Steven Winter Associates, Inc. 293 Route 18 South Telephone (866) 676-1972
Building System Consultants East Brunswick, NJ 08816 Web: www.swinter.com

May 5, 2010

Local Government Energy Program
Energy Audit Report

Township of Parsippany – Troy Hills

Well House 21
Troy Road
Parsippany, NJ 07054

Project Number: LGEA26

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INTRODUCTION

As an approved energy consulting firm under the Local Government Energy Audit Program (LGEA), Steven Winter Associates, Inc. (SWA) was selected to perform an energy audit and assessment for the Township of Parsippany – Troy Hills buildings. The audit included a review of the Parsippany – Troy Hills Town Hall, Public Library, Community Center and Tennis Club, Police Headquarters, Parks Forestry and Recreation building, as well as the Water Utilities Office, DPW building, Park Road Booster Station building, Well 21 building, and Sewer Pump station # 4 building. The buildings are located in Parsippany and Lake Hiawatha, NJ. A separate energy audit report is issued for each of the referenced buildings.

This report addresses the Parsippany – Troy Hills Well House #21 located at Troy Road, Parsippany, NJ. The current conditions and energy-related information were collected in order to analyze and suggest the implementation of building improvements and energy conservation measures.

The Parsippany - Troy Hills Well House #21, located at Troy Road was constructed in 1995. The Parsippany - Troy Hills Well House #21 consists of approximately 450 square feet of conditioned space with no permanent occupancy however, workers do frequent the building as part of both scheduled maintenance and emergency work. The building is home to mechanical rooms with a focus on motors and pumps. It is not open to the public and access is restricted to authorized personnel. The mechanical equipment housed in the building is in operation all day every day with no exceptions.

The goal of this Local Government Energy Audit (LGEA) is to provide sufficient information to the Township of Parsippany – Troy Hills to make decisions regarding the implementation of the most appropriate and most cost effective energy conservation measures for the building.

Launched in 2008, the LGEA Program provides subsidized energy audits for municipal and local government-owned facilities, including offices, courtrooms, town halls, police and fire stations, sanitation buildings, transportation structures, schools and community centers. The Program will subsidize 75% of the cost of the audit. If the net cost of the installed measures recommended by the audit, after applying eligible NJ SmartStart Buildings incentives, exceeds the remaining cost of the audit, then that additional 25% will also be paid by the program. The Board of Public Utilities (BPU's) Office of Clean Energy has assigned TRC Energy Services to administer the Program.

- Section 1 and section 2 of the report cover a description and analysis of the building existing conditions.
- Section 3 provides a detail inventory of major electrical and mechanical systems in the building.
- Sections 4 through 7 provide a description of our recommendations.
- Appendices include further details and information supporting our recommendations.

EXECUTIVE SUMMARY

The Parsippany - Troy Hills Well House #21, located at Troy Road was opened in 1964, when work was completed as a new construction. The Parsippany - Troy Hills Well House #21 consists of approximately 450 square feet of conditioned space with no permanent occupancy however, workers do frequent the building as part of both scheduled maintenance and emergency work. The building is home to mechanical rooms with a focus on motors and pumps. It is not open to the public and access is restricted to authorized personnel. The mechanical equipment housed in the building is in operation all day every day with no exceptions.

Based on the field visit performed by the SWA staff on October 23rd, 2009 and the results of a comprehensive energy analysis, this report describes the site's current conditions and recommendations for improvements. Suggestions for measures related to energy conservation and improved comfort are provided in the scope of work. Energy and resource savings are estimated for each measure that results in a reduction of heating, cooling, and electric usage.

Existing conditions

From August 2008 through July 2009, the period of analysis for this audit, the building consumed 827,640 kWh, equivalent to 2,824 MMBTUs at a price of $129,310 and an approximate rate of $0.156/kWh.

SWA has entered energy information about Well House #21 in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. Currently, the building is not eligible to receive a performance rating due to its classification and size. Well houses are currently not rated by Portfolio Manager. SWA encourages the Township of Parsippany - Troy Hills to continue entering utility data in *Energy Star Portfolio Manager* in order to track weather normalized source energy use over time.

The Site Energy Use Intensity is 5,957.0 kBtu/sq ft yr compared to the national average of a building consuming 104.0 kBtu/sq ft yr. This number is extremely high since well houses contain pumps, motors and other process equipment that is factored into a small building area. Implementing this report's highly recommended Energy Conservations Measures (ECMs) will reduce use by approximately 0.8 kBtu/sqft yr, with an additional 0.2 kBtu/sq ft yr from the recommended End of Life Cycle ECMs.

Recommendations

Implementing this report's recommendations will reduce use by approximately 1.0 kBtu/ft^{2}yr, which would decrease the building's energy use intensity to 5,956.0 kBtu/ft^{2}yr.

Well House #21 is used for extracting well water from the ground, treating the water and then feeding it into the township distribution system. This well house is not occupied regularly and the structure provides a shelter for the pumping and motor system. Due to the use of the building, the intended scope of work is limited.

Based on the assessment of the building, SWA has separated the recommendations into three categories (See Section 4 for more details). These are summarized as follows:

Category I Recommendations: Capital Improvement Measures

- None

Category II Recommendations: Operations and Maintenance

- Bi-annual inspections of exterior areas
- Provide weather stripping / air sealing

Category III Recommendations: Energy Conservation Measures

At this time, SWA highly recommends a total of **3** Energy Conservation Measures (ECMs) for Well House #21 that is summarized in the following Table 1. The total investment cost for these ECMs with incentives is **$2,994**. SWA estimates a first year savings of **$1,322** with a simple payback of **2.3 years**. SWA also recommends **1** End of Life Cycle ECM.

The implementation of all the recommended ECMs would reduce the building electric usage by 5,813 kWh annually, or 1% of the building's current electric consumption including pump and motor usage. SWA estimates that implementing these ECMs will reduce the carbon footprint of Well House #21 by **224,898 lbs of CO_2**, which is equivalent to avoiding the need of 25 trees to absorb the annual CO_2 produced. SWA also recommends that Township of Parsippany - Troy Hills contacts third party energy suppliers in order to negotiate a lower electricity rate. Comparing the current electric rate to average utility rates of similar type buildings in New Jersey, it may be possible to save up to $0.006/kWh, which would have equated to $4,726 for the past 12 months.

