Appendices

Appendix A

Campus Energy Project
Work Plan (Fall 2003)

I. Background

The University of Oregon employs 3,800 people, provides educational facilities for more than 20,000 students and housing for 3,000 students. As a community we consume huge amounts of energy, but the vast majority of faculty, staff, and students have, at best, only a vague understanding of where our energy comes from and what its environmental impacts are. The University purchases 45 million Kilowatt Hours a year for 1.6 million dollars from Eugene Water and Electric Board (EWEB). The campus power plant produces 14% of the University's yearly power consumption. Without education and a campus energy curriculum, the University of Oregon stands little chance of reducing our energy consumption. EWEB has provided a grant for the University of Oregon's Environmental Studies Service Learning Program (SLP) to provide that education and record the results.

The work plan below describes how the SLP will research, develop, and present curriculum to educate our campus community about our energy use and conservation. The plan also describes how the SLP team will work towards introducing a student fee increase for transitioning a percentage of our energy purchased from primarily hydroelectric power to EWEB's wind energy program.

II. Proposed Work Program

The Environmental Studies Service Learning Program will be responsible for completing all project related tasks. A team of four Environmental Studies juniors and seniors will work over the course of the academic year to complete the work. Sarah Mazze, a paid graduate student, will be the project manager and will be responsible for all day to day operations. Steve Mital, the Service Learning Program Coordinator, will supervise and work directly with Sarah Mazze.

Description of Tasks

There will be four components to this project:

I. Orientation
II. University of Oregon Energy Conservation Education and Outreach Campaign
III. University of Oregon Wind Power Campaign
IV. Reporting and Wrap-up

The project work will begin by November of 2003 and conclude by June 15, 2004. The specific tasks are described below.

Component I. Orientation

Task 1 – Review Existing Background Material

The SLP team members will read all pertinent background material including an overview of energy production and consumption in the USA, Pacific Northwest, and on US campuses, as well as alternative fuels and technologies.

Schedule: November 2003 – December 20003

Task 2 – Visit University of Oregon power plant

The SLP team will tour the University of Oregon power plant and other pertinent campus sites.

Schedule: December 2003 – January 2004

Task 3 – Compile research on University of Oregon energy use

The SLP team will gather and compile information on current campus energy consumption. They will do this through meetings with campus facilities staff, Energy lab staff, and review of relevant documents.

Schedule: January 2004
Product: Document

Component II: University of Oregon Energy Conservation Education and Outreach Campaign

Task 4 – Create campus energy project website

The SLP team will create, manage, and periodically update a campus energy project website. The website will contain information about the links between energy production, consumption, and the environment. The website will also contain a profile of current campus energy consumption. Goals of the project as well as select presentation times will be posted on the website.

Schedule: November 2003 – June 2004
Product: Website

Task 5 – Plan presentation

The SLP team will create an interactive presentation focusing on campus energy use, possibilities for conservation, and alternative energy. The team will offer to present to the Environmental Issues Committee (EIS) for feedback on and approval of the presentation.

Schedule: January 2004 - February 2004
Product: PowerPoint presentation

Task 6 – Schedule Presentations

The project manager will be responsible for scheduling presentations in as many classrooms, residence hall meetings, student club meetings, and faculty/staff meetings as possible.

Schedule: January 2004 – March 2004
Product: Schedule of presentations

Task 7 – Recruit and train presenters

The SLP team will recruit and train presenters to assist in reaching 25% of the University of Oregon with their educational outreach.

Schedule: February 2004 – March 2004
Product: Presentation training

Task 8 – Present to University of Oregon

The SLP team and those whom they have trained will present their PowerPoint presentation to 25% of the University of Oregon community.

Schedule: March 2004 – May 2004
Product: PowerPoint presentation

Task 9 – Link education to conservation

The SLP team will send a follow-up survey to 10% of those who saw the presentation. The survey will gauge the impact of the presentation on their views and behaviors. The team will also compile data from facilities regarding energy use in May 2003 to May 2004. The team will compile the data received.

Schedule: May 2004 – June 2004
Product: Survey, document

Component III: University of Oregon Wind Power Campaign

Task 10 – Research costs and possible scope of wind power

The project manager will research the costs of purchasing wind power for all or part of the campus.

Schedule: November 2003 – January 2004
Product: Document

Task 11 – Demonstrate student support for wind power with ballot initiative

The SLP team will first get approval on the wording of the initiative from the constitutional court, researching all similar measures that have passed or failed. The team will get signatures from 5% of the student body in support of the initiative. Lastly, the team will include mention of the initiative in their presentation on energy conservation, encouraging students to vote in school elections.

Schedule: March 2004 – April 2004
Product: Measure on ballot

Task 12 – Present Campaign to EMU Board/University Senate

The SLP team will present to the EMU Board the idea of raising student fees in order to switch a portion of campus to partial wind power. The SLP team will encourage the EMU Board to recommend the idea to the University Senate.

Schedule: April 2004
Product: PowerPoint presentation

Component IV: Reporting and wrap-up

Task 13 – Report on success of energy conservation campaign

The SLP team will collect and compile meaningful data on the success of their educational outreach to the University of Oregon community regarding energy conservation.

Schedule: March 2004 – May 2004
Product: Document

Task 14 – Create educational poster

The SLP team will produce an educational poster about the links between energy production, consumption, and the environment and a profile of current campus energy consumption; and the goals and results of this project. The poster will be used to educate the campus community about the campus energy project.

Schedule: May 2004
Product: Two print-ready (electronic format) posters

Task 15 – Prepare final presentation

The SLP team will prepare and deliver a PowerPoint presentation that explains the project results. Members from the EIS will be invited to attend.

Schedule: June 2004
Product: PowerPoint presentation

Task 16 – Prepare final report

The SLP team will prepare a comprehensive final report that describes all project work, analysis, and recommendations where appropriate.

Schedule: June 2004
Product: Report

Appendix B

Campus Energy Project Data

UO Energy Use

All energy data and square footage for graphs provided by Josh Ruddick, Utilities Analyst, and UO Facilities.
Population information located on University of Oregon Registrars website.

From Graph 1: University of Oregon Energy Use

Electrcity (kWh)	Natural Gas (kWh)
153,000	527,000

From Graph 2: University of Oregon Total kWh Used

Year	Total kWh Purchased	Total kWh Generated	Total kWh Used
1993	41,713,170	13,394,000	55,107,170
1994	48,164,840	8,508,000	56,672,840
1995	53,359,530	1,045,000	54,404,530
1996	43,889,710	4,893,000	48,782,710
1997	49,753,070	7,174,000	56,927,070
1998	54,180,246	5,294,000	59,474,246
1999	55,403,708	5,421,000	60,824,708
2000	55,226,568	6,064,000	61,290,568
2001	42,749,469	13,819,000	56,568,469
2002	48,396,646	5,751,000	54,147,646
2003	46,478,256	9,087,130	55,565,386

From Graph 3: University of Oregon Kilowatt Hour, Square Feet and Population Trends
Percent Change from 1993

Year	Total kWh Used	Total Sq Ft.	Population
1993	55,107,170	4,346,731	16,593
1994	56,672,840	4,365,008	16,681
1995	54,404,530	4,365,008	17,138
1996	48,782,710	4,365,008	17,269
1997	56,927,070	4,650,830	17,207
1998	59,474,246	4,786,131	16,780
1999	60,824,708	5,091,795	16,716
2000	61,290,568	5,146,848	17,843
2001	56,568,469	5,191,473	19,008
2002	54,147,646	5,191,473	20,044
2003	55,565,386	5,191,473	20,033

Year	kWh % of 1993 use	Sq Ft % of 1993 use	Student population % of 1994 level
1993	100%	100%	100%
1994	102.80%	100.42%	100.55%
1995	98.72%	100.42%	102.74%
1996	88.52%	100.42%	103.52%
1997	103.30%	107%	103.15%
1998	107.92%	110.11%	100.60%
1999	110.38%	117.14%	100.21%
2000	111.22%	118.41%	106.97%
2001	102.65%	119.43%	113.95%
2002	98.26%	119.43%	120.16%
2003	100.83%	119.43%	120.09%

From Graph 4: University of Oregon KWh per Student

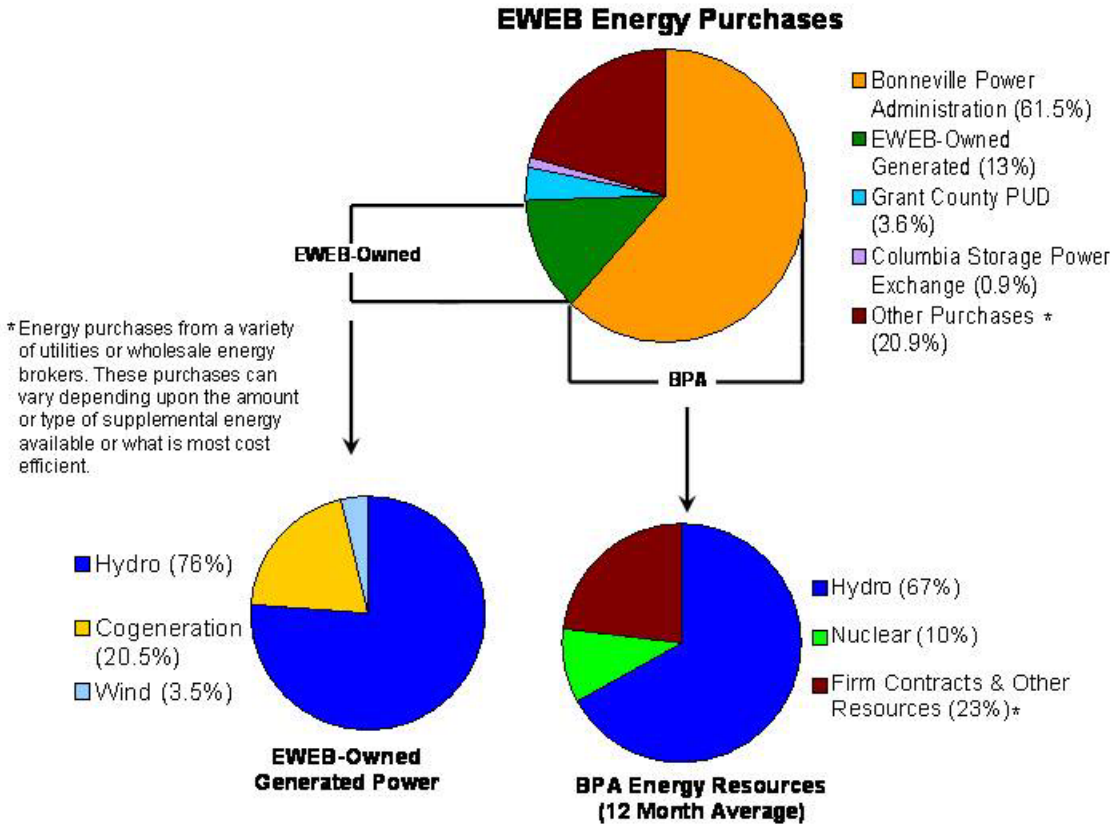
Year	Total kWh/total Sq Ft.
1993	12.678
1994	12.983
1995	12.464
1996	11.176
1997	12.24
1998	12.426
1999	11.946
2000	11.908
2001	10.896
2002	10.43
2003	10.703

From Graph 5: University of Oregon KWh per Sq Ft

Year	Total kWh/Person
1993	3321
1994	3,397
1995	3,174
1996	2,825
1997	3,308
1998	3,544
1999	3,639
2000	3,435
2001	2,976
2002	2,701
2003	2774

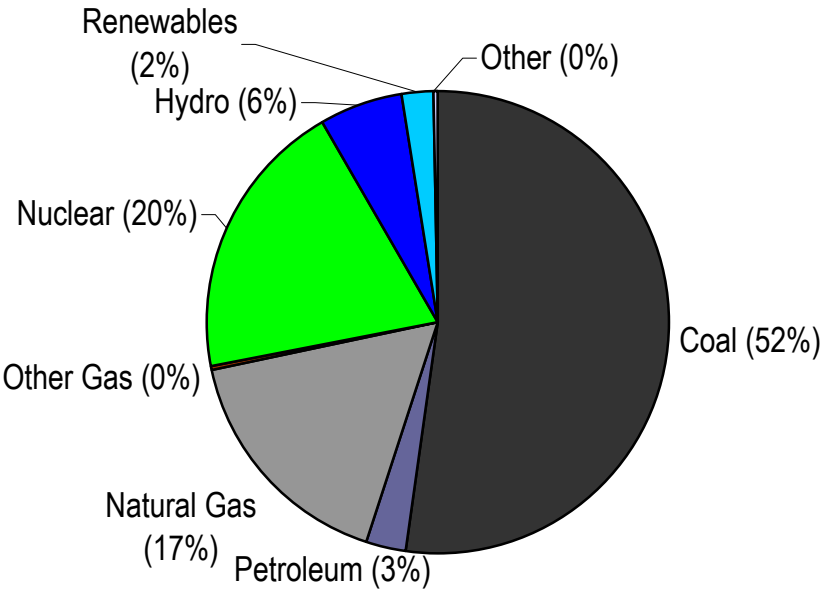
Energy Production

This graph represents the break down of electricity from EWEB, which accounts for 87% of the total UO electric profile.



Data for charts provided by the Eugene Water and Electric Board, the Bonneville Power Administration, and Josh Ruddick Utilities Analyst UO Facilities

US Electric Profile (2003)



Data for graph provided by the Energy Information Administration

Survey Results

All data from Campus Energy Team phone survey

From Graph 9: Year in School of Participants

Year in School	Percent
Freshman	16.5
Sophomore	14.8
Junior	29.4
Senior	37.9
Graduate Student	1.5

From Graph 10: Percent of Correct Survey Answers

Correct	Before %	After %
U.S. Energy Source	34.6	51.8
U of O Energy Source	70.5	74.9
U of O Per Capita Electricity Use	8.8	55.9
U of O Alternative Investments	31.8	82.1
Computer Damage	81.1	92.8
Average	45.7	71.5

From Graph 11: Importance of Knowing Electricity Use

Electricity Use	Before %	After %
1	2.3	1.5
2	9.2	4.6
3	34.6	28.2
4	33.2	45.6
5	20.7	20

From Graph 12: Importance of Knowing Electricity Source

Electricity Source	Before %	After %
1	6.9	5.2
2	21.2	14.4
3	28.6	32.3
4	24.4	27.7
5	18.9	20.5

From Graph 13: Percent of Dorm and Off Campus Participants Responses to Question 1

Turn Computer Off	Dorms %	Off Campus %
Always	15.5	30.4
Usually	7.1	17.5
Sometimes	20.2	12.3
Occasionally	17.9	14.1
Never	39.3	25.8

From Graph 14: Respondents Who said Yes to Wind Power

Said Yes	Before %	After %
U of O invest in wind	88	94
Even if cost more	73	77
Even if student fees are raised	51	61
(If disagreed) If raised less than $5/year	88	89

Appendix C

Interview Write-Ups

Interview 1

Josh Ruddick
Utilities Analyst
Office Phone: (541) 346-2293
E-mail: ruddick@darkwing.uoregon.edu

Kathy Young
Tuesday January 20, 2004
10:45 am to 12:15 pm

Josh Ruddick of the University of Oregon Facilities Services manages raw energy data, analyzes trends in energy consumption, configures billing, and maintains correspondence with EWEB. Given these responsibilities he can provide information regarding campus energy use, trends in this use, and possible student controls of it.

