ENERGY CONSERVATION STUDY
And
EQUIPMENT SURVEY

For:

The Scio Central School District
3968 Washington Street
Scio, New York 14880

March 23, 2010

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ENERGY CONSERVATION STUDY
And
EQUIPMENT SURVEY

A. Overview

The intent of this report and survey is to review the existing Scio CSD infrastructure and to identify energy saving solutions, as well as alternative energy solutions for the district. The main building is a two floor K-12 public school of 107,636 square feet, and originally constructed in 1938. This report documents audit findings and reviews recommended retrofit and replacement measures, including a description of existing conditions, mechanical equipment list, proposed retrofit, energy and cost saving measures, associated payback periods for the building mentioned above.

B. Energy Evaluation

The utility bills for the facility have been evaluated and the results of that analysis reviewed for anomalies. An energy benchmark analysis is on the following page. This analysis compares the operational characteristic of the facility from a "cost to operate" point of view.

From the results of this analysis, the existing facilities are operating at roughly the national average cost for this type of facility. What is lost in this comparison under the energy star program is a true reconciliation to the cost of energy geographically. Specifically, electrical energy in the Northeast is approximately 25% above the national average.

Many times there are interesting points that arise from the review of the energy bills, which are best depicted on the graphs. Examples include the escalation of KWH usage in September, October, and into November. This may be indicative of operation of outdoor sports/security lighting for increasing hours as the days grow shorter. In general there are no anomalies which are concerning from the graphic analysis. The school has a standard use profile based on seasonal influences and is not indicative of obvious problems. Also of interest is the electrical use profile, which depicts a relatively normal 200,000 KBTU's (60,000 KWH) per month, but cost variances for that use. The winter activities are explained above, however there are anomalies in April's and September's billing amounts, where the billing is low. This is likely originating from reduced demand as daylight savings time moves the demand window out past the hours where security lights and site lighting is on, but before there is a considerable air conditioning load. These are behavioral items, and there is no recommendation for changing operations. It is offered as a discussion of understanding of how items such as lighting or air conditioning can make a significant impact on demand charges.

Energy Benchmark Report

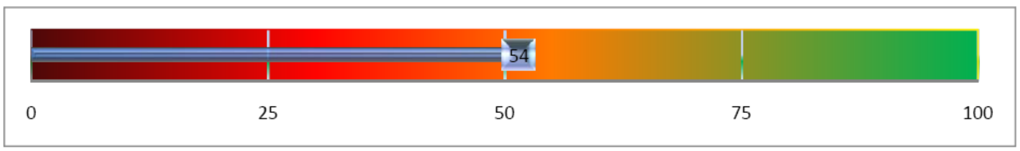
Energy Performance:

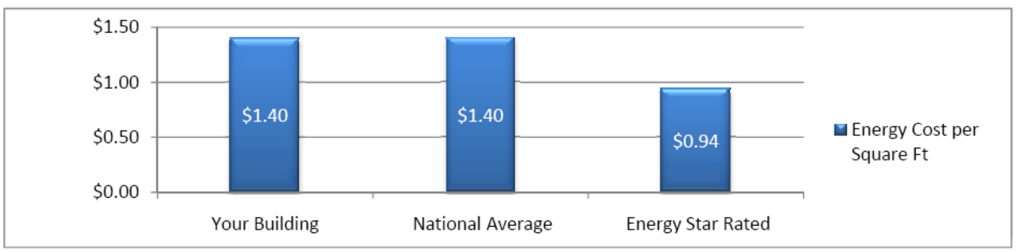
The building evaluated has	107,000	Ft^2		
and a total annual energy spend of	$149,637	or	$1.40	per square foot
for the evaluation period from	January-09	through	December-09	

This is 0% higher than the industry average, based on the Commercial Building Energy Consumption Survey (CBECS) conducted by the U.S. Department of Energy

This building's Energy Utilization Index (EUI) is	81	kbtu per square foot
National EUI average of a building in this classification	81	kbtu per square foot
ENERGY STAR rating for a building of this type	54	kbtu per square foot

The ENERGY STAR Energy Performance Rating for this building is 53





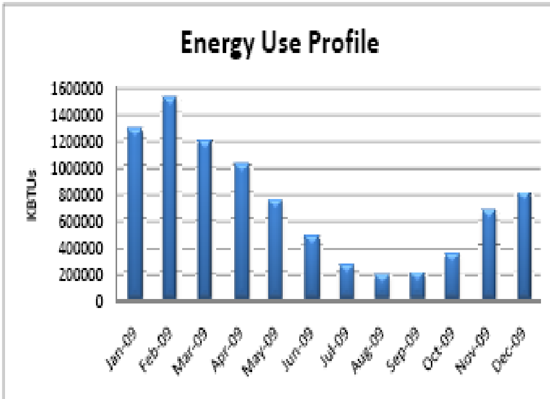
Opportunity for Improvement:

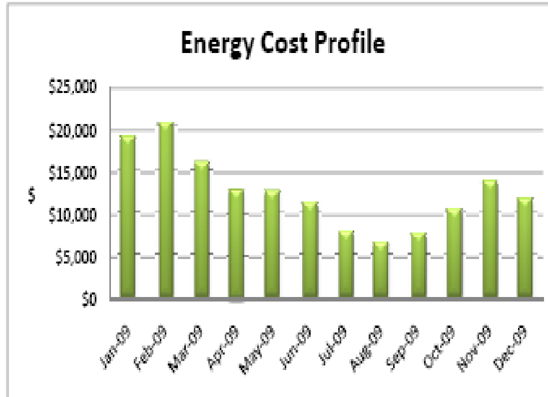
While an onsite assesment is required to evaluate specific energy conservation opportunities, broad statements about energy savings potential can be made by comparing the performance of this building to the Energy Star database and the U.S. Department of Energy CBECS analysis.

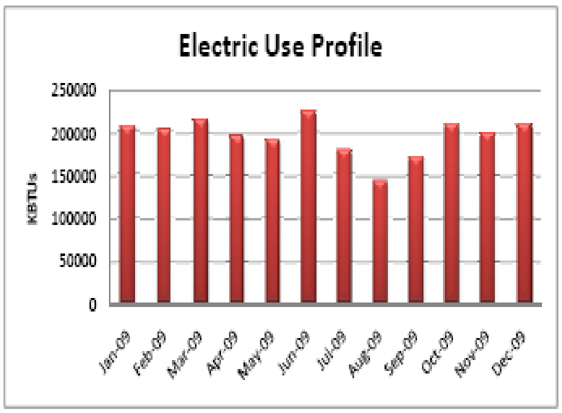
If the energy performance of this building were improved to meet the national average and/or the level required for Energy Star certification (an Energy Star rating of 75), the following savings would result.

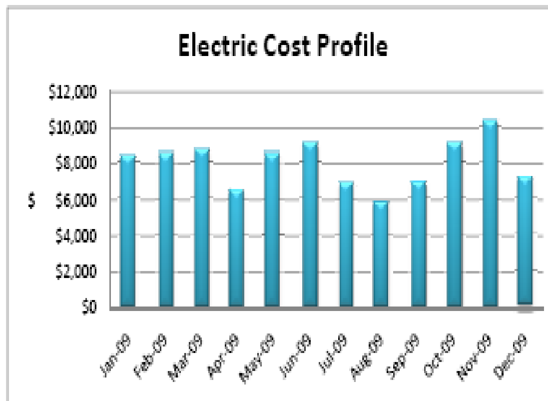
	Savings Potential Compared To	
	National Average	Energy Star
$	-$689	$49,419
$ per sq. ft	-$0.01	$0.46

