
APPENDIX L
GREEN HOUSE GAS EMISSIONS ANALYSIS MEMORANDUM

***GREENHOUSE GAS ANALYSIS FOR THE
NAGOG POND WATER TREATMENT PLANT***

ACTON, MASSACHUSETTS

August 2016

**GREENHOUSE GAS ANALYSIS FOR
THE NAGOG POND WATER TREATMENT PLANT**

ACTON, MASSACHUSETTS

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1.0 INTRODUCTION AND SUMMARY

1.1 Overview of Energy Efficiency Design

A greenhouse gas (GHG) emissions analysis was performed for Nagog Pond Water Treatment Plant (the “Project”), a public water supply project owned by the Town of Concord, consistent with the EOEEA “Greenhouse Gas Emissions Policy and Protocol” (May 5, 2010; the “Policy”). The Project consists a single 9,338 sf building, with process equipment on the first floor (7,165 sf footprint) and an office and laboratory on the second floor (2,173 sf). The facility will consume a significant amount of electricity (973 MWh/yr with high-efficiency equipment) for water processing equipment. Process equipment includes pumps, compressors, chillers and mixers. As discussed in Section 2.0, GHG emissions for the Project are reduced by the following building design, process equipment and operational energy efficiency measures (EEMs):

- Using higher efficiency windows and building envelopes (roof and wall insulation) ;
- Specifying high-efficiency heating and cooling systems;
- Sealing, insulating, and testing HVAC supply ducts;
- Using high-efficiency LED lighting for the interior of the building;
- Using LED lighting for parking lots;
- Installing Energy STAR equipment in the office and lab;
- Installing higher efficiency process equipment;
- Using environmentally friendly building materials; and
- Generating renewable energy on-site – either a 300 kW cogeneration system or a 195 kW third-party PV installation.

The GHG Policy requires a project to quantify carbon dioxide (CO₂) emissions and identify measures to avoid, minimize or mitigate such emissions, quantifying the effect of proposed mitigation in terms of energy savings and emissions reduction. The GHG Policy requires quantification of GHG emissions from three sources: direct emissions from on-site stationary sources, indirect emissions from energy generated off-site (electricity), and traffic generated by the Project. For this Project, however, MEPA has stated transportation emissions do not need to be quantified. The Project’s GHG emissions will include: 1) direct emissions of CO₂ from natural gas combustion for space heating and hot water; and 2) indirect emissions of CO₂ from electricity generated off-site and used on-site for lighting, building cooling and ventilation, and the operation of process equipment.

Whereas the Town of Acton has adopted the Stretch Energy Code, the GHG analysis used the ASHRAE 90.1-2007 code as the Base Case. CO₂ emissions were quantified for: (1) the Base Case, and (2) the Mitigation Alternative, which includes all energy saving measures, detailed in Section 2.3. The proposed building is not over 100,000 sf in size and will therefore be subject to Section 501.1.4 of the Stretch Code, the Prescriptive Option. The GHG analysis assumes energy mitigation measures consistent with, or better than, the Stretch Code.

1.2 Summary of Results

The Proponent commits to the CO₂ reduction presented below, but retains the flexibility to achieve this goal using energy efficiency measures that may be slightly different in the final design. Table 1D reveals that the Mitigation Alternative will reduce stationary sources CO₂ emissions by 16.7%, compared to the Base Case.

1.3 Section 61 Findings

At the completion of construction, the Proponent will provide a certification to the MEPA Office, signed by an appropriate professional. The certification will identify either of the following: (1) all of the energy efficiency mitigation measures adopted by the Project as part of the Mitigation Alternative have been implemented; or (2) an equivalent set of energy efficiency mitigation measures that together are designed to achieve the same percentage reduction in CO₂ emissions as the Mitigation Alternative, based on the same modeling assumptions in this report, have been adopted.

2.0 GREENHOUSE GAS (GHG) MITIGATION ANALYSIS

The GHG Policy requires that the Proponent identify measures to avoid, minimize, or mitigate GHG emissions. Section 2.1 presents the methodology and summary of results. Sections 2.2 through 2.4 discuss the Project's site, building design, and on-site renewable energy options.

2.1 Methodology and Results

A greenhouse gas (GHG) emissions analysis was performed for Nagog Pond Water Treatment Plant (the "Project"), a public water supply project owned by the Town of Concord, consistent with the EOEEA "Greenhouse Gas Emissions Policy and Protocol" (May 5, 2010; the "Policy"). The Project consists a single 9,338 sf building, with process equipment on the first floor (7,165 sf footprint) and an office and laboratory on the second floor (2,173 sf). The facility will consume a significant amount of electricity (973 MWh/yr with high-efficiency equipment) for water processing equipment. Process equipment includes pumps, compressors, chillers and mixers.

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Whereas the Town of Acton has adopted the Stretch Energy Code, the GHG analysis used the ASHRAE 90.1-2007 code as the Base Case. CO₂ emissions were quantified for: (1) the Base Case, and (2) the Mitigation Alternative, which includes all energy saving measures, detailed in Section 2.3. The proposed building is not over 100,000 sf in size and will therefore be subject to Section 501.1.4 of the Stretch Code, the Prescriptive Option. The GHG analysis assumes energy mitigation measures consistent with, or better than, the Stretch Code.

This analysis uses the eQUEST energy design software (version 3.65), which incorporates the U.S. Department of Energy's DOE-2 building energy use model. Since the process area of the building (the first floor) will be heated to a lower temperature than the occupied office and lab (second floor), and since waste heat from the process equipment enters the internal heat balance for the first floor, the two floors of the building were modeled separately in eQUEST.

The principal EEM for this Project is high-efficiency process equipment. Studies by the Water Research Foundation, EPRI and the American Council for an Energy Efficient Economy estimate energy efficiency design in a water supply and treatment plant can reduce electrical consumption by 10% to 30% for individual pieces of equipment.^{1,2} For this analysis, we have assumed an overall 15% reduction in process electricity use for the following Design Best Practices that are included in Town of Concord's Nagog Pond Water Treatment Plant:

- Correctly design pumps to meet anticipated loads
- High efficiency pumps and motors
- Variable frequency drives (VFD)
- Correctly sized motors
- SCADA System to ensure demand response of equipment minimizes electricity use

In the analysis that follows, the Base Case process electrical use is assumed to be 1,145 MWh/yr and the Mitigation Alternative is 973 MWh/yr. As explained below, approximately 30% of these totals are assumed to convert to waste heat within the first floor of the building, and are thus included in the eQUEST model for the process area (floor one): 349 MWh/yr Base Case and 296 MWh/yr Mitigation Alternative. Due to the fact there is substantial waste heat within the first floor interior space and the process area will not be heated above 55°F using a gas-fired furnace for supplemental heat, the projected gas use for the building is relatively low.

The efficiency of electrical motors, pumps and compressors is less than 100% and each piece of equipment will emit waste heat into the first floor process area. While high-efficiency electrical motors with VFD have efficiencies listed up to 94%, that number refers only to operation at 100%

¹ Water Research Foundation and Electric Power Research Institute, "Electricity Use and Management in the Municipal Water Supply and Wastewater Industries," Palo Alto, CA, November 2013.

² ACEEE, "Energy Efficiency Opportunities in Municipal Water and Wastewater Treatment Facilities," <http://aceee.org/sector/local-policy/toolkit/water>.

load and most motors are designed to operate at 75% to 80% load the majority of the time. Data of wire-to-shaft efficiencies for high-efficiency motors with VFD reveal overall motor efficiency, as operated, is in the 90% range,³ representing 10% loss as waste heat at the electric motor. A comprehensive energy-loss analysis of water pump stations, by Carollo Engineers, concludes that the combined electric motor, drivetrain and pump energy losses are 34% of the electricity used.³ For this GHG analysis, we assumed combined energy losses of 30% of the electricity converting to waste heat within the first floor of the building.

Consistent with the ASHRAE Appendix G3 methodology recommended by MassDOER for MEPA GHG studies in Stretch Code communities, energy modeling for the building assumes a split-system HVAC unit for cooling and a gas-fired furnace for heating. The actual heating and cooling equipment used in the building may be different.

This analysis uses the eQUEST energy design software (version 3.65), which incorporates the U.S. Department of Energy's DOE-2 building energy use model, and CO₂ emission rates of 117.1 lb/MMBtu of natural gas⁴ and 726 lb/MWhr.⁵ Energy use and CO₂ emissions are detailed in Tables 1A through 1D in Section 2.3, and the eQUEST model output is provided in Appendix A. Table 2 summarizes total CO₂ emissions for the Project, for the Base Case (building design that complies with the baseline Code), and the Mitigation Alternative (building design that includes all proposed energy efficiency measures). The eQUEST model input files have been provided to the Massachusetts Department of Energy Resources (DOER). The eQUEST model inputs are summarized in Tables 3 and 4.

The Proponent commits to the CO₂ reduction presented below, but retains the flexibility to achieve this goal using energy efficiency measures that may be slightly different in the final design. Table 1D reveals that the Mitigation Alternative will reduce stationary sources CO₂ emissions by 16.7%, compared to the Base Case.

³ Crowley, T. and Hart, V., "Maximizing Efficiency of Pump Stations for Water and Wastewater Systems," presented to the Southwestern American Water Works Association, October 14, 2014.

⁴ U.S. Department of Energy, Energy Information Administration.

⁵ ISO New England Inc., 2014 New England Electric Generator Air Emissions Report, Annual Average Emission Rate, table 5.1, November 132015.

**TABLE 1A
ENERGY AND CO2 MODELING FOR NAGOG POND WATER TREATMENT PLANT - PROCESS AREA, FLOOR ONE**

Effects of Individual Mitigation Measures

<i>Mitigation Measures - eQUEST Model Run</i>	GLA (sf)	Electrical Usage (MWh/yr)	Electrical Change (%)	Gas Usage (Mcf/yr)	Gas Change (%)	Heating CO ₂ Emissions (tons/yr)	Electrical CO ₂ Emissions (tons/yr)	Total CO ₂ Emissions (tons/yr)	CO ₂ Emissions Change (%)
Base Case	7,165	464.48		2.60		0.2	168.6	168.8	
Increased Roof Insulation		464.53	0.0%	2.50	-3.8%	0.1	168.6	168.8	0.0%
Increased Wall Insulation		464.71	0.0%	2.60	0.0%	0.2	168.7	168.8	0.0%
Lower Window Glass U-Value		459.07	-1.2%	2.60	0.0%	0.2	166.6	166.8	-1.2%
Higher Efficiency Space Heating		464.48	0.0%	2.50	-3.8%	0.1	168.6	168.8	0.0%
Higher Efficiency Cooling		462.49	-0.4%	2.50	-3.8%	0.1	167.9	168.0	-0.4%
Lower Light Power Density		440.93	-5.1%	2.50	-3.8%	0.1	160.1	160.2	-5.1%
Higher Efficiency Process Equipment		403.51	-13.1%	2.50	-3.8%	0.1	146.5	146.6	-13.1%
Mitigation Alternative - All Measures Listed Above		373.21	-19.6%	2.50	-3.8%	0.1	135.5	135.6	-19.6%

Note: 30% of Process electrical use is included in the eQUEST model as internal heat load. The remaining 70% of Process electrical use is listed in Table 1C below.

