COOK COUNTY EECBG ENERGY EFFICIENCY AUDIT

Industrial Company Name

Address

City, State Zip

Prepared By:

Delta Institute

53 W Jackson Blvd | Suite 230 | Chicago, IL 60604

And

[ENERGY AUDITOR NAME]

Level II Energy Efficiency Audit

Table of Contents

List of Figures

List of Tables

DISCLAIMER

The actual energy and cost savings realized by implementing energy cost reduction measures depend upon a wide variety of factors beyond the control of [Energy Auditor Name]. These factors include, but are not limited to: climatic conditions, operating procedures, building occupancy and scheduling. Accordingly, [ENERGY AUDITOR NAME] does not expressly or implicitly warrant or represent that [Energy Auditor Name]'s energy and implementation cost estimates of building or equipment operation will be the actual energy consumption and cost. Furthermore, [ENERGY AUDITOR NAME] does not expressly or implicitly warrant or represent that the cost estimates included in this report will be the actual cost of implementing the recommended energy cost reduction measures.

Our intent, given the time and budget parameters of this project, is to provide enough information at a level of accuracy that will allow the ownership of Company to make informed decisions about energy cost reduction opportunities.

Given the nature of the no/low-cost measures, spending additional time to provide more accurate cost savings estimates will not achieve incrementally greater benefits than those presented in this report. The retrofit measures, on the other hand, may require additional study and design prior to implementation. This report is not to be used as a construction document.

1.0 Introduction

Company commissioned a Level II energy audit of their facility located at Address to identify and evaluate no-cost/low-cost energy cost reduction opportunities and energy cost reduction opportunities requiring capital expenditures. For the purpose of this report, capital investment measures are defined as having a first cost of over $5,000. The Level II energy efficiency audit was performed under the funding provided through the Cook County Energy Conservation Block Grant Program (EECBG). The EECBG program is managed by the Delta Institute, Chicago.

Company manufactures machine parts, assemblies and components. The Level II energy efficiency audit site visit was performed on [DATE]. Prior to the site visit, [Energy Auditor Name] received copies of the utility bills from the facility for the most recent 12 month period. The utility bills were analyzed to determine any irregularities in the monthly energy use pattern and also to determine the marginal costs per unit of natural gas and electricity.

The audit process started with a kick-off meeting with the facility's owner. The objective of this meeting was to get started with the auditing process and develop an understanding of the facility's operations.

A walk-through of the facility was then conducted by [ENERGY AUDITOR NAME] engineers and facility personnel. Data was collected on types of space use and occupancy schedules at the facility; spot measurements were taken pertaining to the space temperatures, space humidity, light intensities, HVAC and lighting equipment nameplate information, and equipment operating schedules. Additionally, data loggers were installed on process equipment to measure motor load factor, temperatures in various spaces, and compressed air usage profile. The building envelope was examined for insulation quality and infiltration from potential leaks and cracks. Operational procedures and preventive maintenance practices were discussed with facility personnel. The onsite visit ended with a brief meeting with facility personnel; next steps of the energy efficiency audit were explained followed by a brief discussion on the key findings during the site visit.

Using the information collected, a list of recommendations was established for the facility addressing opportunities to reduce process energy, lighting energy and HVAC energy. The recommendations presented in this report represent a potential reduction of 5% in energy usage (no natural gas saving measures were identified in this audit, however a possible measure was identified as requiring further analysis in section 5.3) which amounts to a 10% savings in annual energy costs.

Project Contacts

[Energy Auditor Name & Contact]

Margaret Renas
Delta Institute
53 West Jackson Blvd. Suite 230
Chicago, IL 60604
Phone: 312-554-0900
Fax: 312 443-0193
mrenas @delta-institute.org
www. delta-institute.org

2.0 Executive Summary

Table 2.1: Summary of Low Cost/No Cost Energy Reduction Measures (ERMs) including Operations & Maintenance Measures

- All savings, costs and reductions are estimated and reported on an annual basis

	O&M/ERM [1]	**Measure Type**	**Electric Savings (kWh) [2]**	**Natural Gas Savings (therms) [3]**	**Electric Demand Savings (kW-mo/yr)**	**Cost Savings ($)**	**Project Cost (First Cost)**	**Simple Payback in Years**	**Available Incentive**
6.1.1	Install Outside Air Intake to Serve Compressors	(ERM)	28,502	0	0	$2,451	$4,575	1.9	$0
6.1.2	Install Occupancy Sensors in Selected Areas	(ERM)	32,763	0	0	$2,818	$2,911	1.0	$1,455
6.1.3	Turn Off 50 Ton Unit when Areas are Unoccupied	(ERM)	41,416	0	0	$3,562	$1,800	0.5	$0
6.1.4	Install Variable Frequency Drive on 50 Ton Unit	(ERM)	37,960	0	0	$3,265	$4,700	1.4	$1,500
-	**Total**	**---**	**140,641**	**0**	**0**	**$12,096**	**$13,986**	**1.2**	**$2,955**

[1] Implementation of each O&M measure and each ERM is independent of the implementation of other measures unless stated otherwise; order of implementation does not affect the projected energy savings

[2] Electric cost based upon contract price of electricity provided Direct Energy and delivered by ComEd to Company.

[3] Natural gas cost based upon 2010 purchased gas cost plus utility delivery charges.

Table 2.2: Summary of Capital Investment Energy Cost Reduction Measures (ERMs)

– All energy reductions, implementation costs, and energy cost savings are estimated and reported on an annual basis

	ERM [4]	Measure Type	Electric Savings (kWh) [5]	Natural Gas Savings (therms) [6]	Electric Demand Savings (KW-mo/yr)	Cost Savings ($)	Project Cost (First Cost)	Simple Payback in Years	Available Incentive
6.2.1	Upgrade Existing Lighting Systems in Office and Break Areas	(ERM)	50,981	0	12	$5,224	$19,075	3.7	$6,038
6.2.2	Replace Open Blowing of Compressed Air with Fans	(ERM)	69,998	0	0	$6,020	$6,200	1.0	$1,455
-	**Total**	**---**	**120,979**	**0**	**12**	**$11,244**	**$25,275**	**2.2**	**$7,493**

[4] Implementation of each ERM is independent of the implementation of other measures unless stated otherwise; order of implementation does not affect the projected energy savings

[5] Electric cost based upon contract price of electricity provided by ComEd and Company.

[6] Natural gas cost based upon 2010 purchased gas cost plus utility delivery charges.

3.0 Facility Description

3.1 General

3.1.1 Construction Type, Age, and Location

Building Name	Construction Type	Age	Location
Main	Steel Frame and Brick	40 years	[Municipality], IL

3.1.2 Usage/Space Function Types

Space	Usage / Function
Office	Individual and Main Office Areas
Warehouse	Raw Material and Finished Product Storage
Production	Manufacturing

3.1.3 Square footage and gross conditioned square footage

Space	Square footage	Gross conditioned square footage
Office	9,000	9,000
Warehouse	28,000*	28,000*
Production	95,000	95,000
Total	**132,000**	**132,000**

*Areas are heated during the winter, but are not conditioned during the summer

3.2 Building Envelope

3.2.1 Walls and Wall Insulation

Walls	Wall Type	Wall insulation
Office Walls	Block /50% Single Pane Glass	Spray Foam
Production and Warehouse Walls	20% Block and 80% Metal Siding /10% Single Pane Glass	Spray Foam

3.2.2 Roof and Roof Insulation

Roof	Roof Type	Roof insulation
All Areas	Steel	None

3.2.3 Windows and Doors

Space	Windows	Doors
Front	Non-operable, Single Pane, No Coating	Metal frame with Single Pane Glass.
Sides	Non-operable, Single Pane, No Coating	Dock Doors / Metal Frame Emergency Exit Doors
Rear	Non-operable, Single Pane, No Coating	Metal Frame Emergency Exit Doors

3.3 Operating Schedule

Space	Operating Schedule
Office	[Hours of Operation]
Production	[Hours of Operation]

4.0 Overview of Major Systems

4.1 Process Equipment

Company Inc. is an industrial facility with half of the facility's annual electrical energy use dedicated to process equipment. Discussions with facility staff showed that there is approximately 1,600 hp worth of electrical motors in the entire facility, with many machines being required to operate throughout production. The majority of these motors are used to operate CNC machines that fabricate the product. The facility also has a compressed air system that is operated during production. The facility has two [Brand] VFD compressors, a 75 hp air compressor and a 60 hp air compressor, that are used for production. The facility has a process heat requirement that involves operating a large oven to treat products. There are four of these ovens and they typically have parts loaded and unloaded into them approximately every 20 minutes. Two of these ovens use a 200 gallon compressed air tank to blast compressed air into the room to exhaust the steam and heat that remains in the oven after the process.

4.2 HVAC Systems

The facility has a mixture of natural gas fired overhead heaters and infrared heaters in the production and storage space, these areas are not cooled. The facility has a system to control the ventilation in the production and storage space based on the static pressure in the building. This ventilation system consists of a series of six constant volume (15,000 CFM) exhaust fans that are scheduled to operate for 15 minutes out of every hour during the winter and continuously during the summer to remove air that may have been contaminated by the process. The facility also has two 50,000 CFM variable speed fans that are controlled off of the buildings static pressure. Based on the pressure reading the fans will either exhaust air from the space or supply air to the space. The office and quality assurance areas receive conditioned air primarily through the facility's 50 ton air handling unit (AHU), however these areas also have six smaller roof top units to provide cool air to the spaces. The office areas also have electric baseboard heat; however during the assessment it was found that all these heaters had been manually turned off, and that the 50 ton AHU was the only source of heat for the office areas.

4.3 Lighting Systems

The primary lighting fixtures in the office areas are T-12 linear fluorescent lamps with magnetic ballasts, however some areas are lit with T-12 U-shaped bulbs, and incandescent lights. The warehouse and production space have recently been retrofitted with efficient T-8 lighting.

