The *Resource Appraisal*
- A Due Diligence Report for Energy/Resource Performance Retrofit Financing

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Synopsis:

Financing for energy efficiency retrofits of existing buildings are handicapped by poor quality loan risk analysis. Standardized reports written by independent experts like property valuation appraisals and Environmental Site Assessment Phase I reports are used by banks to quantify loan risk. A similar analysis and reporting "third party" [as in not the borrower and not the lender] process can be completed regarding a building's energy/resource use.

This article considers characteristics and issues would come into play for just such a due diligence report which I am calling a *Resource Appraisal*. The goal here is not to draft a detailed road map on how such a report could be written but rather to consider its various components, why certain key features are critical and relate them all to the loan process. All *Resource Appraisal* individual components currently exist in the market and in some sectors (like Energy Service Companies) quite the process is very similar. Likewise a large part of the workflow design closely follows a classic bank ordered third party report process. The key departure is the integration of the energy/resource performance analysis and reporting with the financing to pay for an on-going series of property upgrades.

Criteria for traditional loan underwriting is included to provide a perspective on where energy/resource performance upgrade loans fit into a bank's general loan risk profile. Loan credit enhancement techniques using traditional and creative options are reviewed with an eye on how performance enhancing loans might be made cheaper, faster and easier.

The *Resource Appraisal* is outlined as a way to unify and integrate the many existing reports and components that are currently being used to support energy/resource upgrades. These include energy audits (like an ASHRAE Level 1&2), Return on Investment (ROI) analysis, Measurement & Verification (M&V) sensors & controls, Energy Management System [EMS] tech and popular certification standards (like LEED, Energy Star). All of these elements have a role to play in a Resource Appraisal.

Any successful energy/resource performance building enhancement relies on a "Retrofit Triangle" with three key parts: Technology, Operations and Finance. To prove performance Technology (sensors and software) are managed by the Operations staff resulting in a robust data flow feeding into the Financing area where data analysis proves the worth (in theory) of the performance upgrade investment. This Technology/ Operations/ Financing triangle linkage drives the constantly updated content of the "live" Resource Appraisal. A steady updating and both better operational visibility, providing a path for optimal building performance. Also watching the data stream are financing sources that now have enhanced decision making.

Overview of the problem

Availability to financing for energy/resource performance retrofits of existing buildings has been below the level desired by property owners, public officials and lending institutions. A primary hindrance to both borrowers and lender has been the lack of any standard and reliable method to analyze the retrofit investment risk. The first question is always about how quickly and surely will be the payback from an investment to upgrade building performance. After the payback period the question is will that investment increase the property value? These are highly complex issues requiring measurements and analysis by qualified experts. Banks use such independent experts often who, by their signature on a written document, effectively assuming a portion of the risk with their analysis and projection of the future. Typical for the banking process is a review to make sure the report is credible, sound in its basic research and procedures, so that both bank and borrower can feel that the investment risk is better understood.

While this article considers energy retrofit financing, loan risk and due diligence reporting from a traditional banking perspective, but many others benefit from a Resource Appraisal process. The borrower/owner's confidence in successful ownership as well as the building operations group performance will gain from this framework and content. A valuation appraiser's view of the building operations measurement and verification data impacts both the cash flow and overall property value. Ideally this enhanced operational efficiency will also feed into the familiar valuation appraisal workflow and help banks and borrowers make more secure property upgrades.

Historic Due Diligence in loan underwriting

Determining reasonable and acceptable loan risk thru a defined process is expected of federally insured financial institutions. Independent/third party expert reports regarding loan collateral is a fundamental part of that process and an everyday event. Without these highly structured analysis documents, loans could not be made without risking the wrath of federal regulators from the Office of the Comptroller of the Currency (OCC) and others.

The most commonly required due diligence report is the valuation appraisal required to comply with Title X1 of FIRREA [Financial Institutions Reform, Recovery and Enforcement Act of 1989]. Nearly all bank ordered valuation appraisals must comply with the FIRREA regulations which came about following the dissolution of hundreds of insolvent thrift institutions by the Resolution Trust Corporation.