**TABLE 1B
ENERGY AND CO2 MODELING FOR NAGOG POND WATER TREATMENT PLANT - OFFICE/LAB, FLOOR TWO**

Effects of Individual Mitigation Measures

<i>Mitigation Measures - eQUEST Model Run</i>	GLA (sf)	Electrical Usage (MWh/yr)	Electrical Change (%)	Gas Usage (Mcf/yr)	Gas Change (%)	Heating CO ₂ Emissions (tons/yr)	Electrical CO ₂ Emissions (tons/yr)	Total CO ₂ Emissions (tons/yr)	CO ₂ Emissions Change (%)
Base Case	2,173	19.83		43.22		2.5	7.2	9.7	
Increased Roof Insulation		19.83	0.0%	41.91	-3.0%	2.5	7.2	9.7	-0.8%
Increased Wall Insulation		19.84	0.1%	41.19	-4.7%	2.4	7.2	9.6	-1.2%
Lower Window Glass U-Value		17.94	-9.5%	47.69	10.3%	2.8	6.5	9.3	-4.4%
Higher Efficiency Space Heating		19.83	0.0%	38.69	-10.5%	2.3	7.2	9.5	-2.7%
Higher Efficiency Cooling		19.66	-0.9%	43.32	0.2%	2.5	7.1	9.7	-0.6%
Lower Light Power Density		17.48	-11.9%	47.10	9.0%	2.8	6.3	9.1	-6.4%
Energy STAR Office / Lab Equipment		19.13	-3.5%	44.51	3.0%	2.6	6.9	9.6	-1.8%
Mitigation Alternative - All Measures Listed Above		14.80	-25.4%	44.23	2.3%	2.6	5.4	8.0	-18.2%

TABLE 1C
ENERGY AND CO2 MODELING FOR NAGOG POND WATER TREATMENT PLANT - PROCESS ELECTRICAL USE NOT CONVERTED TO WASTE HEAT

Effects of Individual Mitigation Measures

<i>Mitigation Measures</i>		Electrical Usage (MWh/yr)	Electrical Change (%)	Gas Usage (Mcf/yr)	Gas Change (%)	Heating CO ₂ Emissions (tons/yr)	Electrical CO ₂ Emissions (tons/yr)	Total CO ₂ Emissions (tons/yr)	CO ₂ Emissions Change (%)
Base Case		796.0		0.0		0.0	288.9	288.9	
Mitigation Alternative - Higher Efficiency Process Equipment		677.0	-14.9%	0.0	0.0%	0.0	245.8	245.8	-14.9%

TABLE 1D
ENERGY AND CO2 MODELING FOR NAGOG POND WATER TREATMENT PLANT - ALL ENERGY USE

Totals

<i>All Buildings - Combined Mitigation</i>	Electrical Usage (MWh/yr)	Electrical Change (%)	Gas Usage (Mcf/yr)	Gas Change (%)	Heating CO ₂ Emissions (tons/yr)	Electrical CO ₂ Emissions (tons/yr)	Total CO ₂ Emissions (tons/yr)	CO ₂ Emissions Change (%)	Energy Use Change (%)
Base Case	1,280.3		45.8		2.7	464.8	467.4		
Mitigation Case	1,065.0	-16.8%	46.7	2.0%	2.7	386.6	389.3	-16.7%	-16.6%

TABLE 2
GREENHOUSE GAS (CO₂) EMISSIONS SUMMARY
NAGOG POND WATER TREATMENT PLANT
(TONS/YEAR)

Source	Base Case	Mitigation Alternative	Change in GHG Emissions
Direct Emissions	2.7	2.7	0%
Indirect Emissions	464.8	389.3	-16.8%
Subtotal Direct and Indirect Emissions	467.4	389.3	-16.7%

2.2 Site Design Mitigation Measures

The Project will adopt all reasonable and feasible site design mitigation measures. The Project is committed to the following mitigation measures:

- ***Sustainable Development Principles*** – The Project conserves land by reusing a previously developed site.
- ***Minimize Energy Use Through Building Orientation*** – While the building has windows on all four sides, the largest area of glass is on the east side to provide natural light into the building without increasing the interior heat load.
- ***Best Practices for Stormwater Design*** – To the extent possible, the stormwater management system will utilize Best Management Practices (BMP).

2.3 Building Design and Operation Mitigation Measures

The eQUEST energy model inputs, including ventilation rates and occupancy, are summarized in Tables 3A, 3B and 4. All buildings are steel-framed. The Project's Base Case Energy Use Intensity (EUI) is compared to the Pacific Northwest National Laboratory (PNNL) prototype building EUI in Table 5, assuming the ASHRAE 90.1-2007 base code. Note that the actual EUI will vary due to differences between the PNNL prototype building and the proposed buildings in terms of building size, number of floors, footprint, building materials, window area, and ventilation rates. The Code referenced below is the Base Case ASHRAE 90.1-2007.

- ***Energy Efficient Windows and Building Envelope*** – Building envelope insulation will exceed Code. Building roof insulation will be R-25, wall insulation for the CMU walls will be R13ci, and window glass type will be better than Code: double-pane, low-e glass, U value = 0.29, SGHC=0.29.
- ***Cool Roofs*** – The building will have a light to medium-colored roof.
- ***Higher-Efficiency HVAC Heating Systems*** – The building will use gas-fired heating furnaces with have a thermal efficiency of 90.
- ***HVAC Cooling Efficiency and Heat Pumps*** – The preliminary building design has a split-system HVAC unit with an EER value 10% higher than Code. The Proponent will consider heat pumps (air or water source) in the actual MEP design. Given the very small area of the second floor office and lab, whether an HVAC unit or a heat is used, the building's energy use will not significantly change.

- ***Seal, Test and Insulate HVAC Supply Ducts*** – HVAC supply ducts will be sealed, leak tested, and insulated to reduce energy losses.
- ***Energy Management Systems*** –The buildings utilize highly efficient energy management systems (EMS) to track and control energy use. Energy needs are closely monitored and the use of heat, cooling, and lighting is minimized. The Base Case set points for occupied and unoccupied time periods equal the eQUEST default values for the second floor Office and Lab: Occupied (cool=76°, heat=70°), Unoccupied (cool=82°, heat=64°). For the first floor process area, a single set-point for heat=55°F was assumed. The Mitigation and Base Case values are the same.
- ***Energy Efficient Interior Lighting*** – Interior light power density (whole building method) for the Office and Lab are below Code at 0.7 W/SF. A LPD of 0.8 W/SF was assumed for the process area. High efficiency LED lighting will be used indoors.
- ***Energy Efficient Exterior Lighting*** – Energy efficient LED fixtures will be used to light the parking lots and walkways.
- ***Energy Efficiency Incentives*** – The Project’s electric and gas suppliers are National Grid, which offer “Whole-Building Approach Customer Incentives” for new buildings designed better than Code. Like all rebate programs they impose numerous conditions. The Proponent is pursuing both the design support and customer incentives offered by NSTAR.
- ***Energy STAR Appliances*** – Energy STAR equipment will be used in the occupied Office and Lab on the second floor. The plug loads with Energy Star are assumed to be 10% below Base Case values.
- ***Energy Efficiency in Process Equipment Design*** – For this analysis, an overall 15% reduction in process electricity use for the following Best Practices was assumed:
 - Correctly design pumps to meet anticipated loads
 - High efficiency pumps and motors
 - Variable frequency drives (VFD)
 - Correctly sized motors
 - SCADA System to ensure demand response of equipment minimizes electricity use
- ***Use Water Conserving Fixtures and Practices*** – Restrooms in commercial buildings will use low-flow faucets in wash sinks and low-flow toilets.
- ***Use Building Materials with Recycled Content, Building Materials that are Manufactured Within the Region, Use Rapidly Renewable Building Materials, and Use Low-VOC Building Materials*** – Whenever practical, the Project will use environmentally friendly building materials, including materials with recycled content, rapidly renewable building materials, and low-VOC materials. Also when practical, the Project will purchase building materials that are manufactured within the region.

Other building design and operation mitigation measures were considered for the Project, but were rejected because they are either technically/financially infeasible or inappropriate for the Project:

- ***Reduce Energy Demand by Using Peak Shaving or Load Shifting Strategies*** – These measures are not appropriate for buildings that must use power during peak periods to produce public drinking water.
- ***Construct Green Roof*** -- The proponent does not consider it economically feasible to construct and maintain a green roof. Green roofs, which consist of layers of gravel, soil and vegetation atop a rubberized water-proof membrane, are expensive to install and maintain. They typically require a steel-reinforced concrete roof that can support a dead weight of 35 lb/sf and the installation cost exclusive of roof redesign is \$30/sf.⁶ While green roof technology has the potential to improve stormwater management on the Project and reduce overall energy costs, the significant additional costs (\$250,000 million for the Project) related to the required engineering, construction and installation of the green roof is not economically feasible.

⁶ Oberndorfer, Erica, et al., “Green Roofs as Urban Ecosystems: Ecological Structures, Functions and Services,” BioScience, Vol. 57, No. 10, November 2007.

**TABLE 3A
SUMMARY OF ENERGY MODELING ASSUMPTIONS
PROCESS EQUIPMENT AREA (FLOOR ONE) – 7,165 SF**

Energy Efficiency Measure (EEM)	Base Case (Code)¹	Mitigation Case²
Building Envelope (Steel-framed, CMU Block Walls)	Roof R20 Walls 11.4ci	Roof R25 R13ci
Window Glass	U=0.55, DOE Type 2003	U=0.29, SHGC=0.29 DOE Type 2667
Cool Roof	No	Yes
Furnace Heating Combustion Efficiency	80%	90%
Cooling Efficiency Split HVAC (10-ton)	EER 11.0	EER 11.8
Light Power Density (Whole Bldg. Method)	1.5 W/SF	0.8 W/SF
Electric Plug Load (30% of Process Electrical Use)	13.2 W/SF	11.2 W/SF
Parking Lot Lighting	Lighting Zone 3 100 W/1,000 SF	LED 35 W/1,000 SF
Ventilation Rate³	22.5 cfm/person	Same as Base Case
Occupancy³	500 SF/person	Same as Base Case

¹ ASHRAE 90.1-2007 Appendix G.

² Complies with Stretch Code section 501.1.4 and 507.2.1, and with 2012 IECC plus Section 406.1 option (1).