Table 4.1: HVAC, Lighting, and Process Equipment

HVAC Equipment		
HVAC Equipment Item	**Description**	**Capacity / Size**
Production Space Heaters	9 overhead direct fired space heaters	~200,000 btu/h
Infrared Production Heaters	2 infrared heaters	Unknown
Supply/Return Fan	2 VFD fans that supply or exhaust air	50,000 CFM
Exhaust Fans	6 exhaust fans	15,000 CFM
Air Handling Unit	Used to cool the office space during the summer	50 tons
Process Equipment		
Equipment Item	**Description**	**Capacity / Size**
Compressors	2 rotary screw compressors	75 hp and 60 hp
Motors	45 CNC machines with ~35 hp worth of motors/machine	1,600 hp
Lighting		
Lighting Equipment	**Description**	**Fixture Wattage**
T12-4’	Overhead lighting in office and production	34 W/lamp
Incandescent	Office area lighting	150-100 W
T-8	Warehouse and production lighting	32 W

5.0 Energy Use

5.1 Facility Energy Analysis

Building Values for previous 12 months: 2,300,000 kWh/yr; 107,600 therms / yr and total area of 132,000 sq-ft.

Table 5.1: Energy Use Index (EUI)

	Company	Facility EUI	Industry Average *	Target **	Projected Energy Savings
Electric (kWh/Sq. Ft.)	[Company]	17.5	Not Available	15.6	11%
Natural Gas (Therms/Sq. Ft)	[Company]	0.8	Not Available	0.8	0%
Total Energy (mmBtu/Sq.Ft)	[Company]	0.14	Not Available	0.1	5%

* ENERGY STAR® Portfolio Manager is a benchmarking tool that is used to compare the energy performance of similar facilities in the United States. The rating scale takes into account the type of space, occupancy, and local climate to develop a rating. The Company facility does not currently participate in the ENERGY STAR® Portfolio Manager program and therefore benchmarking information was not available.

** Target EUIs based on projected energy savings of 140,641 kWh/year and 120,979 kWh/year from the no cost/low cost and capital investment ECRMs, respectively.

Table 5.2: Facility's Annual Energy Use and Cost by Type

	Natural Gas	Electricity	Total
Usage (mmBtu)	10,769	7,918	18,687
Cost ($)	$63,801	$199,564	$263,365
Rates ($/mmBtu)	$5.92	$25.20	$14.09

5.1.1 Energy Performance Summary

Energy and cost indices (refer to Table 5.4) for Company Service facility are determined from the monthly energy bills provided by the electricity supplier and distribution company. A total gross floor area of 132,000 square feet has been used to determine the indices. Table 5.3 consists of a template (Recommended by ASHRAE Standard 105-2007 – Standard Methods of Measuring, Expressing, and Comparing Building Energy Performance) used to establish the energy and cost indices. The energy and the cost indices for the facility energy use for the twelve-month period ending March 2011 are 141.56 kBtu/ft^2.yr and $1.995/ft^2.yr respectively (refer to Table 5.3).

Table 5.3: Energy Performance Summary

Energy Type	Source of Energy Data	Energy Use Numerical Value	Units	Conversion Multiplier to kBtu (kWh)	Energy kBtu/yr (kWh/yr)	Energy Cost ($)
1. Electricity—Purchased	Monthly Electricity Bills	2,320,517	kWh	3.412	7,917,604	$199,564
2. Natural gas	Monthly Natural Gas Bills	107,685	Therms	100	10,768,500	$63,801
3. Steam	-	-	-	-	-	-
4. Hot water	-	-	-	-	-	-
5. Chilled water	-	-	-	-	-	-
6. Oil # ________	-	-	-	-	-	-
7. Propane	-	-	-	-	-	-
8. Coal	-	-	-	-	-	-
9. Thermal—On-Site Renewable	-	-	-	-	-	-
10. Other	-	-	-	-	-	-
11. Electricity—On-Site Generated	-	-	-	-	-	-
12. Thermal or Electricity—Exported	-	-	-	-	-	-
Total Energy [1]	-	-	-	-	**A: 18,686,134**	**$263,365**
Net Energy [2]	-	-	-	-	**B: 18,686,134**	**C:$263,365**

[1](Sum of 1 to 11 minus 12) - Total Energy is the sum of all energy used in the building, plus on-site generated electricity from renewable sources or from sources other than fuels covered in items 2–8, minus exported energy. Under a net metering agreement, the electric utility meter may record the purchased energy minus the exported energy.

[2](Sum of 1 to 11 minus 9 and solar PV-generated kWh in 11) - Net Energy is the sum of the purchased energy minus sold or exported energy (thus accounting for both on-site generated energy used in the building and energy exported from the site).

Table 5.4: Energy and Cost Indices

Total Energy Index (A ÷ Gross Floor Area)*	141.56	kBtu/ft^2·yr (kWh/m^2·yr)
Net Energy Index (B ÷ Gross Floor Area)	141.56	kBtu/ft^2·yr (kWh/m^2·yr)
Energy Cost Index (C ÷ Gross Floor Area)	1.995	\$/ft^2·yr (\$/m^2·yr)

*The Total Energy Index and Net Energy Index are metrics based on total energy used per square foot of facility space; a low energy index score indicates that a building is efficient. The purpose of this index is to provide a standard that can be evaluated against similar buildings in the same climate zone. However, due to the highly process dependent energy use of industrial facility's no standardized benchmark is available to compare Company to other similar facility types.

Table 5.5: Facility's Annual Energy Use and Cost by Major End Uses

End Use	Calculated Energy Usage Natural Gas (Therms/yr)	Calculated Energy Usage (converted) Natural Gas (mmBTU/yr)	Calculated Energy Usage Electricity (kWh/yr)	Calculated Energy Usage (converted) Electricity (mmBTU/yr)
Lighting	-	-	986,454	3,366
Motors	-	-	715,200	2,440
Compressors	-	-	397,360	1,356
Air Conditioning	-	-	97,830	334
Ventilation	-	-	95,230	325
Heating	98,870	9,887	-	-
Ovens	4,935	494	-	-
Domestic Hot Water	822	82	-	-
Other*	3,058	306	28,443	97
Total	**107,685**	**10,769**	**2,320,517**	**7,918**

*Includes Plug Loads, Kitchen Equipment, Cleaning Energy, and Miscellaneous Process Equipment

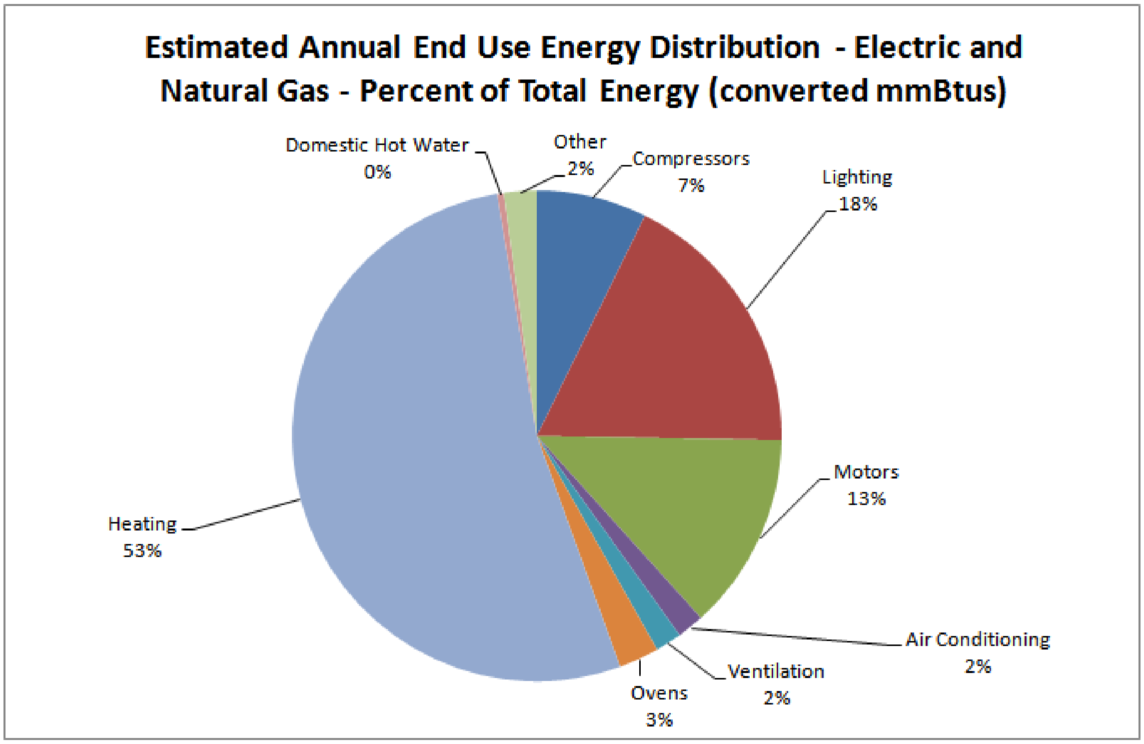

Figure 5.1: **Estimated Annual Natural Gas and Electric Energy End Usage Expressed as a Percent of Total Usage**