There are various incentives that Township of Parsippany - Troy Hills could apply for that could also help lower the cost of installing the ECMs. SWA recommends that the Township of Parsippany - Troy Hills apply for the NJ SmartStart program through the New Jersey Office of Clean Energy. This incentive can help provide technical assistance for the building in the implementation phase of any energy conservation project. A new NJ Clean Power program, Direct Install, to be rolled out soon, could also assist to cover 80% of the capital investment.

The following two tables summarize the proposed Energy Conservation Measures (ECM) and their economic relevance.

Table 1 - Highly Recommended 0-5 Year Payback ECMs																		
ECM #	ECM description	Source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
1	Install 1 new CFL fixture	RSMeans	10	0	10	175	0.0	0	0.0	3	35	5	157	0.3	1,471	294	345	147	313
2	Upgrade two (2) Baldor chlorine system motors	RSMeans	880	120	760	2,204	0.4	0	0.4	30	427	10	3,603	1.8	374	37	56	2,843	3,946
3	Install 12 new T8 fluorescent fixtures	RSMeans	2,584	360	2,224	2,427	0.5	0	0.4	424	861	15	10,130	2.6	356	24	38	7,906	4,346
	TOTALS		**3,474**	**480**	**2,994**	**4,806**	**0.9**	**0**	**0.8**	**457**	**1,322**	**-**	**13,890**	**2.3**	**-**	**-**	**-**	**10,896**	**8,605**

Assumptions: Discount Rate: 3.2% per DOE FEMP; Energy Price Escalation Rate: 0% per DOE FEMP Guidelines
Note: A 0.0 electrical demand reduction / month indicates that it is very low / negligible

Table 2 - Recommended End of Life Cycle (>10 year payback) ECMs																			
ECM #	ECM description	source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
4	Install 5 new Pulse Start Metal Halide fixtures	RS Means	4,026	125	3,901	1,007	0.2	0	0.2	171	352	15	4,145	11.1	6	1	4	244	1,803
	TOTALS		**4,026**	**125**	**3,901**	**1,007**	**0.2**	**0**	**0.2**	**171**	**352**	**-**	**4,145**	**11.1**	**-**	**-**	**-**	**244**	**1,803**

Note: For more details on End of Life Cycle ECMs and associated incremental cost for high efficiency equipment and performance see Section 4.

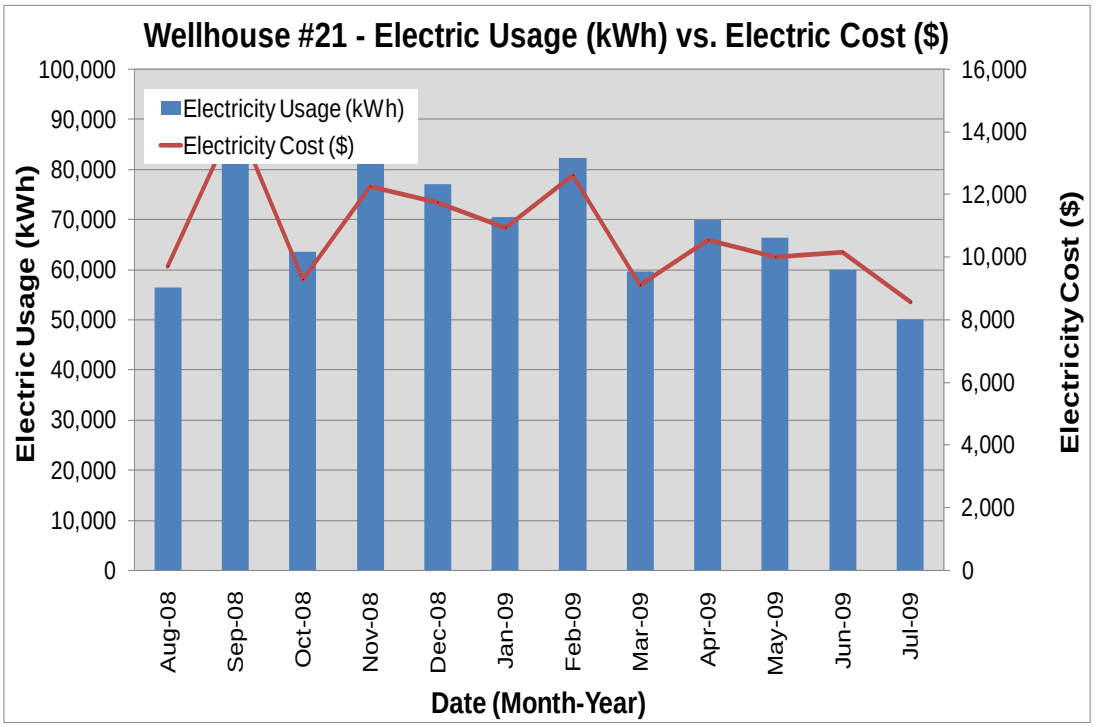
1. HISTORIC ENERGY CONSUMPTION

1.1. Energy usage, load profiles and cost analysis

SWA analyzed utility bills from **August 2008 through July 2009** (period of analysis) that were received from the utility companies supplying Well House #21 with electric and natural gas.

Electricity - Well House #21 buys electricity from JCP&L at **an average rate of $0.156/kWh** based on 12 months of utility bills from August 2008 to July 2009. Well House #21 purchased **approximately 827,640 kWh or $129,310 worth of electricity** in the previous year. Well House #21 is currently charged for demand (kW) which has been factored into each monthly bill.