Due diligence reports dealing with hazardous material contamination were developed in the 1980's as CERCLA [Comprehensive Environmental Response, Compensation and Liability Act of 1980] was interpreted by the courts to provide an "innocent landowner defense". By 1988 the HTS Environmental Group had copyrighted the HTS "Due diligence inquiry checklist" to support the "innocent purchaser defense" from contamination liability. The checklist eventually formed the basis of the current ASTM [American Society of Testing and Materials] Environmental Site Assessment Phase 1 E1527 report. The legal importance of this document for lenders and land owners was underscored by the Superfund Cleanup Acceleration Act of 1998 which requires commercial property owners to perform the ASTM E1527 Phase 1. The most recent site inspection guideline is the "Standards and Practices for All Appropriate Inquires" 40 Code of Federal Regulations, also known simply as "All Appropriate Inquiries" or AAI.

Most Freddie Mac and Fannie Mae loans require a Phase 1 ESA and also an engineering grade inspection report or Property Condition Assessment [PCA] following the ASTM 2018 standard.

Small Business Administration loans also often require Phase 1 Environmental Site Assessments and Property Condition Assessment engineering reports.

The role of highly structured, standards compliant documents completed by trained impartial professionals in the lending environment is clear. These reports are "third party" reports that disengage the borrower and bank from the conclusions which allows them to rely on them for loan underwriting, tax liabilities and business decisions.
Ultimately the history of due diligence is about risk and liability; defining it and quantifying it. Banks and the OCC want to sufficiently understand a loan risk to be profitable and calculate the appropriate level of cash reserves. Banks make money from the arbitrage of the income from loan fees and interest compared to the calculated loan risk. High risk loans are alright and low risk loans are fine, but loans with undefined risks are not. Not for the profit motivated banks who need to know the risk spread and not for the Federal regulators overseeing them and want lending to be prudent.

Which concludes the current problem with making a loan based in part on thinly described risks in the future performance of energy/resource upgrades which may involve complex building design that are understood by few and stand on an incomplete set of standard operating procedure.

Construction lending is risky and expensive

In the world of banking, construction lending on proposed real estate improvements is considered one of the riskiest loan situations and energy retrofits is particular subset of this class. The adage that "It's hard to make predictions, particularly those about the future" is why the value of proposed collateral is always riskier than a loan based on an As-Is collateral value. Appraisers and underwriters (and borrowers) peer into the future when construction will be completed, the property up and running as planned and what market conditions might exist. This "As-Proposed" future value state of building and market requires is both complex to estimate and needs a future condition risk adjustment.

Traditional construction financing is also expensive to administer needing a team of skilled costing and construction specialists to survey fund disbursement to make sure dollars are spent correctly. An appraisals presents three distinct values (As-Is, As Proposed At Construction Completion and As Proposed, Stabilized) making the report complex and more expensive. Many banks have dedicated loan officers who specialize in construction and lending programs that only cover the construction period itself with an exit as soon as the subject is built and occupied/stabilized.

Banks have a hard time making a profit on small loans

There are have significant fixed cost to process any loan and small loans (say under $2MM) are difficult for a bank to make money in the best of circumstances. The loan process for commercial is vastly different than for single family homes/1-4 units. Budgets for commercial energy/resource performance retrofits often can't overcome the due diligence costs and aggregating diverse pools of small loan balance commercial loans into a mortgage security is difficult. Adding to this a layer of complexity based on an As Proposed energy/resource performance is a major disincentive. Lenders have to decide where to put their efforts; small, complex loans with a difficult to prove value case or more conventional business, their profit motive drives them to the greener (as in dollars) choice.

It is possible to create a lending program for small commercial loans and one option is to make it be streamlined with very standardized and efficient process. Right now that option is a challenge with

the limited experience most have with performance enhancing lending. Another small commercial loan option is via credit enhancement like SBA or a loan loss pool which protects a bank from the losses (more on that later).