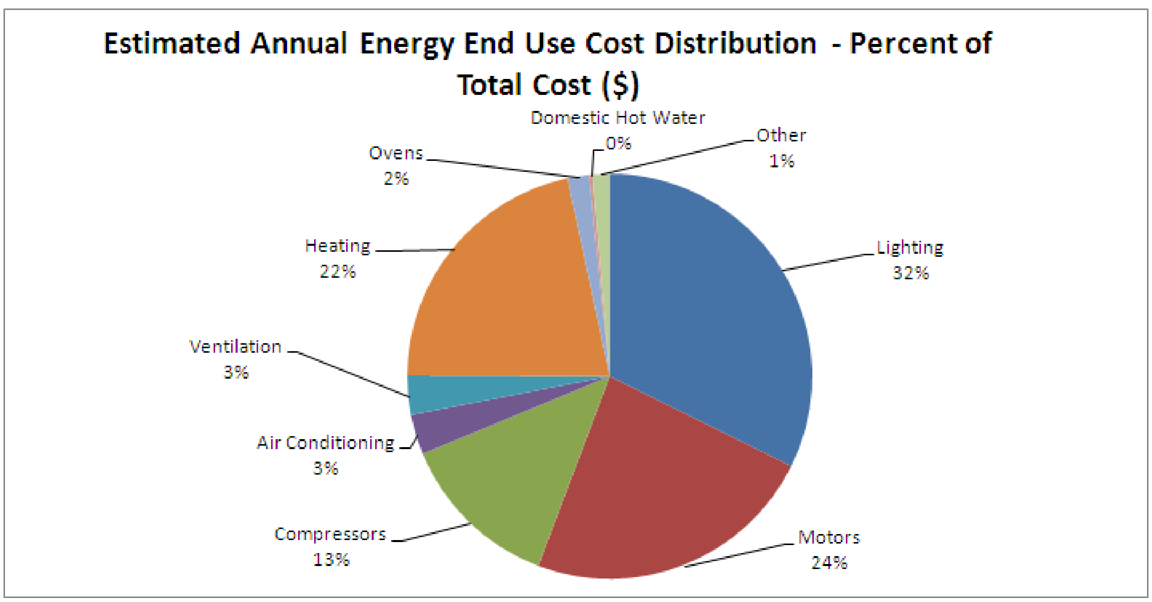

Figure 5.2: **Estimated Annual Natural Gas and Electric Energy End Cost Expressed as a Percent of Total Cost**

5.2 Utility Rate Structure Analysis

Company has two electric accounts, the large one (approximately 86% of total energy used) is classified in the 100 to 400kW rate class, while the smaller one (approximately 14% of total energy used) is classified in the 0 to 100 kW rate class. To determine the cost savings of electrical energy measures, a weighted average of the electrical rates are used to determine energy cost savings for all measures. This class has been declared "competitive" by the Illinois Commerce Commission. According to the most recent electricity bill available to [ENERGY AUDITOR NAME], dated March 2011, electric is supplied by Direct Energy and delivered to Company by ComEd.

According to the most recent natural gas bill available to [ENERGY AUDITOR NAME], dated February 2011, natural gas is supplied by Santanna Energy Services and delivered to Company by Nicor Gas. The Nicor Gas account number is [Number] 5, and the meter number is [Number]. The utility rate analysis for this facility is presented in Appendix B; the marginal costs are summarized in Table 5.6.

Table 5.6: Facility's Utility Rate Analysis

Weighted Average Marginal Cost of Energy ($ / kWh)	$0.08600 / kWh
Weighted Average Marginal Demand Cost ($ / kW)	$5.68 / kW
Natural Gas Cost, first 150 Therms ($ / therm)	$0.65775 / Therm
Natural Gas Cost, 151-5,000 Therms ($ / therm)	$0.59248 / Therm
Natural Gas Cost, Over 5,000 Therms ($ / therm)	$0.58578 / Therm

5.3 Monthly Average Usage and Demand

Utility bills were received from the facility for the previous 12 month for both electricity and natural gas.

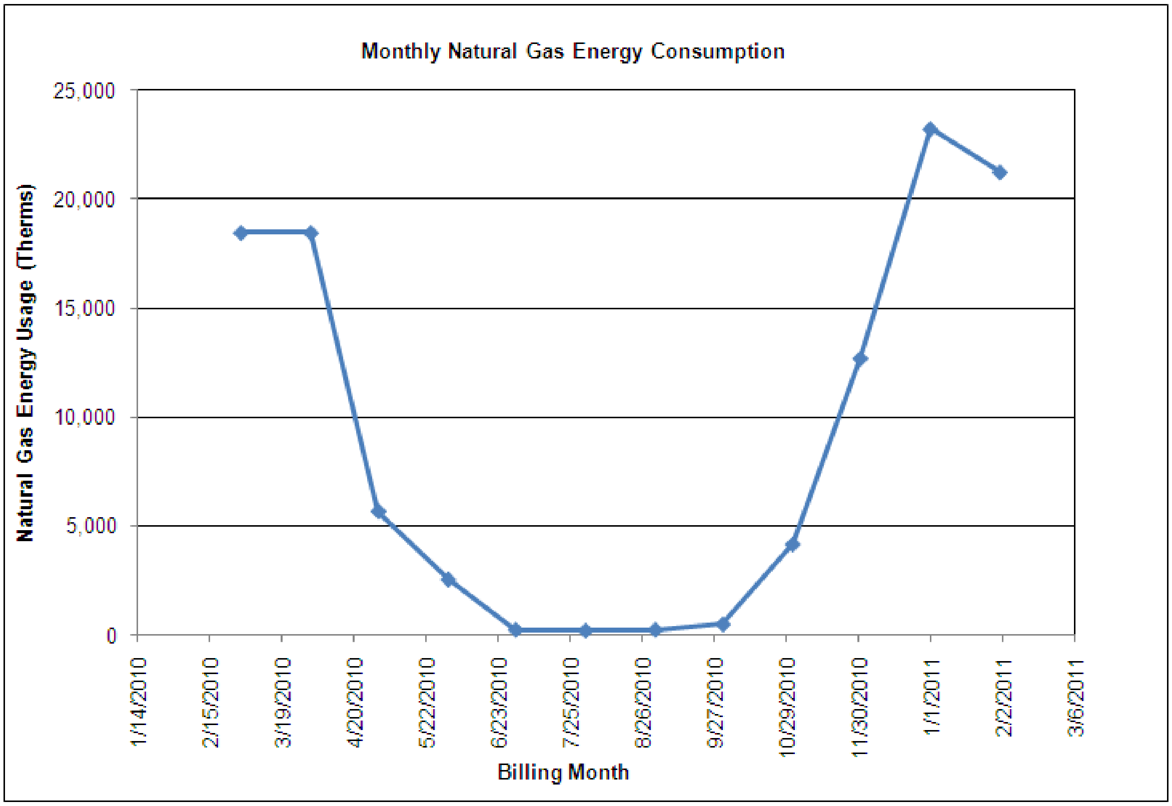

Figure 5.3: Monthly Natural Gas Purchased for Current 12 Months

As expected, the natural gas usage in the facility is higher during the winter months due to the comfort heating demand. January, the month with the lowest average temperature of 22°F, is where the peak usage occurs indicating that the HVAC system is responding correctly to outdoor temperatures. The facility did not receive a bill in March 2010 and instead were billed for both March and April's natural gas use in April, for the purposes of creating this chart the billed amount in April was evenly split between these two months.

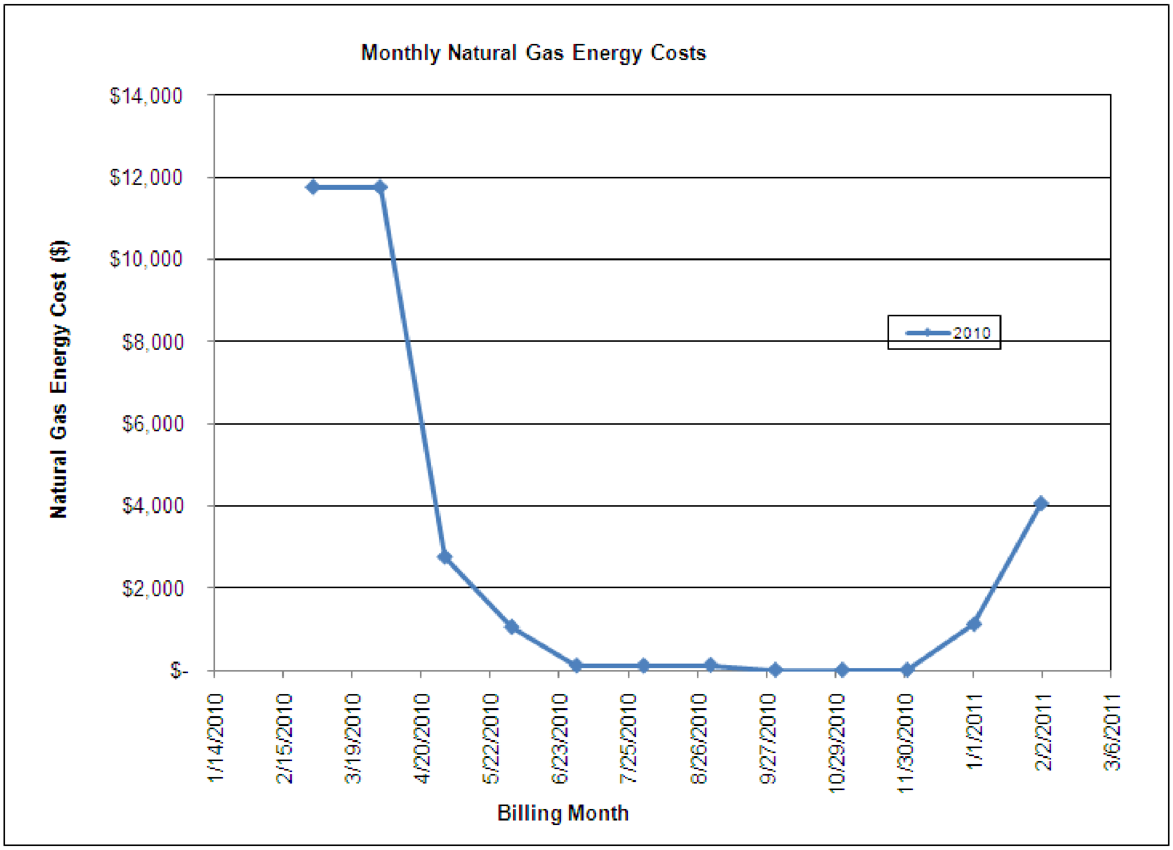

Figure 5.4: Monthly Natural Gas Cost for Current 12 Months

The facility's natural gas cost does not directly correspond to the facility's usage, with much lower costs in January and February 2011, compared to February and March 2010, this is likely due to the facility switching natural gas providers in September 2010, from Nicor to Santanna Energy Services.

