Unlocking Deep Efficiency in Commercial Buildings

THE METERED ENERGY EFFICIENCY TRANSACTION STRUCTURE

May 2016

MEETS™ ACCELERATOR COALITION

BULLITT FOUNDATION

INTRODUCTION

In the United States, buildings use 70 percent of all electricity and account for 40 percent of all carbon emissions. At least half that energy is wasted due to inefficiencies in the ways those buildings are designed, built and operated.[1]

We can dramatically cut society's total carbon emissions simply by making our buildings more comfortable, cost-effective and efficient. Yet, despite decades of rhetorical commitment, energy efficiency programs have failed to achieve dramatic improvements.

The challenge boils down to this: existing approaches rely on a building owner to make the investment, while the savings from lower energy bills flow mostly to the tenants. Few owners will make expensive investments if the financial returns all flow to someone else. And tenants will not make significant investments in buildings that they don't own. In buildings that are owner-occupied, current owners usually limit their investments to those that will pay back during the period they plan to own the building.

Add to this the fact that a truly successful program of investments in deep efficiency, if done using existing techniques, would undermine the current economics of the utility industry. Utilities – which we rely on to provide reliable power through the grid – currently depend on the sale of power for their revenues. When a building cuts its energy use in half, the utility's revenues from that building are also reduced by half. Thus utilities currently have a compelling economic interest in avoiding major reductions in energy use.[2]

To overcome these obstacles, Seattle has pioneered a new approach, known as the Metered Energy Efficiency Transaction Structure (MEETS). MEETS aligns the interests of all parties – building owners, utilities, ratepayers, tenants, and investors – by turning buildings into revenue generating "energy efficiency power plants." It is the only energy efficiency program yet proposed in which all parties are better off than they were before.

[1] When this paper speaks of "buildings," it is referring to residential and office buildings and the appliances, office equipment, and other plug loads they contain.

[2] Even if we transition to an era powered principally by distributed renewable energy sources, utility grids and microgrids will remain important. They will provide storage for back-up power, maintain the quality and quantity of electricity, and transport electricity from rooftop solar panels, wind farms, hydropower dams, and other sources to wherever it is needed.

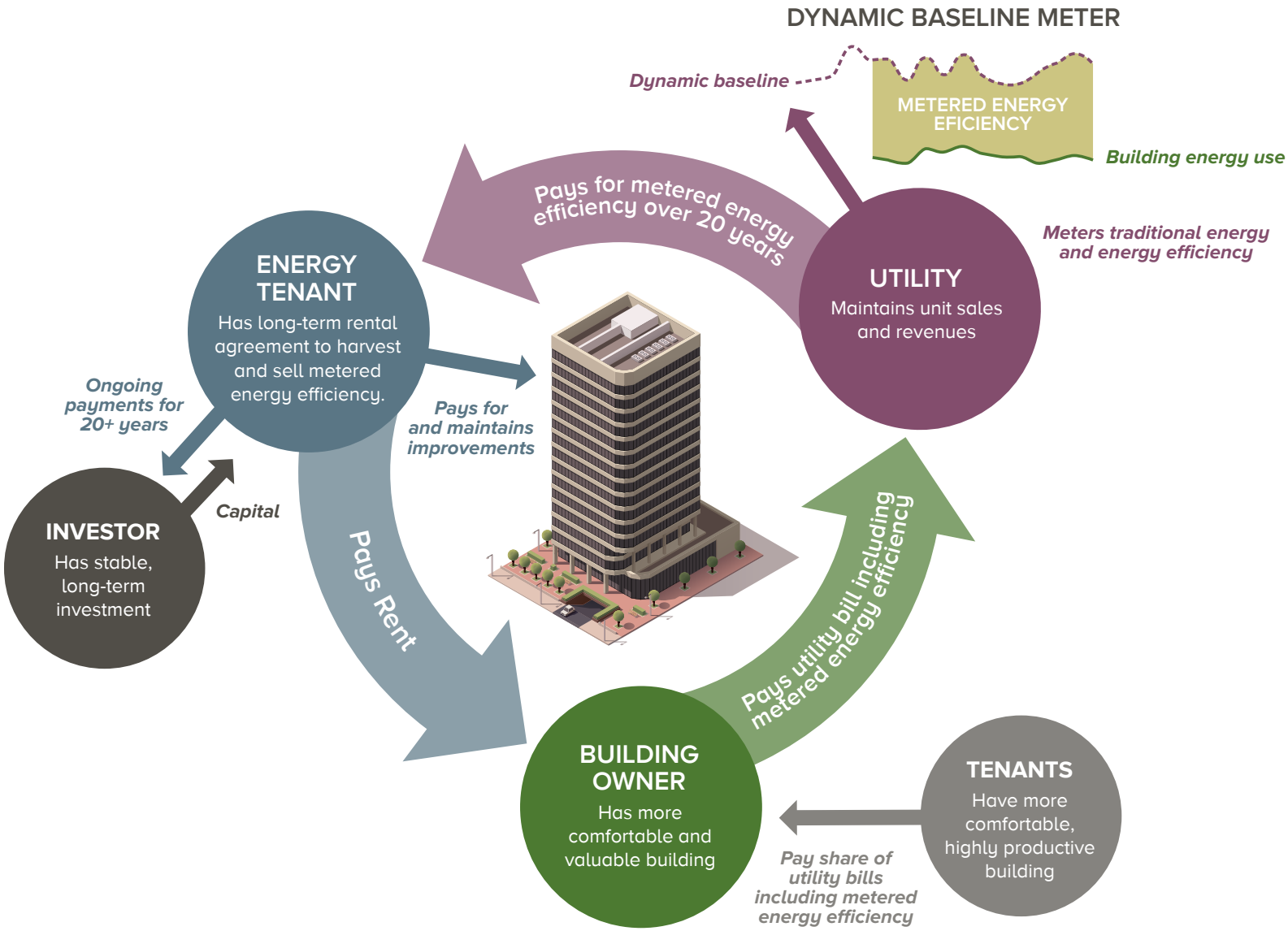
BARRIERS TO DEEP EFFICIENCY IN COMMERCIAL BUILDINGS

We know that energy efficiency in commercial buildings can be dramatically improved – in many cases by 50-70 percent, which we consider to be "deep efficiency" – and that the savings can provide a handsome return on the investment. Yet while 10-20 percent savings are commonly achieved in utility-sponsored programs, investments in deep efficiency are almost unheard of. There are several reasons for this:

- **Most building owners pass energy costs through to their tenants, so they have no incentive to invest in efficiency beyond modest improvements with very short paybacks.** The benefits from any such investments would flow to the tenants, not the investor.
- **Developers commonly "flip" their properties soon after they are fully leased.** Tenants will not pay higher lease rates for deeply efficient buildings, leading the large majority of real estate owners and developers to shun deep efficiency improvements, believing that such buildings do not command higher prices in the market.
- **Utilities lose retail revenues and unit sales when buildings use less energy.** While rate reform and decoupling can make up for the lost revenue, they do so by raising rates on all customers. The fundamental problem is the lost units in the system caused by energy efficiency. With fewer units in the system, the utility has fewer units to cover its costs, forcing it to charge more per unit. As a result, utilities will promote energy efficiency up to the modest levels required by regulators but are loath to exceed those requirements.
- **Tenants are unlikely to invest in permanent improvements to a building they do not own.** Tenant improvement budgets are usually dedicated to aesthetic and functional improvements necessary to their business, not to upgrading whole-building energy systems.
- **In the past, it has been difficult and expensive to accurately measure the actual savings from efficiency upgrades.** Energy use depends not just on building efficiency but also on the types of tenants (restaurants vs. law firms), how densely the workers are packed, weather, and other highly variable factors. The interactivity of energy efficiency measures has also created challenges.
- **Energy efficiency enhancements have often failed to achieve predicted savings or to maintain those savings over time.**

HOW MEETS WORKS

HOW MEETS WORKS



"You can't leap a canyon in two jumps." – Denis Hayes, CEO, Bullitt Foundation

For an energy efficiency program to work well, all important stakeholders need to benefit from its success. For energy efficiency in commercial buildings, that includes four principal groups: building owners, third-party developers or investors, utilities, and tenants.

The unique advantage of the MEETS framework is that it takes the full economic value of energy efficiency over a building's life, and turns it into a single cash flow big enough to make deep projects happen. It also creates a flexible, equitable way to share the economic rewards from deep efficiency investments among all stakeholder groups. Here's how it works:

- **MEETS creates a role called the EnergyTenant.[3] The EnergyTenant is responsible for installing and maintaining the energy improvements in the building.** Any party can play this role. At the Bullitt Center, the EnergyTenant is a subsidiary of the Bullitt Foundation, the building owner. The party playing the role of EnergyTenant is easily transferrable.
- **An investor provides capital to the EnergyTenant.** Any party can be the investor. At the Bullitt Center, the investor is the Bullitt Foundation, the building owner.
- **Often the building owner will play the role of EnergyTenant.** If the building owner is not the EnergyTenant, then the third-party EnergyTenant enters into a long-term (20-30 year) lease (rental agreement) with the building owner, paying the building owner for the right to maintain and service the equipment (pumps, fans, lights, windows, motors, etc.) installed. If the building is sold, the sale is subject to this lease, and the lease is easily assignable to the new building owner just like a traditional lease agreement.
- **The EnergyTenant uses the investor's capital to improve the energy efficiency of the building.** As a result of the investments, the building is at least as comfortable, well lit, healthy, and productive as it was before, but it achieves these goals using dramatically less energy.
- **The EnergyTenant signs a long-term (20- or 30-year) contract (Power Purchase Agreement or PPA) with the utility to deliver metered energy savings from the efficiency upgrades.** The length of the PPA matches the length of the EnergyTenant's agreement with the building owner. If the building is sold, the PPA is easily assignable at point of sale just like a traditional lease agreement.

