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IMPLEMENTING ENERGY EFFICIENCY MEASURES

ARTICLE

Investments that reduce ongoing operation cost can be a very effective strategy for businesses. Implementing an energy efficiency project is a business decision that begins by deciding if the project is a good fit for the business but includes many other factors. This article provides information that introduces terms and contrasts different project delivery methods. Energy audit reports, equipment upgrade proposals, etc. are all just paper unless they result in savings for the customer. So, we continually look for ways to 'move the needle' of implementation.

Business Case

Some proposals are one item, like new lighting or a more efficient air conditioner. Other Customers may decide to investigate all or part of the suggested items. As a minimum, estimated utility savings (electric energy, demand, fuel, water, wastewater) are converted to dollars and are weighed against project cost. Other factors for the business case - saying yes or no to the project - may include:

- Measure life
- Reliability
- Avoided repairs of equipment that is getting old, i.e. impending normal replacement
- Aesthetics and noise characteristics
- If complexity is a good fit for operations staff
- Features that help other business aspects such as control capabilities that can be leveraged
- Accountability for savings

Business case also looks at risk. The obvious context of 'risk' is risk to the financial aspect, such as higher than expected cost or disappointing savings. But other risks exist such as impact to the business itself. At the end of the article is an expanded discussion of 'risk' with some examples that will get you thinking, including some practical ways to manage risks.

Stuff

Implementation includes cost estimates or proposals. Financing. Tax considerations. Codes. Contractors are involved… maybe engineers. Interruptions – distractions – noise – mess. Ladders. Trucks. Permits. Schedules. Insurance. Contracts. Rebates. Measuring savings. ***"Stuff"!*** All of this while you are conducting your regular business activities. Really?

- Small projects may be implemented successfully using yourself to coordinate the details, but larger projects can be overwhelming during construction without an intermediate contractor to do the coordination and get most of the details off you so you can continue with your business.

- Ignoring the 'stuff' is usually not a good plan, because of the bind faith risk it creates. It is good to decide early on if the project is something you can manage effectively or not.

Some Terms and Topics for Implementation

Project Intent

The key to a successful energy efficiency project is understanding the project intent items – the drivers that create the savings. Holding those requirements firm is the way to assure the savings come to pass. Control adjustments, equipment options, substitutions, and other items can erode savings substantially. It is good practice to write down the key "project intent" items and make sure they remain the focus of the project and all involved. Retaining the energy professional who calculated the savings is one way to keep the important features alive and well in the project.

Out-source or In-source

Some facilities have in-house capability that can include design and project management. If resources are available, this can be a good use of the existing talent. For most customers, capital projects will be outsourced. In all cases there will be a customer contact person.

Hard and Soft costs

Hard costs are equipment, materials, sub-contractors, etc. related to physical improvements. Soft costs are mostly those from architects and engineers, money spent on brain power to devise, plan, draft, calculate, analyze, advise, etc. Permitting fees and loan interest are other soft costs.

Design-Bid-Build / Design-Build / Performance Contracting

You have choices in how the project is "delivered". Different ways have different advantages that may be appealing, depending on the work. Each carries a fee proportional to the amount of involvement and risk, so there is no free lunch. Each requires owner involvement, and the less owner involvement, the more trust is needed in the working relationship. (read the last sentence again). The number of documents on "project delivery methods" is almost as vast as the number of opinions as to which is best – always consider the source and take comfort in the fact that most energy efficiency projects are relatively simple compared to a brand-new building. Some basics are reviewed here.

- *Design-Bid-Build* is the traditional approach for very large or complex projects (It is designed, then bid, then built). First the customer selects a design team. Then when the plans are finished the bid process is used to select a contractor. Success of these projects relies on documentation. A variation of this method is the use of an engineer for their expertise, but without elaborate drawings; for small-scope projects, sketches and technical descriptions can often suffice and reduce design costs. It has the highest 'soft costs' but also has the best track record of legal support if needed and there is direct alliance between design team and owner. What it lacks sometimes is attention to cost effectiveness and is often augmented with 'value engineering' process where similar products are proposed.
- *Design-Build* delivery can be useful especially when projects have time constraints. In this arrangement the design team and the construction team are one, allowing things to be done more quickly. Costs and schedule are generally better controlled with this method. Design documentation is generally less, so design costs are less. Where the design team is employed by the contractor, the independent advice of the designers can be impacted. Risk tends to increase because of the greater reliance on intent than documentation for scope definition.