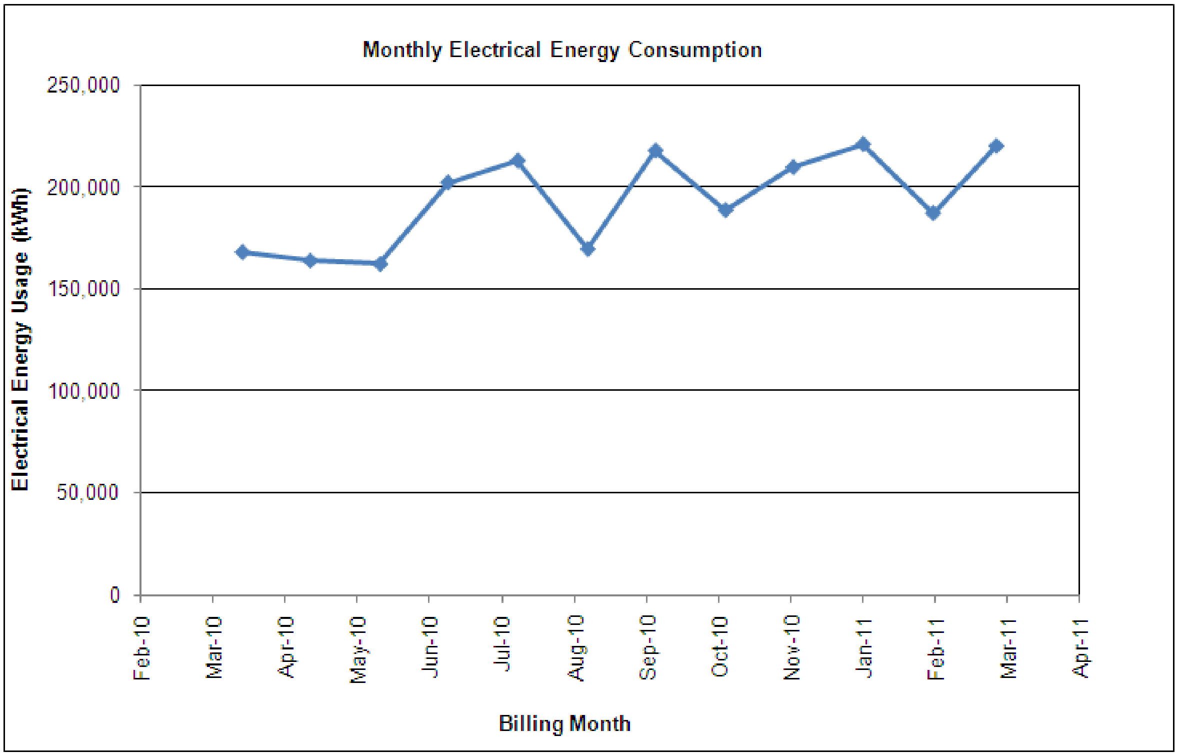

Figure 5.5: Monthly Electrical Usage for Current 12 Months

Electricity use is relatively consistent over the 24 month period shown in Figure 5.5. The absence of spikes in electrical use indicates that the building does not have a large HVAC load and the usage is dominated by process equipment.

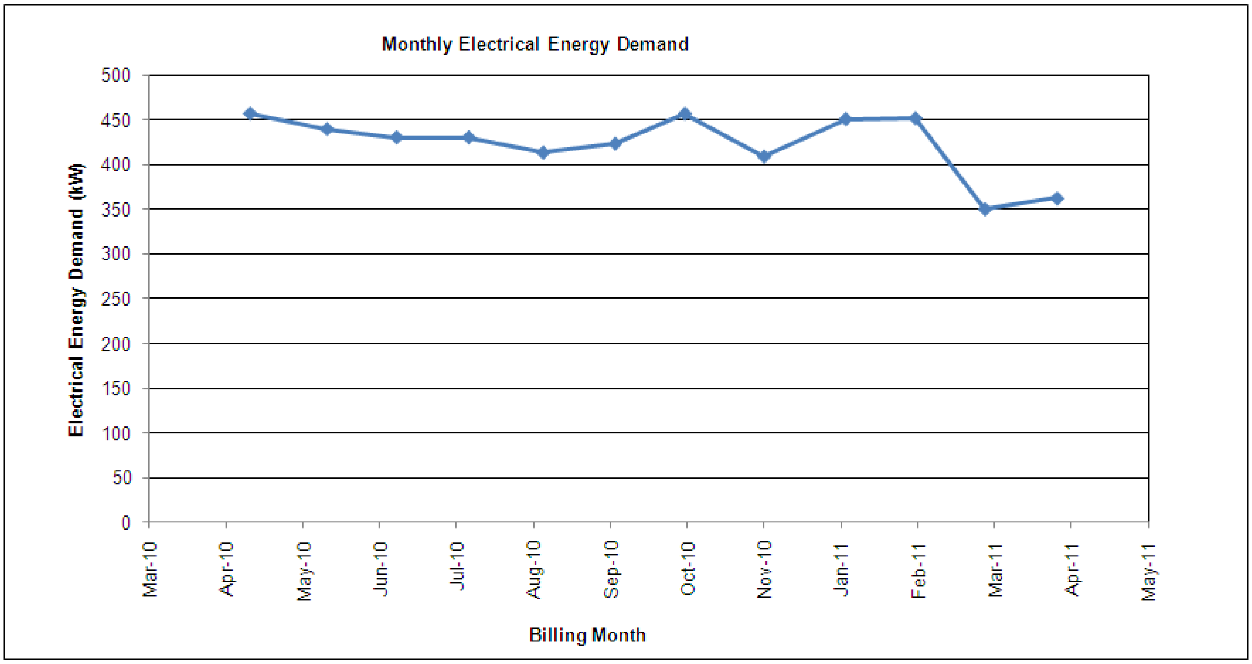

Figure 5.6: Monthly Electrical Demand for Current 12 Months

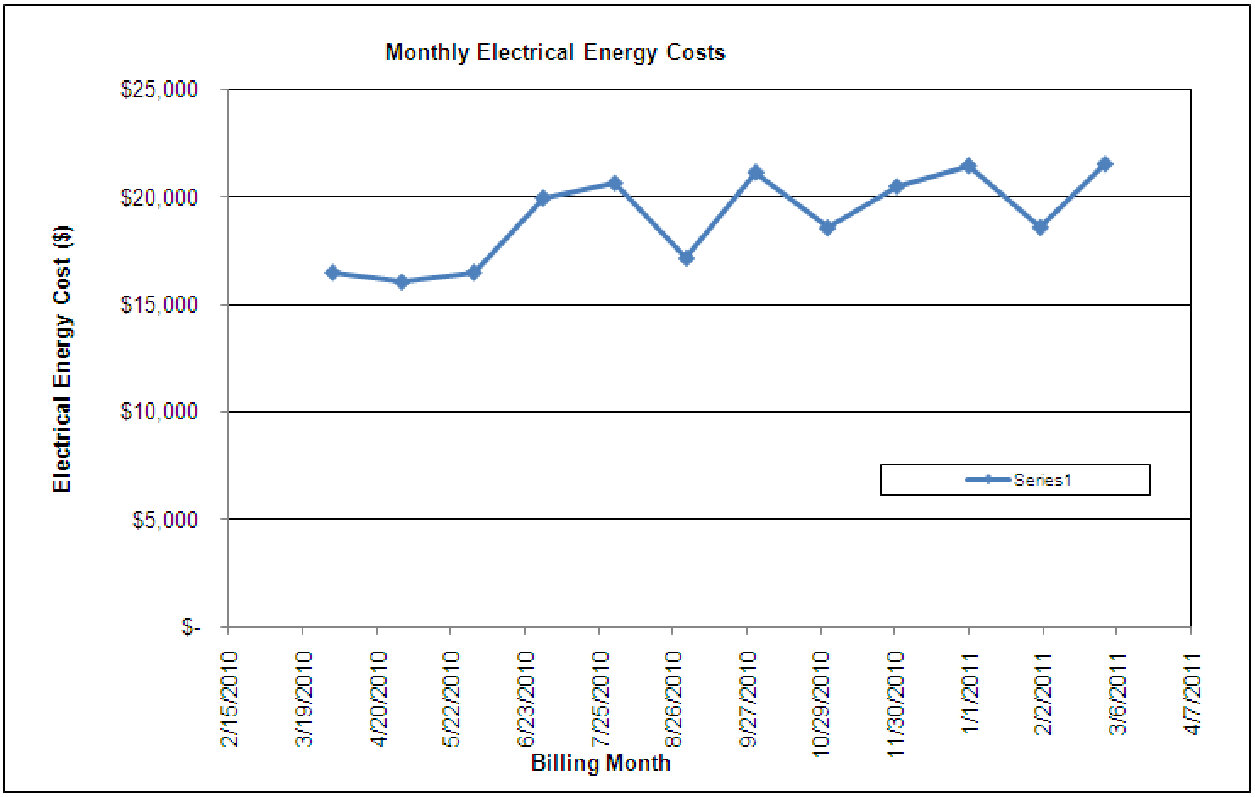

Figure 5.7: Monthly Electrical Cost (Usage plus Demand) for Current Year

The marginal electricity cost is associated with ComEd charges for delivering electrical energy and Direct Energy charges for supplying the electrical energy and specifically excludes fixed monthly costs and demand charges. The demand cost is equivalent to the ComEd distribution facilities charge.

