



Efficiency Building Investment: HVAC/Controls

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The idea of the ‘smart building’ is gaining traction in the commercial market, due largely to the aging infrastructure in America. With as many as 72% of U.S. buildings over 20 years old¹, controls systems not only have an age problem, they also have a technology problem. Combine an outdated, “untuned” HVAC with volatile electricity rates, and you understand why 30 to 50 percent² of energy costs are HVAC related.

In this paper, we discuss the benefits of an HVAC/controls retrofit, including a deep dive into the financials. And because these investments are typically opportunistic, to take advantage of energy savings, they’re often not budgeted so we’ll walk through a cash purchase and a financed purchase to further explain the economic benefits.

Teach Your Old Building New Tricks

Smart building control systems have gained traction in the marketplace, and over the last decade phrases like ‘smart grid’ and ‘smart buildings’ have surfaced. What does it mean to be ‘smart’ in this context? By incorporating advanced technologies, buildings and utility delivery systems are now enabled to receive instructions and respond by modulating according to a set of programmed or learned conditions. These controls encompass a broad suite of building systems including HVAC, lighting, air quality, security, and more.

Intelligent control matters because we want to do more than just turn things on and off. We want our lamps to vary their output depending on the availability of daylight. We want our heating and cooling systems to respond quickly to changing environmental conditions and contrary preferences by occupants within the same space. This type of control dramatically increases occupant comfort, which keeps buildings occupied, in turn keeping your real estate assets profitable.

Smart control also does something else—good control of HVAC systems is one of the best ways to manage your utility costs. You can turn down or off major energy consuming systems when not needed; you can also participate in load shifting, demand response and time of use programs offering enormous potential cost savings.

Advanced control systems are specified in the majority of new construction projects. But what about existing building stock? Across the country, there are thousands of buildings with outdated control technology. These controls either aren’t optimized or they simply don’t have the ability to receive or understand complex instructions. With results from a Lawrence Berkeley National Lab study indicating that control projects can save up to 30% of your total energy spend, it’s time for an upgrade.

Understand the Returns on Your Controls Investment

Control projects are not as straightforward as lighting fixture upgrades or like-for-like equipment replacements. And they can be expensive, complicated, and difficult to understand. So how can you decipher a proposal to upgrade your control systems? The good news is that you don't have to understand proportional-integral-derivative algorithms to understand the economic benefits of upgrading your controls.

The first thing to find out is if you need new hardware, software, or both. Your facilities engineer or contractor can advise you here.

If you are fortunate to have modern devices with modulating capabilities and digital controls, chances are you don't need to buy any new equipment. Implementing advanced control strategies under this scenario has a relatively low price tag compared with the resulting cost savings, tenant comfort, and productivity improvements. Consider that these improvements typically run about \$0.25/ft², and you're likely to see payback in a matter of months.

But if your energy systems are outdated, you'll need to make equipment purchases before you can benefit from advanced control strategies. Let's walk through a scenario.

In this example, we'll look at a multi-tenant office building with a high incidence of tenant complaints. The property manager requested a service call to investigate, and was presented with the following solution.

SCOPE OF WORK: Install New Network Controller, Retrofit Terminal Boxes with Direct Digital Control, Replace Actuators with Electrical blah blah blah, etcetera....

