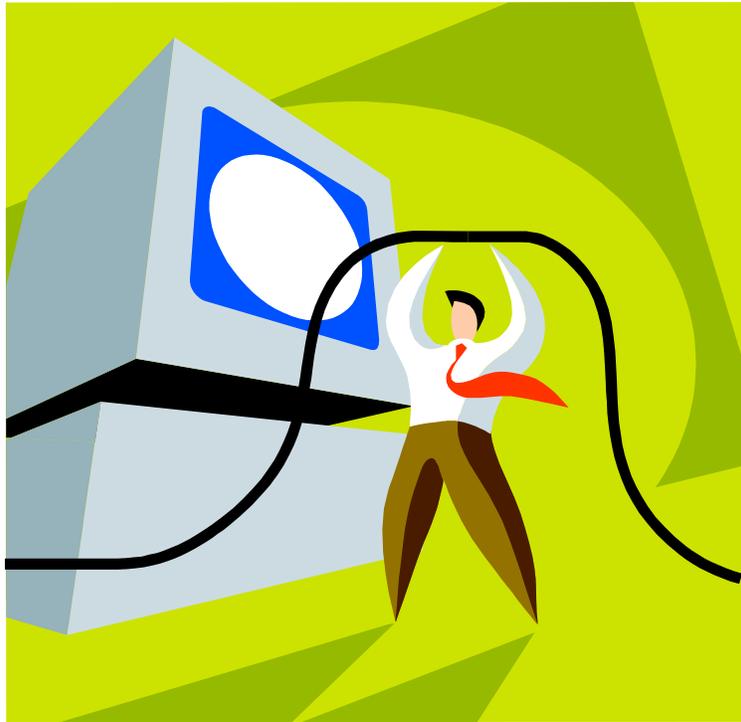


# ***WATTS UP WITH OUR ENERGY USE ON CAMPUS?***



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## 1.0 Introduction

### 1.1 Purpose behind the project

Did you know that a university can expect to save 200,000 kilowatt-hours per year, or about **\$17,000** in energy bills, for every **1,000** university monitors? EnergyStar believes that this can be achieved by simply reducing the amount of energy computers use on a daily basis by using either the settings on the computer or applying energy saving software. Imagine these savings on Western's campus!

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

This particular project is a continuation from last quarter (Winter 2011). We used a machine called WattsUp in the Nash dorm computer lab that measures how much energy a computer or a bunch of computers are using in a given day. The computers were directly plugged into the machine. The project was broken up into three different phases and measured a certain amount of days. We were only able to complete the first phase of the project and started the second phase last quarter (to be explained in more detail in Section 2.3). This quarter, I was able to successfully monitor the second and third phase.

During this quarter, two questions were brought up to try to answer. One was what is the amount of different in energy use between phase 1, 2, and 3? The second was what did JuicePress (to be explained later in the report) report for energy used from the time we started the software to the time we stopped it and what did the WattsUp meter report?

### 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. Restek overlooks 56 residence hall computers and ATUS is in charge of about 590 computers (not

including the labs that are currently closed in Miller Hall). Some of these labs include the Communications building, the AIC, and Haggard (see diagrams in Figures section for more). Other departments have their own computer labs and managed by the general Information Technology (IT) staff on campus. Most computers run during the night 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 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 or they wouldn't be able to properly wake up the computers for late night updates.

The computers on campus all have different settings applied to them to try to save energy. For example, the computer monitors in the Student Technology Center in the Wilson library turn off after a certain amount of inactive time. They wake back up when someone moves the mouse or presses a key on the keyboard. The mode that these computers are in is called 'sleep mode.' Other settings, like hibernate and standby mode can also be applied. These terms will be explained in Section 1.4.

