Greenhouse Gas Emissions Inventory

University of Texas at Arlington

This report summarizes the findings of the Greenhouse Gas Emissions Inventory for the University of Texas at Arlington. The purpose of conducting the analysis and creating this document is to clarify the sources of emissions and to develop short and long term reduction policies.

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Section I: Introduction

The University of Texas at Arlington is committed to sustainability and stewardship of the environment. Sustainability represents societal efforts to meet the needs of the present without compromising the ability of future generations to meet their own needs. A growing number of institutions of higher education – along with federal, state, and local governments as well as corporations – are directing attention to sustainability, as concerned citizens recognize that the earth's resources are finite. Because our economy and society are dependent on a healthy environment, sustainability requires balancing economic success with environmental conservation, and social equity, also known as the triple bottom line.

The University of Texas at Arlington is committed to this triple bottom line and is striving to become a leader in campus sustainability through the efforts of administration, faculty, staff, and students. The University is actively engaged in greening facility operations, promoting innovative research, supporting and encouraging student initiatives, implementing environmentally and sustainability focused curriculum, and sponsoring public service initiatives.

The Office of Sustainability was established in 2010 to develop a university wide program that promotes the principles and mission of the University's Sustainability Committee (USC). The office of sustainability integrates sustainability practices into all facets of UT Arlington's mission and master plan, including teaching, research, campus operations, outreach, and community engagement. All initiatives involve collaboration with faculty, staff, and students as well as local and regional partners like Environmental Protection Agency (EPA), North Central Texas Council of Governments (NCTCOG).

The Carbon footprint analysis is a campus wide initiative coordinated by the Office of Sustainability and guided by a university wide working group (USC) that initiates and coordinates teaching, research, campus policy, and engagement projects to advance the goals of UT Arlington. The purpose of conducting this analysis and creating the emissions inventory is to identify the sources of emissions and to develop short and long term reduction targets or goals. A similar analysis was conducted by UT ARLINGTON in 2008 using ICLEI's CACP software. It was however acknowledged during the analysis that CACP is tailored for use by government

entities rather than universities, and the Clean Air Cool Planet calculator was recommended as an alternative.

A greenhouse gas emissions inventory is an accounting of the amounts and sources of emissions of greenhouse gases attributed to the existence and operations of an institution. The completion of such an inventory provides an essential foundation for focused, effective outreach on the issue of sustainability at a university, and the basis for institutional action to address it. It is a crucial first step toward comprehensive campus climate action efforts.

Section II: Data Sources and Methodology

The Clean Air-Cool Planet calculator was used for UT Arlington's inventory. We selected the calculator because it was designed specifically for higher education campuses, measures the six greenhouse gases identified in the Kyoto Protocol (CO2, CH4, N2O, HFC and PFC, and SF6), and assists with future projected trends.

Clean Air-Cool Planet offers a Campus Greenhouse Gas Emissions Inventory Calculator, an MS-Excel-based spreadsheet tool, for use in completing these activities. The Calculator incorporates three steps, providing procedural protocols and a framework for investigation. The spreadsheets, based on workbooks by the Intergovernmental Panel on Climate Change (IPCC) for national inventories, have been adapted for institutional use.

The major emission source categories are on-campus energy production, purchased electricity, transportation, waste, agriculture and refrigerants. Looking at the emissions levels in each of these categories provides a good idea of the best opportunities for emissions reduction. The Campus Carbon Calculator uses standard methodologies codified by the Greenhouse Gas Protocol (GHG) Initiative, and employed by corporations, the state of California, The Climate Registry, and other entities to account for greenhouse gas emissions. The GHG Protocol presents a useful accounting concept, called scopes, that can help entities understand and structure decisions about operational boundaries, and can simultaneously help address the potential for "double counting". This approach defines three levels of responsibility for

emissions, and basically posits that an entity's responsibility for emissions is directly related to its control over, or ownership of, the sources of those emissions. In order to make future data collection easier, all data is recorded in the fiscal years September 1 through August 31- and entered by the year in the which the fiscal year starts (i.e., FY 2007-08 appears in CA-CP as year 2007).

Institutional Boundaries

Institutional boundaries were set to include all operations over which the university has control-UT Arlington owned or leased buildings, number of students (full time equivalent), faculty and staff, the university vehicle fleet, waste stream (including food waste).

Operational Boundaries

Inventoried emissions were categorized into three types:

Category 1 – Direct GHG Emissions

-Sources include natural gas, University fleet fuel, and fertilizers

Category 2 – GHG Emissions from Imports of Electricity

-Sources include all electricity consumption

Category 3 – Other Indirect GHG Emissions

-Sources include student and faculty daily commutes, waste sent to landfills

Exclusions

Several sources of University emissions are outside the scope of this inventory. In most cases, these emissions are excluded because of a lack of sufficient data. The omitted activities include: University related ground travel for which the University fleet was not used; and University related air travel. Obtaining University-related travel data from individuals was deemed infeasible at this time. Emissions from excluded activities, as well as those from satellite campuses, will be considered at a later time.