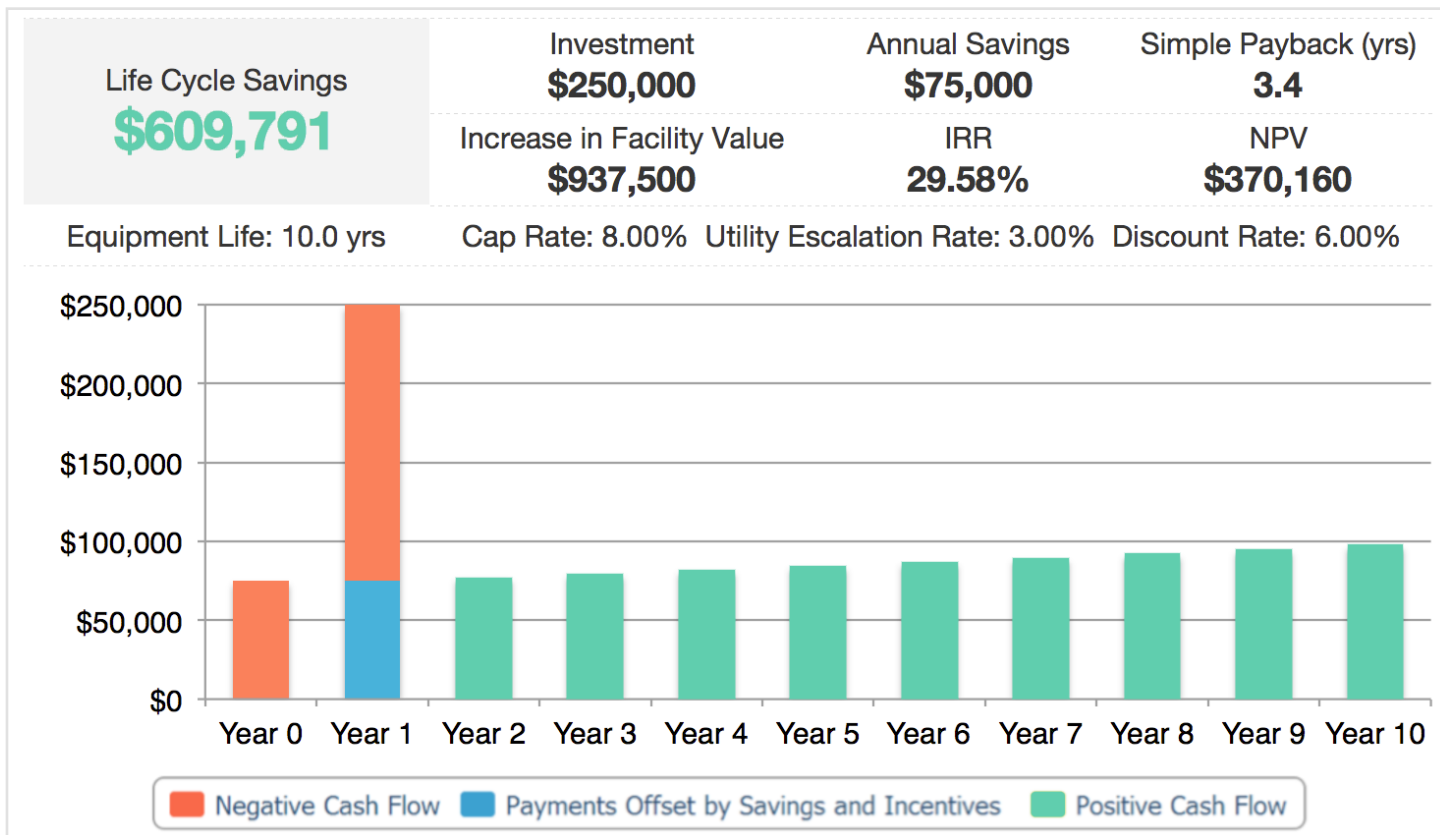
COST: \$250,000

The scope of work in this example is abbreviated because the exact detail of the equipment and the specified control strategies are not what really matter. Find a reputable contractor and hire a skilled operating team and then trust their recommendations on the equipment side. Your job is to evaluate and understand how this project impacts your bottom line.

Preliminary estimates suggest cost savings total about \$75K per year, with utility prices expected to rise on average 3% per year. Let's assume that the control project is expected to have a useful life of 10 years. So what can you do with this information? Here are 2 common scenarios for evaluating the economic impacts of this project.

SCENARIO 1

Cash Purchase. In this scenario, you elect to pay for the equipment and upgrades in full at the time of their installation. (Output using the Noesis platform)



