Energy Audit Department of Housing and Urban Development

June 2006

Housing Authority of the City of La Crosse

La Crosse, WI

Michaels No.: H3406AAN

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Introduction

The Housing Authority of the City of La Crosse has retained Michaels Engineering to complete energy audits for its seven high-rise facilities, four low-rise developments, a preschool, and the Housing Authority Administration building. This report includes the findings of the energy audit for Becker Plaza. This energy audit meets the federal Housing and Urban Development requirements for periodic energy audits.

This report contains a description of the facility's energy and water using systems and notes any deficiencies that were observed during the site investigation.

This report also includes rough cost and savings estimates for the identified measures. These estimates were generated using rules of thumb, experience with similar projects in other facilities and engineering judgment. The analysis is not investment grade.

The intent of these estimates is to provide a magnitude of savings potential and approximate costs to achieve the savings. The estimates are at best accurate to one significant figure. The estimates will help the Housing Authority to decide whether to pursue certain projects and to plan for future facility upgrades. Select projects can be analyzed in detail as part of a separate effort if further project development or investment-grade financial information is needed to support the decision making process.

Potential incentives from Wisconsin's Focus on Energy program are included as well. These incentives are estimates only.

Energy and operating cost saving opportunities are categorized as (1) cost effective based on energy savings alone, (2) saves some energy and offers other non-energy benefits, or (3) premium efficiency strategies should be pursued when the equipment or system needs to be replaced for other reasons.

To save time and for pragmatic reasons, a sampling of apartment units have been investigated and the results of these findings have been projected over the entire facility.

A summary report including projects for all 11 properties is provided as a separate document.

Energy and Water Consumption

TABLE 1: FACILITY BUILDING USE AND COST

Billing Month & Year	Electricity (Code el)		Natural Gas (Firm) (Code gf)		Water/Sewer (Code wp)					
	Cost	kWh	Cost	Therm	Cost	CCF				
May 05	$ 1,542	28,000	$ 853	1,065						
Jun 05	$ 2,250	39,200	$ 319	390						
Jul 05	$ 2,485	42,240	$ 344	390	$ 1,341	786				
Aug 05	$ 2,077	35,040	$ 384	408						
Sep 05	$ 1,782	29,440	$ 538	474						
Oct 05	$ 1,493	23,520	$ 2,978	2,435	$ 2,215	913				
Nov 05	$ 1,551	27,840	$ 5,879	4,572						
Dec 05	$ 1,833	32,800	$ 8,400	7,472						
Jan 06	$ 1,524	25,600	$ 5,569	4,913	$ 1,404	755				
Feb 06	$ 1,662	28,960	$ 6,264	6,452						
Mar 06	$ 1,549	25,920	$ 4,010	4,490						
Apr 06	$ 1,378	22,880	$ 1,037	1,248	$ 1,428	705				
Totals:	$ 21,127	361,440	$ 36,576	34,308	$ 6,388	3,159	$ -	-	$ -	-
Avg. Rate:	$ 0.0585 / kWh		$ 1.0661 / Therm		$ 2.0221 / CCF					
Escalation:	DOE		DOE		Same as Gen. Inflation					

Economic Parameters:	General Inflation Rate: 2.3%	Discount Rate: 5.6% Nominal, 3.2% Real	Maximum Analysis Period: 25 Years

