a combination of loans, grants, and incentives are needed to finance commissioning, conservation, and renewable energy projects. In their report for OUS, McKinstry (2009) discussed several incentives and credits. Those applicable to OIT included:

* Federal incentives
* Energy Efficient Commercial Buildings Tax Deduction
* Modified Accelerated Cost-Recovery System (MACRS) + Bonus Depreciation
* The Oregon Business Energy Investment Tax Credit (ITC)
* Renewable Electricity Production Tax Credit (PTC)
* Energy Trust of Oregon Incentives including:
  + Business Energy Efficiency Rebate for Existing Buildings
  + Open Solicitation Program
  + Solar Electric Buy-Down Program
  + Solar Water Heating Buy-Down Program

Many of the mitigation strategies proposed in the Climate Action Plan need to be investigated in greater detail to include more accurate estimates of the cost associated with each, and to enable a higher level of project prioritization.

Possible funding options for offsetting travel-related emissions were discussed in section 5.2, strategies 7 and 8.

1. **Education, Research, & Public Engagement**
   1. **Introduction**

Education, research, and public engagement are essential elements to achieving climate neutrality and full community participation in sustainability efforts. OIT has a .5FTE Sustainability Coordinator who coordinates sustainability education and public engagement and tracks campus research projects. Current activities include campus participation in the climate action planning process, co-curricular activities, sustainability curriculum development, partnership-building with local counterparts, and facilitation of Earth Week activities. An overview of education, research, and public engagement efforts, associated costs, and tracking methods is in Appendix B.

* 1. **Methodology**

In June of 2008, a survey of 33 constituents involved in sustainability efforts across the institution was conducted. The constituents represented students, administrators, facilities, and faculty from OIT’s Portland and Klamath Falls campuses. The result of this survey was the OIT Sustainability Plan. For each of the 13 priority categories established by the survey, a mission, brief history, 3-year and 10-year goals were written. The categories include Plan Administration, Monitoring and Reporting; Academics; Community—OIT Campuses; Energy; Facilities; Food; Greater Community; Landscape; Procurement; Research; Transport; Waste; and Water. In June of 2009, progress on each of the goals was assessed using the following metric: nothing done; in initial steps; in progress; near completion; goal met; goal met beyond expectation; on going; goal eliminated or no longer relevant; and action taken in direction counter to goal achievement.

During the 2008-2009 academic year, a concurrent proposal was being developed by faculty on incorporating sustainability into the OIT curriculum. The proposal outlined several possibilities including development of new courses, inclusion of sustainability into existing courses where relevant, creation of a required sustainability course for all students, incentives for faculty participation in sustainability, creation of certificate programs, establishment of a sustainability minor, launch of new programs, and setting up a new sustainability institutional student learning outcome.

In order to combine these efforts and track progress more effectively, the “Sustainability in Academics Proposal” and the “Sustainability Plan” were incorporated into the STARS: Sustainability, Tracking, and Rating System assessment tool created by the Association for the Advancement of Sustainability in Higher Education (AASHE). The first version of the tool was released in September of 2009 and is rapidly becoming the primary campus sustainability rating tool in the United States. OIT’s use of STARS metrics will enable sustainability dedicated personnel to compare OIT’s progress with other institutions. The initiatives and activities subsequently outlined either represent efforts currently underway or ones that can be achieved utilizing available resources, as identified in the Sustainability Plan. For each effort, individuals within the institution have been identified who are responsible for completing, leading, or continuing the activity. See Appendix B for a table outlining goals, identifying responsible personnel, and a measure of current STARS ratings.

* 1. **Education**
     1. **Campus participation in the CAP**

Campus participation in the Climate Action Plan includes review of preliminary drafts by students, faculty, administrators, and facilities personnel. All campus community members were invited to review a draft of the CAP and provide comments and feedback. Additionally, student Sustainability Interns conducted research on carbon offset options, sustainability funding mechanisms, the STARS tracking tool, and sustainability-related and sustainability-focused courses.

* + 1. **Co-curricular activities**

Several co-curricular activities related to sustainability are available to students. There are student worker positions open to work-study students. These students are paid to promote sustainability on campus and the work includes “education hours” at the college union, weekly sustainability “blurb” submissions to the campus electronic newsletter, maintenance of a sustainability wiki site, education about campaigns and sustainability events, and leadership of the Outdoors Program. Student workers take a leadership role in planning the Recyclemania campaign and Earth Week activities. The Sustainability Club also participates in Recyclemania and Earth Week; additional activities include service and environmental education at community events. The Sustainability Internship program offers year-long intern positions focusing on specific campus leadership needs. 2010 positions include energy auditors, carbon offsets specialist, garden coordinator, course assessment coordinator, sustainability office designer, funding mechanisms specialist, and sustainability assessment coordinator. Interns work closely with two faculty supervisors and are expected to volunteer 40-60 hours per year toward their project.