All of the natural gas and most of the electricity used by the university comes from EWEB. The natural gas primarily steams water for heating purposes. The University power plant also produces electricity with this generated steam. The rest of the electricity, purchased directly from EWEB, funnels through three meters located on campus. Ruddick estimated that last year the generated portion of electricity consisted of 10% to 15% of the total campus electricity consumption. The relative cost of electricity to natural gas drives the amount of electricity that the university chooses to generate.

Most buildings have electric meters providing detailed electricity use information for campus. In comparison only 10 to 12 meters measure steam or chilled water use for all of campus, limiting the detail of information available. Total energy use can be complied from all these meters but some buildings are separated for billing purposes. The campus uses more energy in the winter and natural gas use is significantly higher during this time. Daily energy use peaks mid afternoon while low times occur during the middle of the night.

Meters provide data for electrical use for each campus dorm, every 15 minutes. Student use could be estimated by comparing measurements during student breaks to times when students were present. This base load of energy used when students are not present could be subtracted from the total use to determine student use. Ruddick discussed ways students could reduce their energy use. Most suggestions related to conservation awareness, energy use education, and behavioral changes. Jeff Kline at Energy Studies in Buildings Laboratory and Facilities Services deals specifically with campus energy conservation.

Question & Answer

1) What is your job title and what responsibilities do you have in relation to campus energy?

- Utilities Analyst for University of Oregon
- Responsible for raw energy data, analyzing trends in consumption, preparing information for the campus community, configuring billing for specific campus buildings, paying the university energy bills and maintaining correspondence with EWEB regarding campus energy.

2) What specific data do you have on current university energy use? What form does this data come in and how can we best access, comprehend, and manage it?

- Monthly totals and cost for all of campus energy use.
- Specific data is available for buildings that are not part of the general billing fund: (include but not limited to) EMU, Student Recreation Center, Student Health Center, University Housing and electricity for Agate Hall.
- Data available for each specific building or building groups.
- Ask Ruddick for specific data regarding energy use.
- E-mail best form of communication to get specific data.

3) What is the distribution of energy use between sources of power? What part of our energy uses requires natural gas steam vs. electricity? What are some trends in our energy use? What part of our electricity is from EWEB and what part is from our power plant, and why?

- Campus electricity, from EWEB, funnels thorough three meters, two at the power plant and one on 15th and Kincaid.
- Natural gas is used to steam water, which is pumped to campus buildings to provide heat.
- Energy use for campus is higher in the winter.
- Winter, highest natural gas usage. Summer, significantly less natural gas used.
- KWh are used for measuring electricity. Tons are used for discussing cooling capabilities. Therms or MMBTU's are used for total energy used.
- 10% to 15 % of the total energy consumption in the past year was generated at the university power plant from steam.
- Cost is the main factor in determining how much electricity is generated.
- Graphs of daily use at http://darkwing.uoregon.edu/~esbl/esbl_facilities_services.php
- Further questions could include: What is the trend for producing electricity? What is the current electricity and natural gas cost? How do they compare to the average? What percentage of total campus energy use is electricity? Natural gas?

4) What data do you have on the breakdown of energy use for specific campus buildings? What buildings are not included or are measured separately?

- The general fund pays for the utilities for most buildings. Some buildings are billed separately for their specific use.

- Most buildings have their own electric meter and generally electricity use is available for individual buildings or a small group of buildings.
- Specific building information is not as detailed for steam or chilled water use. There are only 10 to 12 meters measuring each.
- Further questions could include: What buildings are primarily for administrative purposes? Student use? Classroom space? Specific data for each group and for normal and slow times. How has use changed over time?

5) How is campus energy being used? What specific data is available for each type?

- Natural gas, electricity, chilled water, and cooling.
- Natural gas is used for heating and electricity generation.
- Further questions could include: Information about specific data on energy use. What is the total energy use? What is the trend of this use?

6) Is there any information specific to student energy use? What suggestions would you have for gathering this information? How have other groups attempted to determine student energy use?

- Student use is hard to determine. One possibility that other groups have tried includes looking at electrical use in the dorms. A base load could be figured out by comparing measurements during student breaks to times when students were present. Subtract base load from total use to determine student use.
- Data on the electrical use for each of the campus dorms is available. For most of the university housing there are remote monitors providing electric use data every 15 minutes. This data and graphs of it are available through Ruddick.
- The amount of energy increased by more than half during peak times. Daily, low energy use times are usually during night hours.
- There was still a base amount of energy being used even at low times from: general night uses such as custodians, lights left on either unnecessarily or for security, heating, transporting energy, and running fans to move steam heat around.
- Ruddick worked last year with Page West from ASUO on university housing energy conservation.
- More information on student use from a report done by a sustainability class. Available at: http://darkwing.uoregon.edu/%7Ereppe/ENVS411/EcologicalFootprint.doc

7) *What part of energy use do students have control over? What are ways for students to reduce energy use?*

- Energy conservation examples: not using wheelchair automatic door openers unless needed or not using elevator for just a few floors.
- Education of how heating systems work could reduce energy waste. Example, understanding time delay on heaters and how personal space is heated. Avoid heat being left on all day and people opening window to cool off when the heat is still on.
- Occupancy sensors help reduce unnecessary energy use. Turn off both monitors and computers over night.

- Further questions could include: What solutions have previously been tried? Success?

8) *What other sources of information would you suggest I investigate?*

- Ruddick best source for campus energy use.
- Jeff Kline at Energy Studies in Building Laboratory (ESBL).
  Facilities Services deals with campus energy conservation issues.

Interview 2

Interviewee:
Jim Maloney (EWEB)
Energy Resource Project Manager
Office Phone: 541-484-2411
E-mail: jim.maloney@eweb.eugene.or.us

Interviewer:
Maureen Sander
January 20, 2004
10:30-11:30 am

Jim Maloney works as Energy Resource Project Manager for Eugene Water and Electric Board (EWEB). His job includes serving as the technical lead and support, the main contact in buying and selling of "green tags", the lead in development of alternative energy projects, and consultant on decision analysis for the rest of EWEB. Maloney discussed primarily the inefficiency of energy production and the environmental and technological trends affecting the future of these resources. The questions concentrated around three main areas: energy production and distribution, technologies, and the economics of wind power.

Maloney described the notion of *net energy* as the resulting energy produced after the generation process. According to Maloney, it may take the energy from one barrel of oil to process one and a half barrels of oil. Clearly, this is very inefficient. Soon after reaching the peak of production, we are using more energy in the production process than we are receiving. This is why it is essential to develop more energy-efficient modes of production through renewable energy sources.

Wind power is an alternative energy source that may provide a partial solution. In regards to wind power, Maloney mentioned a lack of funds to organize advertising and outreach campaigns within the community. Before investing in other alternative energy sources, EWEB must prove the success of selling wind power. The University of Oregon is a very large consumer of energy in Eugene. Maloney stated that if the University purchases a percentage of wind power, with the help of other local corporations, EWEB would be able to invest in other renewables. By involving the University community, we can improve public understanding of the importance of shifting to sustainable energy practices.

Question & Answer

1) How would you describe the work that you do for EWEB? What are your specializations in this field?

- Technical lead and support person: in charge of handling the computer modeling and the technical and economic assessment.
- Main contact person on the buying and selling of "green tags", which labels a company as "green" because of monetary investments in renewable energies.

- Lead person during the prospecting and development process of large-scale, new renewable resource development that EWEB's involved with such as wind, geothermal, solar, etc.
- Consultant to other parts of the organization that need assistance on decision analysis.

2) Previously, you made the statement that wind power is becoming competitive with other forms of energy production such as natural gas or even coal. You attributed some of this to the fact that the production of natural gas has already peaked. What can you tell me more specifically about this?

- Oil is most condensed form of fossilized energy producing hydrocarbon. Western civilization is based on the exploitation of this dense energy resource.
- We do not have the infrastructure needed to respond to the depletion of these resources.
- The common view of 95% of geologists is that there will not be a neat transition to more efficient methods of energy production.
- Further questions could include: What steps will we have to take to make this transition to more efficient methods of energy production? How will if affects us economically, socially, politically? How soon will this occur?
- Maloney created a data CD for further information on natural gas and oil.

3) What are some of the inefficiencies in the production of natural gas?

- Production inefficiencies:
    - Some economists don't take into account the concept of *net energy*.
    - It takes about one barrel of oil energy to pump approximately one and a half barrels out of the ground. Oil requires energy in pumping, refining, and transporting.
    - We're using more and more energy to recover less and less oil.
- The expiration curve:
    - Production of gas or oil peaks and falls off.
    - After peak of production, about half of resource is available. Because of energy it takes to produce the product, part of resource is unobtainable. At certain point past the peak of production, more energy used to produce the material than available for exploitation.
- Oil isn't just motor and energy fuel. Almost 90% of the agriculture in the western United States is oil dependent- petroleum, fertilizer, and pesticides are examples.
- The average automobile is only about 1% efficient:
    - The efficiency of the gasoline engine is about 20%.
    - The efficiency of the transmission system is maybe 80%,
    - The vehicle itself weighs about 2,000 pounds.
- Hydrogen not an energy source, it is energy carrier. It takes a lot of energy to produce and is maybe about 40% efficient.
- European building codes require that building must be designed using daylight lighting first with electric lighting only as a supplement.
- Not the case for U.S. building codes. Northwest has a lot of diffuse light which is good for day lighting practices. This approach taken with new Lillis Business Complex at UO.

- Further questions could include: What are some more efficient methods of processing oil or natural gas? What technologies have developed in these areas? How does the Lillis building compare with other buildings on campus in terms of lighting efficiency?

4) You have also mentioned that coal production makes up about 23% of our current energy consumption in the Northwest, which is significantly lower than the dependence of coal in eastern states. Where does most of this coal production occur? If coal is making a comeback, how could it affect the Northwest?

- Most coal production is located in plants just outside of the central Northwest.
    - There's a coal plant in Centralia, Washington.
    - Oregon has a plant in Bordman, in Eastern Oregon.
    - The other big coal plants are in Montana and Western Wyoming.
- Coal in the Pacific Northwest is relatively low in sulfur.
- Pacificorp is largest owner of coal plants in Northwest with portfolio of about 60% coal.
- The Montana Power Company also owns a lot of coal.
- A German company promoting small coal plants in Northwest using European technology.
    - Europe has continued developing coal technologies, resulting in much more efficient coal production.
    - Newest US coal plant built twenty years ago. Engineering firms in US don't have the expertise for coal plants anymore because of focus on natural gas production.
- Most coal plants cheapest if right near mine mouth. These are called Mine Mouth Plants.
    - Mine Mouth Plants require additional transmission because locations are generally far away from areas of high population. This puts additional tension on the already strained transmission lines.
    - Another way is to transport the coal on a train; however, trains use diesel fuel.
    - Coal is very cost competitive.
- More information on coal can be gathered through Pacificorp.

5) How much of our current energy consumption comes from large dams?

- 65-70% comes from large dams while the rest comes from smaller facilities.
- The Grand Coulee not built with a salmon bypass. Most dams downstream have fish ladders.
- Last dam on the Columbia, before reaching the ocean, is Bonneville: 40-50 miles east of Portland.
- Further questions could include: What are the effects of these large dams on the salmon population downstream? How has the damming of large rivers, such as the Columbia or the Willamette affected local riparian vegetation?

6) With the trend of global warming, summers in Oregon will most likely become warmer and dryer. Because our energy production is extremely dependent upon the weather conditions, in your opinion, how will this affect production in the Northwest?

- Forecasts from the Climate Impacts group at the University of Washington indicate warmer, dryer summers.

    - Precipitation may increase but will most likely fall as rain rather than snow.
    - This would lead to more rain-driven events and less snow pack.
- No energy loss but the production will shift more to the winter, with less in the later summer and early fall.
- The Northwest is in exchange program with the Southwest. In winter, we don't have enough resources to meet our peak loads, so we buy energy from California, Arizona, or Colorado. When their loads are generally down, our loads are generally up.
- When Northwest energy loads are up, energy is exported at relatively high costs, which brings in a lot of money.
- This will lead to a change in the economic balance of Pacific Northwest.
- There will be an increased frequency in extreme weather events.
    - Forest fires or range fires can impact the electric system. When fires occur near power lines, it heats the air around the power lines and they tend to sag. It is thus necessary to decrease the amount of energy flowing on the power lines. If they sag too low they can arc to the ground, igniting other fires.
- Generally energy peaks in winter with low loads in the summer. However, recently more buildings have air-conditioning. Therefore, small hump in summer. Energy load during summer hump growing faster than energy load in winter peak.
- Further questions could include: What other extreme weather events will affect the energy system in the Northwest and what measures and being taken to combat this?
- There may be more information on this available from the Climate Impacts group at the University of Washington.

7) Previously, you mentioned difficulties in transporting natural gas and wind power, involving the term, 'Distributed Generation', describing local energy production as more efficient, less productive. Can you describe some problems associated with electricity transportation? What is inefficient in the transport process?

- Existing transmission system in Northwest is well utilized and under some strain.
- *Cut plains* are places where transmission restraints occur.
    - *Cut plains* not all restrained at same time.
    - During certain times of year, we are unable to receive energy from Montana or Wyoming because of *cut plains*.
    - There are also other constraints on energy moving to the Southwest.
- The transmission lines in the Northwest are loaded to capacity. The existing technology and the number of lines that are there cannot take any more energy transfer.
- EWEB is working on building a new transmission to fix the "West of McNary" constraint (located west of Bonneville).
- Two major gas pipelines in the Northwest. One from British Columbia, the other Alberta.
- Most gas from these pipelines once supplied California, now supplies gas generation plants in Northwest.
- There are proposed plans to build 1000 MW plant in Coburg. This will put constraints on locally distributed generation unless the pipeline made bigger.
- To increase energy consumption, it is necessary build transmission lines, pipelines, or increase the utilization of renewables.

- Further questions could include: What are the costs of rebuilding the current transmission system in the Northwest? What are some new technologies that may increase the efficiency of this transmission system?

8) Updating technology has dramatically increased product efficiency. What are some of the newer technologies available in energy production and transportation that have a potential to increase energy efficiency? What are the overall costs and benefits of these technologies?

- Hydroelectric:
    - Only small improvements in the efficiency of hydroelectric production.
    - Newer technologies more efficient but no significant increase in efficiency of production. Change incremental, rather than new or innovative.
    - Problem with hydro is that generators are large and heavy with few ways to increase efficiency.
- Natural Gas:
    - Older technologies are about 25% efficient.
    - The Combined Cycle Combustion Turbine plant is more recent technology: natural gas fed into spinning combustion engine, through a shaft and into generator. This produces electricity and air emissions. Combined Cycle plant runs exhaust gas through a Heat Recovery Steam Generator. This exhaust gas is so hot that it can boil water. This generates even more steam that runs through the generator one more time to produce more electricity. Overall efficiency about 50%.
- Fuel cells are 40-60% efficient
- Older coal plants are only 25-35% efficient but much more cost effective than other forms of electricity.
- Wind Power:
    - Price of wind-generated electricity fallen from 10-12 cents/kWh to about 3.5 cents a kWh over last decade.
    - Modern wind turbines much larger and lighter, but also very strong.
    - Electronic power equipment in turbines has been reduced to about a quarter of its original size.
- Solar has become much less expensive but cannot yet compete.
- Further questions could include: How do nuclear power plants in the U.S. differ from plants in Europe in terms of energy efficiency and waste disposal? How do they compare?

9) What are EWEB's plans for investing in green energy? What would influence EWEB to buy more renewables?

- EWEB's current energy strategy is to change about 1% of their total load into new renewables each year.
- Under this strategy, EWEB has added two wind projects: purchasing 2 MW of electricity from both the State Line project in Washington and from Foote Creek. They have also purchased a hydroelectric project.