The basis of loan underwriting: People, Credit, Real Estate
Understanding some basic loan underwriting concepts can help those unfamiliar with the process to better understand the process applied to all loans, including those for performance upgrades. Lending money is a business depending on lenders getting repaid as agreed where taking loan collateral is to be avoided and regulators feel assured risk is understood. Wells Fargo is a tradition and conservative bank that looks measures every real estate loan using three fundamental concepts about risk: *People, Credit and Real Estate* and in that order of priority.

First it's about *People*, basically who are you the borrower, the actual person, not their company and do we (the bank) "know" you, have we had a relationship over time. Is the borrower a depositor, how long and deep (number of accounts) have we. Do people we know, know you, who are you in business with? Have you proven to be a financially stable person?

Next in priority is about *Credit*. Do you have a history of borrowing money and paying it back as agreed? Is the borrower well capitalized with sufficient liquid (cash) reserves? What is your credit rating, the credit rating of your business?

The third key factor is the *Real Estate* collateral. The process around determining risk is this area has a particularly heavy set of regulatory requirements. Regarding real estate value, everyone knows that the first three rules of real estate are location, location, location. Next is who is in the building, what are they doing and is this something stable, that can be relied on. An appraisal considers value via the Income Approach via four elements: income, vacancy, expenses and risk. With the expense set are property taxes, maintenance, management and also utilities. And within utilities there is water, trash, electricity and gas. And under energy a portion of the expenditure is avoided via the energy/resource performance upgrade.

When viewed this way the fundamental loan underwriting is prioritized from who you are, creditworthiness, then to the property and then within the property expenses and saving a part of that. It is clear from this hierarchy that saving a portion of the energy outlay only moves the dial a certain distance in the schema of obtaining a loan.

This also is a tip off that while energy savings are important and have the advantage of easy measurement, it would be better to include the upgrade effect on the other value factors of income, vacancy and risk. While these impacts are trickier to determine, overlooking them in a high performance retrofit has the risk of overlooking significant value. Speed of sale, higher interior environmental quality (light & air), if leased higher grade tenants and other factors. The Resource Appraisal goal is to allow a more comprehensive method to measure upgrade impacts and use this information in loan underwriting. But even with all influences available solid fundaments of borrower, credit and building need to exist no matter how "green" the proposed project.

Differences in loan risk megawatts vs. negawatts

"Negawatts" refer to avoided energy which can be created via efficiency upgrades. While efficiency upgrading is known to be the first step in an integrated design, avoided energy is fundamentally complex to measure reliably. At its core negawatts are something in the future that does not happen in a consistent way. And this non-event future condition is very dependent on

human behavior which can be fickle. The amount is impacted by use and ultimately poses the question of how much energy does an empty building save? These uncertainties impact the loan repayment risk.

Distributed on-site power like solar photovoltaics (solar PV), wind mills or fuel cells create output which can be easily measured. Solar PV for example has a highly predictable output as the sun comes up every day, panels have precise output ratings and the output value can be priced in real time against utility charges. Distributed power like solar PV is highly reliable with no moving parts, a long technology history backed up by long manufacturer warrantees. Since the output can be meticulously measured in real time and any malfunctions can be quickly detected and repaired. Lastly the systems are often (like solar PV) not integral to the building like the energy efficient new windows or insulation. A solar PV array could in theory be unbolted from the building without a major impact where this would not be true of the high performance windows and insulation. The combination of reliability, easy market pricing and asset recovery (if necessary) makes the projection and monitoring of performance easy with on-site power systems. This in turn produces a much more precise and predictable investment risk.

This risk "dreaded blending" presents a quandary to deep retrofit projects and true net zero solutions involving both on-site power and highly efficient building design. By combining these two dissimilar risk profiles into one loan, this degrades the reliability of the highly predictable power while doing little to improve the questions surrounding energy/resource performance payback rates.