[3] The MEETS Coalition is a not-for-profit association. It trademarked the term "EnergyTenant" to ensure that its role was consistent across MEETS projects.

HOW MEETS WORKS, CONT.

- **The utility meters traditional energy use – via the existing energy meter – and energy savings (called "negawatt-hours"),** via a new type of meter, called a 'normalizing baseline meter' or a dynamic baseline energy efficiency meter.[4]
- **The utility bills to the building include both the traditional energy used and the metered energy efficiency.** The total energy bills are for the same number of kWhs as they would have been if the efficiency investments had never been made.
- **The building tenants, who pay the building's energy bills, are paying for "energy value," at normal energy rates.** They are paying for the same energy value they always needed to get a comfortable, well-illuminated building.[5]
- **The utility collects revenue from traditional sales of energy to the building, plus sales of the metered energy efficiency.** The utility, in turn, pays the EnergyTenant for the metered energy efficiency each month over the life of the PPA.
- **The EnergyTenant uses the revenue from the PPA to repay the investor and to pay the 'rent' due to the building owner.** The 'rent' is generally a portion of the value of the PPA.
- **The roles are flexible to meet the needs of the stakeholders.** The building owner can provide the capital or use outside capital. The building owner can act as the EnergyTenant or sub that role to another party.
- **MEETS creates a flexible, equitable way to share the economic rewards from deep efficiency investments among all stakeholder groups.**

Here's why it works:

- **Because the energy savings are metered, the utility is able to include them on the energy bill at the retail rate.** The utility is thus able to maintain unit sales, even though the building consumes less energy. Other ratepayers benefit because the utility's fixed costs stay spread over more units, reducing the adverse rate impacts from traditional approaches to energy efficiency.
- **Because the developer or investor can contract in a simple way for saved energy value lasting two decades or longer, larger investments in deep efficiency become economical.**

[4] For information on how the energy efficiency is metered, see Appendices A-D.

[5] For instance, if a utility buys metered energy efficiency from sophisticated daylighting improvements, which result in a tenant using natural light instead of fluorescent light, and sells the energy value to the tenant, the tenant is getting the same (or better) light as before, and paying the same party (the utility) the same price for it, measured as before in kWh. It's just originating with a different physical plant – a skylight instead of a coal plant.

HOW MEETS WORKS, CONT.

- **MEETS allows for deeper investments in a building, improving and updating the building's systems.** In addition, if the building owner is the investor, they receive the value of the PPA. If the building owner is not the investor, they receive the ongoing 'rent' from the EnergyTenant. These cash flows make the building more valuable. The building's marketability as a green building is also improved.
- **The tenants make no investment, but have office spaces that are more comfortable with the same or better level of services, while paying an energy bill equal to what it would have been without the upgraded energy services.** And they get the marketing and brand benefit of being in a greener building.

BENEFITS BY STAKEHOLDER

In more depth, here's how stakeholder groups benefit:

BUILDING OWNERS

In the MEETS framework, building owners are able to leverage capital to deeply improve the energy performance of their buildings. The MEETS Power Purchase Agreement (PPA) with the utility creates a powerful cash flow that increases the Net Operating Income for the building and increasing the residual value at the point of sale.

The MEETS PPA is between the utility and the EnergyTenant. In many cases, the building owner will choose to be the EnergyTenant, in which case the entire value of the PPA flows to the building owner.

If the building owner wishes to use a third-party for the EnergyTenant, the EnergyTenant signs a long-term lease (rental agreement) with the building owner to maintain the improvements. All of the improvements are done under a standard Tenant Improvement agreement. This means that the improvements immediately become the property of the building owner and the EnergyTenant simply has the right to utilize those improvements to harvest metered energy efficiency from the building.

The EnergyTenant:

- **Receives the investment capital from the investor (who may be the building owner)**
- **Installs and maintains the energy improvements**
- **Receives the payments from the utility PPA**
- **Repays the investor**
- **Pays the building owner a monthly 'rent' for use of the building (if the building owner is not the EnergyTenant) – generally a percentage of the money from saved energy that the EnergyTenant receives from the utility.**[6] Because the rent is a percentage of the PPA, the building owner will benefit from deeper savings.

If the building owner sells the building, the MEETS framework remains in place, as any sale would be subject to existing leases – including the energy tenancy. The EnergyTenant's contract with the utility continues and the EnergyTenant continues to maintain the energy-saving investments and pay the new owner rent for the use of the building. If the building owner is the EnergyTenant, they can easily transfer this role to the new owner.

[6] This is the same approach that has been used for decades in the development of utility-scale wind and solar power plants

As a building owner, MEETS is simple. Every month, we get a utility bill, which our tenants pay. We also receive a big check every month from the utility for the metered energy efficiency. The MEETS revenue is an important part of our high net operating income and repays us for the deep energy efficiency investments we made. It's a win all around.

-Salley Anderson— Chief Financial Officer, Bullitt Foundation

TENANTS

Today, many tenants occupy buildings that are inefficient, poorly lit, have bad indoor air quality, and are seasonally too hot or too cold.[7] Since payroll is the main expense for most commercial organizations, employee comfort and productivity are central factors shaping business performance. Unfortunately, barriers to energy efficiency cause most tenants to resign themselves to a reality that is inefficient, unhealthy and uncomfortable.

Under the MEETS approach, the tenant's energy bill remains what it would have been before the energy upgrades (or in the case of a new building, like Bullitt Center, what it would have been in a building constructed to then-current local energy codes).

The tenants make no investment and receive improved office conditions at no greater cost.

UTILITIES

To fully appreciate the utility benefits of MEETS it is important to understand a few basic principles of utility ratemaking.

Utilities have what is called a 'revenue requirement' that regulators approve, which is the total revenue the utility requires to meet all of its costs.

Utilities meet their revenue requirement by selling units of energy. Simply put[8] regulators divide the revenue requirement by the number of units in the system and the rate (price) per unit is the result.

[7] Ironically, they tend to be too hot in the winter and too cold in the summer.

[8] Utility ratemaking is very complex. This simplified description is provided to make a broad point about the impact of MEETS on utility rates.

All utility power purchase agreement costs (including MEETS power purchase agreements) and all other costs of generating or procuring energy are part of the revenue requirement.

All utility sales of energy units (including the sale of MEETS units) create revenue to meet the revenue requirement.

So, both the purchase of MEETS units in the MEETS PPA (as a cost) and the sale of MEETS units to the building (as revenue) are part of utility rates.

RATEPAYERS

MEETS was designed to address the utility "death spiral" – a self-reinforcing and accelerating upward spiral in rates that can be quite harmful to ratepayers. It's rooted in the following pattern:

1. Buildings use less energy because of investments in efficiency, solar and other distributed energy sources.
2. The utility sells fewer energy units from which to recover its investments in power plants, power lines, substations, and other "fixed" costs.
3. The fixed costs are spread over fewer units when regulators next calculate rates.
4. Rates go up.
5. Facing higher energy bills, more customers invest in deeper efficiency, and in solar and other distributed energy sources.
6. With an even smaller unit base to charge, the utility has to raise rates still higher, and the death spiral continues.

By allowing the utility to bill for actual energy use and also for saved energy, MEETS keeps units in the system, so step two (above) does not happen. Therefore, the increase in per-unit share of fixed costs in step three does not happen. MEETS does not contribute to the death spiral.

Everyone's rates stay lower. Every time an energy efficiency installation is done through MEETS instead of conventionally – all other ratepayers benefit.

PRICING

We anticipate that the starting price in a MEETS PPA will equal the retail rate per unit, plus any incentives the utility would normally provide. If the rate is significantly lower than this, the building owner will not perceive the deal as fair.

Once the contract begins, the MEETS PPA escalates at a rate below the projected escalation of the utility's retail rates. Therefore, although the MEETS PPA begins at a price higher than retail, over time the PPA rate will be significantly below retail. MEETS makes a net ***contribution*** to the utility revenue requirement, leaving utility ratepayers (customers), paying lower rates.

On a net present value basis and over the life of the MEETS PPA, the utility receives more revenue from the retail sales of Metered Energy Efficiency than it pays under the PPA.[9] The elegant result is that MEETS uses no "incentive" dollars.[10]

BENEFITS TO UTILITY BUSINESS

Using MEETS, utilities are able to maintain or grow their retail revenues.

Utilities are able to purchase saved energy just as they could purchase energy from an independent power producer. That has several system benefits:

- **The utility pays only for the actual metered energy savings.** In traditional conservation programs, by contrast, utilities pay building owners a ratepayer-funded incentive up-front to invest in more efficient lights, fans, windows, or air handlers, for example, without regard to actual performance.
- **Pay for performance creates a standard – and powerful – encouragement to the developer and investor to make sure the efficiency is delivered and stays persistent.**
- **Efficiency becomes locally provable and so locally targetable.** The metering means a utility knows exactly where on the grid the benefit is showing up, and in what quantities. So, utilities can plan and manage it as a substitute for local capacity, in a way that was not previously possible.

Efficiency's load shape becomes a highly valuable feature. Unlike a wind farm, efficiency delivers energy to the grid (by shedding consumption) precisely when the utility's energy demand is highest. Through metering, MEETS makes this benefit something utilities can manage and rely upon.

[9] This is comparable to the basic framework for all utility power purchase agreements.

[10] For more information see the "Regulators" section, below.

DEVELOPERS AND INVESTORS

Within the investment community, there is huge pent-up demand for long-term, stable investment opportunities tied to energy efficiency.

Before MEETS, the key barrier to investment was that most financial benefits from efficiency flowed to tenants or subsequent owners in the form of reduced energy bills. Developers had no way to create the cash flows that attract long-term investment.

Even if the owner or investor successfully negotiated separate shared savings agreements with all of the tenants – an almost-impossible task in large buildings – such agreements would run only for the period of the tenants' leases – typically 5 to 7 years.

