



## ABINGTON FREE LIBRARY & ROSLYN BRANCH

Abington Twp., Pennsylvania

BUILDING BACKGROUND

### Abington Free Library

Building Usage **Town Library**  
 Daily Visitors **1,000 - 1,500**  
 Size **26,000 sq ft**  
 Stories **Two**  
 Year Built **1956**  
 Weekly Operating Hours **65**  
 Start Year for Energy Management **2002**  
 Energy Efficiency Typology **Whole Building**

### Roslyn Branch

Building Usage **Town Library**  
 Daily Visitors **60**  
 Size **1,750 sf**  
 Stories **One**  
 Year Built **1972**  
 Weekly Operating Hours **32**  
 Start Year for Energy Management **2004**  
 Energy Efficiency Typology **Whole Building**

### retrofit at a glance

- .....Energy Management Systems
- .....HVAC Scheduling & Controls
- .....Lighting Technology Upgrade & Scheduling
- .....Airflow Management
- .....Capital Improvements
- .....Peak Load Reduction

## Overview & Scope

Abington Township, located in Montgomery County, Pennsylvania, began numerous efforts in 2002 to improve energy efficiency in the Abington Free Library and a satellite library facility in Roslyn. The Abington Free Library is a 26,000 SF building that was built in 1956 and has undergone several renovations during its lifetime. Abington Free Library's satellite branch in Roslyn is a 1,750 SF building composed of two portable classrooms.

Efforts to reduce energy use at both facilities began with an examination of current operations to identify no- or low-cost improvements. The library management team tested a variety of energy reduction strategies and monitored their impact on energy usage to reach their goals. In the preceding years, the library's energy consumption and expenditures had been steadily rising, and it became clear that energy reduction strategies would be a good way to reduce costs while increasing overall sustainability. The library facilities manager implemented a series of operational improvements that maximize energy efficiency without compromising occupant comfort.

## Project Details

### Operational Improvements

**HVAC Controls** - Initially, after a 1999 renovation of the Abington Free Library (AFL), the building's HVAC system was programmed to start the boiler when the outdoor temperature was colder than 50°F and turn on the air conditioning when the outdoor temperature was warmer than 50°F. This setting worked well in the winter and summer months when temperatures rarely fluctuate, however, this was problematic in spring and autumn when the temperature would often be below 50°F at night and above 50°F during the day.

In 2001, AFL reprogrammed its HVAC so that the boiler started only when the outdoor temperature was under 40/45°F and turn on the air conditioner if it was warmer than 60°F. Additionally, the library started manually disabling the boiler between April and October, when it was not necessary.

**HVAC Scheduling** - The building management determined that during the winter it was unnecessary to run the boiler throughout the night. By disabling the boiler from 9:00 pm to 7:00 am, the library's temperature would drop from 72°F to 60°F. By restarting

the boiler an hour before the library opened, the temperature is easily brought back up to a comfortable setting by 9:00 AM when patrons arrive.

**Energy Management System (EMS)** - In 2002, the library had PECO install a pulse contact electric meter for \$1,000 and the building's EMS (Johnson Controls) was upgraded at a cost of \$1,500. Both features enable building managers to measure energy use on an on-going basis. Using the new systems, the Abington Free Library reduced its mechanical system's operation schedule from 93 hours a week to 82 hours a week. By 2003, this change alone led to an 11% decrease in energy use and a \$4,000 savings for the following year.

**Air Flow Management** - In 2009, the library initiated maximums on its Safronics system to control airflow and increase efficiency. The library set the system to 75% of maximum airflow in the winter, 80-85% in the spring and fall, and 90-95% in the summer.

## Lighting

**Lighting Scheduling** - Abington Free Library scaled back its light usage in 2008 by turning the indoor lights on at 8:55 am when the library staff arrives instead of at 7:30 am when the maintenance staff arrives. Parking lot light controls were set to turn on after dark and turn off at 9:30 pm, instead of 11 pm. However, some of the potential energy savings was offset by the installation of extra spotlights in the parking lot and an increase in the parking light wattage from 175W to 250W to address safety concerns.

