

Determining the Life Cycle Cost of a Building Automation System



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Introduction

Of all of the capital expenditures facility managers have to take into consideration, the building automation system is one of the trickiest to follow in regards to life cycle cost and savings. Building automation systems, also known as energy management systems, are generally responsible for monitoring and controlling the functions of a building's HVAC, lighting, access control, and fire alarm systems.

Each building automation system (BAS) is different, but most consist three main components:

1. Front end software to operate the system
2. Network infrastructure that carries commands and data to and from the head end computer
3. Field controllers that operate equipment and send data to and from the front end software

Although the HVAC, lighting, access control, and fire and life safety systems can all be run through a single software platform, often times they are kept separate. This happens for a variety of reasons, but what it results in, for our purposes, is property management having to negotiate and work with multiple service partners. Also worth mentioning is that in a large building or campus style layout, there may be multiple service partners for a single function. For example, there are frequently a number of HVAC controls manufacturers on college campuses, each of which may control a few buildings.

As we delve deeper into these complex systems, we will explore both the initial and ongoing costs along the way. We will then discuss some of the savings provided by the same systems and how one may calculate ROI on this critical purchase.



The Initial Investment

The upfront costs of building automation systems can vary greatly. A large portion of this investment will depend upon whether you are integrating with or replacing the system and whether you are leveraging the existing network infrastructure or installing everything new. With that said, let's first explore the differences between installing a BAS in a new building vs. an existing building.

New Construction

In the case of new construction, your BAS options are going to be much more straightforward. Potential building automation service partners will be working on a fairly even playing field from which they will bid the work. They should all be recommending similar solutions in this scenario.

When assessing proposals, keep an eye out to see if any service partners have engineered the job differently than the others. If so, are they trying to be innovative or were they just not paying close enough attention to the specification?

A Word to the Wise

Selecting your BAS service partner is different from selecting any other contractor in the pre-construction process. Unlike other contractors, your controls partner will be around for the long haul and will be very difficult to replace. Do you really want to end up with the lowest bidder of the lowest bidder? If your answer is no, then you need to get involved in this selection process early on.

Integrate, Upgrade, or Replace?

In the case that you have a current automation system that is in need of updating, you have a

few different options; You can integrate to the existing system with a new service partner, upgrade your systems with your existing controls service partner, or rip out your old system and start from scratch. Each approach has its advantages and disadvantages, but we will keep our focus on the cost of each approach.

Integrate



Depending on the integrator, you may see a slightly different approach, but generally, most



integrators will leave the majority of your existing infrastructure intact and replace the head end software of your building automation system. This solution should also come along with a complete recommissioning of the system it is controlling. For example, in HVAC applications, the installing technician should ensure that commands are effectively controlling each piece of equipment in the HVAC system and all sensors are reporting back good information. Otherwise, your new front end will be giving you bad data to work from, making recommissioning during the

integration process is an absolute necessity.

If you decide to go this route, you'll certainly be saving money in the short term, but you'll need to have a plan of action when existing field controllers start to fail. Through planned obsolescence, many manufacturers will no longer manufacture or support what they consider to be obsolete hardware. This issue will be discussed frequently in subsequent sections of this e-book.

