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Challenges to Implementing the Greenhouse Gas Inventory at Illinois Wesleyan University

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Executive Summary

This report investigates what conducting a greenhouse gas (GHG) inventory at Illinois Wesleyan would entail. In it I discuss *what* emissions Illinois Wesleyan should consider including and *how* Illinois Wesleyan would collect this data. The findings are based on interviews I conducted on campus with Illinois Wesleyan staff who were deemed likely to have access to data and also on inventories performed by American College and University President's Climate Commitment (ACUPCC) signatory institutions.

It is essential to have a clear understanding of the boundaries of the inventory. Emissions fall under three scopes. Scope 1 emissions are a result of burning fuel on campus with vehicles or energy sources over which the university has direct control. Scope 2 data are indirect emissions that are produced by the electricity that the university consumes. Scope 3 emissions are a result of the practices at the university that are not owned or controlled by the university. These are more elusive to tabulate. The ACUPCC requires that we include commuting and air travel under Scope 3, and I found that it is very common to include agriculture and landfill emissions as well. The other possible main Scope 3 component is upstream emissions, or embodied energy, which are emissions that are a result from production of purchased materials, equipment, and infrastructures. Although including these emissions can give us a clearer picture of our full impact, trying to include them could also unnecessarily complicate the project. So I believe we need to think about what Scope 3 emissions would be a positive inclusion in the inventory. We want to make sure that the university still has some control or influence over these emissions so that including them would be beneficial for the purpose of the inventory.

Clean Air-Cool Planet offers a "calculator" to tabulate data in eight categories. I provide information on what each category includes, findings related to our campus, suggestions for data collection, and who the best contact would be for information. By looking closely at each category, I found that the data are available with just a few exceptions (fuel mix and commuter data). Other areas will be time-consuming (energy and air travel). We will also have to decide if including student commute, fertilizer usage on farms, and fraternity waste is worth the effort to collect. The budget, refrigerants, and offsets categories all have accessible data that are already compiled.

Overall, we must determine how to include historical data, streamline the collection process, define the boundaries, decide what upstream emissions to include, and meter buildings. We must also decide who will be responsible for the inventory. Compiling the inventory requires analytical decision-making; it is not just number crunching. The person responsible for conducting the GHG inventory needs to be a staff member with an institutional home. The inventory will only be valuable-- both in terms of money saved and sustainability -- if we have the personnel to utilize it. In the future, the best answer seems to be to add it to the list of many projects assigned to a sustainability coordinator. These are key issues we must consider carefully before we start the inventory in order to make the process as efficient and effective as possible.

Introduction

As global climate change and sustainability issues become more salient to the public, colleges and universities are taking up the challenge to join the environmental movement. With 521 signatories as of April 18, 2008, The American College and University President's Climate Commitment, or the ACUPCC for short, represents just one part of the larger higher education push towards sustainability. This document, which was created in 2006, calls for signatories to make a commitment to ultimately neutralize greenhouse gas (GHG) emissions through a series of steps. The requirements for signatory institutions, as listed in the ACUPCC Implementation Guide (Dautremont-Smith, 2007), are:

- Create or designate institutional structures to guide the development and implementation of the ACUPCC within two months;
- Conduct GHG emissions inventory within a year, and annually thereafter;
- Take immediate steps to reduce GHG emissions by selecting at least two of the tangible actions from the commitment within two months of commitment and implementing them within two years;
- Create a climate action plan (CAP) within two years;
- Integrate sustainability into the curriculum;
- Report GHG emissions and progress in implementing climate action plans to the ACUPCC within three years;
- Make the GHG inventory, climate action plan, and progress reports publicly available;
- Report emissions data annually, starting in year four and submit a narrative progress report with it at least every other and annually if possible.

The key part of the ACUPCC is the carbon inventory because it highlights areas where the university can improve and serves as the measuring instrument for GHG reductions. Most ACUPCC signatories use The Clean-Air Cool-Planet (CA-CP) calculator to quantify their emissions. The CA-CP calculator is affiliated with the ACUPCC and is thought of as the best tool for universities. This calculator lists eight emissions categories: budget, energy, commuter traffic, air travel, agriculture, solid waste, refrigeration, and offsets. Every inventory is unique because each of these categories has subcategories that may not apply to every university (Rusina, 2007). The CA-CP calculator also suggests initially including up to ten years of historical data in the

institution's carbon inventory so that the school can track trends. Ultimately, every school must make its own decisions as to how to define the boundaries of the inventory, yet there are certain emissions that all schools must include in order to fulfill the requirements outlined in the ACUPCC. To make these common requirements clear, emissions are divided into three "Scopes." As the ACUPCC implementation guide explains,

- **Scope 1** refers to direct GHG emissions occurring from sources that are owned or controlled by the institution.
- **Scope 2** refers to indirect emissions generated in the production of electricity consumed by the institution.
- **Scope 3** refers to all other indirect emissions -- those that are a consequence of the activities of the institution, but occur from sources not owned or controlled by the institution (Dautremont-Smith, 2007).

Signatories are required to account for Scopes 1 and 2 and a portion of Scope 3 emissions (commuting and air travel paid for by the institution). Universities may go above and beyond the requirements, especially if these emissions are significant and provide good opportunities for reduction. For example, Illinois Wesleyan could make a difference by researching and including the "embodied emissions," or the GHG emissions emitted from the extraction, production, and transportation of products in our inventory (Dautremonth-Smith, 2007). Although this step is not mandatory, it would give us knowledge about the impact our purchases make on our overall GHG emissions, and point to ways in which we can reduce our impact.

At President Wilson's request I have investigated what conducting a GHG inventory at Illinois Wesleyan would entail. In this report I discuss *what* emissions Illinois Wesleyan should consider including in its GHG inventory and *how* Illinois Wesleyan would collect this data. I do this by first elaborating on Scope 1 and 2 definitions and discussing Scope 3 emissions as they pertain to our university. I then look at the data categories in the CA-CP calculator and determine the steps necessary to collect the information at Illinois Wesleyan, providing suggestions in a few cases of specific data to consider excluding. Through this examination and the attached communications journal, I hope that the project can be continued into the future.

Methodology

This report is based on interviews I conducted on campus with Illinois Wesleyan staff who were deemed likely to have access to data and also example inventories of other ACUPCC signatories. I collected the data during March and April.