Base Year

Fiscal year 2005-06 was selected as the base year. For some indicators, we have data going back to 1990. But this historic data was not available for all the indicators. 2005-06 was the most recent year for which complete information was available for all the indicators. Reduction goals in the Action Plan will use 2005-06 as the benchmark year.

Data Collection by Category

This section contains detailed information of data collection and entry into CA-CP

Budget

The Operating budget consists of all sources of funding UT Arlington has financial control of and is plainly considered as the cost to operate the institution. Research dollars includes all sources of financial funding that UT Arlington receives for its cumulative research endeavors. Energy budget is total spent providing the energy needs of all operations. Operational budget data for all fiscal years (1990-91 to 2009-10) was received from the Office of Finance and Administration. Energy Budget data for all fiscal years (1990-91 to 2009-10) was received by the Office of Facilities Management. The combined budget includes budget for electricity, steam and chilled water, and on-campus stationary sources (heating, etc). Research budget data was available for the years 2005-09.

Population- Students and Faculty

The fall semester was chosen as a reasonable representation of the university population which includes full time and part time students, and each category includes both graduate and undergraduate students. We choose to exclude summer students as suggested by the CA-CP tool. Faculty data also includes full time and part time. The information was provided by the Institutional Research, Planning and Effectiveness office. Staff data has not been included.

Building Space

Total building size data was provided by the Office of Facilities Management for the fiscal years 1990-91 to 2008-09. Research building data was also provided by the Office of Facilities Management for the fiscal years 2005-06 to 2008-09.

Transportation

This category includes the emissions from any vehicles that are owned by the university. The information was provided by the Office of Facilities Management. The data includes gallons of gasoline and diesel used by the university fleet for the years 1990-01 through 2009-10 and alternative fuel (compressed natural gas) for the years 1990-91through 2006-07. The decrease in the usage of the natural gas was due to the reduced usage of the CNG vehicles. Due to the lack of fueling stations within reasonable distance from the campus, it was not feasible to convert the fleets from gasoline to CNG.

Table 1: Consumption of diesel and gasoline by the University Fleet

Year	Diesel in gallons	Gasoline in gallons	Natural gas in gallons	Natural gas in MMBtu*
1999-2000	1502.57	46792.71	365.67	0.0505
2000-2001	2792.80	45603.02	192.97	0.0267
2001-2002	3711.90	42843.44	600.03	0.0829
2002-2003	5088.50	53603.51	212.94	0.0294
2003-2004	7854.53	68765.76	66.78	0.0092
2004-2005	9003.80	70735.77	67.69	0.0094
2005-2006	12145.14	71637.07	41.81	0.0058
20006-2007	12729.73	72860.27	20.73	0.0029
20007-2008	9968.67	77353.99	-	-
2008-2009	10529.23	76345.72	-	-
2009-2010	3976.68	25517.42	-	-

**MMBtu= (0.00014MMBtu/1gallons of natural gas) (x gallons of natural gas)*

Refrigerants and Chemicals

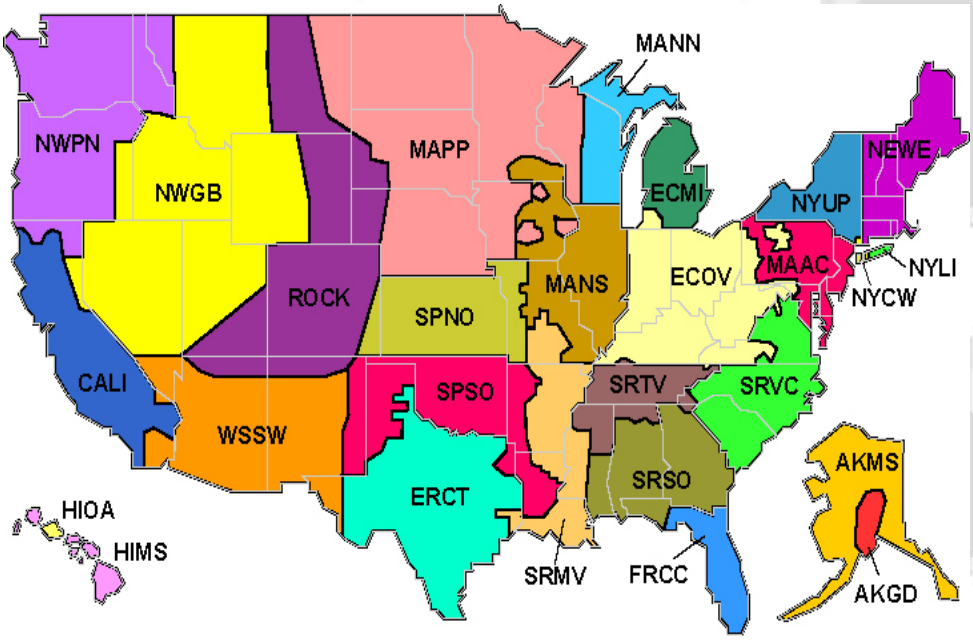
R-22 and CFC-22 is employed in space conditionally applications at the Thermal Energy Plant on Campus. Chlorodifluoromethane or difluoromonochloromethane is a hydrochlorofluorocarbon (HCFC). This colorless gas is better known as HCFC-22, R-22. The losses of R-22 were obtained for the years 2000, 2001, 2005-2009 by the HVAC shop and entered for HCFC-22 in the calculator.