A parallel of the dreaded blending scenario exists in the classic valuation appraisal when the market value of a mixed-use property with several uses/build out types (like a retail shop, apartments upstairs and warehouse in back) is the collateral for one loan. A mixture of the different uses and risks results in a higher interest rate. A similar result would be expected in the Resource Appraisal process and this parallel between issues and solutions of the Resource Appraisal and valuation appraisal process are frequent. When confronted with a quandary with the Resource Appraisal process a look at the process with a valuation appraisal can often indicate a solution that will be well understood by those in the loan process.

Credit Enhancement to overcome loan risk

Many loans taken individually do not have the People, Credit, Real Estate characteristics to meet traditional underwriting standards and the solution is to provide "credit enhancement". This might be a personal guarantee by the borrower, adding additional borrowers, adding additional property or assets that can be tapped is the loan goes into default and losses occur.

Other credit enhancement options come from the public sector where loan access is considered to have a public benefit. A well known example is the loan security provide by the Small Business Administration [SBA]. SBA loans allow small business owners with little capital to purchase their own building with a low down payment. These credit challenged borrowers can obtain loans with only 10% down but if losses occur the first 40% is covered by the SBA. This leaves the bank with effectively 50% loan to value facility.

A loan loss reserve account is another public sector credit enhancement option. In anticipation of unknowns with the PACE [Property Assessed Clean Energy] loan program, the state of CA took a portion of its reserves and established a loan loss reserve to backstop any lender losses. While PACE has not growth the way anticipated the loan loss reserve option could be a way to remove uncertainty from energy/resource performance lending. The cost avoidance of performance

upgrades can provide cash flow to make such a program self supporting as efficiency loan payments should save more than the cost of the debt to finance them.

HOW THE **RESOURCE APPRAISAL** [RA] PROCESS WORKS

The Resource Appraisal has similarities to the property valuation appraisal process

Banks and borrowers already have familiar procedures with the Valuation Appraisal process which determines the market value of the loan collateral. Much of that Resource Appraisal workflow mimics the valuation appraisal process which will ease the adaption of the RA. Both appraisals include a property inspection with photos and measurements, analysis of operating statements, financial calculations, certification of the results by experts, production as needed of a written document signed by an uninterested third party to the transaction. Once delivered both are reviewed to check for content and analysis. Emphasizing the similarities of the RA to the classic valuation appraisal process will help its adaption all concerned and assist the RA idea a faster acceptance.

Adjusting to the 7 major loan/ownership classes

It surprises no one that a valuation appraisal report of a single family residence does not look like the appraisal of a high-rise office building or a hospital. While not perfectly accurate, I propose that there are seven basic property/ownership classes which are mirrored by loan and banker groups which patronize them. These seven property families produce a similar seven types of ownership, each with particular holding period, buying and management (general) tendencies. This is reflected in valuation appraisal analysis and reporting formats.

While often varied in market, data and analysis, there are also many report sequence/content and workflow process similarities in managing the respective loans within a bank. Just like the valuation appraisals the RA reflects the same differences and similarities in scope of work, data gathering and analysis which varies by property types.

Property and loan class breakdown might be generally divided in the following classes [C&I = Commercial and Investment by some and Commercial Industrial by others]:

1. SFR/ 1-4u: Single Family Residences and 1 to 4 unit apartment buildings
2. Small C&I: SBA, mom & pop owner user, property and loans – valuations < $2MM
3. Medium C&I: larger owner user/part owner user, local investor – value $2MM to $10MM
4. Large C&I: multi-tenant leased investment, portfolios – values >$10MM
5. Multifamily: medium and large investor grade apartment complexes
6. Specialty: gas station, fast food, hotel/motel, movie theaters, data centers, etc
7. MUSH: Municipal, University, School (grades 1-12), Hospital/healthcare

The RA data, analysis and reporting will likewise reflect the particular personalities and risk of these groups as seen in the valuation appraisal. Particularly important for a performance upgrade return on investment analysis is the (vastly) different holding periods, return on equity expectations and access to capital of these seven classes.

