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GESPC-U Lesson #115:

The Science of the IGA Savings Calculations

FYI: Terms and Acronyms can be found on the last page

Summary: The practice of full disclosure and transparency is represented by the IGA engineering calcs that ensure the accuracy of the project's estimates and projections. In this lesson we examine how the very math of the project comes together and defines the ultimate paid from savings project.

The engineering of the IGA is where the math of the project comes together and defines the ultimate paid from savings project. Each project owner should expect that the math of the project, all the used or applied assumptions and applications of engineering standards, be displayed to the degree that a knowledgeable third party could reproduce the calculations and arrive at the same or remarkably similar results. This practice of full disclosure and transparency helps ensure accuracy and adds credibility to the estimates and projections.

On the other hand, it's equally important that the work of the calculations, the math and logic, is described in such a way so as to be understandable to a lay person. This generally means that all the sources of data be labeled and referenced -- all the descriptions of the algorithms, weather bin analysis, assumptions, calculations – it all needs to be presented and explained in what we've come to call "Third grade math teacher language". This is simply so that anyone reading

the IGA has the ability to understand what's illustrated in the sophisticated calculations that ultimately represent the energy savings for the report. So, first the science of the calculations and then a description that could be reasonably well understood by a reviewer or supervising authority.

It's important to note that requiring the presentation of this highly technical information be understandable for lay readers, shouldn't replace the experienced technical review that is necessary. Like we've repeated often, if the owner does not have an experienced technical staff to be able to adequately review the engineering and the calculations, they should seek help. Hopefully, if necessary, the owner has already procured the services of a third-party reviewer, but if not, they should certainly engage one now.

In this section of the report where these calculations are displayed, the utility and cost savings for all of the energy conservation measures must be illustrated for each year of the performance period or guarantee period, of finance period. We emphasize each year of the contract so that you give reasonable thought as to whether or not you should expect the avoided costs to go up or to go down over the number of years the project is going to be guaranteed, or financed, as agreed to between the ESCO and the owner. Recall that the duration of this "Performance Period" may be subject to the term limitations outlined in a State's enabling legislation.

One of the things that comes into play when you're predicting savings for each year into the future -- is the concept of the escalation of utility rates and/or labor costs. We spent a little time on utility rate escalation in a previous lesson but as you can imagine, these escalators can have significant impact on the total savings projections over the full contract term. It's a good idea that the owner's budgeting authority is in agreement with any rate escalations proposed for a project. In NC the

Treasurer's Office has determined that if an ESCO escalates any utility rate the ESCO in essence is guaranteeing the utility rate for the life of the project. This one move makes the ESCO think twice about escalation but does not keep an ESCO from using escalation. However, most will not use escalation to keep from guaranteeing something that is out of control of the ESCO. As the owner, if escalation is used, having the annual reconciliation report reviewed by a 3rd party is valuable to make sure the ESCO is correctly calculating the escalation. Remember if the ESCO is short on the guarantee, they write the owner a check.

In summary, these savings calculations are some of the most important metrics in terms of determining what the savings will pay for or what can and cannot be included in the project. This along with the allowable term of financing essentially provide boundaries around what the project can pay for defining the ultimate paid from savings project.

But it's not just the math of pre and post construction utility consumption or spend that should be presented here in the IGA. Alongside these calculations there must be a discussion about all of the variables that impact the savings. Things like when and how many occupants will be in the spaces, and how that was determined. What is the range of temperature and humidity, light levels and the like that will be considered acceptable? Weather data; where it came from and if or how it was normalized to the base year case. All this information is important to take into consideration when you're projecting savings and cost estimates into supporting calculations both for now and for how they might change over the term of the agreement. Without appropriate documentation, determining where savings come from or why savings didn't show up as expected, is nearly impossible. And it's important to note some State's legislation, or separately their program rules, define what may or may not be used in the calculation of cost savings. Some state's define measures and have yet to include water savings. Some include maintenance and operation savings, and

some don't. There are examples over the years where an item proposed as cost savings turns out to be a cost liability for the owner. Knowing the difference between the true savings and what might be a future cost liability is what some have called a future capital cost avoidance. This is such a nebulous term it may ultimately turn out that measures labeled future capital cost avoidance, may generate no savings at all.

