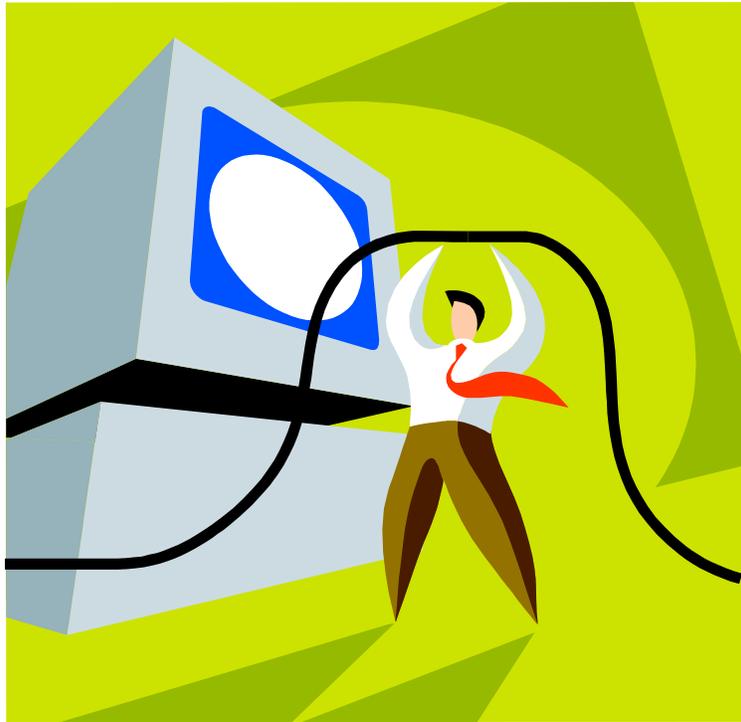


WATTS UP WITH OUR ENERGY USE ON CAMPUS?



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1.0 Introduction

1.1 Purpose behind the project

The purpose of this project is to help reduce the university's energy costs and usage. Western Washington University does not have any campus-wide energy saving software on its computers. This project is important because as the case studies we found show; energy reduction software does work and does reduce energy costs. The goal of the project was to decide what would work for Western Washington University, and to see if the installation of new software or the implementation of computer settings changes would make a difference or if the costs outweigh the benefits. Stakeholders in the project are concerned with feasibility of the project and any changes to the user experience, in addition to costs.

1.2 What is the current situation at WWU?

Computers on campus are not all under one administrative body; ATUS and ResTek are in charge of the majority of computer labs on campus, other departments have their own computer labs, and WWU staff are the only users of some computers. Most computers are still running during the night or when not in use because the IT department needs active computers to perform critical updates and other maintenance. Most of those updates are done in the middle of night from a central location, not on each individual computer, and so they all must be compatible with any proposed changes. The IT department has been afraid to make changes because they worry that the computer user's experience may degrade.

1.3 What is the difference between sleep and hibernate modes?

It is important to know a few technical definitions for this project. According to TechNet Magazine, **sleep mode** uses a small amount of energy to maintain memory function. Waking a computer from sleep mode takes about two seconds. **Hibernate mode** saves settings and memory to the hard disk, shutting down computer function. This mode takes longer to awake and may not actually use less energy than sleep mode on a Desk Top computer. The use of a **screen saver** when the computer is not in use does not actually use any less energy than active use of the computer.

1.4 What is computer power-management software?

Power management software is used to monitor the energy use of a computer and turn off unused systems so increase the efficiency of the machine. The more things that a computer has

running at a time, the more energy it must draw to run effectively. In laptop computers power-management software can increase the amount of time that it can run off of the battery charge. In desktop computers power-management software allows the machine to draw less energy to run properly.

1.5 Significance to WWU

This project has the potential to save the university money by reducing expensive energy costs and reduce carbon emissions, making WWU a more sustainable campus. WWU strives to be a leader in sustainability in any way possible.

2.0 Methodology

2.1 Internet Research

In order to gather information for our project, we conducted research on similar projects other universities had done. More in-depth information is discussed in the next section of the report, titled *Case Studies*. Additionally, we researched the type on software suggested for our use (JuicePress) on the internet from that company's website. The EPA's *EnergyStar* website was a source of information on recommended settings for computers. We used those recommendations in the second portions of data collection and research.

