



The recent interest in solar energy as a way to meet our country's growing energy needs and built-environment energy efficiency goals coincided with our 30th anniversary as a company and 20 years of occupying our own office building. Our office building provided us with an ideal energy efficiency learning laboratory where we could hone our energy control technologies and integrate on-site solar energy production to meet our Silver LEED EB energy retrofit targets. The knowledge and experience we gained from retrofitting our own office building puts us in a unique leading position to design and provide proven, leading-edge solar and energy control technologies to our extensive client base in many different industries.

As a key part of our energy retrofit, in 2009 we installed a 10KW three-phase PV grid tie solar system, partnering with Murray City Power to meet their green energy goals. Our solar thermal installation includes live performance data from three different types of solar thermal panels, some of which were donated so that our solar partners had live access to our real-time, web-based solar performance data on a daily basis. In 2010 we have reduced our historical electrical demand by almost 50% by retrofitting our standard DX cooling with three-stage evaporative cooling technologies. Our PV solar, lighting retrofits, and controlling and reducing our plug loads have also contributed significantly to our energy savings. In August 2010 we installed an additional 3.6KW PV generating capacity for a system total of 13.6KW grid-tie PV.

Our heating system retrofit included installing 95% condensing boilers, replacing our low-efficiency gas-fired unit heaters with fan coil units, and meeting part of our heating demand with our solar hot water generation. Our goal with these retrofits has been to not only develop experience for our engineering team, but to provide a training laboratory for all of our employees in the latest technologies for sustainable building energy utilization. Our live energy data is available to anyone who would like to access our live building automation demo at [www.atkinsondemo.com](http://www.atkinsondemo.com). Along with viewing live data, we invite our clients to visit us for a technical tour of our energy project.

# **HOW WE HAVE REDUCED OUR ENERGY USAGE BY ALMOST 50%**

---

Atkinson Electronics has decades of experience providing control systems to a varied customer base to help them control their environment and manage their energy costs. The ASHRAE targets of having a zero-energy footprint for a commercial building by the year 2030 can only be accomplished by innovative approaches to building energy usage, along with on site renewable energy generation. The challenge of maintaining the comfortable environments to which we have all become accustomed, but with a reduced carbon foot print and the lowest possible energy usage, is a challenge that was key to Atkinson's decision to retrofit our own office building. We have achieved the target of reducing our energy usage by almost 50% over our historical average through implementing the following retrofits.

## **PV SOLAR RETROFIT**

In the summer of 2009 we installed a 10KW grid-tie photovoltaic (PV) system and brought it online in the middle of August. In August of 2010 we brought online an additional 3.6KW of PV solar generation, using available roof space. Since startup in August of 2009, our first year of solar production has exceeded 16MW.

## **THREE-STAGE COOLING AND ROOFTOP RETROFIT**

On-site alternative energy generation is only part of the overall energy efficiency improvement process. Our 20-year-old air cooled direct expansion rooftop units were not only becoming highly unreliable, but they drove our total building demand to over 50KW during peak summer months. In the spring of 2010 we replaced all of these units with three-stage direct/indirect evaporative cooling sections and installed 14 SEER back-up DX air cooled refrigeration. We installed VFDs on all of the supply fans, the DX refrigeration compressors, and the evaporative cooler indirect fans, enabling us to achieve the same cooling capacity tonnage as before but with less than half the electrical power consumption.

## **HIGH EFFICIENCY BOILER, SOLAR THERMAL, AND HOT WATER RETROFIT**

In the autumn of 2008 we installed our first solar HW collectors. We replaced our old boiler with two modulating capacity 95% high efficiency condensing boilers. In the late autumn of 2009 we increased our solar hot water generation capacity by adding two more banks of collectors. Our solar hot water collector angle is optimized for winter collection to supplement our domestic hot water, space heating, and radiant floor needs. In the spring of 2010 we replaced our low efficiency, gas-fired, shop unit heaters with hydronic fan coil units.