Fertilizers

This section includes fertilizer application on grounds and fields as part of the university's landscaping operations. Synthetic fertilizers are used for grounds keeping and de-icing by the housing department. Synthetic fertilizers are labeled with their chemical makeup to represent the percentages of nitrogen (N), phosphorus (P), and potassium (K). 10,000 lbs of `25-3-5` (~2500 lbs of nitrogen) and 500 lbs of `46-0-0` fertilizer (~ 230 lbs of nitrogen) is used annually by UT Arlington. This equals 2720 lbs or 27.3% of nitrogen. According to the Office of Facilities Management, the fertilizer usage has remained constant through the timeline considered for this inventory.

Purchased Electricity

Scope 2 emissions from purchased electricity are likely to be a significant emissions source. The e-grid sub region was chosen as "ERCT" under the region "ERCOT ALL" for pre and post 2006 e-GRID sub region choices. An e-grid sub-region represents a portion of the US power grid that is contained within a single North America Electric Reliability Council (NERC) region, and generally represents sections of the power grid which have similar emissions and resource mix characteristics, and may be partially isolated by transmission constraints. E-grid's emissions represent emissions from fuel only used for generating electricity.



KWh of electricity used per year for the fiscal years 1990-91 through 2009-10 was obtained by the Office of Facilities Management.

Steam and Chilled Water

Steam is being generated using natural gas as fuel. The natural gas consumption data for the fiscal years 1990-91 through 2009-10 were provided by the Office of Facilities Management. Chilled water is generated using electricity and has already been accounted for in the "Purchased Electricity" and therefore no data has been entered for this section.

Student Commute

This category includes the number of annual miles traveled by faculty, staff, and student. The reason this is an integral part of the inventory is because the university can influence this travel in future by offering alternatives like bus, shuttle or a car sharing program. In this analysis we included the data for only student commute, assumed 100% personal vehicle travel, 4 times a week. The total number of weeks per year is based on the university calendar for spring and fall; 16 weeks in spring and fall. The numbers of summer students have been excluded. We restricted our radius to 60 miles around campus for calculating the total miles traveled.

Solid Waste

A fairly representative data for the tonnage of waste from the UT Arlington to the City of Arlington's landfill was obtained for the fiscal year 2007 and 2008 by Republic Services. There is no methane recovery.