I found that defining the boundaries of the inventory is very important. If the boundaries are not clear, then collecting the data is much more difficult and confusing because it is never clear where to stop. In order to get a clear understanding of the inclusions and procedures of a GHG inventory, I read the eleven example inventories from ACUPCC signatories made available on the AASHE website (Campus GHG Emissions Inventories, 2008). These included inventories by California State Polytechnic University, New Hampshire, Middlebury, Carleton, Duke, UC-Santa Barbara,

Connecticut, Smith, University of Pennsylvania, Evergreen, and University of Illinois at Chicago. From this I was able to better understand the Scope 1, 2, and 3 definitions and provide insights on how other schools collected the data. Many of the schools I studied highlighted defining the boundaries as the most essential step (Middlebury: The Carbon Neutrality Toolkit, 2007, UCSB: Ahmed, 2006).

In order to apply inventory boundaries directly to the Illinois Wesleyan campus, I spoke with people in various offices at Illinois Wesleyan that were likely to have the data needed or the access necessary to obtain it. I asked them if the data was already compiled and what effort would be necessary to collect the data. I also looked for possible problem areas, or data categories we might choose to omit. At times I had to speak with multiple people in order to determine who would be the best contact. From these interviews I determined where data was located, what data are available, and what would need to be done in order to retrieve the data, and developed a list of those who are responsible for this data to serve as future contact people. I did this for all of the data categories for the CA-CP calculator as I had found that all of the schools I surveyed used this calculating tool.

First, in order to conduct the inventory, we must have a clear understanding of Scopes 1, 2, and 3, and what they entail.

Scope 1 and 2 emissions

As noted above, Scopes 1 and 2 emissions must be included in the inventory. Most schools find that these categories account for a large majority of their total emissions. In order to make the collection process efficient and transparent, it is essential to clearly define what is included in Scopes 1 and 2. Most universities choose to include only those things over which they have operational control. The University of Pennsylvania included "all buildings and facilities…that serve direct academic and residential functions for the faculty, staff, and student body, and that are owned and operated by the University of Pennsylvania" (University of Pennsylvania Carbon Footprint, 2007, 10). *Including only operationally controlled emissions simplifies data collection because the emissions are captured in receipts and budget records.*

As defined by the ACUPCC, Scope 1 data are all emissions from sources that the university owns or controls, including the heating and cooling done on campus, the college fleet, refrigerants, and offsets. These are emissions that are a result of burning fuel on campus with vehicles or energy sources over which the university has direct control. Scope 1 also includes the budget category. Although the budget is not an emissions source, entering demographic and institutional data helps facilitate analysis of the results and fluctuations over time. Other universities have included the following pieces of information under their Scope 1 emissions:

- Production of electricity, heat, steam, chilled water
- Co-generation plants (combined heat and power)
- Transportation with university fleets including cars, vans, buses, trucks, etc
- Emissions from unintentional leaks (e.g. refrigerants)

- Composting and any other offset purchases (e.g. green tags)
- Budget including research, operational, and energy
- Population, physical size, and total building space

Transportation of the campus fleet is the most difficult area to define under Scope 1 emissions. First, the university must define what is included in its transportation fleet and related mileage. Most schools include all university owned vehicles and vehicles used for athletic team travel. Schools surveyed obtained information from: budgets from the business office for gas expenditures, reimbursement sheets for each month (estimate total gallons based on average cost of fuel), and fuel consumption at the gas pump owned by the university. A few schools found it difficult to include bus mileage by students and athletic teams because of lack of data (Carleton: Lord, 2005, Duke: Hummel, 2004).

Another finding with regard to Scope 1 emissions is that refrigerants had very little impact on the overall inventory of several schools surveyed (Cal Poly-Pamona: Rusina, 2007, Duke: Hummel, 2004). Evergreen College noted that they subtracted the Pell awards out of their operational budget because they do not have financial control over them; they simply pass through the system (Evergreen: Pumilio, 2007, 86).

The ACUPCC defines Scope 2 data as indirect emissions that are produced by the electricity that the university consumes. For example, Scope 2 would include the GHG emissions that are created through the burning of fuels to produce the energy that the university brings in. This determination essentially includes finding out the fuel mix that produces the energy used by the university and the amount of energy the university purchases. Finding the fuel mix can be tricky, especially if the energy comes from a regional grid. Oftentimes the fuel mix varies over time and must be approximated as closely as possible (University of Pennsylvania Carbon Footprint, 2007). The best bet is to contact the energy supplier to see if it can provide you with the current fuel mix (Evergreen: Pumilio, 2007). If it is impossible to find the exact fuel composition, the calculator includes a conservative default setting based on EPA regional averages that can be substituted.

Scope 3 emissions

While Scopes 1 and 2 are fairly easy to delineate, Scope 3 has many more possibilities for inclusion and, thus, far more decisions need to be made. Scope 3 emissions are a result of the practices at the university that are not owned or controlled by the university. Emissions that fall under this category that are required by the ACUPCC for inclusion are commuting (by faculty, staff, and students) and air travel. Further Scope 3 emission inclusions are university specific and depend on the data available and the constraints on time (Cal Poly-Pamona: Rusina, 2007). Each school must determine what Scope 3 emissions are important to include. Connecticut College explained that it limited its Scope 3 emissions to "those emissions which can be directly influenced by Connecticut College and its associated energy policies" and noted, for example that "it cannot control the delivery of packages by UPS to the campus which also generates emissions of carbon dioxide" (Connecticut: Dziubeck, 2003, 5). Certainly the university

wants to keep emissions investigations within reason. But at the same time, in order to be effective, the inventory must give the most accurate picture of its emissions as possible. Similar types of Scope 3 emissions sources are included in many of the sampled inventories, often because these sources hold a significant weight in total emissions. In addition to the required commuting and air travel emissions, universities commonly include agricultural practices and landfill emissions in their Scope 3 calculations.

Below I discuss possible Scope 3 categories.

Commuting

Depending on the university location and geographic set up, commuting can be a significant contributor to the carbon footprint. Just one example is California State Polytechnic University, which found that over 55% of its emissions were a result of transportation, and a large part of transportation was faculty, staff, and student commuting to and from the university (Rusina, 2007). On top of the daily commute, Duke has considered trying to include the emissions resulting from students coming to campus for the semester and going home at the end of the year (Duke: Hummel, 2004). Most universities and colleges, however, stick to the daily commute.

In order to factor in information on commuting universities must consider the number of people at the university (staff, faculty, and students), the fuel efficiencies of their cars, the percent of those who drive alone, the percent that carpool, the number of days commuting, and the trip distance (UCSB: Ahmed, 2006, Evergreen: Pumilio, 2007). Measuring all of these factors can be overwhelming, but some have found a way to effectively approximate the emissions. From consulting the example inventories, I found that the most popular way was to conduct a survey to determine commuter habits (Evergreen: Pumilio, 2007, University of New Hampshire, 2004, Connecticut: Dziubeck, 2003, Smith: Thomas, 2005). The survey could be extensive, or it could simply ask how many days a year on average campus members commuted. From the number of days commuted, you can use national averages of fuel efficiencies to determine emission amounts. Other schools bypassed the survey by using national statistics of commuting days, fuel efficiencies, and carpooling trends (Connecticut: Dziubeck 2003, UIC: Klein-Banai, 2007). They then figured the distances traveled by obtaining anonymous zip codes of staff, faculty, and students (Carleton: Lord, 2005, Duke: Hummel, 2004). The zip codes were then put into Mapquest to determine the approximate mileage (Connecticut: Dziubeck 2003, UIC: Klein-Banai, 2007).

