

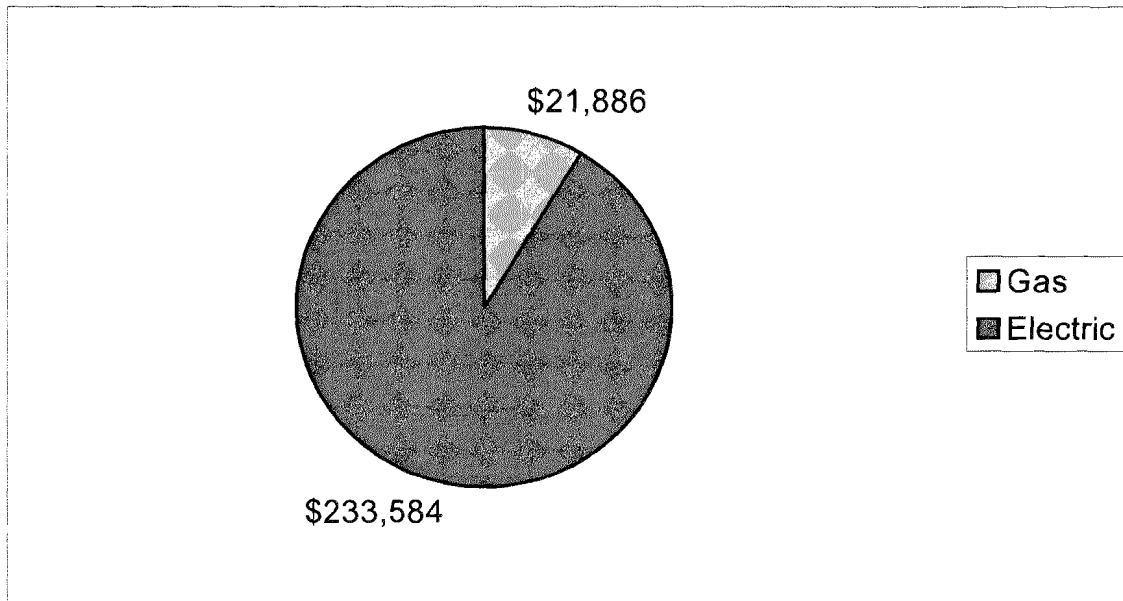
## Facility and Operations Description

The Woodstream Falls Condominiums located in Denver, Colorado are a community made up of 470 condo units. There are 3 different floor plans with an average footprint of 950 ft<sup>2</sup>, for a combined total living space of 446,500 ft<sup>2</sup>. There is also a small clubhouse on the property currently serving as the community office and maintenance shop. Cooling and heating are provided to the property through a two-pipe system that is manually switched between cooling and heating. Cooling is provided by two 240 ton reciprocating chillers. A flat plate heat exchanger is installed; however, it has not been cleaned for a number of years and could not currently provide adequate cooling to justify turning off either of the two chillers. One of the chillers was cleaned before the summer and provided enough cooling that the other chiller was not needed. Heating is currently provided by six 1,700 kBtu/hr hot water boilers. These boilers were recently installed, and a control system is currently being installed to control their operation. Interior lighting is a mixture of four foot and eight foot T12 fluorescent fixtures and screw-in incandescent lamps. Exterior lighting consists of metal halide pole fixtures, metal halide fixtures in the car park, and wall mounted incandescent fixtures at each condo unit entrance. A small percentage of the wall mounted incandescent fixtures have been replaced with wall mounted compact fluorescent fixtures with built in photocells.

## Energy Profile

The following charts identify your electric and natural gas use.

### Total Annual Energy Expense



## Executive Summary

Woodstream Falls HOA requested that Xcel Energy perform an energy assessment of the Woodstream Falls Condominiums to identify energy-related opportunities that show potential for improvement and investment options. This is the first step toward developing a long-term energy plan for the Woodstream Falls Condominiums. Ryan Long from Nexant, Inc. visited the customer's business site on October 22, 2008, and met with Barry McConnell. This energy assessment describes key energy conservation opportunities (ECO), for which costs, savings, rebates, and paybacks are calculated. This report also describes strategic opportunities, which are other energy saving projects that require further study before implementation.

## Energy Savings Opportunities

Table 1 below summarizes the energy conservation opportunities recommended for this facility.

Table 1. Summary of Energy Conservation Recommendations

Energy Conservation Opportunity	Estimated Demand Savings (kW)	Estimated Energy Savings (kWh)	Estimated Thermal Savings (Therms)	Estimated Annual Cost Savings (\$)	Estimated Capital Cost (\$)	Simple Payback (Years)	Estimated Xcel Energy Incentives (\$)*
<b>Payback less than 2 years (capital cost opportunities)</b>							
1   Lighting Retrofits – Exterior	11.9	199,824	0	\$8,935	\$4,453	0.5	\$0
<b>Retrofit opportunities payback 2 – 10+ years</b>							
2   Lighting Retrofits – Condos	96.9	201,319	-1,105	\$22,920	\$54,933	2.3	\$3,175
3   Clean Condo Fan Coils and Replace Filters	0	126,100	0	\$4,330	\$24,675	5.7	\$0
4   Install Premium Efficiency Motors	3.2	10,669	0	\$923	\$7,662	7.4	\$850
5   Clean Flat Plate Heat Exchanger	0	48,979	0	\$1,682	\$17,000	10.1	\$0
6   Lighting Retrofits – Clubhouse, Mechanical Rooms, Laundry Rooms	1.1	4,594	-3	\$347	\$4,528	11.7	\$458

\* Items marked with an asterisk are custom efficiency projects and may require pre-approval to qualify for an Xcel Energy rebate. Please check with your Xcel Energy representative before purchasing/implementing measure.

