



**Elizabethtown
COLLEGE**

**Elizabethtown College's Commitment to
Reducing our Impact on the Environment**

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Introduction: Looking Back and Looking Forward

For many years Elizabethtown College has taken a proactive approach to the efficient use of water, natural gas, fuel oil, electricity, in the reduction in the amount of storm water we send to the Chesapeake Bay and the sanitary waste and solid waste we generate. Several principles have guided the College's efforts:

- The energy you never use is the cheapest energy there is and energy not used does not generate carbon.
- Reduce, Reuse and Recycle.
- We will use best management practices (BMP) handling our storm water.
- We will continually evaluate new conservation technologies and implement those that can reduce our consumption of utilities while demonstrating reasonable paybacks.

This document outlines our accomplishments in these areas and provides insight into the developing technologies that we are investigating. In many areas you will see duplication as one management technology or strategy often acts to reduce consumption of multiple utilities. Efficiency improvements such as water conservation and efficient lighting that have been implemented across the campus. Many of the conservation strategies have been incorporated in existing buildings and planning is taking place for implementation in the renovation remaining buildings and in new construction.

Building Automation Systems (BAS)

- The brain of our conservation strategy is our Building Automation System (BAS) that allow us to operate and monitor the majority of the energy consuming systems on campus. We control HVAC, space temperatures, lighting and electrical demand in the majority of our buildings 24/7 and our technicians are capable of accessing the BAS from their homes to respond quickly to calls for service after hours.
- The R25 event scheduling system is a key component of the BAS management and allows our maintenance and operation staff to efficiently schedule their work during the periods when spaces are not occupied.
- The most recent version of R25 can link to our BAS on a real time basis to allow us to further extend our strategy to operate unoccupied spaces at unoccupied temperatures.
- Our BAS also allows us to effectively manage electrical demand. Our electric bill is made up of two parts, consumption in kilowatt hours (KWH) and demand kilowatts (KW). The demand portion of our monthly electric bill is based on the highest 15 minute demand reached during that month - commonly referred to as a ratchet charge. Since the demand charge can be thousands of dollars per month we have invested in upgraded primary switch gear that allows us to monitor the KW demand, allowing the BAS to carry out load shedding to limit our electrical demand to a pre-set limit.

Electrical Consumption Management

Historically, electricity has been the utility where the College spends the most money and as such, considerable effort has been expended in this area to reduce electrical consumption. There are many technologies that reduce electrical consumption and in most cases building occupants would never notice:

- Conversion of all fluorescent lighting from T12 tubes with magnetic ballasts to T8 tubes with electronic ballasts, and installation of T5 tubes in new projects. The T12 to T8 conversion took place nearly 10 years ago.
- Conversion of incandescent exit lights to LED exit lights.
- Replacement of inefficient electric motors with high efficiency motors
- Use of variable speed drives (VSD) combined with variable volume (VAV) HVAC systems to provide exactly the amount of heating, ventilating, and air conditioning to each space. A VAV system becomes even more efficient when combined with carbon dioxide sensors to improve the accuracy of outside make up air supplied to the space.
- Room occupancy sensors that turn on room lights when the room is occupied and turn the lights off when the room is unoccupied. We have installed occupancy sensors in all of our new buildings and are retrofitting them into existing buildings. The latest occupancy sensors will automatically change the room temperature to an occupied setting when the lights are on and an unoccupied setting when the lights are off.
- We are now experimenting with LED exterior and interior lights so we can be in a position to implement this technology when it matures. You can read an article about fluorescent, compact fluorescent and LED lighting from Scientific American [at this link](#). As LED lights generate very little heat, they will also reduce cooling load resulting in reduction in electrical energy consumption.
- Our location in southeastern Pennsylvania and the moderate temperatures allow us to use heat pumps to heat and cool many of our buildings. Ground source and air source heat pump technology is evolving rapidly and the efficiency of heat pumps is improving rapidly. Thus we have been replacing our existing heat pumps with more efficient equipment with resultant decreases in electrical consumption.
- A substantial amount of our electrical energy is consumed during the cooling season as we use window air conditioners, water and air cooled chillers and heat pumps to cool our buildings. Modern heat pumps are even more efficient in the cooling mode than in the heating mode and we are replacing inefficient units with higher efficiency units.
- There are new heating/cooling technologies that are proving to be even more efficient than ground source heat pumps. We have installed a test system to evaluate the technology and if it proves to operate as efficiently as the manufacturer claims, we will move from heat pumps to this technology.
- Large chiller technology has significantly reduced the number of KW per ton of chilling capacity and we have installed 320 tons of state of the art magnetic levitation chillers supplying the Nicarry

district cooling system with chilled water for the Hoover Center, the Masters Center complex, Nicarry and portions of Steinman. These chillers are very efficient as the bearings, lubricating oil, pumps and associated equipment have been replaced by magnetic levitation bearings resulting in significantly improved efficiency. We will be installing an additional 160 tons of magnetic levitation chilling this summer so it is online when we open the SMEC Phase III renovated areas this fall.