Air Travel

Although air travel is classified under Scope 3 emissions, universities have control over how much they choose to fly. Air travel paid for by the universities usually includes trips necessitated by conferences, educational programs, business trips, and athletics (Evergreen: Pumilio, 2007, 95). An inventory would *not* include personal student air trips for spring break since the universities do not fund those air miles. However, the university should consider including study abroad programs funded through the university (New Hampshire: 2004-2005 Update, 2006).

Obtaining air travel data can sometimes be difficult because it is often decentralized within universities and reported to many different offices (Duke: Hummel, 2004, UCSB: Ahmed, 2006, 32). Many universities cited the need to develop a standardized process for recording airplane mileage (Cal Poly-Pamona: Rusina, 2007, New Hampshire: 2004-2005 Update, 2006, UIC: Klein-Banai, 2007). Many of the example inventories were limited to reimbursement forms for the flights as data sources. (New Hampshire: 2004-2005 Update, 2006). Once the amount of money spent on air travel is obtained through reimbursement forms, you can approximate the total air miles by using the average cost per mile to fly.

Agriculture

Another common Scope 3 emission that universities try to account for is agriculture. When any fertilizer containing nitrogen is used, nitrous oxide, which is a GHG, is released (University of Pennsylvania Carbon Footprint, 2007, 21). Agriculture emissions could include animals owned by the university, nitrogen usage on campus grounds and landscaping, and chemical practices used on farms owned and leased by the university. Many universities chose not to include agriculture because they found that emissions from these sources were negligible, or insignificant enough that it was unnecessary to include in the inventory (UIC: Klein-Banai, 2007, Carleton: Lord, 2005, New Hampshire: 2004-2005 Update, 2006). Some universities only included fertilizer used on their own grounds, and determined the pounds of synthetic and organic fertilizer and percent nitrogen to approximate emissions (Carleton: Lord, 2005, University of Pennsylvania Carbon Footprint, 2007, Evergreen: Pumilio, 2007).

Landfill emissions

Landfills are a significant contributor to global climate change because they emit methane, a potent GHG (Evergreen: Pumilio, 2007, 108). The calculator includes an input space for the amount of waste that the university sends to a landfill, as well as the type of landfill utilized. Including statistics on the amount of waste disposed can be beneficial because it also illuminates over time whether or not progress is made with waste reduction (New Hampshire: 2004-2005 Update, 2006, 43). Sometimes there is difficulty in determining the exact distribution of trash because it is taken to multiple landfills (University of Pennsylvania Carbon Footprint, 2007). The distribution is important because different types of landfills emit varying amounts of GHG emissions. The University of Pennsylvania estimated emissions by checking landfill websites, and if the information could not be found a basic landfill was assumed (University of Pennsylvania Carbon Footprint, 2007, 22). Another aspect of waste management that should be included in the GHG inventory is the emissions associated with transporting the waste to the landfill (Evergreen: Pumilio, 2007, 108).

Other possibilities

Outside of these four commonly identified GHG producing factors, universities have identified other emissions they think would be beneficial to incorporate into their inventory. A few examples are outsourced activities and contracts such as construction (University of Pennsylvania Carbon Footprint, 2007), carbon sequestration capabilities of the campus landscape (e.g. from planting trees) (Cal Poly-Pamona: Rusina, 2007), and food miles traveled to campus (Connecticut: Dziubeck, 2003, Evergreen: Pumilio, 2007).

This last suggestion, calculating the miles traveled by the food consumed on campus represents an "upstream emission," which is synonymous with, "embodied energy." These are essentially the emissions resulting from the production of purchased materials, equipment, and infrastructures (UCSB: Ahmed, 2006). For example, energy production emits GHGs other than during the combustion phase. Mining, transporting, and refining the fuels is also energy intensive (Connecticut: Dziubeck, 2003). Another example is the embodied energy in water consumption (Cal Poly-Pamona: Rusina, 2007), the cleaning and transportation of water consumes a lot of energy, and thus emits GHGs. Yet there is no data set in the calculator that would include these emissions.

Calculating the embodied energy in products is complicated, but it can highlight purchasing choices, including both environmentally positive (bamboo) and negative (mahogany) ones. Embodied emissions help to show the depth and complexity of the GHG emissions problem. The University of New Hampshire found that if it included upstream emissions its total emissions increased by 15% (University of New Hampshire, 2004, 1). A university must be aware that the types of materials that it chooses to buy have a significant effect on the environment.

One argument against including embodied energy centers on the question of who holds responsibility for these emissions. The Environmental Protection Agency has purposely excluded these emissions from its calculator because it believes they are the responsibility of the industries producing these materials (University of New Hampshire: 2004-2005 Update, 2006, 46). Perhaps in the future their strategy would be viable, when all industries are concerned with their emissions; but at this time this inclusion is important because it is important for universities to support industries that are concerned with their GHG emissions. Thus, having awareness of the products purchased is critical.

Ultimately, it is very difficult to include a full account of upstream emissions, and trying to do so could unnecessarily complicate the project. Embodied energy is also somewhat of a slippery slope leading to an unclear and unmanageably large university boundary. When conducting a GHG inventory, it is important not to reach so far as to get away from learning about emissions over which the university has control or influence. So while determining upstream emissions can be beneficial to the inventory as a whole, a line must be drawn when including them becomes detrimental to the purpose and benefits of the inventory.

Suggestions from example inventories

Defining Boundaries

As seen, determining where to stop or what emissions to include can be quite difficult. Upstream, or embodied energy opens the door to endless possibilities of emission areas to include, which can be overwhelming. But at the same time, having a holistic view of the impact of university actions is essential. Determining what to include requires a constant evaluation of the time and effort it would take to include the data, and how big an impact this data would actually represent on the overall GHG inventory. UCSB followed the following five principles when setting the operational boundary of the inventory: relevance, completeness, consistency, transparency, and accuracy (UCSB: Ahmed, 2006).

- *Relevance*
  One way to determine whether or not to include an emission is to estimate what percentage of total emissions it would likely represent. For example California State Polytechnic University did not include off-campus property leased by the university because it would account for fewer than 5% of total emissions (Rusina, 2007). Another way to consider this is to remember that if the calculator does not explicitly ask for the emissions area, there is a good chance it does not account for a significant portion of the inventory. The main and important areas are covered in the calculator.