As a result, serious efficiency in the commercial sector has been limited to owner-occupied buildings – and deep efficiency to institutional buildings that expect never to sell.

Under MEETS, cash flow is delivered through an agreement with the utility and does not rely on repayment by the building owner or the tenants. Because the agreement is long-term, it generates many more years of cash flow, and hence, can both finance and maintain much deeper efficiency installations.

The instruments that define the contract – modeled on a Power Purchase Agreement for an Independent Power Producer – are well understood by utilities, investors, and banks.

Because the developer's/investor's contract is with the utility, which is an investment-grade institution, investors and banks view loans against PPAs as low-risk. Indeed, Power Purchase agreements for MEETS are lower risk than those for wind farms, which suffer from ongoing NIMBY challenges and depend on uncontrollable meteorological events.

THE BULLITT CENTER EXAMPLE

Labeled by *World Architecture* magazine as the greenest commercial building in the world, the Bullitt Center is piloting the MEETS approach in partnership with Seattle City Light.

In its MEETS contract, the Power Purchase Agreement (PPA) with Seattle City Light[11] begins at 8.41 cents per kWh with a 2% escalator.[12]

Retail rates for electricity delivered to commercial customers in Seattle are approximately 6 cents per kWh and are rising at approximately 4.5 percent per year, meaning that over time, the utility will be billing the Bullitt Center at a retail rate that exceeds the PPA rate.[13]

No upfront utility incentive payment was paid and over the life of the contract no incentive dollars are required.

Assuming the building maintains a high level of energy efficiency, the 20-year MEETS PPA will pay more than $1.2 million to the Bullitt Center, or $740,000 in current dollars (using a standard 5% discount rate). Bullitt's investors come out ahead.

[11] The building is all electric. In a mixed-energy building (electric and gas, say) the energy benefits can be metered and contracted separately, or it can all be translated into electricity units and dealt with in one contract.

[12] On the Bullitt transaction, the 2% escalator only applies to the portion of the starting price above 2.5 cents. This is a product of this specific negotiation and is not fundamental to MEETS.

[13] For more information on the economics of the Bullitt Center – Seattle City Light MEETS contract, please see Appendix F.

Over the same period, the utility will receive an estimated $1.25 million from sales of the metered energy efficiency back to the building – $33,000 more than it paid under the PPA. Seattle City Light's ratepayers come out ahead.

Bullitt's tenants wind up paying a normal rent and a normal price for the energy services (comfort, productivity, lighting) they are getting – yet get to live in one of the finest buildings in the world. Bullitt's tenants come out ahead.

During the first few months of the agreement, here's how the Bullitt Center performed relative to an average new code building in Seattle (numbers are rounded for simplified reading):

Date	Built to Code Energy Use (Adjusted Baseline)	Bullitt Center Energy Use	Metered Energy Efficiency	Value of Metered Energy Efficiency
April 2015	50,000 kWh	13,000 kWh	37,000 kWh	$3,868
May 2015	65,000 kWh	12,000 kWh	53,000 kWh	$4,457
June 2015	71,000 kWh	10,000 kWh	61,000 kWh	$5,130
July 2015	79,000 kWh	11,000 kWh	68,000 kWh	$5,718
August 2015	71,000 kWh	11,000 kWh	60,000 kWh	$5,070
September 2015	70,000 kWh	12,000 kWh	58,000 kWh	$4,868
October 2015	59,000 kWh	12,000 kWh	47,000 kWh	$3,944
November 2015	75,000 kWh	19,000 kWh	56,000 kWh	$4,692
December 2015	70,000 kWh	20,000 kWh	50,000 kWh	$4,174
January 2016	79,000 kWh	21,000 kWh	58,000 kWh	$4,864
February 2016	66,000 kWh	19,000 kWh	47,000 kWh	$3,959
March 2016	62,000 kWh	17,000 kWh	45,000 kWh	$3,747
One Year Totals	**816,676 KWh**	**177,920 kWh**	**638,756 kWh**	**$53,719**

Note that only one year into the 20-year MEETS PPA, the investor has already received nearly $54,000 under the PPA. That is more than sixty percent of the ($84,000) one-time upfront incentive that the investor gave up in exchange for the MEETS agreement. Yet MEETS uses no incentive dollars – it's entirely self-financing for the utility and its ratepayers.

Summer 2015 was a hot one in Seattle, and as the season got hotter, other buildings turned on their air conditioning. Due to the investments in energy efficiency, by contrast, the Bullitt Center was kept uniformly comfortable without air conditioning. Instead of adding to Seattle City Light's summer peak during the air conditioning season when snowpack was depleted and hydropower reservoirs low, Bullitt Center energy use stayed flat. For tenants at the Bullitt Center, the investments in efficiency meant the building stayed comfortable throughout the summer.[14]

The Bullitt Center offers its tenants an incentive for efficiency right in their leases: if tenants stay within their energy budgets for plug loads (computers, printers, task lighting, etc.), they receive a rebate for the full value of their energy bills at the end of the year. This bonus is not standard in the MEETS approach, but was added to encourage efficient tenant behavior.[15]

[14] Tenants maintain that the Center was the most comfortable office in the city. In other buildings, tenants fried when they were close to a double-paned window and froze in the interior offices. Bullitt's tenants were always comfortable near its triple-paned, argon-filled, low-e windows with external venetian blinds deployed on the side of the building facing the sun. Interior temperatures remained uniformly comfortable using radiant cooling instead of air conditioning.

[15] Unrelated to MEETS, the Bullitt Center has a substantial solar energy array on its roof. Bullitt set tenant goals at levels that, combined with its superior whole building performance, would allow the building to generate more electricity on-site than it uses.

REGULATORS

There is general consensus that energy efficiency is a benefit to society. Despite this consensus, current regulatory approaches have been unable to deliver the investments in deep energy efficiency that society is seeking. Regulators across the nation are asking stakeholders for new ideas that move beyond upfront payments for estimated savings and shallow retrofits, and rate structures that discriminate against cost-effective investments in efficiency and on-site generation.

MEETS can help regulators by addressing some of the most vexing regulatory problems.

DEATH SPIRAL

Today, it is common for utilities to attempt to solve their "death spiral" problem by seeking regulatory approval to charge their customers more costs on a flat charge, and less on a charge that varies with the amount of energy consumed. More of the utility bill would be a fixed monthly cost for being interconnected to the grid and less of it would fluctuate according to the amount of power actually used.

Regulators have resisted, in part because such a shift would dramatically reduce the potential for savings from investments in energy efficiency and distributed generation. A large portion of the customer's bill would remain the same regardless of how much power the customer saves or produces.

Regulators have also seen, based on the experience of the telecom industry, that going to large flat charges might briefly delay the spiral, but ultimately the flight from and undermining of the grid accelerates.

MEETS offers an alternative.

By billing the building for metered energy efficiency in standard units and at normal retail rates, the MEETS approach means MEETS installations result in lower rate increases than do the same retrofits financed conventionally. **MEETS can maintain lower rates for all ratepayers because the utility revenue requirement is spread across more units.**

BYPASSING INCENTIVES COMPLEXITY

MEETS, unlike nearly all other current energy efficiency structures, works without reliance on utility incentive dollars.

Eliminating the use of incentive dollars bypasses four historically vexing problems.

"Even the most earnest real estate developers and owners continue to be hamstrung by the industry's outdated investment frameworks that stack the deck against deep energy efficiency improvements. What we need is a game-changing mechanism that gives investors access to the long-term cash flows from efficiency projects, which in turn increase asset value and create the financial incentive to make investments in better energy technology. MEETS can be that game-changing mechanism our industry needs."

-Brett Phillips - Director of Sustainability, Unico Properties

ARGUING OVER COST EFFECTIVENESS

What's Cost Effective?

- **A Simple Definition:** It is of course, never improper for a building owner to use the building's own savings to pay for a retrofit. In fact, buying as deep a retrofit as the savings will pay for, pretty well defines the base cost effectiveness test to building owners and to policy makers alike.
- **Incentives Add Complexity:** Regulators though have wrestled for decades over the proper criteria to determine what energy efficiency measures are cost effective when incentive dollars are at stake.[16] Since the savings value is always paid (because the building gets to keep the savings) this problem is about the value above the savings value.

MEETS uses the simple definition, because it's about the savings value – not additional incentive dollars. The building pays the full savings value into the system, so for total PPA costs up to that value, the project is (from a utility and utility ratepayer perspective), cost-effective.

Under some circumstances a utility would find it cost-effective to pay more than the savings value, if its alternative were to pay still more than that to buy a very expensive grid resource,

[16] Terms like "free riders" and "what would have happened anyway" and "program baselines" and "total resource cost tests" represent 40 years of policy work all to make sure public dollars are well spent. But up to the full savings value, every MEETS project funds itself. Up to the savings value, there *are* no public dollars at risk, and this complexity can be bypassed. In fact it is desirable to do so even for modest savings, if a building wishes to finance them with MEETS. Every MEETS project reduces rates for nonparticipating ratepayers, by comparison to the same project done with conventional finance – even if it otherwise "would have happened anyway."

so “savings value” is not an upper bound. But it is a lower bound. The simple savings value transaction is always cost-justified; by definition under MEETS it always pays for itself, because the building pays for the savings at the full retail rate as the savings appear.

THE EFFECT OF CODES AND STANDARDS

- **Should we pay for retrofits that just bring a building up to current codes and standards?**
- **What do we do about baselines when codes and standards change?**

It is common today for regulators to refuse to allow utility incentive dollars to be spent on efficiency improvements that are already required by building codes. In many cases, the result is that buildings remain unimproved and inefficient for long periods of time because building owners cannot afford to upgrade them without incentives. The more stringent the new codes, the worse this problem gets for existing buildings. **Because MEETS is designed to use no incentive dollars, the “code vs. better than code” issue becomes moot.** Utilities can sign a MEETS contract that pays for the Metered Energy Efficiency for the entire delta between the existing building energy use and the building post-retrofit energy use, and not spend any ratepayer dollars that the building doesn’t already contribute. How much of the work would have been required by code is no longer relevant.