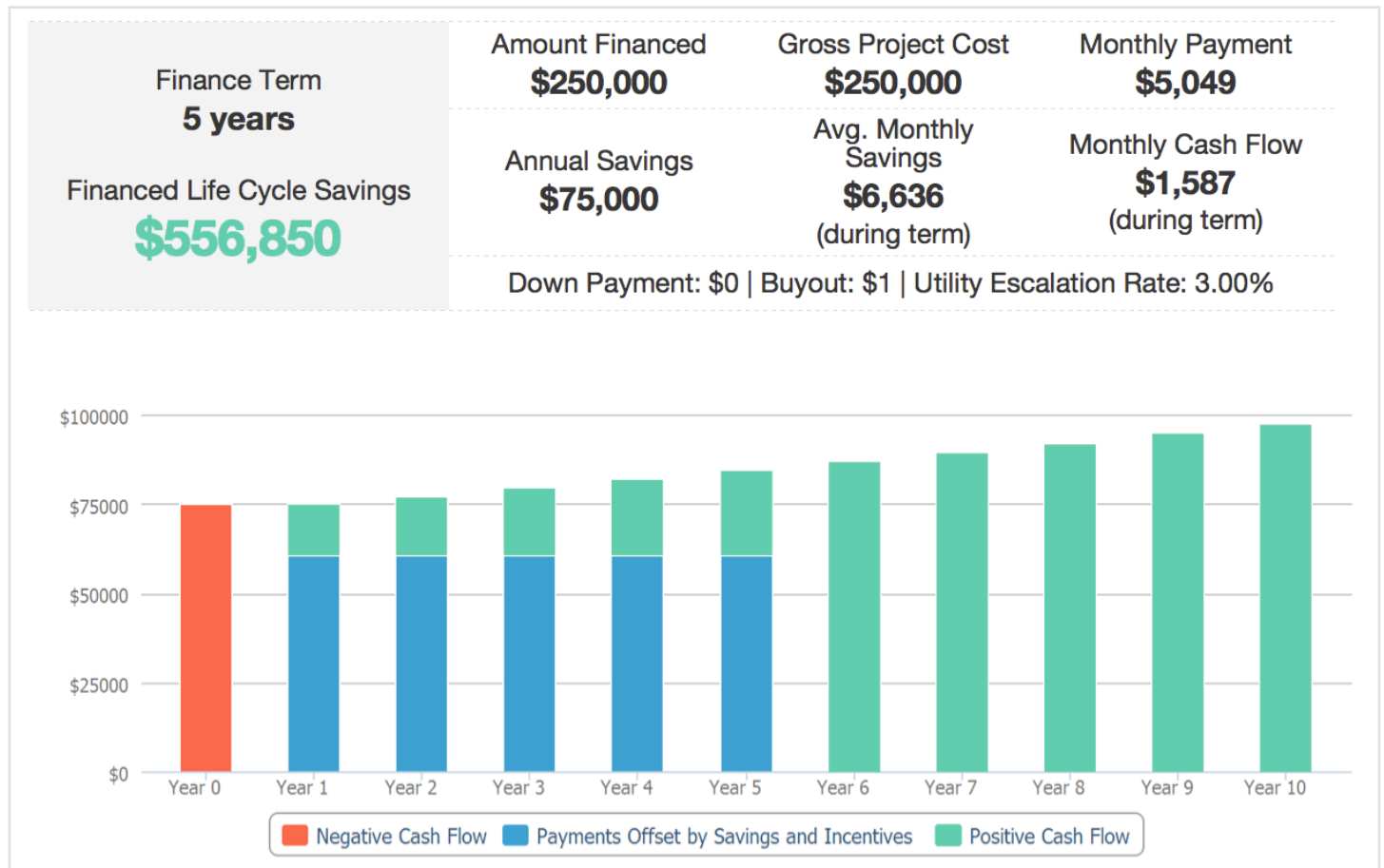
The red bar labeled 'Year 0' is your current energy cost that turns into savings. You can see the impacts of the project beginning in year 1. The red bar represents the portion of the project cost that is not offset by savings, while the blue bars represents the portion of cost offset by savings (budget neutral expenses). After the project is paid in full after implementation in year 1, the green bars represent your savings.

On the surface, the economics of this project look good. A 30% IRR and more than \$600K in life-cycle savings are very attractive. But what about that investment in year 1 — can we do something about that huge capital outlay?

Let's review the project from another perspective.

SCENARIO 2

Finance It. In this scenario, you elect to finance the equipment and pay for the upgrades over time.



Year	Savings	Tax Benefits/Incentives	Payments	Payments Offset by Savings and Incentives	Cash Flow
1	\$75,000	\$60,588	\$60,588	\$119,193	\$14,412
2	\$77,250	\$60,588	\$60,588	\$40,124	\$16,662
3	\$79,568	\$60,588	\$60,588	\$29,169	\$18,980
4	\$81,955	\$60,588	\$60,588	\$22,676	\$21,367
5	\$84,413	\$60,588	\$60,588	\$23,048	\$23,825
6	\$86,946	\$1	\$1	\$18,290	\$86,945
7	\$89,554			\$13,544	\$89,554
8	\$92,241			\$1	\$92,241
9	\$95,008				\$95,008
10	\$97,858				\$97,858

The financing option represented in Scenario 2 is a 100% financing option with fixed monthly payments over a 5-year term, and a nominal \$1 buyout at the end of the term. Under this scenario your monthly finance payments are less than your anticipated energy savings, making this project cash flow positive from year 1. Because savings offset all of your financing payments, you can implement this project with no cash out of pocket.

Conclusion

This may sound too good to be true, but is actually quite common for control improvement projects. Of course, you'll want to establish a plan to ensure that your building doesn't drift away from optimal performance after the project is completed. Work with your operations team and control contractor to make sure the savings persist over time.

Also, keep in mind that the savings represented in this scenario are only energy cost savings and are therefore conservative—when you consider the additional benefits of tenant comfort³ and productivity improvements, you'll recognize that control upgrades are one of the smartest business investments you can make for your facilities.

How Noesis Helps Accelerate the Sales Process

Noesis is a commercial lending marketplace for building owners to finance energy-related building improvements, including both energy efficiency and distributed generation (e.g. solar) projects. We help building owners make informed investment decisions about energy projects that generate incremental cash flows and increase the value of their real estate.

Systems controls projects are only one of several types that Noesis can finance. *To learn more about financing for your commercial building project, visit our website: noesis.com*



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Angel is an energy efficiency professional with 10-years of experience in the field. With a Masters degree in Energy Management, she specializes in making the business case for energy efficiency projects through financing. Angel is an Energy Finance Manager at Noesis, and works with partners to prepare their projects to present to borrowers and lenders. She is a member of the Association of Energy Engineers and a Certified Energy Manager (CEM).

1 http://www.associatedrenewable.com/sites/default/files/Deep_Energy_Retrofits_An_Emerging_Opportunity.pdf
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