- *Completeness*
  Another way to define boundaries is to determine whether or not data are available. Data can be difficult to obtain, and if even approximation is impossible, you should just take note of the omission and move on. As the emissions inventory guide from Middlebury states, sometimes you "have to decide what to include based on what is actually available" (Middlebury: The Carbon Neutrality Toolkit, 2007). UCSB admitted that ultimately it was "largely influenced by the availability of data of reasonable quality" (UCSB: Ahmed, 2006). One common source of incomplete data is in how far back data are available (Evergreen: Pumilio, 2007). If these numbers are not available (as many schools find to be the case), you can simply extrapolate the data back. If one previous year can be found, then the in-between years can be estimated by charting the change. Or you can find data back to the farthest date possible and then assume the previous years are similar (Carleton: Lord, 2005, Smith: Thomas, 2005).

- *Accuracy*
  Inventories will almost always necessitate at least some approximation. Sometimes this is a result of the kind of data available (e.g. converting airline expenditures to mileage) and other times it is because of a lack of data (e.g. historical records) (University of Pennsylvania Carbon Footprint, 2007, 7). The

important step is to document when you approximate and also what method of estimation you use (Evergreen: Pumilio, 2007, 81).

- *Consistency/Transparency*
  Ultimately, the most important rule of an inventory is transparency. Every university is different, and thus every inventory will be different. Therefore explaining the reasoning behind exclusions, approximations, and possible gaps in data is essential. While I was reading through inventories, I found that the ones that were most helpful were those that explained in full when there was a difficulty obtaining data or a discussion of a decision to exclude a source of emissions. It is very important to explain and justify the decisions you make, because many of them are subjective and thus up to the individual conducting the inventory. This also opens the door for future improvements and for expanding the data set because the next person conducting the inventory will see where approximation or omissions had to be made. Transparency will lead to consistency because every year the person doing the inventory can see how it was done the year before and can make sure that the same omissions and approximations are included, if they cannot be improved upon.

Conducting the Inventory?

From the inventories available for reading, I found the following types of people were responsible for conducting the inventories surveyed:

- Graduate school class (Cal Poly-Pamona, UCSB)
- Masters student (Duke, Evergreen, UIC),
- Part time facilities intern during the summer (Smith)
- Environmental sustainability coordinator (Duke)

Institutional Changes

From reading the example inventories, I found two main suggestions for institutional changes necessitated by conducting an inventory: metering buildings and centralizing the data collection.

- *Metering Buildings*
  Gaining knowledge about the total emissions does little to help actually make reductions if the university does not meter individual buildings (University of New Hampshire: 2004-2005 Update, 2006). As California State Polytechnic University argues, metering "assesses energy usage for various campus activities, and provides feedback on the effectiveness of reduction strategies. A method for prioritizing metering installation should be developed" (Rusina, 2007, 9). If each building is metered separately, the institution can pinpoint where reductions can be made and highlight improvements.

- *Centralizing the Data Collection*
  One of the main reasons schools found collecting the data to be time consuming and difficult was because they had no centralized location to obtain information (Smith: Thomas, 2005). Completing an inventory, especially for the first time, is

similar to a scavenger hunt. One suggestion to ease the process in the future is to create one location where all of the required data are sent annually (Middlebury: The Carbon Neutrality Toolkit, 2007). Centralization eliminates searching offices across campus for different segments of the inventory.

The Inventory at Illinois Wesleyan University

I examined each input area in the CA-CP calculator to identify what data Illinois Wesleyan would need to gather for its inventory, who the contact person would be to acquire this data, and what would have to be done to find this information. The eight input areas are: budget, energy, commuter traffic, air travel, agriculture, solid waste, refrigerants, and offsets. Within each of these input categories, I provide information on what the category includes, findings related to our campus, suggestions for data collection (if any), and who to contact.

1.) Budget

Summary

The budget category is divided into three sections: operating budget, research dollars, and energy budget. The operating budget "consists of all sources of funding the University has financial control of and is considered plainly as the cost to operate the institution" (CA-CP user's guide). The research dollars are what it sounds like: all of the funding Illinois Wesleyan receives for research programs. Finally, the energy budget is the total money spent on providing energy for all university activities.

Findings

The budget is straightforward and should take the least amount of time to collect. This information can be found at the Business Office.

<u>Contact:</u> John Bryant, Controller

2.) Energy

Summary

The Energy input includes on-campus stationary sources, off-campus electricity production, and transportation. On-campus stationary sources includes "all fuel burned on campus except in vehicles" (Clean Air-Cool Planet, 2006). If the university uses co-generation (combined heat and power) plants, this data would also go here. Off-campus electricity includes all the electricity that the university purchases as well as off campus steam production. Finally, transportation includes the amount and type of fuel consumed by the campus fleet.

Findings

First, Illinois Wesleyan does not use co-generation and does not produce steam, so we do not need to worry about those areas of emissions. Illinois Wesleyan uses mostly natural gas. It is easy to determine the total usage by looking at the monthly bill at the

Physical Plant. The bill has a list of building categories (academic, residence halls, fraternities, university rentals, etc.) and the amount of therms used for each section. To collect the data we need to add up the accounts for each month.

As for off-campus electricity production, Illinois Wesleyan does not need to include steam or chilled water. We do not purchase steam, and we chill water within each building, so the emissions would fall under gas purchasing. Again, the Physical Plant (specifically Rory McGuire) has all of the data for purchased electricity. Illinois Wesleyan's electricity supplier is Ameren, which obtains gas from Nicor Gas Company. Determining the fuel mix is slightly problematic, although a good estimate exists. Darcy Conner, the contact at Ameren, explained that "currently Illinois is a deregulated state and the utility no longer owns generation. Ameren buys power from numerous sources and that means each supplier has different types of generation (i.e. coal, natural gas, nuclear, etc)" (Conner interview, 2008). With the fuel report she sent me I was able to find the source composition of the natural gas. The only issue is that Ameren is unable to identify 13% of its supply, which it lists as "unknown," so we will not be able to identify 100% of our sources (Amerenlines, 2008). I have attached the Ameren report for future reference, so that every year a similar report can be found. Once we obtain the amount purchased is obtained, the University would need to make sure it is in kWh, and if not to convert it.

At Illinois Wesleyan, transportation falls under three categories: the motor pool fleet, the fleet fueled by the university's gas tank, and the individual travel accounts reimbursed by the business office. For the GHG inventory, we must obtain the total gallons of gas used. For certain categories, the gallons can be approximated by using the number of miles driven and the fuel efficiencies of the vehicles.