6.0 Energy Cost Reduction Measures

6.1 No Cost/Low Cost (Including Operations and Maintenance Opportunities)

6.1.1 Install Outside Air Intake to Serve Compressors

Objective: Reduce compressor energy consumption by utilizing outside air. Energy is saved because the outside air is, on average, cooler and denser than the air in the compressor room, which is currently being used.

Issues, Observations, and Recommendation:

Compressed air is used in the plant for hand tools, blowing, and other process equipment. There are two air-compressors at the facility, one 75 HP units and one 60 HP unit. Both these compressors operate throughout the production period.

The compressors are located in a mezzanine level inside the production area, adjacent to an outside wall. Temperature loggers that were installed in the compressor area showed that the temperature in this space was 86°F on average.

Proposed Change:

The facility would be able to reduce the load on the compressor system by installing ductwork to bring cool outside air directly into the compressor inlet. The reduction in load is due to the fact that the cooler outside air (49°F on average) is also denser than the air in the compressor area. This increase in density of the inlet air would allow the VFD compressors to operate at a reduced speed, since the compressor inlet is a constant volume, denser air allows a greater mass of air through the inlet decreasing the amount of energy required to compress the air to the pressure set point as well as increasing the pressure capability of the compressors.

Economic Summary:

[ENERGY AUDITOR NAME] estimates the savings for this measure to be $2,451/year. The implementation for this recommendation consists of the cost to install duct work from the wall adjacent to the compressor area to the compressor's inlet. The material cost to purchase 20' of duct work and associated material is $1,075 based on RS Means pricing. The labor cost to install the ducts and to create a hole in the wall to bring in outside air is $3,500 based on estimates provided by RS Means. The total implementation cost for this measure is then $4,575, with a simple pay back of 1.9 years. This measure will last the lifetime of the existing compressed air system and could be easily modified to work with any new system that may be installed.

- Implementation of this ECRM will have no negative impact on occupant health or safety.
- There would be no impact on the occupant service capabilities and the current operating and maintenance procedures can still be followed.
- Trended temperature data that was assumed to be the typical year round temperature in the compressor area.
- A Microsoft Excel™ spreadsheet was used to determine the energy savings.

Table 6.1: Energy Cost and Savings Summary

Demand Savings (kW-mo/yr)	0
Energy Savings (kWh/yr)	28,502
Energy Savings (therms/yr)	0
Greenhouse Gas Savings (metric tons/year)	20.46
Cost Savings ($/yr)	$2,451
First Cost ($)	$4,575
Payback (Yrs)	1.9

6.1.2 Install Occupancy Sensors in Selected Areas

Objective: Install occupancy sensors in selected areas in order to reduce the electrical energy consumption of the current lighting system.

Issues, Observations, and Recommendation:

Some areas of the facility are lit for extended periods of time while unoccupied. Energy savings can be achieved by using occupancy sensors to control the lighting fixtures in these areas.

Proposed Change:

The areas that are suitable for occupancy sensors vary from office areas to large break rooms; each type of space requires a different sensor. Three types of occupancy sensors are generally used: ultrasonic, passive infrared, and dual-technology. Ultrasonic sensors fill the room with high-frequency sound; movement causes the reflected sound to have a frequency shift, which activates the lights. This type of sensor is well suited to areas with tall obstacles. Passive infrared sensors rely on variations in temperature caused by body heat. To be detected, a person must move between the “vanes” created by the sensor's lens. Dual-technology sensors are a combination of the first two types. Sensors can be either ceiling-mounted or wall-mounted. Many wall mounted sensors can replace standard light switches. A summary of the proposed occupancy sensors can be found in Table 6.2.

Table 6.2: Occupancy Sensor Summary

Building Area	Number of Sensors	Sensor Type	Percent Usage Reduction	Total Sensor Cost ($)	Installation Cost ($)	Implementation Cost ($)
Warehouse Break Room	2	Ceiling Sensors	50%	$345	$60	$405
Offices and Break Room	16	Self Adjusting-US	25%	$1,136	$480	$1,616
Conference Room	1	Self Adjusting-US	25%	$71	$30	$101
Plant Restroom	4	Ceiling Sensors	15%	$459	$120	$579
Office Restroom	2	Self Adjusting-US	25%	$150	$60	$210
Total	**25**	**---**	**---**	**$2,161**	**$750**	**$2,911**

Economic Summary:

The implementation cost for this recommendation is based on the cost of the sensors and the labor required to install them. The labor cost to install 25 sensors is $750. Sensor types are selected based on area type, area size, and activities occurring within the area. The purchase cost of 19 self-adjusting ultrasonic occupancy sensors for offices and bathrooms is $1,357, and the cost for 6 ceiling mounted dual technology occupancy sensors is $804. The total implementation cost for this measure is then $2,911. Based on an annual cost savings of $2,818/year the simple payback for this measure is 1.0 years. To reduce the implementation cost of this measure rebates are available through ComEd for $0.15/ Watt controlled. The facility would be eligible for $3,190 in rebates through this program, however ComEd limits the available rebate to 50% of the implementation cost meaning the facility would only be eligible for $1,455 in rebates. If the facility is awarded a rebate for the installation, the payback falls to 0.5 years.

- Implementation of this ECRM will have no negative impact on occupant health or safety.
- There would be no impact on the occupant service capabilities and the current operating and maintenance procedures can still be followed.
- The operating hours for many of the spaces will vary from day to day. The percent usage reduction for the various spaces are estimates based upon occupancy sensor manufacturing data. Actual usage reduction will vary.
- A Microsoft Excel™ spreadsheet was used to determine the energy savings.

Table 6.3: Energy and Cost Savings Summary

Demand Savings (kW)	0
Energy Savings (kWh/yr)	32,763
Energy Savings (therms/yr)	0
Greenhouse Gas Savings (metric tons/year)	23.52
Cost Savings ($/yr)	$2,818
First Cost ($)	$2,911
Payback (Yrs)	1.0
Incentive ($)	$1,455

6.1.3 Turn Off 50 Ton Unit when Areas are Unoccupied

Objective: Reduce the use of the 50 ton unit by turning it off when offices and the break room in the production area are unoccupied.

Issues, Observations, and Recommendation:

The facility operates a 50 ton air handling unit (AHU) 24/7. This unit primarily serves office spaces, with a percentage of the air from the AHU serving a production area break room. The amp draw on this unit was held fairly constant throughout the day at an average amp draw of 10.33 amps, which corresponds to an 8.6 kW power draw, this is shown in Figure 6.1.

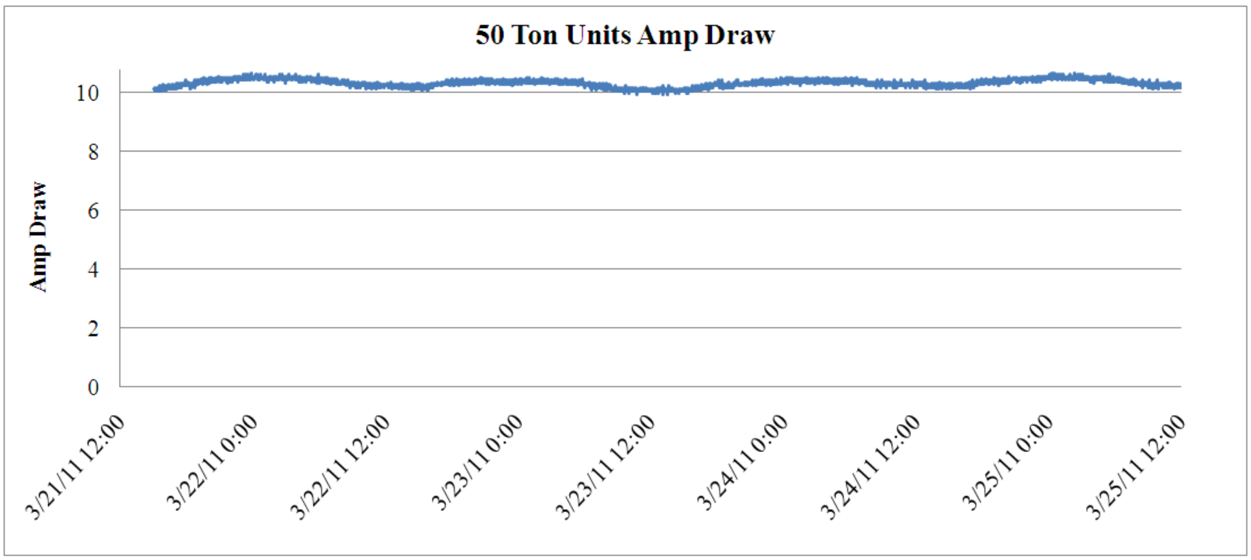

Figure 6.1: Amp Draw of 50 Ton Unit

Proposed Change:

The facility would be able to reduce the energy use of the facility by turning off the 50 ton fan system during unoccupied hours throughout the year. The 50 ton fan system primarily services the office areas which are unoccupied approximately 100 hours/week. The 50 ton unit may also supply the break area in the production area, if this is the case the unit should be scheduled to operate before and during the break period to condition the space when needed. It is recommended the facility operate the 50 ton unit for an average of two hours per night when the outside air temperature is below 45°F or above 65°F, this strategy would have the 50 ton unit operate only 8 hours/week on average.

Economic Summary:

[ENERGY AUDITOR NAME] estimates potential energy cost savings for turning off the 50 ton unit at night to be $3,562/year. The implementation of this measure consists of six hours of in-house labor at $50/hr to install a time clock and outside air temperature sensor to control the 50 ton unit during the night, for a total labor cost of $300. The material cost of this measure includes a seven day time clock, outside air temperature sensor, and associated wiring costs, for a total material cost of $1,500. The total implementation cost for this measure is then $1,800. This recommendation has a simple payback of 0.5 years. While the temperature sensor may require yearly calibration, and replacement every 7-10 years, this measure is expected to last the life of the 50 ton unit, and the temperature sensor and time clock could be used to control any unit that is used to replace the 50 ton unit.