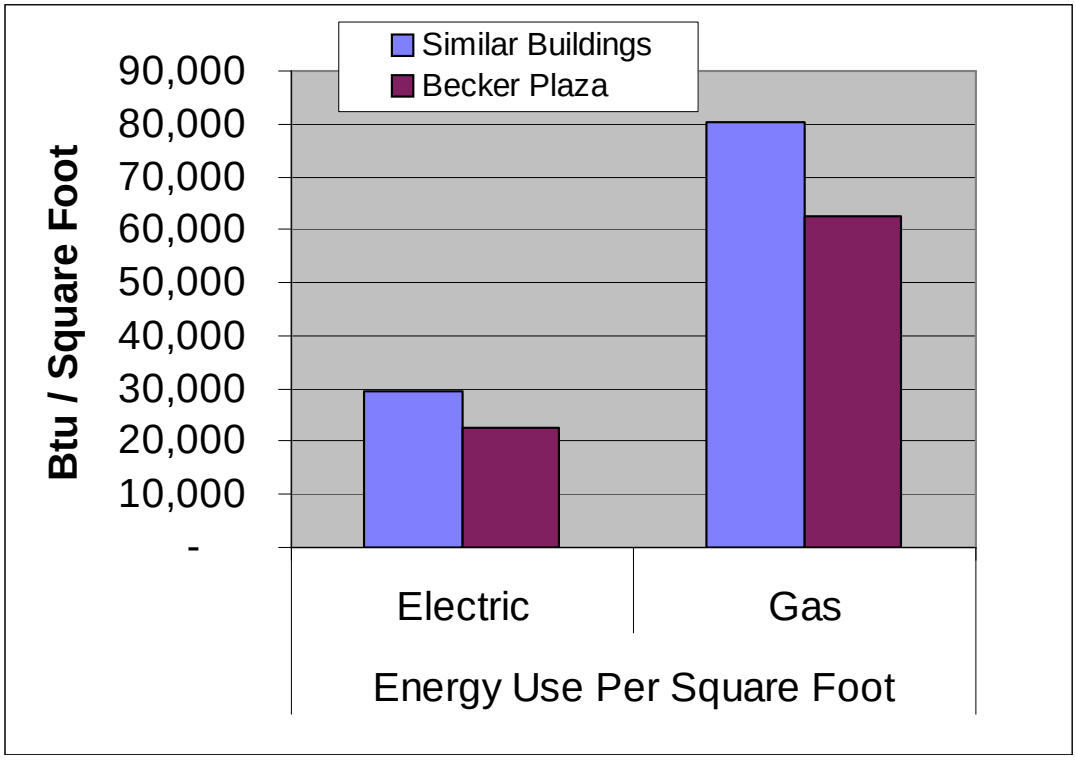
		Total Electricity		Total Other Fuels		Building Total	
Building Square Feet:	55,000	MMBtu/yr.	Btu/sq.ft.-yr.	MMBtu/yr.	Btu/sq.ft.-yr.	MMBtu/yr.	Btu/sq.ft.-yr.
Yearly Energy Consumption		1,234	22,436	3,430	62,364	4,664	84,800

	Total Electricity		Total Other Fuels		Building Total	
	$/yr.	$/sq.ft.-yr.	$/yr.	$/sq.ft.-yr.	$/yr.	$/sq.ft.-yr.
Yearly Energy Cost	$ 21,127	$ 0.38	$ 42,964	$ 0.78	$ 64,091	$ 1.17

Energy Intensity Comparison to Other Buildings

Energy intensity is used to compare the efficiency of facilities, as a whole, with similar facilities in similar climates. The US Department of Energy's Energy Information Administration database was used to develop a comparison of this building's energy use to that of similar buildings. The database was filtered for geographical area, principle use, and building size.

FIGURE 1: ENERGY INTENSITY COMPARISON TO SIMILAR FACILITIES



This facility uses substantially less energy than similar buildings and this is confirmed by the lack of many substantial energy opportunities noted in this report.

Energy Star Rating

The US Environmental Protection Agency (EPA) provides a means for benchmarking the energy use of buildings through the Energy Star program. A building is given a rank between 0 and 100 that corresponds to the percentage of similar buildings that it outperforms in energy use. The energy records and building specific information for Becker Plaza were evaluated. Becker Plaza achieves an Energy Star rating of 81, meaning that it uses less energy per square foot than 81% of similar buildings.

FIGURE 2: ENERGY STAR RATING

Facility Summary: **Becker Plaza**
How do I use this page?

Building ID: 1146357
Level of Access: Building Data Administrator

Generate a Statement of Energy Performance for uses other than applying for the ENERGY STAR.

General Information Edit	
Address: 414 S. 7th St La Crosse, WI 54601	
Year Built: 1975	
Baseline Rating: N/A	**Current Rating: 81**

Facility Performance Set Baseline Period | Set Energy Performance Target

Select View: Facility Performance Create View | Edit View

12 Months Ending	Actual Annual Site Energy Intensity (kBtu/Sq. Ft.)	Annual Energy Cost (US Dollars ($))	Rating (1-100)	Target Rating	Annual Site Energy Intensity (for Avg. Rating of 50) (kBtu/Sq. Ft.)
April 2006	84.8	$57,701.00	81	N/A	130.0

Building Description and Opportunities

General Building Description

Becker Plaza is a 55,000 square foot, seven-story apartment building with 75 living units that was constructed in 1975.

Building Envelope

Envelope Description

The roof in this building consists of a stone-ballasted roofing membrane with approximately three inches of rigid insulation over a concrete deck. The roof has an estimated R-value range of 18-20. This is an adequate amount of insulation. Although the addition of roof insulation would result in reduced energy use for the building, the benefit would not justify the cost. The Housing Authority should evaluate insulation levels when the roof needs replacement. It may be cost justified to increase insulation levels when the roof is removed for replacement.