GETTING WHAT WE’RE PAYING FOR

For 40 years, regulators have faced the problem that incentives get paid up front, based on the forecast effects of a retrofit or measure. There is considerable concern that such forecasts don’t accurately estimate savings, and that savings, once “paid for”, are not kept persistent.

MEETS avoids this problem, because MEETS pays only for actual performance. Thus even ***if*** incentive dollars were added on top of a MEETS project, regulators could know that none of those dollars would be spent unless the contracted-for benefit actually showed up.

USING ENERGY EFFICIENCY AS A GRID MANAGEMENT TOOL (UTILITY-GRADE MEASUREMENTS)

For years, the utility world has understood that in physical effect an efficiency installation is the same thing as a generator installed at the same spot on the grid – and that the “load shape” of the efficiency generator was especially valuable.

But regulators could not translate that knowledge into grid management, planning, and regulation, because those functions depend on meter readings to know what is happening. And the “energy” from an “efficiency generator” could not be metered.

MEETS works because people figured out how to solve that problem. MEETS allows utilities, regulators, system operators, and all other interested parties to meter the energy the "efficiency generators" deliver to the system. The metering is transactionally sufficient. The complexities of estimating and verifying deemed savings are eliminated. Energy efficiency can be reported to system operators and incorporated into region-wide planning efforts, not just on a forward-looking basis, but as the savings are delivered.

A REGULATORY BREAKTHROUGH

MEETS offers a solution to the logjam currently facing the market for energy efficiency. By metering energy savings over time, MEETS rewards improvements that persist over decades, while also lowering the cost of evaluation, measurement and verification.

We believe regulators will be pleasantly surprised at the degree to which MEETS creates incentives for stakeholders to collaborate. In the Bullitt Center example, all stakeholders testified in front of the utility's regulator (the Seattle City Council) in favor of the MEETS pilot project and the regulators voted unanimously to support it.

Regulators will also experience the benefits that the self-reinforcing elements within MEETS have on efficiency goals. MEETS was designed to support deep energy retrofits at scale. With MEETS in place, it will be in the economic interest of all parties to harvest the maximum amount of economically justifiable energy efficiency. And, because MEETS creates new, powerful cash flows, the amount of energy efficiency that can actually be captured is substantially increased.

SOCIETY

One hundred years ago, the utility rate compact gave birth to a remarkable, transformative public-private institution – the regulated rate utility. Utilities – both community and investor owned – flourished as the capital formation engine of the community energy grid. They lit up every home, neighborhood, city, and state – and in just a few short decades, they had transformed the planet into unprecedented prosperity.

And it was all done at fair and reasonable rates, with a high degree of social equity.

Utilities formed and deployed trillions of dollars in capital, safely and effectively and without windfall profits. The investment and transaction system utilities deploy has been so stable that utility stocks and bonds became a synonym for safe, reliable investments. These stocks and bonds form the stable core of our retirement funds, insurance reserves, and nest eggs, and so the controlled profits are also very widely shared.

In the last 40 years, energy efficiency and other behind-the-meter resources that collectively show up as the distributed grid have come to threaten the stability of this hugely successful and now central system. These new resources are critically important to fight climate change, and to save the very health of our planet for future generations.

But while they present no physically insurmountable challenge to grid operations, they present a fundamental economic threat. And that's because the only way they could be financed, destroyed the transactional revenue on which the AAA-rated financial integrity of the utility grid was based.

MEETS reverses that threat. MEETS is a rate-compact native solution to what's really an energy problem – efficiency and distributed resources. In a sense it's the shape of the structure that can finance not just energy efficiency, but the smart grid overall – a two-way cash flow to support the needed two-way value flow between the grid and customer sites. By establishing that transaction flow, MEETS unlocks the value everyone has always known is there, by deploying for our generation's transformation, the strength of this core financial engine.

In the process, MEETS benefits not just all ratepayers, participating and non-participating alike – but all of society. By encouraging widespread deployment of capital, labor and technology to retrofit millions of existing buildings and vastly reduce energy waste, MEETS can become an important driver for jobs, reductions of carbon emissions, and improved economic efficiency. And because utilities already permeate the entire economy, these benefits can reach every corner of society if the MEETS framework is broadly adopted.

Using MEETS, we can unleash the extraordinary system that lit up the planet a century ago, to green it today.

CONCLUSION

If the MEETS framework is such a good idea, why isn't it everywhere?

MEETS is quite simple in concept – it's really just applying the principle Amory Lovins made clear 40 years ago: Efficiency is energy.

But realizing that truth transactionally had to wait until computing caught up with theory. The technology underpinning this framework – a dynamic baseline meter capable of measuring normalized metered consumption – energy savings – is new. Five years ago, the MEETS framework would not have been possible. Today, especially in commercial buildings, it is.

As society increasingly feels the urgency of moving toward higher levels of efficiency, MEETS offers a new way to deliver dramatic results while providing an attractive, long-term return on investment, while helping to keep our utilities healthy.

GET INVOLVED

The purpose of this paper is to outline the approach and benefits of the MEETS framework. For stakeholders interested in exploring these ideas more fully, we offer the following steps to get involved:

- **Review media coverage**[17] **–** While the MEETS framework is relatively new, there has been some media coverage of the approach:
  - **Making Energy Efficiency Attractive for Owners of Older Seattle Buildings –** *New York Times*
  - **This May Be the Most Innovative Energy Efficiency Financing Tool Yet –** *Greentech Media*
  - **Seattle Trying Innovative Financing Model for Building Efficiency –** *Xconomy*
- **Ensure data access –** MEETS absolutely requires historical energy data to create a baseline for each individual building. For existing buildings, the building's (all fuel) historical energy use is required. For new buildings, a baseline must be established based on how similar buildings built to code actually perform. Usually, only utilities have full access to such energy use data, so utility cooperation is necessary from the beginning if MEETS is to succeed.
- **Test the dynamic baseline meter –** Once you have access to energy use data you can calculate the baseline. It will be important for stakeholders who have an interest in MEETS to familiarize themselves with dynamic baseline meter technology.[18]
- **Join the MEETS Coalition –** To support stakeholders and accelerate adoption of the MEETS framework, a MEETS Coalition has formed. Coalition membership is focused on utilities, investors, energy service companies, advocates and others. The coalition offers significant resources for people exploring the MEETS framework. More information is available at www.meetscoalition.org.[19]

[17] These articles were written before all of the contract terms were in place. This paper provides a more accurate description of the final economic terms of the agreement. To read media coverage of MEETS, visit www.meetscoalition.org.

[18] For more information, see Appendices A-D.

[19] Also see Appendix E.

- **Work with regulators –** To build comfort with the MEETS approach, it is appropriate to begin with a pilot. Pilot projects, by definition, are limited in various ways. MEETS pilots can, without harm if capital is available, limit the number of buildings that participate. But it is useful to remember even in a pilot that harvesting the long-term savings benefit – 20 or 30 years – is what MEETS is ***for***. Long-term investment is central to achieving the objective of deep energy efficiency retrofits, so pilots should be set up to demonstrate it. Regulators must also allow for billing of metered saved energy at retail rates (the metered readings are just energy; as in Seattle, no special tariff is required). MEETS is entirely opt-in: a standard MEETS agreement includes a commitment by the building owner(s) to pay for the metered energy efficiency on the utility bill. No ratepayer gets a MEETS bill who did not agree to it and want it, so allowing this billing imposes no un-elected result on any ratepayer.

APPENDICES

APPENDICES

A. How Energy Efficiency is Metered in a MEETS Transaction

B. Example DeltaMeter Energy Statement

C. Deployed DeltaMeter Graphic

D. DeltaMeter Results to Date

E. Description of the MEETS Coalition

F. Financial Analysis Spreadsheet

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Brad Kahn is the owner of Groundwork Strategies and communications director for the Bullitt Center.

APPENDIX A: HOW ENERGY EFFICIENCY IS METERED IN A MEETS TRANSACTION

MEETS transactions measure metered energy efficiency using a dynamic baseline meter (also called a meter of "normalized consumption"). The "dynamic" or "normalized" element of this approach is essential.

Building energy use changes over time for reasons external to the building's energy plant. Examples of external factors are weather, occupancy fluctuations, the types and intensity of use, and changes in a building's conditioned dimensions. Some of these factors are routine and predictable, others happen at unpredictable intervals or rarely, and are non-routine.

What MEETS requires is a measurement and verification tool that can inexpensively and accurately adjust the baseline for both routine and non-routine changes for a specific building, or if needed for specific buildings in a set (a facility, campus, or other aggregate). A static baseline, or one normalized only to weather, or only to routine changes, cannot accomplish this, nor can a comparison of a specific building to other buildings in a particular class (such as commercial office).

Dynamic baseline meters use a thermodynamic model of the specific building (a type of model the industry calls "Option D")[20] to enable adjustments to the baseline when routine or non-routine changes occur. It also allows for the use of the building's historical and ongoing energy bills to inform the baseline adjustments as needed.

In principle both "built-up" and "inverse" Option D models can be used. The built-up model requires substantial amounts of building data to construct a physical model and can be difficult and expensive to keep calibrated. The inverse model focuses on the building's past energy usage (utility bills) to capture its thermodynamic performance. The difference in approach makes inverse models, (like the DeltaMeter, in use at the Bullitt Center), less costly, much faster and specific to that exact building.