³ eQUEST default values for Mechanical/Electrical Room

TABLE 3B
SUMMARY OF ENERGY MODELING ASSUMPTIONS
OFFICE AND LAB AREA (FLOOR TWO) – 2,173 SF

Energy Efficiency Measure (EEM)	Base Case (Code)¹	Mitigation Case²
Building Envelope (Steel-framed, CMU Block Walls)	Roof R20 Walls 11.4ci	Roof R25 R13ci
Window Glass	U=0.55, DOE Type 2003	U=0.29, SHGC=0.29 DOE Type 2667
Cool Roof	No	Yes
Furnace Heating Combustion Efficiency	80%	90%
Cooling Efficiency Split HVAC (10-ton)	EER 11.0	EER 11.8
Light Power Density (Whole Bldg. Method)	1.0 W/SF	0.7 W/SF
Electric Plug Load (App G Value)	0.75 W/SF	10% less for Energy STAR Equipment
Parking Lot Lighting	Lighting Zone 3 100 W/1,000 SF	LED 35 W/1,000 SF
Ventilation Rate³	5.0 cfm/person	Same as Base Case
Occupancy³	200 SF/person	Same as Base Case

¹ ASHRAE 90.1-2007 Appendix G.

² Complies with Stretch Code section 501.1.4 and 507.2.1, and with 2012 IECC plus Section 406.1 option (1).

³ IMC Table 403.3.

**TABLE 4
SUMMARY OF ACTIVITY AREAS FOR NAGOG POND
WATER TREATMENT PLANT**

Building Name Floor Area (sf)	eQUEST Activity Type	% Floor Area
Floor 1 7,165 sf	Mechanical and Electrical	100.0
Floor 2 2,173 sf	Office/Lab	100.0

**TABLE 5
COMPARISON OF eQUEST BASE CASE ENERGY USE INTENSITY (EUI)
TO PNNL PROTOTYPE BUILDING EUI FOR THE ASHRAE 90.1-2007 CODE**

Building Floor	Base Case EUI (kBtu/SF)	Mitigation Case EUI (kBtu/SF)	PNNL EUI (kBtu/SF)
1 (100% Mechanical/Electrical)	221.5	178.1 -19.6%	ND ¹
2 (100% Office/Lab)	51.1	43.6 -14.7%	49.1 ²

¹ There are no PNNL data for a process equipment area.

² PNNL data for Medium Office.

2.4 On-Site Renewable Energy

2.4.1 Solar PV – Original Plan

The potential for on-site renewable energy generation has been extensively studied for this Project. In 2013, a PV solar feasibility study⁷ for the site was done for the Town of Concord and concluded any PV system would need to use a third-party Power Purchase Agreement to access tax credits and accelerated depreciation. At the time, Solar-Renewable Energy Credits (SREC) availability and net metering could not be firmly established with NSTAR. The PV option evolved to a proposed ground-based solar field of 17,768 sf located northeast of the proposed building (see the Project ENF), which would have an approximate capacity of 195 kW. Since the proposed PV system was made public, intense opposition formed from abutting residential property owners, as evidenced in comment letters on the ENF for this Project. As a result, the Proponent is now proposing an alternate renewable generation design that uses CHP.

The 195-kW PV system would generate approximately 200 MWh/yr of electricity. The projected process equipment electricity use, with high-efficiency equipment, is 973 MWh/yr. Thus, assuming net metering was available, the PV system would provide 20% of the process electricity demand and 19% of the total building electricity demand under the Mitigation Alternative. A PV system supplying 200 MWh/yr of electricity would reduce CO₂ emissions by 72.6 tons/year,⁸ which is 19% of total building CO₂ emissions for the Mitigation Alternative.

Even if the PV system did not face local opposition, uncertainty remains as to whether this Project would be eligible for SRECs as there is a large backlog of other projects waiting for those State subsidies. The building roof is pitched, not flat. The south-facing roof surface has clerestory windows. The Proponent will consider a small PV rooftop system for the small portion of the south-facing roof that does not have clerestory windows.

⁷ Epsilon Associates, Inc., “Nagog Pond Watershed and Solar Feasibility Study, Acton/Littleton, MA,” prepared for the Town of Concord, July 2013.

⁸ 200 MWh/yr x 726 lb CO₂/MWh / 2000 lb/ton = 72.6 tons/yr CO₂.

2.4.2 Combined Heat and Power (CHP) – Current Plan

The current plan is to install three Tecogen INV-100e+ Ultra-Low Emissions CHP Units outside on a concrete at the west end of the building, with an installed capacity of 300 kW. These reciprocating engines provide a 10:1 turndown ratio for electrical generation. Each Tecogen unit has a rated output of 100 kW, producing 100kWh of electricity when burning 1.15 MMBtu/hr of natural gas.⁹ At rated capacity, each Tecogen unit provides waste heat of 0.613 MMBtu/hr in the form of hot water flowing at 30 gallons per minute, warming inlet water at 180°F to an outlet temperature of 230°F.

Whereas net metering is not allowed for this type of generating source, the Tecogen units will provide grid-independent generation for process equipment in the building. ENE performed an electrical and cost analysis¹⁰ for the proposed Tecogen units and concluded their installation and use are cost feasible even without the use of engine waste heat. At present, the Proponent is considering using the waste heat for radiant floor heating in the process area only. A preliminary analysis by the Town of using this heat in the second-floor office has concluded the additional pumping loss and piping may that option financially unattractive.

The CHP proposal assumes the Tecogen units will provide all but 10,000 kWh per month for the building, which is 120 MWh/yr from the grid. Using the Town's projected total electrical use for the building of 1,150 MWh/yr,¹¹ then 1,030 MWh/yr will be provided by the CHP units, which will require the burning of 11,845 MMBtu/yr of natural gas.

Space heating demand for the two floors of the building is quite low, 43.0 MMBtu/yr of natural gas combustion, with the assumption that 30% of process equipment electrical use converts to waste heat within the process area of the building. This sum is 42.6 MMBtu/yr for space heating of the 2,173 sf office/lab space (a space-heating EUI of 19.6 kBtu/sf-yr) and 0.4 MMBtu/yr for space heating of the process area of 7,165 sf (EUI of 0.1 kBtu/sf-yr). The process area does not require much space

⁹ Tecogen, Inc., Specifications for INV-100e+ Efficient Ultra-Low Emissions CHP.

¹⁰ T. Hebert, P. Gomez and B. Kasle, ENE, "Town of Concord Nagog Pump Stations CHP Peer Review Analysis – Final," June 28, 2016.

¹¹ Note that the eQUEST modeling for the building including process use estimates the Mitigation Alternative total electrical demand to be about 9% lower than this figure. Whereas all of these studies project approximate figures, the Town's CHP energy analysis is used here.

heating for two reasons: the space will be heated to only 55°F in the winter, and the large motors, pumps, compressors, etc. will emit substantial waste heat. To provide an upper bound on the space heating demand for the process floor of the building, eQUEST modeling was done for the Mitigation Alternative assuming 0% waste heat (0% plug load) in the process area, and the space heating demand was 145.9 MMBtu/yr (EUI 20.4 kBtu/sf-yr). Depending on the amount of process equipment waste heat emitted inside the building (0% to 30% of process electricity use), the heating demand for both floors of the building ranges from 188.5 MMBtu/yr down to 43.0 MMBtu/yr of natural gas combustion. The generation of 1,030 MWh/yr of electricity by the CHP units will produce waste heat of 6,314 MMBtu/yr¹² in the form of 230°F hot water. Thus, only a very small amount of this CHP waste heat (0.7% to 3.0%) can be used to replace space heating.

CO₂ Emissions Analysis

Using the MEPA approved emission factors for GHG analysis, a reduction of grid electricity of 1,030 MWh/yr is a CO₂ reduction of 373.9 tons/year.¹³ The on-site combustion of 11,845 MMBtu of gas is a CO₂ increase of 693.5 tons/year.¹⁴ The use of waste heat to replace space heating demand reduces onsite combustion of 43 to 188.5 MMBtu/yr of gas for a CO₂ decrease of 2.5 to 11.0 tons/year. The next change in CO₂ emissions is an *increase* of 308.6 to 317.1 tons/year. One reason the calculation yields an unexpected result of increased GHG emissions is that the ISO New England emission rate of 726 lb CO₂ per MWh of electricity assumes the actual mix of fuels in New England, about half of which does not involve any fossil fuel combustion,¹⁵ and this is being compared to on-site generation that uses 100% fossil fuel combustion. For this reason, MEPA allows the comparison of stationary source fuel consumption, with and without CHP, using a source energy compliance path.

Source Energy Path Analysis

The source energy path credits the efficiency of systems providing both electricity and thermal energy. On-site fuel use is converted to source fuel use using conversion factors of 3.01 for electric power at the meter, and 1.09 for natural gas. The source energy path analysis will usually show a net

¹² [Waste heat generation of 6.13 MMBtu/hr per 1,000 kWh of generation] x 1,030 MWh/yr

¹³ 1,030 MWh x 726 lb CO₂/MWh / 2,000 lb/ton = 373.9 tons CO₂.

¹⁴ 11,845 MMBtu gas x 117.1 lb CO₂/MMBtu / 2,000 lb/ton = 693.5 tons CO₂.

¹⁵ Nuclear, hydro, wind, solar.

reduction in source energy for a CHP installation that can use most of the waste heat from the on-site generator. In this case, the space heating demand for the building is no more than 3% of the waste heat generated by the CHP units, and one would therefore not expect a net reduction in source energy. The calculation is as follows.

On a source energy basis, the CHP units will increase source energy by 12,911 MMBtu/year.¹⁶ The electricity not purchased from the grid will decrease source energy by 10,578 MMBtu/year.¹⁷ The use of waste heat from the CHP units to displace space heating will decrease source energy by 47 to 205 MMBtu/yr.¹⁸ The net change is an increase in source energy of 2,128 to 2,286 MMBtu/yr, a result consistent with the fact that only a small percentage of the CHP waste heat can be used at the facility.

¹⁶ [11,845 MMBtu/yr of natural gas burned in the Tecogen CHP units] x 1.09 site-to-source-conversion-factor.

¹⁷ [1,030 MWh/yr of electricity not used at the meter] x 3.01 site-to-source-conversion-factor x 3.412 MMBtu/MWh.

¹⁸ [43 to 188.5 MMBtu/yr of natural gas not burned for spaced heating] x 1.09 site-to-source-conversion-factor.