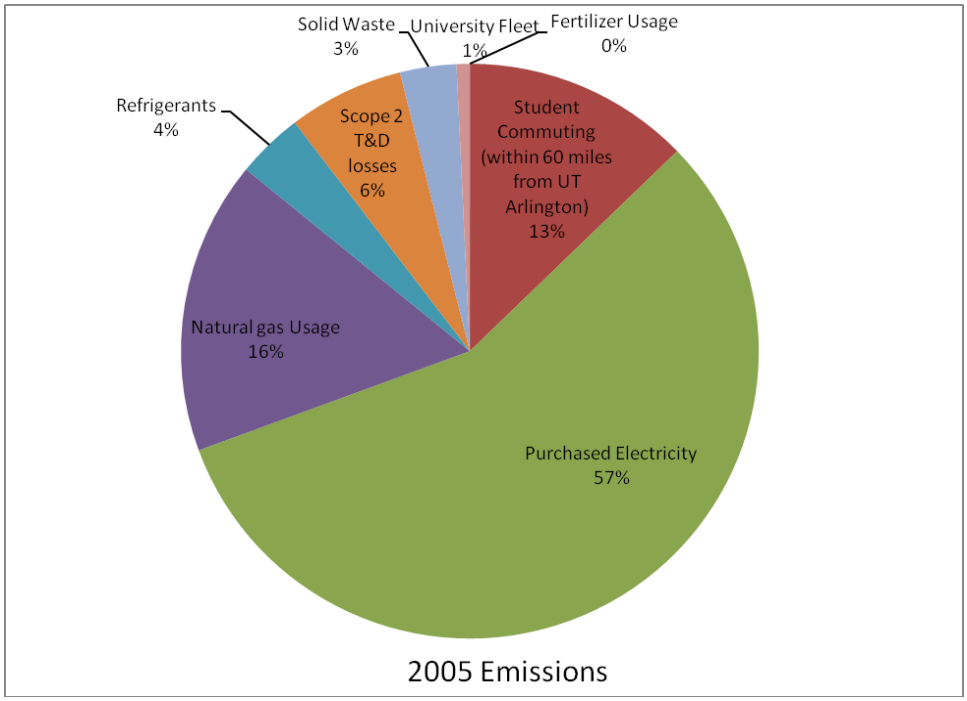
Offsets

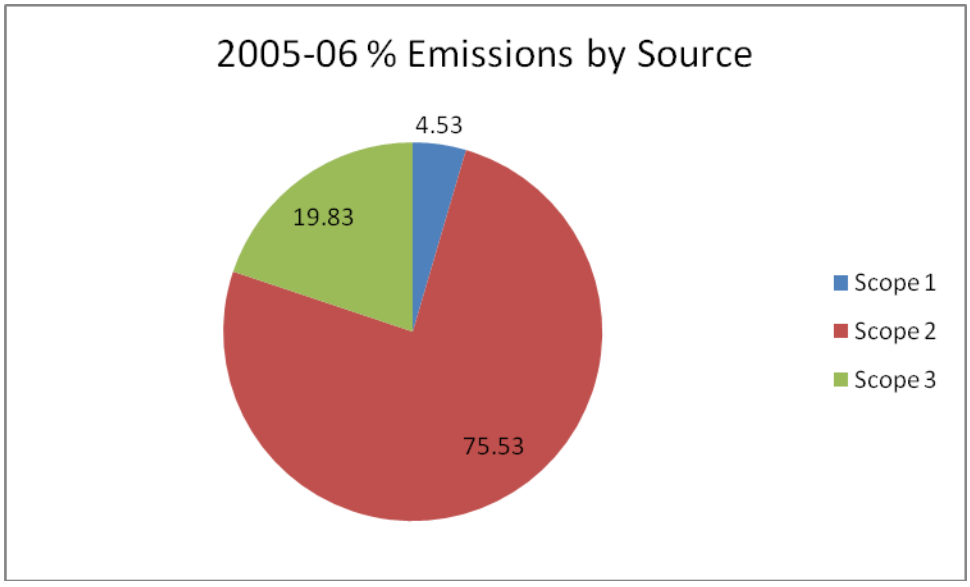
Offsets are operations or activities that the organization undertakes to compensate for the damage to the environment. These activities can include recycling or investing in clean technologies or sustainable activities whose positive impacts are measureable. UT Arlington has an onsite compost program since 2001, and hence this program qualifies as an Offset with Additionality. The weights of the composted material have been obtained from the Recycling Coordinator for offsets.