Long term holders like Small C&I mom & pop businesses might have an easier time accepting a longer payback period of a performance upgrade than a Large C&I owner. But on the other hand a Small C&I borrower might also have less access to capital. A Large C&I owner corporate owner

might need a short a holding period to keep their holding period options open. Corporate return on equity is often around 30% to 35% or a 3 year payback investment goal. Multifamily property owners have to address the split incentive issues (split incentive issues is quandary of a property owner paying for upgrades but it is the tenant who gets the advantages), but can benefit from a homogenous property design and opportunity for on-site power generation. Specialty properties often have very high energy use (like hospitality and data centers) and these occupant operations can impact the overall performance enhancement calculations. MUSH market owners are nearly all owner user/single tenant type property with very long holding periods. This is a natural place for first adaptors of sustainable design as they have many advantages; they can skip the split incentive problem, payback period is not an issue and often there is ready access to low cost (public, tax advantaged) capital.

The RA (just like a valuation appraisal) needs to adapt the global framework for these different property types, capital/debt situations and how a performance upgrade payback risk will be calculated. Nearly all loans require borrowers have some "skin in the game" so the RA analysis needs to serve both the owner's equity return calculations and the bank/debt underwriting. AT some point when enough performance upgrade loans exist they might be pooled into a new type of EE (Energy Efficiency) mortgage backed bond. Pooling loans will add another layer of security and demand for process and content consistency.

The Resource Quintet

High performance property is resource attentive, watching, tracking and reporting its resource use. To make the point using the automobile analogy, most buildings today are running without a speedometer, don't know if the lights are on and only know their gas consumption when they get the bill at the end of the month. The goal is to have them run more like a Prius with a real time MPG readout front and center. It is easy to understand why resources like energy, water, air quality are nearly impossible to track as they are basically invisible, used in small and unknown amounts over time. Humans are wired to react to events that are highly visible and have an immediate cause and effect. To make resources visible a specific tracking and reporting system, often called an Energy/Resource Management System [EMS] is not the case with the five major components of a high performance property, what I am calling the **Resource Quintet**.

The Resource Quintet consists of the five primary resources that flow thru a property impacting its footprint on the planet and environmental quality of its occupants. They are Energy, Water, Waste, Cabon and IEQ (Interior Environmental Quality). Tracking, monitoring the flow and status of these five property characteristics will be the goal of the Resource Appraisal.

While the Resource Quintet characteristics reside inside the property boundary addition factors in the immediate vicinity can impact the property's long term value and economic stability. For example Walkability reflects access to employment centers, services, cultural features, parks and transit. This is graded by websites like Walk Score http://www.walkscore.com/ and can definitely impact property value. The impact of high gasoline prices and foreclosure rates in the exurbs is being recognized as significant loan risk verses high Walk Score locations.

The micro climate conditions of noise, particulate and air pollution from a nearby arterials and freeways have become the modern day version of "living on the wrong side of the tracks" [footnote 1]. Wind conditions, solar exposure, soil quality and shading from adjacent trees might also be a value impact related to the Resource Quintet.

Tracking activity of all components of the Resource Quintet is realistically speaking not a first step, but is a final design objective. Buildings frequently have limited methods of tracking resource activity other than monthly utility bills. Getting the EMS up and running should start slowly with small advances and move steadily forward. Key to measuring progress is to always know where you are starting from before upgrades.

This makes the first upgraded the Energy/Resource Management System property resource measurement and tracking system. Once a reliable measurement and verification (M&V) system is in place, data regarding improvements from any subsequent upgrade can be clearly identified. This critical "point of beginning" pre-upgrade state is absolutely vital to proving the upgrade worth to a finance committee, a bank or an appraiser. Without hard data gathered over time an investment's financial return will always be in question and when it comes to loans, dollars offset doubts (risk = higher interest rates, due diligence fees).

*Spinning the **Retrofit Triangle***

Typical business organizations have silos for the departments addressing IT (information technology), building operations & maintenance and finance. Their separate reporting hierarchy, different cultural bias' and impact on the business bottom line make them more competitors than collaborators. In many ways "integration" and "balance" are the defining words of high efficiency design. Successful retrofit programs always involve integrating these three groups [technology, operations, and finance] and their linkage can be described as the **Retrofit Triangle**.