Now that the savings for the energy conservation measures have been calculated, the report requires the illustration of the savings percentage that is proposed to be achieved from each measure in relationship to the baseline energy consumption and demand. This is simply taking the calculated or estimated cost savings and determining what percentage the savings represents relative to the Baseline utility that the measure is going to save.

To recap the logic here, the report calls for an illustration of existing situation, a proposed replacement or retrofit, a complete illustration of how savings are projected for the measure and what percent of the pre-construction energy consumption and costs are projected to be avoided.

Also, in a previous lesson we discussed utility bill analysis. At this point in the report, the ESCO should describe and calculate the savings for any proposed rate changes. Interestingly enough, through the rigorous utility bill analysis an ESCO has completed, they may find opportunities or errors in the billing and may suggest recommendations in the actual billing rates that could result in cost savings. And, again if that's the case, those need to be described fully here as well. But to be clear, those savings are not an energy savings but merely cost savings through a legitimate change in the billing rate for a particular meter.

A great example of a rate change comes from facilities that have undergone numerous expansions over time and perhaps now have

multiple electric meters tracking the consumption for a single facility. The IGA and analysis might illustrate that no single meter registers enough consumption to be treated as a “large commercial user” which for many utilities is a tariff or rate structure that may appear to be more attractive than a “small commercial user.” However, the cost for kWhs under small commercial rates is generally higher because it is likely incorporating anticipated demand charges. Large commercial customers typically enjoy a lower kWh rate but a demand charge is structured and applied to each billing period. If aggregating the multiple meters reflects the total use of energy at one facility would meet the hurdle of a “large commercial” user justifying the application of the more attractive large commercial rate then a cost benefit to the project owner may ensue. This avoided cost discovered as a part of the good work of the ESCO should be illustrated and described in the IGA report. The determination of whether or not these savings, or avoided cost, should be included in the project savings is something owner and ESCO need to discuss, negotiate and resolve.

This level of detail needs to be shown in all of the ESCO calculations and applied to all measures – including discoveries from the study and interactive savings or penalties as well.

One example of an interactive savings occurs with nearly every lighting project. In the reduction of power required for new more efficiency lighting systems or retrofits, are additional savings other than just the lighting cost savings. Typically, when you reduce the wattage of a lighting system the cooling load decreases commensurately, so there is less of a load on the cooling system – resulting in additional cooling savings. Conversely, when you remove that heat from the space -- and if the space is also heated -- the heating system will have to provide additional heat to accommodate for the reduction in the heat that was generated by the lighting system – this is a very common example of the interaction of savings.

Other discoveries or disclosures that should be clearly documented in an IGA include things like restoring fresh air delivery in the retrofit or replacement of an HVAC unit. Poorly working HVAC systems tend to reduce or eliminate the appropriate amount of fresh air that was designed to be brought into a facility. This not only needs to be remedied to bring the facility back into code for the health and wellbeing of the facility occupants, but skews the baseline and preconstruction utility costs and introduces additional cost to heat and cool the facility. Once again, transparency, helping the owner understand these impacts simply brings credibility and trust to the working relationship between the ESCO and Owner.

Another part of an IGA report calls for the documentation, calculation and savings projections for Operational and Maintenance Savings, or O&M. The logic is that the equipment currently operating is older and likely requires significantly more maintenance and operational costs just to keep it running than new equipment. So, in order to be included in the contract, we recommend the owner first of all be totally aware the ESCO is going to consider O&M savings and that the baseline of these current cost records should be provided by the owner, be documented, and then used as the baseline in the contract. Maybe these are invoices for parts and pieces, or excessive service calls from outside technicians. It's always best that these O&M costs are documented by actual expenditures.

When calculating operations and maintenance cost savings, the ESCO must include the new cost of the preventive maintenance that will occur on the new equipment, rather than assuming that there will be zero cost on maintenance. It's important to understand that maintenance is not going to completely disappear -- it'll just be reduced and it's the reduced new cost of the maintenance that needs to be compared to the baseline costs to calculate the net O&M cost savings.

Again, the owner needs to have full agreement and disclosure on these particular cost savings.