### 1.3 What is computer power-management software?

Power management software is used to monitor the energy use of a computer, schedule times when the computers will shut down and turn back on, and allows the user of the software to manage a large network of computers at once. The internal settings on computers are not typically considered to be power management software because it doesn't monitor energy and doesn't report any kind of savings. There are many types of software that can be used to reduce energy use on computers. JuicePress is an option that ATUS has been looking into for a year or two now. This software is attached to the LabStats suite that Western already has so no research was done to find a perfect fit. The LabStats suite basically manages the computers on campus and can generate data reports on people usage and the amount of time students are on the computers.

JuicePress in particular does not cost a lot of money and some of the costs could even be covered by Puget Sound Energy grants, which is about \$8 per computer. The server cost is about \$500 to implement JuicePress on. It is about \$9 per computer for the program and \$3 for computer maintenance every year.

### 1.4 What is the difference between sleep, hibernate, and standby mode?

It is important to know a few technical definitions for this project. **Sleep mode** uses a small amount of energy to maintain memory function. Waking a computer from sleep mode takes about two seconds. Moving the mouse or pressing a key on

the keyboard will wake up desktop computers from sleep mode. **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 desktop computer. **Standby mode** is a low power mode and uses little to no energy. When a computer is awakened from this state the computer returns to its state before it went into this mode. On desktop computers, the power button needs to be pressed to wake up from this mode. This only takes a few seconds. Just as a side note, 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.

## 1.5 Significance to WWU

WWU strives to be a leader in sustainability in any way possible. This project especially can help the school save energy and expensive costs. Looking more closely at computer energy use on campus during these economic times will relieve budget pressures and allow the university more room to decide where they want to put the savings towards.

## 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 Section 3.0. Additionally, we researched the type of 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*

**Deborah.Frost@wwu.edu (360) 650-3289**

I met with Deborah once a week to make sure the project was on track and to get JuicePress set up successfully. We were able to get all three phases completed.

**Susan Brown**, *Software Services Manager, WWU*

**Susan.Brown@wwu.edu (360) 650 7388**

Contacted Susan about getting a trial of the software, JuicePress. I also met with Susan a few times throughout the quarter to get

JuicePress up and running and to find out how to obtain the reports from the software.

**Joe Molinario**, *Director of Information Technology Information Technology*,  
Harvard Kennedy School of Government (KSG)

**Joe\_Molinario@harvard.edu**

I emailed Joe about KSG using a program called Power Save and asked about a computer project the IT Department conducted. He gave me a link to what Harvard is doing to go green on the campus.

**Michael Lohrbach**, *Senior Systems Analyst*, Iowa State University  
**mlbach@iastate.edu**

I emailed Michael about a similar computer project that Iowa State participated in. He answered several questions that I had. His email is below in the Case Studies section.

## 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 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. We had the computers go to sleep mode after about 15 to 20 minutes of inactivity. 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 monitors the computer's energy usage. During this phase, I found out that when the computers went into standby mode, students didn't know to push the power button to wake the computer back up. In order to clear up the confusion and frustration, Deborah and I put up signs stating that the lab was being used for a pilot project and to wake up the computers up from 'standby' mode, the power button needed to be pushed. I conducted an informal survey and asked a couple students what they thought of the signs. The signs turned out to be effective and didn't affect students in a negative way. Below are the dates of the phases:

### **Phases of Project:**

January 28<sup>th</sup> – February 9<sup>th</sup> **10 days** (1<sup>st</sup> phase, last quarter)

April 25<sup>th</sup> – May 8<sup>th</sup> **13 days** (2<sup>nd</sup> phase)

May 9<sup>th</sup> – May 20<sup>th</sup> **12 days** (3<sup>rd</sup> phase)

May 21<sup>st</sup> – May 28<sup>th</sup> **8 days** (2<sup>nd</sup> phase)

The second phase was measured twice because I thought I didn't have enough data to have it compare to phase 3.

## 3.0 Case Studies

### 3.1 Howard Community College

Howard Community College uses Power Save made by Faronics to conserve on computer energy. They have been able to save about \$50,000 per year by applying energy saving settings on all of the computers on campus. Power Save shuts down "monitors after 20 minutes of inactivity and computer after 2 hours of inactivity."