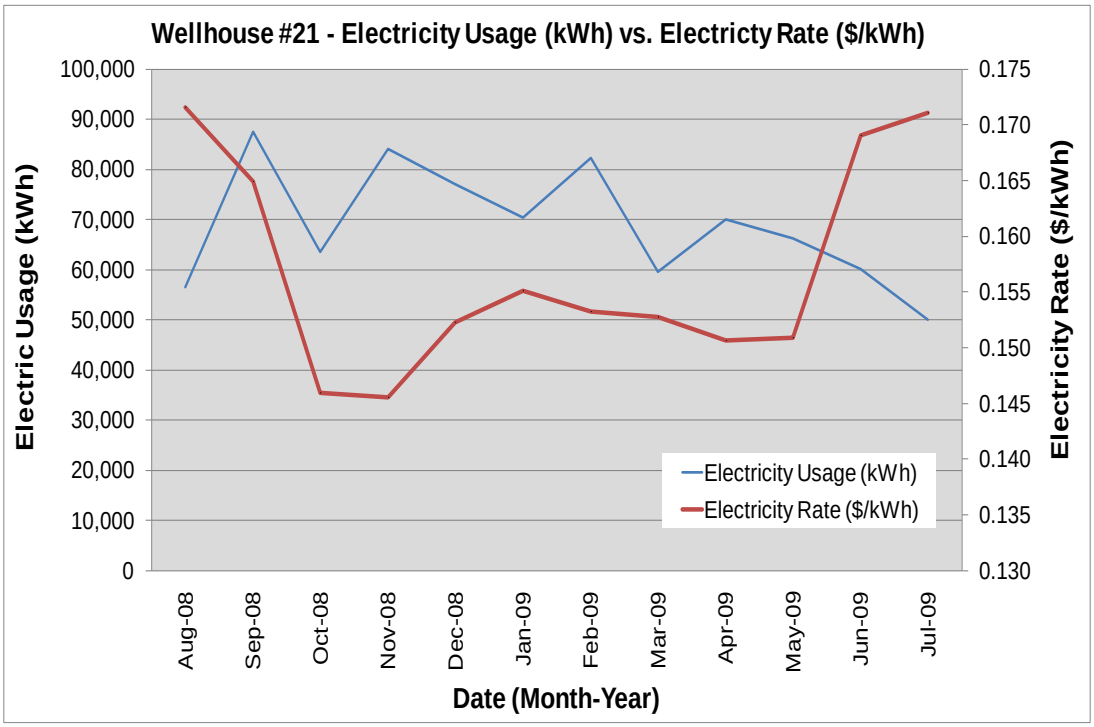
The following chart shows electricity use versus cost for Well House #21 based on utility bills for the 12 month period of August 2008 to July 2009.



Electricity use follows a trend related to pump motor usage and does not necessarily correspond to building HVAC usage. The cost of electricity fluctuates as expected with usage.

1.2. Utility rate analysis

Well House #21 currently purchases electricity from JCP&L at a general service market rate for electricity use (kWh) including a separate (kW) demand charge that is factored into each monthly bill. Well House #21 currently pays an average rate of approximately $0.156/kWh based on the 12 months of utility bills of August 2008 to July 2009. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year. The electric rate does not show large fluctuations throughout the year except for an anticipated rise in the summer time and increase in the winter that corresponds with the use of electricity as a heating fuel source. Based on these observations this appears to be the appropriate rate for the building.



1.3. Energy benchmarking

SWA has entered energy information about Well House #21 in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. Currently, the building is not eligible to receive a performance rating due to its classification and size. SWA encourages the Township of Parsippany - Troy Hills to continue entering utility data in *Energy Star Portfolio Manager* in order to track weather normalized source energy use over time.

The Site Energy Use Intensity is 5,957.0 kBtu/sq ft yr compared to the national average of a building consuming 104.0 kBtu/sq ft yr. Implementing this report's highly recommended Energy Conservations Measures (ECMs) will reduce use by approximately 0.8 kBtu/sqft yr, with an additional 0.2 kBtu/sq ft yr from the recommended End of Life Cycle ECMs.

Per the LGEA program requirements, SWA has assisted Parsippany-Troy Hills to create an *Energy Star Portfolio Manager* account and has shared the Firehouse building facility information to allow future data to be added and tracked using the benchmarking tool. SWA is sharing this Portfolio Manager Site information with TRC Energy Services. As per requirements, the account information is provided below:

Username: ParsippanyTroyHillsTownship
Password: PARSIPPANY

Below is an energy performance statement generated based on historical energy consumption from the Portfolio Manager Benchmarking tool.

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Wellhouse #21

Building ID: 1977957
For 12-month Period Ending: August 31, 2009[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: December 30, 2009

Facility	Facility Owner	Primary Contact for this Facility
Wellhouse #21 Troy Road Parsippany, NJ 07054	Township of Parsippany - Troy Hills 1001 Parsippany Boulevard Parsippany, NJ 07054	Jasmine L. Lim 1001 Parsippany Boulevard Parsippany, NJ 07054

Year Built: 1964
Gross Floor Area (ft²): 450

Energy Performance Rating[2] (1-100) N/A

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	2,680,877
Natural Gas - (kBtu)[4]	0
Total Energy (kBtu)	2,680,877
Energy Intensity[5]	
Site (kBtu/ft²/yr)	5958
Source (kBtu/ft²/yr)	19898
Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	408
Electric Distribution Utility	
FirstEnergy - Jersey Central Power & Lt Co	
National Average Comparison	
National Average Site EUI	104
National Average Source EUI	213
% Difference from National Average Source EUI	9242%
Building Type	Other

Stamp of Certifying Professional

Based on the conditions observed at the time of my visit to this building, I certify that the information contained within this statement is accurate.

Certifying Professional
N/A

Meets Industry Standards[6] **for Indoor Environmental Conditions:**	
Ventilation for Acceptable Indoor Air Quality	**N/A**
Acceptable Thermal Environmental Conditions	**N/A**
Adequate Illumination	**N/A**

Notes:
1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.
2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR.
3. Values represent energy consumption, annualized to a 12-month period.
4. Natural Gas values in units of volume (e.g. cubic feet) are converted to kBtu with adjustments made for elevation based on Facility zip code.
5. Values represent energy intensity, annualized to a 12-month period.
6. Based on Meeting ASHRAE Standard 62 for ventilation for acceptable indoor air quality, ASHRAE Standard 55 for thermal comfort, and IESNA Lighting Handbook for lighting quality.

EPA Form 5900-16

2. FACILITY AND SYSTEMS DESCRIPTION

2.1. Building Characteristics

The Parsippany - Troy Hills Well House #21, located at Troy Road was opened in 1995, when work was completed as a new construction. The Parsippany - Troy Hills Well House #21 consists of approximately 450 square feet of conditioned space with no permanent occupancy however, workers do frequent the building as part of both scheduled and emergency work. The building is home to mechanical rooms with a focus on motors and pumps. It is not open to the public and access is restricted to authorized personnel. The mechanical equipment housed in the building is in operation all day every day with no exceptions.

2.2. Building occupancy profiles

There is no permanent occupancy however, workers do frequent the building as part of both scheduled and emergency work and occupancy will not increase beyond that since the building is not open to the public and access is restricted to authorized personnel. The mechanical equipment housed in the building is in operation all day every day with no exceptions.