Option C[21] tools use statistical correlations and inverse fit techniques to equations that are not a physical model of the building. They do not create a thermodynamic model of the particular building or aggregate, and therefore, cannot be properly adjusted and are not recommended for time periods over one year, or where external factors change within the year is a possibility, or for other than static projects.

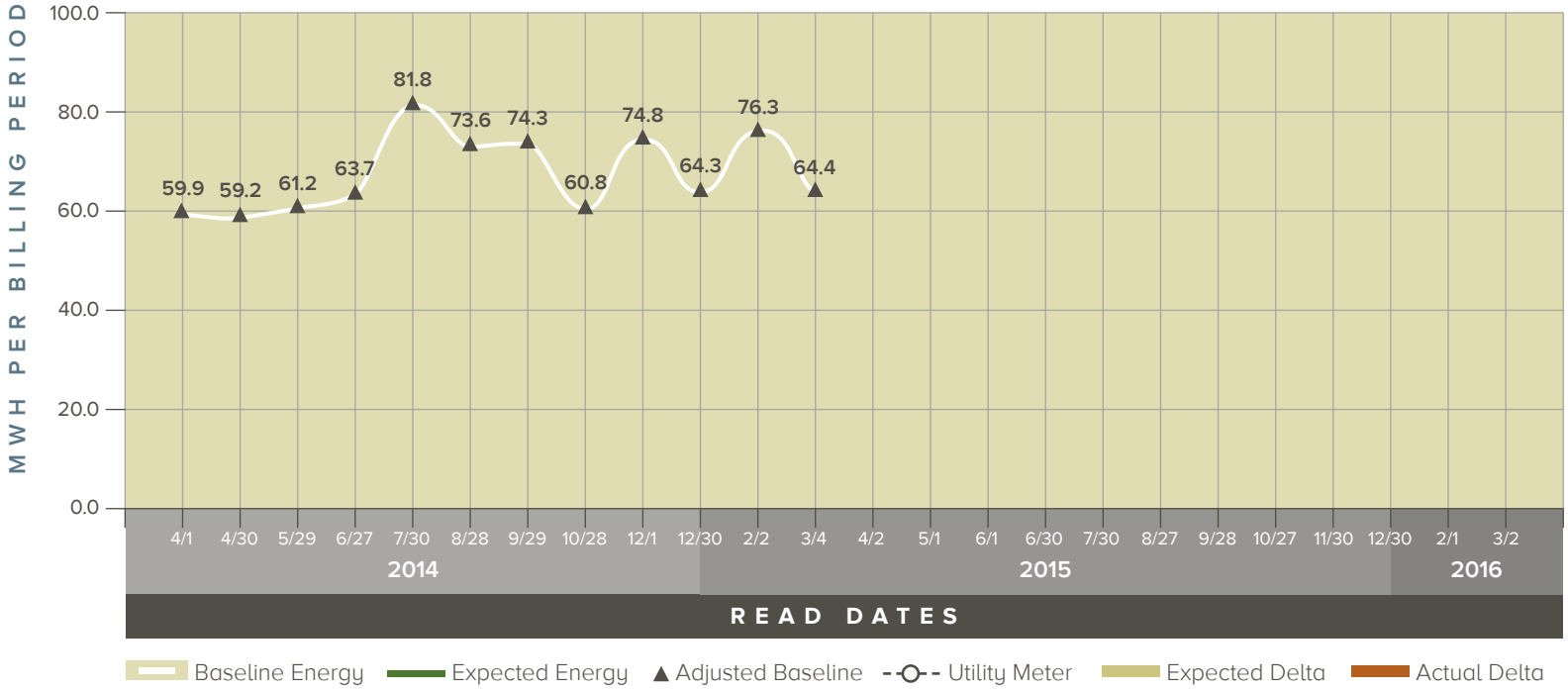
Dynamic baseline metering allows delivered energy efficiency (savings) to be continuously metered and verified – with utility-grade accuracy and reliability. This allows energy efficiency to be treated by all parties as energy in the system.

[20] Options C and D are standards under the International Performance Measurement and Verification Protocol (IPMVP).

[21] ibid

The images below describe how dynamic baseline meters are deployed.[22]

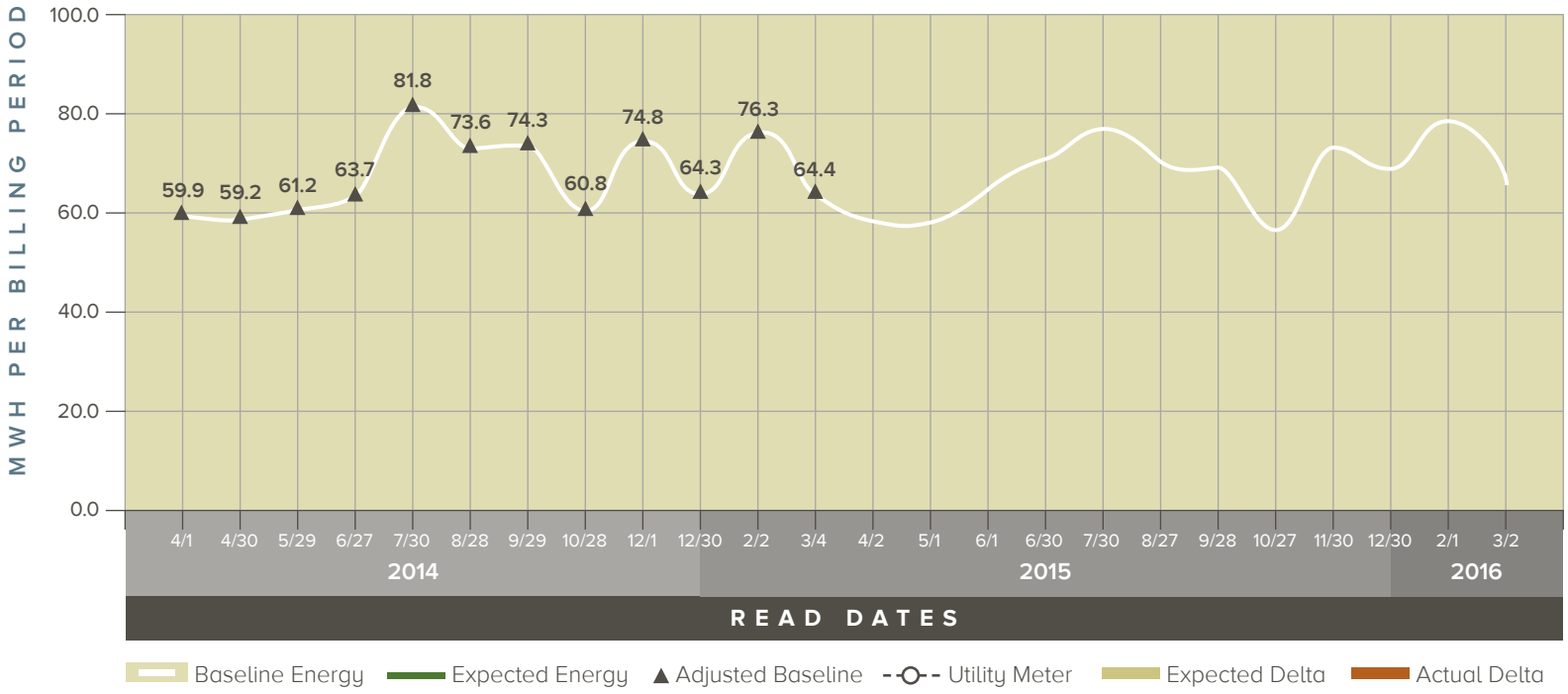
STEP 1: CREATE HISTORICAL BASELINE USING OPTION D MODELING



Note: *This series of charts is designed to show how dynamic baseline meters are deployed. It is an example only and not based on actual data.*

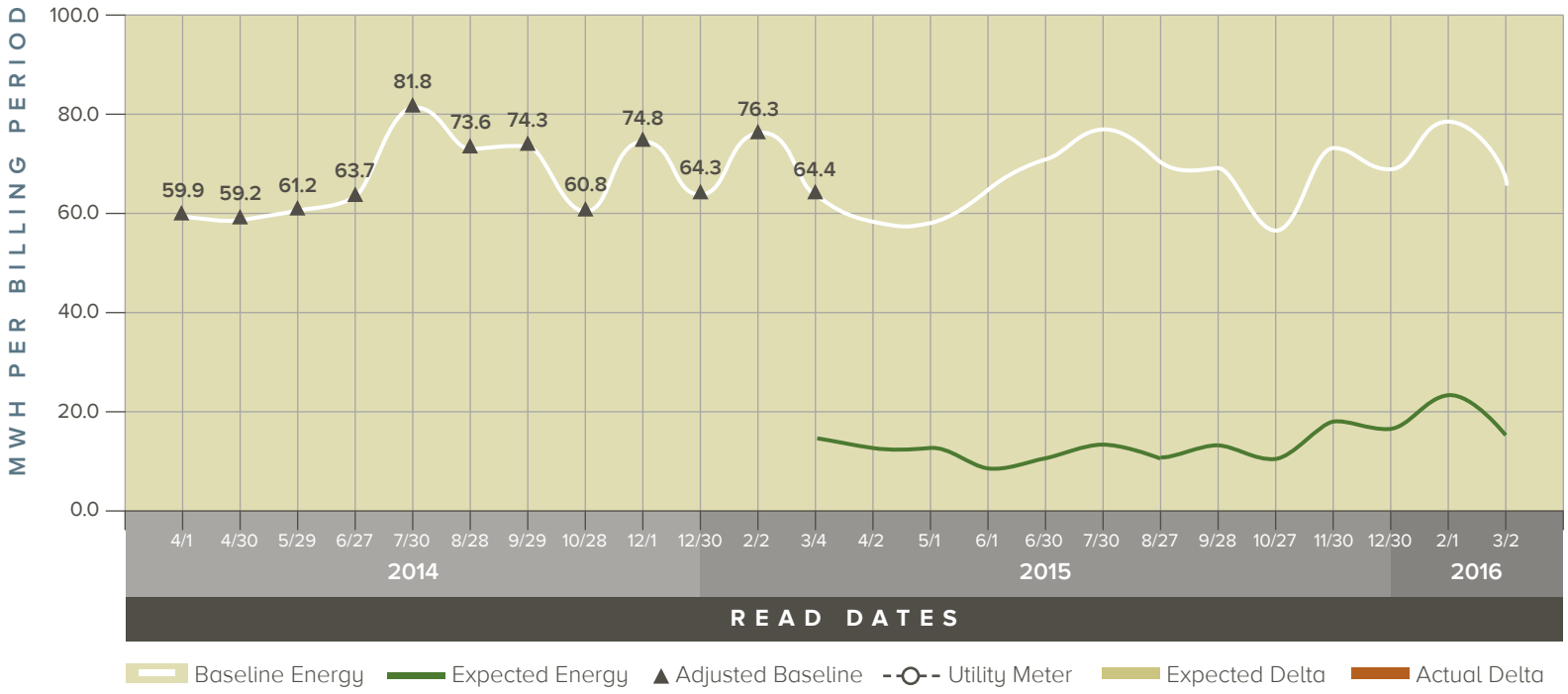
[22]The images are based on EnergyRM's DeltaMeter, which is deployed in the "cloud." The authors would like to express our appreciation to EnergyRM for providing these dynamic baseline materials. www.en-rm.com