2.2 Contacts and Meetings

Deborah Frost, *Assistant Director for Information Technology, WWU*

We met a couple of times with her to discuss the project. She had the idea that this project could be done in three phases of monitoring.

Jonathan Geller, *Lab Coordinator, WWU*

Met with Jon several times to receive help in Nash computer lab recommended

Susan Brown, *Software Services Manager, WWU*

Contacted Susan about getting a trial of the software, JuicePress

Bill Welch, *Desktop Engineering ITS Support Technologies, Yale University*

Emailed Bill about Yale's computer energy reduction project and was able to answer several questions about their project.

Laura Knaapen, *Director of Academic Computing, University of Wisconsin*

Emailed Laura questions about University of Wisconsin's computer project to find out how it got started and if the project is still running.

2.3 Project Steps

When the project was first being designed with the assistance of ResTek three different phases were envisioned to occur. **Phase one** was to monitor the computers in the Nash Residence Hall computer lab without any changes being done to it. The data was collected as a baseline to compare with once changes in the next two phases were made.

Phase two consisted of changing the computer settings to the recommended EnergyStar settings to see if there was an energy drop.

Finally, the plan for **phase three** was to install a trial version of the JuicePress software to see if there would be any changes in energy use and see if the software actually the computer's energy usage.

Since the project was on a short time scale and a fairly new project for Western, implementing the trial version of JuicePress will be tested during Spring Quarter 2011. Another possible future study would be to evaluate the user satisfaction for all proposed changes to the computers on campus because that came up as a concern in our case studies and with talking to ResTek employees at WWU.

3.0 Case Studies

3.1 Indiana University

Indiana University attempted a pilot program led by a group of students in 2008. The School of Education had about 700 computers involved in the study. By making changes similar to the ones proposed here at WWU, Indiana University found that they would be able to reduce energy use enough that each computer would save \$20 per year, simply by changing settings and using energy-monitoring software. Part of their pilot program was to put a CO₂ readout for all computer labs on the desktop of each computer, with the intention of making lifestyle changes.

3.2 Yale University

Yale recently released their Sustainability Strategic Plan 2010-2013, which comprises of areas such as transportation, water use, energy use, environmental health and safety, etc. that the university would like to improve in the future. They believe that the Yale community as a whole need to collaborate in order to achieve their goals that are mentioned above. One of their concerns is to reduce their greenhouse gas emissions by 43%, a reduction from 2005 levels, by 2020. Yale was also mentioned in a case study Indiana University created, which pointed out that Yale was

able to shut down 105 computers and wake them up during the night for critical updates and security patches. Yale was able to save \$40 on each computer per year, or in other words \$4,200 per year.

3.3 University of Wisconsin, Oshkosh Campus

University of Wisconsin had a similar project as Yale, but saved \$20 per machine per year.