2.3. Building envelope

2.3.1.Exterior Walls

The typical exterior walls at Well House #21 are a 3” layer of red masonry brick with a 1” air gap and 8” layer of concrete block. Overall, exterior and interior wall finishes of the envelope were found to be in age-appropriate, good condition with no major signs of water or air leakage.

Existing Exterior Walls

There were some isolated instances where the masonry wall is beginning to show signs of damage as well as some slight water damage, and cracked seams at the transition to the base of the building. SWA does however; recommend biannual maintenance inspections to inspect the exterior walls with a focus on cracks and pointing of the masonry, degraded caulking, and locating sources of water and air leakage.

Exterior wall with water damage and cracked seam at base transition

2.3.2. Roof

The roof of Well House #21 is a sloped asphalt shingle roof. The surface of the roof is asphalt shingle with a vapor barrier and plywood layer at the interior that rests on the ceiling joists. The roof is in good age-appropriate condition. Given the age of the building, there are no improvements to the roof assembly or insulation that would provide a significant improvement to the building performance; however, SWA does recommend biannual maintenance inspections with a focus on the drainage, penetrations, flashing and seams of the roof.

2.3.3. Base

The building's base is 10" concrete slab-on-grade. The benefits of installing slab perimeter insulation would not justify the expense and disruption of excavating around the entire building. If excavation is ever required for other reasons, consideration should be given to installing a minimum of 2 inches of rigid foam board insulation.

2.3.4. Windows

The existing windows of Well House #21 are operable double-hung, vinyl-clad aluminum frame windows and aluminum windows. The windows in the front have doors while the windows in the rear have insect screens. The windows appear to be in good age-appropriate condition. Installation of new windows would not be economically viable, but as a best practice, SWA recommends that all windows be inspected at least once a year. Any gaps, cracks, or damage to weather-stripping or caulking should be repaired or replaced, as needed, to minimize energy loss around those openings.

Typical window installation

2.3.5.Exterior doors

The exterior doors at Well House #21 are metal framed, insulated, paneled, hollow core metal doors. The exterior doors are in adequate condition however some of the weather-stripping is missing. If not properly maintained, exterior doors can become major sources of heat loss and infiltration. As a best practice, SWA recommends checking the weather-stripping of each door on a regular basis and replacing any broken seals immediately. This will help optimize comfort and energy performance.

Typical exterior door installation

2.3.6. Building air tightness

Based on a visual inspection and communication with the building staff, the building was observed to be well-sealed and air tight which is consistent with the age and intended use of the building. As a best practice, weather-stripping on doors and windows should be checked every 6 months for deficiencies and replaced as they fail.

2.4. HVAC Systems

Well House #21 is heated but not cooled. The building consists of only approximately 450 square feet and does not have a large heating load.

2.4.1. Heating

The heating system consists of two, ceiling-mounted Qmark electric unit heaters. Due to the size of the building and the amount of pumping equipment installed, the electric unit heaters are rarely used. The space of the building contains enough pumping equipment, including motors, that provides enough waste heat the interior temperature rarely drops low enough to call for heat. The Qmark electric unit heaters are used primarily to prevent freezing. The Qmark electric heaters were observed in good condition and showed little signs of use and are not recommended to be replaced at this time.

2.4.2. Cooling

There is no cooling for this building.

2.4.3. Ventilation

As mentioned above, the HVAC system for Well House #21 is minimal. The building contains passive vents in the architecture to allow excessive heat to dissipate from the building. The building contains a motorized louver to introduce fresh air to the building when the diesel generator is used.

2.4.4. Domestic Hot Water

The building does not currently contain domestic hot water due to the nature of it being a pump house.

2.5. Electrical systems

2.5.1. Lighting

Interior Lighting – Well House #21 contains mostly inefficient lighting. All lighting in the building uses incandescent fixtures that SWA recommends replacing with CFL's (Compact Fluorescent Light bulb) and some 4' T12 fixtures that SWA recommends replacing with T8 fixtures. See attached lighting schedule in Appendix A for a complete lighting inventory throughout the building and estimated power consumption.

Exterior Lighting - The exterior lighting surveyed during the building audit was found to be 100W metal halide fixtures. SWA recommends replacing the metal halide fixtures with 65W pulse start metal halide fixtures.

2.5.2. Appliances

Due to the use of the building as a well house, there are no appliances used.

2.5.3. Elevators

Well House #21 does not have any installed elevators.

2.5.4. Process and others electrical systems

Well House #21 uses a system of pumps and motors to extract fresh water from the ground, treat the water and then feed the water in to the Town of Parsippany-Troy Hills water distribution network. The building uses a pump that contains an efficient 200HP high thruster motor for distributing the water and two inefficient Baldor motors that circulate chlorine treatment for the well house. SWA recommends upgrading the two Baldor motors to NEMA Premium efficiency motors. Building staff informed SWA that the current well is approximately 90 feet deep and the well house sees approximately 2,000,000 gallons of water per day.

3. EQUIPMENT LIST

Inventory

Building System	Description	Physical Location	Make/ Model	Fuel	Space served	Date Installed	Estimated Remaining useful life %
Pumps	Chlorine pump motors; Two (2) Baldor motors associated with Chlorine pumps, 2 HP, Nema Nom Efficiency 78.5%, Power factor 99%, 3450 RPM, 60 Hz	Inside Well house	Baldor, Cat. #VM8555-NP, Spec #35A13-672F5, Serial #F200	Electricity	Well house pumps	2005	50%
Pumps	Distribution Pump motor; U.S Electrical Motors, Premium efficiency High Thrust motors, 1750 RPM, Nema Nom. Efficiency 95.4%, 200 HP	Inside Well house	U.S Electrical Motors, Model #NA, Serial #NA	Electricity	Well house pumps	2005	50%
Heating	Two (2) Qmark electric unit heaters, rarely used because pumps provide most of heat	Inside Well house	Qmark, Model #NA, Serial #NA	Electricity	Well house	1991	20%
Power Transmission System	Twin Disc Power Transmission equipment	Inside Well house	Twin Disc, Model #SP211HP2, Serial #329298	Electricity	Well house	1991	20%
Starter	Delco-Remy solenoid starter	Inside Well house	Delco-Remy, Series 42MT, Type 400, Model #1990419, Serial #93J11	Electricity	Well house	1991	20%
Generator	DMT Corporation Generator	Inside Well house	DMT Corporation, Model #NA, Serial #NA	Diesel	Well house	2000	30%
Lighting	See Appendix A	-	-	-	-	-	-

Note: The remaining useful life of a system (in %) is an estimate based on the system date of built and existing conditions derived from visual inspection.