- The other goal is to meet the load growth with efficient and new renewables. The program is a six-month process to review existing strategies and decide if they are still the right strategies or if they need modification.

10) How much wind power would the University have to buy to make an impact?

- At EWEB, wind power-marketing group targets residencies, businesses, and other facilities.
- Electricity from wind facility enters into the grid and Pacificorp transmits energy to Eugene.
    - This is done by re-dispatching energy to mimic production in Wyoming.
    - Every MW hour that the Foote Creek plant generates, the local coal plant doesn't generate.
- EWEB buys 22% of the Foote Creek project and sells a portion to the BPA. With what is left, half of wind power is subscribed, the rest redistributed into the system.
- Marketing board stated that excess wind power must be subscribed before EWEB can make further investments. To do so, EWEB wind power needs more large customers. If the University buys a significant portion, it would help.
- Once wind sells out, board may be interested in other retail marketing programs such as solar energy.
- Further questions could include: What percentage of energy is ideal for the University of Oregon to purchase in order to make a significant impact?

Interview 3

Interviewee:
Jeff Kline
Research Associate, Energy Studies in Buildings Laboratory (ESBL)
Office Phone: (541) 346-5647
E-mail: jkline@uoregon.edu

Interviewer:
Zachary Withers
January 16, 2004

Jeff Kline is a research associate with Energy Studies in Buildings Laboratory (ESBL) with extensive knowledge of energy efficiency in building design and renovation. He manages campus facilities conservation projects as well as focusing and tracking conservation projects on campus.

ESBL manages and tracks conservation projects on campus. For example, in November and February of the 2001-2002 school year, energy conservation competitions were held between dormitories. ESBL hired three students to educate and bring energy conservation into focus with residents, and tracked the resulting energy savings over a six-month period. Currently Jeff Kline is calculating these energy savings.

Student control of energy on campus is limited. Kline notes that students could be most effective in conserving energy by using common sense: be aware of light switches and use a reasonably lit space for studying by utilizing task lighting. Also, they can ask facilities to turn the steam down rather than open a window as a thermostat.

Kline promoted occupancy sensors as a physical application to conserve energy. By automatically cutting energy loads when presence is not detected, conservation does not rely on us to be aware.

The main weaknesses in conservation at the UO are heating demands. Even in September, when no students are present, the gas load to buildings remains high. Jeff recommended the installation of digital thermostats and intensive insulation of pipes to buildings. Energy is mainly lost due to the hot water demands of buildings year round, and a solution could be the installation of solar water heaters to reduce the year round demand for steam in buildings.

For other sources of information, Kline recommended we speak to Josh Ruddick**,** Utilities Analyst for Facilities Services, Kyle Allred with the Associated Students of the University of Oregon, and Fred Tepfer with the UO Planning Office.

Question & Answer

1) What is your position/job description on the U of O Campus?

- Manage campus facilities conservation projects, focus and track conservation projects on campus. (With a tight budget, evaluations of proposed projects focus on how to get the most use out of money available.)
- Position also entails developing a database on energy conservation at U of O campus.

2) Brian Hawley, with EMS at EWEB, discussed an energy competition between dormitories. Could you describe in more detail: what conservation ideas were focused on?

- Competitions were held in 2001-2002 school year.
- November 2001, with another February 2002. Both focused on electricity rather than heating.
- Conservation efforts focused on educating students about what they can do to decrease energy consumption.
- Education also focused on getting students interested in conservation because of concern over new energy surcharge in 2001-2002 school year. Kyle Allred, with ASUO, received money from George Hecht to hire three students to focus on dorm conservation.
- They boosted awareness on energy issues by creating posters to educate about energy conservation; meeting with Resident Assistants to spread the effort to residents; and adding incentives such as a pizza party and other donated gifts from local community.

3) Were physical applications involved to help the dormitories to save energy? (Appliances, light sensors, fluorescents)

- No. Focus on conservation through awareness and human related energy saving techniques.

4) What specifically was your part in the dormitory competition?

- Energy Lab responsible for technical support; including documenting raw data on energy use at dorms in question.
- The energy savings during the competition were based on previous year's energy use and a base line average. Namely, how much energy dorms used with no students present (Winter break). By factoring out non-occupant energy use from the two years, an energy savings equal to $25,000 a month was found.

5) Are there resources still available from this project for students interested in conservation? (Energy banners, flyer ideas, catchy conservation headlines etc…)

- Brochures and flyers are very effective, and the ASUO may still have many banners and brochures on hand. It is helpful to use artistic designs to get message across.

6) Are there documented results of this energy conservation campaign? (e.g. dollars saved, annual kWh saved)

- A technical report is in the process of being completed; however, there was an energy savings equal to $25,000 based on the months of the contest.

7) What sources of information would you recommend pertaining to energy conservation and use at the U of O?

- Myself and Josh Ruddick with the UO power plant. Other good sources include the E-Lab website, ASUO environmental coordinator Kyle Allred, and Fred Tepfer with the Planning Office (Responsible for new construction/renovations, how to operate and maintain buildings to reduce energy)

8) What on-campus groups, that you are aware of, have focused on energy conservation in the past?

- The Associated Students of the University of Oregon (ASUO)

9) What do you feel the campus community can or cannot do about electric use at the University?

Since students can control only so much, these areas are most effective:

- Ask facilities to turn down steam in controllable rooms.
- Turn off light switches!!!
- Be smart-don't use an empty room to study in. Go somewhere with multiple occupants.
- Use more task lighting. Less overhead lighting. (Task lights are basically lamps and focused small reading lights.)

10) What physical means of conservation do you see as the most valuable to promote?

- Occupancy sensors work well in dorms – when no one is in the room the switch automatically turns off energy load. Not good for computers, however, it's too dangerous if computer left on accidentally. Difficult to decide if University or students should buy them.

11) What are some weaknesses in energy conservation at the U of O?

- The Blue lines on the Energy Lab gas measure are high. Even in September when no students are present the gas load to the buildings are still high.
- We need more digital controls on gas lines as well as insulation of piping.
- Mainly load is due to need for hot water in buildings at all times. This is a long trip for steam when it is used only for water heating in months where cold is not an issue.
- Even if steam is not needed to heat the building, it still must be sent to heat water.
- One solution is to install solar water heaters, like those located on the Gerlinger Annex, which heats the water without the need for steam.

Interview 4:

Interviewee:

John Mitchell
Media Relations, Eugene Water and Electric Board (EWEB)
Office Phone: 341-8593
Email: john.mitchell@eweb.eugene.or.us

Interviewer:

Megan Edgar
January 21, 2004
2:15-3:15 pm

John Mitchell serves as Media Relations for Eugene Water and Electric Board (EWEB). He states that wind power has increased in recent years in both use and availability. In 1999, EWEB launched its wind power campaign in which customers could choose to purchase a percentage of wind power. However, due to limited advertising, the number of wind power customers has stagnated. Approximately 2,200 residential customers choose to pay extra on their electric bill in order to support this alternative energy, accounting for about 3% of all customers. Wind power costs more because as a modern resource it is relatively new when compared to other mainstream forms of power. Although wind is now competitive economically, its lack of 'mainstream' status and relative scarcity denies further reductions in cost.

This wind power, which comes from the Foote Creek Rim wind project in Wyoming, accounts for 5% of EWEB's total energy budget. Other small projects, such as the State Line project on the border of Northeast Oregon and Southeast Washington, accounts for a small percentage as well. Additional projects in the surrounding area are possible; however, due to lack of demand, it is unlikely that EWEB will pursue more wind power in the near future. If the University of Oregon, were to purchase even a small percentage of wind power, demand would increase. With this increased demand, the possibility of EWEB utilizing more wind power improves.

The fact that the number of wind power customers has remained the same is partly due to lack of advertising, as mentioned above, but confusion about what it is they are purchasing influences some customers. While wind power clients pay extra, they do not physically receive the wind power. Rather, those living in Wyoming near the wind farm are likely to receive that power. What people may not understand is that their patronage of wind power displaces other forms of energy from the energy 'pool', resulting in more clean technology and less polluting sources. Most people who pay extra for wind power view this as a realization of their 'green ethic'. Appealing to this ethic is the best way to promote conservation and the use of alternative energy.

Question & Answer

1) What is the status of wind power at EWEB? How much do they purchase, and how much of that is subscribed to consumers who choose wind power?

- 5% of EWEB's total electric energy needs are met by wind
- The Foote Creek Rim project in Wyoming supplies most of EWEB's wind power.

- About 2,200 residential customers are signed up for wind power, which is about 3% of EWEB's customer base.
- Less than 50 of those customers purchase 100% wind because of economic costs.

2) Why does wind cost more?

- Wind power is a new resource.
- Northwest is hydroelectric-based, but no new hydroelectric facilities to be installed.
- Coal, nuclear, and fossil fuels such as oil and natural gas are not acceptable to EWEB customers who demand renewable sources such as wind and solar energy.
- This puts EWEB in the position where their customers want wind, so they purchase it.

3) *When was the wind power program at EWEB initiated? Has public interest grown? If so, why do you think this is? Has EWEB done anything specifically to promote wind power?*

- The wind power program began on Earth Day, April 22, 1999.
- The resource itself has grown but the number of customers signed up for it has not because EWEB spends little to push wind power at the discretion of the board of directors.
- The board wants to let customers know they can purchase wind power, but don't want to 'hustle' them into purchasing it, because wind power costs more.
- People who sign up for wind power do it primarily because they believe it shows their environmental ethic, making it worth the extra money.
- While increased promotion may result in increased participation, the company does what is economically worthwhile.
- The question becomes: should EWEB promote wind more as an add-on resource or incorporate it into the general portfolio, making it 'rate based' (so that everyone gets it whether they like it or not, and it simply becomes part of the total cost).
- There are people who argue that wind should be part of the whole package because everyone needs to 'take their medicine.'
- This issue will come under review in the next year, but ultimately becomes an economic issue.

4) The EWEB web site mentioned the possibility of purchasing a share of the State Line wind project, as well as discussions about other projects in Oregon. What is the likelihood of these projects? What would their impact be?

- EWEB has already purchased some of the State Line project.
- Geographically, the area is a perfect for a wind project.
- The turbines are built on the Oregon-Washington border, almost to Idaho. The area is barren, without much scenic beauty, and there is nothing much on it except for cows, which coexist with wind power well.
- There are some other projects near the area, mostly to the west.

5) The web site also explained that electric customers near the Wyoming site are likely to receive actual power from wind, while those in Eugene are the ones who pay for it. What is the actual

benefit to customers who purchase wind power, and does this issue affect their decision making when it comes to purchasing it?

- Some people have an issue with this concept, mostly because they don't understand the laws of physics.
- The way to look at the entire electric system is like one big pool. Every bit of wind power added to the pool displaces other, polluting types of energy.
- Generating wind power in Eugene is not possible because the average wind speed in Eugene is about 2.5 miles per hour, while a 15-mile per hour average is needed for wind power generation. The average at the Wyoming site is 23 miles per hour.
- The coast is not an option because wind there is gusty and scenic beauty must be considered. The coast also serves as a major traffic zone for birds, and "windmills and birds do not mix".

6) What would be the impact, both on the environment and for EWEB, if the University of Oregon purchased wind power? How much would it take to make an impact?

- 2,200 residential and 75 commercial wind power customers receive 75% of EWEB's wind power, which leaves 25%.
- The University of Oregon is one of EWEB's top 5 customers, making any purchase substantial enough to possibly warrant the purchase of more wind power to accommodate the demand. A 1% to 2% purchase would be good.

7) What have you found to be successful in the promotion of wind power? What do people respond to?

- Appealing to 'green ethic' proves very successful. For example, commercial clients promote that they are wind customers and thus, 'green businesses'.
- To convince those who don't care, it is best to describe growth of Northwest. When considering load (how much energy that we use) and resource base (how much we need to meet that load), load in the Northwest is growing, and thus, new resource base is needed.

8) If you had just a few minutes to 'sell' wind power to a bunch of college students, what aspects would you highlight? How would you get your message across in a short time?

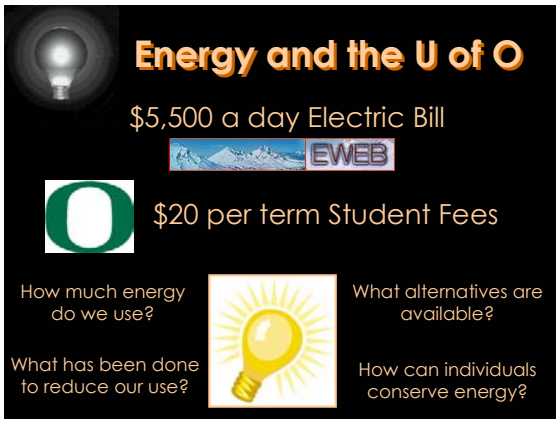
- Appeal to their 'green ethic'.
- Assume that cost will be an issue.
- Explain that to contribute in a small way is not that expensive.
- Tell them "It is an opportunity to practice what they preach – if you really believe in this, you can purchase a bit of wind power."
- If a college student purchases 10% wind, it would probably cost about $3 extra a month, and even a college student can afford that…that's not even a full pizza.

Appendix D

Presentation Content

UO Profile Presentation Slides

Slide 1



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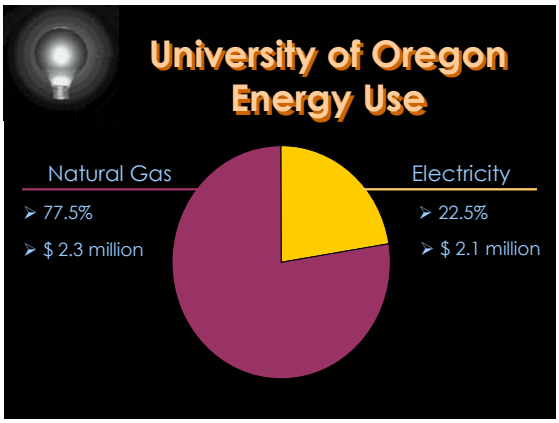

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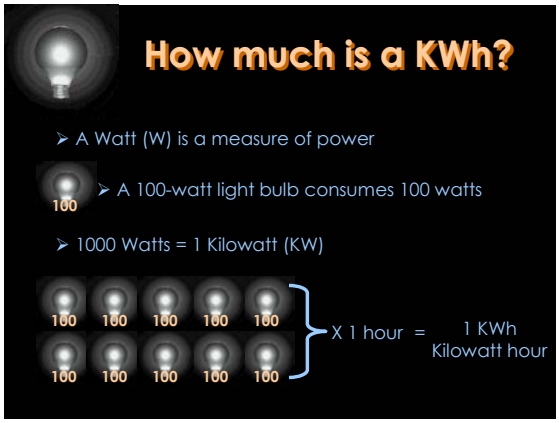

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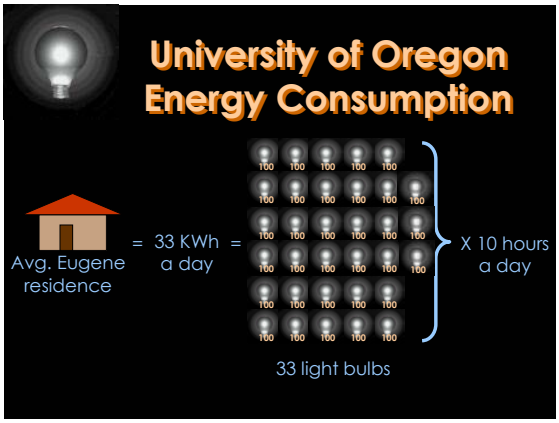