The basic linkage is that technology tools allow the operations group to both improve their control over the property function and simultaneously delivery a data stream on performance to the finance group who gauge the investment performance. Once again the backbone is an EMS network of hardware (sensors, controllers) and software (operational, data gathering, analysis, display and reporting). Using this information the finance arm can define payback with a precision that allows true risk determination. With confidence around the data stream a performance investment can be made, results proven which can then lead to additional investments.

EEComps – Energy/resource Efficiency Comparable Database

When reliably gathered, disclosed and organized energy/resource efficiency investments with a good before and after story can form an "EEComp" (Energy/resource Efficiency Comparable) database. This would resemble the sold property database sources use by appraisers, buyers and banks to support valuations and loan underwriting.

Existence of such a database could have a multiplier effect on EE retrofit financing activity. For this reason a disclosure agreement would be a real and highly desirable product from any publicly supported program. Recognizing the power of this information at this early stage of market participation, the permission to fully disclosure information sufficient to create a bona fide EEComp is not a "nice to have" program feature. In fact it may be a programs most valuable results and long range benefit as it will lay the foundation upon which a market can be built.

Unfortunately every survey conducted shows that property owners consider individual privacy rights to be of the highest priority and those who believe this should have their view respected. I expect however that this might be more philosophical than expected and the negative impact of disclosing energy use will be overcome by the many positive features of an advantageous loan program, recognition of support for the common good and desire to save money.

Prioritizing locations for support where property owners have agreed to detailed resource use disclosure in exchange for program participation is reasonable. The early adaptors also fuel market developments that will benefit those who upgrade later.

The 6 Retrofit Stages, the role of an Energy/Resource Management System

To determine the *actual* repayment of the retrofit budget verses the *modeled* repayment, benchmarks of the subject are needed. Without knowing the point of beginning baseline resource use, determining true progress is impossible. It is certainly possible to compress the retrofit stages above but the go-slow pace will capture more owners who may just not be that sure it will all work out as planned.

Stage 1 - As-Is Where Is and looking backwards
Stage 2 – Fruit on the Ground; Energy Management System and tweaks
Stage 3 – Low hanging fruit ; short payback 0-2 year payback
Stage 4 – Medium Payback ; 2-7 years
Stage 5 – Long Payback ; >7 years
Stage 6 - Net Zero or as close to it as can you get

Stage 1 – As-Is, Where-is and looking backwards
Establishing the history and pre-upgrade state of the property is the most important step to later establish the true investment performance and prove it to a bank. The initial before and after record keeping will involve some time and expense, but due diligence is all about documentation. The best interest rate comes from having the best risk calculations, sufficient to convince others (like bank regulators) that the rate of return is accurate.

There are practical limits to how much time a building's operation need to be measured to set the As-Is level. Data gathered over just a few weeks can paint a much brighter picture than if the pre-retrofit review is limited to a walkthrough and survey of current utility records. Performance is a timeline, not a snapshot. Valuation appraisers working for banks typically request three years past operating statements from a property owner for a reason. Likewise putting systems in place to track future performance will allow the most credible performance claims over historic levels.

In addition to resource use at a building, an accurate record of the property's physical characteristics and renovation history are vital. The single largest cause of inaccurate property valuations is not getting the collateral description right. Inaccurate building sizes, flawed interior buildout descriptions, poor renovation records will almost guarantee an inaccurate value result even if everything else is done perfectly. Thanks to a cadre of technology tools like digital images cameras, video, including aerials images, infrared cameras and 3-D sketch programs the opportunity to have accurate and rapid physical building modeling be attainable.

I can imagine a time in the not distant future when a Best Buy Geek Squad team swings by a location taking laser measuring tools, photos, videos and notes. Before they leave they have installed a set of strategically located and leased resource sensors, data loggers, time lapse cameras and other hardware. At the end of say 30 days the Geek Squad is back to recover the rented gear and will then upload the data gathers so that a group of remotely located energy modeling experts can accurately build a 3-D building energy model. Based on the results upgrade budgets and paybacks can be projected and available rebates listed.