**Upgrade Lighting Technology** - 14 of the building's exit signs were upgraded from incandescent lamps to LED lamps. The lights came as part of a retrofit kit purchased from Graingers, at a cost of \$34 each. Due to the low cost, the library was able to purchase these lamps out of its operating budget.

## Reducing Peak Demand

The building was originally equipped with three compressor units that were designed to meet a projected maximum cooling load. In practice, it was only during rare heat waves that the third compressor was actually used, turning on briefly to augment the other units. On those days, the spike in electricity use caused by the use of the compressor significantly increased their peak load profile and resulted in a substantially higher kilowatt hour price for that month. To avoid high electric costs, AFL decided to utilize two air conditioners to cool the library. The right-sizing of their mechanical equipment greatly lowered their peak energy

demands, and helped the library develop a better load profile, saving them money. They have received very few complaints from library patrons regarding indoor air temperature.

## Other Capital Projects

**Windows** - In 2004, double-paned windows with insulated glass were installed at a cost of \$35,000.

**Solar Panels** - Recently, the library installed a 1.25 kW solar panel on its roof. The Redevelopment Fund provided the solar panel after the township agreed to purchase 20% of the electricity used for its municipal operations from renewable sources. Between November 2009 and June 2010 the solar panel has generated 885 kWh of electricity.

## Performance

The Abington Free Library's energy improvement programs were successful in reducing both energy consumption and expenditure. A baseline comparison reveals that the library used 16% less electricity and 25% less gas in 2009 than in 2004. The load factor for the facility also increased by 14%, indicating more level energy usage with lower peak and therefore a lower kilowatt hour price. Additionally, the improvements have led to significant cost savings with expenditures on gas decreasing by 13% over the span of the improvements.

## Economic Analysis Abington Free Library

Energy Savings Investments	
Energy Efficient Windows (26 total)	\$35,000
LED Exit Signs (14 total)	\$476
Pulse Contact Meter	\$1,000
Johnson Control System	\$1,500
Summary of Savings	
Total Load Factor Improvement	14 %
Electricity Usage Reduction (kWh)	16 %
Natural Gas Usage Reduction (ccf)	25 %
Savings From Natural Gas Reduction (annually)	\$ 4,200
Savings From Johnson Control System Upgrade	\$ 4,000
Greenhouse Gas Reduction (Tons CO <sub>2</sub> e)	28

## Roslyn Library Branch

### Building Control System

The Roslyn Branch consists of two portable classrooms that were originally climate controlled using two coil electric heaters and two electric air conditioners. In 2005, the library invested in a Trane heat pump to supply the building's heating and cooling load. The system led to a 37% energy reduction and will recoup its \$9,200 cost in about five years.

### Windows, Lighting & Carpet

In 2003, the Roslyn Branch installed new carpet that insulated the rooms and resulted in lower energy use. The following year, the library spent \$1,775 to replace the windows with new double-paned units. At the same time, the library removed forty light bulbs and replaced them with reflectors. Together, the new carpet, windows, and reflectors led to an almost 15% reduction in energy use.

### Performance

The Roslyn branch has cut its electricity use by almost 50% saving almost \$3,500 during the last five years on their total bills of just over \$20,000; a 17% savings. Many of the library's improvements were operational and free to implement, leading to a significant economic return.

## Lessons Learned

The Abington Free Library and the Roslyn branch have put in tremendous effort over the past nine years to improve energy efficiency. The main lesson learned was to examine current usage and operations first to identify simple, inexpensive opportunities to save energy. After their operational changes started to show decreases in energy use and expenditures, the staff had proven accomplishments that they could leverage to encourage the Township to make further energy-saving improvements. Many of the township's efforts were borrowed from best practices of other successful building retrofits by their peers. In the end, the Abington Free Library reduced its energy consumption and financial cost through strategic capital improvements and operational changes.

## Economic Analysis

### Roslyn Library Branch

Energy Savings Investments	
Energy Efficient Windows (5 total)	\$ 1,775
Heat Pump and Thermostat	\$ 9,200
Summary of Savings	
Total Load Factor Improvement	10%
Electricity Usage Reduction (kWh)	50%
Energy Cost Savings in 2009	\$1,400
Energy Cost Savings - Last 5 Years	17%
Greenhouse Gas Reduction (Tons CO <sub>2</sub> e)	5