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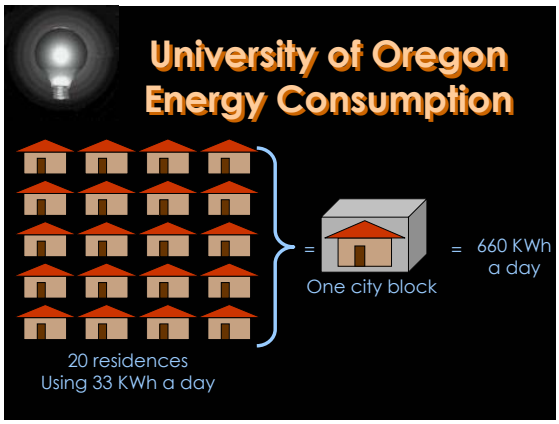

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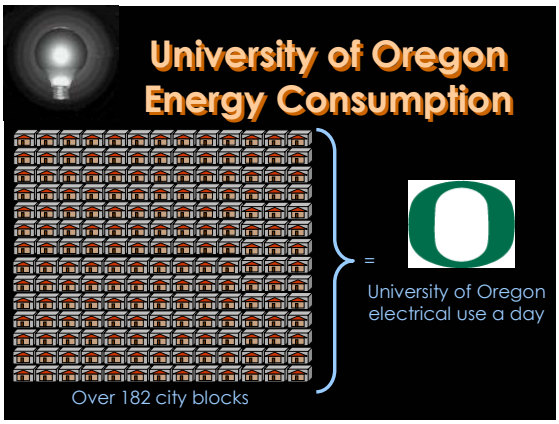

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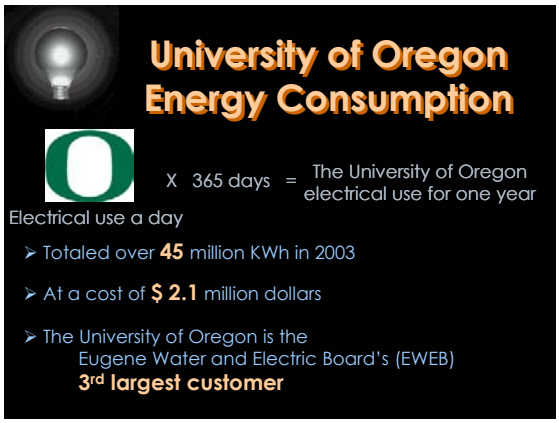

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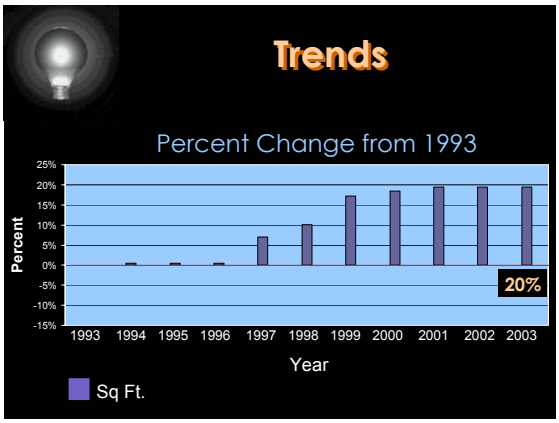

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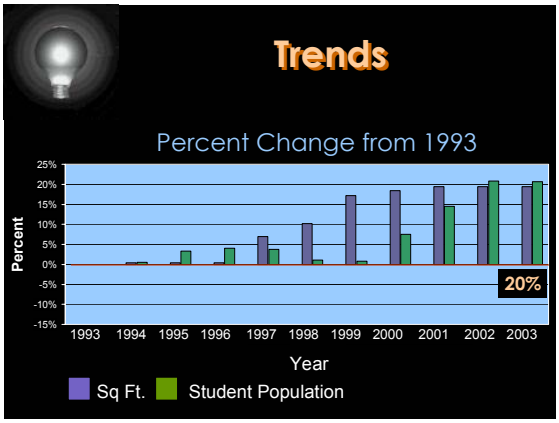

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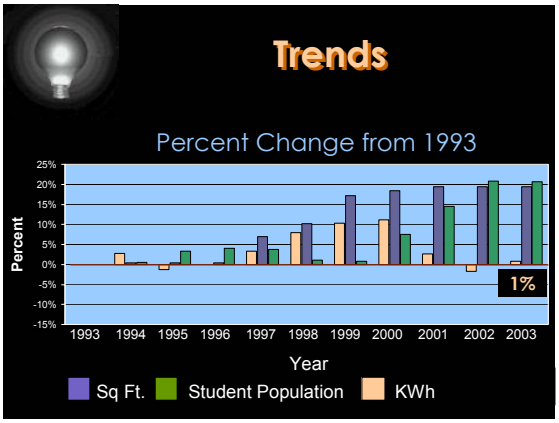

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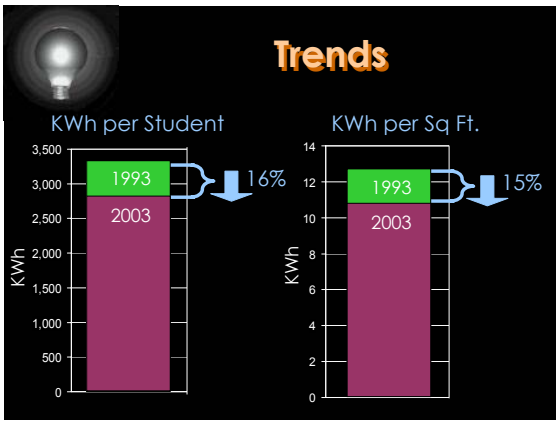

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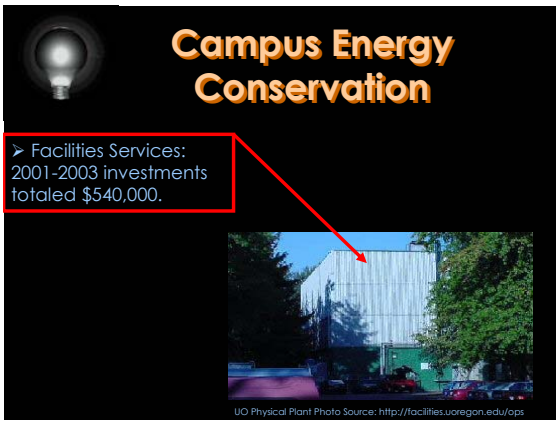

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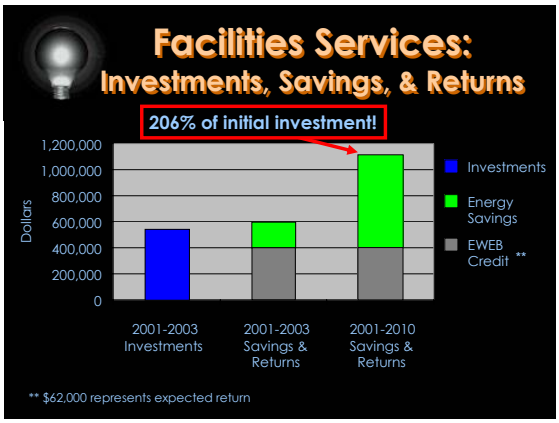

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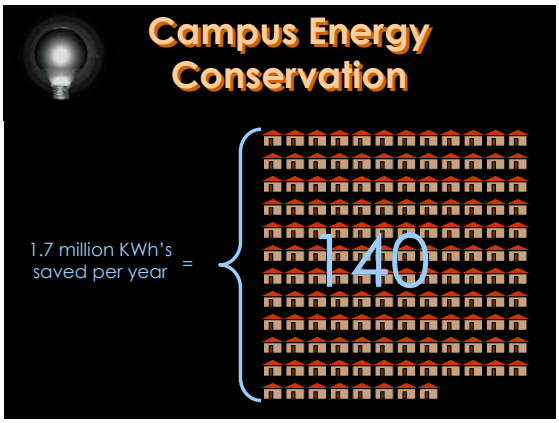

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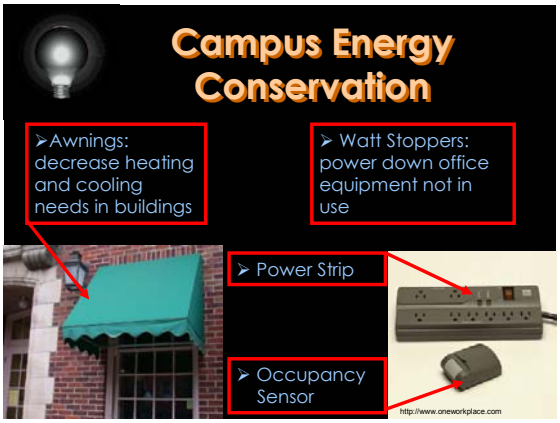
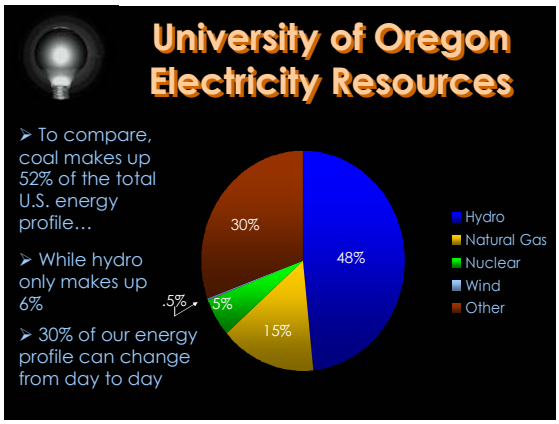


Slide 14

Slide 15



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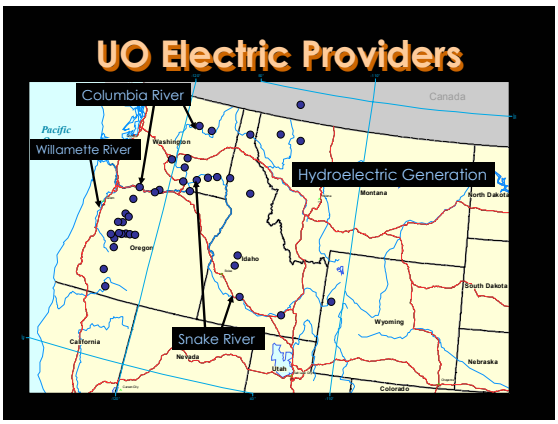

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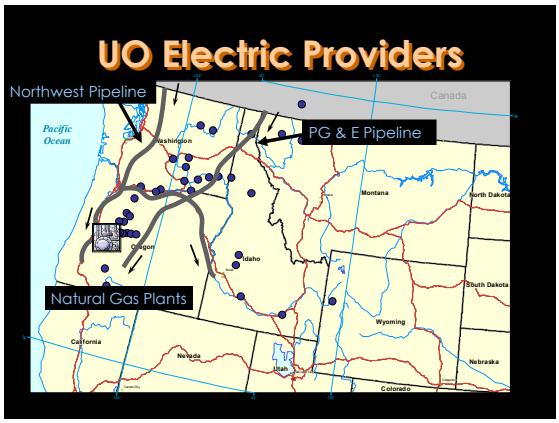

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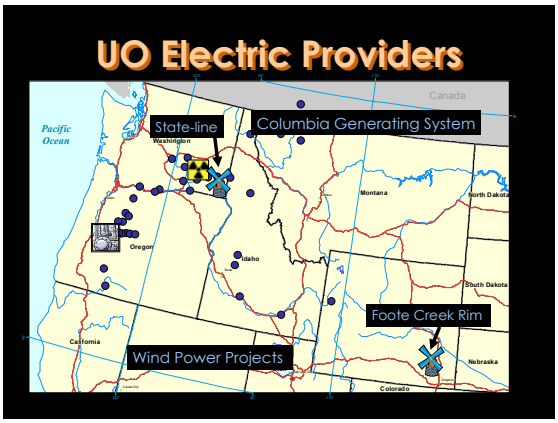

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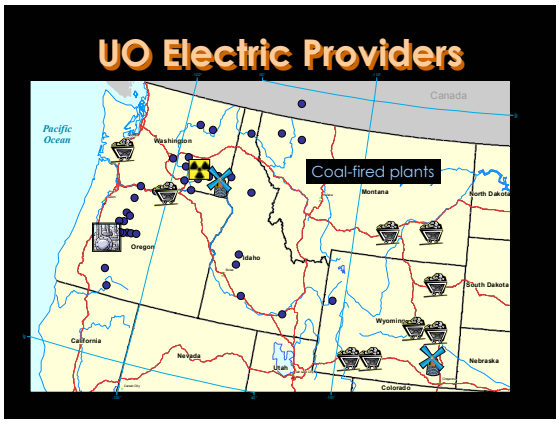

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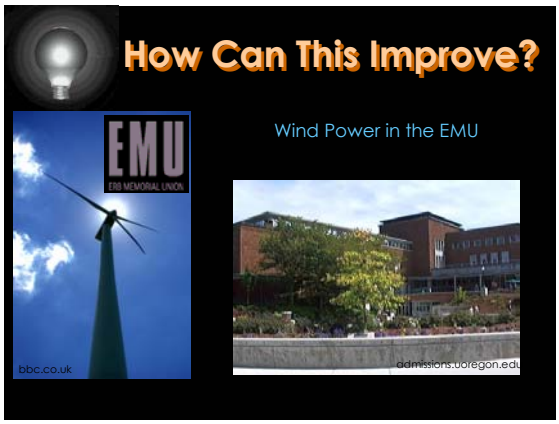
Slide 18



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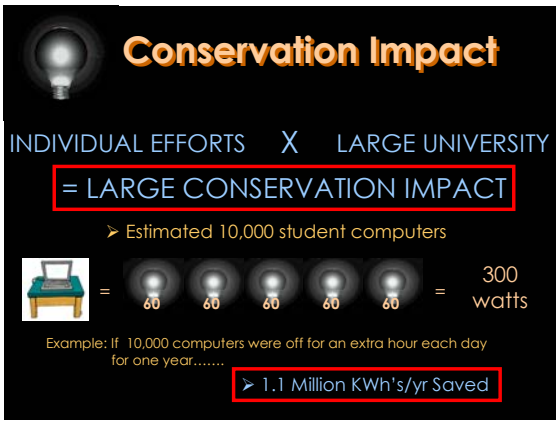


Slide 20

UO Profile Presentation Script
(Underlined words indicate PowerPoint animation)

Slide #1:

Who can guess how much the University of Oregon spends on electricity each day?
Close, actually…
Not quite that much, actually….etc.

- The U of O electric bill is over $5,500 a *day*.
- Also, $20 of your student fees are allotted to an "energy surcharge fee" each term
- And while obviously the University's energy use costs money, it also has harmful costs for the environment, leading to such things as global warming, air pollution and loss of biodiversity.
- My name is ……. and this is …….. and we're from the Environmental Studies Service Learning Program. Today our presentation will cover the University of Oregon energy use.
- In this presentation, we hope to answer the questions…
  - How much energy do we use?
  - What has been done to reduce our use?

- What alternatives are available?
- How can individuals conserve energy?

Slide #2:

- Of the total energy used by the U of O last year, 77.5% was Natural Gas and the remaining 22.5% was electricity, mostly purchased from EWEB.
- The natural gas cost 2.3 million dollars
- Whereas electricity cost 2.1 million dollars,
- This presentation will primarily focus on the electric portion of the U of O energy profile because more detailed monitoring is available for electrical use, the cost is similar to the large percentage of natural gas, and we as students have more influence over electricity.

Slide #3:

- Before analyzing our electric use it is important to understand electricity measurements.
- A watt is a measure of power; it is the most basic unit of electricity.
- For example, a 100-watt light bulb consumes 100 watts of electricity at any given time.
- 1000 watts equals one Kilowatt.
- At any given time, one Kilowatt can power 10 100-watt light bulbs.
- Powered for 1 hour, these 10 light bulbs consume 1 kWh of electricity.