- *Performance Contracting* is attractive to some customers. This is a derivation of design-build where the assured outcome is energy savings. These companies (aka ESCOs: Energy Service Companies and ESPCs: Energy Service Performance Contractors) specialize in energy projects and will *guarantee* savings. ESCOs typically provide energy calculations, project management, verification of savings, and arrange for financing, but work scope can be tailored. These companies are organized to process large and complex jobs and generally not well suited for small jobs although there is nothing stopping an entrepreneur in focusing the same business model on smaller work. For this paragraph, 'large' project might be >$1M. The normal ESCO business model is 'Cost Plus' with soft cost recovery as an hourly fee. Cost-plus means projects involving construction and equipment are attractive to the ESCO. Good fits from the ESCO view are also those customers without a revenue source for normal replacement work but where long term loans paid back through energy savings is acceptable. The combination of large costly projects and long term commitments to pay back steers ESCOs to 'permanent' customers such as schools and government sites. Sometimes energy savings are leveraged to fund other facility improvements like a roof or parking lot – when this is done it should be recognized that. Service level is high - ESCOs pretty much take care of everything start to finish.
    - The guaranteed savings provision is a source of risk for the ESCO, and so this 'security blanket' that is attractive to the customer comes at a price in the form of a markup, combined with skilled engineering and probably some saving de-rates to account for uncertainties. Measures that have lower certainty, such as reliance on a behavior change, will be unpopular with the ESCO for the simple reason of being asked to guarantee something that changes a lot, although a large enough ESCO scope can easily bundle O/M and behavior measures when in small proportion. An important aspect to a guaranteed savings contract is the Measurement and Verification (M&V) activity that is required for each year of the savings guarantee, and which is a fee to the customer. This is an example of 'shared risk'. The M&V fee (a soft cost) spends some of each year's savings and so some customers may elect to opt out of the guarantee after 3-5 years of consistent good results to reduce this cost.
    - Some customers choose to exclude the guarantee provision altogether - this reduces the fee further since the Owner now accepts all risk of savings. Here, it may be advisable to get a second opinion from an independent energy professional to confirm the savings figures. With no guarantee of savings, the Owner can monitor energy use themselves and assure diligent operation and maintenance – good things no matter who does them.
    - Some customers don't need a loan or a guarantee of savings, but still will choose an ESCO for the convenience of expertise and turnkey project delivery.

  ESCOs are energy specialists very good at 'getting things implemented' so this method often results in customer savings beginning sooner than later. With guaranteed savings, fees increase. Project focus is mostly on energy savings and can sometimes neglect other facets of the work.
- *Utility Energy Service Contracts* (UESCs) are a variation of a standard ESPC. In this version, the utility is the sponsor of the project and keeps overall accountability for work product, which is a risk to the utility. Utility may receive compensation as a portion of the project cost and/or have interest in demand reduction that produces savings from delaying or reducing the size of generation and transmission capacity increase projects. An important difference between ESPC and UESC contracts is a reduced level of rigor in M&V and generally the absence of contractual savings guarantees. There may be a reliance on engineering calculations and favoring measures with proven track records to manage this risk to both parties. This is a weaker link for customers needing a firm savings number to firmly defray loan payments. Good customer fits could be those ready to pay back the loan but needing the ESCO-style expertise and project