- Implementation of this ECRM will have no negative impact on occupant health or safety.
- There would be no impact on the occupant service capabilities and the current operating and maintenance procedures can still be followed.
- It has been assumed that the facility will not require conditioned air when the outside air temperature is between 45-65°F, if the facility can maintain temperature in the break room space over all outside air temperatures the facility could reduce implementation cost by not installing an outside air temperature sensor to override the time clock.
- It is assumed that the 50 ton unit will require an hour to reach the set point temperature in the break room space, and that the room will be occupied for one hour for an average operating time of 2 hours/day when the outside air temperature is not between 45-65°F.
- Additional natural gas and electrical savings will be found from not conditioning the air throughout the night, resulting in less use of the cooling equipment and less use of the natural gas burners.
- [ENERGY AUDITOR NAME] did not receive documentation on the 50 ton unit showing whether or not this unit had a return fan. If the 50 ton unit does have a return fan additional energy savings would be possible by turning off this fan as well for a minimal increase in implementation cost.
- The 50 ton unit may serve the Quality Assurance area, which has strict temperature requirements 24/7. If the 50 ton unit does serve this area a smaller system may need to be installed to provide conditioned air for this area, which would increase the implementation cost.
- A Microsoft Excel™ spreadsheet was used to determine the energy savings.

Table 6.4: Energy and Cost Savings Summary

Demand Savings (kW)	0
Energy Savings (kWh/yr)	41,416
Energy Savings (therms/yr)	0
Greenhouse Gas Savings (metric tons/year)	29.74
Cost Savings ($/yr)	$3,562
First Cost ($)	$1,800
Payback (Yrs)	0.5

6.1.4 Install Variable Frequency Drive on 50 Ton Unit

Objective: Install variable frequency drive (VFD) on the 50 ton fan to reduce fan energy consumption during periods of low air requirement.

Issues, Observations, and Recommendation:

The fan on the 50 ton unit is a constant speed motor. During summer months, it is expected that more air is required in the space, and during winter months, only the required ventilation air may be needed. Currently the 50 ton unit supplies a constant volume of air regardless of the season or outside air temperature.

Proposed Change:

[ENERGY AUDITOR NAME] recommends that the building install a variable frequency drive on the 50 ton unit fan to take advantage of conditions where design airflow is not required. It is expected that the fan speed can be reduced by 40-50% during winter months.

Economic Summary:

[ENERGY AUDITOR NAME] estimates potential energy savings for installing a variable speed drive on the 50 ton unit of $3,265. The implementation of his recommendation consists of the material cost of the VFD as well as installation by a qualified technician. It has been estimated that the total material cost for a VFD is $3,000. The cost of installation of the units has been estimated at $1,700, which includes twelve hours of in-house labor at $50/hr as well as an additional $500 material expense, and four hours of control contractor programming at $150/hr. The implementation cost for this measure is $4,700 with an associated simple payback of 1.4 years, however this measure is eligible for a Com-Ed prescriptive rebate of $1,500 and with rebates the simple payback is reduced to 1.0 years. Variable speed drives have an expected lifetime of 20-25 years if properly maintained and serviced.

Table 6.5: Proposed Fan Energy Use

OAT Low (°F)	OAT Avg. (°F)	OAT High (°F)	Utilization Factor (%)	Current Average Speed (Hz)	Estimated VFD Speed (Hz)
95	97	99	100%	60	60
90	92	94	100%	60	60
85	87	89	100%	60	55
80	82	84	100%	60	45
75	77	79	100%	60	45
70	72	74	100%	60	45
65	67	69	100%	60	40
60	62	64	100%	60	40
55	57	59	100%	60	40
50	52	54	100%	60	35
45	47	49	100%	60	35
40	42	44	100%	60	35
35	37	39	100%	60	35
30	32	34	100%	60	35
25	27	29	100%	60	30
20	22	24	100%	60	30
15	17	19	100%	60	30
10	12	14	100%	60	30
5	7	9	100%	60	30
0	2	4	100%	60	30
-5	-3	-1	100%	60	30
-10	-8	-6	100%	60	30

- Implementation of this ECRM will have no negative impact on occupant health or safety.
- A technician from a control contractor will be needed to install the necessary equipment, commission the system and program the system.
- There would be no impact on the occupant service capabilities and the current operating and maintenance procedures can still be followed.
- The average percent reduction in fan speed was estimated based on typical active operating hours for the building.
- BIN weather data was used to determine the average outside air temperatures throughout the year for this location, actual savings will vary from year to year.
- If the 50 ton unit does have a return fan, the return fan should also have a VFD installed on it to ensure the proper building pressure is maintained. This would increase the implementation cost of the measure, but would have increased energy savings.

- Conservative fan laws were used to determine the fan energy savings at the proposed average fan speed.
- A Microsoft Excel™ spreadsheet was used to determine the energy savings.

Table 6.6: Energy and Cost Savings Summary

Demand Savings (kW)	0
Energy Savings (kWh/yr)	37,960
Energy Savings (therms/yr)	0
Greenhouse Gas Savings (metric tons/year)	27.26
Cost Savings ($/yr)	$3,265
First Cost ($)	$4,700
Payback (Yrs)	1.4
Incentive ($)	$1,500

6.2 Capital Investment Measures

6.2.1 Upgrade Existing Lighting Systems in Office and Break Areas

Objective: It is recommended that the existing fluorescent T-12 lamp fixtures and incandescent lights in the office and break areas be replaced with 28 W T-8 lamps and compact fluorescent (CFL) bulbs, respectively.

Issues, Observations, and Recommendation:

The facility currently uses T-12 fluorescent lamps with magnetic ballasts in its office and break areas and incandescent lights in some office areas. While these lights provide adequate light, the bulbs and ballasts are inefficient. The light levels measured in the office and break areas were higher than the standards published by the Illuminating Engineering Society of North America (IESNA). The facility has 200 T-12 fixtures (a mixture of U-shaped and linear) as well as 24 incandescent lights.

Proposed Change:

It is recommended that the existing T-12 lamp fixtures and associated magnetic ballasts be replaced with energy efficient T-8 lamp fixtures and electronic ballasts, and that the incandescent bulbs be replaced with CFL bulbs. Electronic ballasts are required to operate the new T-8 lamps, and are a significant improvement over the current magnetic ballasts which are inefficient. Current T-12 lamps can be replaced with 28 W T-8 lamps that will produce increased lumen levels while reducing energy consumption. The 28 W fluorescent T-8 also increases the lamp life compared to the existing T-12 fixtures while reducing electrical demand. The 28 W T-8 lamps will produce 105% of the light generated by the current 34 W T-12 lamps. Similarly the incandescent bulbs can be replaced with energy efficient CFL bulbs which will provide more light with increased life and reduced energy use.

Economic Summary:

The implementation cost for this recommendation consists of the cost of the new T-8 fluorescent lamps, the electronic ballasts, CFL bulbs and the installation cost. The total material cost for 802 lamps (24 CFL, 22 U-shaped, and 756 4' linear) and 389 electronic ballasts is $12,656. The labor cost for this measure is based on one hour per magnetic fixture and fifteen minutes per incandescent bulb replaced of the facility staff's time at a rate of $50/hour for a total labor cost of $6,419. The implementation cost for this measure is then $19,075 with an associated simple payback of 3.7 years. ComEd is currently offering an incentive of $6/electronic ballast for a rebate of $2,334, as well as a rebate of $0.30/W reduced for a potential rebate of $3,704. The total implementation cost for this measure is $19,075, after rebates is $13,037. The total annual cost savings of $5,224/yr yields a simple payback after rebates of 2.5 years. While the facility will continue to need to replace burnt out bulbs this measure will persist indefinitely.

Table 6.7: Current Lighting Energy Use

Building Area	Lamp Fixture Description	Number of Fixtures	Usage Time (hr/yr)	Fixture Power (W)	Total Energy Usage (kWh/yr)
Warehouse Break Room	4 ft, 4 x 34W T-12 FL fix; 2 mag ballasts	23	7,488	163	28,073
Warehouse Break Room	4 ft, 4 x 32W F32T8/SP35; 1 elec ballast	2	7,488	128	1,917
Warehouse Break Room	2 x 35W T12 Cool White, 6" Bend	11	7,488	84	6,919
Office Area	4 ft, 4 x 34W T-12 FL fix; 2 mag ballasts	84	3,120	163	42,719
Offices and Break Room	4 ft, 4 x 34W T-12 FL fix; 2 mag ballasts	42	3,120	163	21,360
Offices and Break Room	1 x 100W incand. lamp	6	3,120	100	1,872
Conference Room	1 x 150W incand. lamp	18	3,120	150	8,424
Plant Restroom	4 ft, 4 x 34W T-12 FL fix; 2 mag ballasts	28	7,488	163	34,175
Office Restroom	4 ft, 4 x 34W T-12 FL fix; 2 mag ballasts	10	3,120	163	5,086
Total	---	**224**	---	---	**150,545**

Table 6.8: Proposed Lighting Energy Use

Building Area	Lamp Fixture Description	Fixture Power (W)	Total Energy Usage (kWh/yr)
Warehouse Break Room	4 ft, 4 x 28W F28T8/Sp30/Umx/Eco; 2 elec ballasts	112	19,289
Warehouse Break Room	4 ft, 4 x 28W F28T8/Sp30/Umx/Eco; 2 elec ballasts	112	1,677
Warehouse Break Room	2 x 32W T8 RE 735 Phosphor 6" Bend	64	5,272
Office Area	4 ft, 4 x 28W F28T8/Sp30/Umx/Eco; 2 elec ballasts	112	29,353
Offices and Break Room	4 ft, 4 x 28W F28T8/Sp30/Umx/Eco; 2 elec ballasts	112	14,676
Offices and Break Room	1 x 40W CF lamp w/ elec ballast	40	749
Conference Room	1 x 23W CF lamp w/ mag ballast	28	1,572
Plant Restroom	4 ft, 4 x 28W F28T8/Sp30/Umx/Eco; 2 elec ballasts	112	23,482
Office Restroom	4 ft, 4 x 28W F28T8/Sp30/Umx/Eco; 2 elec ballasts	112	3,494
Total	---	---	**99,564**

- Implementation of this ECRM will have no negative impact on occupant health or safety.
- There would be no impact on the occupant service capabilities and the current operating and maintenance procedures can still be followed.
- A Microsoft Excel™ spreadsheet was used to determine the energy savings.