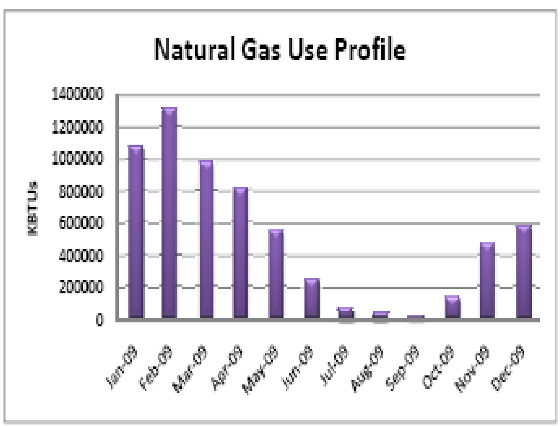
Scio CSD

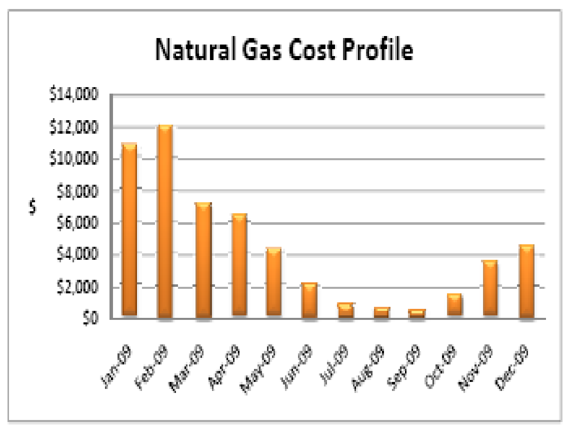

Energy Use Profile
KBTUs
1600000
1400000
1200000
1000000
800000
600000
400000
200000
0
Jan-09 Feb-09 Mar-09 Apr-09 May-09 Jun-09 Jul-09 Aug-09 Sep-09 Oct-09 Nov-09 Dec-09


Energy Cost Profile
$
$25,000
$20,000
$15,000
$10,000
$5,000
$0
Jan-09 Feb-09 Mar-09 Apr-09 May-09 Jun-09 Jul-09 Aug-09 Sep-09 Oct-09 Nov-09 Dec-09


Electric Use Profile
KBTUs
250000
200000
150000
100000
50000
0
Jan-09 Feb-09 Mar-09 Apr-09 May-09 Jun-09 Jul-09 Aug-09 Sep-09 Oct-09 Nov-09 Dec-09


Electric Cost Profile
$
$12,000
$10,000
$8,000
$6,000
$4,000
$2,000
$0
Jan-09 Feb-09 Mar-09 Apr-09 May-09 Jun-09 Jul-09 Aug-09 Sep-09 Oct-09 Nov-09 Dec-09


Natural Gas Use Profile
KBTUs
1400000
1200000
1000000
800000
600000
400000
200000
0
Jan-09 Feb-09 Mar-09 Apr-09 May-09 Jun-09 Jul-09 Aug-09 Sep-09 Oct-09 Nov-09 Dec-09


Natural Gas Cost Profile
$
$14,000
$12,000
$10,000
$8,000
$6,000
$4,000
$2,000
$0
Jan-09 Feb-09 Mar-09 Apr-09 May-09 Jun-09 Jul-09 Aug-09 Sep-09 Oct-09 Nov-09 Dec-09

C. HVAC Systems

A complete survey of the mechanical equipment was made at the school. This information is tabulated in a spreadsheet and will be forwarded to the school electronically for their record, and is included as an appendix in this report

The Scio CSD HVAC system consists of a Primary/Secondary Variable Pumped Hot Water System consisting of Four (4) CNN 1800 Lochinvar Boilers, each with dedicated circulation pump. All secondary pumping systems are variably pumped.

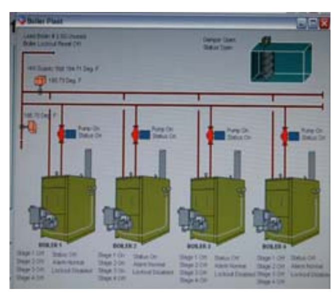
Typical classrooms are served by Unit Ventilators with outside air intake through dedicated unit wall louvers.

There are rooftop units that provide cooling to areas such as offices, large group instructional areas and the auditorium.

There was a Performance Contract completed in 1997/1999 which provided most of the upgrades for the facility related to energy. This project included the boiler and pump upgrades, the Control System Upgrade (KMC), and general HVAC upgrades. This project provided the energy direction for the school

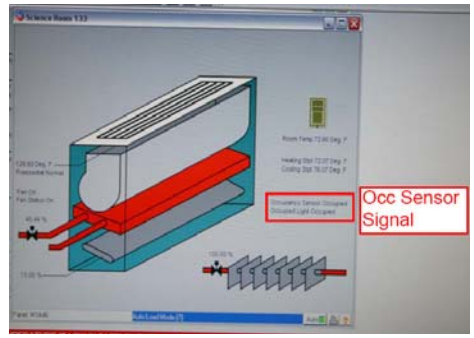
Options/Recommendations

Boiler Systems – The current boiler systems are approximately 88% efficient systems, and are considered to be on the higher end of the efficiency scale. The facility currently uses approximately 63,000 therms of natural gas a year at a cost of approximately $54,000 per year. Outside of winter operation, there may be an opportunity to achieve condensing temperatures in the hot water systems which would allow the operational efficiencies to increase to approximately 92% as an average. Under this basis, approximately 6,300 MMBTU's of energy would be provided to the facility and would be combusted at an efficiency of 92% rather than 88%. This amounts to approximately $1,650 in energy savings based on available condensing temperature operation. Converting the boiler plant to a 92% efficient plant would be on the order of $100,000 for the equipment alone, which provides a simple payback of approximately 60 years. Thus, this upgrade is not recommended.



Controls – The control systems is a KMC system, installed by the Joseph Davis Corporation in 1997. The system is currently service by Carrier Corporation.

The control system installation is well thought out and complete. There are many energy conservation measures which are included in the integration of the system which are not integrated into typical systems today. Simply stated, the installation is complete, and ahead of its time. As an example, the room occupancy sensors are tied into the classroom unit ventilator operation, and puts the unit ventilators in individual classrooms in unoccupied mode whenever the room sensor signals the unoccupied condition. An example unit is shown at right.



Each control system page was reviewed and inspected for operation, and was well implemented. Time of day scheduling existing for all large group areas.

Thus, there are no recommendations for operational changes within the controls.

Rooftop Units

There is a variance of rooftop units which are present at the site, dating from 1997 to 2007 Each of these units has an SEER value between 8 and 13 SEER. SEER is a performance ratio based on seasonal use of input energy to output cooling delivered. As an example, an 8 SEER unit will provide 8,000 btuh of cooling (2/3 ton) per 1 Kilowatt Input, and a 12 SEER unit will provide 12,000 btuh of cooling (1 ton) per 1 Kilowatt. In this example a 12 SEER unit will use 50% less energy to deliver 1 ton of air conditioning than a 8 SEER unit. At face value there is a substantial savings here, 50%. What is important to keep in mind is that there is approximately 30,000 KWH which is used for cooling during summer months. At a blended cost, this equates to $3,600 per year. Assuming all units where operating at a SEER of 8, and 13 was an attainable number, this amounts to an operational pool of money to finance replacements of $1384 per year. Thus, these units should not necessarily be replaced on efficiency as much as they should on age and reliability. At the time of replacement, high efficiency selections should be made. SEER 14+ units would be appropriate.

Air-to-Air Recovery Systems

Air to air heat recovery units, while not a practical installation option, are the vehicle to achieving better performance from an energy consumption perspective. Currently, all unit vents handle their outside air directly. It is single pass air, entering the unit vent, mixing with return air from the room, and delivered as conditioned air to the space. For any outside air that comes in, that quantity of air is then relieved from the building at essentially room temperature. So, a typical classroom, ventilating at 400 cfm of outside air, is bringing in 400 “basketballs” full of air a minute from the outside, at the outside condition. On a 0 degree day, at current gas rates, this is approximately $0.40 per hour per classroom. Assuming 6 hours of occupied time, that’s $2.40 per day per classroom.

Air to Air effectiveness would drop this ventilation cost component to $1.20 or less. The architectural layout and existing conditions do not readily allow this conversion, and it is not recommended at this time, but it would be prudent to consider Air To Air ventilation systems for future classroom additions.

C. Lighting Systems

Replace Lighting Systems/Types

The existing lighting Systems for the Scio Central School District are in excellent to satisfactory condition. The building was inspected by a walkthrough on March 18, 2010 to determine possible Energy Conservation Means which could reduce utility costs for the district.