STEP 2: PROJECT BASELINE FORWARD USING TYPICAL METEOROLOGICAL YEAR (TMY)



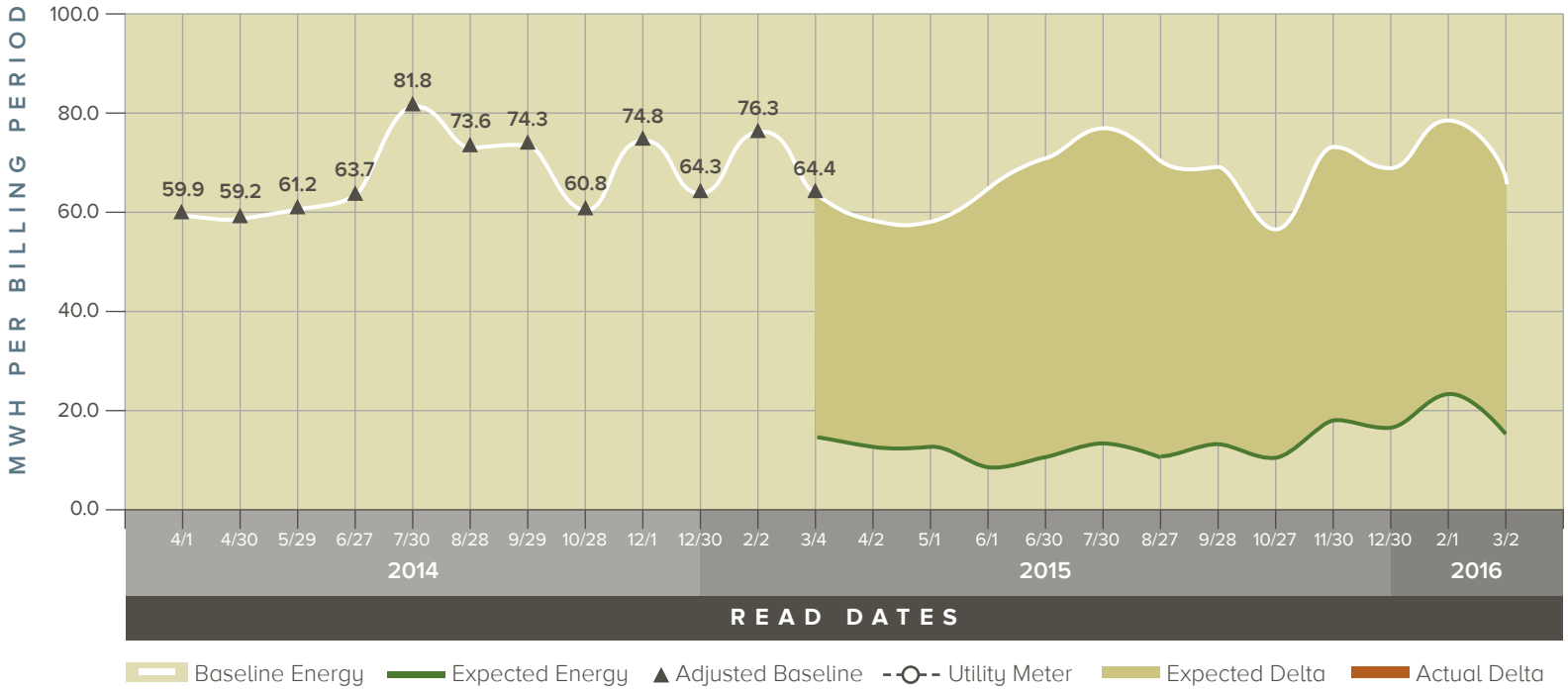
Note: *This series of charts is designed to show how dynamic baseline meters are deployed. It is an example only and not based on actual data.*

STEP 3: ESTIMATE ENERGY USE POST-RETROFIT DESIGN AND TMY (GREEN LINE)



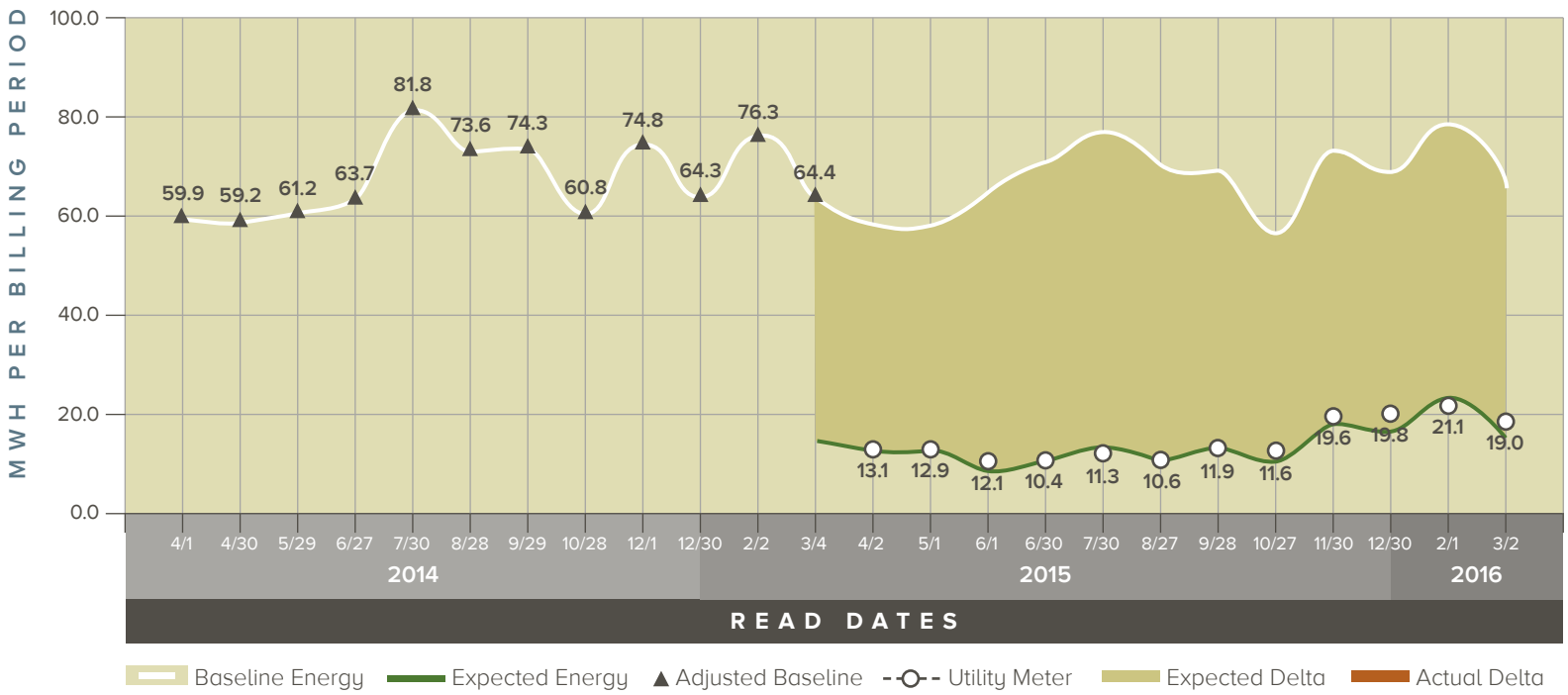
Note: *This series of charts is designed to show how dynamic baseline meters are deployed. It is an example only and not based on actual data.*

STEP 4: CALCULATE ESTIMATED EE "YIELD" FROM RETROFIT (TAN SHADED AREA)