Stage 2 – Energy Management System, fruit on the ground , <1 year payback
Using the information from the EMS this stage just looks at tweaking the existing building systems so that they operate the way they should. Under 1 year, no cost payback items are in many cases just deferred maintenance like making windows and doors close properly, correcting heating and AC vent operation and correcting malfunctioning hot water control equipment.

After the first look at performance this stage is when the property's Energy Management System [EMS] components, basic smart meter and operations tracking devices are installed. No one would drive a car without a speedometer or expect to only know how much they paid for gas at the end of the month but this is how most buildings operate. An EMS does more than just monitor resources for better operation, it broadcasts their use in real time making energy/resources visible. Humans respond to stimulus and the visibility taps into human behavior for both working in the building and the operations staff. This feedback loop to humans is a key reason to look at an EMS as far more than just a way to measure resource performance.

At the end of this stage existing building systems should be working as best they can, repairs made and a basic EMS installed to start visualizing resource movement.

Stage 3 – Low Hanging Fruit – One to Three year payback
The first serious upgrade investments in improving performance are made in this stage. This will almost always include lighting related items like occupancy sensors and higher efficiency bulbs. Another common fast payback upgrade are controllers on hot water and HVAC systems. Other upgrades will be evident in energy audit report (like an ASHRAE level I or II) which will show those improvements with low cost and quick payback.

Stage 4 – Medium payback Capital upgrades – 3 to 7 year payback
Replacing windows, insulation projects and other medium priced investments. Building occupants are more aware now and in better control of their experience in the building. In this phase (as well as others) plug load controls and tracking could be added devices. Data is now flowing from the operations seamlessly into the offices of the operations staff and from there into financial reports.

Stage 5 – Long Term Payback >7 years
At this stage distributed on-site power like solar photovoltaic, small wind (depending on the rebate programs) start to fit in. There are also power offset devices like ground sourced heat pumps, solar thermal hot water, fuel cells or cogeneration (power and heat) or tri-generation (power, heat and AC) systems. These upgrades can be properly sized since the building envelop is tight and energy use is under control. This stage is also about tighter integration and balancing resource/energy performance. At this stage every motor should be variable speed, systems tied together with technology and daily operations benefitting from real time feedback.

Stage 6 - Getting to Net Zero (or as close as you can), counting carbon
The ultimate objective of every building design charrette is to reach Net Zero, where all functions of the building seek to be self supporting. Actually reaching this level of sufficiency is less important than examining and gauging what it would take to get there. Perhaps some upgrades are better left to a future time when the economics of $200 per barrel oil and super efficient solar cells will tip the scale about something that is not yet practical.

Upgrading existing buildings always presents unique challenges as everything is impacted by the building's original design. In the process of reaching for Net Zero designers can identify which

buildings might have inescapable flaws that pre-destine obsolescence. Other buildings might be closer than you could have imagined. The investment goal is to reach a point where the building is functioning at a highly efficient level and operations are transparent with a sense of what it would take to get to truly Net Zero. Having looked at the net zero state will also be a deliverable to a future buyer.

So start slow at the start of a RA program, it can speed up later

Speed is the enemy of cost and accuracy. Trying to balance speed/price/quality shows it is only possible to reliably get two items at any one time. If something is fast and cheap, it is not accurate. If it is slow and expensive, it should be reliable. If something is fast and accurate, it won't be cheap. For a limited amount of time it might be possible to have it all, fast/cheap/good but it won't last and when it ends the cost will be greater than the now ended balancing act. There is no denying that the RA process is complex and it can be expensive. If done with too much speed the result could end up expensive, inaccurate and ultimately slower (when re-done).