Slide #4:

- To compare, an average Eugene residence uses 33 kWh a day.
- That is equal to 33 100 watt light bulbs being powered for 10 hours a day.

Slide #5:

- Assuming that there are 20 residences per city block, a total of 660 kWh would be used per day for each block.

Slide #6:

- It would still take over 182 city blocks to equal the total kWh used by the U of O each day.

Slide #7:

- Multiply this by 365 and you get the use for one year
- This totaled over 45 million kWh in 2003.
- At a cost of over 2.1 million dollars.
- This use also has considerable environmental impacts such as those I mentioned earlier. And remember, this is just for electricity, which accounts for less than a quarter of U of O total energy use.
- Our electrical use made us EWEB' 3rd largest customer last year.

Slide #8:

- This graph displays the trend in total square footage at the U of O in the last decade. The bars represent the percent change from the 1993 value. For example the addition of the

Student Recreation Center and Knight Law Center account for the increase between 1998 and 1999.

- Over the last decade the total square feet have increased by almost 20%.
- The green bars depict the change in student population from the 1993 level. Over the last decade the population has continually increased and currently there are over 20,000 students.
- These additions total to a 20% increase.
- The peach bars represent the annual kWh use percent change from the 1993 level. As you can see, the total kWh use has fluctuated over the last decade.
- But in 2003 there was less than 1% more kWh used than in 1993.
- The minimal increase in kWh use occurred regardless of the 20% increase in square feet and student population. This can be partly attributed to higher building design standards and energy conservation efforts.
- Combining these figures can help us further understand these trends.

Slide #9:

- The total kWh used per student was over 3,300 in 1993 and less than 2,800 in 2003.
- This means that the U of O kWh per student decreased 16% in the last decade.
- The total kWh used per square foot. Also decreased. In 1993 it was 12.7 and in 2003 it was only 10.7.
- This means that the U of O kWh per Sq. Ft decreased over 15% in the last decade

Slide # 10:

- U of O's reduced electrical use can be partly attributed to its conservation efforts. Here are a few examples
- From 2001-2003 Facilities Services invested just under $540,000 to upgrade lighting systems and install fan timers across campus.

Slide # 11:

- This graph shows investments, energy savings, and returns for the lighting and fan timer projects.
- This bar represents facilities initial investments of over a half a million dollars.
- This part shows an EWEB subsidy, a monetary credit for $400,000 to the University for participating in conservation measures.
- Adding energy savings, the total three-year savings and returns adds up to $600,000.
- Looking to the future, the University stands to save over a million dollars over a ten-year period.
- That's 206% of the initial investment. Not only did the U of O save money, it also saved energy.

Slide # 12:

- The energy saved each year from these investments averages 1.7 million kWh's per year. That's enough energy to power 140 average Eugene residences for an entire year. This is an example of just one project the University has done.

Slide # 13:

- Other conservation efforts include the addition of awnings to various older buildings around campus. These help to reduce heating and cooling needs throughout the year.
- Watt Stoppers have been installed to numerous offices across campus. This equipment allows for any appliance plugged into the power strip to be powered down when the occupancy sensor senses the area is no longer in use.

Slide # 14:

- In addition to these conservation efforts Facilities Services contracts Energy Studies in Buildings Laboratory to research and monitor other campus energy projects.
- One of these projects was the 2001 to 2002 school year Dormitory awareness campaign.
- This campaign called **"**Reduce the Juice**"** entailed an energy conservation competition between dorms. The competition not only saved energy but initiated conservation practices among new students.
- Regardless of these savings and conservation efforts, we are still a large consumer of electricity.

Slide #15:

- That being said, it is important to understand where our energy comes from.
- Hydroelectric generation makes up the bulk of the University of Oregon electric profile, about 48%. Natural gas makes up about 15% and nuclear makes up 5%. Wind accounts for less than a half a percent.
- To compare, coal makes up around 52% of the *national* energy profile, while hydroelectricity accounts for a mere 6%. UO energy trends are almost a complete reversal of those trends.
- In addition, 30% of our energy profile is undefined. Energy can be purchased from day to day and the price can fluctuate, much like the stock market. And because coal makes up about 20% of the Pacific Northwest energy profile, we could be receiving some of our energy from this source.

Slide #16:

- To visualize where this energy comes from, here's a map of our energy resources, most of which is purchased from EWEB.
- Dams are the most dominant energy producers in the Northwest. They are considered a "renewable" resource, however, they have impacts on salmon and biodiversity. Energy we receive from this resource is produced mostly along the tributaries of the Willamette River, the Snake River, and the Columbia River.
- Electricity from natural gas is generated by the UO facilities services here in Eugene. We also receive a small portion from a Cogeneration plant from our neighbors in Springfield. Although natural gas emits less CO_2 than coal, it is hazardous to produce and is a limited resource. The gas itself is transported by two pipelines, owned by Northwest and PG&E, both originating from Canada.

- The Columbia Generating System is a Nuclear power plant in Southeast Washington, which supplies about 5% of the University power pool. While nuclear generation does not emit pollutants, it creates a toxic radioactive waste.
- In addition, EWEB also contracts a small percentage of wind power from the State-line project in Washington and partially owns the Foote Creek Rim project in southeast Wyoming.
- And finally, these graphics depict the locations of larger coal plants in the Northwest. We may receive an estimated 6% of our power pool from coal, due to that 30% undefined that I mentioned earlier. Coal is the highest producer of toxic air pollution.
- As you can see, all of those sources have environmental impacts. What are some more sustainable alternatives to these energy sources?

Slide #17:

- The UO has recently implemented some alternative energy options. The largest portions of which are located in the new Lillis Business Complex.
- This project utilized solar panels in its design, which account for 6% of the building's total energy use.
- Less visible efforts include 50% wind power from EWEB, paid for by the University, at the President's and Chancellor's homes, as well as a smaller solar panel project on the EMU and a solar water heater on Gerlinger Annex.
- When taken all together, these projects still don't amount much when compared to the University's total energy consumption. So is there a way this can improve?

Slide #18:

- One suggestion is to promote 100% wind power in the EMU. Teamed with the existing solar panels, this high profile (and high consuming) building would put a huge dent in the environmentally damaging energy sources that we use.
- And it would cost each student less than $2 a year to purchase the wind power from EWEB.
- However, while clean and renewable energies decrease the University's environmental impact , conservation should come first.

Slide #19:

- As part of the University community, we can save energy in many ways.
- Our small efforts multiplied by the size of the university equal a very large conservation impact.
- For example, there are an estimated 10,000 personal student computers within the UO community, which does not include some 6,000 campus computers in different labs across campus.
- A typical desktop computer uses five times the electricity required to power a 60 watt bulb, utilizing 300 watts of power at any given time.
- If these 10,000 computers were turned off for merely 1 extra hour every day for a year, the community consumption would be reduced by almost 1.1 million kWh. That's enough electricity to power 91 average Eugene residences for an entire year, just by turning off a computer for one extra hour.

- This is just one example of how easily we can help reduce consumption.

Slide #20:

- Here are five simple choices you can make as an individual to help reduce energy consumption both on and off campus.
- Be aware of lights when leaving rooms. Many people believe that turning lights on and off actually uses more energy than just leaving it on. However, turning them off for just a short time does save energy.
- Turn off computers when finished. Contrary to popular belief, turning off computers actually increases the life span of your computer.
- Utilize task lighting as opposed to overheads.
- Ask Facilities to turn the heat down. If your classroom is too hot, which they often are, let facilities know and they can turn it down.
- Report Wasted Energy. In addition to wasted heat, unnecessary lighting, insulation needs, anything you see fit can be reported – All to help create an all campus conservation attitude. And hopefully help to reduce our $5,500 a day electric bill as well as the environmental impact of that electrical use.

So that is the UO energy profile, hopefully you have a better understanding of campus energy use, conservation efforts, and the availabilities of alternatives within our reach. If you want more information, check out our website. There are many useful links and a fun energy IQ quiz.

Appendix E

Public Speaking Course

Syllabus

ENVS 406 Field Studies: Public Speaking
(Instructor approval required)

Overview: Public speaking and presenting are important (and often required) communication skills for many professionals. In this special 2 credit course you will develop and improve your public speaking skills. You will spend the first two weeks in an intensive workshop environment where you will learn how to make confident public presentations using Powerpoint and LCD projectors. You will be trained to deliver an existing 10 -minute presentation about the University's energy profile. You will then be assigned to a team and deliver the presentation 5 - 8 times during the remainder of the quarter to classes, clubs, and faculty meetings across campus.
Credits: 2 credit Pass/No Pass only
Class Size: maximum of ten students
Meetings times: See table below
Instructor: Steve Mital (smital@uoregon.edu) 346-0591

Class Meeting Schedule and Assignments

Week 1	Tuesday, March 30th 4:00 - 6:00 pm Columbia 47	• Introduction • Review campus energy profile • What makes a good presentation • Working with PowerPoint • View campus energy presentation • Assignment: Rehearse campus energy presentation
Week 1	Thursday, April 1st 4:00 – 6:00 pm Columbia 47	• Give presentation and receive feedback • Give presentation a second time and get videotaped • Assignment: watch video tape and critique your performance • Assignment: Read campus energy report
Week 2	Tuesday, April 6th 4:00 – 6:00 pm Columbia 47	• Quiz on campus energy • Give presentation in teams and answer questions • Troubleshooting projectors, screens, etc • Scheduling presentations
Week 2	Thursday, April 1st 4:00 – 6:00 pm Columbia 47	• TBA

Week 3-10	According to your schedule	• Present the campus energy profile (in teams) to classes, clubs, and faculty meetings across campus • Submit audience evaluation forms
Week 10	Reflection paper due	• Submit a 3 page paper reflecting on your experience and responding to audience evaluations.

Quiz and Answers

Service Learning Program
Campus Energy Project Quiz - Master

Multiple Choice/True-False

1. *Hydroelectric generation is an appealing option because it is more reliable than other forms of energy production, such as nuclear generation.*

   TRUE *FALSE*

2. *Which source(s) supply EWEB with most of its electricity?*

   a) Grant County Public Utility District
   b) Pacificorp
   c) B.C. Hydro
   d) Bonneville Power Administration
   e) EWEB-owned power producers

3. Why promote wind power in the EMU?

   a) The EMU is a big consumer of energy on campus.
   b) The EMU is a prominent student building used by the majority of the campus community.
   c) The EMU is physically in the center of campus.
   d) All of the above.

4. How much does wind power cost per kWh?

   a) 3.527 cents
   b) 5.271 cents
   c) 5.883 cents
   d) 6.313 cents

Fill in the Blank

5. EWEB offers wind power in increments of 10 , 25 , 50 , and 100 percent.

6. An average wind speed of __15__ miles per hour is needed for wind turbines to operate. The average in Eugene is __2.5__ miles per hour.

7. While __hydroelectric__ generation makes up about half of the University of Oregon electric profile, electric power generated from __coal__ accounts for half of the national profile.

8. Facilities Services __Contracts__ Energy Studies in Buildings Laboratory to __Research__ and __Monitor__ conservation projects on campus. The title of one of these projects is __reduce the__ __juice__.

Short Answer

9. Why are dams harmful to the biodiversity of riparian vegetation?

Dams restrict the natural flooding of the floodplain, which previously provided various nutrients to the riparian soils. Also, the reduction in salmon populations, as a result of the construction of dams, has reduced the number of nutrients returning to streams from the ocean.

10. From 2001-2003, how much money did Facilities Services invest in conservation projects? What was this money spent on?

$540,000 to upgrade fluorescent light systems and install fan timers across campus.

11. How do awnings reduce heating and cooling needs?

Awnings block high angled summer light to reduce cooling needs and allow low angled winter light in to reduce heating needs.

12. What does the U of O use electricity for? Natural gas?

The U of O uses electricity for general electric demands on campus as well as for cooling purposes. Natural gas that the U of O purchases is used for generating steam at Facilities Services. This steam is primarily used to heat campus buildings. Some of the steam is used to run electrical generators to produce electricity.

13. What percent of the U of O electricity is purchased from EWEB and where does the other part come from and why?

On average over the last decade 87% of the electricity used by the U of O was purchased directly from EWEB. That means that on average about 13% came from elsewhere. The U of O owns steam-powered generators that are located at UO Physical Plant. Natural gas is used to generate steam, which runs the electrical generators. The primary factor influencing the amount of electricity generated is cost. When the cost of natural gas is low

and electricity costs are high, it is more economical to purchase natural gas and generate electricity here on campus than to purchase electricity directly from EWEB.

14. Why is electricity the focus of our presentation?

    Electrical meters are located in almost every campus building, providing specific information on a regular basis. In comparison, there are only 10 to 12 steam meters for the entire campus. Thus there is more information regarding electrical use on campus. In addition to better information, the cost of the electrical use is about the same as the cost for all of the natural gas. Electricity is also the focus because many conservation projects at the U of O focus on reducing electrical use. This is partly due to the conservation cooperation between EWEB and the U of O.

15. What are the trends for the U of O kWh per student and kWh per square foot and why are these significant?

    Over the last decade the U of O kWh use per student has decreased. In 1993 it was 3,321 kWh and in 2003 it was 2,774 kWh. That is a 16% reduction over this decade. There was a similar trend for kWh per square foot. In 1993 it was 12.7 and in 2003 it was only 10.7. That means there was a 15% reduction in kWh used per square foot over this decade. The decreases displayed in both of theses cases suggest that it is possible for the U of O to reduce its energy use even as it grows both spatially and in population.

Appendix F

Frequently Asked Questions

Campus energy use

Q. What percent of the total electricity bill and total energy bill does the "energy surcharge fee" cover?

Each term students pay a $20 energy surcharge fee. Assuming 20,000 students are enrolled each term for three terms, the fee adds up to about 1.2 million dollars. In 2003, that totaled to enough money to cover about 56% of the University of Oregon electric bill or about 27% of the total University of Oregon energy bill (including natural gas).

Q. What does the University of Oregon use electricity for?

The University of Oregon uses electricity for general electric demands on campus as well as for cooling purposes.

Q. What does the University of Oregon use natural gas for?

Natural gas that the University purchases is used for generating steam at the Facilities Services plant. This steam is primarily used to heat campus buildings. Some of the steam is used to run electrical generators to produce electricity (see question below).

Q. What percent of the University of Oregon's electricity is purchased from EWEB, and where does the other part come from and why?

On average, over the last decade, 87% of the electricity used by the University of Oregon was purchased directly from EWEB. That means that on average about 13% came from elsewhere. The University owns steam-powered generators that are located at Facilities Services. Natural gas is used to generate steam, which can be used to run electrical generators. The primary factor influencing the amount of steam generated is cost. When the cost of natural gas is low and electricity costs are high it is more economical to purchase natural gas and generate electricity here on campus than it is to purchase electricity directly from EWEB.

Q. Why is electricity the focus of the educational presentation?

Electrical meters are located at almost every campus building providing specific information regularly. In comparison, there are only 10 to 12 steam meters for the entire campus. Thus there is more information regarding electrical use on campus. In addition to better information, the cost of the electrical use is about the same as the cost for all of the natural gas use, about 77.5%. Electricity is also the focus because many conservation projects that the U of O partakes in focus on reducing electrical use. This is partly due to conservation cooperation between EWEB and the U of O.

Q. Where do the figures about the average Eugene residences come from?

The figure that the average residence uses 33 kWh a day comes from information supplied by EWEB, indicating that the average Eugene residence uses 1000 kWh a month. The figure of 20 residences per city block is just an estimation to allow for comparison to the University of Oregon.