Upgrade \$\$

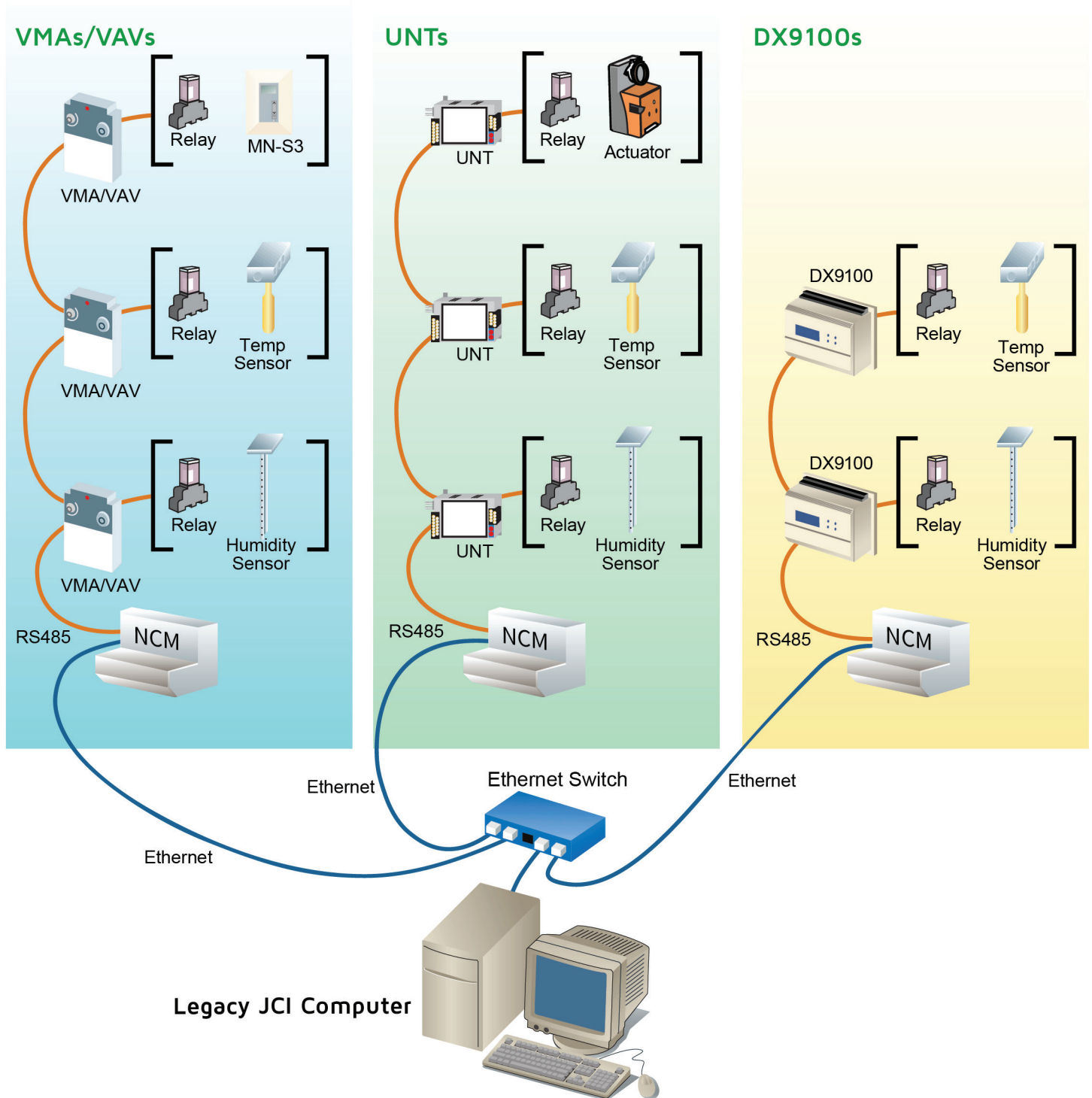
There are a couple of different approaches to upgrading a BAS. You can simply upgrade your software to the latest version which may allow you to better control your current system, or you may need to upgrade your hardware as well.

Why might one upgrade their hardware? Perhaps an improvement in technology, bug fixes in a new rev of software, it has become unreliable, or more likely because the BAS provider has obsoleted their current control system.