## **LIGHTING RETROFIT**

With the electrical demand monitoring provided by our automation system, we discovered that our T-12 fluorescent fixtures were consuming a significant part of our electrical demand. In 2008 we started replacing our T-12 fluorescent fixtures with high-efficiency T8 electronic ballasts. Prior to that we had already installed a number of SolaTube skylights to bring daylight into the interior areas of our building. Motion detectors were also installed to control the lights in many areas. We completed our T-12 to T-8 retrofit in the summer of 2010.

## **AUTOMATION CONTROLS RETROFIT**

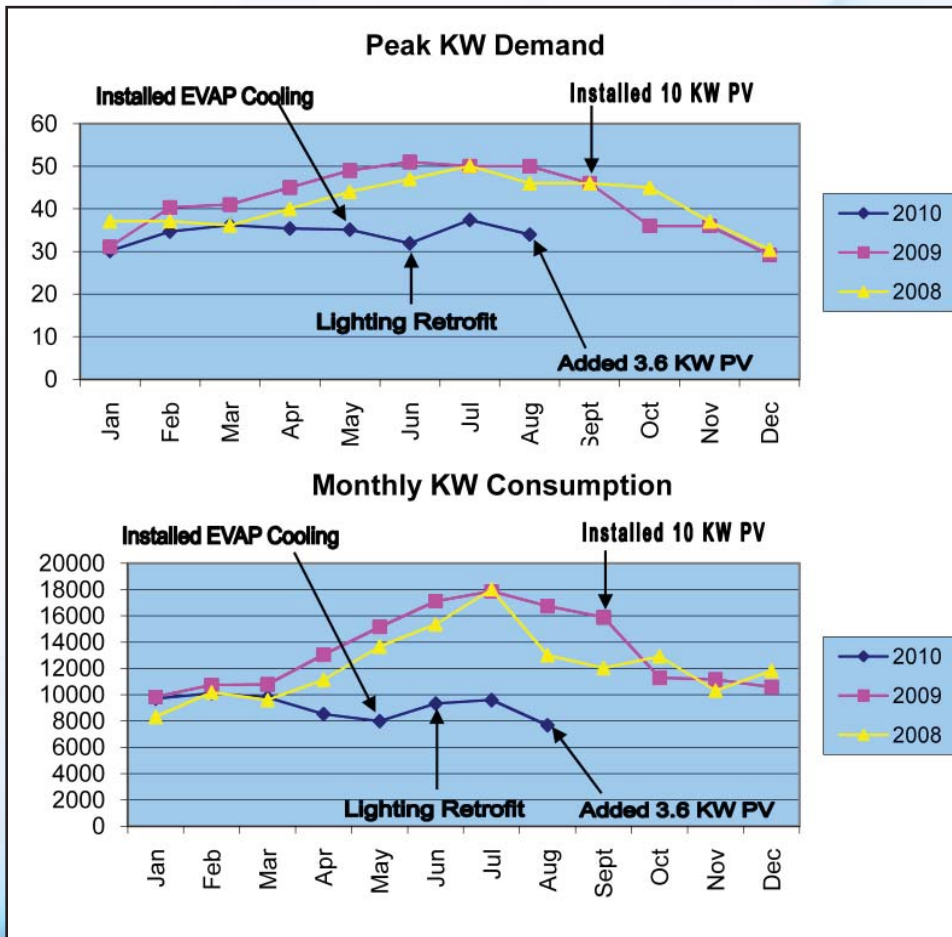
HVAC equipment that is turned to manual operation for service is frequently not returned to "Auto" and continues to run 24/7 until it is noticed, often after many months. Our new automation system that we started installing in 2008 along with our boiler retrofit, made us aware that we had several pieces of equipment that were running in manual operation and not following the automation schedule. Along with the solar, lighting, and boiler retrofits, we have eliminated this problem by installing the latest Internet-based automation technology that not only controls our building, but allows many interested parties to view and monitor our building operation via Internet web pages and identify any problem areas as they arise.