OIT also maintains several education and publicity mechanisms including a sustainability website and wiki, sustainability tours for prospective students, and regular coverage of sustainability events and information on the campus electronic newsletter. Areas of co-curricular sustainability activity that require development include sustainability representation in student government and incorporating sustainability into new student and residence hall orientation.

* + 1. **Curriculum**

Although OIT has been leading Oregon State universities in sustainable facilities, sustainability in the curriculum has been a more recent effort. Curriculum developments include sustainability courses and programs, incentives for developing courses and programs in sustainability, and discussion of an institutional student learning outcome in sustainability. The 2008-2009 Sustainability Assessment Report records that 2.77% of OIT’s courses are sustainability-related and .032% are sustainability-focused. STARS defines sustainability-related courses as concentrating “on the concept of sustainability, including its social, economic, and environmental dimensions, or examin[ing] an issue or topic using sustainability as a lens” and sustainability-related courses as incorporating “sustainability as a distinct course component or module, or concentrat[ing] on a single sustainability principle or issue” (AASHE, 2009, p. 38). Annual assessments of this metric will be conducted for STARS and increased education of faculty on related-and-focused definitions will serve to broaden awareness of sustainability efforts as well as motivate faculty to modify courses to contain sustainability content.

OIT recently created the successful Renewable Energy Engineering program and a sustainable technologies emphasis in the Environmental Sciences program. The management department is in the process of defining a new sustainability-related program as well. Currently, there are several mechanisms to support faculty in developing courses and programs in sustainability:

1. The Commission on College Teaching offers competitive grants to faculty who create a new course or incorporate new teaching methodologies into a course,
2. The Sustainability Office offers an annual Spring Institute on incorporating sustainability concepts into coursework, and
3. Most summers, the Provost’s office offers summer productivity grants to design new programs and courses.

Recent budget cuts, however, have not only led to the suspension of summer productivity grants but also hiring freezes. Many faculty are managing unprecedented work overloads—a notable disincentive for being creative or trying to design new curriculum. OIT could improve incentives for faculty by creating and supporting additional training opportunities, recognizing sustainability activities in tenure and promotion processes, offering awards for exceptional sustainability efforts, in addition to managing sustainable workloads for faculty.

One other way to incentivize the incorporation of sustainability into the curriculum is to create an institutional student learning outcome (ISLO), recognizing sustainability as a curricular focus of the institution. A sustainability ISLO would require program assessment coordinators to request being excused from assessment of this ISLO if a program did not address sustainability in the program curriculum. Additionally, many programs create program student learning outcomes (PSLO) that mirror ISLO’s in order to facilitate the assessment process. A sustainability ISLO would identify sustainability as a curriculum priority for OIT, motivate program directors and assessment coordinators to include sustainability in their programs, and encourage faculty to incorporate sustainability into their courses. This ISLO could also be used to evaluate sustainability literacy of students entering and leaving OIT to monitor curriculum effects on graduates.

* + 1. **Financing education initiatives**

The majority of costs associated with sustainability education initiatives are covered through faculty salaries and funding for sustainability dedicated personnel. Initiatives not covered from general funds or the Provost’s Office include funding student sustainability workers ($700/year funded through the Oregon Renewable Energy Center, OREC), a Sustainability Coordinator for special campaigns and events ($6,000/year funded through OREC), the Sustainability Club ($300 per year funded through ASOIT), and sustainability tours (incorporated into tours given by ambassadors, funded through the Admissions office).

OIT is in need of funding sources for the Sustainability Internship Program, a Sustainability Office, Sustainability Education Campaigns, education materials, student leaders and workers, student sustainability research projects, faculty incentives and awards, and training opportunities. Possible funding sources and mechanisms are being explored such as an internal carbon offset program from faculty travel, donations through the Oregon Tech Foundation, student sustainability fees, self-funded and fundraising events such as Earth Week, and grants.

* 1. **Research**
     1. **Research initiatives**

OIT has excellent research opportunities through its hands-on learning environment. Both faculty and students conduct primary research on sustainable technologies and past projects have included funded proposals (by the Built Environment and Sustainable Technologies, BEST, research center) for “Horizontal Axis Wind Turbine Free Wake Model for AeroDYN” and “Biodiesel Grade Oil Extraction Automation and Control.” OIT, however, is primarily a teaching institution and faculty workloads concentrate on course loads instead of research work. Although there is a grant writing committee to assist faculty in the pursuit of grants, there are few or no incentives for investing time in grant writing. OIT could improve the likelihood of faculty research by allowing release time for grant writing and including research in tenure and promotion considerations.