management muscle to get it done. Funding for these projects is provided, either from the utility or an outside lending source.
    - Note: Colorado Springs Utilities is not a sponsor or lending point of UESC projects at this time
- *Smaller projects.* Not every energy project is a big production. Mainstream commercial buildings can entertain upgrades like anyone else and look for ways to get it done. Projects can be basic things like more efficient lighting, higher efficiency rooftop HVAC units, insulation, or automatic controls. Here, the work can involve a single contractor or vendor with a clear scope and requires little more than a purchase order. Business case will be more certain with a reasonable estimate of savings and asking a vendor what their device will save should be taken with a grain of salt. Value of clear scope, expectations, and what success looks like are equally important for all size projects.
- *Alternate Financing.* Funding and time horizon to pay off the improvements can both be a barrier to energy projects. There can be more to borrowing money than the interest, such as bond ratings that look at ratios of debt to assets, and when business horizons are shorter than the measure life or loan repayment period.
    - Loans guaranteed by virtue of property liens may be attractive but may also haunt a sale if not yet paid off.
    - Landlord-tenant arrangements are another barrier to energy projects since the interests of tenant and landlord are normally short and long respectively; however long term leases like triple net would be less of a barrier.
- *Normal replacement.* This is an example of removing an imaginary barrier. When an essential part of a building is worn out, it needs to be replaced. This is normal life cycle that is, for many items, a repeating 20-year event. A 'like kind' replacement that meets current code is what is needed regardless of energy savings. For the business case ratio, compare utility savings to project upgrade cost difference that is above and beyond normal replacement cost, *not the entire project.* Of course, if something entices replacing something before end of life, the discarded value from early replacement should also be 'charged' against the savings.

Engineers and Architects

Projects that alter the building itself or are very complex may involve an engineer or architect. The main thing here is to choose one that has expertise in your type of project, so it gets done properly and your building does not become an experiment. There are many fields of specialization, including energy, so ask a lot of questions until you are comfortable. You're paying for expertise, experience, and judgment that will be in your best interest. There is value in independent opinions of design professionals. For smaller projects, the expertise embedded in the energy audit may be sufficient. Sometimes, an engineer or architect stamp is required to get a permit.

Project Management

Another soft cost. This task keeps track of the construction activities and is especially important when multiple trades and multiple vendors are involved. Done properly, schedules are substantially met, and surprises are kept to a minimum.

Financing

For energy efficiency projects it is the job of the energy efficiency improvement to pay this back and earn its keep. Small projects may be paid for out of working capital. Larger projects are truly an investment and include borrowing in one way or another, and interest to pay back. The finer points of financing may be different for different businesses, such as taxes. The financing stage

usually includes a variety of 'what if' scenarios that juggle the project scope; this is a normal and healthy part of the project.

Risks

All projects include risk. In addition to cost / benefit criteria, it is important understand risks introduced with any project before starting it. Blind trust is a mistake and risk-free is an illusion. Examples that show judgment are needed for happy endings and balance is often a good path vs. rigidity:

- Project viability tests often reduce risk at the onset with an inflated 'hurdle rate', an internal rate of return value that is high enough to build in a buffer so that small dents in the outcome (savings a bit low, cost a bit high) still results in a positive outcome. Excessively conservative hurdle rates can exclude a viable project.
- Defining expectations of the contractor, engineer, and project itself is a very good way to control risk. Things like "light levels measured before and after, with new light levels adjusted down to simulate mid-life readings, shall be no less than existing light levels"…. are clear and measurable and can fit into a contract. It is fair to both parties to spell out what the expectations are. For complex projects, some help in defining 'project intentions' and how to establish a clear yes/no is good contracting technique. To the contractor, yes means I'm done, and I get paid. The value of clear expectations cannot be overstated.
- Basic safety and quality risks are controlled through a permit and inspection process. It is a very good process, but reviews/inspections are not exhaustive, and something allowed to be built does not assure the project made sense to begin with.
- Cost figures are estimates. Eliminating risks in cost can take the form of padded estimates by persons required to guarantee something with inherent variability. Excessive padding of the project cost can create a 'no' for a viable project, meaning a lost opportunity. Cost estimates get tighter with greater detail of investigation, but the professional time is not free. One example of balance includes a project budget from an experienced contractor you are comfortable with and a 'contingency' line item which is used with discretion for little things that come up. Especially in renovation work, 'stuff' does crop up.
- Savings figures are estimates. Eliminating risks in savings numbers can take the form of de-rated savings by the persons asked to guarantee something with inherent variability. Excessive de-rate of savings can create a 'no' for a viable project, meaning a lost opportunity. Savings estimates get tighter with more detailed modeling, but the professional time is not free. Some projects include 'measurement and verification' that measures savings with good accuracy, but alas this service is not free either. (why is nothing free?). One example of balance includes savings from a reliable source that you are comfortable with and a minor de-rate. Side notes on savings that show that the quality of the savings estimates depends on the source of the calculations:
    - It is common for savings in one item to interact with operating cost somewhere else, in most cases resulting in a savings reduction compared to ignoring the interaction. One easy example is efficient lighting, where the reduced energy means reduced heat which means increased heating necessary in winter; consider electric lights and electric heating and you can have zero savings in winter months.
    - It is common for electric savings to be monetized (converted to dollars) based on a 'blended rate' value that is the overall average cost per kwh of energy. This can work, but sometimes does not and should be considered. An easy example is efficient parking lot lighting while on a time of use rate…here the savings are almost entirely 'off-peak', and the dollar savings might be half of the same watt saved on indoor lighting…meaning the payback period doubled.
- Some rebate savings require specific forms or prior approval or inspections. A project cost proposal that presumes the customer gets a rebate at the end and has deducted that amount can