Review of the K-12 building reveals the following observations:

1. All the exit light fixtures installed building wide are energy efficient LED
2. All light fixtures were in good working order an no burned out lamps or ballasts were noted.
3. T8 lamp types where all F032/741 lamps.
4. Inspected ballast types for Flourescent fixtures were all >20% Total Harmonic Distortion (THD).
5. All existing corridor lighting is energy efficient 2 lamp T8, recessed or surface mounted 2x4 fixtures with high efficiency reflectors and acrylic lenses, with the exception of main entrance compact fluorescent pendant fixtures.
6. Typical office lighting consists of 2-lamp T8 recessed 2x4 fixtures with either Parabolic lenses or Acrylic lens with a high efficiency reflector.
7. Cafeteria lighting consisted of 2U-lamp, T8 lamps recessed 2x2 fixtures with Acrylic lenses.
8. HS gymnasium and Elementary Gym/ Auditorium Lighting consist of metal halide fixtures.
9. All mechanical space lighting consists of 1 lamp t8 industrial acrylic wraparound fixtures.
10. All offices, Science Room 122, Computer Room 133, Distance Learning 135 and the classrooms in the High school wing have occupancy sensors installed to shut-off lights in unoccupied condition.

Recommendations:

1. Install lighting controls to turn off or turn down lights in the remainder of the building including corridors and mechanical spaces during all un-occupied periods. Install combined infrared/ultrasound occupancy sensors in all spaces to reduce lighting demand when unoccupied.
2. Gymnasium/Auditorium Options:

a. Option 1:

Install 50% step level HID dimming retro-fit systems in the school gymnasiums. In the case of a school gym, the lamps can be dimmed to provide suitable lighting for sports, assembly, social events, maintenance, and other purposes. The lamps can be dimmed in response to a signal from an occupancy sensor, which can yield energy savings. When the space is occupied again, the lamps will be able to achieve full light output quickly.

b. Option 2:

Replace existing HID fixtures with new High-bay Fluorescent fixtures in same quantities, provide occupancy sensor over-ride so that lights are not operating during unoccupied periods of the school day.

D. Alternative Energy Options

Cogeneration (CHP)

Cogeneration, also referred to as combined heat and power (CHP), has been around since the beginning days of central power. Thomas Edison used cogeneration as early as 1882 in America's first power plant, selling both electricity and the waste heat produced as a byproduct. Industrial facilities that require process heat or steam have long benefited from cogeneration systems that supply both electrical and thermal energy. More recently, building owners and managers have discovered that cogeneration can be a cost-effective source of reliable energy as well as heating and cooling - the highest building operating expense.

A cogeneration system consists of an engine, turbine, or fuel cell (prime mover) that generates on-site electricity plus a heat recovery unit that captures waste heat from the generation process. Cogeneration systems are often connected to an absorption chiller that provides heating and cooling for the central heating, ventilation, and air conditioning (HVAC) system. The absorption chiller, which is powered by thermal energy, replaces a traditional chiller powered by electricity. Cogeneration systems can also heat domestic water for use in the building.

Common equipment options for on-site electricity generation that are compatible with cogeneration include: reciprocating engines, steam turbines, combustion turbines, and combined cycle combustion turbines. Reciprocating engines are the most common and most efficient prime mover used in commercial cogeneration systems today - technologically the most mature of the distributed energy resources, reciprocating engines are manufactured inexpensively and are widely available. Microturbines, fuel cells, and Sterling engines may be economically viable for cogeneration as technology advances.

Cogeneration is not recommended for a number of reasons, ranging from geographic location (service reliability for maintenance) to at risk fluctuation of Natural Gas costs, and minimal summer time thermal load needs.

Solar Photo-Voltaic Technology

As the financial and environmental cost of relying on traditional fossil fuels rises, harnessing the energy of sun proves to be a renewable, clean, and affordable solution for a green future. Solar power is inexhaustible and available anywhere, making it a resource for energy generation.

Solar cells convert solar energy into electricity as part of interconnected module systems that are laminated and framed in a durable, weatherproof package.
PV panel design allows for flexible installation options. A site with unobstructed blue-sky exposure, such as the roof of a commercial building, is a candidate for PV panel installation. For panel installation in the northern hemisphere, maximize southern exposure, especially for the winter season. You can mount a solar system to a roof or use stand-alone pole-mounts, specifically designed to withstand high force wind. Trackers for pole-mounting systems augment fluid-pumping applications.

In grid-tie applications, direct current (DC) from solar modules is transformed into alternating current (AC) via an inverter, which directly supplies power to electric appliances. The surplus supplied by the panels is sent onto the grid and resold. Grid-tie systems use a combination of PV modules, inverters and a network to supply lighting, household power, and energy metering. Architects can combine function and aesthetics by integrating glass panels into building structure and design.

In remote applications, PV systems provide public lighting, assist pumping systems, and enhance telecommunications. PV systems contribute to public lighting by illuminating advertising and road signage or bus shelters.

Commercially viable PV products are made using either crystalline silicon, thin-film, or string-ribbon technologies.

Our current analysis has the payback on these types of systems to be in excess of 30 years without support of grants and financial aid, and thus are not recommended due to the true payback period being in excess of the lifespan.

Geothermal System

Owners of geoexchange systems can relax and enjoy high-quality heating and cooling year after year. Geoexchange systems work on a different principle than an ordinary heating/air conditioning system, and they require little maintenance or attention from owners. Boilers and furnaces must create heat by burning a fuel--typically natural gas, propane, or fuel oil. With geoexchange systems, there’s no need to create heat, hence no need for chemical combustion. Instead, the Earth’s natural heat is collected in winter through a series of pipes, called a loop, installed below the surface of the ground or submersed in a pond or lake. Fluid circulating in the loop carries this heat to the home. An indoor geoexchange system then uses electrically-driven compressors and heat exchangers in a vapor compression cycle--the same principle employed in a refrigerator--to concentrate the Earth’s energy and release it inside the home at a higher temperature. In typical systems, duct fans distribute the heat to various areas.

Vertical Ground Closed Loops are ideal for facilities above 10,000 SF where open space is insufficient, for buildings with large heating and cooling loads, when the Earth is rocky close to the surface, or for retrofit applications where minimum disruption of the landscaping is desired. Contractors bore vertical holes in the ground 150 to 450 feet deep. Each hole contains a single loop of pipe with a U-bend at the bottom. After the pipe is inserted, the hole is backfilled or grouted. Each vertical pipe is then connected to a horizontal pipe, which is also concealed underground. The horizontal pipe then carries fluid in a closed system to and from the geoexchange system. Vertical loops are generally more expensive to install, but require less piping than horizontal loops because the Earth deeper down is alternatingly cooler in summer and warmer in winter.

In summer, the process is reversed in order to cool the facility. Excess heat is drawn from the facility, expelled to the loop, and absorbed by the Earth. Geoexchange systems provide cooling in the same way that a refrigerator keeps its contents cool--by drawing heat from the interior, not by injecting cold air.

Geoexchange systems do the work that ordinarily requires two appliances, a boiler/furnace and an air conditioner. There's no need to exchange heat with the outdoor air. The indoor location also means the equipment is protected from mechanical breakdowns that could result from exposure to harsh weather.

Geoexchange works differently than conventional heat pumps that use the outdoor air as their heat source or heat sink. Geoexchange systems don't have to work as hard (which means they use less energy) because they draw heat from a source whose temperature is moderate. The temperature of the ground or groundwater a few feet beneath the Earth's surface remains relatively constant throughout the year, even though the outdoor air temperature may fluctuate greatly with the change of seasons. At a depth of approximately six feet, for example, the temperature of soil in most of the world's regions remains stable between 45 F and 70 F. This is why well water drawn from below ground tastes so cool even on the hottest summer days.

Studies show that approximately 70 percent of the energy used in a geoexchange heating and cooling system is renewable energy from the ground. The remainder, electrical energy which is employed to concentrate heat and transport it from one location to another. In winter, the ground soaks up solar energy and provides a barrier to cold air. In summer, the ground heats up more slowly than the outside air.

In winter, it's much easier to capture heat from the soil at a moderate 50 F. than from the atmosphere when the air temperature is below zero. This is also why geoexchange systems encounter no difficulty blowing comfortably warm air through a facility's ventilation system, even when the outdoor air temperature is extremely cold.

Conversely, in summer, the relatively cool ground absorbs a facility's waste heat more readily than the warm outdoor air.

However, for all of its benefits, geothermal applications have a difficult time cost justifying themselves in a retrofit application unless there is some cost avoidance from capital expenditure. As an example, if a fan coil system were present in a facility that used chilled water generated from an air cooled chiller, and the chiller and fan coils were scheduled for replacement, there is a cost associated with this work. If this "avoided cost" can be used to discount the cost of the geothermal system, then it would be likely that the geothermal system would provide economic benefit. The corollary, where the existing systems were being removed purely for the purpose of the retrofit, would not provide economic benefit suitable for investment.