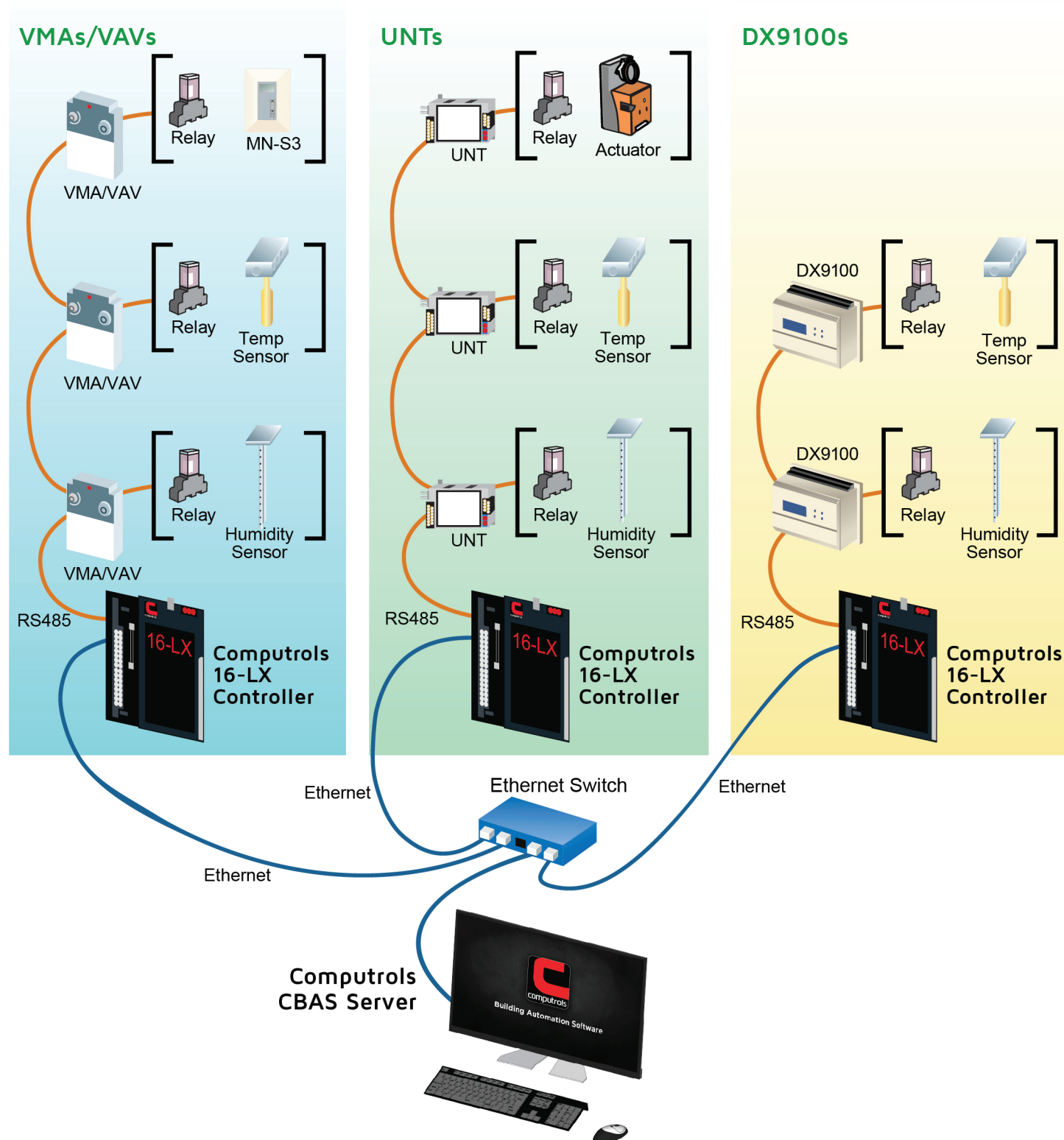
Replace \$\$\$

Completely ripping out and replacing an existing BAS is obviously going to be your most expensive option but may be necessary depending on the age of your building. If your facility is using truly outdated technology that is causing your building occupants discomfort, a rip-and-replace may be your best option. This will involve significant time and labor for the demolition of the current system and potentially costly wire runs to install a new communication network.

Legacy Johnson Controls Building Automation System



Computrols Integration to Legacy Johnson Controls System



Ongoing Expenses

"Studies have shown that 75% of a building's life cycle cost is operational—with utility and maintenance typically the two largest cost components."

- *Pacific Standard, Energy and the Empire State*

Property managers are never excited to bite the bullet on the cost of the initial installation of a BAS. They go through rigorous assessments and negotiations with service partners trying to cut costs wherever they can and far too often, the initial investment is all that gets considered during the decision-making process. This is a purchase that will affect your facility more than any other decision you will make for the next 5, 10, or 20 years. Considering life cycle cost and savings is absolutely vital.

Planned Obsolescence

"A typical optimal life cycle for BAS is between seven and ten years. After seven years, BAS become very difficult to support and with proprietary based control networks, can be made to be functionally obsolete by being incompatible with the next generation product line(s)."

