

Disclaimer:

The State Energy Office of North Carolina would like to thank the National Energy Services Coalition for allowing the use of this resource for USI participants. A great deal of work went into compiling this information into a single location. As you go through this program and/or have additional questions, please contact Reid Conway reid.conway@ncdenr.gov.



GESPC-U Lesson #110:

The Investment Grade Audit: The Science of it All

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

Summary: The ESCO gathers the information that needs to be collected that lays the foundation for the development of an accurate energy and water baseline.

At this point in the project timeline, the investment grade audit has been initiated and the owner has collected a significant amount of information about the sites, the facilities and their systems, challenges or areas that may need special attention as well as the historical utility bill data and delivered it to the ESCO. The next step is for the ESCO to collect information from the field, the in-person on site investigation. As we said, most of this information has been provided by the owner, and perhaps some insights have been gained from preliminary interviews the ESCO may have conducted with those that manage or work in the buildings. Now the ESCO needs to get into the buildings, the facilities, the mechanical rooms, and spaces, and start the firsthand surveys of the equipment and systems themselves. The overall results of this detailed survey will lay the foundation for the development of an accurate energy and water baseline. For an ESCO to provide a paid for from guaranteed savings project, it's in all parties' best interest that the ESCO field verify and validate the information that's been provided to them.

Don't be surprised if the utility information gathering and the onsite work coincide. The ESCO is working on a specified timeline and often large enough staffs able to multitask. So be prepared to be handling multiple requests from the ESCO as the IGA is going on.

It also goes without saying that just the word survey, can mean a lot of different things to different people. Fundamentally, for our use, survey is the process to investigate the sites, identify and record an inventory of equipment -- a complete list of systems and devices including but not limited to lighting -- both indoor and outdoor, heating equipment and cooling systems, automated controls, air distribution systems, outdoor ventilation systems, exhaust systems, electric motors, transformers, even vending machines. Specialty systems like kitchens or dining equipment, or labs, computer rooms or closets, renewable energy systems – really anything using energy or water – down to and including plug load inventories. For water, the list may include rest rooms, locker rooms and cafeteria fixtures, irrigation systems, and make up water for heating and cooling systems. Admittedly, this is a long and detailed effort for the specific purpose of capturing and being able to display and subsequently reconcile to the utility bill, what is consuming energy and water and when.

Physically inspecting and formally recording the equipment's "plate data" or the manufacturer's operating specifications, like motor horsepower, or chiller and boiler capacities as two simple examples, is the first critical step in conducting the survey. Once complete plate data is in hand, the ESCO needs to ascertain the detailed operating parameters of the equipment that are relevant to each system.

Elements such as hours of operation, specific control strategies, varying load characteristics, and a whole lot more. If no accurate logs or records exist, the ESCO may need to install utility monitoring devices to obtain this critical information. Without this level of detail and

information, it would be impossible to achieve an accurate in-depth analysis of the energy use patterns of the equipment. So, this process is more than merely taking a cell phone out and taking pictures of air handlers and boilers and other pieces of equipment. That said, photographs of the surveyed equipment can add significant value to an IGA report by illustrating and documenting the conditions observed.

It's startling to some that all this information is required, including the plug loads and any parasitic load – all of the chargers and clocks and storage devices and printers, all the stuff we leave plugged in including the plug strips that are powered but no one is using. Every piece of equipment or device that regularly consume energy. This is where the audit becomes a real science -- to inventory all these pieces of equipment, survey how and when they are being used and come up with a reasonable and credible representation of what is using power and water and when, so that there is a clear understanding of how efficiency can be employed.

But this work is more than the inventory or survey -- it begins to bleed into the actual analysis. Estimating these loads and their impact becomes an elegant enjoining of what we know about the consumption of energy and water from the utility bills and how it is parsed out, and reconciled with the loads identified, when it is being used and who is using it. This sort of comprehensive audit does a marvelous job of helping all parties understand the real-world limits of potential of savings and serves to identify where significant efficiency and modernization can occur.

Because we know the actual baseline energy usage from the previously collected utility information -- the task now is to determine what portion each of these end uses contribute to the total utility usage. For this we use the term “to disaggregate” the end-use loads – or to separate the individual impacts of these end uses devices and systems.

Accurately reconciling the individual energy and water use loads with utility bills is the level of verification that needs to be accomplished by the ESCO to develop a realistic and credible utility baseline -- one that both the owner and ESCO have confidence in.

This whole facility, whole project comprehensive baseline looks at loads and consumptions and is representative of all utilities being used under certain conditions and places bounds or limits of reasonableness around the savings that might be projected from future installed measures. It needs to be clear between the Owner and ESCO that the audit explicitly defines this inventory – that it illustrates this reconciliation and looks at what is impacting consumption and that all the impacting variables are identified. This then serves as the appropriate starting point for all proposed changes.

The baseline should be presented with all this information. An equipment list, the quantity of people that are in differing spaces at differing times, the temperature, humidity, and light levels anticipated to be acceptable during the times people are there -- and during the times they are not there. It should also include things like vacation schedules – all the things that we have mentioned along the way that are part of this information gathering and validation – and how it all comes together into that final reconciliation of all the loads and all the variables that impact it.

And of particular importance is the requirement that the IGA contain the survey, inventory, load parsing and reconciliation to the utility bills as described here -- along with the documentation of all the variables that are impacting the load to.

If there are modifications, or for some reason the contracts are not to be followed to the letter, those reasons and the specific changes need to be made clear prior to the solicitation of the project so all the

respondents know what is being asked of them. And if having received the solicitation, an ESCO thinks this is not necessary, before or at the submission of their response is the only time to take exception. This clarity, those agreements, are some of the most important guidance to avoid any future dispute. Assuring real clarity on following the contractual guidance is a clear value of having third party oversight. It takes experience and knowledge to know what must be clear upfront and the impact that decisions today may have on the project now and for the full term of the agreement.

Another real value that comes from field audits are the little discoveries that sometimes show up when you're fulfilling a survey and inventory. It never hurts to grab a quick photo of that actuator arm that has slipped off the linkage. These sorts of documented discoveries may explain why there may be chronic comfort issues in some areas, such as it's either too hot or too cold in a classroom or office. Or, why the energy used by a piece of equipment suddenly skyrocketed. In fact, just because the equipment is there doesn't mean it works properly. It's important to understand what impacts energy and water consumption, and that the equipment designed to control the space does what it supposed to.

All this work results in what the ESC Documents define as a baseline. Just to be clear, there are other processes, other methodologies, some abbreviated, that may be followed at times to establish other baselines and we'll cover more about that concept in a future lesson.

This leads us into the next step: With all the data collected, the ESCO may begin to identify what the potential Energy Conservation Measure or ECM opportunities begin to look like. Combining the owner's needs and desires with what's been documented and observed in the field survey and inventory and what makes good engineering and economic

sense, will begin to form the preliminary list of potential measures that are worthy of additional study.

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 10 Quiz

1. In GESPC, what is the word survey meant to mean?
2. List at least 10 items that should be included in the identifying and recording of the inventory that makes up the total utility load?
3. What are some to the areas and systems to consider for reducing water consumption?
4. What is the purpose of an energy and water equipment/system inventory?
5. Physically inspecting and recording the name plate information is the first step in conducting an equipment inventory. When the inventory is completed the ESCO must then determine several other variables. List some of those variables?

6. What does a comprehensive audit help all parties understand?
7. List some of the details that should be documented to authenticate the results of the IGA.
8. What is a baseline?

Terms and Acronyms

| | |
|-----------------------|---|
| 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 |