E. CONCLUSIONS

The condition of the equipment at the Scio CSD and its current performance is well above the norm. The performance contract from the 1997 project provided a well thought-out upgrade which was integrated completely. Subsequent projects have followed this lead.

The main items of recommendation would be the following:

1. Replace rooftop units with High Efficiency rooftops at the end of the equipments useful life, not as an energy retrofit prior. This type of equipment has a useful life of 15-25 years, depending on use and maintenance. There were no immediate replacements necessarily, but unit replacement should be scheduled.

2. Boilers should remain as is for their useful life, again 15-25 years. At the time of replacement, similar boilers are recommended. The cost of flues and systems for high efficiency boilers over the cost of a straight retrofit by type will not offer an economic advantage.

3. Maintain the control systems and extend the same items/approach as the 1997 Performance Contract. This schools control system is one of the most complete and best operating we have observed.

4. Maintain the same standards, operations and maintenance are at a very high level.

GLOSSARY OF TERMS

AMPERE: A unit of electrical current (amp).

BALANCE POINT TEMPERATURE: The outside temperature which will enable the building's heat loss to remove all the heat generated within the building. Above the balance point air conditioning (A/C) is required, below, additional heat is required.

BALLAST: Device which limits the electrical current to what is needed to start and operate a fluorescent or HID lamp.

BTU: British Thermal Unit. The amount of energy required to raise 1 pound of water 1 degree Fahrenheit at standard atmospheric conditions.

BUILDING CONSTANT: A number that represents the number of Btu's lost or gained per degree (Fahrenheit) difference between the inside and outside temperature of a building.

BUILDING ENVELOPE: The exterior surfaces of a building which are subject to climatic impact such as a roof, outside walls, windows, doors, etc.

CCF: 100 cubic feet. A common measure of natural gas. 1 ccf of natural gas is about 1 therm (100,000 Btu).

CFM: Cubic feet per minute, a common unit of air flow.

COOLING DEGREE DAYS: An index of how hot the year was. Degree days are accumulated whenever the daily average temperature is above 65°F.

COP: Coefficient of performance; Common measure of rating the efficiency of an air-conditioner or heat pump.

EFFICIENCY: The ratio of output to input.

ENERGY: The ability to perform work.

ENERGY CONSERVATION MEASURE: A measure that can be implemented with the potential to reduce energy usage.

ENERGY USE INDEX: The ratio of the Btu used by a facility divided by square footage.

FLOW RESTRICTOR: A device installed in showerhead, faucets, and other hot water lines to reduce water flow.

FOOTCANDLE: A measure of light level.

HEATING DEGREE DAYS: An index of how cold the year was. Degree days are accumulated whenever the daily average temperature is below 65°F.

HID: High Intensity Discharge. Name given to mercury vapor, high pressure sodium and metal halide lamps.

HVAC: Heating, Ventilating, and Air Conditioning; refers to the equipment or process by which the environment within a building is modified for comfort, sanitation, and safety, etc.

INFILTRATION: Uncontrolled air flow into a building through cracks in windows, doors, floors, entrances and other openings.

INSULATION: A material with high resistance to heat flow used to retard the heat loss or gain of a buildings exterior components.

INTERACTIVE SAVINGS: The energy analysis utilized to estimate energy and cost savings using a methodology that accounts for the diminishing interaction between measures. The savings of one measure may negatively affect the savings of another measure if both measures are implemented. For example: If two measures-ceiling insulation and a clock thermostat - were considered and implemented together, part of the savings from the clock thermostat would be offset by savings from the ceiling insulation.

KW: Kilowatt: 1000 watts.

KWH: Kilowatt-Hour: The amount of energy consumed when 1,000 watts are supplied for 1 hour.

LUMEN: The unit of the amount of light produced by a lamp.

R-VALUE: A number used to describe the resistance of a material to heat flow. The higher the R-value the higher the insulation value.

SETBACK: The adjustment of a thermostat to a setting which will reduce consumption of energy.

SEER: Seasonal Energy Efficiency Rating; a common rating of A/C equipment. Is equal to the COP times 3.413.

SIMPLE PAYBACK: Payback calculations are based on projected yearly energy savings in 1996 dollars and the estimated cost of construction (including any required engineering and design fees) in 1996 dollars. Simple payback has been calculated as follows: Payback = Cost/Savings. Fuel cost has not been escalated but is expected to at least keep pace with the annual rate of inflation; therefore the calculation will reflect payback in real dollars.

SOLAR HEAT GAIN: Heat from the sun, as it impacts the interior spaces of a building, or zone within a building.

THERMOSTAT: A device that automatically activates equipment such as furnaces, air conditioners, etc., in response to a temperature change.

VENTILATION: The process of supplying and removing air by natural and mechanical means in order to maintain air quality.

WATT: Unit of electrical power. A watt is the energy equal to one amp flowing under a potential of one volt. (3.412 Btu/hr).

CONVERSIONS

1 Btu (British Thermal Unit)	= Heat required to raise 1 lb. of water 1 degree Fahrenheit
1 Therm	= 100,000 Btu
1 Kilowatt	= 1000 Watts
1 Kilowatt-Hour	= 3413 Btu
1 Ton of Refrigeration	= 12,000 Btu per Hour
1 Horsepower	= 746 Watts = 2545 Btu per Hour

FUEL HEATING VALUES (APPROXIMATE)

No. 2 Fuel Oil	138,700 Btu per Gallon
Natural Gas	1000 Btu per Cubic Foot 100,000 Btu per ccf
Propane	21,490 Btu/lb.
Electricity	3,413 Btu per Kilowatt Hr

EQUIPMENT SURVEY Scio Central School District (CUSTOMER/LOCATION) DATE________________________