* + 1. **Financing research initiatives**

Current financing of research initiatives comes from grant money. OIT retains one development person to assist with grant writing, but one position is insufficient to support the needs of the institution. Further hiring of grant-writing personnel is on hold pending budget projections.

* 1. **Public Engagement**
     1. **Public engagement projects**

OIT is an integral and active part of the local community not only in the Klamath Basin but also in surrounding rural areas such as Lakeview in Eastern Oregon. The OIT Sustainability Committee maintains partnerships with Klamath Sustainable Communities, Local Food Network, Cascadia chapter of the US Green Building Council, and Urban Issues Working Group. Several members of the community regularly participate in and provide consultations for Sustainability Committee initiatives and students routinely provide volunteer services during community activities. Annual Earth Week celebrations connect students, local sustainability-related businesses (including the local bakery and organic farmers), sustainability-related non-profit organizations, and OIT academic programs.

Additionally, sustainability dedicated personnel at OIT work with sustainability coordinators at other Oregon universities—Southern Oregon University, University of Oregon, Oregon State University, and Portland State University—on statewide sustainability conferences, development of renewable energy sources, greenhouse gas emissions inventories, university system-wide initiatives, power purchasing agreements, and student collaboration. The university sustainability network has been an invaluable resource to OIT, creating opportunities to share stories, resources, expertise, and support amongst all of the institutions.

* + 1. **Financing public engagement projects**

Current public engagement projects are funded through general funds; ie., faculty and sustainability-dedicated personnel salaries. Earth Week is self-sustaining through donations and fees for registration. No financing is required for continuation of these activities.

1. **Tracking Progress**
   1. **Emissions inventories**

OIT provides annual GHG emissions inventories on the ACUPCC reporting site, as required by ACUPCC to sustain active membership. Additionally, through participation in STARS, OIT’s performance in emissions reductions will be rated under Operations (OP) Credit 4: GHG Emissions Inventory (up to 2 credits available for Scope 1,2, & 3 inventories); OP Credit 5: GHG Emissions Reduction (up to 14 credits available for GHG reduction per weighted campus user compared to a 2005 baseline); Climate Tier 2 Credit: Air Travel Emissions (.25 points available for having a program to reduce air travel emissions); and Climate Tier 2 Credit: Local Offsets Program (.25 credits available for offsetting carbon emissions locally) (AASHE, 2009). Additional metrics for tracking, reporting, and rating waste reduction and diversion; water consumption; sustainable purchasing policies; conservation, energy consumption, and renewable energy projects; and building efficiency are available in STARS and will be used to track OIT’s sustainability progress.

* 1. **Education, research, and public engagement**

STARS will also be used to track OIT’s sustainability progress in the areas of education, research, and community outreach. See Appendix B for a list of education, research, and public engagement activities with associated costs, implementation plan, and metric for annual assessment. STARS credits are available for sustainability outreach campaigns, new student orientation programs, publications, sustainability-related and focused classes, programs, literacy assessments, research projects, research incentives, partnerships, inter-campus collaborations, and community service. Annual assessment of OIT’s STARS rating and biannual submission of STARS data will provide institutional feedback on progress on sustainability metrics, nation-wide comparisons to other institutions, and incentives for improvement.

1. **Conclusion**

OIT’s commitment to sustainability and renewable technologies spans over 40 years, from the time that it built a campus in Klamath Falls, OR around the area’s geothermal resources. OIT also houses the Geo-Heat and Renewable Energy Centers that provide expertise and education on sustainable technologies both for the state and internationally. It makes sense, then, for OIT to commit to an aggressive plan for exceeding Oregon State requirements by becoming climate neutral by 2050. OIT will achieve climate neutrality through a combination of conservation and retrocommissioning projects suggested by the consultig firm, McKinstry; innovative renewable energy projects such as a “large” geothermal power plant and a solar concentrating facility; purchase of offsets for travel-related and other unmitigated emissions; and curricular, co-curricular, research and public engagement activities. OIT will function as a leader in sustainable technologies and carbon emission reduction strategies in Southern Oregon by reducing its own emissions and by providing student graduates with essential skills and first-hand experience to enact GHG emissions reductions in the workplace. As this document is revised and updated in coming years, more detail will be provided on the emissions, programs and plans for the OIT satellite campuses.

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