- Through the Residential Renewal strategy, we are planning to replace the inefficient window air conditioners in Myer, Ober and Royer with high efficiency building cooling systems when these buildings are renovated.
- We still have some buildings that were constructed when the cost of electricity was 1 cent per KWH – the Library is the largest consumer of electricity as it is heated with resistance heating. Thus, we are developing plans to improve the efficiency of the Library HVAC by use of improved heating and cooling technologies.
- To further reduce electrical consumption we have been installing solar film on windows with south exposures to improve occupant comfort and to reduce cooling loads.
- We are in discussion with the Elizabethtown Borough about installing wind turbines and a solar array as a prototype installation to evaluate this carbon free source of electricity.

Natural Gas/Fuel Oil

- Many of our larger buildings are heated with natural gas and many of the conservation opportunities outlined in the electrical portion of this document are also used to reduce the consumption of natural gas:
 - Variable volume HVAC systems.
 - Occupancy sensors to allow space to operate at the unoccupied setting when not occupied.
 - Carbon dioxide sensors to allow us to provide the exact amount of make- up air to spaces for proper comfort.
 - Efficient make-up air systems for our laboratory hoods have been installed in Musser and in the SMEC project areas where lab hoods are installed. This equipment minimizes the amount of tempered outside air that is exhausted from the hoods while providing the required hood face velocity for safe hood operation.
- Additionally, we have been replacing inefficient boilers in many buildings with high efficiency boilers as funding becomes available.
- Many of our SDLC buildings are heated with fuel oil and our strategy has been to replace the existing boilers with high efficiency boilers.
- As the SDLC buildings and other buildings, like Admissions, are older houses that were constructed when energy was inexpensive, we have been installing insulation, siding and replacing leaky windows with new efficient windows.
- Throughout the campus we are insulating, sealing and making our buildings more energy efficient to reduce cooling and heating loads.

Grounds Maintenance

Our Grounds Maintenance is based on a minimal impact on nature by utilizing the following strategies:

Beneficial Insects

- Maintaining habitat for beneficial insects by planting pollen and nectar plants as well as keeping winter habitat, i.e. leaves and flower stalks, standing over the coldest months.
- Allowing beneficial insects to multiply and keep pest insects in check by using only narrow spectrum pesticides.

Compost

- Branches, leaves, weeds, etc., are chipped and composted for use as mulch and soil amendments.
- When conditions permit, return all grass clippings to the turf, reducing the need for fertilizer and helps retain soil moisture.
- Amending sports fields with organic topdressing compost to increase fertility and retain moisture.

Fertilizer

- Fertilizing landscape beds with natural debris, such as compost and leaves when aesthetically acceptable to the College Community.
- We use organic and chemical fertilizers to amend landscape beds only when there is a severe deficiency.
- We use natural organic fertilizer on 25% of our sports turf.

Integrated Pest Management

- Integrated pest management is used to apply only to precise type and quantity of pesticides needed by:
 - Applying pesticides only when an identified pest has surpassed the allowable threshold.
 - Our goal is to use pest-specific pesticides to ensure non-target species are not harmed.
 - Applying pesticides only when pests are most easily controlled.
 - Our goal is to treat 95% of turf for insect pests only when acceptable infestation threshold is exceeded.

Mulch

- Reducing the use of mulch by mulching most areas on a two or three year rotation—this ensures mulch is not building up.
- Mulching to no more than three inches to aid in weed control and moisture retention.
- Applying mulch in a manner that provides proper application control.

Native Plants

- Using native plants in all new planting projects, this ensures that the plants are low maintenance, able to withstand regional temperature extremes, require no irrigation once established, and take very little soil amendment.
- Focusing on planting the right plant in the right place which also lowers maintenance time and increases survival rates.
- This strategy provides food and cover for native insects, birds, and animals with native plants.

Storm Water Infiltration and Erosion Control

- Several years ago the College implemented the College's first Growing Greener grant to create storm water retention areas on the stream flowing into Lake Placida so the water quality is improved by the action of bacteria in the retention areas prior to flowing into the lake.
- Maintain wetland plantings around Lake Placida and entering waterways to control erosion and filter water-borne pollutants to ensure cleaner water.
- Created several infiltration swales to collect storm water runoff from fields and parking lots, these areas serve as recharge areas for ground water levels and also help filter sediment and pollutants. These areas are:
 - Between Hackman parking lot and Founders Hall
 - The recent installation of our aquifer recharge facility between Founders and the Hackman North lot is the latest in our implementation of storm water best management practices. This project was funded from the College's second Growing Greener grant. A copy of the grant application can be seen [at this link](#).
 - Below Schreiber Quadrangle
 - Below Boyd Field
 - Beside Leffler Chapel
 - Our planned new residential construction will also incorporate storm water retention/treatment areas and aquifer recharge areas and providing habitat for wetland species in these areas.
- Planting of rain gardens to allow aquifer recharge from storm water.

Wildflower Meadows

- Maintain several wildflower areas whose deep rooted plants help decrease water runoff and increase ground water absorption
- Reduce time and resources spent by mowing turf
- Provide native habitat for insects and birds in these areas

Staffing

- We have a Pennsylvania Certified Horticulturalist and a Certified Turfgrass Professional on staff.