- [*Raed Salem, Director of MEP Engineering, Larson & Darby Group*](#)

Planned obsolescence is a problem that plagues a number of industries but particularly any related to electronics. The vast majority of controls manufacturers (not including Computrols) plan to obsolete their building automation controls within 5 to 10 years from the time they

start manufacturing them. Not only do they stop manufacturing the line of controllers, but they will stop supporting them all together. This puts their customers in a position where they either have to upgrade, integrate, or replace them. In an effort to get more bang for their buck, many consumers resort to buying these controllers from third party websites like eBay.

Depending on where the manufacturer is in the product's lifecycle, you could be setting yourself up to have to purchase multiple building automation systems within a five year period. Talk to these potential service partners about this issue and see where they stand prior to making your decision.

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"There is so much talk of 'big data' today, but data without the ability to process it and take corrective action is as useless as not having the data in the first place."
.....

Operational Costs

"Research shows that only about 20% of facility managers use 80% of the available capabilities in their BMS. The remaining 80% use a very limited amount (20%) of the potential functionality in their system."

- *PikeResearch, Smart Building Managed Services*



This comes as no surprise, but your facility engineering team absolutely must be able to operate their own BAS. If not, you'll find yourself paying for a hefty maintenance contract and regular service calls. There is so much talk of "big data" today, but data without the ability to process it and take corrective action is as useless as not having the data in the first place.

Facility engineers also have the distinct advantage of being in the building on a daily basis. No one knows how their building operates better than they do. They are the most qualified group of individuals to optimize the operations of the facility through the building automation system, but they have to feel comfortable using it.

Warranty

It's inevitable that controllers will fail, but how long will the manufacturer insure them through their warranty? As with most electronic devices, BAS controllers will fail within the first several months if they are defective. It is rare that controllers fail between one to three years of use, but it does happen.



You should also read the fine print in the warranty information to understand what is covered. At a cost of anywhere between hundreds and thousands of dollars, the longer and more thorough the warranty, the more you'll save in the long run.

Hardware Failure

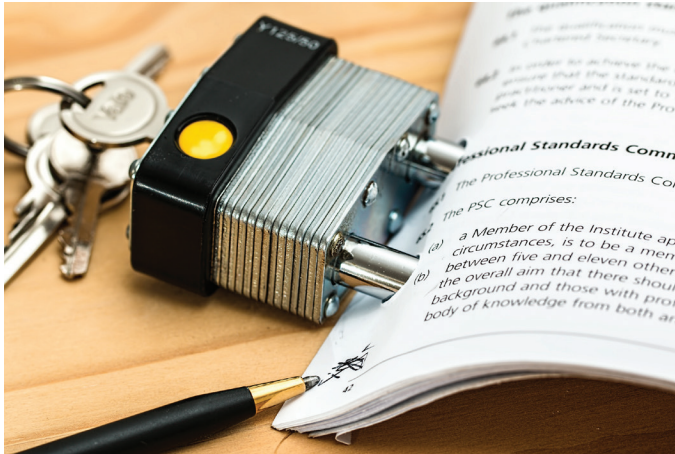
Whether you manage a commercial office tower, large-scale hospital, or college campus, your energy management system will likely have tens of thousands of data points. Even at a minuscule 1% failure rate, this means replacing hundreds of sensors and controllers per year. Before choosing a manufacturer, find out what the failure rate is after the time the warranty has expired to better budget for your BAS life cycle costs.

Adding New Components to Your BAS

Most BAS projects arise when a few existing components perform inefficiently or ineffectively. You will undoubtedly build on your initial building automation system as technology progresses and your facility evolves, so this must be kept in mind when making your ultimate decision. Ensure your system not only solves your initial issues, but is also scalable for your future needs.

Maintenance Agreement

The maintenance contract you agree to should be directly correlated to the usability of your BAS and the support that comes along with it. For example, if your facility management team feels comfortable using the software and remote/phone support is included, a quarterly visit will likely suffice. In this case, your team would utilize phone support to whatever degree possible and then make a list of issues to be addressed during quarterly visits.



On the other hand, if your facilities team does not feel comfortable operating the system themselves and no complimentary support is provided, you'll probably require a substantial service agreement to ensure the comfort and safety of building occupants. This could end up costing more than the BAS itself and seriously cut into your operational budget.