There will be Operation and Maintenance costs in new devices and systems and while they may start out very low, it is quite likely that they will increase over time, just like the old equipment has. To that end, Owners and ESCOs should consider the escalation in costs over the life-cycle of the device or system. Finally, these O&M savings must be clearly and definitively documented. Generalization or unsubstantiated assumptions only serve to demean the credibility of the entire model.

Here in NC and in almost every other state, O&M funds do not reside in the utility account. If O&M savings are to be claimed as part of the performance contract, then the owner will need to move the funds out of the O&M budget and move them over into the account used to pay off the loan for any performance contract. Since in many cases O&M budgets are not properly funded, the use of O&M savings as stated above must be thoroughly vetted. Reducing funds from an already limited budget should be examined closely.

It's also not uncommon for investment grade audits in which some of the project's energy baseline and energy cost savings use parsed or derived savings projections from computer simulations. For most of the world, the reviewer's eyes immediately gloss over when they see the level of detail that's generated by these computer simulation reports. But let us emphasize again that if the ESCO relied on computer simulations, an in-house, or out-of-house third-party experienced engineer should lay eyes on these calculations to validate their accuracy and consider the reasonableness of assumptions, as those savings are going to define the boundaries for the project.

If on the other hand the ESCO uses their in-house calculations like Excel spreadsheets, then as we've mentioned, all the detail, all the assumptions, even displaying the formulas should be included in

describing how these manual calculations are performed. And, as we discussed earlier, this level of detail may not necessarily be presented in the body of the report but could instead be referenced as to where it can be found as an appendix or an exhibit to the draft report.

Another way of looking at this is that no simulation should be relied upon that is not repeatable by another party. All assumptions, inputs, variables and values need to be provided so that following reasonable engineering practices a third-party could repeat the work of the model and come up with the same results and conclusions.

One final caution, sometimes folks present results of proprietary software that's been created or written for their company or organization. Owners should proclaim clearly in the project solicitation that the use of proprietary software or systems that did not display all data, calculations, assumptions and formula would be strictly prohibited. In this fashion, all participants start with this clear understanding. These are big decisions, financial commitments and should come with full disclosure and transparency along every step of the way.

Once you feel comfortable with the information above, please scroll down and complete the quiz below. Email your answers to Reid Conway at reid.conway@ncdenr.gov. If you have additional questions, feel free to include them as well.

Lesson 15 Quiz

1. What calculations and parameters should a 3rd party reviewer be able to reproduce and confirm?

2. Why does full disclosure and transparency benefit both parties?
3. True or False; these projects require sophisticated and elaborate calculations so it's understandable if they cannot be read and understood by reviewers. Why or why not?
4. What are some of the synonyms used to describe the full term of the contract?
5. Rate escalations for utility costs and labor can have a significant impact on projects. If the rates do not increase as much as predicted in the IGA, who does it affect the most?
6. Explain how an IGA can affect or change your energy utility rates?
7. Why is it important to understand O&M savings? What could it do to an already small budget?
8. What level of understanding should the calculations and information in the IGA be tailored to? Why?

Terms and Acronyms

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| 3 rd Party | 3 rd Party Engineer |
| COS | Council of State |
| DOA | NC Department of Administration |
| DPI | NC Department of Public Instruction |
| ECM | Energy Conservation Measure |
| ESA | Energy Services Agreement |
| ESC | Energy Services Coalition |
| ESCO | Energy Service Company could be interchangeable with QP |
| ESPC | Energy Saving Performance Contracting |
| GEPC | Guaranteed Energy Performance Contracting |
| GESPC | Guaranteed Energy Saving Performance Contracting |
| GS | General Statute |
| GU | Governmental Unit |
| IGA | Investment Grade Audit |
| IPMVP | International Performance Measurement and Verification Protocol |
| LGC | Local Government Commission (Housed in the Treasurer's Office) |
| LGU | Local Governmental Unit |
| M and V | Measurement and Verification |
| OR | Owner's Representative |
| OSBM | NC Office of State Budget and Management |
| PC | Performance Contracting |
| Pre-Bid | Meeting held prior to the bid opening |
| QP | Qualified Provider could be interchangeable with ESCO |
| QR | Qualified Reviewer |
| RFP | Request for Proposal |
| SEO | State Energy Office |
| UNC | Refers to the UNC System |
| USI | Utility Savings Initiative |