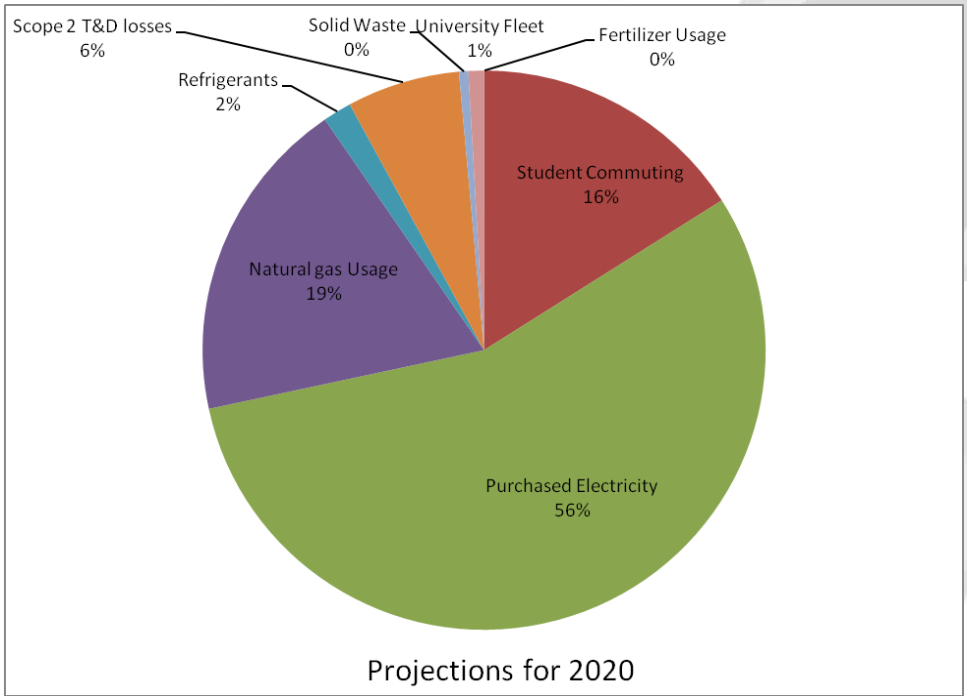
Section III: Findings

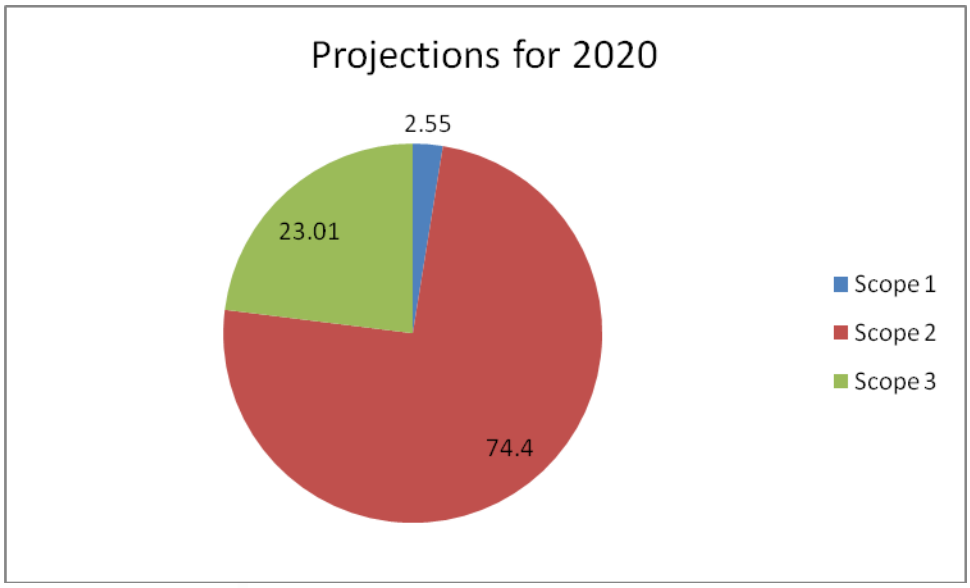
The total emissions for Scope 1, 2, and 3 are shown in Table 1

Emissions in Metric Tons	2005	%	2010	%	2015	%	2020	%
Fertilizer usage	11.4	0.011	11.4	0.11	11.4	0.11	11.4	0.10
Student Commuting	13145.1	12.73	13972.5	14.34	15307.4	15.18	16677.6	16.00
Purchased Electricity	58455.7	56.64	54856.7	56.30	56436.5	55.96	58016.1	55.62
Natural Gas usage	17038.2	16.51	17922.5	18.40	18765	18.61	19607.6	18.80
Refrigerants	3855.5	3.73	1216.6	1.25	1468.1	1.45	1719.5	1.65
Scope 2 T&D losses	6678.1	6.47	6368.7	6.53	6569.3	6,51	6769.8	6.49
Solid Waste	3256.7	3.15	2356.9	2.41	1457.1	1.44	557.3	0.53
University Fleet	761.7	0.73	725.1	0.744	828.1	0.82	931	0.9
TOTAL	103202.4	100	97430.4	100	100842.9	100	104290.3	100
Scope Wise Emissions								
Scope 1: Direct Fuel use	4628.6	4.63	1953.1	2.00	2307.5	2.28	2661.9	2.55
Scope 2: Electricity Consumption	75493.9	75.53	72779.2	74.72	75201.4	74.57	77623.7	74.43
Scope 3: Waste Generated	19823.1	19.83	22662.8	23.26	23333.8	23.13	24004.7	23.01
TOTAL	99945.62	100	97395.07	100	100842.7	100	104290.3	100


Solid Waste
3%
University Fleet
1%
Fertilizer Usage
0%
Refrigerants
4%
Scope 2
T&D
losses
6%
Student
Commuting
(within 60 miles
from UT
Arlington)
13%
Natural gas Usage
16%
Purchased Electricity
57%
2005 Emissions