This software does not require any expensive hardware to be set up on the computer and can be managed by a central location on campus.

[http://www.faronics.com/en/ContentLibrary/CaseStudy\\_HCC.aspx](http://www.faronics.com/en/ContentLibrary/CaseStudy_HCC.aspx)

### 3.2 Harvard University Kennedy School of Government

The school has been able to save more than \$14,000 a year on its energy bills by enabling 800 computer monitors to power down to sleep mode when not in use.

They work closely with EnergyStar and the EZ save software that EnergyStar created. They were able to reduce their energy consumption by 160,000 kWh per year, enough electricity to power more than 180 US homes for one month.

### 3.3 Iowa State

Iowa State University partakes in a campaign on campus called 'Live Green,' where the university has outlined what is important to them to focus on and reduce their impacts on the environment. One area they want to work on is saving energy by shutting down inactive computers. The Information and Technology Department believes that the school can save \$60 per computer per year. There are about 700 computers, which equates to about \$40,000 per year of savings. Below is an email from Michael Lohrbach with answers to questions I asked him:

#### **What was the purpose of the project?**

The intent of this project from our perspective was to reduce the cost of energy for our clients (they pay for this directly so there was no monetary benefit to central IT).

#### **What was the software that was used for the project?**

Central IT used a group policy to implement which can be done at no cost for anyone using a Microsoft Active Directory environment.

#### **How many computer labs on campus were included in the project?**

Many computer labs use different techniques. ITS managed labs did not sleep the machines but rather force the machines to shut down at a desired time and they do not restart until a user turns it on.

**Was there a timeline for the project to be completed and fully implemented on campus?**

As we managed the labs, that was a relatively simple implementation. The implementation for faculty staff desktops took about 6 months from testing to full implementation.

**What departments on campus did you have to contact for the project?**

ITS worked directly with each department that we desired to implement this for which consisted mostly of administrative units such as President, Provost, Student Affairs, Athletics, Residence, etc...

**What were some of the biggest challenges to get the project started on campus?**

Helping departments understand what this entailed and why it was being done and helping areas determine who really needed remote access and sharing the different options such as Wake On LAN (WoL)

**What is the status of the project now?**

We are continuing to move and update our settings as new energy star settings are released. We are also working to offer these settings to areas that are not under central support to make it easy for anyone to buy into this initiative. The last piece we are working on is using existing tools such as SCCM to find options for tracking benefits of implementing these settings.

## 4.0 Research & Analysis

The data we have collected comes from a set of six computers in Nash residence hall. The computer lab is generally limited to only residents of the dorm. The computers in this lab are managed by ResTek. How the project got started last quarter was we hooked up three computers to one WattsUp meter machine and the other three computers to another machine since the computers were on different power strips. The first phase was measured for ten days during winter quarter and the second phase wasn't completed during winter quarter. This quarter I measured the second phase for 21 days and the third phase with the JuicePress for 12 days.

When JuicePress (third phase) was applied to the computer lab, Deborah, Susan, and I set up a schedule of when we thought students use the computers most, when they use them the least, and when they moderately used them (see Figures section for schedule). The pink color represented the high peak usage, the green meant low usage, and the salmon color meant moderate usage. When the computers were about to go into standby mode, a message

popped up on the screen after 5 minutes of inactivity, letting students know that if the computer remains inactive for 5 more minutes, the computer will enter standby mode. If the computer went into standby mode, the student had to follow the directions provided on the sign that was posted in the lab.

The third phase also depicted a decrease but did not record the same number as the WattsUp meter did. It was likely to happen that the JuicePress kWh number was going to be different because it has an internal calculator and won't be 100% accurate. JuicePress is also a fairly new software product on Western's campus and there are a lot of variables and general knowledge about the software that needs to be understood in order to see good results.

## 5.0 Conclusion

The project was able to move in a progressive manner this quarter, with implementing the JuicePress trial version successfully in the Nash computer lab. This project will need further research on JuicePress if Restek and ATUS decide to try the software in a different lab. The version of JuicePress was also an older version since Susan couldn't implement JuicePress on the school's server because it could cause problems. It might have made a difference if we were able to use the latest version of JuicePress.