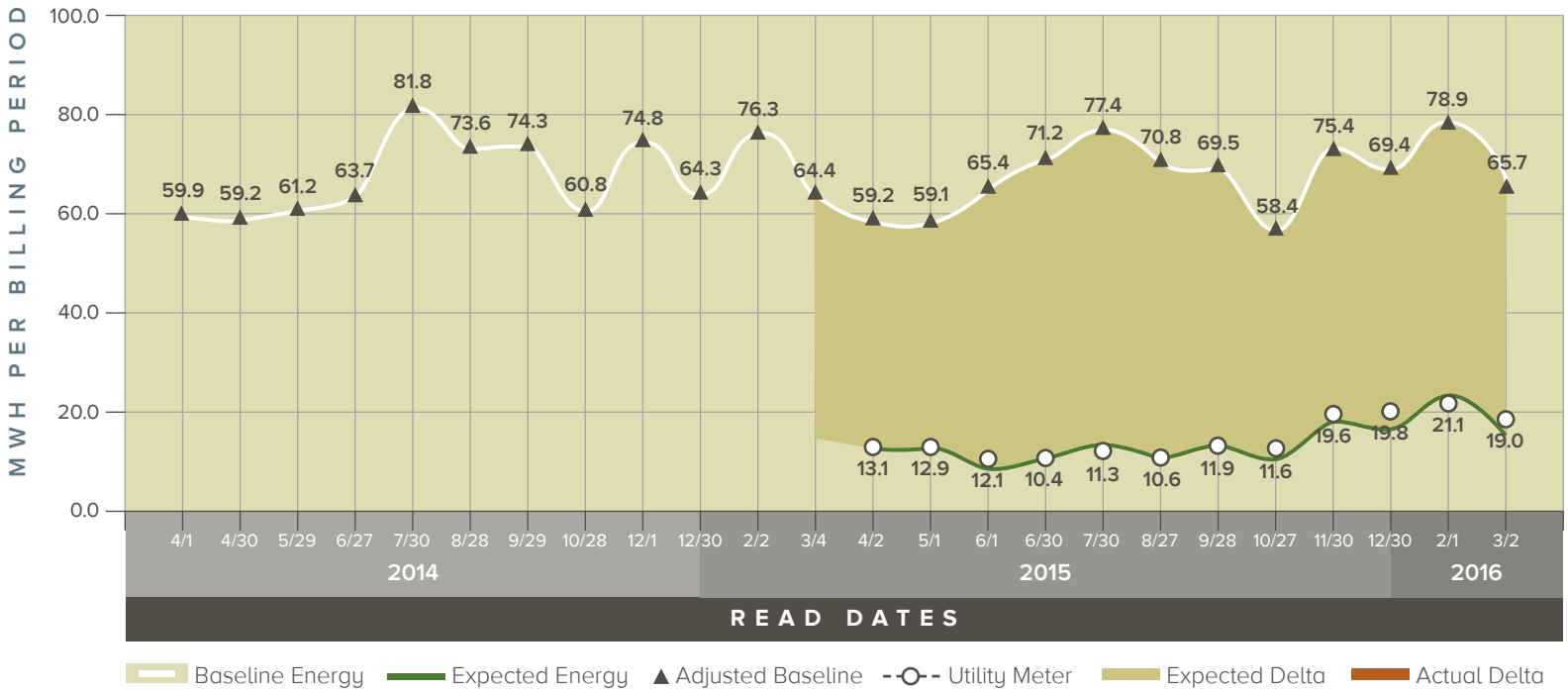
Note: *This series of charts is designed to show how dynamic baseline meters are deployed. It is an example only and not based on actual data.*

STEP 5: INPUT MONTHLY UTILITY METER READINGS AS THEY BECOME AVAILABLE (NUMBERS NEAR GREEN LINE)



Note: *This series of charts is designed to show how dynamic baseline meters are deployed. It is an example only and not based on actual data.*

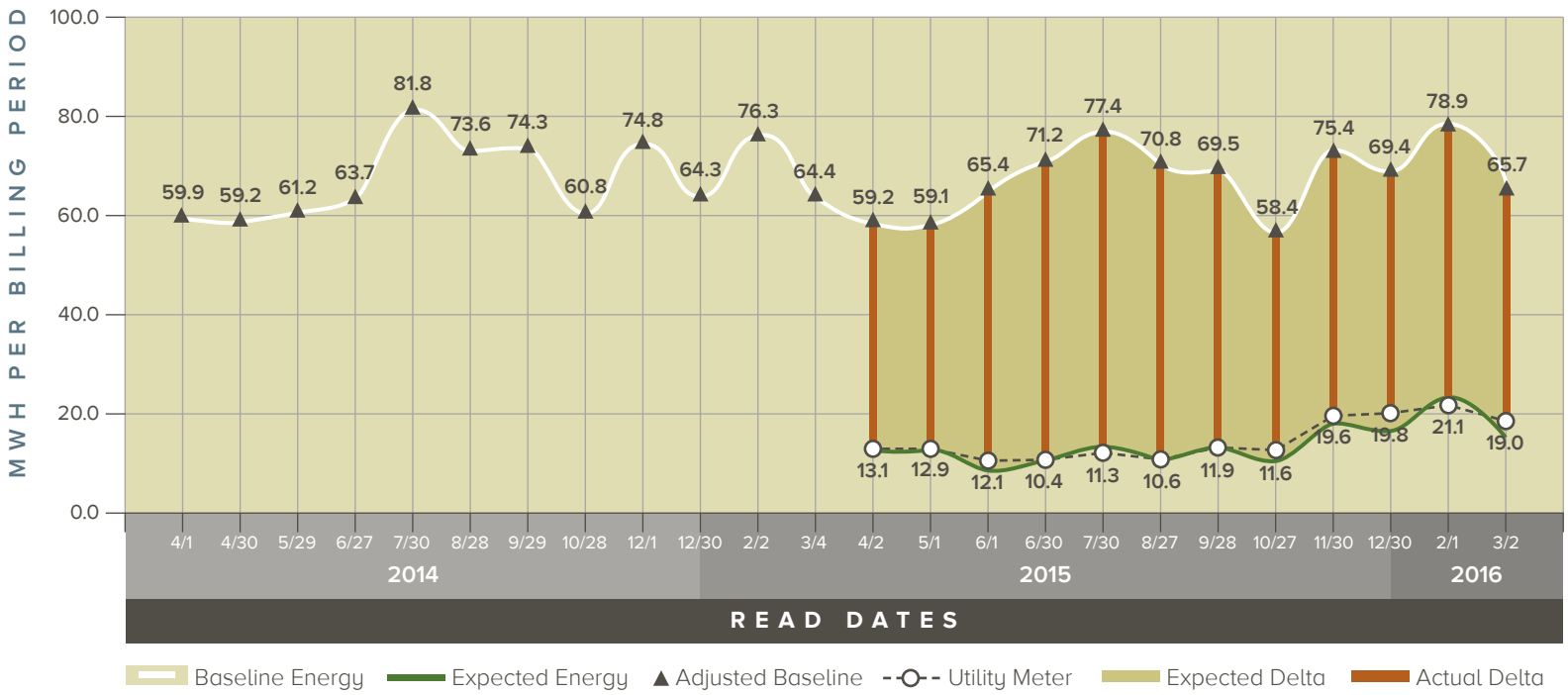
STEP 6: ADJUST DYNAMIC BASELINE FOR ROUTINE AND NON-ROUTINE CHANGES[23] (NUMBERS NEAR WHITE LINE)



Note: *This series of charts is designed to show how dynamic baseline meters are deployed. It is an example only and not based on actual data.*

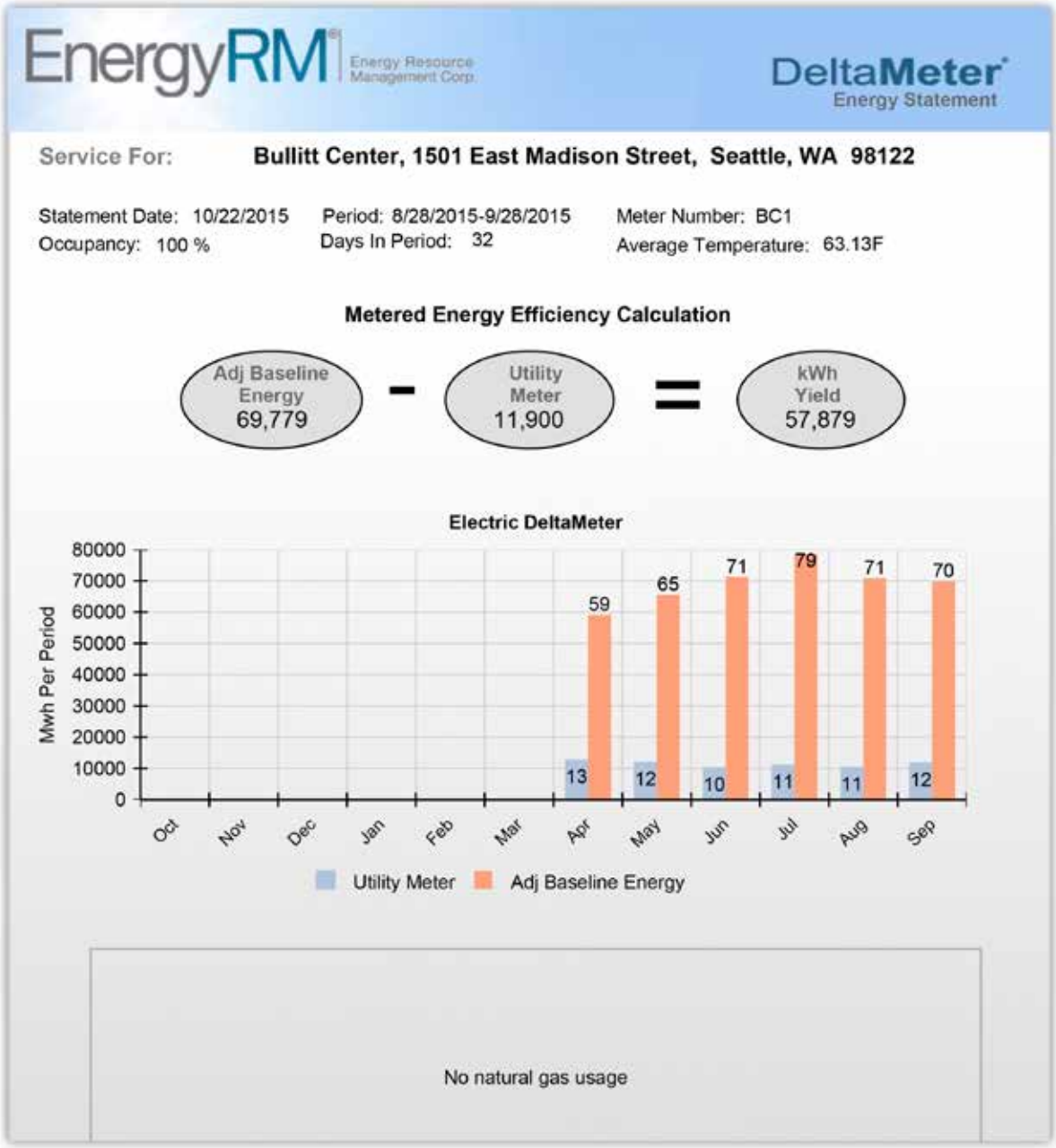
[23] Routine changes (weather, periodic occupancy like summer vacation in schools) are self-normalizing. In other words, routine changes result in automatic adjustments once the data (i.e weather) is provided to the meter. Non-routine changes require a **change** to the baseline (which is of course, also an adjustment).