The motor pool fleet includes any vehicle owned by the university that is checked out through the university. In order to obtain a university vehicle, you must fill out a form to document the number of miles driven. So to determine the total mileage, we would need to go through each individual form and add the total mileage for all forms. We could also organize the miles by type of vehicles to take into account differing fuel efficiencies. Gas tank totals for the university provide data on any vehicles that fuel up at the university owned gas and diesel tanks, for example, Physical Plant vehicles. Again, the Physical Plant has the receipts that would show the gallons consumed. Finally, for the calculator, we need to include the mileage from the reimbursement forms for employees traveling as a result of university activities. This includes individuals in areas on campus like the development office and admissions as well as faculty and staff who travel in their own vehicles for university related business. All reimbursement forms go through the business office. In order to collect the data we would have to go through and tabulate each reimbursement form. These invoices would also include summary reports of credit cards to see the travel expenses put on the university purchasing card program and invoices on charter coach buses for athletics and field trips. The data are available and all the information funnels through the business office; it just requires time to go through all of these individual accounts. Once all of the accounts are tabulated we have to convert the amount reimbursed to gallons used. This can be done using average gas

prices. We might choose to omit athletic referees' travel, since referees are paid a flat rate and are not reimbursed for travel. This would most likely account for a very minimal portion of the total emissions.

Suggestions for data collection

The main issue in the energy section is time. It is important to work to compile information as efficiently as possible. John Bryant gave a rough estimate that it would take 5-10 hours a week for a student worker to compile all of the transportation emissions that come through the business office. (This estimate does not include staff oversight, but it does include compiling air travel data). On top of hours of work in the Business Office, there would be hours of work at the Physical Plant (Mary Anderson) too, adding in individual accounts of university vehicle usage.

- Rory McGuire suggested that keeping tabs on the inventory on at least a monthly basis would be the easiest way to go, whereas trying to compile data for an entire year would be a larger project.
- Once we commit to keeping track of the emissions, tabulating them on a weekly basis (or perhaps daily) as part of the normal record keeping will decrease the immensity of the project.
- We could also save time by changing the reimbursement form procedure. Right now each form is different and there is not consistency on how the data come in. If there were a line on every form that included miles driven, it would take less time to add up. In addition, that change would reduce the degree of estimation.

Contacts:

Rory McGuire, Senior Physical Plant Operations Coordinator for information on on-campus stationary sources, electricity consumption, and gas tank totals

Mary Anderson, Physical Plant Services Coordinator for information on vehicles loaned out by the university

John Bryant, Controller for information on individual travel reimbursement forms

Darcy Conner, Account Manager Customer Service at Ameren for information on fuel mix

3.) Commuter Traffic

Summary

Commuter traffic refers to "the number of annual miles traveled by faculty, staff, and student commuters" (Clean Air-Cool Planet, 2006). The guide acknowledges that this will be a rough estimate, depending on the data available.

Findings

I contacted Cathy Spitz in the Human Resources department for information on employee commuting distances. I was told that the office could provide an anonymous list of zip codes for both faculty and staff. This would enable us to estimate the number of miles traveled (especially for those who commute greater distances). Student commuters are another issue. We could determine how many live off campus and approximate travel

distances. In reality, student commute probably accounts for a very small percentage of the overall inventory. However, the zip codes would not give exact commuter distances and would also not take into account those faculty and staff that use alternative forms of transportation or carpool, which we may want to encourage further in the future.

Suggestions for data collection

- In place of using only zip codes, we could do what many other schools do and conduct a survey, as discussed in the previous section. It will take less time and be more accurate than averaging zip codes.
- We would have to consider how extensive the survey would be. It seems that having just a few questions asking how many days faculty and staff commute, their mode of transportation (including the fuel efficiencies of cars and carpooling), and the distance would give us a good idea of the miles traveled. We can then take averages of all of these numbers to estimate the total emissions.
- We could conduct the inventory very easily at the beginning of the academic year during faculty and staff convocations.

Contact: Cathy Spitz, Associate Vice President for Human Resources for information on employee zip codes

4.) Air Travel

Summary

Air travel can have a large impact on the inventory results, so it is important that the university include at least an estimate of the air miles traveled. As discussed above, this category includes any air transport paid for by the university (faculty and staff on business, student programs, conferences, sports teams travel, etc).

Findings

Air travel would also be found in the business office reimbursement records. We would have to go through individual forms to find the money spent. The forms do not include the miles traveled, so we could use the estimate given in the CA-CP calculator guidelines for cents per air mile to change from money to miles. This calculation would include tabulating accounts from May term travel courses, athletics, guest speakers, admissions, and faculty and staff travel. One wrinkle is that sometimes the admissions office offers to pay for a portion of a student to fly in and visit. We would have to decide whether or not to account for all of the miles, or only the portion that Illinois Wesleyan paid for. We also would have to decide if we would include the Illinois Wesleyan sponsored study abroad programs, which would include determining the miles traveled times the number of students on the program. Air travel data would be gathered at the same time and place as much of the transportation data. Again, the main issue here is time. Just collecting the current year would take time; if we wanted to gather historical data (it exists up to seven years back) it would take much more time.

Suggestions for data collection

- To obtain a historical background for understanding the significance of our inventory, we could possibly just determine the total air miles traveled from seven years ago and approximate the trend up to the present year. This would save time with the historical data.
- In the future we may want to change the individual reimbursement forms to include miles, so that we do not have to use the estimate from cents to miles.

Contact: John Bryant, Controller

5.) Agriculture and Grounds

Summary

Agricultural practices produce methane and nitrous oxide emissions. The university should include emissions from both livestock and fertilizer application on fields and grounds. We need to find the total amount of fertilizer in pounds and the percentage of nitrogen of the fertilizer used.

Findings

Since Illinois Wesleyan University does not own any livestock, only fertilizer applications must be taken into account. The university leases land to over twenty farms, so obtaining the nitrogen content and tillage practices of each individual farm could be very difficult, especially since the practices vary even within one farm. Since we do not have control over these practices, we are not required to include them. We would, therefore, need to consider whether or not including the data from these farms is worth the effort.

On campus, Illinois Wesleyan uses fertilizer on the grounds. In the Physical Plant Eric Nelson has all the forms documenting exactly what kind of fertilizer (including nitrogen percentage) and how much is used. We would have to go through each sheet and add up the total amounts of fertilizer used and the nitrogen content for each. Since we have a relatively small campus, this does not seem to be a large task.

Suggestions for data collection

- If data from university-based farms would not account for a significant percentage of our overall inventory or if we could not obtain accurate information, this data could be omitted.