Q. Why are the trends for the University of Oregon kWh per student and kWh per square foot significant?

The decreases displayed in both of these cases suggest that it is possible for the U of O to reduce its energy use even as it grows both spatially and in population.

Q. How does the University of Oregon compare to other universities?

Comparisons to other universities are complicated and accurate information is hard to obtain. One way is to compare the kWh used per square foot. This takes into consideration the size of the university. Based on this comparison, the University of Oregon currently uses 10.7, Lane Community College uses 14.3, and Oregon State University uses 9.7 kWh per square foot. These numbers don't give a great comparison because each campus uses electricity for different things. Another way to compare universities is to use electricity spending per square foot for each campus. However, these figures are problematic because not only don't they consider what electricity is used for, but they do not take into account the cost of electricity in the local area either.

Energy Production and Effects

Q. Why do we only receive natural gas from Canada? Why are there limitations on the transportation of natural gas?

Unlike oil, natural gas cannot be transported long distances because it remains in vapor form. Most of the natural gas consumed in the United States is produced within the US, mainly from Texas and Louisiana. The US imports very little, of which almost 100% is imported from Canada. Natural gas can be converted into a liquid; however, the energy necessary to do this decreases the efficiency of this source. It is also a very expensive process and can be subject to hazards, such as gas explosions.

In the United States, gas consumption is on the rise, but production is not increasing to meet this demand. This results in increased imports, increasing the distance of transport.

Q. If hydroelectric generation makes up the majority of energy production in the Northwest, why does coal account for so much on the national profile?

The Eastern half of the United States is still highly dependent upon coal. This is because coal is an abundant resource and cheap to produce. Unfortunately it is also the largest contributor to toxic air pollution in the world. The Northwest is very distinct from the rest of the country in terms of energy production because of its reliance on hydroelectric power. In fact, the Grand Coulee dam, located

on the Columbia River, is the largest producing dam in the United States and the third largest producing dam in the world.

Q. How reliable is hydroelectric generation compared to other forms of energy generation?

The production of hydroelectricity depends upon weather conditions. The supply of water affects a dams generating capacity. In years of drought, electric generating capacity is reduced; during wetter periods, the generating capacity of dams increases. In comparison, nuclear generation is considered very reliable. It is not dependent upon weather conditions and can operate 24 hours a day, 7 days a week. In addition, the burning of natural gas is dependent upon supply, availability, and locality.

Q. From where does EWEB receive its electricity?

EWEB purchases most of its electricity from the Bonneville Power Administration, which mainly consists of hydroelectric power as well as some nuclear power. EWEB also receives a small portion of hydropower from Grant County Public Utility District, as well as through a contract with Canada. About 20% of EWEB's profile comes from EWEB-owned power plants, which are mainly smaller dams. They also own about 22% of the output from the Foote Creek Rim Wind project.

Wind Power

Q. How much does wind power cost compared to other power?

The 100% wind power rate is 5.271 cents per kWh, while the conventional rate is 3.127 cents per kWh (for EWEB).

For an example of the extra cost, a one-bedroom apartment might use 600 kWh in a month. The normal rate for this is $41.00. 10% wind would be $2.08 extra, 25% wind would be $2.71 extra, 50% would be $5.42 extra, and 100% would be $10.85 extra a month.

Q. Why promote wind power in the Erb Memorial Union? Why not a percentage of the entire campus?

The EMU is a prominent *student* used building and has been since 1950. It is home to over 150 student organizations, as well as many student services, eateries, and a computer lab. It is also at the physical center of campus, serving as a meeting place for the diverse campus community.

In addition, the EMU is large, and uses lots of electricity. In 2003, it consumed 2.3 million kWh, which is equivalent to 190 average Eugene residences. This use represents about 5% of the total University electric use. Although converting a percent of the total use would have the same effect both in cost and for the environment, converting this building is not only simpler, but would make a more visible statement about the University's environmental ethic.

Q. How can this wind power campaign be initiated in the Erb Memorial Union?

Unfortunately, the budget for the 2004-2005 school year is already decided. However, the EMU board would have to decide to convert to wind power, and then ask the ASUO Senate for approval, who would in turn raise the student fees to cover the cost. Our goal is to present wind power to both groups and hope that they agree. If this works, the EMU could be converted by to wind by the 2005-2006 school year.

Q. What are some of the costs and benefits of wind power?

Wind is clean and renewable, as it does not emit pollutants and does not deplete the resource it uses (wind). It is also now competitive with conventional energy sources in both cost and efficiency. However, people argue that the turbines are loud and ugly. This makes it hard to find locations for them because people don't want to see them. They also have a compatibility issue with birds. However, turbines are responsible for about 10-40,000 bird fatalities each year while cars are responsible for 60-80 million and housecats 100 million.

Q. Can we buy wind at home? How?

Yes. You can purchase increments of 10, 25, 50, or 100% wind power, which only costs a few extra dollars each month, depending on how much you buy (See question on costs). You can either call EWEB or sign up on-line at www.eweb.org/windpower/index.html. On this web site, you can also find a breakdown of how much this would actually cost you based on your kWh usage.

Q. Why doesn't EWEB build a wind project closer to Eugene?

The average wind speed needed for turbines to operate is 15 miles per hour. The average here in Eugene is only 2.5 miles per hour. The coast has wind, but this is too gusty and not sustained. The closest area with substantial wind resource is the state-line project in Washington, from which EWEB receives some of its wind power.

Conservation

Q. Does turning your computer off and on multiple times per day truly extend the life of its hard-drive?

Yes. In fact, most computers built after 1998 are able to withstand 40,000 on/off cycles in their 5-7 year life span. The less time your computer is on the longer the hard-drive will last.

Q. What is meant by "upgrading Fluorescent lighting"?

The lighting upgrades from 2001-2003 involved replacing magnetic ballast t-12 fluorescent systems with newer, more efficient electronic ballast t-8 fluorescent systems.

Appendix G

Survey

Survey Questions

May I please speak with _____? (If home, wait. If not available ask when a good time to call back is.)

Hello, my name is _____. I am conducting a phone survey for the Environmental Studies Service Learning Program at the University of Oregon. Are you enrolled as a student at the University of Oregon?

I am trying to better understand the university community's knowledge of energy issues and attitudes and behaviors regarding energy conservation.

This is a completely anonymous survey. Your identity will not be recorded or linked in any way with your responses. Would you be willing to answer several questions regarding energy consumption? It will only take 5 minutes. (If yes, proceed to first question. If no, say thank you for your time and hang up)

1. A team of University students are delivering a presentation about energy use at the UO to classes across campus. How many times have you seen it? (0, 1, 2, 3, 4+)

These first few questions are designed to gauge your understanding of energy use.

Knowledge Questions:

2. Does the majority of US electricity come from nuclear, coal, hydroelectric sources?

3. Does the majority of the University of Oregon's electricity come from nuclear, coal, or hydroelectric sources?

4. Has the University of Oregon's per capita electricity use increased, decreased, or stayed the same over the last decade?

5. What forms of alternative energy has the U of O invested in: none, wind, solar, or both wind and solar power?

6. What percent of the UO electric pool do wind and solar make up? Less than 1%, 2% to 5%, 6% to 10%, 11% to 20%, more than 20%

7. Does the average Eugene residence use about 3, 30, 100, or 300 kWh a day?

8. Does it damage a computer to turn it off and on for the purpose of saving energy? (Yes, No, Don't know)

And changing topics…..

Values and Attitudes:

9. On a scale of 1-5, with 1 being irrelevant and 5 being most important, how important to you is it to know how much electricity you use?

10. On the same scale, how important is it to know the source of your electricity?

11. Should the University invest in wind energy? (Yes, No, It depends)

    Even if it costs more? (Yes, No, It depends)
    Even if student fees will be raised to support the cost increase? (Yes, No, It depends)
        If answer no or it depends, ask: What if these fees were less than $5 per year? (Yes, No)

Behaviors:

12. Do you purchase wind power from EWEB? (Yes/No/Don't know)

13. What temperature do you keep your residence: below 50, 51-60, 61-70, 71-80 degrees, or don't know?

14. Do you turn lights off when leaving a classroom or your office? (always, usually, sometimes, occasionally, never)

15. Are you more energy conscious at home or at the University? (At home, at the university, about the same)

16. If you are cold at home are you more likely to put on warmer clothing or turn up the heat? (Clothing, heat, both, neither)

17. Do you turn your heat down before going to sleep at night? (always, usually, sometimes, occasionally, or never)

18. Do you turn off a computer (this does not include sleep mode) when you won't be using it for more than 30 minutes? (always, usually, sometimes, occasionally, or never)

Lastly, here are a few questions for classification purposes.

Demographics:

19. Are you male or female?

20. How old are you?

21. What year are you in school?

22. What is your major/field of study?

23. Do you live in a house, apartment, or dorm?

24. Are you responsible for paying a monthly utility bill?

Survey Results

Total number of respondents: 412
Number of surveys taken before seeing presentation: 217
Number of surveys taken after seeing presentation: 195

How many times have you seen the presentation?				
Never: 217	Once: 165	Twice: 23	3 times: 4	4+ times: 3

Answer	Before	After	Total
Does the majority of US electricity come from nuclear, coal, or hydroelectric sources?			
Nuclear	59 (27%)	27 (14%)	86
Coal	74 (34%)	101 (52%)	175
Hydroelectric	83 (38%)	65 (33%)	148
Does the majority of UO electricity come from nuclear, coal or hydroelectric sources?			
Nuclear	26 (12%)	15 (8%)	41
Coal	37 (17%)	34 (17%)	71
Hydroelectric	153 (71%)	145 (74%)	298

Answer	Before	After	Total
Has the UO per capita electricity use increased, decreased, or stayed the same over the last decade?			
Increased	180 (83%)	75 (38%)	255
Decreased	19 (9%)	109 (56%)	128
Same	17 (8%)	10 (5%)	27
What forms of alternative energy has the U of O invested in?			
None	21 (10%)	1 (0.5%)	22
Wind	8 (4%)	3 (1.5%)	11
Solar	119 (55%)	30 (15%)	149
Wind & Solar	69 (31%)	160 (82%)	229
What percent of the UO electric pool does wind make up?			
<1	66 (30%)	45 (23%)	111
2 to 5	76 (35%)	74 (38%)	150
6 to 10	53 (24%)	45 (23%)	98
11 to 20	14 (6%)	22 (11%)	36
>20	6 (3%)	8 (4%)	14
Does it damage a computer to turn it off and on for the purpose of saving energy?			
Yes	36 (17%)	11 (6%)	47
No	176 (81%)	181 (93%)	357
Don't Know	5 (2%)	3 (1.5%)	8
On a scale of 1 to 5, with 1 being irrelevant and 5 being most important, how important to you is it to know how much electricity you use?			
1	5 (2%)	3 (1.5%)	8
2	20 (9%)	9 (5%)	29
3	75 (35%)	54 (28%)	129
4	72 (33%)	89 (46%)	161
5	45 (21%)	39 (18%)	84
On the same scale, how important is it to know the source of your electricity?			
1	15 (7%)	10 (5%)	25
2	46 (21%)	27 (14%)	73
3	62 (29%)	63 (32%)	125
4	53 (24%)	54 (28%)	107
5	41 (19%)	40 (21%)	81
Should the University invest in wind energy?			
Yes	191 (88%)	183 (94%)	374
No	18 (8%)	8 (4%)	26
It Depends	8 (4%)	4 (2%)	12
Even if it costs more?			
Yes	158 (73%)	151 (77%)	309
No	46 (21%)	25 (13%)	71
It Depends	8 (4%)	19 (10%)	26

Answer	Before	After	Total
Even if student fees are raised to support the cost?			
Yes	110 (51%)	119 (61%)	229
No	79 (37%)	42 (22%)	121
It Depends	18 (8%)	32 (16%)	50
(If answered "No" or "It Depends"): What if these fees were less than $5 per year?			
Yes	64 (88%)*	70 (89%)	134
No	9 (12%)*	9 (11%)	18
Do you purchase wind power from EWEB?			
Yes	37 (17%)	20 (10%)	57
No	140 (65%)	138 (71%)	278
Don't Know	36 (17%)	33 (17%)	69
What temperature do you keep your residence?			
<50	18 (83%)	8 (4%)	26
51 to 60	70 (32%)	60 (31%)	130
61 to 70	93 (43%)	83 (43%)	176
71 to 80	15 (7%)	6 (3%)	21
Don't know	36 (17%)	7 (4%)	43
Do you turn off lights when leaving a classroom or your office?			
Always	112 (52%)	79 (41%)	191
Usually	45 (21%)	45 (23%)	90
Sometimes	13 (6%)	10 (5%)	23
Occasionally	21 (10%)	28 (14%)	49
Never	26 (12%)	33 (17%)	59
Are you more energy conscious at home or at the University?			
Home	158 (73%)	121 (62%)	295
University	21 (10%)	5 (3%)	26
Same	38 (18%)	52 (27%)	90
If you are cold at home are you more likely to put on warmer clothing or turn up the heat?			
Clothing	174 (80%)	161 (83%)	335
Heat	28 (13%)	21 (11%)	49
Both	14 (6%)	13 (7%)	27
Neither	1 (0%)	0 (0%)	1
Do you turn your heat down before going to sleep at night?			
Always	93 (43%)	92 (47%)	185
Usually	41 (19%)	26 (13%)	66
Sometimes	17 (8%)	23 (11%)	40
Occasionally	19 (9%)	13 (7%)	32
Never	44 (20%)	28 (14%)	72

*Only 73 out of 97 respondents were asked this question.

Answer	Before	After	Total
Do you turn off a computer when you won't be using it for more than 30 minutes?			
Always	54 (25%)	58 (30%)	112
Usually	33 (15%)	30 (15%)	63
Sometimes	29 (13%)	28 (14%)	57
Occasionally	33 (15%)	28 (14%)	61
Never	66 (30%)	51 (26%)	117
Male or Female?			
Male	96 (44%)	84 (43%)	180
Female	121 (56%)	111 (57%)	232
How old are you?			
17	0 (0%)	2 (1%)	2
18	14 (6%)	16 (8%)	30
19	26 (12%)	39 (20%)	65
20	26 (12%)	37 (19%)	63
21	45 (21%)	31 (16%)	76
22	37 (17%)	25 (13%)	62
23	16 (7%)	9 (5%)	25
24	11 (5%)	8 (4%)	19
25	4 (2%)	3 (1.5%)	7
26+	38 (18%)	25 (13%)	63
What year are you in school?			
Freshman	25 (12%)	43 (22%)	68
Sophomore	26 (12%)	35 (18%)	61
Junior	65 (30%)	56 (28%)	121
Senior	98 (44%)	58 (30%)	156
Graduate	3 (1.5%)	3 (1.5%)	6
What is your major/field of study?			
Social Science	85 (40%)	69 (35%)	154
Natural Science	23 (11%)	31 (16%)	54
Humanities	9 (4%)	7 (4%)	16
Professional	27 (12%)	25 (13%)	52
Arts	25 (12%)	20 (10%)	45
Interdisciplinary	7 (3%)	15 (7%)	22
Other	43 (20%)	32 (16%)	75
Do you live in a house, apartment, or dorm?			
House	102 (47%)	86 (44%)	188
Apartment	78 (36%)	62 (32%)	140
Dorm	37 (17%)	47 (24%)	84
Are you responsible for paying a monthly utility bill?			
Yes	149 (69%)	121 (62%)	270
No	68 (31%)	74 (38%)	142

Appendix H

Energy Team Promotion in the Oregon Daily Emerald

Press Release

Contact: Kathy Young, Public Relations Coordinator
Organization: Environmental Studies Service Learning Program, Campus Energy Team
Telephone: (541) 302-5945 or (541) 231-4952
Email: kyoung@gladstone.uoregon.edu
Web Site: http://darkwing.uoregon.edu/~ecostudy/slp/energy

As a member of the energy team, I am working with three other environmentally focused undergraduates. We are all enrolled in the year long Service Learning Program, offered through the Environmental Studies Department. Our project manager is an Environmental Studies graduate student and the Service Learning Program project coordinator is an employee of the department.