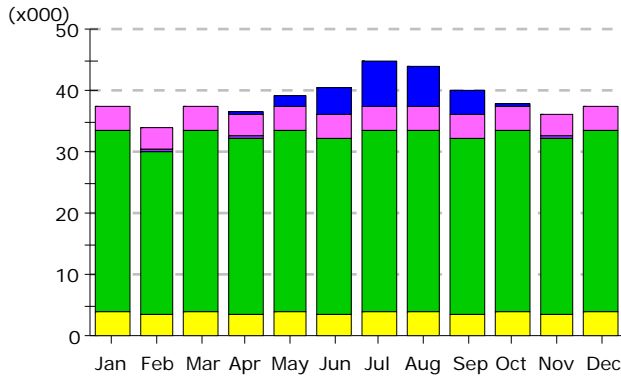
APPENDIX A

EQUEST MODEL OUTPUT

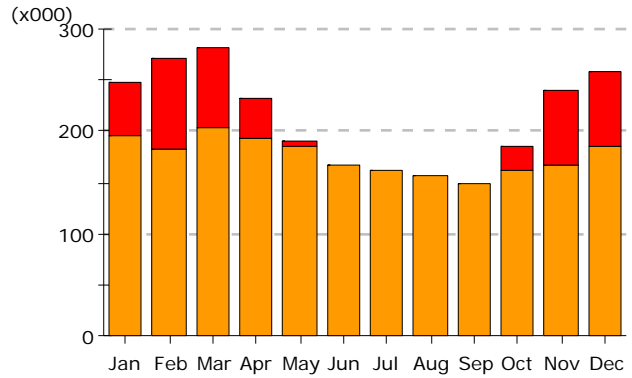
APPENDIX A

EQUEST MODEL OUTPUT

Electric Consumption (kWh)



Gas Consumption (Btu)



- Area Lighting
- Exterior Usage
- Water Heating
- Refrigeration
- Task Lighting
- Pumps & Aux.
- Ht Pump Supp.
- Heat Rejection
- Misc. Equipment
- Ventilation Fans
- Space Heating
- Space Cooling

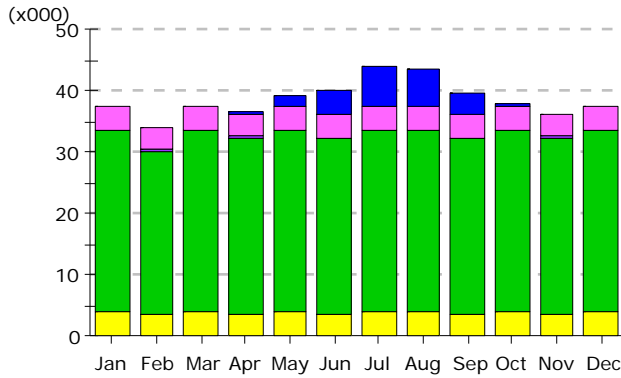
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	0.24	1.94	4.46	7.50	6.66	3.83	0.71	0.08	-	25.43
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	3.79	3.42	3.79	3.67	3.79	3.67	3.79	3.79	3.67	3.79	3.67	3.79	44.60
Pumps & Aux.	0.18	0.17	0.17	0.14	0.03	-	-	-	0.00	0.06	0.15	0.17	1.08
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	29.61	26.75	29.61	28.66	29.61	28.66	29.61	29.61	28.66	29.61	28.66	29.61	348.65
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	3.80	3.43	3.80	3.68	3.80	3.68	3.80	3.80	3.68	3.80	3.68	3.80	44.72
Total	37.38	33.77	37.37	36.38	39.17	40.45	44.70	43.86	39.83	37.97	36.23	37.37	464.48

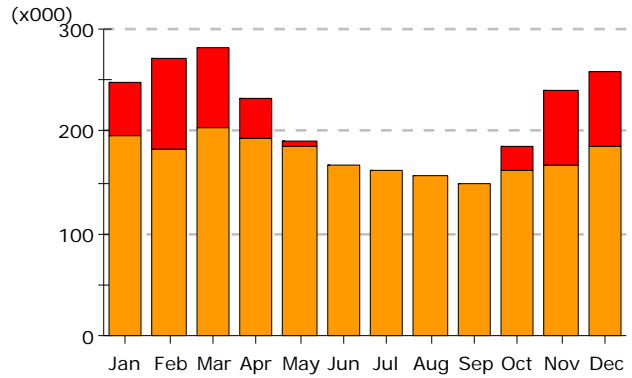
Gas Consumption (Btu x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	52.7	88.3	77.9	38.2	3.9	-	-	-	-	24.1	73.4	73.1	431.6
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	196.1	183.2	203.1	193.2	186.4	167.8	162.2	155.3	149.8	160.8	166.4	184.6	2,109.0
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	248.9	271.5	281.0	231.3	190.4	167.8	162.2	155.3	149.8	184.9	239.8	257.7	2,540.6

Electric Consumption (kWh)



Gas Consumption (Btu)



- Area Lighting
- Exterior Usage
- Water Heating
- Refrigeration
- Task Lighting
- Pumps & Aux.
- Ht Pump Supp.
- Heat Rejection
- Misc. Equipment
- Ventilation Fans
- Space Heating
- Space Cooling

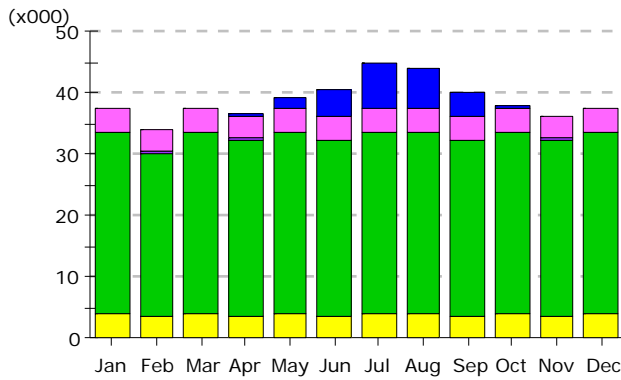
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	0.22	1.79	4.11	6.92	6.14	3.53	0.66	0.08	-	23.44
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	3.79	3.42	3.79	3.67	3.79	3.67	3.79	3.79	3.67	3.79	3.67	3.79	44.60
Pumps & Aux.	0.18	0.17	0.17	0.14	0.03	-	-	-	0.00	0.06	0.15	0.17	1.08
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	29.61	26.75	29.61	28.66	29.61	28.66	29.61	29.61	28.66	29.61	28.66	29.61	348.65
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	3.80	3.43	3.80	3.68	3.80	3.68	3.80	3.80	3.68	3.80	3.68	3.80	44.72
Total	37.38	33.77	37.37	36.36	39.02	40.10	44.11	43.34	39.53	37.91	36.22	37.37	462.49

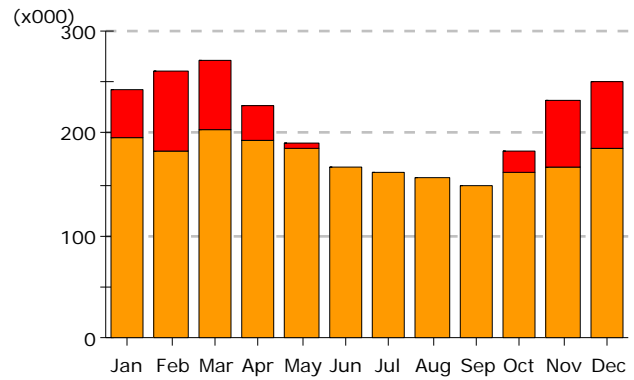
Gas Consumption (Btu x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	52.7	88.3	77.9	38.2	3.9	-	-	-	-	24.1	73.4	73.1	431.6
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	196.1	183.2	203.1	193.2	186.4	167.8	162.2	155.3	149.8	160.8	166.4	184.6	2,109.0
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	248.9	271.5	281.0	231.3	190.4	167.8	162.2	155.3	149.8	184.9	239.8	257.7	2,540.6

Electric Consumption (kWh)



Gas Consumption (Btu)



- Area Lighting
- Exterior Usage
- Water Heating
- Refrigeration
- Task Lighting
- Pumps & Aux.
- Ht Pump Supp.
- Heat Rejection
- Misc. Equipment
- Ventilation Fans
- Space Heating
- Space Cooling

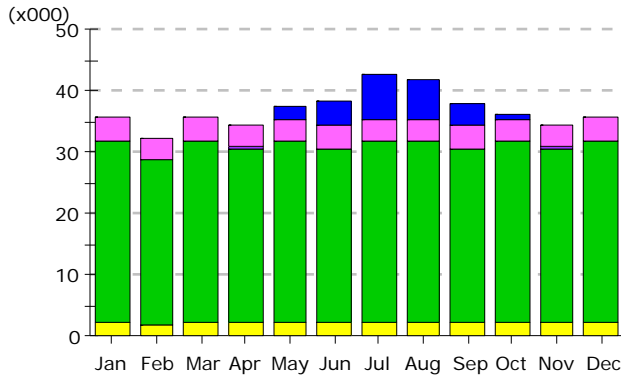
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	0.24	1.94	4.46	7.50	6.66	3.83	0.71	0.08	-	25.43
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	3.79	3.42	3.79	3.67	3.79	3.67	3.79	3.79	3.67	3.79	3.67	3.79	44.60
Pumps & Aux.	0.18	0.17	0.17	0.14	0.03	-	-	-	0.00	0.06	0.15	0.17	1.08
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	29.61	26.75	29.61	28.66	29.61	28.66	29.61	29.61	28.66	29.61	28.66	29.61	348.65
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	3.80	3.43	3.80	3.68	3.80	3.68	3.80	3.80	3.68	3.80	3.68	3.80	44.72
Total	37.38	33.77	37.37	36.38	39.17	40.45	44.70	43.86	39.83	37.97	36.23	37.37	464.48

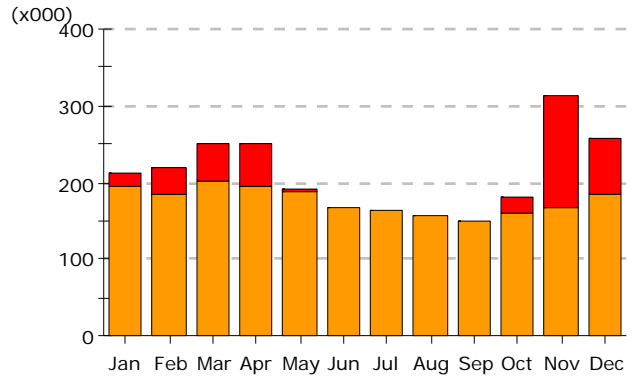
Gas Consumption (Btu x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	46.9	78.5	69.2	33.9	3.5	-	-	-	-	21.4	65.3	64.9	383.7
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	196.1	183.2	203.1	193.2	186.4	167.8	162.2	155.3	149.8	160.8	166.4	184.6	2,109.0
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	243.0	261.7	272.3	227.1	189.9	167.8	162.2	155.3	149.8	182.2	231.7	249.6	2,492.7

Electric Consumption (kWh)



Gas Consumption (Btu)



- Area Lighting
- Exterior Usage
- Water Heating
- Refrigeration
- Task Lighting
- Pumps & Aux.
- Ht Pump Supp.
- Heat Rejection
- Misc. Equipment
- Ventilation Fans
- Space Heating
- Space Cooling