Contacts:

Dan Klotzbach, Vice President for Business and Finance for information on farming practices

Eric Nelson, Physical Plant for information on fertilizer and nitrogen levels

6.) Solid Waste

Summary

Universities must document how much waste (in tons) they send off and where it goes. The particular landfill we send our trash to is important because different kinds of landfills emit different amounts of GHGs. There are five types of disposal:

1. Mass burn incinerator
2. Refuse derived fuel (RDF) incinerator
3. Landfill with no methane recovery
4. Landfill with methane recovery and flaring
5. Landfill with methane recovery with electric generation.

Findings

Although tons of waste does not appear on the bill, Rory McGuire was able to contact the waste removal company and get a report that specified the amount picked up in tons. All of our waste goes to the Clinton landfill. However, fraternity waste is not included on the bills because they use dumpsters that are picked up once a week, no matter how full they are. We would have to approximate the amount of waste fraternities create or decide to document the omission. Approximating the tons thrown away at fraternities is the difficult part of this emissions category. We could measure the dimensions of each dumpster, but we do not know how full they are each week (some weeks could even overflow), and we would also not know the content of the trash (glass bottles vs. aluminum cans) so weight is indeterminable. We may be able to randomly check a few times throughout the semester in order to approximate the average weight of trash thrown out. Again, we would have to decide if including fraternity waste is worth the effort.

Suggestions for data collection

- In order to determine the landfill emissions, we must contact the landfill representatives to determine what type of landfill it is. The website for the Clinton landfill is unclear about which of the five types it is.
- Fraternity waste could be omitted. To determine this, we must assess whether or not it is a large enough percentage of the total emissions to include, and whether or not we can obtain data with any kind of accuracy. We could find out how many students live in fraternities to see approximately how big of an omission this would be.

Contact: Rory McGuire, Senior Physical Plant Operations Coordinator

7.) Refrigeration

Summary

All institutions are required by the Environmental Protection Agency to keep track of refrigerants (HFCs, SF_6, and PFCs). We can find the amount (Kg) of each by "subtracting the amount of recovered refrigerant from the purchased refrigerant" (Clean Air-Cool Planet, 2006, 20).

Findings

Since we are already required to keep this information, this input area of the calculator is very easy. According to Bud Jorgenson, data are available from Terry Tanner, manager of environmental services.

Contact: Terry Tanner, manager of environmental services

8.) Offsets

Summary

Offsets are the only "negative" numbers in the inventory, representing a decrease in overall emissions. Universities can offset their emissions a number of ways. The main ones include Tradable Renewable Energy Certificates (or "green tags") and composting.

Findings

Illinois Wesleyan uses both kinds of offsets. For the composting, I obtained information from Eric Nelson in the Physical Plant. We throw yard waste that cannot be chipped into compost bins. We need to determine the tons of waste we compost.

Just last year, the Admissions Department purchased green tags to offset their car travel emissions (air travel was omitted). We would just need to speak with Chris Kawakita in the Admissions Office to determine how much we offset. Even if the offsets purchased are not an exact representation of the total admissions travel, it is simple to get the exact number of green tags they purchased to input into the calculator.

Suggestions for data collection

- We could measure the volume of the compost bins at the Physical Plant and keep track of how many we fill up in a year (Eric guessed about three or four). From this we could input how many tons we compost.

Contacts:

Eric Nelson, Physical Plant for information on composting
Chris Kawakita, admissions counselor for offsets

Conclusions

Conducting a GHG inventory is technically doable as long as an institutional framework is created. My study demonstrates that the data are available with a few small exceptions. Below I summarize the emission calculations that would be easy to generate, those that would be time-consuming, and those we might omit from the equation. I also discuss suggestions based on the inventories from other universities I have reviewed and what I have learned from collecting information on Illinois Wesleyan's campus.

The budget, refrigerants, and offsets categories all have accessible data that are already compiled. The major categories which will be time consuming are those in which we would have to add up individual accounts. These include energy (especially transportation), air travel, and fertilizer data. Another large time consumer will be collecting historical data (in the areas that are available). From my research, it looks like we will have to make a few approximations and omissions. For instance, the fuel mix is only an approximation (although it seems as though that approximation is better than most since we are not depending on regional averages). We can also approximate commuter values by conducting a survey. We must determine if the difficulties in approximating student commute, fertilizer usage on farms, and fraternity waste is worth the effort to collect.

Including Historical Data

A possible omission, or area of rough approximation, at Illinois Wesleyan would be historical data. How far back should we go? How much estimating should we do? My findings from other school's GHG inventories suggests that this depends on the individual university and what data are available. I found that the historical data might be the most difficult part because in certain areas it either does not exist or it would take a large amount of time to compile. I gathered from reading the other inventories that this is not an area that is prioritized. When data were available, they were included; otherwise very general approximations were used. I think that the important part is seeing where we are and realizing the problem areas we need to improve upon. Once we begin, we can look at the trends and improvements in the future.

Streamlining

Obviously, we want to make data collection as easy and efficient as possible. For example, the transportation section includes a lot of data compilation from reimbursement forms. Any changes we can make to streamline the process would be beneficial. Determining these changes precisely will come with the experience of carrying out the inventory and realizing what works best. I think that institutionalizing the effort is critical. If the inventory is another reporting document that we put out every year it will become a part of the routine and we will find ways to make it efficient.

Defining Institutional Boundaries

I saw over and over again that defining the boundaries of the inventory up front is essential. I found while conducting my own research that it is very easy to get off track with the data you were initially aiming to collect. You start thinking about other possible emissions that are associated with the university. As long as you have a clear picture of the data defined up front as necessary to collect, the inventory is much simpler than it looks. For Illinois Wesleyan, that should include relying on operational boundaries, that is, incorporating anything we pay for. Also, clearly defined boundaries makes it possible for the inventory to be duplicated each year, even if it is a different people conduct the inventory over time.

Including Upstream Emissions

Since defining institutional boundaries is so important, upstream emissions must be discussed before the project begins. I have researched the common Scope 3 emissions: commuting (required), air travel (required), agricultural practices, and landfill emissions. These four are, for the most part, feasible at Illinois Wesleyan, with the exception of farming practices. We have to decide if we want to expand our boundaries and include select upstream emissions. For example, we may want to include food miles, energy used to process fuel sources, water consumption, and material sources. Water consumption might be a feasible and important aspect to consider and can lead to reduction efforts that would also save money. Water has an impact on GHG because of the large amount of energy necessary to purify, transport, and heat and cool. Discovering the hidden emissions of purchased materials can help guide our purchasing choices. One possibility is to expand this area of our inventory once we have a grasp on the inventory basics and when other universities can provide more concrete examples of including these types of emissions.