This year our team has researched the energy profile and conservation efforts of the University of Oregon as well as the effects of our energy use and improvement alternatives. We are currently working on presenting our findings; our goal is to reach 25% the campus community. We have developed an energy profile presentation, which is the dominant media being used to convey our information.

Two to three presentations have been scheduled each week this month and more are being scheduled for the remainder of spring term. Along with this presentation we are conducting a survey to analyze its effectiveness, developing a campus energy tour, promoting the purchase of wind power, keeping up a web page and writing a final report. All of these project tasks are aimed at educating the campus community about the University of Oregon's energy use and conservation efforts as well as promoting alternatives to lessen the environmental impact of our use.

We believe that a story covering our research findings and project happenings will further educate the campus community about the University of Oregon energy use, conservation and proposed alternative energy options. In addition, an article could inform the campus community about the occurrence of our presentations and other project resources and events.

Listed above is contact information to reach me. Also listed is the web address for our project. This site contains pages on our research findings as well as project happenings and contact information for each team member. I can also make available to you our presentation schedule, general project plan and completed portions of our report. We realize further communication and a presentation viewing will be necessary in order for an article to be composed and all members of our team are more then willing to cooperate. It would be best to direct any initial communication or questions to myself via email. I thank you for considering our proposal and we hope to hear from you.

Kathy Young

Article in the Oregon Daily Emerald

Winds of change

Energy Team member Zachary Withers stands among the solar panels on top of the EMU. The team hopes to eventually power the building entirely with renewable wind energy.
Steven Neuman News Reporter

The Energy Team will lead campus tours on Thursday to showcase the University's energy conservation efforts

By Steven Neuman
News Reporter
April 20, 2004

Most people may not consider over-heated classrooms or leaving a light on during the night to be serious issues, but for a group of hand-picked students at the University, a little waste here and there is worth fighting.

The Energy Team, a group of graduate and undergraduate students, has been working for the past school year to educate the campus about the University's energy. The team is part of the Environmental Studies Department's Service Learning Program, which funds yearlong projects with the aid of outside organizations such as the Eugene Water and Electric Board.

The goal is to give students real-world experience and credit while they work on projects that deal with sustainability, public research interest and outreach, and fulfill community needs, according to the Service Learning Program Web site.

Environmental studies major and Energy Team member Zachary Withers joined the seven-person team this winter. "Our goal is to educate about our energy consumption, to talk about investing in alternative sources of energy, and to educate about what we can do on campus to conserve energy," Withers said.

On Thursday, as part of Earth Day, the Energy Team will offer students, faculty and community members the opportunity to tour the campus and observe energy conservation efforts at work.

The energy tour, which will leave the EMU Amphitheater at 11 a.m. and 12:30 p.m. on Thursday, will show participants new efforts to make older buildings more efficient and spotlight new buildings such as the Lillis Business Complex.

"We're going to be showing off the visible conservation measures that the University has put to use," GTF and Energy Team Project Manager Sarah Mazze said.

Withers said the University has already made big steps toward energy accountability. Between 2001 and 2003, the University spent $540,000 to upgrade older fluorescent lighting fixtures and install time clocks on air circulation systems.

"They've saved 1.7 million kilowatts because of that, and EWEB reimburses them for a lot of the cost," he said.

Other less obvious measures, like awnings on University buildings, are just as effective.

"The awnings hang outside the windows on the south sides of buildings and keep the high sun from heating buildings too much in the summer, but they let the low sunlight in the later hours, which keeps the building warm at night," Withers said.

Mazze said the campus community should be aware of the resources it consumes.

"I think it's important to think about the University's energy use," Mazze said. "We're a huge consumer of energy. We're EWEB's third largest customer -- we're bigger than the 4-J school district and the city -- and this is still the case with energy saving measures."

The team gives 10-minute presentations to classes that focus on educating students about the University's energy profile, showcase alternative technologies and make students aware about where the energy they use on a day-to-day basis comes from.

"A lot of it has to do with the things we can't control, like the types of light bulbs we use or where we get energy, or (energy) consumption off campus," Mazze said. "But a lot of it is turning off light switches when you leave a room. This is also a place of learning so it should be a place where people can learn things and take it away and apply it ."

Mazze estimated that the Energy Team has already shown its presentation to about 2,500 people. The goal is to reach 5,000 by the end of the year.

Energy Team Coordinator Steve Mital has been with the project since its inception last spring.

"The goal is to improve campus energy literacy," Mital said. "When we set out, we said that we wanted to show our presentation to 25 percent of the on-campus population. That's a very ambitious goal."

According to Mital, one of the team's future goals is to get the EMU to run entirely on wind-powered electricity.

"We're trying to get students to take aggressive action; inspire them to take an actual role," he said. "One way or another we'll be around in the future." Withers had similar sentiments.

"I'd like to see a push for the University to investing in alternative sources, especially wind power," he said. "We've already invested in solar power and both are totally renewable."

For more information on Energy Team presentations, contact Sarah Mazze at smazze@darkwing.uoregon.edu.

Contact the business/science/
technology reporter
at stevenneuman@dailyemerald.com.

Appendix I

Campus Energy Tour

Energy Tour Script

Volcanology Building
Awnings are Located on five campus buildings:

- Volcanology
- Johnson Hall
- Hendrix Hall
- Gerlinger
- Music Building

Awnings are primarily used on the south side of buildings but some can be found on the east or west sides as well. The Volcanology building awnings are located on the south side with a few on the west. These awnings block high angled summer light, reducing building heat gain and thus the need for cooling. They are designed to allow in low angled winter light, and can be rolled up to maximize light penetration, reducing heating and lighting needs in the winter. This project was proposed and carried out by Facilities Services at a cost of $31,877. They calculated the potential energy savings for each room by measuring room temperature with and without a normal room shade pulled down. The awning installations were prioritized based on the energy saving effectiveness in certain buildings. No new awning installations are being planed as of April 2004, but according to Josh Ruddick of Facilities Services, the subject might be discussed again as the warmer season approaches.

Pacific Hall:
Lighting
From 2001-2003 Facilities Services invested $540,000 to upgrade fluorescent lights and install fan timers across campus. Most of this money was invested in lighting upgrades. Pacific Hall is one of the renovated buildings. The old t-12 fluorescent lights were replaced with more efficient t-8 bulbs. Essentially, this means that the bulbs are now smaller in diameter. T-12 represents 12/8 inches or 1.25 inches, where t-8 bulbs are 8/8 or 1 inch in diameter. These new bulbs use 30% less electricity to produce the same amount of light. The lighting upgrades in Pacific Hall account for 30,000 kWh of electrical savings annually. The renovated hallway space represents 13,000 square feet. On average, 2.3 kWh are saved per square foot, equaling the per capita decrease in electrical use per square foot in 2003 verses in 1993. This conservation project cost $9,800. The University received $5,800 in subsidies from EWEB as a result of those projects.

Energy Studies in Buildings Laboratory
In addition to the lighting project, Pacific Hall is the home to Energy Studies in Buildings Laboratory (ESBL). ESBL is a laboratory on campus affiliated with the Architecture department. Its staff includes graduate students and faculty. ESBL provides technical and practical assistance for campus projects such as “Doin’ it in the Dark” (see report pg.11). They also maintain a web page reporting and graphing hourly campus energy use. In addition, ESBL conducts design-assistance programs for architects, mainly in the Northwest. ESBL is involved in the design of all new

buildings on campus, such as the Lillis Business Complex. They also work with building designers in the initial stages of design to create energy efficient buildings. ESBL can input an architect's design into a program they've designed using computer simulations to recommend building design changes that would make the building more energy efficient.

Lillis Business Complex

The Lillis Business Complex utilizes a variety of energy saving techniques to reduce the building's overall energy consumption. Natural ventilation is accomplished using a high atrium (open central space) to increase velocity of hot air traveling up and out of the building. At night when the air outside cools, vents on each side of the building open, allowing cool air to enter and travel through the building. The incoming air absorbs heat and escapes through ceiling vents. This process is called the night flush. When there is not enough breeze or temperature difference, motorized fans assist in this process.

In addition, the building is constructed with a thermal mass of thick concrete. This mass assists in regulating temperature distribution. The thick-tiered concrete floors, and some ceilings, absorb heat released by occupants and electronic equipment throughout the day. At night, during the flush described above, this thermal mass is cooled by the influx of fresh air passing under and through its bulk. This process essentially releases the stored heat of the thermal mass and prepares it to soak up heat the following day. In addition, this mass can be cooled or heated by water coils incorporated within its design. The latter process requires motorized airflow to distribute energy and is used during extreme temperatures in the winter and summer.

Natural daylight is incorporated in three ways. First, classrooms are equipped with light sensors, which adjust lighting according to the amount of daylight present. Second, light shelves increase the amount of daylight present by reflecting light coming in through an upper portion of the south facing windows, where it is evenly distributed across the ceiling. These light shelves not only increase the amount of natural light but also decrease heat gain by blocking the direct sunshine (see awnings above for more details). Lastly, skylights located in a few select rooms are used to decrease electrical lighting.

Solar panels account for roughly 5-6% of the total building electrical consumption. An average of 58,000 kWh are saved annually. That's not very much in the scope of the total energy used by the building. However, EWEB encouraged this investment through subsidies.

In addition, occupancy sensors located in all of the classrooms and offices power down equipment if left on while the room is not being used. Also, when no one is present in the building and airflow is not needed (late at night), time clocks will stop the fans from running unnecessarily.

Gerlinger Annex Solar Water Heater

Visible from the 9th floor of PLC (south side), this project was completed in the summer of 2003, and its main purpose is to reduce the amount of energy needed to heat water for the building. The solar panels kick on when they reach a temperature of 135˚ Fahrenheit, which is pretty much whenever the sun is out. When on, this solar water heater eliminates the need for steam power generation and decreases the need to cool the building due to heat loss in steam transfer. Although expensive to purchase and install, the energy savings are substantial: substantial enough,

in fact, to warrant plans to install similar system on Condon and Chapman halls this summer (visible from north side of PLC 9th floor).

Student Recreation Center
This building, completed in 1999, received the regional "Energy Smart Award" for its ecological design. Some design features include double-paned, UV rated windows along the front of the building, which regulate inside temperature and reduce the need for heating and cooling. Motion detectors are also used throughout the building to limit non-essential lighting and air circulation. One very interesting feature is the capture of steam created by the warmth of the pool and the locker room showers that is reused for heating elsewhere – like a mini-steam power plant. In addition, the new weight room south is notable for its "smart lighting" system, of which a similar system will be installed in the main weight rooms this summer.

Erb Memorial Union
In the spring of 2001, the Associated Students of the University of Oregon held a competition between various student groups across campus to propose a project that would most benefit the campus community. ASUO awarded $100,000 to a project proposed by the Ecological Design Center (EDC) to install solar panels on the EMU. The EDC hoped that with the installation of the solar panels, the University would not only save energy, it would also generate additional funding (through monetary subsidies from EWEB) to benefit students and promote conservation practices on campus. Original plans called for panels on the EMU ballroom roof; however, further assessment of this location indicated that it could not bear the additional weight of heavy Photo Voltaic panels. The current location of these panels on the EMU balcony is not as conducive to solar radiation. In the future, these panels may move to a more ideal site for solar generation. Each of these three 100 square foot panels can produce 1 kilowatt of electricity.

Campus Energy Tour Pamphlet

See next page.

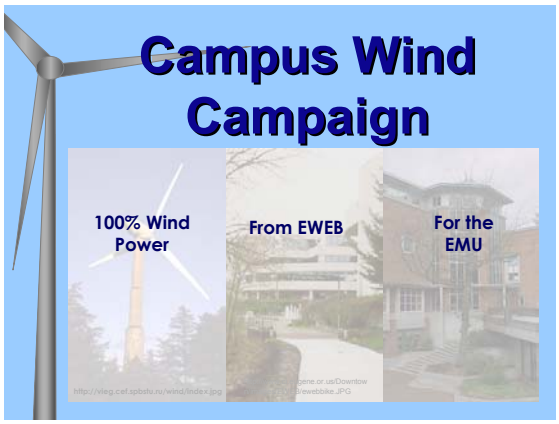
Appendix J

Wind Campaign

PowerPoint Presentation Slides

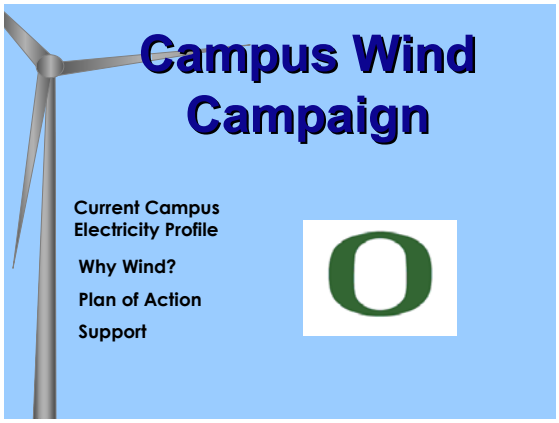
Slide 1a

Slide 1b

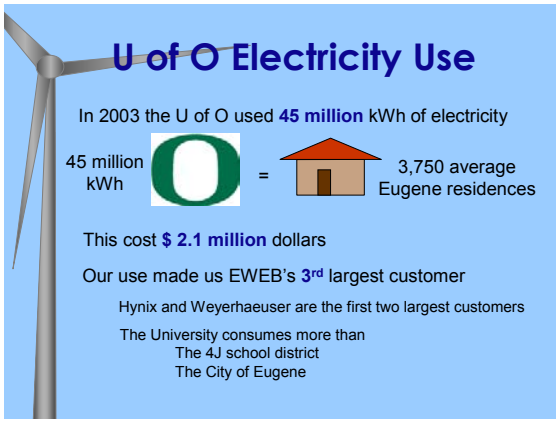


Slide 1c

Slide 2



Slide 3



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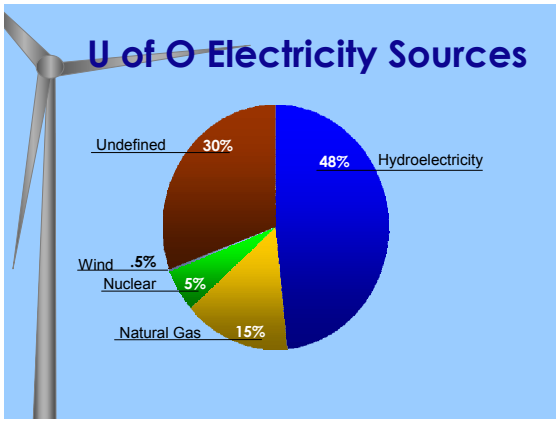
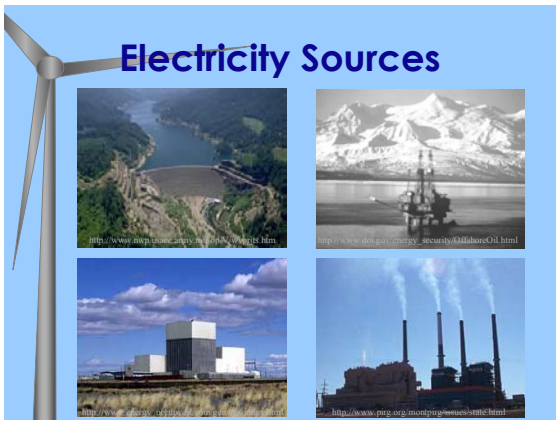
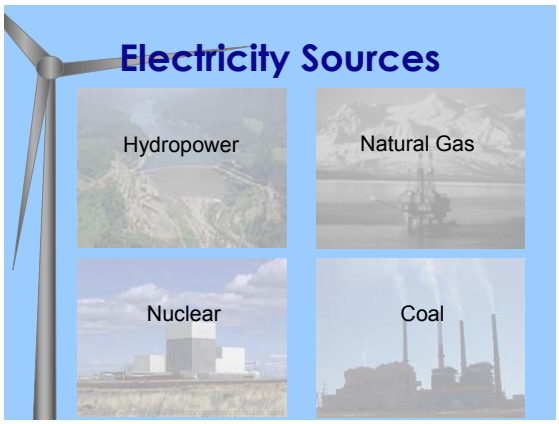


Slide 5a



Slide 5b



Slide 6

Slide 7

Slide 8

Slide 9a

Slide 9b

Environmental Advantages

Renewable Resource

No emissions

- 85 Megawatts of electricity annually
- Enough to power 27,000 Average Homes
- If Coal or Natural Gas were used instead:

150,000 to 380,000 tons of CO_2 would be emitted every year!

windeis.anl.gov

Slide 9c

Environmental Advantages

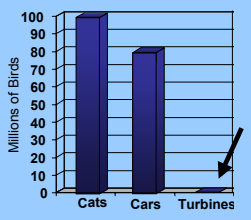
Altamont Pass wind turbines

www.pacamera.com/memberGalleries/berte/altamont.html

- Highest bird fatality rate in North America
- New technologies decrease impacts

Slide 10

Environmental Advantages

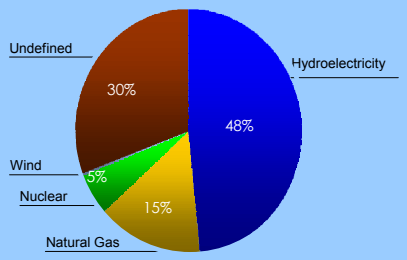


➢The Exxon-Valdez oil spill was responsible for 250,000 bird deaths in one single event!