4. ENERGY CONSERVATION MEASURES

Based on the assessment of Well House #21, SWA has separated the investment opportunities into three recommended categories:

1. Capital Improvements - Upgrades not directly associated with energy savings
2. Operations and Maintenance - Low Cost / No Cost Measures
3. Energy Conservation Measures - Higher cost upgrades with associated energy savings

Category I Recommendations: Capital Improvements

- None

Category II Recommendations: Operations and Maintenance

- Bi-annual inspections of exterior areas - SWA recommends that maintenance staff verify the condition of exterior surfaces including doors, windows, roofing material and exterior walls at least twice per year. It is important that deteriorating exterior conditions are repaired immediately upon observation in order to prevent problems such as freezing, flooding and other weather-related issues.

- Provide weather stripping / air sealing – SWA observed that all windows and doors had proper weather-stripping and air sealing due to their age. As a best practice, SWA recommends that each window and door is inspected twice per year for deficiencies. Any time that a seal has been compromised, building maintenance staff should repair and replace the seal immediately to ensure that thermal barriers are not breached.

Category III Recommendations: Energy Conservation Measures

Summary table

ECM#	Description of Highly Recommended 0-5 Year Payback ECMs
1	Install 1 new CFL fixture
2	Upgrade two (2) Baldor chlorine system motors
3	Install 12 new T8 fluorescent fixtures
	Description of Recommended End of Life Cycle (>10 year payback) ECMs
4	Install 5 new Pulse Start Metal Halide fixtures

ECM#1: *Install 1 new CFL fixture*

Description:
Well House #21 uses 1 incandescent light for part of its exterior lighting. SWA recommends that this screw-type incandescent bulb is replaced with a CFL screw-type bulb. Typically CFL light bulbs can provide equivalent or better quality light, while using 2/3 less energy. In addition, there will be operating cost savings associated with each bulb since CFLs have a longer rated lifetime than incandescent bulbs. See Appendix A for complete lighting schedule and analysis.

Installation cost:
Estimated installed cost: $10
Source of cost estimate: RS *Means; Published and established costs*

Economics:

ECM #	ECM description	Source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime energy cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
1	Install 1 new CFL fixture	RS Means	10	0	10	175	0.0	0	0.0	3	35	5	157	0.3	1,471	294.2	345	147	313

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA assumes operation cost savings based on avoided bulb replacement when upgrading to lighting that consists of longer rated burn hours.

Rebates / financial incentives:
There are currently no incentives for this measure at this time.

Options for funding ECM:
This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.
http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

ECM#2: *Upgrade two (2) Baldor chlorine system motors*

Description:
Well House #21 currently uses two pumps that each contains a 2HP Baldor motor. These motors are used for power to circulate water through the chlorine system at Well House #21. These motors still have approximately 50% of their useful lifetime left, however they are not efficient motors. The existing motors had an efficiency of 78.5% and are recommended to be upgraded to motors with 86.1% efficiency.

Installation cost:
Estimated installed cost: $760
Source of cost estimate: RS *Means; Published and established costs*

Economics:

ECM #	ECM description	Source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime energy cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
2	Upgrade two (2) Baldor chlorine system motors	RS Means	880	120	760	2,204	0.4	0	0.4	30	427	10	3,603	1.8	374	37	56	2,843	3,946

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA used MotorMaster to calculate the savings with the assumption that the motor is run 24/7 at 75.0% load factor. The existing nameplate has an efficiency of 78.5% and is recommended to be upgraded to a motor classified as NEMA premium efficiency 86.1%.

Rebates / financial incentives:
NJ Clean Energy – Premium Motor incentives, (TEFC type motor, 2HP, 3600 RPM, 85.5% efficiency or greater, $60 per motor)
Total incentive amount of $120.

Options for funding ECM:
This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.
http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

ECM#3: *Install 12 new T8 fluorescent fixtures*

Description:
Based on field observations, there are 12 inefficient T12 fluorescent light fixtures with magnetic ballasts that should be upgraded to T8 fluorescent light fixtures with electronic ballasts. Upgrading from T12 fixtures to T8 fixtures generally results in a total power and electric usage savings of 30%. See Appendix A for complete lighting schedule and analysis.

Installation cost:
Estimated installed cost: $2,224
Source of cost estimate: RS *Means; Published and established costs*

Economics:

ECM #	ECM description	Source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime energy cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
3	Install 12 new T8 fluorescent fixtures	RS Means	2,584	360	2,224	2,427	0.5	0	0.4	424	861	15	10,130	2.6	356	24	38	7,906	4,346

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA assumes operation cost savings based on avoided bulb replacement when upgrading to lighting that consists of longer rated burn hours.

Rebates / financial incentives:
NJ Clean Energy Prescriptive Lighting, T-8 lamps with electronic ballast in existing facilities ($30 per fixture)
Maximum incentive amount is $360.

Options for funding ECM:
This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.
http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

ECM#4: *Install 5 new Pulse Start Metal Halide fixtures*

Description:
Well House #21 currently contains 5 Probe Start Metal Halide fixtures for exterior lighting. SWA recommends replacing these existing probe start metal halide fixtures with pulse start metal halide fixtures. Typically, probe start metal halides are installed with excessively high wattages since they degrade over time. Pulse Start metal halides can provide a better quality light that does not degrade and therefore can be sized at smaller wattages. Pulse Start Metal halides also save on maintenance costs since they require less bulb replacements over the lifetime of the fixture. See Appendix A for a complete lighting schedule and analysis.

Installation cost:
Estimated installed cost: $3,901
Source of cost estimate: RS *Means; Published and established costs*

Economics:

ECM #	ECM description	Source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime energy cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
4	Install 5 new Pulse Start Metal Halide fixtures	RS Means	4,026	125	3,901	1,007	0.2	0	0.2	171	352	15	4,145	11.1	6	1	4	244	1,803

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA assumes operation cost savings based on avoided bulb replacement when upgrading to lighting that consists of longer rated burn hours.

Rebates / financial incentives:
NJ Clean Energy Prescriptive Lighting – Metal halides with pulse start ($25 per fixture)
Maximum incentive amount is $125.