Service Calls

While a reduced maintenance contract may provide savings in the short term, if your facilities team does not truly feel comfortable with the BAS software, it could end up costing you more in the long run. Service calls are generally billed at higher rates and come with a minimum number of hours per call. If you have previous records of past service calls, this makes for a simple calculation to estimate your budget for service calls per year.

Upgrading Software

Software upgrades may also be included in

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"This could end up costing more than the BAS itself and seriously cutting into your operational budget."
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maintenance contracts. Find out from your potential BAS providers how often they update their software and what is included in your initial purchase. Bug fixes and minor updates should come along with the BAS, but you will need to negotiate the terms and regularity with which you receive major updates.

Energy Costs/Savings

Disclaimer: Building automation systems do not save energy by themselves.

This is the metric that can make all the difference. Depending on how your facility is currently running and your ongoing operational costs, you might see a return on your BAS investment anywhere between three months and three years.

Identifying Inefficiencies

The most common way that building automation systems save building owners and managers energy is through identifying inefficiencies in their equipment and how it is operating. To do this, one must be able to access and analyze the data in their BAS. Again, we go back to whether or not your in-house staff can effectively use the system's software. If so, you have the advantage of having an individual who sees how the system runs day-to-day that can make adjustments to optimize efficiency.

If you have a service technician coming in on a semi-regular basis, they will probably not know the building as well and as a result, building in new efficiencies will be more difficult. Your ROI will also be delayed by the ongoing cost of those service calls/maintenance.

Computrols Energy Management Dashboard

Building Meter



Liability Costs

Cyber security is surely the greatest liability incurred by an internet connected building automation system. Your system contains valuable data about your facility and its occupants that is potentially subject to hackers if your network is not secure. Many large-scale facilities have even secured insurance policies for these systems.



The other potential liability cost BAS owners face is the general safety and comfort of their buildings' occupants. In the case of an emergen-

cy, fire and life safety and access control must function properly. In a less dramatic scenario, commercial building tenants have provisions in their contracts that guarantee certain temperature levels throughout the work day. If these provisions are not met, it could end up costing the building owner.

Non-Monetary Costs

Despite our best efforts, we cannot quantify all of the costs/value of a building automation system. Studies have proven that the [proper lighting](#) and [temperature control](#) can make building occupants happier and more productive. To what degree this affects each individual will vary, but there is undoubtedly value in these metrics.

Justifying the Costs with ROI

As you can tell by now, there are far more costs to be considered than that of the initial installation. This means there is likely going to be more ground to make up when calculating your payback period. Energy savings is perhaps the biggest cost-justifier that everyone thinks of, but there are more opportunities to recover your investment than you may realize.

Incentives

The number of [state](#) and [federal tax incentives](#) for energy efficiency measures seems to be growing with no end in sight. The only hitch in



these programs is that you must first benchmark where your building stands months or years before your project. In many cases, the more energy that is saved, the greater the incentive.

Overtime Billing

For commercial building owners and managers, overtime tenant billing can be a very lucrative revenue source. Through [overtime billing platforms](#), tenants can schedule and be billed for after hours HVAC, lighting, KWH, and BTU consumption. Most overtime billing platforms will automatically generate invoices, making for a low effort, high yield revenue source. Also to be noted, overtime requests tend to increase when upgrading to a web-based platform.

Be careful when vetting partners for this service. Many providers will charge an ongoing hosting/service fee for this platform that could end up cutting into your profit and extend your payback period.

Residual Value

Like overtime billing, residual value applies mostly to commercial real estate applications. Given the regular turnover in ownership, you must take into account how your BAS will add to your facility's resale value. Consider how to proposition your building automation system to potential buyers. Will it save them energy? How much time is left on the warranty? Will their facility engineers be able to operate it?

Conclusion

There are few products that you will purchase in your lifetime that will still be used in 10 to 15 years down the road. When vetting potential building automation service partners, be thorough in your evaluation process looking beyond

the initial costs. Often times, the ongoing expenditures will outweigh the initial investment and negatively counterbalance any savings the system renders.

About the Author



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Scott Holstein is the Director of Marketing and Business Development for Computrols where he began working in early 2016. Holstein has since immersed himself in the building automation industry and has written articles for the Computrols Blog, ControlTrends and AutomatedBuildings.com and spoken at a number of industry events. Some of his specialties outside of sales and marketing include new technology trends in smart buildings, energy efficient strategies and the internet of things.

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