The good news is that with a solid foundation of training and tools confidence of success improves. Reminding everyone that this is a sequential process, where each event rests on what went before it. It is not a sequence of singular events. Expectations align with a pattern of repeated tracking and tweaking operations. This slow burn process permits all involved (owners, occupants, finance and operations) to watch as the building improves generating a powerful confidence that realistic resource efficiency upgrades do make sense. Understanding the process is a key step to understanding its risk and done too quickly will shortchange the experience, competency and ultimately confidence in the final results. Little matches the enthusiasm of a convert and the proof is that there are no ex-environmentalists.

Occupant behavior, plug load and weather

Human experience can (not all and not always) shift to a new "normal" behavior that becomes naturally more resource conservative. But behavior changes can also be temporarily, engaged only for a time and then revert back to previous a previous style. Others can be counterintuitive thinking that "others are saving resources, so more for me!" Recognizing the irrational nature of humans can lead to insights that while irrational, the behavior is predictable. Monitoring the number of people in a building for which hours of the week and what they do in the building is an important part of tracking resource flow.

Isolating the impact of plug load, non-core systems and humans can be difficult to isolate from the core building operations. However if not done this non-core behavior can dramatically impact "actual" and modeled building performance figures.

Weather is generally normalized in energy modeling software with a mean plus upper and lower range. Including records of all three of these highly variable, non-core building resource impacts will improve the confidence in the EE investment measures.

The Resource Appraisal is a property asset

There is a substantial initial investment to set up a system to track the property baseline energy/resource use, to complete the first turn of the retrofit flywheel. However once the Energy/Resource Management System is in place and generating reports it gives the property an operational advantage over a similar building without such tracking features. This investment provides value to the property in two basic ways. First is creates a more efficient and well

integrated operation. It then produces as a by-product a detailed historic record to prove that the investments are paying back. With such a system up and running a new owner or valuation professional sees it working and how it can be perpetuated. It is a reasonable case can to a bank and appraiser to recognize value in the property upgrades as bona fide and of market value.

In my work as an appraiser it has been frustrating to see an opportunity for a higher market value handicapped by an owner's poor record habits or limited monitoring system. This lack of records would most likely prevent a buyer (and by extension the appraiser or bank) from recognizing operational economies that in most likelihood existed. A well executed, updating RA tied to a energy/resource management system would prevent this.

Worry less more about the downside than about the upside

To justify an investment an increase in cash flow and/or value is expected but an increase compared to what measure? The concerns for where the "extra" value can be identified masks the protection the performance upgrades are providing against the downside of being "brown". Marketplace sophistication varies by location but some markets have tipped so that green is the new normal and other buildings suffer a punishing discount. As resource based economies and peak oil signal changes in global efficiency standards, it is clear that by investing in higher performance the threat of a decrease in value for not doing so is avoided. Every upgrade should provide a reasonable return relative to the investment. Based on where markets are in their adaption of higher performance the more concern owners should have that they should include in their calculations a factor representing the hedge they are creating against the downside of doing nothing.

One of the motivations reasons to study and understand high performance property is to be able to recognize the dogs, those properties whose fundamental design has obsolescence that prevents them from ever (or without extraordinary cost) from becoming highly resource efficient. Likewise at this stage of the market some buildings have an easy path to high performance due to a flexible design, thoughtful site location and have less obsolescence risk.

This "new normal" version of high performance building design could arrive very quickly and to avoiding the value discount might ultimately be more important than hunting for upside.

Conclusion

The Resource Appraisal process described above is a due diligence report that can support risk analysis in financing energy/resource efficiency investment while married to a building management system. Funds coming from the owner or CFO or a loan can use the data flow to reduce or at least better define the investment risk. As outlined the more clearly risk is defined, the greater chance investments will be made and with undefined risk prudent lending is not possible. The Resource Appraisal outlined is intentionally complex and ambitious to make a place to offer the many ideas at play rather than as a roadmap that must be strictly followed.

Commitment to fulfill the ambitions of the process require senior management to re-structure an organization's technology, operations and finance. As more property undergo this effort and their experiences are reported, standardized due diligence reporting formats (as shown by groups like ASTM) should emerge to allow for more streamlined analysis and financing.

END