Table 6.9: Energy and Cost Savings Summary

Demand Savings (kW-mo/yr)	12.3
Energy Savings (kWh/yr)	50,981
Energy Savings (therms/yr)	0
Greenhouse Gas Savings (metric tons/year)	36.60
Cost Savings ($/yr)	$5,224
First Cost ($)	$19,075
Payback (Yrs)	3.7
Incentive Available ($)	$6,038

6.2.2 Replace Open Blowing of Compressed Air with Fans

Objective: Utilize fans to remove steam from the facility's process ovens, instead of compressed air.

Issues, Observations, and Recommendation:

The facility has four process ovens used throughout production. These ovens generate large amounts of steam and hot air that needs to be exhausted from the facility. Two of these ovens are equipped with 200 gallon compressed air storage tanks that are used to blast air into the oven after each batch (approximately every 15-20 minutes for each oven throughout production hours), the compressed air tank is typically emptied within a minute. This process is shown in Figure 6.2.

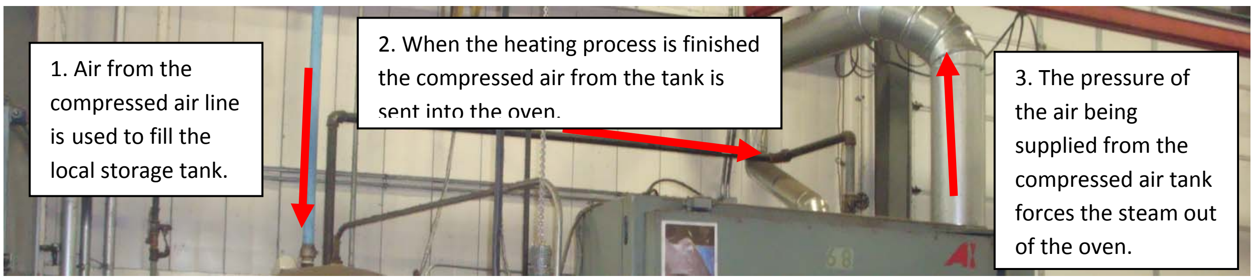

Figure 6.2: Ventilation Process of Ovens [Photo shrunk for generic audit]

Proposed Change:

Compressed air systems are expensive to power and are often essential to plant operation. To minimize operating costs, it is recommended that open blowing processes be eliminated where possible. The facility may be able to eliminate the open blowing process by utilizing fans to remove the steam from the ovens. Analysis was performed on the amount of air that the compressed air tank is currently emptying into the oven, taking into account the change in density of the compressed air from 100 PSI in the storage tank to nearly atmospheric in the oven, the flow of air through the oven is approximately 420 CFM of air at atmospheric pressure. A fan system could be installed that could provide five times the flow of air through the system at a fraction of the energy use of the current compressed air ventilation process. The increased flow is required due to the significantly reduced pressure of the air coming into the oven compared to the compressed air ventilation system. It is recommended that a 2,000 CFM fan be installed on each of the two ovens that use compressed air. This fan should be placed on the existing exhaust duct to draw air from the oven and send it outside.

Economic Summary:
The implementation cost for this measure includes the material cost to purchase the exhaust fans and support brackets, the implementation cost to install the fans, and an additional charge to have the system examined by a contractor to determine if the oven will be adequately ventilated with the proposed fan. A 2,000 CFM exhaust fan can be purchased with brackets for $1,500/fan for a total

material cost of $3,000. The facility can install the fans with two personnel in an 8 hour day for a total of 16 hours at the facility staff's time at a rate of $50/hour, for a total implementation cost of $800. It is recommended that a contractor be brought in with experience in installing process exhaust fans to provide assistance in selecting properly sized fan system, it is estimated that this will require 16 hours of a contractor's time at a rate of $150/hour for a total contractor cost of $2,400. The total implementation cost of this measure will then be $6,200, with energy cost savings of $6,020 this measure will pay back in 1.0 years. This life of a properly maintained fan system is over 15 years.

- Implementation of this ECRM will have no negative impact on occupant health or safety.
- The exact fan that would be able to adequately exhaust the oven has not been determined in this report; it is recommended that an outside contractor with experience in installing process exhaust systems be brought in to help select the correct type of fan.
- There would be no impact on the occupant service capabilities and the current operating and maintenance procedures can still be followed.
- A Microsoft Excel™ spreadsheet was used to determine the energy savings.

Table 6.10: Energy and Cost Savings Summary

Demand Savings (kW)	0
Energy Savings (kWh/yr)	0
Energy Savings (therms/yr)	69,998
Greenhouse Gas Savings (metric tons/year)	50.26
Cost Savings ($/yr)	$6,020
First Cost ($)	$6,200
Payback (Yrs)	1.0

6.3 Unfeasible/Impractical Measures

6.3.1 Install High Efficiency Electrical Motors on Equipment

Premium efficiency motors are 1% to 9% more efficient than standard motors, resulting in a significant decrease in operating costs. Improved design, materials, and manufacturing techniques enable premium efficiency motors to accomplish more work per unit of electricity consumed. These units usually have higher service factors, longer insulation and bearing lives, lower waste heat output, and less vibration, all of which increase reliability. The facility should consider installing premium efficiency motors, as opposed to the current practice of rewinding motors which typically results in 2-3% drop in efficiency each time the motor is rewound. Installing high efficiency motors could save over $10,000 /year, however the high initial cost of premium efficiency spindle motors makes this measure uneconomical.

7.0 Measurement and Verification

7.1 Rational for Measurement and Verification (M&V)

Generally, the long-term effect of energy savings projects is uncertain. This is due to a lack of follow-up or continuous action that creates a climate for enduring, permanent savings. Measurement and verification (M&V), or performance assurance, is a method that provides assurance that energy savings will continue over time.

Measurement and verification (M&V) is intended to provide for ongoing accountability and optimization of building energy consumption performance over time. The International Performance Measurement and Verification Protocol (IPMVP) is the reference standard for the development of site-specific M&V plans.

Energy savings are determined by comparing energy use associated with a facility, or certain systems within a facility, before and after Energy Reduction Measures (ERM) are implemented. The "before" case is called the baseline model. The "after" case is the post-installation model. Baseline and post-installation models can be constructed using the methods associated with M&V options A, B, C and D as described in the International Performance Measurement and Verification Protocol (IPMVP).

Performance of equipment, both before and after a retrofit, can be measured with varying degrees of accuracy. Savings, or more appropriately, energy cost avoidance, is the calculated difference between the measured performance of an ECRM and the amount of energy that the system/building ***would use*** in the absence of the retrofit. The baseline energy usage is created using measured equipment performance data prior to the retrofit coupled with assumptions about how the equipment will operate in the post-installation period.

7.2 Facility (M&V) Recommendations

Measure #	Measure Name	Equipment Needed	Verification Method
6.1.1	Install Outside Air Intake to Serve Compressor	None	Examine the compressor's air intake to ensure the duct has been properly installed..
6.1.2	Install Occupancy Sensors in Selected Areas	None	Verify visually that the occupancy sensors are controlling lights in the selected areas.
6.1.3	Turn Off 50 Ton Unit when Areas are Unoccupied	None	Trend the amp draw on the 50 ton unit to verify that it is turning off correctly.
6.1.4	Install Variable Frequency Drive on 50 Ton Unit	None	Verify visually the speed at which the VFD operates over various outside air temperatures.
6.2.1	Upgrade Existin Lighting Systems in Office and Break Areas	None	Verify visually that the existing lighting has been replaced with luminaries featuring lower wattage T-8 Lamps and electronic ballasts or compact fluorescent bulbs.
6.2.2	Replace Open Blowing of Compressed Air with Fans	None	Verify Visually that the ovens have been disconnected from the compressed air line and that the exhaust fan has been installed.

8.0 Recommendations for Level III analysis

8.1.1 Install Infrared Heaters in the Production Area

The facility continuously brings in and exhausts a large amount of air in the production area. This results in a higher heating load on the production area. The facility currently uses direct fired heaters on the makeup air unit (MAU) to provide the majority of the heat to the space. The facility may be able to decrease the use of the MAU heater by installing infrared heaters in the production areas. Infrared heaters provide heat directly to objects and people through the use of radiation, as opposed to direct fired heaters which heat air and then use convection to carry the heat to the people in the area. Due to the large amount of air being exhausted and brought in the current direct fired method may not be the best way to heat the facility. Savings from this measure would be from decreasing the discharge temperature of the air from the MAU to the space, which would reduce the use of the MAU's heater. Additional heating would then be provided by infrared heaters located throughout the space to ensure a comfortable temperature in the area. The benefits of using infrared heating as the primary heat source is that less heat would escape through infiltration and exhausting since the heat would be located at the ground level as opposed to direct fired heaters which can have significant stratification. A well designed infrared heating system can reduce the natural gas use of a heating system by 20%, which could result in an annual natural gas savings of 15,819 therms/year (assuming 80% of the annual heating load is in the production area).