## **PLUG LOAD RETROFIT**

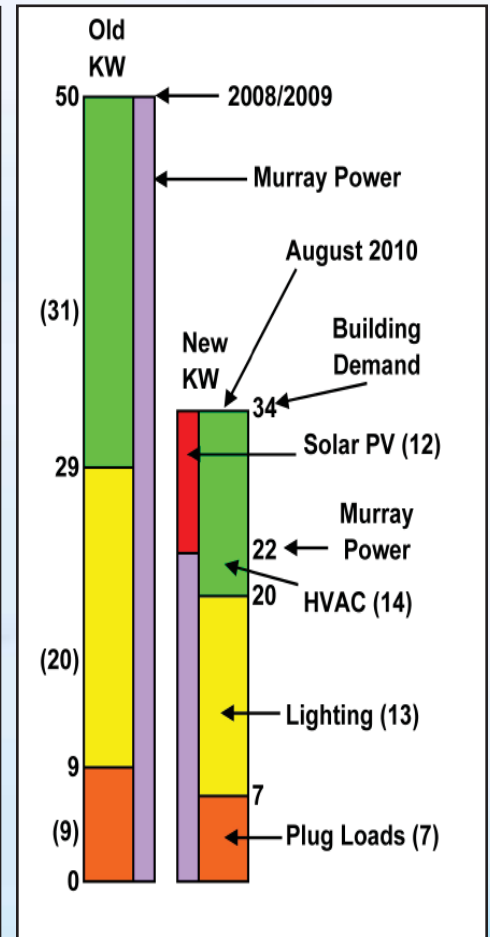
In addition to our other energy efficiency retrofits, we started a campaign to further minimize our energy consumption by reducing electrical plug loads. We replaced all of our CRT monitors with flat screens, and we have identified continuously running equipment (e.g., coolers and vending machines) and connected them to our new, web-based building automation system so they shut off when the building is not occupied. We also educated our employees to turn off their computers and the other equipment (e.g., printers, copy machines) when they go home at night. The building automation system (utilizing the KW power demand signal from the Murray City bi-directional power meter) helped us to discover mechanical equipment, such as fans and air handlers that had been turned to manual and were running continuously. Our building automation system helps us to monitor and control the electrical usage all of the new HVAC, electrical, and solar equipment.

# ENERGY DATA USING OUR AUTOMATION SYSTEM

## 3 YEAR ELECTRICAL KW DEMAND



## BREAKDOWN OF PEAK DEMAND



The graphs show our KW demand and KW consumption over the last three years. In spite of hiring a number of new employees, which expanded our office electrical consumption, our grid-tie solar array (brought online in August of 2009) has offset our electrical increase by producing an average of up to 1,500KW per month (about 15% of our monthly electrical usage). The energy efficiency retrofits in 2010 (changing our T12 lights to T8 and replacing our aging DX cooling units) have reduced our total system daytime demand from an average of 50KW to about 34KW during a typical summer office day. The production of 12KW from our solar arrays drops the power purchase demand to 22KW. The savings from our HVAC, lighting, and plug load retrofits average 16KW. We did not have sub-metering to break out the savings in each of the categories until we installed our new automation system in 2010.

Our July 2010 monthly KW usage of 9,348KW was almost 7,000KW lower than the average of our July 2008 and 2009 usage (16,234KW). Additional dollar savings came from cutting our KW demand charge by almost 50%. Our August utility bill of 7,671KW showed the additional savings realized by finishing our lighting retrofit and bringing online 3.6KW in additional solar PV generating capacity. As of the day this brochure was written (September 15, 2010 at approximately 2:00 p.m.) our solar generated was 11KW, our HVAC KW was 14.2, and our Murray City demand was 27KW.

On-site solar generation, combined with retrofitting our building with higher efficiency equipment, is the means whereby we have achieved over 50% in energy savings. Our automation system has provided the instantaneous electrical usage data that made us aware of the areas of inefficiency, enabling us to plan our retrofit project to maximize our energy savings.