The windows in this building are mainly operable units and all observed windows had clear insulated glass. The windows appear to be in good condition and there are no visible signs of moisture related problems. A window replacement would not result in any appreciable energy savings.

The main entrance in this building has a vestibule. Remaining entrances and exits have a single door. The exterior doors use automatic closers that ensure the doors shut tightly and are not left open. The doors have weather-stripping that is in good condition and appears to form an effective seal. The glass in the doors and the doorframes is single pane clear glass. The doors are in good condition and a replacement would not result in appreciable energy savings.

Envelope Opportunities

Overall, the building envelope at Becker Plaza is in good condition and provides an effective barrier between the conditioned interior space and the environment. There are no specific energy saving projects recommended for the envelope. Maintaining the weather-stripping on doors and windows should be actively pursued. Additionally, future replacements of doors and windows should utilize products that meet or exceed the applicable energy codes.

Heating Plant and Distribution System

Heating Plant Description

The boiler plant in this building is located in a mechanical penthouse on the roof. The plant consists of five gas-fired Burnham boilers with atmospheric burners. The boilers have a rated combustion efficiency of 80% and each has an output capacity of 475.2 mBh. The boilers are not

original to the building and were replaced approximately 10 years ago. The boilers appear to be in good condition.

The heating water system in this building utilizes a single loop. A 5hp pump, with standby, pumps water through the system. The heating plant appears to have temperature reset at the boilers through an automatic control system.

All heating water pipes observed are sufficiently insulated and the insulation is in good condition.

Heating Plant Opportunities

The installation of condensing boilers could reduce the energy consumption of the heating plant. Although it may not be cost effective to remove the existing boilers at this time, condensing boilers should be considered when the existing equipment reaches the end of its useful life. Condensing boilers can have efficiencies in the 90% range compared to 75-80% efficiency for the existing boilers.

An additional energy saving opportunity is installing a variable frequency drive (VFD) on the heating water pump to replace the existing throttling control. The VFD will control pump speed based on system pressure, which fluctuates according to the number of baseboard heaters that are calling for heat.

Cooling Systems

Cooling System Description

Cooling in this building is provided mainly by through-wall air conditioners in each apartment. The air conditioners range in age from new to approximately 20 years old. The first floor cooling is provided by a split system air conditioner with an air-cooled condensing unit. This unit appears to be 15-20 years old.

Cooling System Opportunities

The through wall air conditioners in each apartment should be replaced with Energy Star® air conditioners when they are in need of replacement. Although the building tenants own the air conditioners, the Housing Authority should implement a program to encourage or require the use of efficient units. Additionally, the units should be the correct size for the available wall opening in each apartment.

The air-cooled condensing unit for the first floor appears to be near the end of its useful life and should be replaced by an air-cooled condensing unit that meets or exceeds energy code efficiency standards. This unit should have an energy efficiency ratio (EER) of 11.0 or greater.

Air Systems

Air Distribution and Exhaust System Description

There are two air-handling units in this building. The first handles the space conditioning and makeup air requirements of much of the first floor of the building, and is located on the first floor. The second air handler is a 100% outdoor air unit located in the mechanical penthouse and provides exhaust makeup air to floors two through seven.

The air-handling units in this building are constant volume. The building custodian indicated that the units are shut down between 11:00 pm and 6:00 am. Exhaust occurs through gravity roof ventilators.

Air System Opportunities

This building does not have an extensive air distribution system, and the system is currently operated efficiently.

Automatic Controls

Temperature Control Description

This building uses pneumatic thermostats to control the hot water baseboard heating system. There is no temperature setback in this building.

Temperature Control Opportunities

Since many of the residents of this building do not leave for extended periods on a daily basis, programmable thermostats may not result in appreciable savings.

Lighting Systems

Lighting System Description

The corridors, common areas, and lobby of Becker Plaza are illuminated with four-foot T12 fluorescent fixtures. Apartments utilize a single one-lamp four-foot T12 in the kitchen, an 8W fluorescent fixture above the kitchen sink, and standard household ceiling mount lighting fixtures with compact fluorescent lamps.

The exit signs in the building are illuminated by two 20 Watt T6 incandescent lamps. Mechanical rooms and storage areas have incandescent fixtures.

The exterior of the building uses approximately five 100 Watt metal halide (MH) fixtures and four 150 Watt (estimated) MH fixtures for illumination.

There are no automatic lighting controls for interior lighting in this building. The exterior lights are controlled by photosensors.