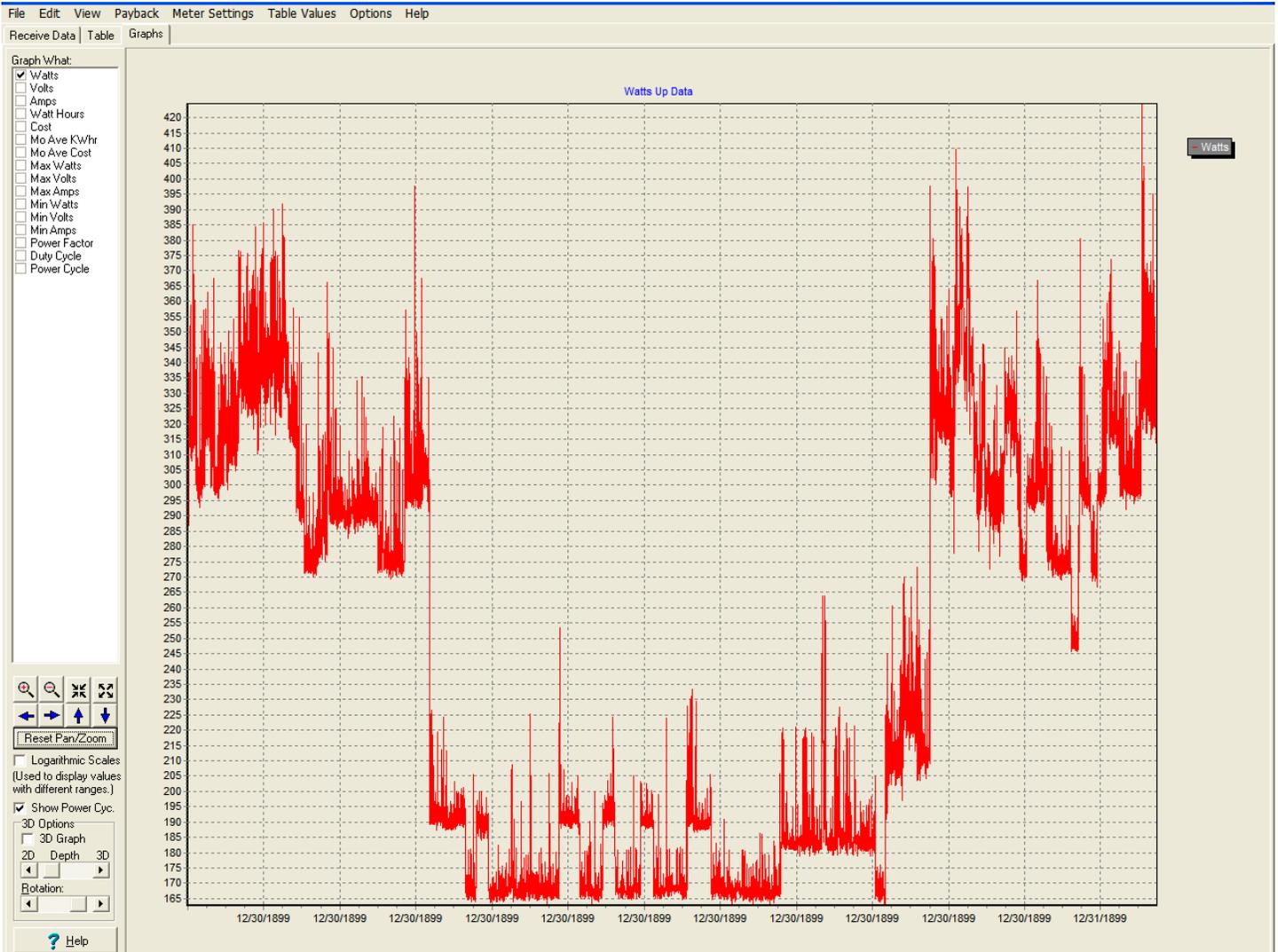
(Email from Dan at University of Wisconsin)

Yeah, I'm familiar with the case study. It's severely outdated as we no longer use Centurion or Windows XP in our labs but I've been able to estimate our actual savings at around \$75,000 for the past five years so there's no doubt the use of the Group Policy tool mentioned has been valuable.