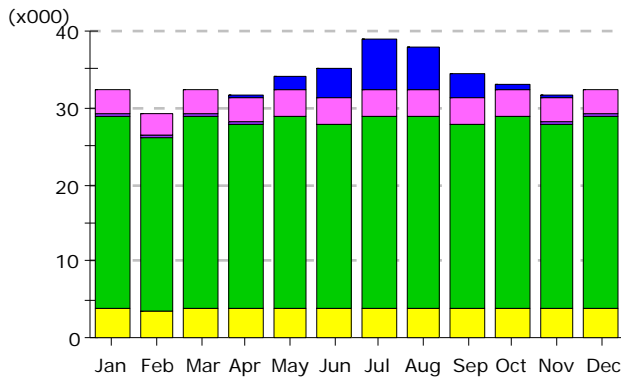
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	0.23	1.84	4.23	7.13	6.33	3.64	0.68	0.08	-	24.16
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	3.67	3.31	3.67	3.55	3.67	3.55	3.67	3.67	3.55	3.67	3.55	3.67	43.19
Pumps & Aux.	0.18	0.17	0.17	0.14	0.03	-	-	-	0.00	0.06	0.15	0.17	1.08
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	29.61	26.75	29.61	28.66	29.61	28.66	29.61	29.61	28.66	29.61	28.66	29.61	348.65
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	2.03	1.83	2.03	1.96	2.03	1.96	2.03	2.03	1.96	2.03	1.96	2.03	23.85
Total	35.49	32.06	35.48	34.54	37.18	38.40	42.43	41.64	37.81	36.04	34.39	35.48	440.93

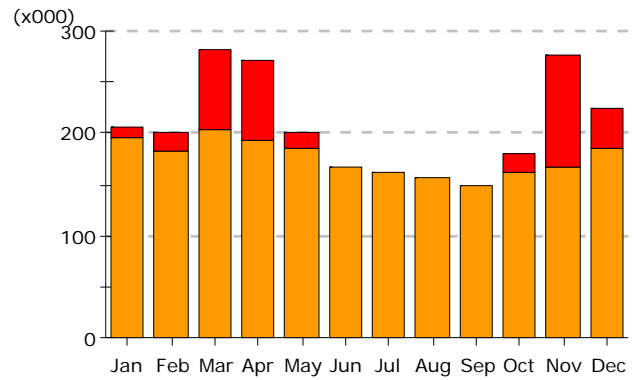
Gas Consumption (Btu x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	17.4	37.4	46.0	58.8	3.7	-	-	-	-	19.5	147.2	72.7	402.7
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	196.2	183.3	203.2	193.2	186.4	167.8	162.2	155.3	149.8	160.8	166.4	184.7	2,109.3
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	213.6	220.7	249.1	252.0	190.2	167.8	162.2	155.3	149.8	180.3	313.6	257.4	2,511.9

Electric Consumption (kWh)



Gas Consumption (Btu)



- Area Lighting
- Exterior Usage
- Water Heating
- Refrigeration
- Task Lighting
- Pumps & Aux.
- Ht Pump Supp.
- Heat Rejection
- Misc. Equipment
- Ventilation Fans
- Space Heating
- Space Cooling

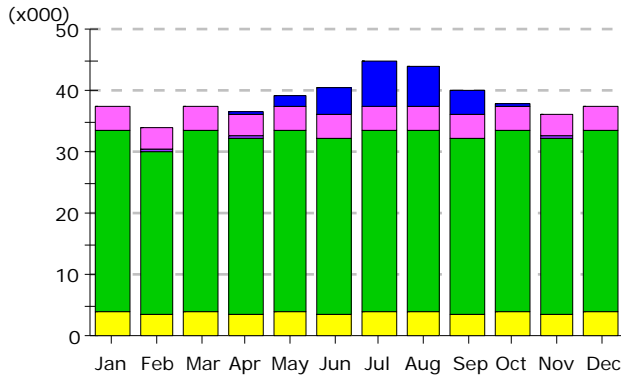
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	0.20	1.65	3.82	6.46	5.73	3.28	0.61	0.07	-	21.83
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	3.40	3.07	3.40	3.29	3.40	3.29	3.40	3.40	3.29	3.40	3.29	3.40	40.05
Pumps & Aux.	0.18	0.17	0.17	0.14	0.03	-	-	-	0.00	0.06	0.15	0.17	1.08
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	25.12	22.69	25.12	24.31	25.12	24.31	25.12	25.12	24.31	25.12	24.31	25.12	295.82
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	3.80	3.43	3.80	3.68	3.80	3.68	3.80	3.80	3.68	3.80	3.68	3.80	44.72
Total	32.51	29.36	32.50	31.63	34.01	35.10	38.79	38.06	34.57	32.99	31.50	32.50	403.51

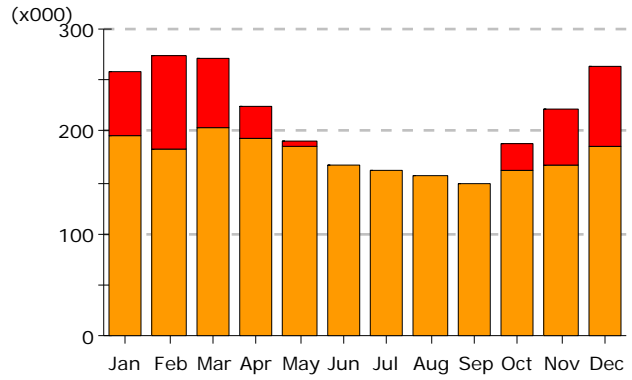
Gas Consumption (Btu x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	8.6	18.1	78.9	78.3	14.4	-	-	-	-	18.4	108.8	40.8	366.2
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	196.3	183.3	203.2	193.2	186.4	167.8	162.2	155.3	149.8	160.8	166.5	184.7	2,109.6
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	204.8	201.4	282.1	271.5	200.8	167.8	162.2	155.3	149.8	179.2	275.2	225.5	2,475.8

Electric Consumption (kWh)



Gas Consumption (Btu)



- Area Lighting
- Exterior Usage
- Water Heating
- Refrigeration
- Task Lighting
- Pumps & Aux.
- Ht Pump Supp.
- Heat Rejection
- Misc. Equipment
- Ventilation Fans
- Space Heating
- Space Cooling

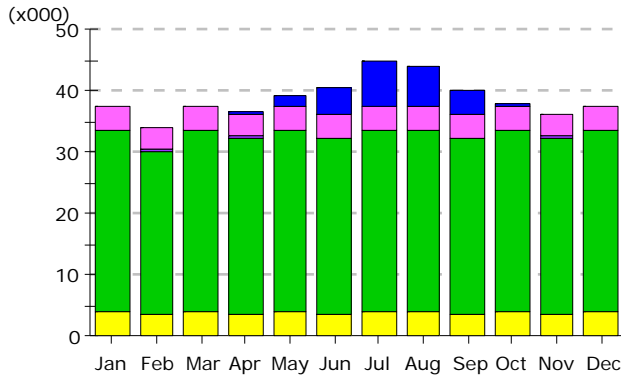
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	0.24	1.95	4.46	7.52	6.67	3.84	0.71	0.08	-	25.48
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	3.79	3.42	3.79	3.67	3.79	3.67	3.79	3.79	3.67	3.79	3.67	3.79	44.60
Pumps & Aux.	0.18	0.17	0.17	0.14	0.03	-	-	-	0.00	0.06	0.15	0.17	1.08
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	29.61	26.75	29.61	28.66	29.61	28.66	29.61	29.61	28.66	29.61	28.66	29.61	348.65
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	3.80	3.43	3.80	3.68	3.80	3.68	3.80	3.80	3.68	3.80	3.68	3.80	44.72
Total	37.38	33.77	37.37	36.38	39.17	40.46	44.71	43.87	39.84	37.97	36.23	37.37	464.53

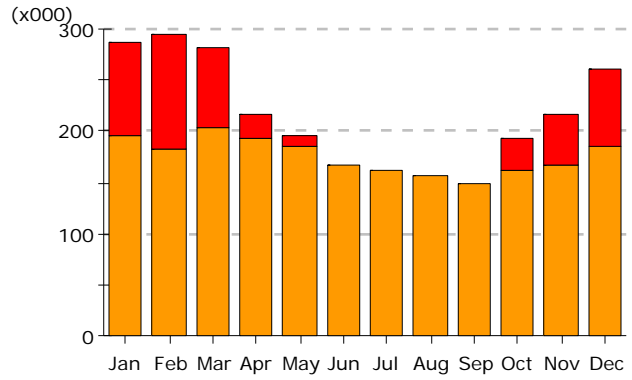
Gas Consumption (Btu x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	62.1	90.1	67.4	30.5	3.9	-	-	-	-	28.0	54.6	78.5	415.1
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	196.0	183.1	203.0	193.1	186.4	167.8	162.2	155.2	149.8	160.7	166.3	184.5	2,108.1
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	258.1	273.2	270.4	223.5	190.3	167.8	162.2	155.2	149.8	188.8	220.9	263.0	2,523.2

Electric Consumption (kWh)



Gas Consumption (Btu)



- Area Lighting
- Exterior Usage
- Water Heating
- Refrigeration
- Task Lighting
- Pumps & Aux.
- Ht Pump Supp.
- Heat Rejection
- Misc. Equipment
- Ventilation Fans
- Space Heating
- Space Cooling

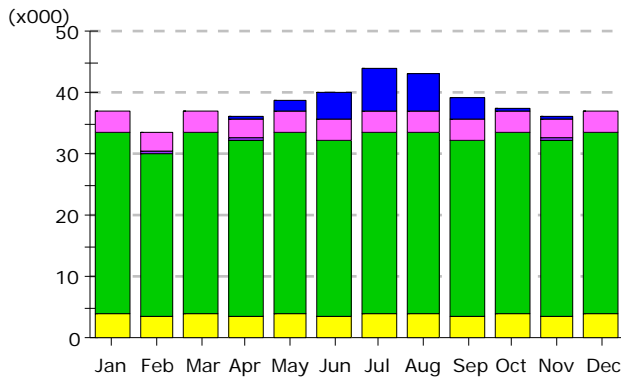
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	0.24	1.96	4.49	7.56	6.71	3.87	0.72	0.08	-	25.64
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	3.79	3.42	3.79	3.67	3.79	3.67	3.79	3.79	3.67	3.79	3.67	3.79	44.63
Pumps & Aux.	0.18	0.17	0.17	0.14	0.03	-	-	-	0.00	0.06	0.15	0.17	1.08
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	29.61	26.75	29.61	28.66	29.61	28.66	29.61	29.61	28.66	29.61	28.66	29.61	348.65
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	3.80	3.43	3.80	3.68	3.80	3.68	3.80	3.80	3.68	3.80	3.68	3.80	44.72
Total	37.38	33.77	37.37	36.39	39.19	40.49	44.75	43.91	39.87	37.98	36.23	37.37	464.71