Unit ID	Manuf	Type of equip	Model	Serial	Manuf. Date	BTUH input	efficiency	Cooling tonnage	Seer/eer rating	Motor HP	Motor efficiency	Voltage	Phase	Full load amps	Econo	Unit location	Area Served	Speed Drive on unit
P-1	Armstrong	In-line	816027-002	N/A	Jul-04	N/A	N/A	N/A	N/A	1/3	N/A	115	1	5.4	N/A	Boiler Room	Boiler 1 Pump	No
P-2	Bell and Gossett	In-line	HD-3 M74793	102226 P# MB0121A01	N/A	N/A	N/A	N/A	N/A	1/3	N/A	115/230	1	4.2/2.1	N/A	Boiler Room	Boiler 2 Pump	No
P-3	Bell and Gossett	In-line	M74793	189105	N/A	N/A	N/A	N/A	N/A	1/3	N/A	115/230	1	4.2/2.1	N/A	Boiler Room	Boiler 3 Pump	No
P-4	Bell and Gossett	In-line	M74793	188105	N/A	N/A	N/A	N/A	N/A	1/3	N/A	115/230	1	4.2/2.1	N/A	Boiler Room	Boiler 4 Pump	No
P-5	Bell and Gossett	Base-Mount	1510-1.1-2BC9.5BF	2017808	N/A	96gpm@90 ft. hd.	N/A	N/A	N/A	5	89.5	200	3	14.9	N/A	Boiler Room	Hot Water Loop Pump	Yes
P-6	Bell and Gossett	Base-Mount	1510-1.1-2BC9.5BF	1994256	N/A	96gpm@90 ft. hd.	N/A	N/A	N/A	5	89.5	200	3	14.9	N/A	Boiler Room	Hot Water Loop Pump	Yes
P-7	Bell and Gossett	Base-Mount	2BC-9.0BF-1691	2069590	N/A	130gpm@82ft.hd.	N/A	N/A	N/A	7.5	91.7	200	3	20.9	N/A	Boiler Room	Hot Water Loop Pump	Yes
P-8	Bell and Gossett	Base-Mount	1510-2BC-1704	2069844	N/A	130gpm@82ft.hd.	N/A	N/A	N/A	7.5	91.7	200	3	20.9	N/A	Boiler Room	Hot Water Loop Pump	Yes
P-9	Taco	Base-Mount	FE1510E2E1F2LOA	N/A	Mar-95	87.5gpm@75 ft. hd.	N/A	N/A	N/A	5	90.2	200	3	15	N/A	Boiler Room	Hot Water Loop Pump	Yes
P-10	Taco	Base-Mount	FE1510E2E1F2LOA	N/A	Mar-95	87gpm@75 ft. hd.	N/A	N/A	N/A	5	90.2	200	3	15	N/A	Boiler Room	Hot Water Loop Pump	Yes
P-11	Grundfos	Cartridge Pump	59896155	UP15-42F	N/A	N/A	N/A	N/A	N/A	N/A	N/A	115	1	0.74	N/A	Boiler Room	DOMESTIC Hot water recirc. loop	No
P-12	Grundfos	Cartridge Pump	59896155	UP15-42F	N/A	N/A	N/A	N/A	N/A	N/A	N/A	115	1	0.74	N/A	Boiler Room	DOMESTIC Hot water recirc. loop	No
P-13	Grundfos	Cartridge Pump	59896155	UP15-42F	N/A	N/A	N/A	N/A	N/A	N/A	N/A	115	1	0.74	N/A	Boiler Room	DOMESTIC Hot water recirc. loop	No
P-14	Bell and Gossett	In-line	Series 100 C99	106189	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Boiler Room	Domestic boiler pump	No
B-1	LOCHNIVAR	Copper fin tube boiler	CNN1800	H979014	Jul-97	1,800,000	84%	N/A	N/A	N/A	N/A	120	1	18	N/A	Boiler Room	Hot water heating loop	No
B-2	LOCHNIVAR	Copper fin tube boiler	CNN1800	H979013	Jul-97	1,800,000	84%	N/A	N/A	N/A	N/A	120	1	18	N/A	Boiler Room	Hot water heating loop	No
B-3	LOCHNIVAR	Copper fin tube boiler	CNN1800	H979012	Jul-97	1,800,000	84%	N/A	N/A	N/A	N/A	120	1	18	N/A	Boiler Room	Hot water heating loop	No
B-4	LOCHNIVAR	Copper fin tube boiler	CNN1800	H979015	Jul-97	1,800,000	84%	N/A	N/A	N/A	N/A	120	1	18	N/A	Boiler Room	Hot water heating loop	No
B-5	A.O Smith	Copper coil boiler	HW300932	AO401185	Jun-05	228,000	82%	N/A	N/A	N/A	N/A	120	1	12	N/A	Boiler Room	Domestic Hot water heater	No
A-1	Hankison	Air Compressor	8005-115	0331-101-9807-838N	N/A	N/A	N/A	N/A	N/A	2@1/2	62%full load eff.	115	1	2	N/A	Boiler Room		No
RTU#1	Aaon	Roof top with hot water heat	RM-010-8-0-BA02-EJL	200707-AMWJ02293	2007	N/A	N/A	10	10eer	5	89.5	208	3	15	y	Gym Roof	Gymnasium	No
RTU#2	Aaon	Roof top with hot water heat	RM-010-8-0-BA02-EJL	200707-AMWJ02294	2007	N/A	N/A	10	10eer	5	89.5	208	3	15	y	Gym Roof	Gymnasium	No
RTU#A	WeatherKing	Gas fired Roof top unit	RRGF-400201-CKR	A5321BTRSCG339700575	Aug-97	400,000	80%	20	8.5 eer	5	N/A	208/230	3	16.7	Y	Roof		No
RTU#B	WeatherKing	Gas fired Roof top unit	WKKA-060CK13E	1X5643ADAAF329715131	Aug-97	135,000	81%	5	9.3eer	3/4	N/A	208/230	3	5.4	Y	Roof		No

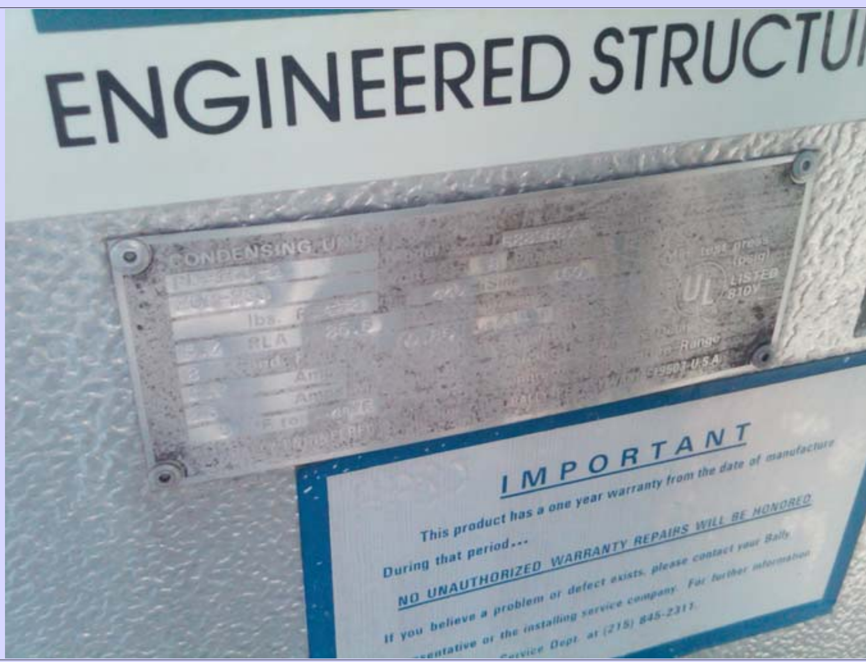
EQUIPMENT SURVEY Scio Central School District (CUSTOMER/LOCATION) DATE________________________

Unit ID	Manuf	Type of equip	Model	Serial	Manuf. Date	BTUH input	efficiency	Cooling tonnage	Seer/eer rating	Motor HP	Motor efficiency	Voltage	Phase	Full load amps	Econo	Unit location	Area Served	Speed Drive on unit
RTU#C	WeatherKing	Gas fired Roof top unit	WKKA-A048CK10E	1X5639ADAAF049711133	Jan-97	100,000	81%	4	9.8eer	1/2	N/A	208/230	3	3	Y	Roof		No
RTU#D	WeatherKing	Gas fired Roof top unit	WKRA-A024JKO8E	1R5169ADAAF119711950	Mar-97	80,000	81%	2	9.1 eer	1/4	N/A	208/230	1	N/A	Y	Roof		No
RTU#E	WeatherKing	Gas fired Roof top unit	RRGF-400201-CKR	A5321BTRSCG339700577	1997	400,000	80	20	8.5 eer	5	N/A	208/230	3	N/A	Y	Roof		No
RTU#F	WeatherKing	Gas fired Roof top unit	RRGF-400201-CKR	A5321BTRSCG339700576	1997	400,000	80	20	8.5 eer	5	N/A	208/230	3	N/A	Y	Roof	Auditorium	No
RTU#G	WeatherKing	Gas fired Roof top unit	RRGF-131065CKR	C4799BTRACG309700289	Jul-97	135,000	81	6.5	9.1 eer	1.5	N/A	208/230	3	N/A	Y	Roof		No
RTU#H	WeatherKing	Gas fired Roof top unit	WKKA-A048CK10E	1X5639ADAAF049711132	Jan-97	100,000	81	4	9.8 eer	.5	N/A	208/230	3	N/A	Y	Roof		No
SS#A	Mitsubishi	Split system condenser	MU-A12WA	6002135T	2002	N/A	N/A	1	13 eer	N/A	N/A	115	1	N/A	NO	Roof		No
SS#B	Lennox	Split system condenser	13ACD-024-230-02	5807D03581	7-Apr	N/A	N/A	2	13	1/5	N/A	208/230	1	N/A	N	Roof		No
SS#C	Rheem	Split system condenser	WAKA-024JAZ	5882-M1997-14266	May-97	N/A	N/A	2	9.1 eer	N/A	N/A	208/230	1	N/A	N	Roof		No
SS#D	WeatherKing	Split system condenser	WAKA-036CAS	4959M249706309	Jun-97	N/A	N/A	3	9.1	N/A	N/A	208/230	3	N/A	N	Roof		No
SS#E	Lennox	Split system condenser	13ACD-036-230-02	5807DO1396	7-Apr	N/A	N/A	3	13	N/A	N/A	208/230	1	N/A	N	Roof		No
SS#F	WeatherKing	Split system condenser	WAKA-048CAS	4968-M2497-06343	Jun-97	N/A	N/A	4	9.1	N/A	N/A	208/230	3	N/A	N	Roof		No
SS#G	WeatherKing	Split system condenser	WAKA-060CAS	4991-M2297-05361	May-97	N/A	N/A	5	9.1	N/A	N/A	208/230	3	N/A	N	Roof		No
SS#7	Carrier	Split system condenser	38H042510DL	2187F41344	1987	N/A	N/A	3.5	9.8seer	N/A	N/A	208/230	3	N/A	NO	Roof		No
SS#X	Bally	Refrigeration Condenser	PN-75N	63050874	N/A	N/A	N/A	N/A	N/A	N/A	N/A	208/230	3	2.3	N/A	Roof	Fridge/Freezer?	No
SS#X	Bally	Refrigeration Condenser	PL150-1	6239587	N/A	N/A	N/A	N/A	N/A	N/A	N/A	208/230	3	5.4	N/A	Roof	Fridge/Freezer?	No