Lighting System Opportunities

The corridor, commons area, and apartment (kitchen) lighting in this building presents an energy saving opportunity. The T12 fixtures in these areas should be retrofitted with T8 lamps and new electronic ballasts.

The incandescent exit signs should be replaced with light emitting diode (LED) exit signs. LED exit signs use considerably less energy than incandescent signs.

Water Using Systems

Water System Description

The toilets in this building are tank-type 3.0 gallon per flush units. The sinks in the kitchen and bathrooms of each apartment and the showers in each apartment were recently retrofitted with low flow aerators.

This building does not have a permanent irrigation system.

Domestic water is heated by two gas-fired water heaters. The domestic hot water system also utilizes a 350-gallon storage tank and a circulating loop. The water heaters each have an input capacity of approximately 370 mBh with storage capacities of 65 and 85 gallons. Each water heater has a recovery rate of 355 gallons per hour. The two water heaters were installed in 2002 and 2004 respectively. The water hot water piping in the building appears well insulated.

The domestic hot water circulating pump in this building is controlled by a time clock and is off between 11:00 pm and 6:00 am.

Water System Opportunities

The water heaters in this building are approximately 80% efficient. Removing the heaters and replacing them with units that are more efficient is not likely to result in a cost effective project. However, the existing equipment should be replaced with high efficiency condensing water heaters when it reaches the end of its useful life. Water heaters with efficiencies above 94% are commercially available and cost competitive.

Toilet replacement was considered, but the low number of uses per fixture results in a payback for replacement that is greater than 50 years. The toilets should be replaced when necessary with new toilets, which are required to be low-use fixtures by law.

Laundry

Laundry

The laundry room in this building has three washing machines and three electric dryers. Two of the washing machines are 33.5 gallon per wash top loading units and the third is a front-loading unit that uses 18.5 gallons per load. The electric dryers have heating elements that are 5,350 Watts.

The building custodian estimated that approximately 100 loads of laundry are washed and dried per week.

Laundry Opportunities

The company that provides the laundry equipment was asked about opportunities to have high efficiency washing machines and gas-fired dryers installed. From a pure efficiency standpoint, the two 33.5 gallon machines should be replaced with 18.5-gallon units to substantially reduce their water usage. Washing machines that are more efficient will also reduce drying energy. Cost information provided by the washing machine rental company indicates that the additional annual cost for using efficient washing machines will be greater than the energy/water cost savings, so this project should not be pursued at this time. This should be re-evaluated each time the rental contract expires.

The installation of gas dryers instead of electric will reduce drying costs by more than the cost increase for switching to gas dryers.

Vending Machines

Vending Machine Description

There is a single soda vending machine in the common dining area. To the best of our knowledge the lighting and refrigeration compressor in this machine operate constantly. Constant operation of the lighting on refrigeration compressor is standard on most vending machines.

Vending Machine Opportunities

The vending machine could be retrofit with a VendingMiser. VendingMisers utilize a sensor to determine if people are near the vending machine. If nobody is near the vending machine, the lights inside the machine will be shut off. The VendingMiser also cycles the refrigeration compressor on and off as needed to save energy. VendingMisers typically save one third of the energy normally consumed by vending machines.

Opportunity Cost and Savings

Table 2 includes the rough cost and savings estimates for each of the opportunities identified during the audit. Each opportunity is categorized as a project that (1) is justified based on energy or water savings alone, (2) provides operating cost savings in addition to other facility benefits, or (3) something that should be considered when replacement is required.

TABLE 2: OPPORTUNITY COST AND SAVINGS ESTIMATES

		Opportunity Category											
Opportunity Description	Item #	Energy Savings Only	Energy Savings Plus	Equipment Replacement	kWh Savings	Therm Savings	Gallon Savings	Dollar Savings	Cost Estimate	Incremental Cost	Simple Payback Years	Recommended (Y/N)	Estimated Focus on Energy Incentive
Install Condensing Boilers	1			X	-	2,693	-	$ 2,871	$ 20,000	Y	7.0	Y	$ 808
Heating Water Pump VFD	2	X			10,760	-	-	$ 646	$ 3,595	N	5.6	Y	$ 323
Corridor Lighting	3		X		5,887	-	-	$ 344	$ 1,481	N	4.3	Y	$ -
Commons Area Lighting	4		X		3,220	-	-	$ 188	$ 1,411	N	7.5	Y	$ -
Apartment Lighting	5		X		2,700	-	-	$ 158	$ 2,116	N	13.4	Y	$ -
Exit Signs	6		X		12,649	-	-	$ 739	$ 4,612	N	6.2	Y	$ 190
High Efficiency Water Heaters	7			X	-	697	-	$ 744	$ 3,000	Y	4.0	Y	$ 209
Conversion to Gas Dryers	8	X			10,347	(415)	-	$ 162	$ 100	Y	0.6	Y	$ 427
Install Vending Miser	9	X			1,153	-	-	$ 67	$ 165	N	2.4	Y	$ 35
Totals					**46,717**	**2,975**	**-**	**$ 5,919**	**$ 36,481**		**6.2**		**$ 1,991**