Metering Buildings

Technically, Illinois Wesleyan will be able to conduct an inventory without installing metering capabilities for individual buildings. But if we cannot track emissions to specific sources, we will not be able to reap the full benefits. We will not be able to pinpoint problem buildings or highlight what reduction efforts have succeeded. Understanding the distribution of our emissions seems nearly as important as knowing our total emissions. We should make it a goal to start installing metering technology on all of the buildings.

Determining Responsibility

One of the toughest and most important questions that needs to be addressed is who will be responsible for conducting the inventory. One option is splitting the work on an office-by-office basis. Many of the time consuming areas could possibly be integrated into already existing student worker positions. Students could compile the information on a weekly basis as part of their work-study desk job. The problem here lies in who would be responsible for pulling it all together and analyzing the results. The inventory requires analytical thought: not just number crunching. Of the inventories I looked at, graduate school students were usually responsible for conducting the inventories. Since Illinois Wesleyan does not have any graduate students, this work would need to be done by someone else.

An interested student might conduct the university's GHG inventory as an independent research project. However, in many ways, conducting GHG inventories over time is not well suited to student research. The demand for consistency of reporting and interpretation of data would require a lot of oversight and supervision to ensure that the inventory was conducted each year so that the results would be meaningful. Moreover, with students performing this job, there is no continuity and no guarantee that the project will continue each year because it would be dependent on student interest. A better way to get students involved in campus carbon reduction efforts would be to encourage them to work on independent studies that look at specific ways of reducing

campus GHG emissions once we determine where our emissions come from. In other words, it is possible that students could be very involved with analyzing the inventory to figure out the kind of "where next" questions by evaluating possible solutions to problem areas. In short, I think that depending on a constant stream of undergraduate students willing and able to tackle this project in a short amount of time is not the best option.

The person responsible for conducting the GHG inventory needs to be a staff member with an institutional home. The inventory will only be valuable-- both in terms of money saved and sustainability -- if we have the personnel to utilize it. In the future, the best answer seems to be to add it to the list of many projects assigned to a sustainability coordinator. This is a key issues we must consider carefully before we start the inventory in order to make the process as efficient and effective as possible.

Thinking about Future Possibilities

It is impossible to determine all of the potential problem areas or questions that need to be answered until we actually start conducting the inventory. There will still probably be areas where we will have to alter or perform conversions on the initial data we collect in order to input them into the calculator. I hope that I have done the best possible job and answered the most questions I can at this early planning stage. My main focus was to figure out if it would be possible for Illinois Wesleyan to undertake an inventory and what kind of effort it would take. Now that I have found out that this project is feasible, we need to take a close look at the actual calculator and determine who will take the next step towards conducting an inventory. I believe that we can conduct an inventory as long as institutional framework is available. The key questions are: how will we analyze the information and how will we use it.

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Conner, Darcy. E-Mail interview. 24 Mar. 2008.

Jorgenson Bud. Personal interview. 20 Mar. 2008.

Klotzbach, Dan. E-Mail interview. 7 Mar. 2008.

McGuire, Rory. Personal interview. 28 Mar. 2008.

Nelson, Eric. Personal interview. 2 April 2008.

Appendix 1:

GHG Inventory Journal

The purpose of this journal is to keep a detailed account of all of my conversations and investigations into the greenhouse gas inventory at IWU. Gathering all of the necessary information sometimes takes talking with multiple people, so I hope that by recording all of my efforts, the next person can take the project directly where I left off.

March 5, 2008

Presented the greenhouse gas inventory to the cabinet.

March 7, 2008

Received an email from Dan Klotzbach, Vice President for Business and Finance. He told me to get in contact with Bud Jorgenson, Director of Physical Plant, concerning energy, refrigeration, solid waste, and university fleet questions. He also directed me to Cathy Spitz, the Associate Vice President for Human Resources for information on employee commuting distances.

I also met with Carl Teichman, Director of Government and Community Relations, who told me to contact Chris Kawakita, admissions counselor, about offsets bought by the admissions office.

March 10, 2008

Received information from the Human Resources Office concerning zip codes for faculty and staff.

March 17, 2008

Met with Chris Kawakita concerning admission offsets.

March 20, 2008

Today I spoke with the director of Physical Plant, Bud Jorgenson. He was able to give me a lot of information about where specific data would be and what data sets we do not need to be concerned about.

Budget Questions: Dan Klotzbach
Air Travel: John Bryant
Energy: Rory McGuire
Fuel Mix: Darcy Conner
University Fleet: Mary Anderson
Gas Tank: Eric Nelson
Travel Reimbursement: John Bryant
Refrigerants: Terry Tanner
Solid Waste: Rory McGuire
Composting: Eric Nelson

I sent an email to all of these people today to work out a time to meet with them.

March 21, 2008

Heard back from Mary Anderson, and have started an email conversation with her.

March 24, 2008

Heard back from Eric Nelson, Will set up a meeting time with him soon. Also spoke with Rory McGuire and will meet with him. Received a fuel mix report from Darcy Conner.

March 25, 2008

Set up a time to meet with John Bryant.

March 27, 2008

Met with John Bryant.

March 28, 2008

Met with Rory McGuire.

April 2, 2008

Met with Eric Nelson.

Appendix 2: Contact Information

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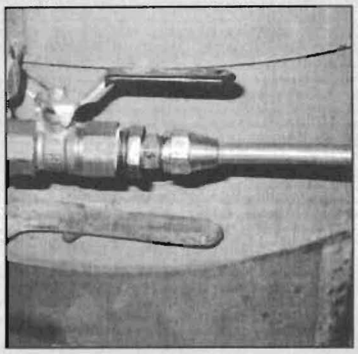


Show Your "Flare" for Safety

Check Natural Gas Flared Fittings Today

If your home uses copper tubing for its natural gas service or to connect appliances to house piping, AmerenIP recommends having that tubing inspected by a professional plumber or heating contractor.

That's because the flared fittings can break, resulting in a leak, fire or explosion.

If the inspection reveals corrosion in the flared connection to your appliances, those connections should be replaced with stainless steel appliance connectors approved for natural gas.

For the piping in your house, you should use black iron pipe (Schedule 40) or corrugated stainless steel tubing. Your municipal or county government may also specify the material to be used for house piping.

And of course, contact AmerenIP if you suspect a gas leak in your home or business.

Visit **www.ameren.com** for more gas safety information.

Energy Efficiency Plan Saves Customers Money, Cleans Up the Environment

In November, the Ameren Illinois utilities filed an energy efficiency plan with the Illinois Commerce Commission. The plan's goal: save customers money by reducing their electricity usage.

But that's not all. The utilities also hope to reduce "greenhouse gas" emissions from coal-fired power plants in the Midwest.