**IN ADDITION TO BUILDING AUTOMATION AND INTEGRATION,  
WE ALSO DELIVER STATE-OF-THE-ART SOLUTIONS FOR THE FOLLOWING INDUSTRIES:**



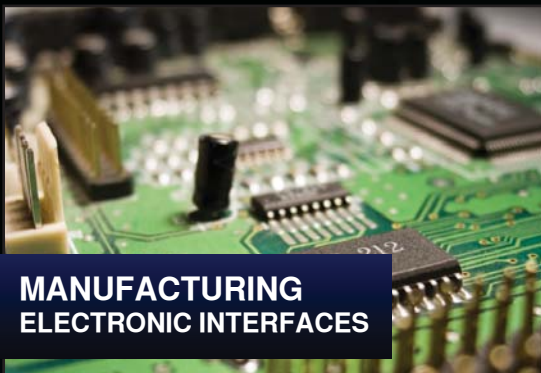
**CRITICAL ENVIRONMENTS**

Atkinson Electronics has extensive experience in variable flow critical environment fume hood controls for large research and university laboratories. Atkinson has partnered with Phoenix Laboratory Control Systems to provide custom critical air flow environments since the late 1980's. For 20 years Atkinson has dominated this industry in the Utah area and has supplied control systems to the majority of laboratories and critical manufacturing environments for many large customers. Some of these include Brigham Young University, the University of Utah, Huntsman Cancer Research, Dugway Proving Ground, Utah State Unified Laboratories, Utah State University, and many others. Atkinson has been at the forefront of recent advances in medical critical environmental systems such as operating rooms, critical environment patient rooms, and other hospital environments.



**SECURITY ACCESS & CCTV**

Atkinson Electronics offers a full portfolio of Access Control solutions to manage the security of your facility. Atkinson's user-friendly automation software allows you to restrict access, control occupancy, monitor door status, and lock or unlock a door or a gate on a schedule. Our extensive experience with custom design and difficult applications enables us to design an electronic door locking system to meet your unique needs. Our custom product line includes integrated enterprise systems, multiple sites, along with single opening applications. Our closed circuit TV (CCTV) solutions enable you to have Internet or conventional security cameras monitoring critical areas with digital video recorders storing images on a continuous basis for after-the-fact area monitoring. We also offer options such as proximity card readers, keypads, and fingerprint or hand geometry biometric readers.