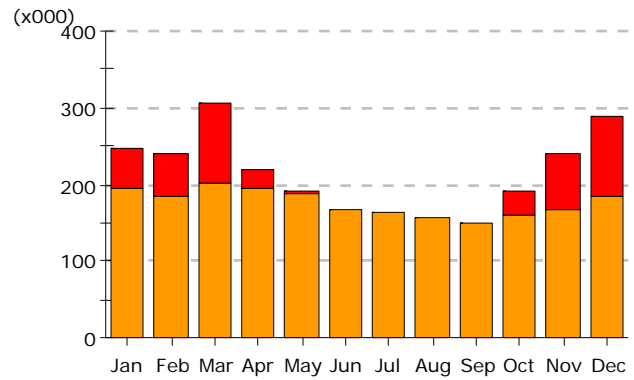
Gas Consumption (Btu x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	90.3	112.2	79.4	24.0	8.0	-	-	-	-	32.1	51.0	77.3	474.3
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	196.1	183.1	203.1	193.1	186.4	167.8	162.2	155.2	149.8	160.8	166.3	184.6	2,108.5
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	286.4	295.3	282.5	217.1	194.4	167.8	162.2	155.2	149.8	192.9	217.4	261.9	2,582.8

Electric Consumption (kWh)



Gas Consumption (Btu)



- Area Lighting
- Exterior Usage
- Water Heating
- Refrigeration
- Task Lighting
- Pumps & Aux.
- Ht Pump Supp.
- Heat Rejection
- Misc. Equipment
- Ventilation Fans
- Space Heating
- Space Cooling

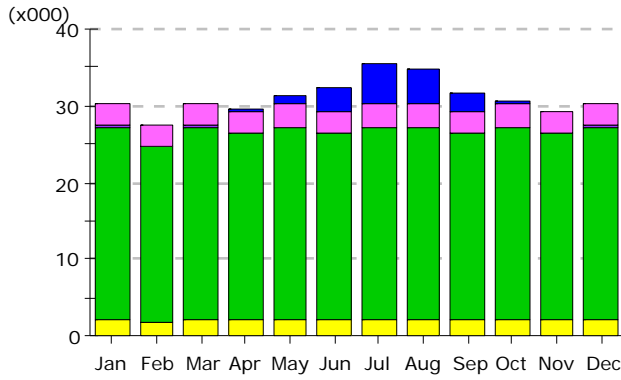
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	0.23	1.83	4.20	7.07	6.29	3.63	0.67	0.08	-	23.99
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	3.45	3.12	3.45	3.34	3.45	3.34	3.45	3.45	3.34	3.45	3.34	3.45	40.63
Pumps & Aux.	0.18	0.17	0.17	0.14	0.03	-	-	-	0.00	0.06	0.15	0.17	1.08
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	29.61	26.75	29.61	28.66	29.61	28.66	29.61	29.61	28.66	29.61	28.66	29.61	348.65
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	3.80	3.43	3.80	3.68	3.80	3.68	3.80	3.80	3.68	3.80	3.68	3.80	44.72
Total	37.04	33.46	37.03	36.04	38.72	39.87	43.93	43.15	39.30	37.59	35.90	37.03	459.07

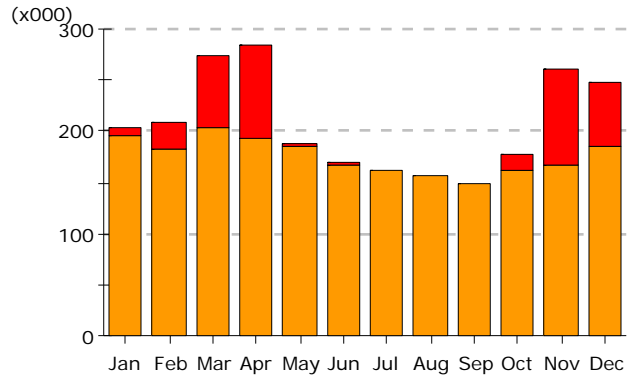
Gas Consumption (Btu x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	49.2	56.7	102.7	27.5	3.7	-	-	-	-	29.0	75.4	102.6	446.8
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	196.1	183.2	203.1	193.2	186.4	167.8	162.2	155.3	149.8	160.8	166.4	184.6	2,108.8
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	245.3	239.9	305.8	220.7	190.2	167.8	162.2	155.3	149.8	189.8	241.7	287.1	2,555.6

Electric Consumption (kWh)



Gas Consumption (Btu)



- Area Lighting
- Exterior Usage
- Water Heating
- Refrigeration
- Task Lighting
- Pumps & Aux.
- Ht Pump Supp.
- Heat Rejection
- Misc. Equipment
- Ventilation Fans
- Space Heating
- Space Cooling

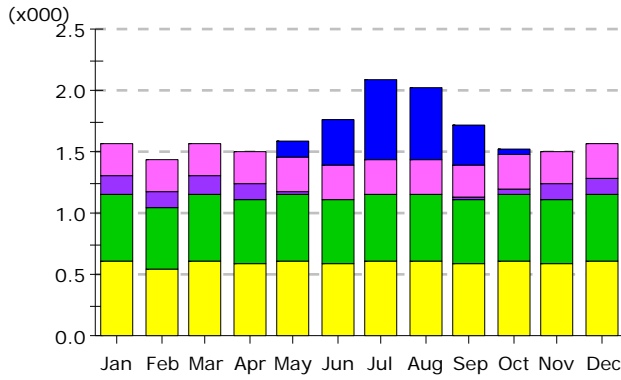
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	0.16	1.34	3.10	5.26	4.68	2.69	0.50	0.06	-	17.79
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	2.94	2.66	2.94	2.85	2.94	2.85	2.94	2.94	2.85	2.94	2.85	2.94	34.66
Pumps & Aux.	0.18	0.17	0.17	0.14	0.03	-	-	-	0.00	0.06	0.15	0.17	1.08
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	25.12	22.69	25.12	24.31	25.12	24.31	25.12	25.12	24.31	25.12	24.31	25.12	295.82
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	2.03	1.83	2.03	1.96	2.03	1.96	2.03	2.03	1.96	2.03	1.96	2.03	23.85
Total	30.28	27.35	30.27	29.43	31.46	32.23	35.35	34.78	31.82	30.65	29.33	30.27	373.21

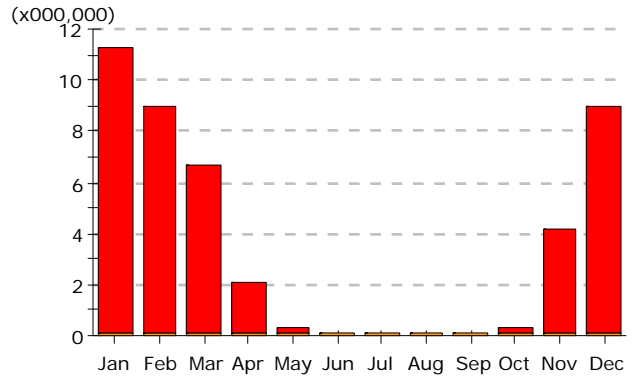
Gas Consumption (Btu x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	6.7	25.4	71.6	90.7	2.7	2.7	-	-	-	16.8	94.3	64.4	375.3
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	196.1	183.1	203.1	193.1	186.4	167.8	162.2	155.2	149.8	160.7	166.3	184.5	2,108.3
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	202.8	208.5	274.6	283.9	189.1	170.5	162.2	155.2	149.8	177.5	260.6	249.0	2,483.6

Electric Consumption (kWh)



Gas Consumption (Btu)



- Area Lighting
- Exterior Usage
- Water Heating
- Refrigeration
- Task Lighting
- Pumps & Aux.
- Ht Pump Supp.
- Heat Rejection
- Misc. Equipment
- Ventilation Fans
- Space Heating
- Space Cooling

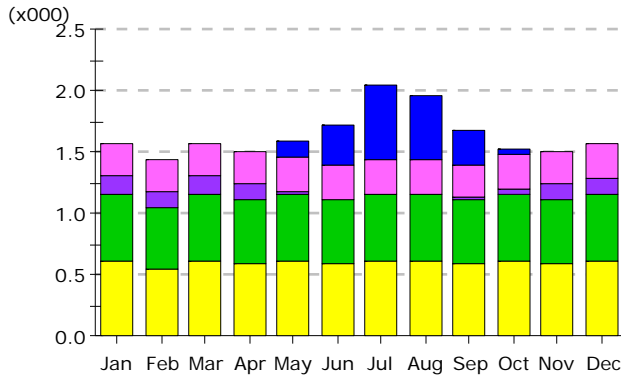
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	0.01	0.14	0.37	0.66	0.58	0.32	0.06	-	-	2.15
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	0.27	0.25	0.27	0.26	0.27	0.26	0.27	0.27	0.26	0.27	0.26	0.27	3.20
Pumps & Aux.	0.15	0.13	0.14	0.12	0.02	-	-	-	0.00	0.05	0.12	0.14	0.87
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	0.55	0.49	0.55	0.53	0.55	0.53	0.55	0.55	0.53	0.55	0.53	0.55	6.42
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	0.61	0.55	0.61	0.59	0.61	0.59	0.61	0.61	0.59	0.61	0.59	0.61	7.19
Total	1.57	1.42	1.57	1.51	1.59	1.76	2.09	2.01	1.71	1.53	1.50	1.57	19.83

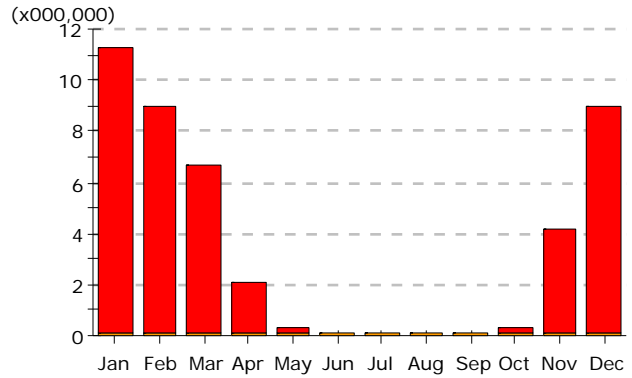
Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	11.14	8.87	6.49	1.95	0.16	-	-	-	-	0.14	4.09	8.86	41.70
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.15	0.14	0.16	0.15	0.14	0.13	0.12	0.12	0.11	0.12	0.13	0.14	1.62
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	11.29	9.02	6.65	2.10	0.30	0.13	0.12	0.12	0.11	0.27	4.22	9.00	43.32

Electric Consumption (kWh)



Gas Consumption (Btu)



- Area Lighting
- Exterior Usage
- Water Heating
- Refrigeration
- Task Lighting
- Pumps & Aux.
- Ht Pump Supp.
- Heat Rejection
- Misc. Equipment
- Ventilation Fans
- Space Heating
- Space Cooling

