Successful Implementation of Energy Efficiency Projects: "Quick and Dirty" Can Be a Losing Approach

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Perhaps I have become cynical over the years. As we age, we all come to realize that the best of intentions are often waylaid by miscommunication, self-interest and incompetence, and that the end result of what should be a successful plan, often falls short. This can be, and is often, the case for energy efficiency.

Every year, thousands of well-thought out, well-analyzed and clearly specified energy efficiency projects fail to deliver the expected savings. Some deliver no savings at all. Countless times I have seen energy conservation measures (ECMs) installed, only to find that they are not saving as much as was expected. I understand that building owners have limited budgets, and it seems wiser, at first glance to use all the money to install as many ECMs as the budget will allow. Unfortunately, this is not the best approach to energy efficiency. It is usually better to install fewer ECMs and ensure that they are all meeting energy savings expectations, than it is to install more ECMs and risk them not performing. The end result, reduction of the utility spend, should be more if you take the measured approach I am describing below.

Consider projects that originate with salesmen of a particular technology. The buyer should be aware that often the energy savings calculations a salesman provides are based on faulty assumptions which may lead to inflated savings expectations. This is why the smarter business owners do not rely on salesmen to identify which ECMs to install, but rather have detailed energy audits done by independent third party auditors. But even the wise owner who elects to base ECMs on third-party audits, often experiences shortfalls in projected energy savings.

Why the shortfalls, then? In this column, I lay much of the blame on poor planning by building owners, incomplete cookbook-type approaches by the contractors who install the ECMs, and building owners who choose not to pay to verify that the project is performing as expected.

The contractors who install the VFDs, the chiller plants, and even the building automation systems are often not energy efficiency people. Even when they work for companies that actively promote energy efficiency, companies that have good energy engineering resources, still, the people doing the installations are technology experts, not energy efficiency experts. The contractors can put the equipment in and get it to run, but often, they do not get it to run in a way that saves energy like it should. Again, you should recognize that just because an ECM is implemented by energy services contractors does not mean it was commissioned properly, especially if your contract did not specify this commissioning as a requirement.

Unfortunately, energy efficiency is not as simple as we would wish. Energy consultants may deliver quality energy audits and retro-commissioning studies, but merely installing new equipment and re-programming the HVAC controls does not guarantee energy savings. The implementation of sound energy efficiency

recommendations requires everything to operate as specified. The weak link is often in the commissioning of the measures to ensure they are doing what they are intended to do.

To avoid underperforming on your energy efficiency measures, I suggest the following strategies:

1. It is vital that whoever produced the energy audit writes a scope of work that clearly describes the ECM to be installed, and how it is to operate. The sequence of operations has to be clear. The owner cannot leave it up to contractor to figure out how to operate the equipment. The contractor is not typically an energy efficiency expert. They often will bid low to get the job, and will not budget sufficient time for the sufficient programming and tuning of the systems. Control sequences written by contractors are often very simple, and energy savings opportunities may be missed. If the contractors have the right scope of work, they likely will budget time to install the ECM correctly.

2. Make it clear to the contractor that you will be commissioning the work. If possible, provide them with the commissioning functional tests that will be done in advance of them beginning the job. This way, they will know they cannot value engineer out vital parts of the job.

3. Commission what you implement with third-party commissioning experts. Commissioning agents are not interested in selling hardware. They are interested in making systems operate according to the design intent. They understand physics and control theory and can identify and repair problems quickly. Unfortunately, commissioning can be expensive, but it is worth it. The commissioning company needs to have the controls sequence of operations, or they, like the contractor who installed the equipment, will only be able to verify that the equipment works. If the commissioning expert determines the system does not operate as required, the contractor should be called back in to correct the problems.

4. Track your energy savings using Measurement and Verification (M&V). Even using something as simple as utility bill tracking software can provide some insight into building performance. An increase in monthly energy usage when a decrease was expected should trigger an investigation into the cause. Verifying performance at the system level, while more difficult and expensive, can isolate the problem much more quickly and accurately. For ECMs that only save a small portion of the meter's total energy usage, this system level M&V may be the better way to go. An M&V expert should be brought in early on, before an ECM is implemented. This will allow the M&V expert to develop a plan, collect appropriate pre-retrofit data, and follow up with collection and evaluation of post-retrofit data. M&V is, in many cases, not easy. It might be best to hire a professional who specializes in M&V. If the M&V indicates that the ECM is not meeting savings expectations, then the contractor should be called back in to correct the problems. M&V can take time and costs money. You may want to use contractual language that puts off the final acceptance and final payment to the implementing contractor until the M&V demonstrates that the ECM is performing as expected.

5. Provide proper training so that your facility staff does not override or bypass your energy efficiency projects. This is one of the most effective steps you can take to ensure persistence of savings. Your staff is the brains behind building operation, despite what BAS vendors may say. Once the ECM is implemented, commissioned and verified, it is up to facility staff to ensure it continues operating properly. Having the smartest control system will do no good if it is operated by untrained operators.

Unfortunately, building owners often value engineer commissioning and M&V out of their projects and leave themselves open to big disappointments in their energy efficiency projects. M&V and commissioning are like insurance—sure, it costs money up front, but the assurance of knowing the project is done correctly should be worth far more than the initial outlay. What other product would you purchase without verifying that you actually received what you paid for? Why should energy efficiency be any different?

Energy efficiency is the best, lowest cost, means to reducing your utility spend. Thousands of energy managers have successfully implemented energy efficiency projects. It is important to keep in mind, that just because you select a "winning" ECM, this does not guarantee that you will be saving energy in the end. A successful energy efficiency project must include proper communication of expectations to the contractor, proper testing and proper measurement of energy savings. It is best to budget these costs into your projects, to ensure success in your endeavors. This is why, rather than trying to implement as many ECMs as the budget allows, wise building owners are measured in their actions and ensure the implemented ECMs actually deliver the promised savings. This may mean decreasing the total scope of ECMs implemented slightly, but is it not better to ensure the measures achieve the desired savings so that funding will be more available for implementing future opportunities?

In closing, following the steps outlined above will add to the cost of implementing ECMs versus a "quick and dirty" approach. However, the cost of not following these steps is the unrealized savings. A wise building owner should consider that the cost to commission and provide M&V on ECMs is typically between 10% and 20% of project cost. If the owner compares that to the potential for unrealized savings, which can typically be between 0% and 100%, it becomes clear that the benefits on average should far outweigh the additional investment. Furthermore, if an honest and expert third-party commissioning or verification specialist is selected, such a specialist can tailor their approach to the process such that the owner realizes the benefits with an acceptable investment.

About the Author

John Avina, CEM, CEA, CMVP, CxA, has worked in energy analysis and utility bill tracking for over 19 years. During his tenure at Thermal Energy Applications Research Center, Johnson Controls, SRC Systems, Silicon Energy and Abraxas Energy Consulting, Mr. Avina has managed the M&V for a large performance contractor, managed software development for energy analysis and M&V applications, created M&V software that is used by hundreds of energy professionals, taught over 250 energy management classes, created hundreds of building models and utility bill tracking databases, modeled hundreds of utility rates, and has personally performed energy audits and RCx on over 25 million square feet. Mr. Avina currently chairs the Certified Energy Auditor Test Committee for the Association of Energy Engineers. Mr. Avina has a MS in Mechanical Engineering from the Univ. of Wisconsin-Madison.