



What is Energy Retrofit & Retro-Commissioning?

Building owners and facility managers should be familiar with retrofit but are they familiar with energy retrofit and retro-commissioning? “Retrofit” is the implementation of corrective action. **Energy retrofit** is the corrective action that will improve energy consumption and system performance. **Retro-commissioning** is the “verification” that the energy corrective action functions as intended. Energy retrofit and the verification of this corrective action performance make economic sense as building mechanical and electrical systems age and/or the systems have chronic operating issues.

Just like one’s automobile requires an engine tune-up after several thousand miles/years of operating, so does a building need its own tune-up. The difference between tuning up an automobile versus a building is that the automobile owner may choose to sell the vehicle instead of investing in making this vehicle operate more efficiently and more reliably. Building owners have the same option but more often than not this owner isn’t going to sell the facility just because it isn’t functioning like it used to operate. This is where owners and facility managers of buildings should learn about and invest in energy retrofitting their mechanical and electrical systems, as well as consider an infrared scan of the building exterior—another energy retrofit initiative.

Utility companies, such as the electrical companies, will offer energy incentives to building owners to reduce the owner’s energy operating cost. In turn, and with a large volume of successful energy rebate requests, the utility company leverages these financial incentives against the need to increase the capacity of the utility plant(s) they own by having buildings reduce their draw and demand on electricity. This can be considered a Win-Win for both the utility customer and utility company.

So what is the process for a facility to reduce its electrical energy, gas, and/or water consumption that



make up a building owner’s operating cost? First, reach out to the various utility companies serving the building to request and receive the local utility company’s energy retrofit program information and the associated work papers to be used as part of their program(s).

Next, the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) *Standard 100-2018, Energy Efficiency in Existing Buildings* is a very good source to read, and then consider hiring a consulting engineer to work with the building owner or facility manager to follow the process and procedures leading up to an energy retrofit of existing buildings in order to achieve greater measured energy efficiency.

Under this 1-2-3 step process to pursue an energy retrofit project opportunity, the building owner or facility manager will hire a consulting engineer(s) who in turn will request the following building information:

- A few years of utility bills noting monthly energy consumption and demand
- As-built equipment submittals and building system record drawings

- Collect existing operating conditions such as system trending of specific control points, existing air and water testing, adjusting, and balancing (TAB) reports, and automatic temperature control record documents, etc.

The Level 1 Phase will be a relatively quick look at the energy consumption converting electrical and gas usage into one common denominator, BTUH. This total annual BTUH is divided by the facility's square footage to become BYUH per square foot per year. This value is then benchmarked against historical data from an energy consumption data source based on the location/state, the application e.g., church, and the hours of operation e.g., 7-days a week, 365 days a year. If the facility is consuming an excessive amount of BTUH per square foot when compared to the historical benchmarked data then this facility may be a good energy retrofit candidate. If the energy per square foot per year comparison is not in line with historical data e.g. 15% or more energy usage than the benchmark, then the building may be a good candidate to proceed to the next phase of the audit.

Level 2 Phase auditing takes the consulting engineer or a team of engineers, and infrared consultants through a preliminary energy assessment. The consultant will then compare the cost to retrofit and divide this cost by the estimated energy savings to determine the associated return-on-investment (ROI) for this retrofit opportunity.

Based on the results, in sync with or without the utility company's financial incentives, the building owner's energy consultant team will provide ROI calculations for each energy initiative being considered in this project. Depending on what the owner considered his or her optimum ROI e.g., projects with a 4 year or less ROI, the owner will make a financial commitment to proceed to Level 3 Phase of the project for those energy initiatives that fall within the one to four year ROI range. Authorized to proceed with Level 3 energy project(s) the team will finalize the engineering documents for the chosen ROI initiatives, solicit bids from local contractors to complete the retrofit work, and receive the contractor bids per energy initiative.

Considered a worthwhile energy conservation initiative is to contract a consultant proficient in infrared scanning of the building exterior including the roof. A "picture is

worth a thousand words", and this scan achieves this statement showing where energy deficiencies exist e.g., roof insulation failure due to the insulation being wet. As part of the energy conservation project this service may also become part of the overall retrofit project resulting in identifying unseen deficiencies in the building exterior.

With the energy retrofit work authorized to go forward, the owner or facility manager should then contract a 3rd party commissioning agent to work with the energy team of consultants entering the construction phase of the project. **Retro-commissioning** is a process to improve the efficiency of an existing building's equipment and systems. It can often identify problems that occurred during original design and construction that did not get resolved back then, or address problems that have developed throughout the building's life as equipment has aged, or as building usage has changed.

The silver lining in implementing an energy retrofit in sync with energy retro-commissioning is the investment is authorized in phases so that as certain potential energy savings initiatives prove out to not be as attractive to originally thought based on the estimated ROI then the owner or facility manager will know this and not invest any additional fund in that specific energy idea. Instead the Level 1, 2, and 3 Phase approach is a pay-as-you-go approach that will educate the owner and facility manager on their building and its performance system-by-system, as well as provide them an infrared picture of this building to show whether there are energy conservation opportunities at the exterior of the building. If the infrared indicates additional energy retrofit opportunities that the team can target that task(s) next with the optimum goal of reducing annual operating cost, reducing energy consumption and making the building a "greener" facility.

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