Environmental Services

- Many of the cleaning chemicals used by the Environmental Services Department are green chemicals. Green chemicals are used throughout campus except where hospital grade disinfectants are needed.
- The use of paper towels is minimized installing hand dryers in restrooms.

Solid Waste Reduction

- To manage our solid waste stream we have an extensive recycling program that can be seen [at this link](#).
- We are always working to improve the level of recycling as an effective recycling program requires the active support and participation of everybody on campus. The College has entered a national recycling competition called RecycleMania. The goal of this competition is to increase awareness of campus recycling. All participating schools are required to report measurements (pounds of recycled materials divided by campus population) on a weekly basis.

Domestic Water Use and Reduction in Sanitary Waste Generation

- The College has been actively involved in the reduction of water use and the resultant generation of sanitary waste for many years. I had the opportunity to present a paper on our successes in this area and you can read the paper [at this link](#).

Motor Pool

- We are purchasing a hybrid vehicle for Campus Security as their stop-and-go use matches the most efficient operating parameters for hybrids.
- We have a comprehensive maintenance program for our motor pool fleet to optimize vehicle mileage.

New Construction Opportunities

- The construction of the Lyet wing and the renovation of Esbenshade incorporated state of the art conservation technologies including:
 - High efficiency motors
 - T8 & T5 lighting
 - Occupancy sensors
 - High efficiency HVAC systems

- Heat wheels to recover BTUs from the 100% exhaust air
 - High R value insulation
 - Low E window glass
 - Laminar flow hoods
 - Air filtration systems for select uses to reduce exhaust air needed
 - Variable volume air handling systems
 - DDC BAS
 - CO2 make up air control
- As we design renovations to other buildings and new construction these technologies will be incorporated into the design and evolving conservation technologies will be evaluated and included as appropriate. For example:
 - Toilets with dual-flush operators, could be installed in residence halls to increase water efficiency.
 - There is potential to reuse grey water and/or rainwater for non-potable/sewage conveyance.
 - We are actively investigating the adaptive reuse of existing structures and doing comprehensive studies to maximize the use of existing spaces/structures on campus and minimize additional building footprint to the campus.

Training & Professional Development

- Facilities Management staff continually participates in training to update their skills and to learn about emerging conservation technologies. During the past year staff have participated in training such as:
 - Leadership in Energy and Efficiency Design (LEED)
 - Backflow preventer inspection and repair certification
 - Best management practices in severe weather management
 - Best management practices in storm water management
 - MRSA sanitation training
 - Swimming pool certification and operation best management practices
 - Pesticide application certification and training
 - Johnson Controls BAS Training - Metasys Extended Architecture Building Operator
 - Siemens Building Technologies BAS Training- S600 Apogee Insight Graphics Design and Editing- Scheduling/ Trending.
 - R.W. Beckett Burner Certification
 - CFC Management Training
 - Pesticide Certification through the Department of Agriculture
 - Workshops on storm water control, Integrated Pest Management, native landscaping, and other environmentally sustainable practices

Professional Organizations

- Elizabethtown College is a member of the Association for the Advancement of Sustainability in Higher Education (AASHE). AASHE is an organization of colleges and universities in the U.S. and

Canada working to create a sustainable future. Its mission is to promote sustainability in higher education through education, communication, research and professional development. AASHE wants to advance the efforts that the college campus by uniting diverse initiatives and connecting practitioners to resources and professional development opportunities. AASHE defines sustainability in an inclusive way, encompassing human and ecological health, social justice, secure livelihoods, and a better world for all generations.

On this website you are able to look at many of AASHE's projects and programs. You are also able to sign up for a weekly e-bulletin that contains the latest news, resources, opportunities, and events related to campus sustainability. Through AASHE's resource center, you are able to view many college individual projects. Some things that can be looked at are institutional commitments, academics, operations- such as building, energy and global warming, and campus culture. Since our college is now part of this website, you will eventually be able to see what our campus is doing to maintain our sustainability once it is updated. Check out this site to learn more!

* In order to become a member of AASHE follow the following steps:

1. Go to <http://www.aashe.org/members/memberlogin.php>
2. Click on Create a New Account
3. Enter all the information it asks for. Your user name will be your email address for Elizabethtown College.
4. Click on Create Account.
5. Check your email account for a password that they will send to you. After you receive the password, go back to the website and enter your email address and password.
6. Click Login.

Future Endeavors

- In consultation with our project design teams, the College continually looks for new processes and technology to reduce our consumption.
- When new technology becomes available, we complete prototype installations to evaluate feasibility and applicability to the College.
- We keep in contact with suppliers and peer institutions for to operate more efficiently.
- We watch for available grants to support new cost reduction technologies. We submitted a grant application for an Energy Harvest grant for an aerobic manure digester. Unfortunately, we were not awarded the Energy Harvest Grant we submitted for an anaerobic digester. The grant application is available [at this link](#). We are pleased that a local farmer took our idea and submitted and was awarded a similar grant.