Scio Schools - Energy Study Condenser x nameplate

Scio Schools - Energy Study Condenser X

Scio Schools - Energy Study Condenserx nameplate



Scio Schools - Energy Study Condenserx

Scio Schools - Energy Study RTU1 - 1

Scio Schools - Energy Study RTU1 - 2

Scio Schools - Energy Study RTU1 - 3

Scio Schools - Energy Study RTU2 - 1

Scio Schools - Energy Study RTU2 - 2

Scio Schools - Energy Study RTU2 - 3

Scio Schools - Energy Study RTUA - 1

Scio Schools - Energy Study RTUA - 2

Scio Schools - Energy Study RTUA - 3

Scio Schools - Energy Study RTUB - 1

Scio Schools - Energy Study RTUB - 2

Scio Schools - Energy Study RTUB - 3

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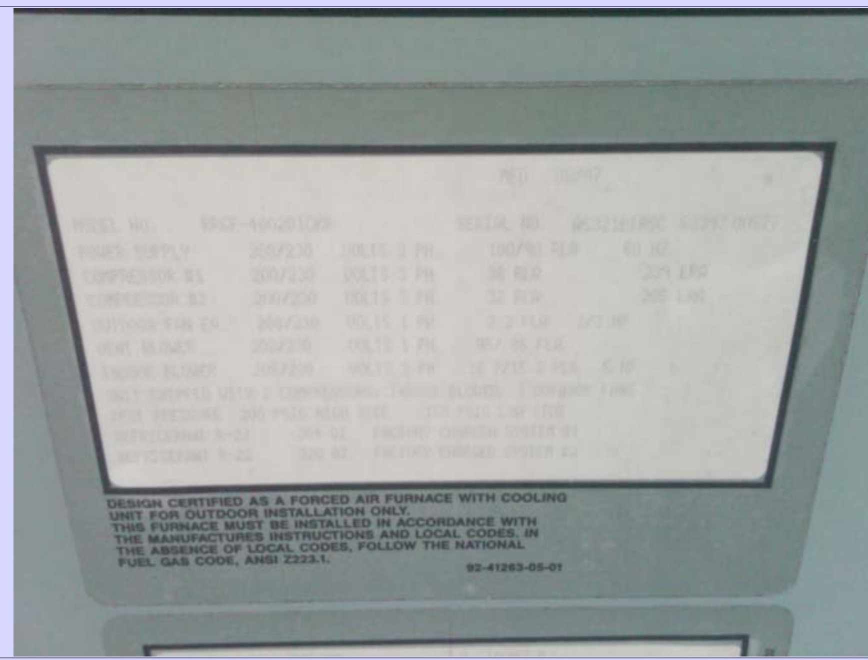
Scio Schools - Energy Study RTUC - 3

Scio Schools - Energy Study RTUE - 1



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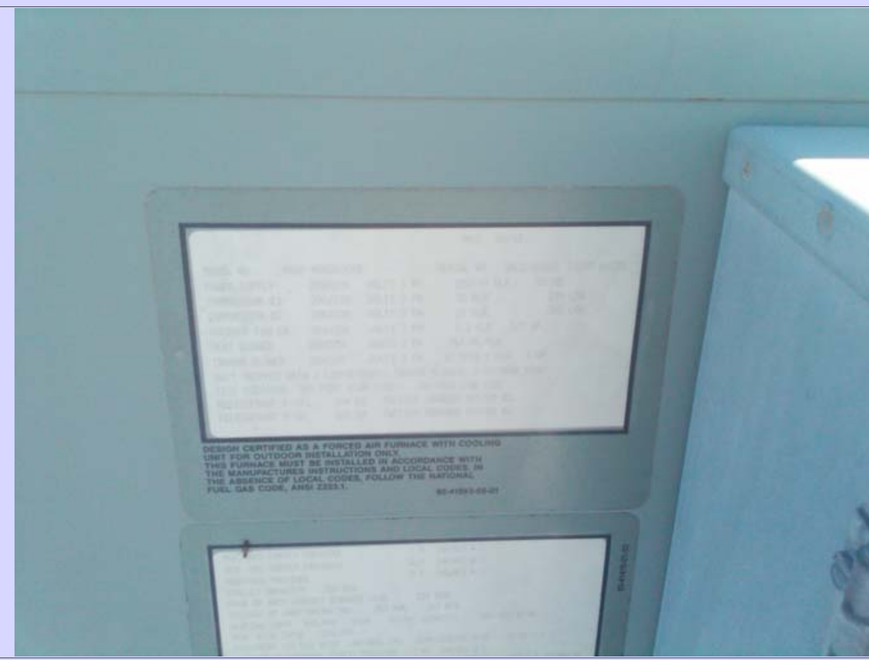
Scio Schools - Energy Study RTUE - 3

Scio Schools - Energy Study RTUF - 1

Scio Schools - Energy Study RTUF - 2



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Scio Schools - Energy Study RTUH - 1

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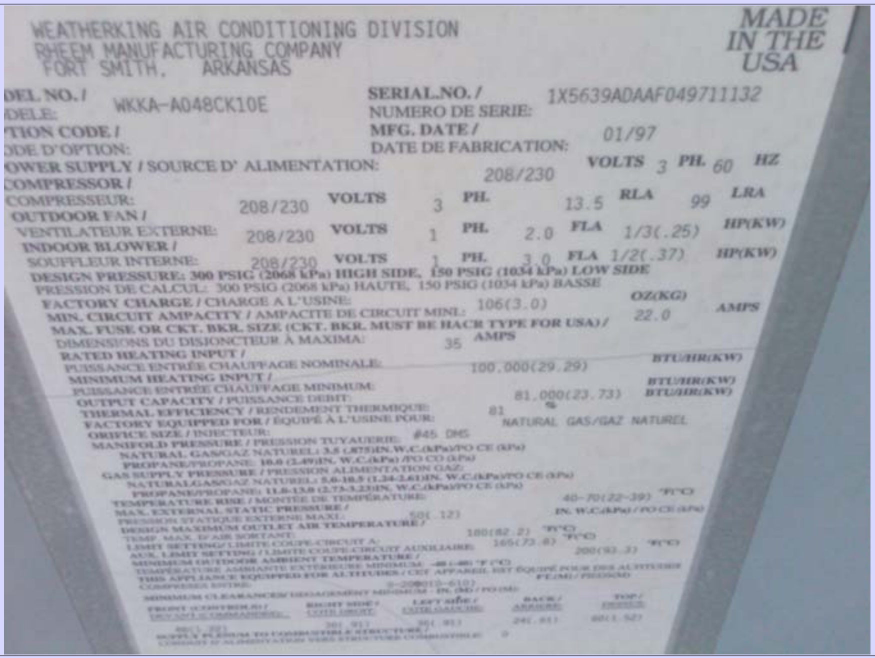


Scio Schools - Energy Study RTUH - 3

Scio Schools - Energy Study SS#7 - 1

Scio Schools - Energy Study SS#7 - 2

Scio Schools - Energy Study SS#A - 1

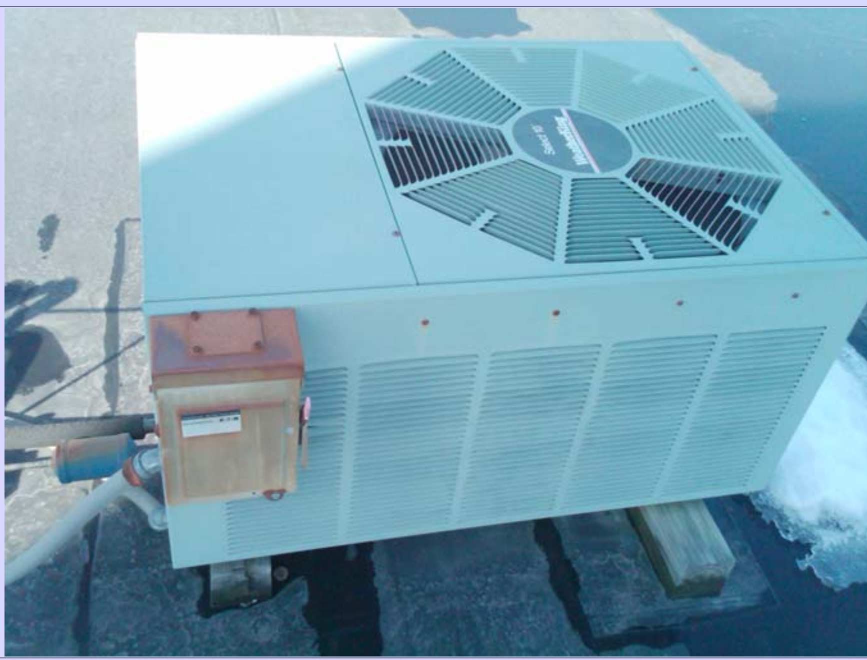
Scio Schools - Energy Study SS#A - 2

Scio Schools - Energy Study SS#B - 1

Scio Schools - Energy Study SS#B - 2

Scio Schools - Energy Study SS#C

Scio Schools - Energy Study SS#D - 1



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Scio Schools - Energy Study SS#E - 1