Options for funding ECM:
This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.
http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

5. RENEWABLE AND DISTRIBUTED ENERGY MEASURES

5.1. Existing systems

There aren't currently any existing renewable energy systems.

5.2. Wind

A Wind system is not applicable for this building because the area does not have winds of sufficient velocity to justify installing a wind turbine system.

5.3. Solar Photovoltaic

A Solar Photovoltaic system is not recommended due to limited and unobstructed area to install solar panels.

5.4. Solar Thermal Collectors

Solar thermal collectors are not appropriate for this building since no hot water is used.

5.5. Combined Heat and Power

CHP is not applicable for this building because of the existing HVAC system, small size and lack of domestic hot water usage.

5.6. Geothermal

Geothermal is not applicable for this building because of existing HVAC system and small size of building.

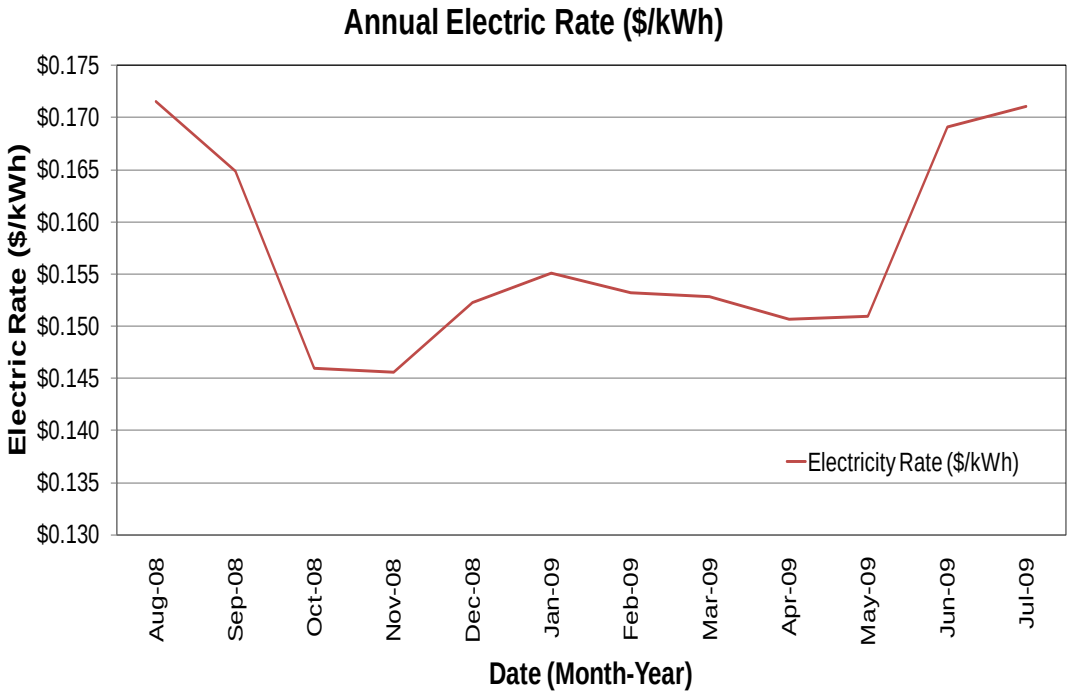
6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES

6.1. Energy Purchasing

An Energy Services Company (ESCO) is a consultancy group that engages in a performance based contract with a client firm to implement measures which reduce energy consumption and costs in a technically and financially viable manner. Electricity is also purchased via one incoming meter directly for Well House #21 from JCP&L without an ESCO. SWA analyzed the utility rate for electricity supply over an extended period. Electric bill analysis shows fluctuations of 29% over the 12 month period of August 2008– July 2009.

Currently, New Jersey commercial buildings of similar type pay $0.150/kWh for electricity. Currently, the electricity rate for Well House #21 is $0.156/kWh, which means there is a potential cost savings of $4,726 per year. A large cost savings potential for electricity exists, however this involves contacting third party suppliers and negotiating utility rates. SWA recommends that Township of Parsippany - Troy Hills further explore opportunities of purchasing electricity from third party energy suppliers in order to reduce rate fluctuation and ultimately reduce the annual cost of energy for Well House #21. Appendix B contains a complete list of third party energy suppliers for the Township of Parsippany - Troy Hills service area. Township of Parsippany - Troy Hills may want to consider partnering with other school districts, municipalities, townships and communities to aggregate a substantial electric and natural gas use

for better leveraging in negotiations with ESCOs and of improving the pricing structures. This sort of activity is happening in many parts of the country and in New Jersey.



6.2. Energy Procurement strategies

Also, Well House #21 would not be eligible for enrollment in a Demand Response Program, because there isn't the capability at this time to shed a minimum of 150 kW electric demand when requested by the utility during peak demand periods, which is the typical threshold for considering this option.

7. METHOD OF ANALYSIS

7.1. Assumptions and tools

Energy modeling tool:	Established / standard industry assumptions, DOE e-Quest
Cost estimates:	RS Means 2009 (Facilities Maintenance & Repair Cost Data) RS Means 2009 (Building Construction Cost Data) RS Means 2009 (Mechanical Cost Data) Published and established specialized equipment material and labor costs Cost estimates also based on utility bill analysis and prior experience with similar projects

7.2. Disclaimer

This engineering audit was prepared using the most current and accurate fuel consumption data available for the site. The estimates that it projects are intended to help guide the owner toward best energy choices. The costs and savings are subject to fluctuations in weather, variations in quality of maintenance, changes in prices of fuel, materials, and labor, and other factors. Although we cannot guarantee savings or costs, we suggest that you use this report for economic analysis of the building and as a means to estimate future cash flow.

THE RECOMMENDATIONS PRESENTED IN THIS REPORT ARE BASED ON THE RESULTS OF ANALYSIS, INSPECTION, AND PERFORMANCE TESTING OF A SAMPLE OF COMPONENTS OF THE BUILDING SITE. ALTHOUGH CODE-RELATED ISSUES MAY BE NOTED, SWA STAFF HAVE NOT COMPLETED A COMPREHENSIVE EVALUATION FOR CODE-COMPLIANCE OR HEALTH AND SAFETY ISSUES. THE OWNER(S) AND MANAGER(S) OF THE BUILDING(S) CONTAINED IN THIS REPORT ARE REMINDED THAT ANY IMPROVEMENTS SUGGESTED IN THIS SCOPE OF WORK MUST BE PERFORMED IN ACCORDANCE WITH ALL LOCAL, STATE, AND FEDERAL LAWS AND REGULATIONS THAT APPLY TO SAID WORK. PARTICULAR ATTENTION MUST BE PAID TO ANY WORK WHICH INVOLVES HEATING AND AIR MOVEMENT SYSTEMS, AND ANY WORK WHICH WILL INVOLVE THE DISTURBANCE OF PRODUCTS CONTAINING MOLD, ASBESTOS, OR LEAD.