The facility currently has some infrared heaters for localized heating; this measure would increase the number of infrared heaters in the production area so that the majority of the heat is provided through the infrared heaters. This measure needs further analysis to determine the number and size of infrared heaters that would need to be added to the space to provide a majority of the heat in the system, as well as a further analysis on how the MAU heater operates.

9.0 Report Fulfillment of ASHRAE Requirements

Table 9.1: Acknowledgement of Satisfying ASHRAE Level I Energy Audit Report Requirements

Requirement Number	Requirement	Section Containing Requirement	Acknowledge with a Check Mark
1	A summary of energy use and cost associated with each end-use. Show calculations performed or quote the name and version of software used and include both input and output pages. Provide interpretation of differences between actual total energy use and calculated or simulated end-use tools.	5.0	✓
2	A description of the building, including typical floor plans and inventories of major energy using equipment. (This information may be included in an appendix.)	3.0 & 4.0 and Appendix D	✓
3	A list of measures considered but felt to be impractical, with brief reasons for rejecting each.	6.3	✓
4	For each practical measure, provide:	6.1 & 6.2	✓
	- A discussion of the existing situation and why it is using excess energy; - An outline of the measure, including its impact on occupant health, comfort, and safety; - A description of any repairs that are required for a measure to be effective; - The impact on occupant service capabilities, such as ventilation for late occupancy or year-round cooling; - An outline of the impact on operating procedures, maintenance procedures, and costs; - Expected life of new equipment, and the impact on the life of existing equipment; - An outline of any new skills required in operating staff and training or hiring recommendations; and - Calculations performed or provide the name and version of software used and include both input and output data.	6.1 & 6.2	✓
5	A table listing the estimated costs for all practical measures, the savings, and financial performance indicator. For the cost of each measure, show the estimated accuracy of the value quoted. This table should spell out the assumed sequence of implementation and state that savings may be quite different if a different implementation sequence if followed	2.0	✓ ✓
6	A discussion of any differences between the savings projected in this analysis and the estimated potential derived in the Level I analysis.	N/A	N/A
7.	Overall project economic evaluation	2.0	✓
8.	Recommended measurement and verification method(s) that will be required to determine the actual effectiveness of the recommended measures.	7.0	✓
9	Discussion of feasible capital-intensive measures that may require a Level III analysis.	8.0	✓

10.0 Appendices

10.1 ASHRAE Audit Data Forms

Audit Forms were in the form of notes taken during walk through audit. Audit forms can be found in Section 5 of this report. Notes are available upon request.

10.2 Utility Information

Plots of the electrical and natural gas usage are provided in section 5.3 of this report. The natural gas and electrical usage is also given below in tabular format:

Electricity Usage Data			
Billing Date	**kWh Usage**	**kW**	**Cost ($)**
Apr-10	167,871	363	$14,437
May-10	163,684	351	$14,077
Jun-10	162,053	451	$13,937
Jul-10	201,918	450	$17,365
Aug-10	212,636	409	$18,287
Sep-10	169,434	456	$14,571
Oct-10	217,571	423	$18,711
Nov-10	188,445	413	$16,206
Dec-10	209,458	430	$18,013
Jan-11	220,668	430	$18,977
Feb-11	186,951	439	$16,078
Mar-11	219,828	456	$18,905
Annual Total	**2,320,517**	**-**	**$199,564**

Natural Gas Usage Data		
Billing Date	**Therms**	**Cost ($)**
Mar-10	18,465	$11,770
Apr-10	18,465	$11,770
May-10	5,685	$2,757
Jun-10	2,550	$1,046
Jul-10	242	$106
Aug-10	202	$103
Sep-10	242	$121
Oct-10	494	$0
Nov-10	4,163	$0
Dec-10	12,698	$0
Jan-11	23,231	$1,114
Feb-11	21,249	$4,056
Annual Total	**107,685**	**$32,842**

Company is supplied by two major energy types: electricity and natural gas. The facility consumed about 2,300,000 kWh of electricity and about 107,000 therms of natural gas over the twelve-month period ending with bills issued during March 2011 for electricity and February 2011 for natural gas.

10.2.1 Electric Rates

According to the most recent electric bill available to [ENERGY AUDITOR NAME], electricity is delivered to Company by ComEd and supplied through Direct Energy. Company is charged a flat around the clock rate for electricity consumption. The Basic Electric Service and Retail Delivery Service sections of the current ComEd tariff describe the charges to which Company is subject. Table 10.1 summarizes the current utility rate structure for electricity at Company. The building belongs to the 100 to 400 kW rate class.

Table 10.1: Electric Utility Rate Structure

Table Space	ComEd Account Number	Meter Number	Rate Class
Company	[Numbers]	[Numbers]	R74, Retail Delivery Service (100 to 400 kW)

The monthly electric bill for the facility consists of charges for supply services through Direct Energy (electricity supply charge, transmission services charge, and purchased electricity adjustment) and delivery services (customer charge, standard metering charge, distribution facilities charge, various required fees for state-mandated programs operated by ComEd), and various taxes (franchise cost, state tax, municipal tax).

Table 10.2 contains a full list of itemized charges that comprise each electric bill. The individual rates for delivery reflect the March 2011 bill; the individual rates for supply are annual averages calculated from published tariff rates for the previous twelve months. The analysis shown below is for the larger of the two electric meters.

Table 10.2: Electricity Bill Components

Electricity Bill Components	Rate
Delivery (ComEd)	
Customer Charge ($/Month)	$19.81
Standard Metering Service Charge ($/Month)	$9.68
Distribution Facilities Charge ($/kW)	$5.67
Smart Meter Program ($/Month)	$1.01
Environmental Cost Recovery ($/kWh)	$0.00015
Energy Efficiency Programs Charge ($/kWh)	$0.00112
Local Government Compliance ($/kWh)	N/A
Franchise Cost (%)	2.506%
State Tax ($/kWh)	$0.00306
Municipal Tax ($/kWh)	N/A
Supply (Direct Energy)	
Electricity Supply Charge ($/kWh)	$0.08166
Transmission Services Charge ($/kWh)	N/A
Purchased Electricity Adjustment ($/kWh)	N/A

The marginal electricity cost is associated with ComEd charges for delivering kWh and Direct Energy supplying the kWh and specifically excludes fixed monthly costs and demand charges. The demand cost is equivalent to the ComEd distribution facilities charge. The marginal electricity and demand costs presented below in Table 10.3 are used to determine energy and demand cost savings for Company, these rates include the energy rates of the second meter to determine a weighted average rate for the entire facility. The around-the-clock rate is an time average cost of electrical energy for any equipment that is operating 24/7.

Table 10.3: Marginal Electricity and Demand Costs

Space	Marginal Electricity Cost ($/kWh)	Demand Cost ($/kW)
Company	$0.08600	$5.68

10.2.2 Electric Rate Structure Comparison

Company large electric account is classified in the 100 to 400 kW rate class. This class has been deregulated by the Illinois Commerce Commission, meaning that the facility is able to find a supplier on the market. The facility has chosen the option to shop for alternative retail electric supply and has been purchasing electrical energy from Direct Energy. Regardless of the choice of supplier, ComEd will continue to serve as the delivery company.

10.2.3 Natural Gas Rates

According to the most recent natural gas bill available to [ENERGY AUDITOR NAME], natural gas is supplied to the facility by Santanna Energy Services and delivered by Nicor Gas. The Nicor Gas account number is [Number].

Table 10.4 contains a full list of itemized gas charges that comprise each gas bill. The individual rates for delivery reflect the February 2011 bill; the individual rate for supply is the annual weighted average calculated from gas charges and usage for twelve consecutive months from March 2010 to February 2011.

Table 10.4: **Natural Gas Billing Components**

Natural Gas Bill Components	Rate
Delivery (Nicor Gas)	
Customer Charge ($/Month)	$137.89
Delivery, First 150 Therms ($/Therm)	$0.1201
Delivery, 151 to 5,000 Therms ($/Therm)	$0.0549
Delivery, Over 5,000 Therms ($/Therm)	$0.00482
Environmental Cost Recovery ($/Therm)	$0.0022
Government Agency Compensation Adjustment ($/Month)	$0.03
Franchise Cost Adjustment ($/Month)	$0.28
Efficiency Program ($/Month)	-$0.03
Municipal Utility Tax for Elk Grove Village (%)	5.15%
Utility Fund Tax (%)	0.1%
State Revenue Tax ($/Therm)	$0.024
Supply (Santanna Energy Services)	
Natural Gas Charge ($/Therm)	$0.50131

The marginal natural gas costs are associated with Nicor Gas charges for delivering and Santanna Energy Services for supplying therms and specifically exclude fixed monthly costs. The marginal natural gas costs presented below in Table 10.5 are used to determine energy cost savings for Company.

Table 10.5: **Marginal Natural Gas Costs**

Space	Usage Tier	Marginal Natural Gas Cost ($/Therm)
Company	First 150 Therms	$0.65775
	151 to 5,000 Therms	$0.59248
	Over 5,000 Therms	$0.58578

10.3 Calculations for Recommended Strategies

All tables used for calculating savings are given in the section appropriate to the specific measure. Calculation files are available upon request in Microsoft Excel Format.

10.4 Supporting Photographs

All photographs relevant to the suggested recommendations are provided in section 6.

10.5 Utility Incentive Information

ComEd Smarts Ideas indoor lighting Incentive Information:
https://www.comed.com/Documents/BusinessSavings_Programs/IndoorLightAppSpecial.pdf

ComEd Smarts Ideas Custom Project Incentive Information:
https://www.comed.com/Documents/BusinessSavings_Programs/CustomApp.pdf

Custom Rebates can be applied to any project that improves the overall efficiency of the building. Rebates range from $0.03 - $0.07 per kWh saved. To comply with incentive requirements, additional measurement and analysis may need to be completed to verify kWh savings.