**MANUFACTURING ELECTRONIC INTERFACES**

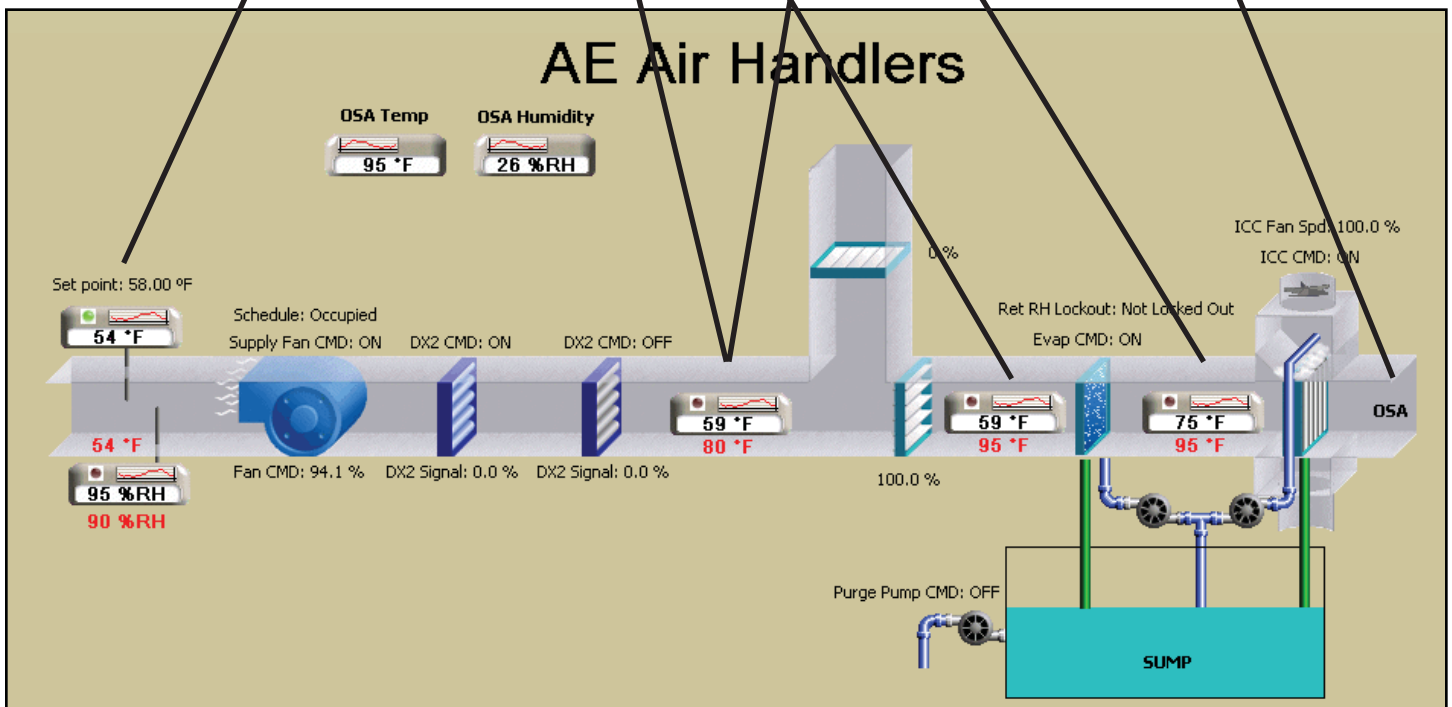
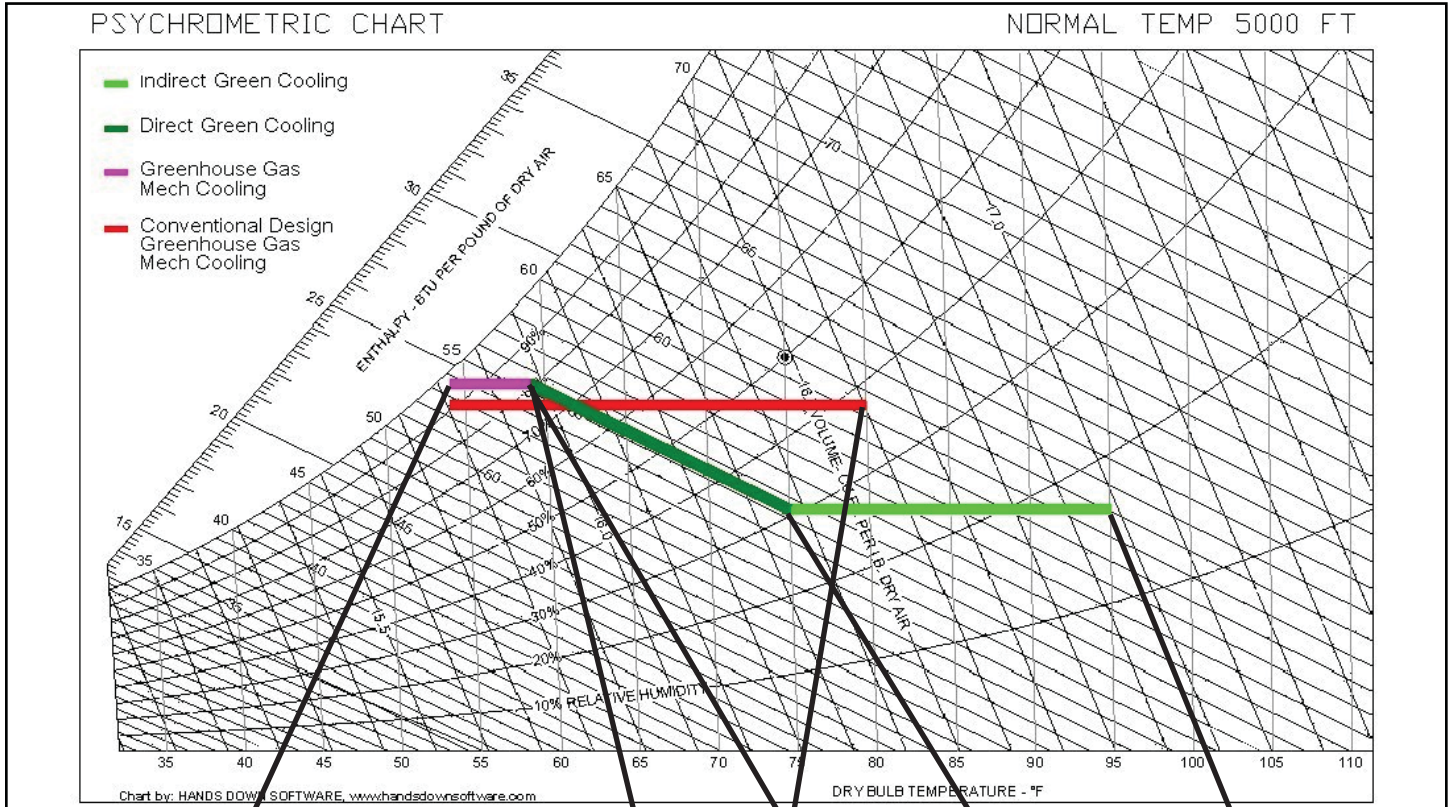
Atkinson's custom electronics manufacturing division has been leading the industry for 30 years specializing in signal conditioners, transducers, signal isolators, and building interfaces that solve many HVAC control signal problems worldwide. Our in-house custom manufacturing capabilities enable us to solve any environmental control problem and helps our automation division fulfill our customers' unique needs. Many of our custom designed control products are found in OEM applications in a large variety of systems offered by other companies. Our extensive product line also includes off-grid solar charge controllers, generator controllers, marine battery chargers, and many other innovative, alternative energy solutions.