Incremental costs are the additional costs associated with purchasing equipment or systems that are more efficient than a baseline system. For projects with "N" in the incremental cost column, the total cost of the project is given. These projects represent situations where equipment could be replaced immediately regardless of the remaining life of existing equipment.

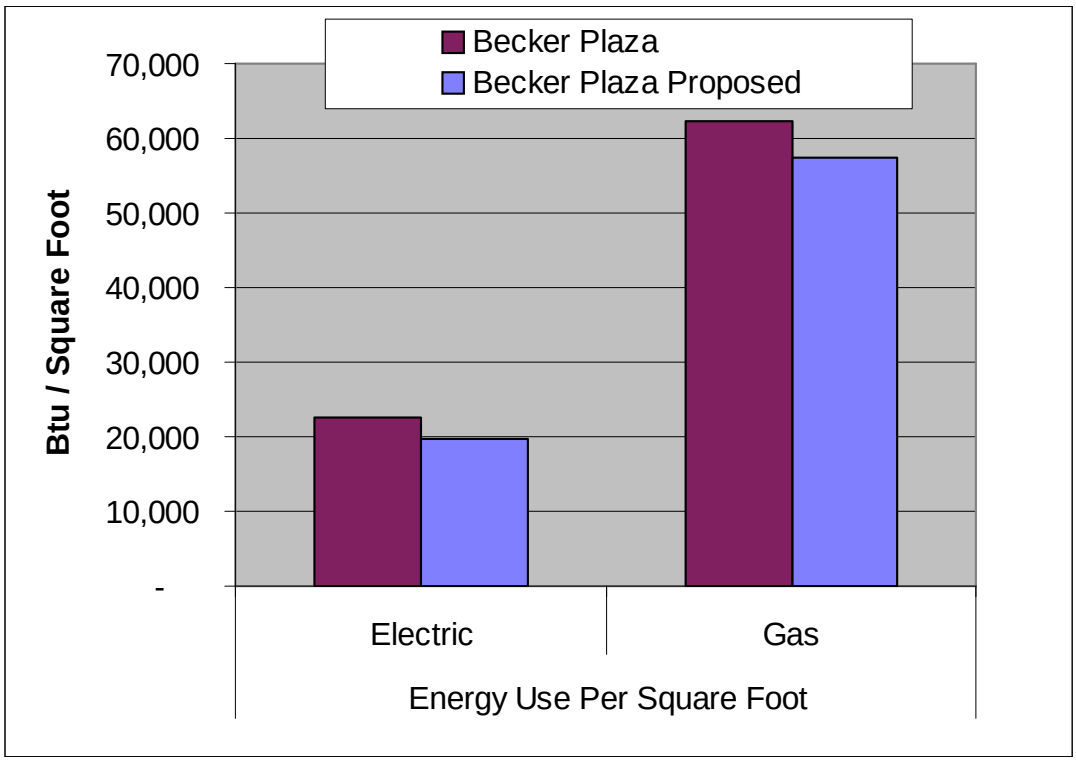
The simple payback provided does not include the impacts of Focus on Energy incentives.

Recommendation Discussion

Each of the projects in Table 2 above is recommended for implementation. As discussed previously in the report, the boiler and water heater projects (items #1 and #7) are recommended at the time that equipment replacement is required. The remaining projects involve the retrofit of existing equipment or the installation of new equipment.

Implementing the energy projects shown in Table 2 would reduce annual energy costs by over $6,000. Gas and electric costs will each be reduced by approximately 9% and 14% respectively. The combined payback of the projects is 6.4 years. Figure 3 below shows the existing energy use of Becker Plaza compared to the proposed energy use of the building if the recommended projects are implemented.

FIGURE 3: ENERGY INTENSITY COMPARISONS BEFORE AND AFTER PROJECT IMPLEMENTATION



Closing Comments

Becker Plaza is a well-maintained building that uses less energy than most buildings of the same type. There are not any large opportunities to reduce this building's energy use, but there are several relatively low cost projects that can be pursued to reduce the overall energy consumption of the building.