Slide 11a

Driving the Market

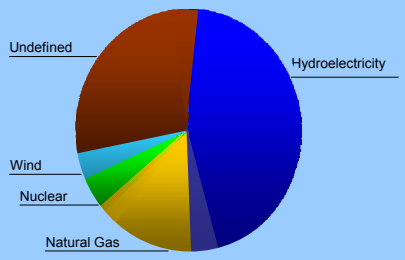
Displaces damaging sources of energy



Slide 11b

Driving the Market

Displaces damaging sources of energy



Slide 12a

Driving the Market

Displaces damaging sources of energy

Large purchase = large displacement

Slide 12b

Driving the Market

Displaces damaging sources of energy

Large purchase = large displacement

"The University acknowledges that environmentally responsible purchasing choices will help create and sustain markets for environmentally responsible and recycled content products."

uaf.edu

Slide 13

Economic Feasibility

- Decreasing costs
- Competitive with traditional sources
- How can we get wind on campus?

Erb Memorial Union

Slide 14a

Erb Memorial Union

Slide 14b

Erb Memorial Union

Consumption

In 2003, the EMU used **2.3 million** kWh of electricity

2.3 million kWh

EMU

=

190 average Eugene residences

5%

Electricity

Slide 14c

Erb Memorial Union

Consumption

In 2003, the EMU used **2.3 million** kWh of electricity

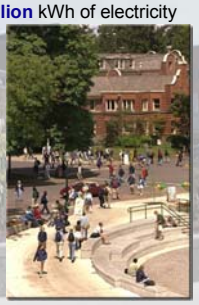
Student Use

Important if student fees are to be raised to support alternative energy

150 student groups

Location

Centrality



Slide 14d

Erb Memorial Union

Slide 15

Cost

No Wind Power

In 2003 the EMU used **2.3 million** kWh of electricity

Total cost **$ 106,800** dollars

Wind Power

Assuming same use of **2.3 million** kWh of electricity

It would cost an additional **$ 38,000** per year

Raise student fees

It would cost less than **2 dollars** per student per year

Slide 16

Student Support

Survey

88.0% felt the U of O should invest in wind energy

80% are willing to raise student at least $5 a year

Slide 17

University Support

University of Oregon Environmental Policy

"The University recognizes that one of the primary methods of exercising its commitment to environmental responsibility is through its purchasing choices."

Slide 18a

Action for Wind

Slide 18b

Maybe The Answer Really is Blowing in the Wind!

PowerPoint Script

Slide 1

- Good evening, my name is _____ and this is my teammate _____. We are both members of the Campus Energy Team, part of the Service Learning Program that is run through the environmental studies department.
- Tonight we are proposing that student fees should be raised to purchase 100% wind power from EWEB for the EMU. We understand that as the ASUO board you are responsible for approving the EMU budget next fall, as well as increasing student fees. We will also be presenting to the EMU board to include our wind power proposal as part of the 2005-2006 budget.
- We feel confident that our proposal will be supported by the U of O administration. The campus Environmental Policy states "Quote" As part of the Campus Energy team, we are driven to help the university uphold its policy and further implement alternative energy's on campus.

Slide 2

- Our presentation tonight will display the current campus electricity profile, the benefits of wind power, the details of our proposal as well as demonstrate university and student support for this plan.

Slide 3

- In order to understand the position wind would play on campus it is critical to understand U of O's current electricity profile. In 2003, the U of O used 45 million kWh of electricity. This is equivalent to the use of almost 4,000 average Eugene homes. This use cost 2.1 million dollars.
- Our electricity use made us EWEB's third largest customer last year. Hynix and Weyerhaeuser are the first two largest. The U of O, however, consumes more that the 4J school district that includes 53 schools and more than the city of Eugene which includes everything from libraries to municipal courts.

Slide 4

- So where does this electricity come from? The majority of electricity comes from hydropower. We also receive electricity from natural gas, nuclear power and wind. Coal is included as part of the undefined sources that are bought and sold daily.

Slide 5

- Each of these sources has positive aspect, but we feel that the negative environmental and health affects greatly outweigh their benefits. As you know, these negative effects include everything from ecosystem disruption, limited resource supply, radioactive waste production and emission of pollutants.

Slide 6

- The U of O has implemented some conservation and alternative energies in order to reduce the negative environmental and health impacts of its electricity use. The U of O has successfully implemented many conservation projects. A few examples include upgraded lighting across campus, Supporting and enforcing more energy efficient building design standers, a product of which is the new Lillis Business Complex, and adding awnings to numerous older buildings across campus.

Slide 7

- The U of O however has only supported a few alternative energy options. A student initiated project purchased solar panels for the EMU. A solar water heater has been added to Gerlinger annex. The U of O has purchased wind power currently both the President and chancellors home receive 50% wind power. Although these alternative projects are note worthy, you can imagine that they only account for a very small fraction of our total electricity use.

Slide 8

- So despite these projects, the University has actually done little to proactively pursue renewables. Wind power seems to be the best way for the University to do this.
- The strongest argument for wind power is its environmental advantages. However, the act of purchasing wind power has the effect of further driving the market for alternative energy. And wind power has recently become more economically feasible, making it even more advantageous.

Slide 9

- Wind is a renewable resource, failing to deplete the resource that it uses: wind.
- It is also clean, helping to reduce Greenhouse gas emissions. For example:
    - The Foote Creek Rim wind facility, which is where we would receive wind power from, produces approximately 85 megawatts of electricity annually. This is enough to power 27,000 homes for a year.
    - If coal or natural gas were used instead of wind, 150 to 380,000 tons of CO_2 would be emitted into the atmosphere. So clearly, the use of wind power successfully reduces environmental impacts of energy use.
- However, there are a few objections to wind energy.
- Turbines have a reputation of standing in the way of birds in flight, often resulting in death of majestic birds like the California golden eagle. Altamont Pass in California – pictured here - has an especially negative reputation, killing more birds than any other wind facility in North America. However, when it was built in 1983, technology was quite different.
- Now, extensive bird flight pattern studies are conducted before any turbines can be installed and newer design standards prevent birds from perching or nesting on the turbine. These measures greatly reduce bird mortality per turbine, and the Foote Creek rim project has implemented many similar precautions.

- So while Altamont pass may still have a bad reputation, this clearly doesn't speak for all facilities.

Slide 10

- In addition, the severity of the issue has often been over-exaggerated.
- The national Audubon society reports that house cats are responsible for approximately 100 million bird fatalities every year in the United States.
- In addition, the national wind coordinating committee found that automobiles are responsible for up to 80 million bird fatalities.
- In comparison, wind turbines result in 10,000 to 40,000 bird deaths each year in the US.
- In addition, the Exxon-Valdez oil spill resulted in 250,000 deaths in *one* single event.
- So this gives a bit of perspective into the controversial bird issue. And obviously, the benefits of wind outweigh this negative.
- There are many other reasons why the University of Oregon specifically should make the purchase. One is driving the market.

Slide 11

- Every little bit of alternative energy helps to replace other forms of polluting sources such as coal and natural gas.
- The University being such a huge consumer magnifies this displacement.

Slide 12

- For example, EWEB is invested in only a certain amount of wind energy; they can't realistically purchase any more until someone first buys what they currently have. John Mitchell of media relations at EWEB declared that this is what a purchase of the size we are promoting would do. Because the UO is such a big consumer,
- A wind power purchase of even a small percentage of the University's electric use would essentially drain EWEB of all its current wind resources, prompting them to purchase even more.
- So not only would the University's purchase displace a substantial amount of damaging energies, but EWEB's further investment would supplant even more. In addition, the University's role as a leader in the community may promote the wind power program at EWEB, which has stagnated since its beginning due to a lack of funding for advertising.
- If the UO made this purchase, the option of wind power would take a more prominent role in the greater Eugene community, even further driving the market for this clean fuel source.
- This act of driving the market is not only an argument for the purchasing of alternative energy, but is a fundamental declaration within the University of Oregon's *official* Environmental Policy.
- "Read quote."
- So if wind power is clean, and if the University's official stance is to support it, what's holding us back?
- Well, it's definitely not costs…

Slide 13

- Due to increased research and technology, the cost of wind power is steadily decreasing, and is now competitive with conventional sources of energy.
- So, how can we get this affordable energy? As we will now show, the EMU is a prime candidate to do this.

Slide 14

- As we have said, our proposal is to convert the Erb Memorial Union to 100% wind power by the 2005-2006 school year.
- There are multiple reasons why the EMU is a good candidate for the implementation of this purchase.
- The first is Consumption. The EMU is a huge consumer of energy. In 2003, the EMU consumed approximately 2.3 million kWh of electricity, which is enough energy to power over 190 homes for an entire year! This use represents about 5% of the total UO energy use – a pretty substantial portion for one building.
- In addition, the EMU is a *student* building. In considering candidates for implementation, we felt that student association was very important. If students are to pay for wind power through student fees, they should be allowed to feel an affiliation with that energy on a regular basis. As a home to 150 student organizations and numerous other useful resources for students, nearly every student at the UO uses the building for something.
- And if they don't enter it, they are likely to pass it, as the location of the Erb Memorial Union at the physical center of campus serves as a central meeting place for the diversity of our community.

And as Kathy will now show, converting the EMU to 100% wind power is economically realistic.

Slide 15

- Here we'll take a look at the cost of electricity for the EMU both with wind power and with out. Currently the EMU has no wind power except what is included in EWEB's electricity profile. In 2003 the EMU used 2.3 million kWh of electricity. The total cost was 106,800 dollars.
- Assuming the same use of 2.3 million kWh of electricity, Tom Williams the Key account representative for EWEB has informed us it would cost an additional 38,000 per year for wind power.
- This additional cost could be covered by student fees. Although 38,000 dollars appears to be a large amount assuming current enrolment it would cost less than 2 dollar a year per student to implement this plan. Split between three terms this is a minimal increase

Slide 16

- Not only is this plan economically feasible but we have measured student support for it. Part of our project consisted of conducting a phone survey. Included in the survey were questions addressing students' opinions of wind power.
- Based on the responses of 217 students 88 % of them are supportive of the U of O investing in wind power. A total of 80% agreed to raising student fees at least 5 $ a year.

- It is important to note that our suggestion of raising student fees for converting the EMU to wind power is intended as a starting point. We feel strongly that the incorporation of wind power to campus will not stop with just this plan. The majority of students are willing to pay more than the cost of our proposal, providing opportunities for larger purchases of wind in the future.

Slide 17

- We also believe that the incorporation of wind will not be limited to student fee funding and that the University will take note of student interests and financially support further purchases of wind power as well. This belief is strengthened by the Environmental Policy that states…"read quote".

Slide 18

- Tonight we have presented to you our proposal of initiating the purchase of wind power on campus. We started by explaining the vast amount of electricity the university uses and the negative environmental effects caused by this use. We then presented wind as a viable alterative to these energy sources. Additionally we have shown student and university support for wind power and that students are even willing to raise their fees to support this investment. Finally we explained our proposal how it is economically realistic. All that must happen now is action. We hope that you take to support our proposal next year as you consider the EMU budget.

Appendix K

Education Campaign Numbers

Class	Professor	Number	Date
Ethics	Mann, Bonnie	200	3-Mar
ENVS 202	Bridgham, Scott	150	9-Mar
Social Inequality >2	York, Richard	220	31-Mar
Women & Politics	Diamond, Irene	115	1-Apr
Global Envir Change >3	Long, Colin	100	6-Apr
American Radicalism	Pope, Daniel	97	6-Apr
Found Disability II	Olson, Deborah	90	13-Apr
Intro Japanese Lit >1	Baskett, Michael	225	14-Apr
Music Theory II	Hurwitz, Robert	72	14-Apr
Intl Leadership >2	Carpenter, Kathie	192	15-Apr
Geography of the US >2	Hardwick, Susan	203	16-Apr
Biogeography >3	Power, Mitchell	82	16-Apr
Psychology of Religion	Robert Gordon McCutchan	62	21-Apr
Intro Env Stu: Hum >1	Toadvine, Ted	194	21-Apr
Environmental Philos >1	Toadvine, Ted	84	21-Apr
Global Lead & Change	Baldwin, John	52	22-Apr
Native Am Lit	Westling, Louise	40	23-Apr
Mrkt Value for Customers	Meeske, Carla	54	26-Apr
Mrkt Value for Customers	Meeske, Carla	39	26-Apr
meeting	Academic Learning Services	6	27-Apr
Natural Environment >3	Long, Colin	133	28-Apr
Structur English Words >1	Yue, K	81	30-Apr
Sem Date & Club Drugs	Mace, Miki	280	1-May
Acting I	Elizabeth Helman	48	3-May
Human Neuropsychology	Helen Neville	49	4-May
CIS-Concepts Info Proccessing	Ritter, Jane	58	6-May
Pol of Development >2	Zahler, Reuben	60	13-May
WR 122	Denise Krane	21	13-May
Earth Resource & Envir >3	Reed, Mark	90	14-May

Sem Driving Drunk	Mace, Miki	280	15-May
meeting	Facillities	12	19-May
Resource Development	Renee Irvin	45	19-May
Stock Market & Invest	Wagenknecht, Jeanne	126	20-May
GIS	Hugh Howard	36	24-May
WR 122	Denise Krane	21	27-May
Total Presentations			**3,617**
Other Sources		**Number**	**Date**
Website hits		379	daily
Energy Tour		6	20-Apr
Wind Campaign		22	26-May
Total Other			**407**

Grand Total	**4,024**