Appendix A: Lighting Study of Parsippany - Troy Hills Well House #21

Location			Existing Fixture Information												Retrofit Information												Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings	Total Savings
1	1	Storage Room	Parabolic	M	4'T12	1	2	40	S	2	365	15	95	69	T8	Parabolic	4'T8	E	S	1	2	32	2	365	6	70	51	18	0	18
2	1	Mechanical Room	Parabolic	M	4'T12	11	2	40	S	24	365	15	895	9,154	T8	Parabolic	4'T8	E	S	11	2	32	24	365	6	710	6,745	2,409	0	2,409
3	Ext	Exterior	Exterior	N	Inc	1	1	60	T	12	365	0	60	263	CFL	Exterior	CFL	N	T	1	1	20	12	365	0	20	88	175	0	175
4	Ext	Exterior	Exterior	N	MH	5	1	100	T	12	365	25	525	2,738	PSMH	Exterior	PSMH	N	T	5	1	65	12	365	14	339	1,730	1,007	0	1,007
Totals:						18	6	240				55	1,575	12,224						18	6	149				1,139	8,614	3,610	0	3,610

Rows Highlighed Yellow Indicate an Energy Conservation Measure is recommended for that space

TO USERS: ONCE ALL ROOMS ARE ADDED, DELETE ROWS NOT USED. MAKE SURE TO DELETE ENTIRE ROW, DO NOT SHIFT CELLS!

Appendix B: Third Party Energy Suppliers (ESCOs)

http://www.state.nj.us/bpu/commercial/shopping.html

Third Party Electric Suppliers for JCPL Service Territory	Telephone & Web Site
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
BOC Energy Services, Inc. 575 Mountain Avenue Murray Hill, NJ 07974	(800) 247-2644 www.boc.com
Commerce Energy, Inc. 4400 Route 9 South, Suite 100 Freehold, NJ 07728	(800) 556-8457 www.commerceenergy.com
Constellation NewEnergy, Inc. 900A Lake Street, Suite 2 Ramsey, NJ 07446	(888) 635-0827 www.newenergy.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
FirstEnergy Solutions 300 Madison Avenue Morristown, NJ 07926	(800) 977-0500 www.fes.com
Glacial Energy of New Jersey, Inc. 207 LaRoche Avenue Harrington Park, NJ 07640	(877) 569-2841 www.glacialenergy.com
Integrys Energy Services, Inc. 99 Wood Ave, South, Suite 802 Iselin, NJ 08830	(877) 763-9977 www.integrysenergy.com
Liberty Power Delaware, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(866) 769-3799 www.libertypowercorp.com
Liberty Power Holdings, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(800) 363-7499 www.libertypowercorp.com
Pepco Energy Services, Inc. 112 Main St. Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com
Sempra Energy Solutions 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 www.semprasolutions.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
Suez Energy Resources NA, Inc. 333 Thornall Street, 6th Floor Edison, NJ 08837	(888) 644-1014 www.suezenergyresources.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com

Appendix C: Glossary and Method of Calculations

Glossary of ECM Terms

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Net ECM Cost: The net ECM cost is the cost experienced by the customer, which is typically the total cost (materials + labor) of installing the measure minus any available incentives. Both the total cost and the incentive amounts are expressed in the summary for each ECM.

Annual Energy Cost Savings (AECS): This value is determined by the audit firm based on the calculated energy savings (kWh or Therm) of each ECM and the calculated energy costs of the building.

Lifetime Energy Cost Savings (LECS): This measure estimates the energy cost savings over the lifetime of the ECM. It can be a simple estimation based on fixed energy costs. If desired, this value can factor in an annual increase in energy costs as long as the source is provided.

Simple Payback: This is a simple measure that displays how long the ECM will take to break-even based on the annual energy and maintenance savings of the measure.

ECM Lifetime: This is included with each ECM so that the owner can see how long the ECM will be in place and whether or not it will exceed the simple payback period. Additional guidance for calculating ECM lifetimes can be found below. This value can come from manufacturer's rated lifetime or warranty, the ASHRAE rated lifetime, or any other valid source.

Operating Cost Savings (OCS): This calculation is an annual operating savings for the ECM. It is the difference in the operating, maintenance, and / or equipment replacement costs of the existing case versus the ECM. In the case where an ECM lifetime will be longer than the existing measures (such as LED lighting versus fluorescent) the operating savings will factor in the cost of replacing the units to match the lifetime of the ECM. In this case or in one where one-time repairs are made, the total replacement / repair sum is averaged over the lifetime of the ECM.

Return on Investment (ROI): The ROI is expresses the percentage return of the investment based on the lifetime cost savings of the ECM. This value can be included as an annual or lifetime value, or both.

Net Present Value (NPV): The NPV calculates the present value of an investment's future cash flows based on the time value of money, which is accounted for by a discount rate (assumes bond rate of 3.2%).

Internal Rate of Return (IRR): The IRR expresses an annual rate that results in a break-even point for the investment. If the owner is currently experiencing a lower return on their capital than the IRR, the project is financially advantageous. This measure also allows the owner to compare ECMs against each other to determine the most appealing choices.