2005-06 % Emissions by Source
4.53
19.83
75.53
Scope 1
Scope 2
Scope 3



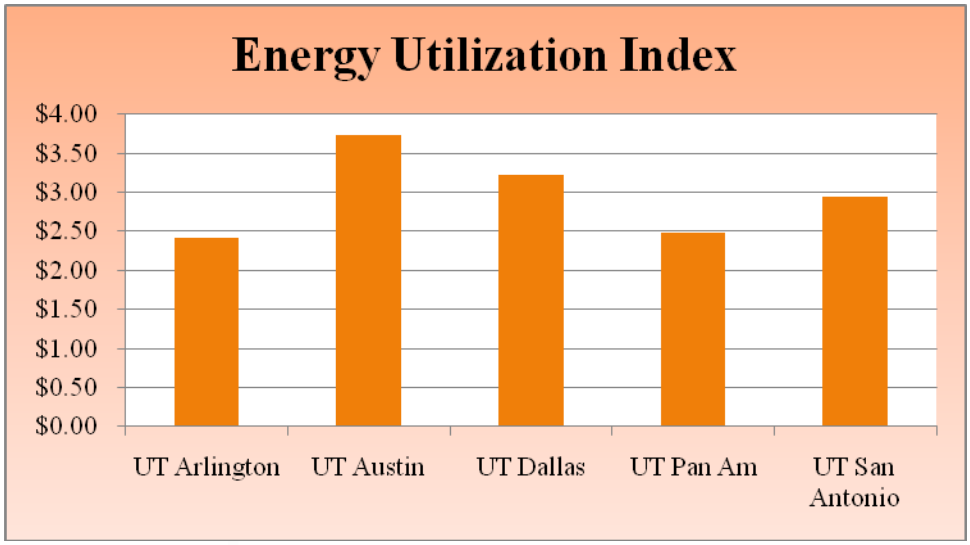


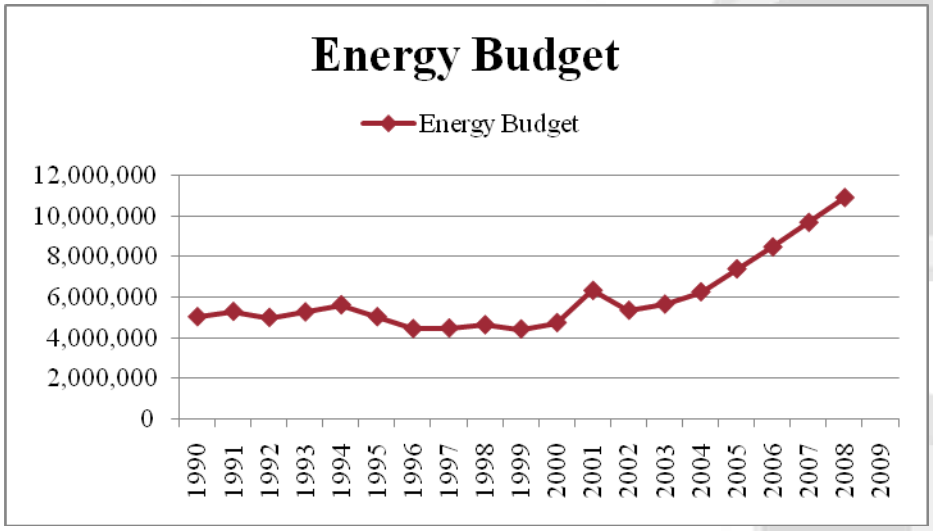
Emissions due to purchased electricity make up for the largest portion of the inventory. UT Arlington electricity use has decreased from 78% in 1990 to 56% in 2005-06, despite a significant increase in the campus population and building space as shown in the figure below. This decrease is due to energy efficiency efforts by the Office of Facilities Management, including performance contracting and various energy efficiency initiatives. The energy budget

(total spent providing the energy needs for all operations on UT Arlington) has been increasing since 1990. UT Arlington's energy Utilization index is $2.42/Sf/year. *EUI (Energy Utilization Index) is the amount of energy consumed per year (measured in Thousands of British Thermal Units {MBTU's}), divided by the gross conditioned area in square feet.*