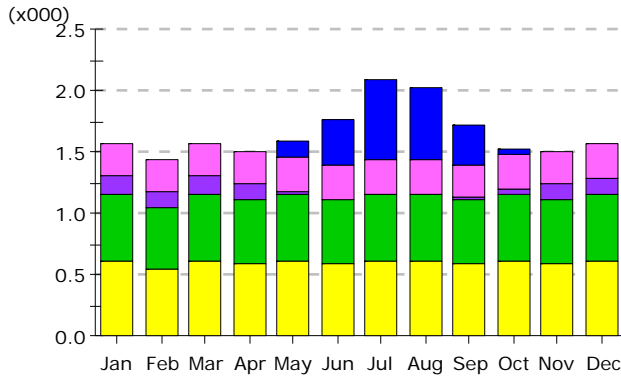
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	0.01	0.13	0.34	0.61	0.54	0.30	0.05	-	-	1.98
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	0.27	0.25	0.27	0.26	0.27	0.26	0.27	0.27	0.26	0.27	0.26	0.27	3.20
Pumps & Aux.	0.15	0.13	0.14	0.12	0.02	-	-	-	0.00	0.05	0.12	0.14	0.87
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	0.55	0.49	0.55	0.53	0.55	0.53	0.55	0.55	0.53	0.55	0.53	0.55	6.42
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	0.61	0.55	0.61	0.59	0.61	0.59	0.61	0.61	0.59	0.61	0.59	0.61	7.19
Total	1.57	1.42	1.57	1.50	1.58	1.73	2.04	1.97	1.68	1.53	1.50	1.57	19.66

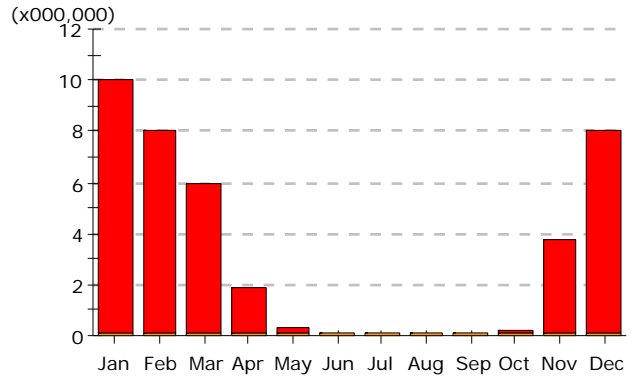
Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	11.14	8.87	6.49	1.95	0.16	-	-	-	-	0.14	4.09	8.86	41.70
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.15	0.14	0.16	0.15	0.14	0.13	0.12	0.12	0.11	0.12	0.13	0.14	1.62
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	11.29	9.02	6.65	2.10	0.30	0.13	0.12	0.12	0.11	0.27	4.22	9.00	43.32

Electric Consumption (kWh)



Gas Consumption (Btu)



- Area Lighting
- Exterior Usage
- Water Heating
- Refrigeration
- Task Lighting
- Pumps & Aux.
- Ht Pump Supp.
- Heat Rejection
- Misc. Equipment
- Ventilation Fans
- Space Heating
- Space Cooling

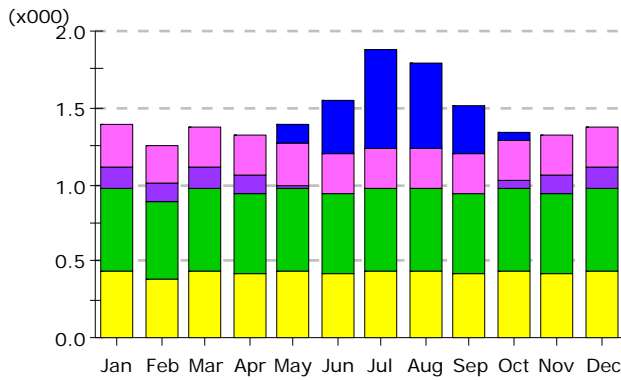
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	0.01	0.14	0.37	0.66	0.58	0.32	0.06	-	-	2.15
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	0.27	0.25	0.27	0.26	0.27	0.26	0.27	0.27	0.26	0.27	0.26	0.27	3.20
Pumps & Aux.	0.15	0.13	0.14	0.12	0.02	-	-	-	0.00	0.05	0.12	0.14	0.87
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	0.55	0.49	0.55	0.53	0.55	0.53	0.55	0.55	0.53	0.55	0.53	0.55	6.42
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	0.61	0.55	0.61	0.59	0.61	0.59	0.61	0.61	0.59	0.61	0.59	0.61	7.19
Total	1.57	1.42	1.57	1.51	1.59	1.76	2.09	2.01	1.71	1.53	1.50	1.57	19.83

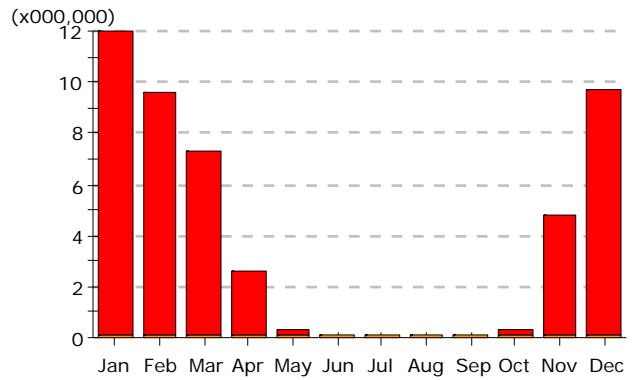
Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	9.90	7.89	5.77	1.73	0.14	-	-	-	-	0.13	3.64	7.87	37.07
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.15	0.14	0.16	0.15	0.14	0.13	0.12	0.12	0.11	0.12	0.13	0.14	1.62
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	10.05	8.03	5.93	1.88	0.28	0.13	0.12	0.12	0.11	0.25	3.76	8.01	38.69

Electric Consumption (kWh)



Gas Consumption (Btu)



- Area Lighting
- Exterior Usage
- Water Heating
- Refrigeration
- Task Lighting
- Pumps & Aux.
- Ht Pump Supp.
- Heat Rejection
- Misc. Equipment
- Ventilation Fans
- Space Heating
- Space Cooling

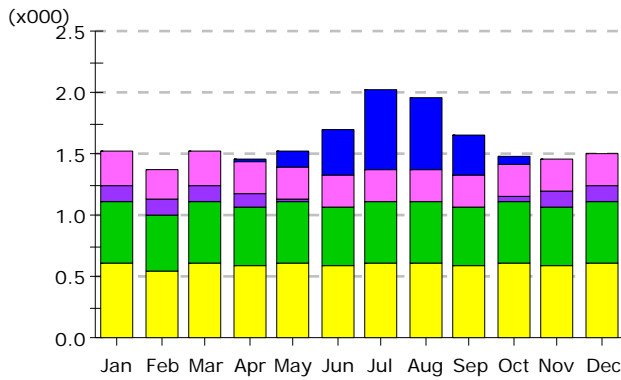
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	0.01	0.13	0.35	0.63	0.55	0.30	0.05	-	-	2.03
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	0.27	0.24	0.27	0.26	0.27	0.26	0.27	0.27	0.26	0.27	0.26	0.27	3.13
Pumps & Aux.	0.15	0.13	0.14	0.12	0.02	-	-	-	0.00	0.05	0.12	0.14	0.87
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	0.55	0.49	0.55	0.53	0.55	0.53	0.55	0.55	0.53	0.55	0.53	0.55	6.42
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	0.43	0.39	0.43	0.41	0.43	0.41	0.43	0.43	0.41	0.43	0.41	0.43	5.03
Total	1.38	1.25	1.38	1.32	1.39	1.55	1.87	1.79	1.51	1.34	1.32	1.38	17.48

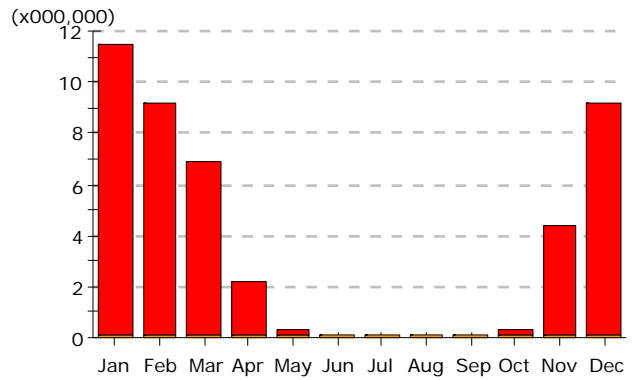
Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	11.80	9.48	7.11	2.41	0.22	-	-	-	-	0.21	4.70	9.55	45.48
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.15	0.14	0.16	0.15	0.14	0.13	0.12	0.12	0.11	0.12	0.13	0.14	1.62
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	11.95	9.62	7.27	2.56	0.36	0.13	0.12	0.12	0.11	0.33	4.83	9.70	47.10

Electric Consumption (kWh)



Gas Consumption (Btu)



- Area Lighting
- Exterior Usage
- Water Heating
- Refrigeration
- Task Lighting
- Pumps & Aux.
- Ht Pump Supp.
- Heat Rejection
- Misc. Equipment
- Ventilation Fans
- Space Heating
- Space Cooling

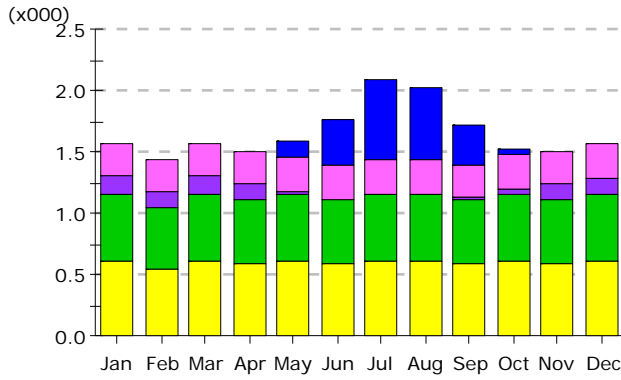
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	0.01	0.14	0.37	0.65	0.57	0.32	0.05	-	-	2.11
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	0.27	0.24	0.27	0.26	0.27	0.26	0.27	0.27	0.26	0.27	0.26	0.27	3.18
Pumps & Aux.	0.15	0.13	0.14	0.12	0.02	-	-	-	0.00	0.05	0.12	0.14	0.87
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	0.49	0.44	0.49	0.48	0.49	0.48	0.49	0.49	0.48	0.49	0.48	0.49	5.78
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	0.61	0.55	0.61	0.59	0.61	0.59	0.61	0.61	0.59	0.61	0.59	0.61	7.19
Total	1.52	1.37	1.51	1.45	1.53	1.69	2.03	1.95	1.65	1.47	1.45	1.51	19.13

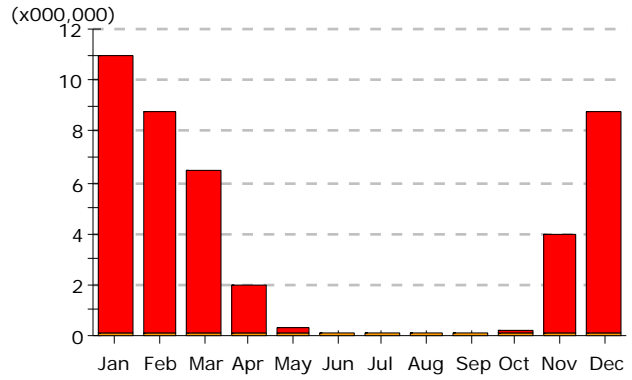
Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	11.35	9.07	6.68	2.09	0.18	-	-	-	-	0.16	4.28	9.08	42.89
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.15	0.14	0.16	0.15	0.14	0.13	0.12	0.12	0.11	0.12	0.13	0.14	1.62
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	11.50	9.21	6.84	2.23	0.32	0.13	0.12	0.12	0.11	0.29	4.41	9.22	44.51