Scio Schools - Energy Study SS#E - 2

Scio Schools - Energy Study SS#F - 1

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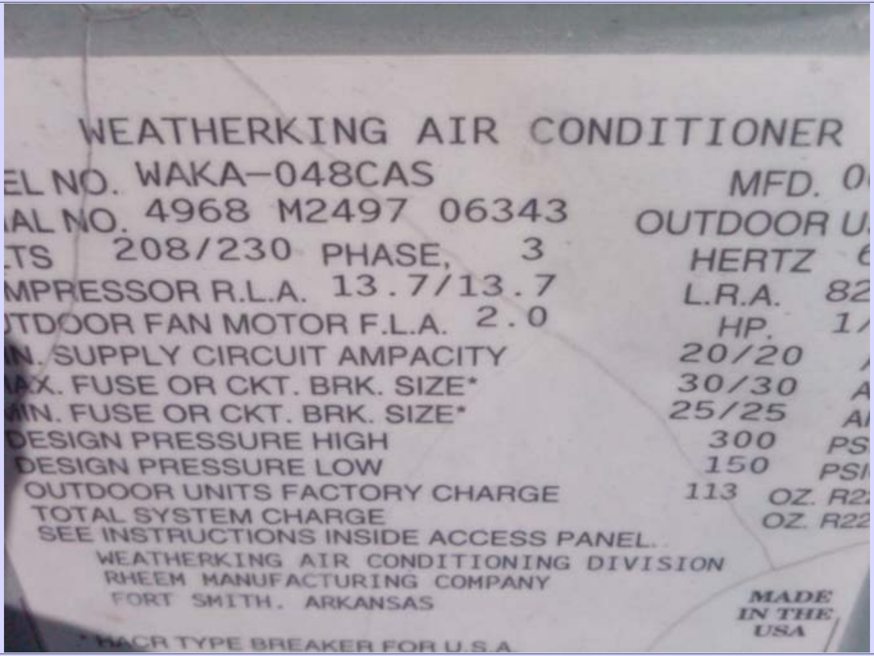
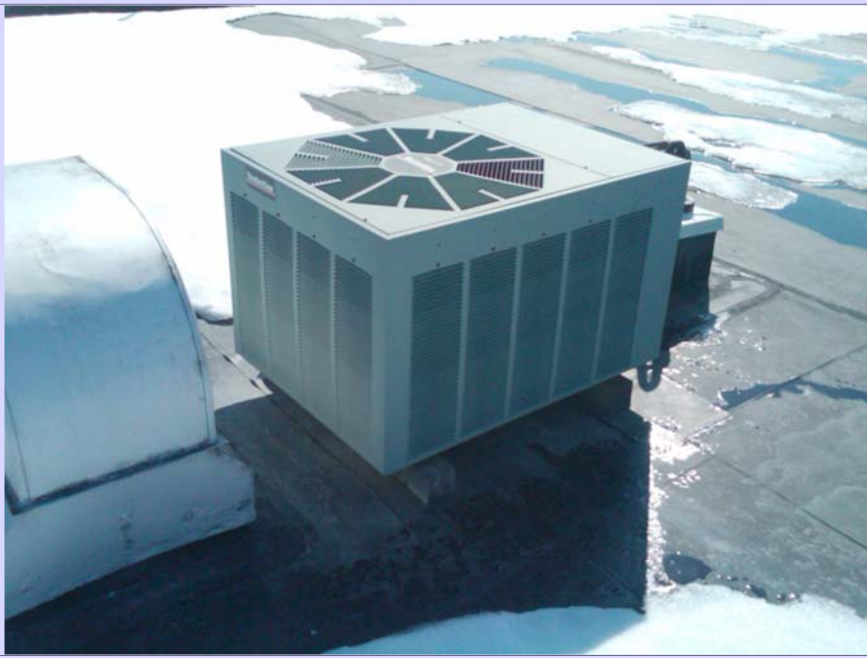


Scio Schools - Energy Study SS#G - 1



Scio Schools - Energy Study SS#G - 2

Customer	Scio CSD
Facility #	
Address	3968 Washington Street
City,State,Zip	Scio, NY 14880
Facility Ft²	107,636
Year Built	1938

ENERGY CONCEPT

Electric

month #	month end	kwh	demand kw	total cost
1	Jan-09	60,286	434	$8,331
2	Feb-09	59,366	438	$8,510
3	Mar-09	62,838	551	$8,684
4	Apr-09	57,743	420	$6,497
5	May-09	55,746	605	$8,463
6	Jun-09	65,537	611	$9,050
7	Jul-09	51,928	445	$6,870
8	Aug-09	41,427	393	$5,799
9	Sep-09	50,025	464	$6,928
10	Oct-09	61,262	614	$9,057
11	Nov-09	58,371	721	$10,314
12	Dec-09	61,286	445	$7,198
	Totals	685,815		$95,702

Natural Gas or Fuel Oil

month #	month end	therms	total cost
1	Jan-09	10,731	$10,704
2	Feb-09	13,088	$11,998
3	Mar-09	9,826	$7,175
4	Apr-09	8,121	$6,377
5	May-09	5,480	$4,182
6	Jun-09	2,502	$2,139
7	Jul-09	755	$882
8	Aug-09	369	$614
9	Sep-09	178	$474
10	Oct-09	1,340	$1,348
11	Nov-09	4,666	$3,506
12	Dec-09	5,796	$4,537
	Totals	62,852	$53,935

Water

month #	month end	gallons		total cost
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

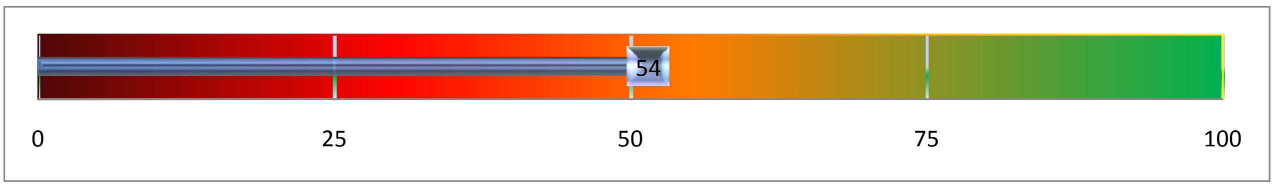
Energy Benchmark Report

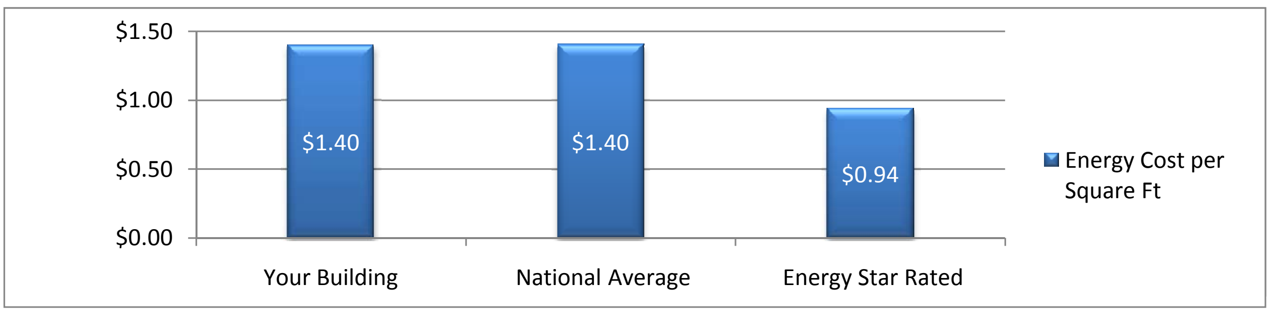
Energy Performance:

The building evaluated has 107,000 Ft²
and a total annual energy spend of $149,637 or $1.40 per square foot
for the evaluation period from January-09 through December-09
This is 0% higher than the industry average, based on the Commercial Building Energy Consumption Survey (CBECS) conducted by the U.S. Department of Energy

This building's Energy Utilization Index (EUI) is	81	kbtu per square foot
National EUI average of a building in this classification	81	kbtu per square foot
ENERGY STAR rating for a building of this type	54	kbtu per square foot

The ENERGY STAR Energy Performance Rating for this building is 53





Opportunity for Improvement:

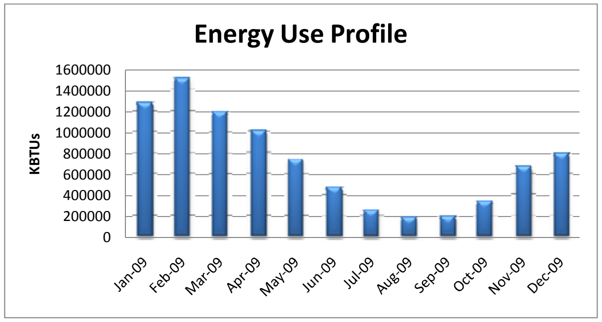
While an onsite assesment is required to evaluate specific energy conservation opportunities, broad statements about energy savings potential can be made by comparing the performance of this building to the Energy Star database and the U.S. Department of Energy CBECS analysis.

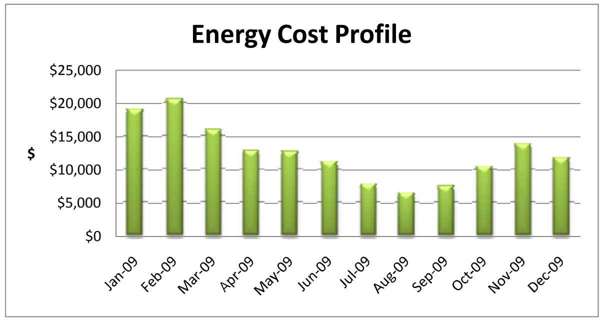
If the energy performance of this building were improved to meet the national average and/or the level required for Energy Star certification (an Energy Star rating of 75), the following savings would result.

	Savings Potential Compared To	
	National Average	Energy Star
$	-$689	$49,419
$ per sq. ft	-$0.01	$0.46

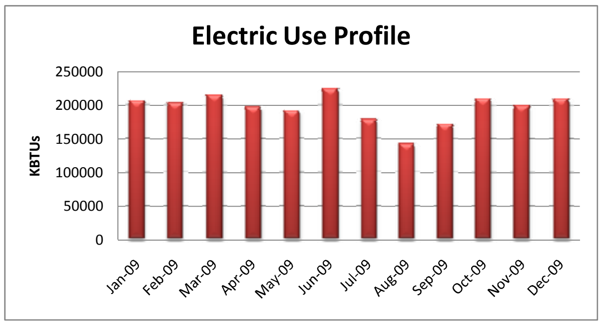
ENERGY CONCEPTS

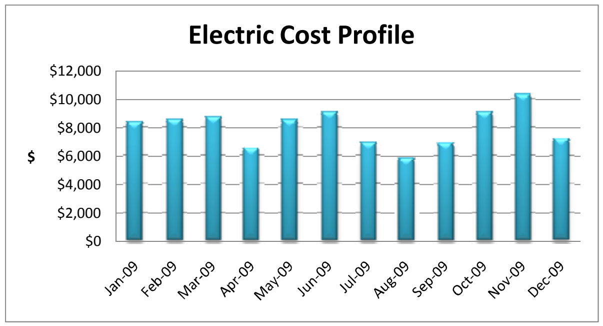
Scio CSD

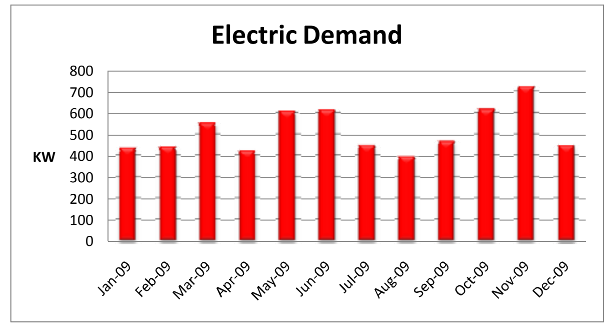


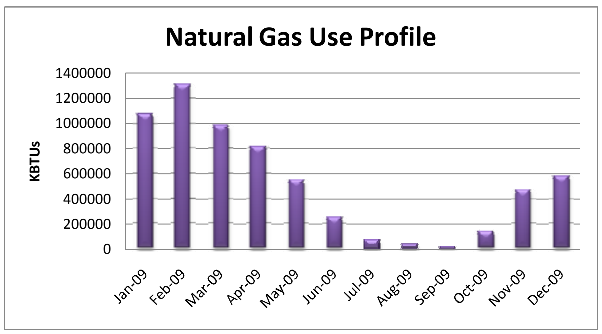


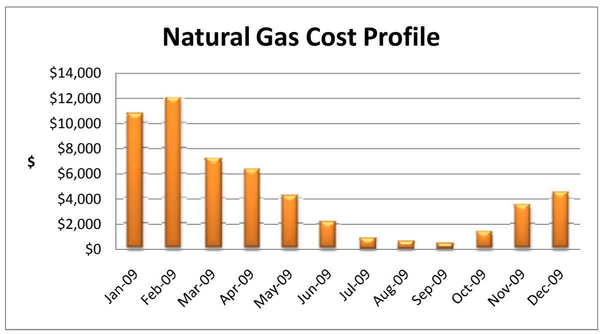
ENERGY CONCEPTS











Month End	Electric kBTU	Gas kBTU	Oil kBTU	Total BTU
Jan-09	205877	1073100		1278977
Feb-09	202735	1308800		1511535
Mar-09	214592	982600		1197192
Apr-09	197192	812100		1009292
May-09	190373	548000		738373
Jun-09	223809	250200		474009
Jul-09	177334	75500		252834
Aug-09	141473	36900		178373
Sep-09	170835	17800		188635
Oct-09	209210	134000		343210
Nov-09	199337	466600		665937
Dec-09	209292	579600		788892

Energy Use Profile
Month Ending

Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09
1278977	1511535	1197192	1009292	738373	474009	252834	178373	188635	343210	665937	788892

Electric Use Profile
Month Ending

Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09
205877	202735	214592	197192	190373	223809	177334	141473	170835	209210	199337	209292

Gas Use Profile
Month Ending

Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09
1073100	1308800	982600	812100	548000	250200	75500	36900	17800	134000	466600	579600

Month End	Electric $	Gas $	Oil $	Total$
Jan-09	$8,331	$10,704		$19,035
Feb-09	$8,510	$11,998		$20,507
Mar-09	$8,684	$7,175		$15,860
Apr-09	$6,497	$6,377		$12,875
May-09	$8,463	$4,182		$12,645
Jun-09	$9,050	$2,139		$11,189
Jul-09	$6,870	$882		$7,752
Aug-09	$5,799	$614		$6,413
Sep-09	$6,928	$474		$7,402
Oct-09	$9,057	$1,348		$10,405
Nov-09	$10,314	$3,506		$13,820
Dec-09	$7,198	$4,537		$11,735

Energy Cost Profile
Month Ending

Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09
$19,035	$20,507	$15,860	$12,875	$12,645	$11,189	$7,752	$6,413	$7,402	$10,405	$13,820	$11,735

Electric Cost Profile
Month Ending

Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09
$8,331	$8,510	$8,684	$6,497	$8,463	$9,050	$6,870	$5,799	$6,928	$9,057	$10,314	$7,198

Gas Use Profile
Month Ending

Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09
$10,704	$11,998	$7,175	$6,377	$4,182	$2,139	$882	$614	$474	$1,348	$3,506	$4,537

Electric Demand Profile

Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09
434	438	551	420	605	611	445	393	464	614	721	445