



U.S. Department of Energy
Energy Efficiency and Renewable Energy

Energy Audits

The Starting Point for Better Building Performance

Retrocommissioning

A Key Strategy for Achieving Efficient Facility Operation

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Why an Energy Audit?

- Save money.
- Reduce energy costs.
- Make business operations more cost effective.
- Develop a management plan for the short and long term.



Levels of Energy Audits

- Walk-through.
- Feasibility analysis.
- Investment-grade/Detailed.



The Energy Audit Process

- Description of facility - general, construction, occupancy, utilities.
- Description of energy using equipment.
- Existing utility bills, cost and usage analysis.
- Equipment inventories and other documentation.



The Energy Audit Process

- Facility improvement measure recommendations, calculations, implementation costs and payback.
- Financial analysis.
- NYSERDA subsidies and program opportunities.
- Energy procurement strategies.



Results of an Energy Audit

- Evaluate the condition of the building and systems.
- Understand how energy is used.
- Identify energy wasters.
- Quantify the benefits of energy improvements.
- Prioritize measures for implementation.



Energy Audit Example #1

- 5,409 square foot building constructed in the 1930's.
- 6 measures identified.
- Estimated total annual energy savings: **\$2,898**
- Estimated total investment: **\$22,027**
- Simple Payback: **7.6 years**





Retrofit Lighting

- Residents' rooms and some hallways have incandescent bulbs. **Replace with compact fluorescent lamps.** Simple Payback: 2.3 years.



Replace Exit Signs

- **Replace 8 existing exit signs using incandescent lamps with L.E.D. exit signs.** Simple Payback: 4.7 years.





Replace Furnace

- The building is served by 3 separate systems. The 2 hot water boilers were in reasonably good condition.
- The existing forced air furnace was installed in the 1960's and later converted to natural gas. **Replace with a high-efficiency condensing unit.** Simple Payback: 7.5 years.





Insulate Walls and Attic Floor

- The building envelope contains no insulation.
- **Install a blown-in type insulation in the second floor ceiling, below the attic floor, and in the perimeter walls.**

Simple Payback - walls: 7.9 years

Simple Payback - attic floor: 10.0 years





Replace Windows

- Windows where the storefront was located and 2 small awning type windows still have original single pane windows. **Install thermal pane windows.** Simple Payback: 16.3 years.





Energy Audit Example #2

- 43,000 square foot building constructed in the 1850's.
- 15 measures identified.
- Estimated total annual energy savings: **\$15,054**
- Estimated total investment: **\$66,183**
- Simple Payback: **4.4 years**





Retrofit Lighting

- Incandescent, fluorescent and parabolic light fixtures are used in the building.
- **Replace incandescent lamps with compact fluorescent lamps.**
Simple Payback: 2.1 years.





Retrofit Lighting

- **Retrofit all fluorescent light fixtures, including installation of electronic ballasts and T-8 lamps. Simple Payback: 5.0 years.**



Automatic Night Setback

- **Program thermostats to reduce unoccupied space temperature. Replace 5 single setting thermostats with automatic thermostats. Simple Payback: 1.2 years.**



Upgrade Freezer Storage to Walk-In Unit

- 3 older freezers in the basement were used for food storage. **Replace with a single walk-in style freezer.**
Simple Payback: 4.2 years.





Convert Water-Cooled Units to Air-Cooled

- **Convert 2 refrigeration condenser units used in the brewing process to air-cooled.** Simple Payback: 4.5 years.
- **Convert 4 air conditioning condenser units to air-cooled.** Simple Payback: 16.7 years.





Additional Measures

- **Install a natural gas fired double convection oven to replace the present electric unit. Simple Payback: 8.6 years.**
- **Install 2 ice makers to replace the older 2nd floor units. Simple Payback: 4.0 years.**





Additional Measures

- **Add storm windows to the single glazed windows on the eastern exposure of the 1st and 2nd floors.** Simple Payback: 25.3 years.
- **Replace 16 existing exit signs using fluorescent lamps with L.E.D. exit signs.** Simple Payback: 13.5 years.





Additional Measures

- **Insulate condensate holding tank.**
Simple Payback: 15.3 years.
- **Steam trap replacement/repair.**
Simple Payback: 12.8 years.
- **Install a new elevator with controls and a high efficiency AC motor with a variable speed drive.** Simple Payback: 27.3 years.





Other Common Measures

- Variable speed drives
- Variable air volume
- Controls





What Is Retrocommissioning?

- A systematic investigation process for improving and optimizing an existing building's efficiency and performance.
- Typically, the focus is on using relatively low cost O&M tune-up activities and diagnostic testing to improve energy-using systems.



Retrocommissioning Objectives

- Bring equipment to its proper operational state.
- Reduce energy and demand costs.
- Improve facility operation and maintenance.
- Identify and fix existing problems.
- Increase equipment life.
- Increase occupant comfort and satisfaction.



Candidates for Retrocommissioning

- “Problem” Buildings
 - High energy costs.
 - Complex O&M problems.
 - Noticeable increase in occupant complaints.
 - Need for major capital improvements.
 - System failure.
- “Good” Buildings
 - Improvements to facilities with multiple and more complex systems.
 - Opportunities for savings with little or no capital outlay.



Common Problems

Systems that are functioning improperly can have a sizable effect on the economics of owning and operating a building.



Common Problems

- Energy management systems that were never installed or programmed to take full advantage of their capabilities or that have degraded over time.
- Controls that are out of calibration or are improperly sequencing.



Common Problems

- Equipment that is running more than necessary or running inefficiently because of improper operating strategies.
- Adjustable speed drives that are no longer adjusting appropriately.
- Economizers not operating properly.



Retrocommissioning Example - Erie County Medical Center

- An energy study identified O&M improvements and retrofits to the cooling system to implement through retrocommissioning:
 - Remove chassis condenser water system from primary chilled water system.
 - Reduce chilled water system operating hours - winter.
 - Chiller optimization - chilled water and condenser water reset.
 - Proper operational sequence for listed equipment.



Erie County Medical Center Results

- Provided ECMC with immediate savings in utility costs of \$1,000 per day during the winter months.
- Payback for the project will be accomplished within one year.
- ECMC upgraded the functionality of the plant with low capital outlay.



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Thank You

Please feel free to contact us
with any questions you may have.

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