**ENERGY SOLUTIONS**

Atkinson Electronics Energy Monitoring and Control Automation software provides building owners with real-time energy usage reports to assist them in meeting their energy efficiency budgets through controlling their HVAC, lighting, and plug loads. In addition to utility-provided energy, (e.g., electrical grid and natural gas), Atkinson's custom software provides energy production monitoring for on-site energy generation such as grid-tie solar PV, solar thermal, and co-generation plants. Our live-data web screens provide user-friendly energy monitoring from any Internet-connected device. Reports can be generated from the energy data collected for use by building owners and managers to optimize energy efficiency.

# THREE-STAGE COOLING AND ROOFTOP RETROFIT





## THREE-STAGE COOLING AND ROOFTOP RETROFIT

In early spring of 2010 we replaced our 20-year-old, air-cooled DX roof top units with 3-stage indirect/direct evaporative cooling (Green Cooling) and supplementary 14 SEER DX refrigeration. All of the fans and compressors in our HVAC system are now controlled by variable frequency drives for optimum energy efficiency.

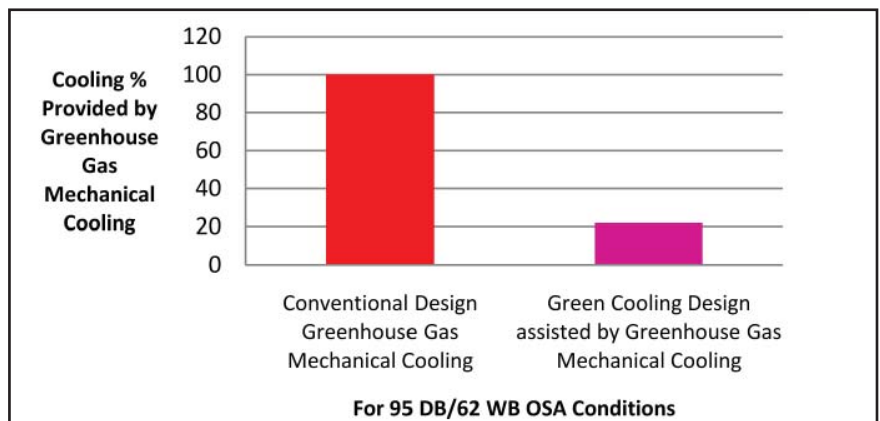
Our Spec-Air indirect/direct evaporative cooling units have played a critical role in helping us to achieve 50% energy savings, replacing our refrigerated air conditioning units as our primary cooling source. They pre-cool outside air by an indirect evaporative cooling section that adds no moisture to the air stream thus depressing the wet bulb temperature. A direct evaporative section further cools the air to between 57-58°F at 80% relative humidity.

Except for humid summer days, this supply air is sufficient to cool our office spaces via VAV boxes. When higher outside wet bulb or dry bulb temperatures exceed the capacity of the indirect/direct evaporative coolers, variable speed DX refrigeration provides supplemental cooling in the supply air stream to maintain a 58°F set point. The Spec-Air indirect/direct evaporative cooler also uses a common sump to improve wet bulb depression on the indirect section.

Our evaporative cooling retrofit, coupled with VFD motor/compressor control, has enabled us to achieve the same cooling capacity tonnage, but with half the average electrical power consumption over the cooling season. In addition, since no chemical water treatment is required, the purge water is used for outdoor plant irrigation.

***This condition shows a design summer day.***

***Mechanical cooling is typically not used below 80° OSA, unless it is a muggy day.***





## LEED POINTS FOR SILVER LEED EB (EXISTING BUILDING) - APPLICATION

---

At the heart of Atkinson's building retrofit project was the push to improve building performance across the metrics that are most important, including energy savings, water efficiency, CO2 emissions reduction, and improved indoor environmental quality. As we have completed our retrofits we have applied for a Silver LEED certification for Existing Buildings in the following categories:

### SUSTAINABLE SITES

Integrated Pest Management, Erosion Control, and Landscape Management Plan	1pt
Alternative Commuting Transportation	4pts
Heat Island Reduction - Roof	1pt
Light Pollution Reduction	1pt

### WATER EFFICIENCY

Water Performance Measurement	
Whole Building Metering	1pt
Sub-metering	1pt
Cooling Tower Water Management	
Chemical Management	1pt

### ENERGY AND ATMOSPHERE

Optimize Energy Efficiency Performance	
ENERGY STAR Rating of 85 or 35th Percentile Above National Median	13pts
Existing Building Commissioning - Investigation and Analysis	2pts
Existing Building Commissioning - Implementation	2pts
Existing Building Commissioning - Ongoing Commissioning	2pts
Performance Measurement - Building Automation System	1pt
Performance Measurement - System-Level Metering	2pts
On-site and Off-site Renewable Energy - 12% On-site	6pts
Enhanced Refrigerant Management	1pt
Emissions Reduction Reporting	1pt

### INDOOR ENVIRONMENTAL QUALITY

Indoor Air Quality Best Management Practices - Indoor Air Quality Management Program	1pt
Indoor Air Quality Best Management Practices - Outdoor Air Delivery Monitoring	1pt
Occupant Comfort - Occupant Survey	1pt
Controllability of Systems - Lighting	1pt
Occupant Comfort - Thermal Comfort Monitoring	1pt
Daylight and Views	1pt

### INNOVATION IN OPERATIONS

LEED Accredited Professional	1pt
Documenting Sustainable Building Cost Impacts	1pt

### REGIONAL CREDIT

2pts

---

Total Points 50