## Strategic Opportunities Summary

Strategic opportunities are measures that are recommended, but could not be fully evaluated for this report. Further study is recommended before implementing these measures:

- Install Photocells for car park lighting
- Install Photocells for exterior condo entrance lighting

## Energy Conservation Opportunity Analysis

### ECO 1 – Lighting Retrofits – Exterior

This measure involves the upgrading of all exterior lighting on the property with lower wattage lighting. All existing incandescent exterior condo entrance fixtures could be replaced with exterior compact fluorescent fixtures. Maintenance staff has already begun the process of replacing these fixtures. All exterior metal halide lamps could be replaced with pulse start metal halide lamps. This retrofit should maintain or improve lighting levels as well as save energy.

For these retrofits, Xcel Energy offers a prescriptive rebate of \$25 for each pulse start metal halide lamp that consumes 175 Watts or less. The summary of the costs, savings, rebates, and paybacks for this ECO are given in Table 1. The assumptions that were used in this analysis are listed below:

- 470 wall mounted incandescent lighting fixtures located outside each condo entrance replaced with 13 Watt one lamp compact fluorescent exterior lighting fixtures.
- 42 metal halide fixtures located in the car park retrofit with pulse start metal halide lamps.
- 122 metal halide pole fixtures located throughout the property retrofit with pulse start metal halide lamps.
- 8,760 annual operating hours for exterior condo entrance fixtures and car park fixtures.
- 4,380 annual operating hours for exterior pole fixtures.

### ECO 2 – Lighting Retrofits – Condo Interior

This measure involves the upgrading of all lighting in the condo spaces with lower wattage lighting. All four foot fluorescent fixtures could be retrofit with four foot 30 Watt T8 lamps with high efficiency instant start electronic ballasts with a ballast factor of 0.78. All incandescent screw-in lamps could be replaced with compact fluorescent lamps. Ballasts and lamps would have to be upgraded in the fluorescent fixtures in the condo spaces for this retrofit, but the existing fixtures can be re-used. This retrofit should maintain or improve lighting levels as well as save energy.

For these retrofits, Xcel Energy offers prescriptive rebates of \$1.50 for each high efficiency electronic ballast, \$5 for each four foot two lamp T12 fluorescent fixture retrofit with four foot T8 fluorescent lamps and electronic ballasts, and \$10 for each four foot four lamp T12 fluorescent fixture retrofit with four foot T8 fluorescent lamps and electronic ballasts. The summary of the costs, savings, rebates, and paybacks for this ECO are given in Table 1. The assumptions that were used in this analysis are listed below:

- 446 two lamp four foot T12 fluorescent fixtures with standard electronic ballasts retrofit with two 30 Watt four foot T8 fluorescent lamps and high efficiency instant start electronic ballasts.
- 24 four lamp four foot T12 fluorescent fixtures with standard electronic ballasts retrofit with four 30 Watt four foot T8 fluorescent lamps and high efficiency instant start electronic ballasts
- 3760 screw-in 60 Watt incandescent lamps replaced with 13 Watt screw-in compact fluorescent lamps
- 6 four lamp four foot T12 fluorescent fixtures with standard electronic ballasts retrofit with four 28 Watt four foot T8 fluorescent fixtures with high efficiency instant start electronic ballasts
- 2,340 annual operating hours for most condo lighting fixtures
- 600 annual operating hours for condo restroom lighting fixtures
- Interactive Heating Penalties and Cooling Savings

### ECO 3 – Clean Condo Fan Coils and Replace Filters

This measure involves cleaning and possibly replacing the heating and cooling coils located in each condominium. During the site visit it was noticed that the air filters as well as the coils had a large build-up of dust causing the restriction of air flow from the supply fans. This dust reduces the cooling and heating effectiveness of the coils, as well as increases the fan energy needed to cool and heat the space.

The summary of the costs, savings, rebates and paybacks for this ECO are given in Table 1. The assumptions that were included in this analysis are listed below:

- 470 squirrel cage supply fans driven by 1/5 HP motors with an assumed 88% efficiency
- An assumed existing fan supply of 500 CFM
- An assumed reduction in supply fan pressure of 0.05 inches of water
- An assumed chiller load reduction of 3%
- 4,380 annual operating hours for the supply fans

### ECO 4 – Install Premium Efficiency Motors

This measure involves replacing the current motors that drive the cooling tower pumps and the domestic water pumps with premium efficiency motors. These motors are considered standard efficiency based on current standards for motor efficiency by the National Electrical Manufacturers Association (NEMA). NEMA sets guidelines for motor efficiency which include minimum efficiency standards for premium efficiency motors.