Electric Consumption (kWh)



Gas Consumption (Btu)



- Area Lighting
- Exterior Usage
- Water Heating
- Refrigeration
- Task Lighting
- Pumps & Aux.
- Ht Pump Supp.
- Heat Rejection
- Misc. Equipment
- Ventilation Fans
- Space Heating
- Space Cooling

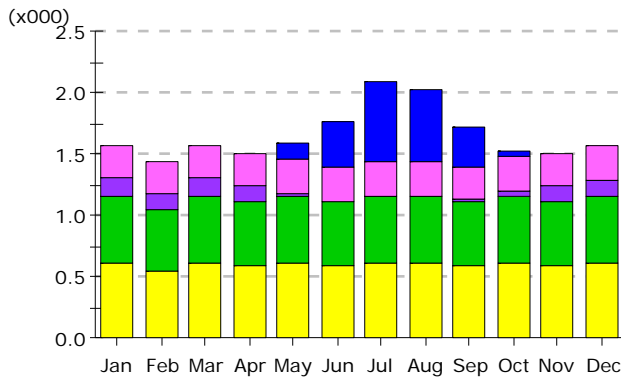
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	0.01	0.14	0.37	0.66	0.58	0.33	0.06	-	-	2.15
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	0.27	0.25	0.27	0.26	0.27	0.26	0.27	0.27	0.26	0.27	0.26	0.27	3.20
Pumps & Aux.	0.15	0.13	0.14	0.12	0.02	-	-	-	0.00	0.05	0.12	0.14	0.87
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	0.55	0.49	0.55	0.53	0.55	0.53	0.55	0.55	0.53	0.55	0.53	0.55	6.42
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	0.61	0.55	0.61	0.59	0.61	0.59	0.61	0.61	0.59	0.61	0.59	0.61	7.19
Total	1.57	1.42	1.57	1.51	1.59	1.76	2.09	2.01	1.71	1.53	1.50	1.57	19.83

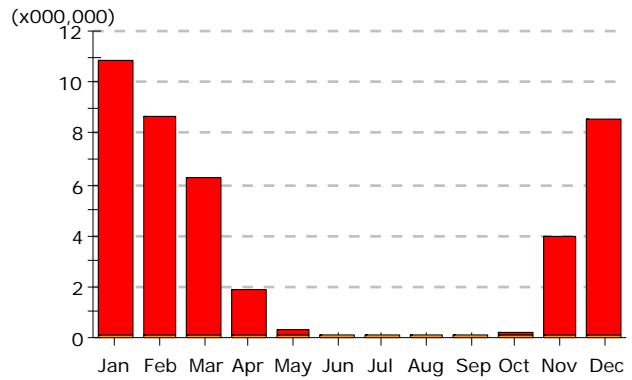
Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	10.84	8.62	6.27	1.83	0.14	-	-	-	-	0.11	3.89	8.58	40.29
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.15	0.14	0.16	0.15	0.14	0.13	0.12	0.12	0.11	0.12	0.13	0.14	1.62
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	10.99	8.76	6.43	1.98	0.28	0.13	0.12	0.12	0.11	0.24	4.02	8.72	41.91

Electric Consumption (kWh)



Gas Consumption (Btu)



- Area Lighting
- Exterior Usage
- Water Heating
- Refrigeration
- Task Lighting
- Pumps & Aux.
- Ht Pump Supp.
- Heat Rejection
- Misc. Equipment
- Ventilation Fans
- Space Heating
- Space Cooling

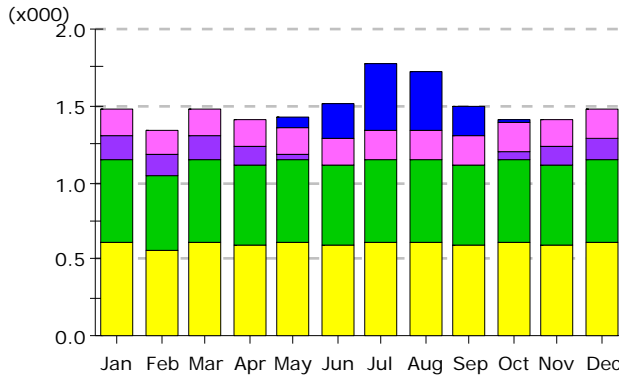
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	0.01	0.14	0.38	0.67	0.59	0.33	0.06	-	-	2.16
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	0.27	0.25	0.27	0.26	0.27	0.26	0.27	0.27	0.26	0.27	0.26	0.27	3.21
Pumps & Aux.	0.15	0.13	0.14	0.12	0.02	-	-	-	0.00	0.05	0.12	0.14	0.87
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	0.55	0.49	0.55	0.53	0.55	0.53	0.55	0.55	0.53	0.55	0.53	0.55	6.42
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	0.61	0.55	0.61	0.59	0.61	0.59	0.61	0.61	0.59	0.61	0.59	0.61	7.19
Total	1.57	1.42	1.57	1.51	1.59	1.76	2.09	2.01	1.71	1.53	1.50	1.57	19.84

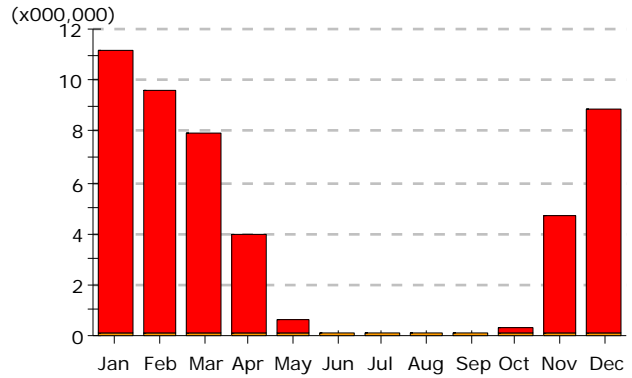
Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	10.71	8.48	6.16	1.75	0.13	-	-	-	-	0.11	3.79	8.46	39.58
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.15	0.14	0.16	0.15	0.14	0.13	0.12	0.12	0.11	0.12	0.13	0.14	1.62
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	10.86	8.62	6.31	1.90	0.27	0.13	0.12	0.12	0.11	0.23	3.92	8.60	41.19

Electric Consumption (kWh)



Gas Consumption (Btu)



- Area Lighting
- Exterior Usage
- Water Heating
- Refrigeration
- Task Lighting
- Pumps & Aux.
- Ht Pump Supp.
- Heat Rejection
- Misc. Equipment
- Ventilation Fans
- Space Heating
- Space Cooling

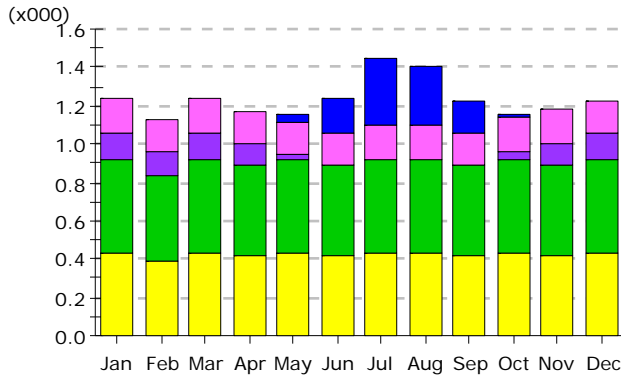
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	0.06	0.22	0.43	0.38	0.20	0.03	-	-	1.32
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	0.18	0.16	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	2.14
Pumps & Aux.	0.15	0.13	0.14	0.12	0.02	-	-	-	0.00	0.05	0.12	0.14	0.87
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	0.55	0.49	0.55	0.53	0.55	0.53	0.55	0.55	0.53	0.55	0.53	0.55	6.42
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	0.61	0.55	0.61	0.59	0.61	0.59	0.61	0.61	0.59	0.61	0.59	0.61	7.19
Total	1.48	1.34	1.48	1.41	1.43	1.51	1.77	1.72	1.50	1.41	1.41	1.47	17.94

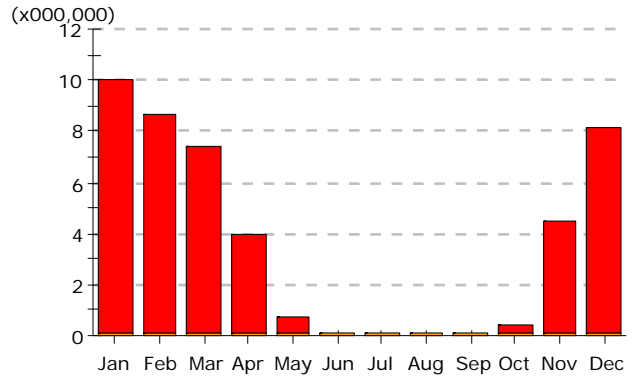
Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	10.98	9.47	7.80	3.82	0.48	-	-	-	-	0.23	4.53	8.76	46.07
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.15	0.14	0.16	0.15	0.14	0.13	0.12	0.12	0.11	0.12	0.13	0.14	1.62
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	11.13	9.61	7.95	3.97	0.62	0.13	0.12	0.12	0.11	0.35	4.66	8.90	47.69

Electric Consumption (kWh)



Gas Consumption (Btu)



- Area Lighting
- Task Lighting
- Misc. Equipment
- Pumps & Aux.
- Ventilation Fans
- Water Heating
- Ht Pump Supp.
- Space Heating
- Refrigeration
- Heat Rejection
- Space Cooling

Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	0.04	0.18	0.35	0.31	0.17	0.02	-	-	1.07
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	0.17	0.16	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	2.05
Pumps & Aux.	0.15	0.13	0.14	0.12	0.02	-	-	-	0.00	0.05	0.12	0.14	0.87
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	0.49	0.44	0.49	0.48	0.49	0.48	0.49	0.49	0.48	0.49	0.48	0.49	5.78
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	0.43	0.39	0.43	0.41	0.43	0.41	0.43	0.43	0.41	0.43	0.41	0.43	5.03
Total	1.24	1.12	1.23	1.17	1.16	1.23	1.45	1.41	1.23	1.16	1.18	1.23	14.80

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	9.87	8.54	7.20	3.83	0.56	-	-	-	-	0.27	4.35	7.97	42.61
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.15	0.14	0.16	0.15	0.14	0.13	0.12	0.12	0.11	0.12	0.13	0.14	1.62
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	10.02	8.68	7.36	3.98	0.70	0.13	0.12	0.12	0.11	0.40	4.48	8.11	44.23