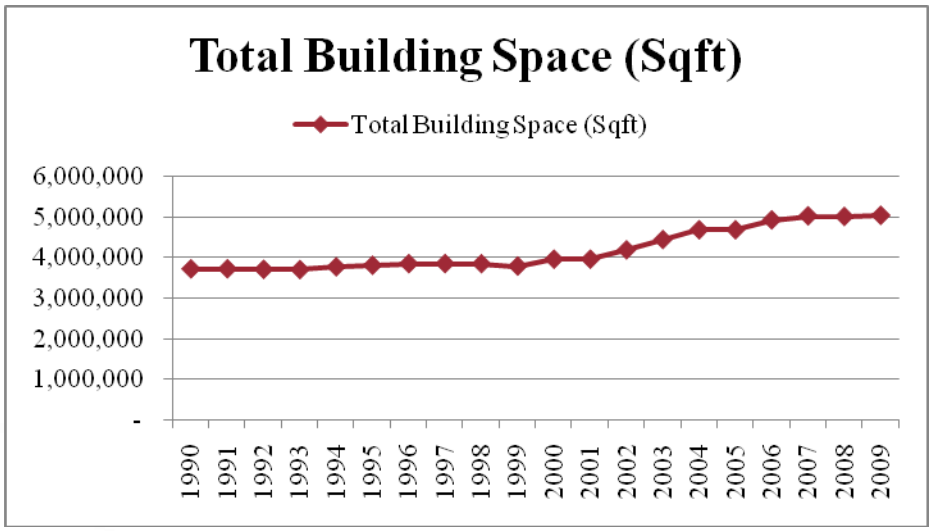
Table 3: Energy Utilization Index

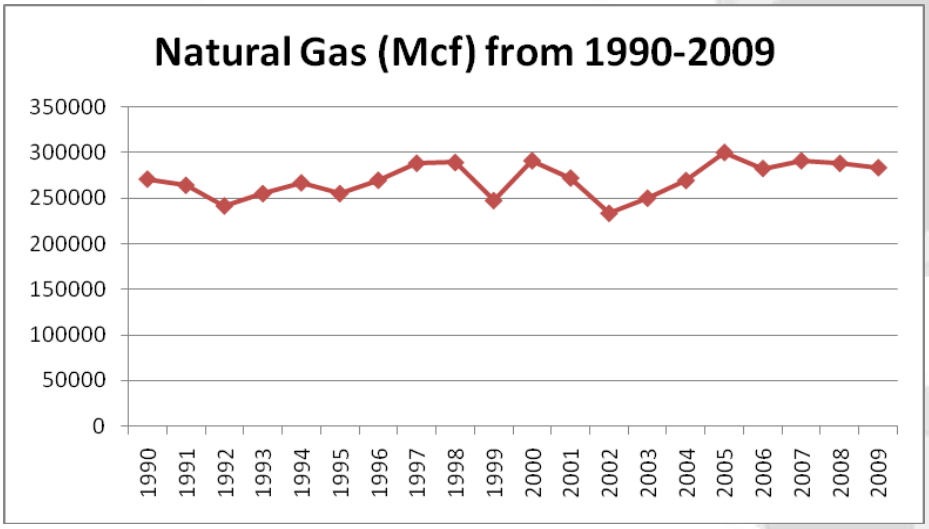
UT Institution	Energy Utilization Index (cost/Sf/year)
UT Arlington	$2.42
UT Austin	$3.73
UT Dallas	$3.23
UT Pan Am	$2.49
UT San Antonio	$2.94

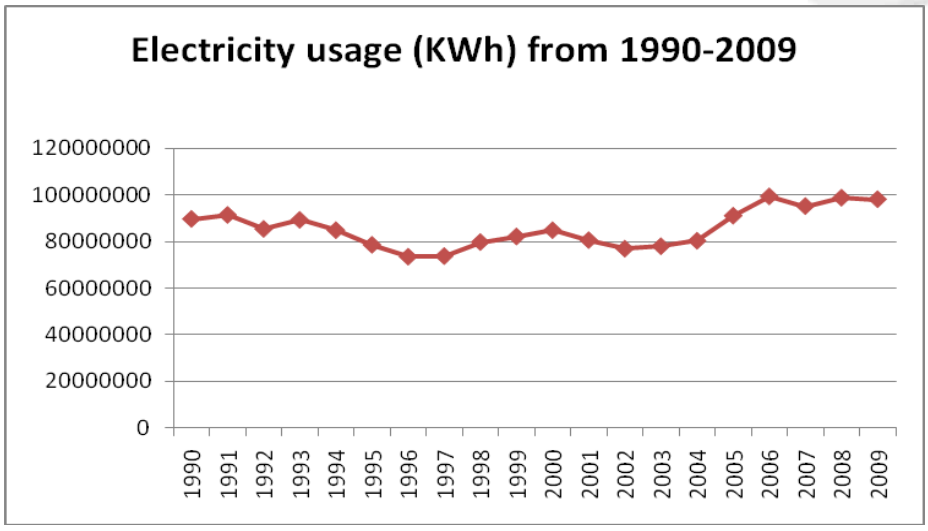




Note: The Energy Budget currently includes about $2.1 million for re-payment on the Energy Performance Contract with Siemens, which will be paid off in another 6-7 years







As seen from these three pie and line graphs, Scope 2 Emissions which includes purchased electricity, steam and chilled water is projected to be 74.4 % for 2020 as compared to 76.29% for 2007-08. As emphasized earlier, this is because of conservations and energy efficiency measures despite growing population and building space.