Slated to begin in June 2008, in its first year the plan will offer rebates and incentives to offset the cost of installing more efficient lighting, heating and cooling systems, and help customers reduce the unnecessary loss of energy from their homes.

The Ameren Illinois utilities expect the program to grow over time. In the first year, ending in May 2009, the companies estimate these energy efficiency efforts will reduce electricity usage by an amount sufficient to power nearly 7,700 single family homes for a year.

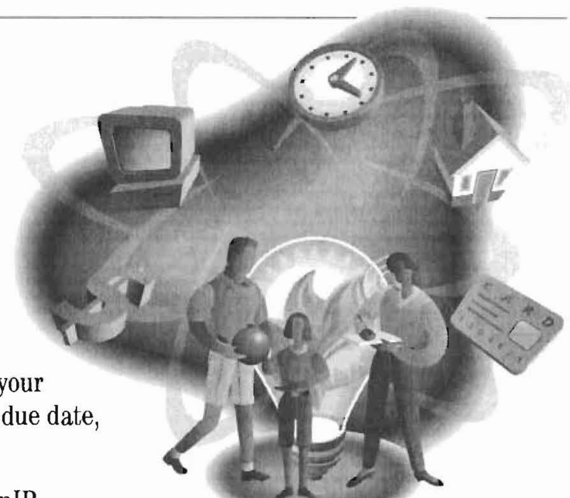
By the third year, which ends May 2011, that number climbs to 46,700 homes.

The plan will cost the typical residential customer 30 cents per month in its first year. However, customers who take advantage of the energy efficiency initiatives should realize savings on their electricity bills that will exceed the cost of the programs.

Look for more information on Ameren's Web site and in future issues of *AmerenLines*.

It's Your Choice

Payment Options Make Life Easier



AmerenIP offers its customers a number of ways to pay their utility bills.

Direct Pay takes the exact amount of your bill directly from your bank account each month on the due date, and not a day before.

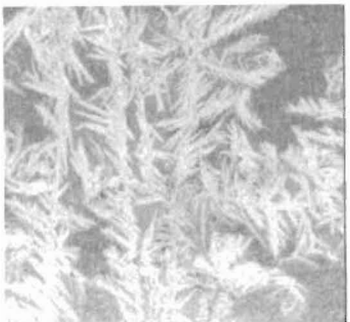
If you are registered as an AmerenIP e-customer, you can log on to pay your bill by electronic check using **CheckFree**.

Ameren's partnership with **SpeedPay** allows you to pay your bill online or over the phone using a major credit or debit card. Over the phone, you can also pay by check.

Pay stations are still available in many locations. See **www.ameren.com** for a list.

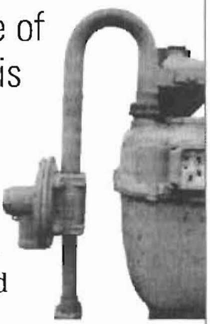
And of course you can still pay by mail.

AmerenIP



Ice and Gas Don't Mix

Keep Your Meter Set Free of Both This Winter



To assure uninterrupted gas service and safety, AmerenIP asks you to check your gas meter set in the winter to make sure it is free of ice and snow.

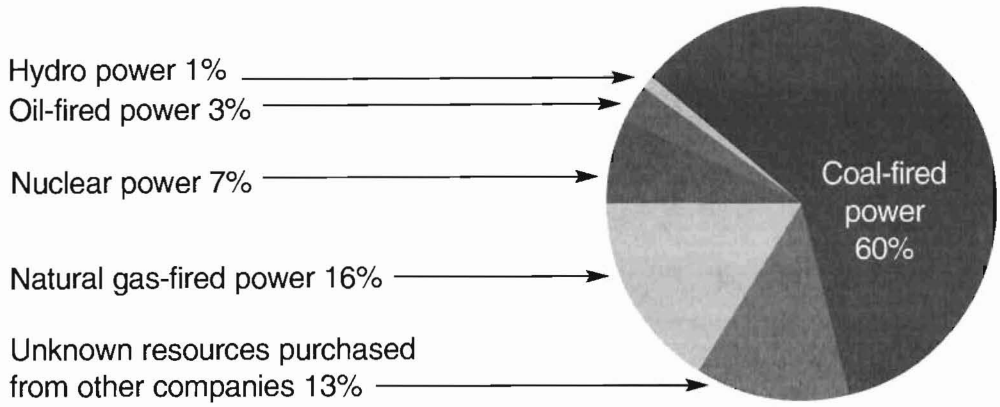
Use a broom to gently remove any snow that accumulates. If you find ice on the regulator vent, call AmerenIP. We will schedule an appointment to check your meter set. Do not attempt to use snow shovels or other tools to remove the ice.

Keep in mind that ice build-up often comes from above — from icicles on roofs, eaves and trees that drip water onto the meter. So "look up" and check the meter regularly.

If you have any appliances with direct vent piping through an exterior wall make sure the vent is clear of snow to prevent the build-up of dangerous carbon monoxide poisoning.

The disclosure of this information is required under Section 16-127 of the Electric Service Customer Choice and Rate Relief Law of 1997 and the rules of the Illinois Commerce Commission, 83 Ill. Adm. Code 421.

Sources of electricity supplied for the 12 months ending September 30, 2007



Sources of electricity supplied for the 12 months ending September 30, 2007	Percentage of total
Biomass power	0%
Coal-fired power	60%
Hydro power	1%
Natural gas-fired power	16%
Nuclear power	7%
Oil-fired power	3%
Solar power	0%
Wind power	0%
Other resources	0%
Unknown resources purchased from other companies	13%
TOTAL	100%

AVERAGE AMOUNTS OF EMISSIONS and AMOUNT OF NUCLEAR WASTE per 1000 kilowatt-hours (kWhs) PRODUCED from KNOWN[1] sources for the 12 months ending September 30, 2007

Carbon Dioxide	1,574 lbs
Nitrogen Oxides	2.05 lbs
Sulfur Dioxide	3.83 lbs
High-Level Nuclear Waste	<.0001 lbs
Low-Level Nuclear Waste	<.0001 ft^3

Footnote

1 13% of the total electricity supplied was purchased from other suppliers and the amounts of emissions and amount of nuclear waste attributable to producing this electricity is not known and is not included in this table.

Additional information on companies selling electrical power in Illinois may be found at the Illinois Commerce Commission's Web site (www.icc.state.il.us).

AmerenIP Customer Service Numbers

Billing/general inquiries: **1.800.755.5000**

Payment arrangements: **1.800.750.7026**

Suspected gas leak: **1.800.755.6000**

Power out/wires down: **1.800.755.7000**

TTY Illinois Relay: **711**

Underground locating (JULIE): **1.800.892.0123** or **811**

Speed Pay information: **1.866.729.2647**