At this point in time, JuicePress might not work on Western's campus, but it hasn't been completely ruled out. Restek is a little skeptical of the software and is leaning more towards just applying the EnergyStar savings on the computers and calling it good. The price for JuicePress altogether isn't too bad, but Restek doesn't want to have to deal with software if it doesn't provide clear results of saving money and energy on campus. There are other power management software options that Restek, ATUS, or the next group to work on this project can research.

## 6.0 Future Works

If Restek and ATUS decide to keep pursuing this project the following steps should be taken next:

- Work closely with Restek and ATUS again to set up JuicePress in other labs
- Restek suggests to monitor each phase every quarter, instead of cramming all three phases into one quarter
- If a trial version of JuicePress can be obtained again, try it in another lab around campus
- Figure out how to work with WattsUp machines and how to effectively download the data

# References

Howard Community College Saves \$50,000 Per Year By Reducing Computer Energy Waste

[http://www.faronics.com/en/ContentLibrary/CaseStudy\\_HCC.aspx](http://www.faronics.com/en/ContentLibrary/CaseStudy_HCC.aspx)

ENERGY STAR® Teaches Universities and Schools to Save Energy and Money a Case Study

[http://www.energystar.gov/ia/products/power\\_mgt/University\\_Case\\_Studies.pdf](http://www.energystar.gov/ia/products/power_mgt/University_Case_Studies.pdf)

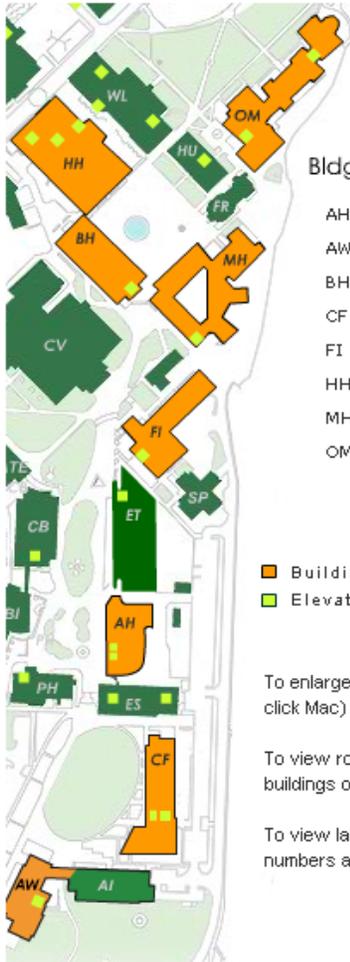
# Figures

## Computers Restek overlooks

Residence Hall	Lab Room Number	Computers	Software/Hardware
<b>North Campus</b>			
Higginson	294	8 PCs	 
Nash	740	6 PCs, 1 Scanner	  
Mathes	913	5 PCs	 
Edens North	439	2 PCs	
<b>Ridgeway</b>			
Ridgeway	Ridgeway Commons 114	14 PCs	 
<b>South Campus</b>			
Fairhaven	Fairhaven Commons 107	16 PCs, 1 Scanner	  
Buchanan Towers	BT Lounge	2 PCs	 
Birmam Wood	BW Community Building	3 PCs	 
<b>Icon Legend</b>			
	Windows XP		Black/White Laser Printer
			HP Color Scanner

## Computers ATUS overlooks

### Computer Lab Map



Bldg	Computer Labs
AH	1, 2, 5
AW	306, 308
BH	319
CF	21, 24, 26, 161, 165, 167, 312
FI	101
HH	101, 112, 122, 233, 245
MH	61, 65, 66, 72
OM	330

- Building with labs
- Elevators

To enlarge this image, right click (control-click Mac) and choose "zoom in".

To view room locations, click on orange buildings or building abbreviations.

To view lab details, click on room numbers above.

# JuicePress Schedule Editor