Calculation References

ECM = Energy Conservation Measure
AOCS = Annual Operating Cost Savings
AECS = Annual Energy Cost Savings
LOCS = Lifetime Operating Cost Savings
LECS = Lifetime Energy Cost Savings
NPV = Net Present Value
IRR = Internal Rate of Return
DR = Discount Rate

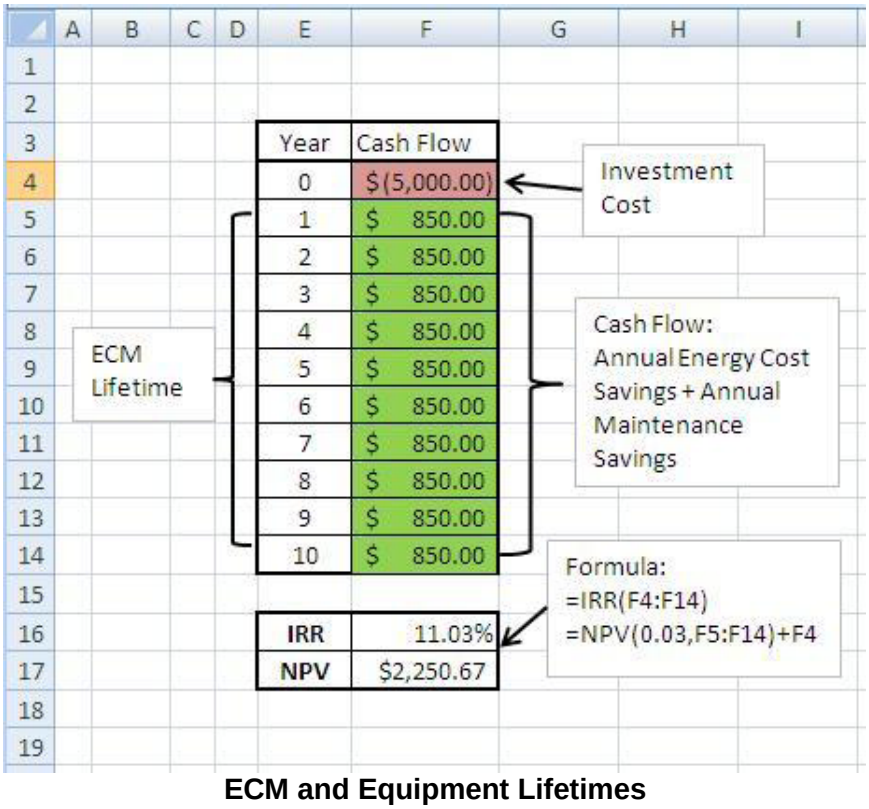
Net ECM Cost = Total ECM Cost – Incentive
LECS = AECS X ECM Lifetime
AOCS = LOCS / ECM Lifetime

Note: The lifetime operating cost savings are all avoided operating, maintenance, and / or component replacement costs over the lifetime of the ECM. This can be the sum of any annual operating savings, recurring or bulk (i.e. one-time repairs) maintenance savings, or the savings that comes from avoiding equipment replacement needed for the existing measure to meet the lifetime of the ECM (e.g. lighting change outs).

Simple Payback = Net ECM Cost / (AECS + AOCS)
Lifetime ROI = (LECS + LOCS – Net ECM Cost) / Net ECM Cost
Annual ROI = (Lifetime ROI / Lifetime) = (AECS + OCS) / Net ECM Cost – 1 / Lifetime
It is easiest to calculate the NPV and IRR using a spreadsheet program like Excel.

Excel NPV and IRR Calculation

In Excel, function =IRR(values) and =NPV(rate, values) are used to quickly calculate the IRR and NPV of a series of annual cash flows. The investment cost will typically be a negative cash flow at year 0 (total cost - incentive) with years 1 through the lifetime receiving a positive cash flow from the annual energy cost savings and annual maintenance savings. The calculations in the example below are for an ECM that saves $850 annually in energy and maintenance costs (over a 10 year lifetime) and takes $5,000 to purchase and install after incentives:



ECM and Equipment Lifetimes

Determining a lifetime for equipment and ECM's can sometimes be difficult. The following table contains a list of lifetimes that the NJCEP uses in its commercial and industrial programs. Other valid sources are also used to determine lifetimes, such as the DOE, ASHRAE, or the manufacturer's warranty.
Lighting is typically the most difficult lifetime to calculate because the fixture, ballast, and bulb can all have different lifetimes. Essentially the ECM analysis will have different operating cost savings (avoided equipment replacement) depending on which lifetime is used.

When the bulb lifetime is used (rated burn hours / annual burn hours), the operating cost savings is just reflecting the theoretical cost of replacing the existing case bulb and ballast over the life of the recommended bulb. Dividing by the bulb lifetime will give an annual operating cost savings.

When a fixture lifetime is used (e.g. 15 years) the operating cost savings reflects the avoided bulb and ballast replacement cost of the existing case over 15 years minus the projected bulb and ballast replacement cost of the proposed case over 15 years. This will give the difference of the equipment replacement costs between the proposed and existing cases and when divided by 15 years will give the annual operating cost savings.

NJCEP C & I Lifetimes

Measure	Measure Life
Commercial Lighting — New	15
Commercial Lighting — Remodel/Replacement	15
Commercial Custom — New	18
Commercial Chiller Optimization	18
Commercial Unitary HVAC — New - Tier 1	15
Commercial Unitary HVAC — Replacement - Tier 1	15
Commercial Unitary HVAC — New - Tier 2	15
Commercial Unitary HVAC — Replacement Tier 2	15
Commercial Chillers — New	25
Commercial Chillers — Replacement	25
Commercial Small Motors (1-10 HP) — New or Replacement	20
Commercial Medium Motors (11-75 HP) — New or Replacement	20
Commercial Large Motors (76-200 HP) — New or Replacement	20
Commercial VSDs — New	15
Commercial VSDs — Retrofit	15
Commercial Comprehensive New Construction Design	18
Commercial Custom — Replacement	18
Industrial Lighting — New	15
Industrial Lighting — Remodel/Replacement	15
Industrial Unitary HVAC — New - Tier 1	15
Industrial Unitary HVAC — Replacement - Tier 1	15
Industrial Unitary HVAC — New - Tier 2	15
Industrial Unitary HVAC — Replacement Tier 2	15
Industrial Chillers — New	25
Industrial Chillers — Replacement	25
Industrial Small Motors (1-10 HP) — New or Replacement	20
Industrial Medium Motors (11-75 HP) — New or Replacement	20
Industrial Large Motors (76-200 HP) — New or Replacement	20
Industrial VSDs — New	15
Industrial VSDs — Retrofit	15
Industrial Custom — Non-Process	18
Industrial Custom — Process	10
Small Commercial Gas Furnace — New or Replacement	20
Small Commercial Gas Boiler — New or Replacement	20
Small Commercial Gas DHW — New or Replacement	10
C&I Gas Absorption Chiller — New or Replacement	25
C&I Gas Custom — New or Replacement (Engine Driven Chiller)	25
C&I Gas Custom — New or Replacement (Gas Efficiency Measures)	18
O&M savings	3
Compressed Air (GWh participant)	8