The summary of the costs, savings, rebates, and paybacks for this ECO are given in Table 1. The assumptions that were included in this analysis are listed below:

- Two 25 HP motors with an assumed 86.5 % efficiency driving the cooling tower pumps
- Two 60 HP motors with an assumed 93.6% efficiency driving the domestic water pumps. One of these pumps is a backup pump
- 8,760 annual operating hours for the running domestic water pump
- 2,190 annual operating hours for the cooling tower pumps
- Estimated 80% load factor

### ECO 5 – Clean Flat Plate Heat Exchanger

This measure involves cleaning the flat plate heat exchanger currently installed on the property, and upgrading or reprogramming controls for its operation. The plates within the heat exchanger have not been cleaned for a number of years reducing the effective cooling capacity of the heat exchanger. A control system has already been installed to turn off the chillers when the heat exchanger can handle the cooling load of the property. However, the set-points for the chiller and heat exchanger operation are not known. Woodstream Falls HOA has already received a bid to clean the heat exchanger. The only other unknown for the implementation of this measure is the cost for upgrading the controls of the cooling system.

The summary of the costs, savings, and paybacks for this ECO are given in Table 1. The assumptions that were used in this analysis are listed below:

- A maximum water supply temperature of 50°F to the property
- Savings resulting from turning the chillers off for heat exchanger operation
- 698 proposed annual operating hours for the heat exchanger
- 4,278 current annual operating hours for the chillers
- 3,580 proposed annual operating hours for the chillers

## ECO 6 – Lighting Retrofits – Clubhouse, Mechanical Rooms, Laundry Rooms

This measure involves the upgrading of all lighting in the clubhouse, mechanical rooms and laundry rooms with lower wattage lighting. All four foot fluorescent fixtures could be retrofit with four foot 30 Watt T8 lamps with high efficiency instant start electronic ballasts with a ballast factor of 0.78. All eight foot fluorescent fixtures could be retrofit with four foot 30 Watt T8 lamps with high efficiency instant start electronic ballasts with a ballast factor of 0.78. All screw-in incandescent lamps could be replaced with screw-in compact fluorescent lamps. Ballasts, lamps and tombstones would have to be upgraded for all fluorescent fixtures, but the existing fixtures can be re-used. This retrofit should maintain or improve lighting levels as well as save energy.

For these retrofits, Xcel Energy offers prescriptive rebates of \$1.50 for each high efficiency electronic ballast, \$5 for each four foot two lamp T12 fluorescent fixture retrofit with four foot T8 fluorescent lamps and electronic ballasts, and \$10 for each four foot four lamp T12 fluorescent fixture retrofit with four foot T8 fluorescent lamps and electronic ballasts. The summary of the costs, savings, rebates, and paybacks for this ECO are given in Table 1. The assumptions that were used in this analysis are listed below:

- 51 two lamp four foot T12 fluorescent fixtures with standard electronic ballasts retrofit with two 30 Watt four foot T8 fluorescent lamps and high efficiency instant start electronic ballasts
- 5 four lamp four foot T12 fluorescent fixtures with standard electronic ballasts retrofit with four 30 Watt four foot T8 fluorescent lamps and high efficiency instant start electronic ballasts
- 6 two lamp eight foot T12 fluorescent fixtures with standard electronic ballasts retrofit with four 30 Watt four foot T8 fluorescent lamps and high efficiency instant start electronic ballasts
- 5 screw-in incandescent lamps replaced with screw-in compact fluorescent lamps
- 2,340 annual operating hours for lighting fixtures in the mechanical rooms and laundry rooms
- 1,560 annual operating hours for lighting fixtures in the clubhouse

## **Strategic Opportunity Analysis**

### SO 1 – Install Photocells for car park lighting

This measure involves installing photocells to control the metal halide fixtures located in the car park. These fixtures are on 24 hours per day, 7 days per week, or 8,760 hours per year. The installation of photocells to control these fixtures would reduce their operation from dusk until dawn, or 4,380 hours per year. By reducing the operation of these fixtures significant energy savings could be achieved. The implementation costs for this measure are unknown and need further investigation before implementation.

### SO 2 – Install Photocells for exterior condo entrance lighting

This measure involves installing photocells on the exterior wall mount fixtures located at each condo entrance. These fixtures are currently on 24 hours per day, 7 days per week. The installation of photocells to control these fixtures would reduce their operation from dusk until dawn, or 4,380 hours per year. These fixtures are currently controlled by a circuit located within the circuit breaker panel located in each condo. A few test fixtures with built in photocells have been installed on the property. However, the installation of these fixtures has caused some operational problems. For instance, two fixtures were installed at the entrances of two condos located on opposite sides of a pathway. The operation of one fixture has caused the photocell on the other fixture to be activated resulting in an inactive fixture. Due to these issues the implementation costs for this measure are unknown and need further investigation.