be a risk. Ways to control this risk include managing all aspects of the rebate yourself to make sure it happens as planned or show the cost with no rebate and agree to give the rebate to the contractor.

- Savings advertised by product manufacturers tend to be exaggerated. Without some form of measurement for accountability, it is good to de-rate these, sometimes by half.
- Savings based on behavior or reduced maintenance are 'squishy'. Savings over 5% for a behavior item are probably not realistic. Savings based on reduced routine maintenance are zero for in-sourced staffing unless the measure deliberately includes job elimination (sunk cost argument) but can be real for out-sourced staffing. Measures that fundamentally eliminate maintenance, such as air-cooled vs. water-cooled HVAC cooling equipment can save on maintenance cost while increasing electric cost.
    - Note that behavior includes adhering to optimizing automatic control routines – overriding or deleting these features is very easy with modern digital controls and will reduce savings. Proactive ways of managing this risk include involving operations staff during project conception, training, and setting expectations. Reactive ways of managing this risk include weekly or monthly override reports with discussions revolving around 'why', settings that restrict overrides, and overrides that automatically time out after a day.
- New equipment selected on price point is at the beginning of its life cycle. An important consideration is support for the measure. The business case project premise can be weakened if savings decay over time and if repair costs nag at the measure cost over time. This risk can be managed by knowing the manufacturer reputation (in case it goes kaput right away), where replacement parts will be sourced, and access to trained service to keep it going. For new and high end technology, sometimes an extended warranty makes sense.
- For design-bid-build 'value engineering' step, the substitutions proposed are a project risk. Equipment differences that detract from one of the project intent items may only become noticed after installation. A way to manage this risk is to have all substitutions reviewed carefully by the engineers or architects and agree to pay them for the time so they will be thorough – in turn, the substitution needs to show notable cost reduction to be considered at all, acknowledging it costs money to review and poses some risk to the project.

Summary:

Strategic energy efficiency investments are your hedge against the certainty of higher utility bills that you cannot control (1). This article introduces some basic elements of implementing an energy efficiency improvement project. Some you can do yourself and some you may want help with. Delivery methods vary, and some arrangements include guaranteed savings. All fees and soft costs reduce the amount of savings you will see. No contract or delivery method is perfect, so Owner involvement is strongly recommended for all projects. Be safe and ask a lot of questions and stop if you're not comfortable. When the work is done you can enjoy the savings.

Citations

(1) *Financing Energy Efficiency Projects*, Small Business Administration, sba.gov, 2013

Learn More

Handbook on Project Delivery, The American Institute of Architects California Council, 1996

An Owner's Guide to Project Delivery Methods, Construction Management Association of America, 2012

Performance Contracting / Measurement and Verification, White Paper, Colorado Springs Utilities, 2020