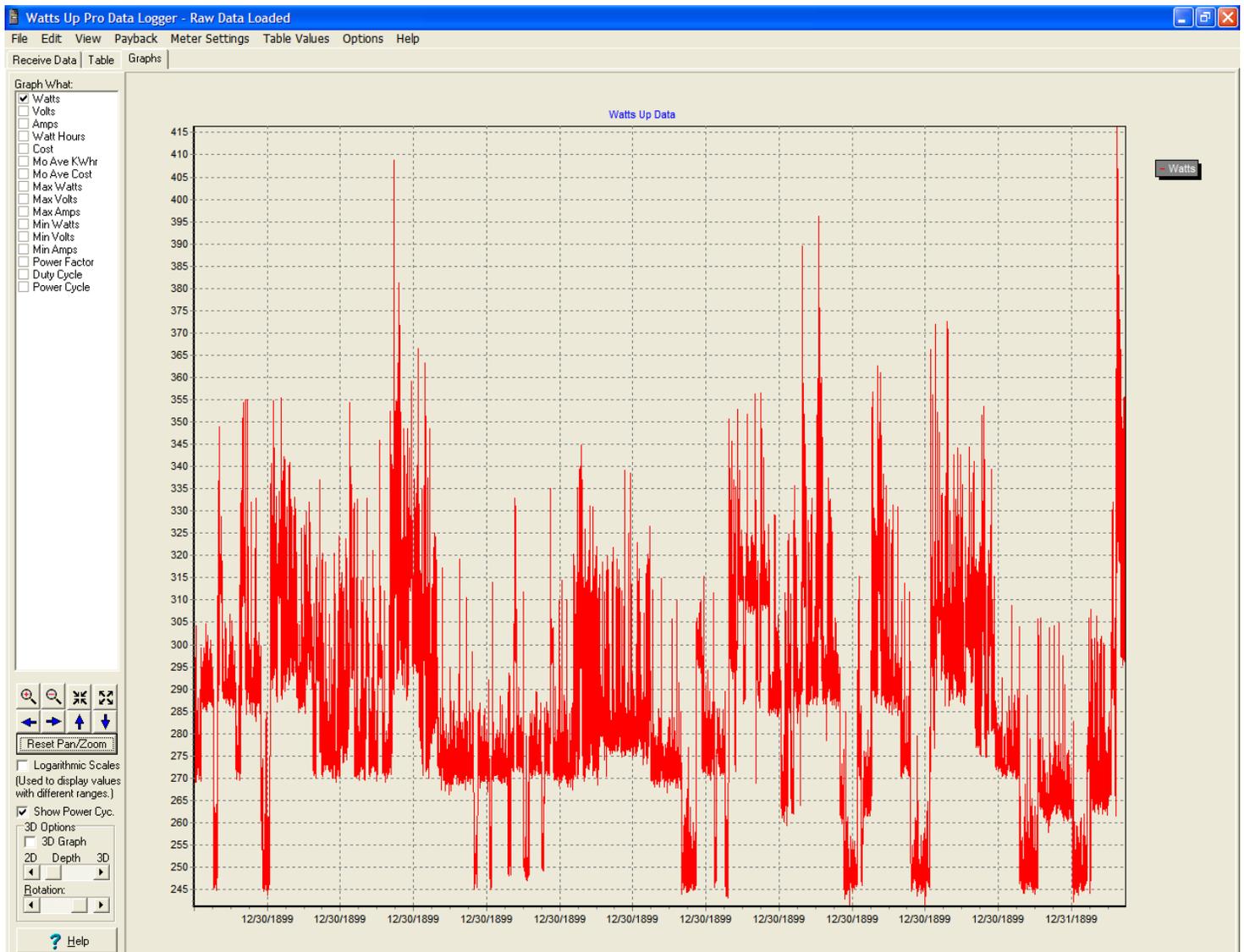
4.0 Research & Analysis:

4.1 Background Information

The data we have collected comes from a set of six computers in Nash residence hall. The computer lab can only be accessed by residents of that hall because a key is needed for entry. The six computers are under the administration of ResTek. Using energy-flow monitoring devices called "WattsUp Pro ES" we connected three computers to each and were able to track and record data of energy use. The first stage of the project was to use the equipment to find a baseline of energy use, that way there would be something to compare new data with as we made changes to the computers.



Graph of WattsUp Pro ES Computer Data (recorded every second)



Graph of computer settings changed (recorded every minute).

5.0 Conclusion

Until the research phases are complete, we cannot make a conclusion. The only reliable data is from the unchanged computer settings. Because our sample size was small, projections can easily become inaccurate. The first stage of data collection was the only one that we could get enough reliable data from. The baseline we found for average watt use per hour can be used in future studies. Although a larger sampling of computers would make the data more reliable, we are limited here in the number of monitoring devices and number of computers we have access to. After collecting almost a week's worth of data from the second phase of the project, and analyzing the average amount of energy used we did find that there was a slight reduction in the energy use.

Without having the ability to monitor how often and how long the computers in Nash Hall were being used for on a daily basis, it is impossible to know the cause for the energy reduction. We are able to conclude that there was a correlation between changes in the computer settings for “sleep” and “hibernate” modes to *EnergyStar* recommendations and a reduction in the electricity that was used by those machines.

7.0 Future Works

The group plans on continuing with Phases 2 and 3 next quarter to achieve better graphs and to accurately see if the JuicePress software is worth installing in computer labs around campus. To initiate the trial version of JuicePress, we would like to install it first in the Nash computer lab and record any changes with the same monitoring equipment we used winter quarter.

Working more closely with Restek next quarter will be crucial to get the project on the right track and to make sure the team is conducting the project in an effective manner. During Phase 3 we want to create a user experience survey to see if the student notices any changes in the computer’s start up time and if it affected the student’s work in any way.