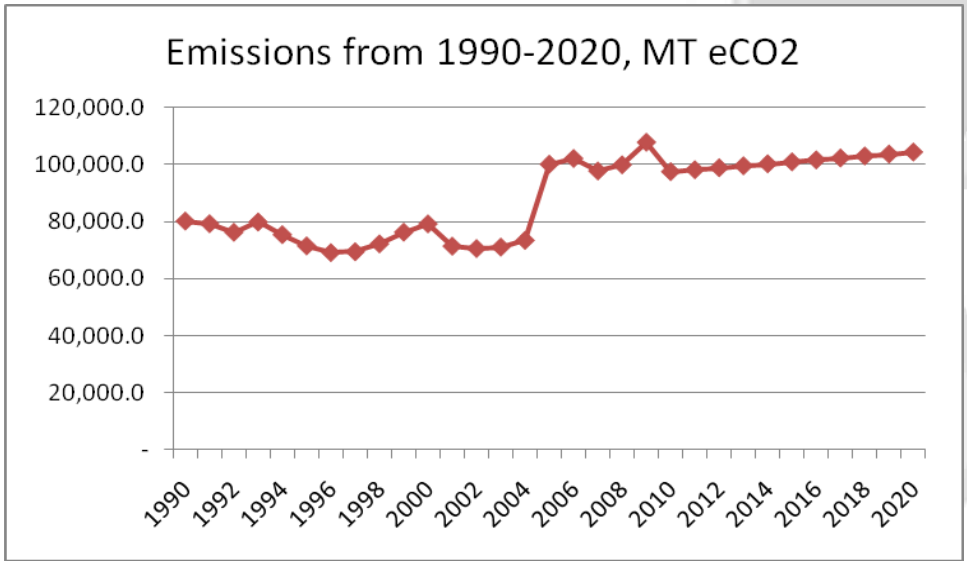
The Scope 1 Emissions are the direct emissions from On-Campus Stationary sources, direct transportation sources, refrigeration and chemicals, and agriculture. Fertilizer application makes up for such a small percentage of the total emissions, that it could be classified as de

minimus source and not tracked for future inventories. Direct transportation sources, which include the emissions from the University fleet decreased from 4.53 % in 2005-06 to 0.94% in 2007-08. It is projected to increase in 2020 to 2.55% as the University grows and the building space and campus population increases. Having more electric/hybrid, CNG vehicles on campus will help reduce these emissions.

Scope 3 Emissions includes solid waste, faculty air travel, commuting, transportation and distribution losses from purchased electricity, etc. It shows a progressive increase in emissions from 2005-06 to 2007-08 and 2020. Transportation data collection was the most difficult task of the entire inventory. Historic data was sparse at best, and several assumptions were necessary. Based on campus population numbers and information from the Institutional Research, Planning and Effectiveness office, we can assume a steady increase in commuter emissions. Promoting and offering car sharing, car pooling, and bike and hike program in the coming years can help reduce these emissions. We will revisit these findings in the future after we have access to more data on air travel by faculty and faculty/staff commute.

Solid waste is also an integral part of Scope 3 Emissions. The data for solid waste reductions has not been collected or tracked. No historic data is available for this indicator. The data was available for 2006-07 and 2007-08. We will revisit these findings in future if we get information on historic data. Going forward it will be beneficial to track the numbers more efficiently and correctly.

Section IV: Conclusion and future steps



As seen in the graph above, the CO2 emissions for UT Arlington show a slight upward trend for 2020. The purpose of this report is to provide an accurate snapshot of UT Arlington's current GHG emissions, utilize historic emissions data to project trends for 2020, and to be transparent and thorough about the methodologies, data collection, and interpretation. This report will be a useful tool for the Office of Sustainability and the University's Sustainability Committee as it moves forward drafting a Sustainability/Climate Action Plan. With a CAP, UT Arlington will set a target date and interim milestones for reducing the CO2 emissions. The CAP is a vital piece of the University's commitment to Sustainability and provides a tool for planning future operations and management strategies.

The UT Arlington has not signed the American College and University Presidents Climate Commitment (ACUPCC). Like many institutions, considering the growth and increase in campus population, UT Arlington's GHG emissions have increased over the past few years. However, the decreases in electricity and natural gas usage appear to be positive sign. Clearly, we must channel our focus on energy conservation, reducing natural gas and electricity usage, and harboring a behavior change to focus on a more sustainable campus

Considering UT Arlington's commitment to sustainability and energy conservation efforts, it is in UT Arlington's best interest to identify measures and strategies to reduce the carbon footprint over the coming years as seen by the increasing trend in the graph. Kyoto mandates 7% reductions below 1990 levels by 2012. Using the emissions inventory as a guideline, the University's Sustainability Committee will work to prepare a comprehensive plan for campus sustainability, including interim objectives and targets

Acknowledgements

This report required cooperation from many people, most of whom are very busy with their regular duties and responsibilities. Thank you to everyone for taking the time to help prepare an accurate and thorough measurement of our campus greenhouse gas emissions, and to President James Spaniolo and Vice President John Hall for their support and insight to commit the university to addressing long term planning and implementation of sustainability initiatives on campus.

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