STEP 7: UTILITY PAYS THE DIFFERENCE BETWEEN THE UTILITY METER READ AND ADJUSTED DYNAMIC BASELINE (RED COLORED BARS)



Note: *This series of charts is designed to show how dynamic baseline meters are deployed. It is an example only and not based on actual data.*

APPENDIX B: EXAMPLE DELTAMETER ENERGY STATEMENT



In the Energy Statement to the left, "Utility Meter" is the measured energy consumed by the building. In the case of the Bullitt Center, this is the sum of the portion of the solar energy produced and consumed on site, plus the energy delivered by the utility.

The "kWh Yield" is the Metered Energy Efficiency.

APPENDIX B: EXAMPLE DELTAMETER ENERGY STATEMENT

EnergyRM® Energy Resource Management Corp.

DeltaMeter® Energy Statement

Energy Efficiency Yield Calculation

Energy Efficiency Yield is defined as the difference under current conditions between the energy used by a building, following installation of certain measures, as compared to the energy the building would have used absent those measures. The sections below show how the yield is calculated.

Current DeltaMeter Conditions	Value	Source
Average Daily Temperature for Billing Period	**63.13F**	(measured)
Previous Month Usage Factor	**100 %**	(previous month bill)
Current Usage Factor	**100 %**	(reported by building)
Expected Energy	**11,295**	(from Expected Energy)
Utility Meter	**11,900**	(measured by utility meter)
Adjusted Baseline Energy**	**69,779**	(from Baseline Energy)

Variance Calculation

The variance measures the difference between the expected energy usage and the actual meter reading. Any variance greater than +/-5% will be analyzed and resolved.

Utility Meter – Expected Energy = kWh Variation ▶ **11,900 kWh - 11,295 kWh = 605 kWh**
Variation / Expected Energy = Percent Variation ▶ **605 kWh / 11,295 kWh = 0.054 (5.4 %)**

Variance Adjustments

Variance adjustments will be made during any month that has a usage variance greater than +/-5%.

Reason	Description	Amount (kWh)
Usage Intensity	The entire deviation from expected usage (605 kWh) is accounted for by a modest increase in usage intensity due to end of summer and new staff. No adjustment is warranted in the Baseline.	0
	Total (kWh) :	0

DeltaMeter Summary

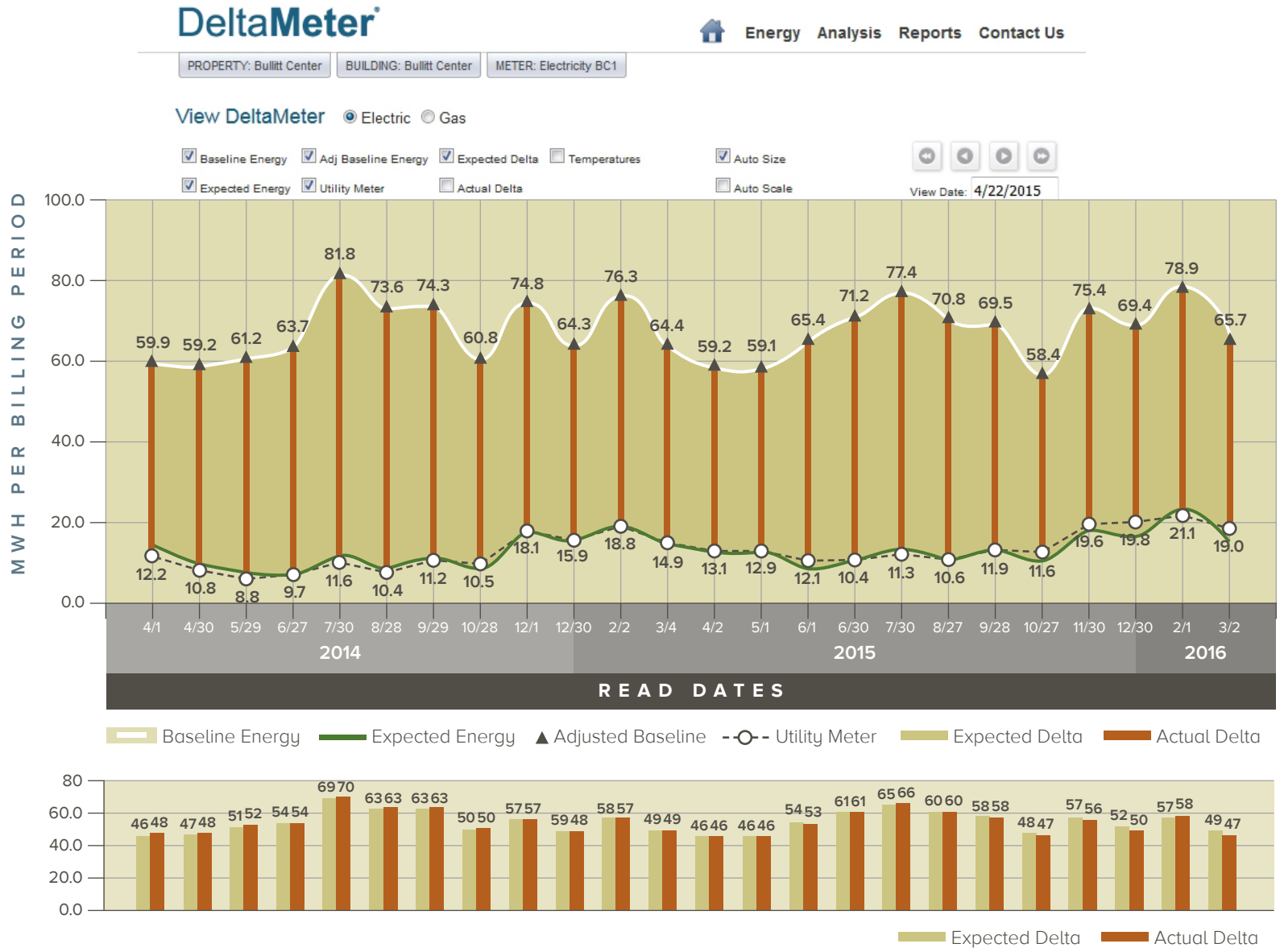
Adjusted Baseline Energy (kWh)	Expected Energy (kWh)	Utility Meter (kWh)
69,779	**11,295**	**11,900**

Energy Efficiency Yield: 69,779 kWh - 11,900 kWh = 57,879 kWh

**Value prior to adjusting for variance

Note: *At the Bullitt Center, programs to control tenant behavior to constrain use intensity are one of the installed measures. Accordingly, variation in use intensity does not cause a baseline recalibration or normalization.*

APPENDIX C: DEPLOYED DELTAMETER GRAPHIC



APPENDIX D: DELTAMETER RESULTS TO DATE

The DeltaMeter began officially delivering data to all parties beginning with the April 2015 meter read (at the commencement of the contract between Bullitt Center and Seattle City Light). (See Appendix B for a DeltaMeter Energy Statement example.)

The DeltaMeter's Meter Services Agreement calls for metering the amount of efficiency energy the Bullitt Center generates. That requires the DeltaMeter to calculate a dynamic baseline representing what the building would have used if it had not incorporated all of the energy efficiency measures (what the California CPUC recently called "normalized metered consumption").

The advancement that enables the Metered Energy Efficiency Transaction Structure (MEETS) is the DeltaMeter's ability to do that calculation in a way that analyzes and resolves variances from expected energy use greater than +/- 5% per month, or +/- 2% per year. Part of the purpose of the MEETS pilot in Seattle is to determine how well the meter can do this.

Over the twelve-month period between April 2015 and March 2016, inclusive, the building made six excursions from expected energy use by more than +/- 5%, and had one occupancy change. All were analyzed. Five of the six were accounted for as performance variances, with no adjustments to the baseline required. The sixth was an occupancy change (+15%) that took place between the April and May statements, and resulted in a baseline adjustment of 15%.

EnergyRM has produced a full review if the dynamic baseline meter performance during the first twelve months of the contract. For additional information, please contact EnergyRM.[24]

[24]www.en-rm.com

APPENDIX E: DESCRIPTION OF THE MEETS COALITION

The MEETS Accelerator Coalition was created to substantially reduce energy waste in the built environment.

The Coalition is advancing a new approach to energy efficiency that strengthens our utilities, attracts long-term capital, stabilizes the grid, and goes deep. From the outset, MEETS has been carefully designed to do just that.

To realize this promise, members came together as the MEETS Accelerator Coalition to develop, evolve, and grow the MEETS transaction structure. They expect the path to yield new tools, technologies, best practices, and shared experiences.

The Coalition membership categories includes the following:

- Energy utilities—both investor-owned and municipal-owned
- Utility regulators
- Investors
- Building owners
- Construction and implementation companies offering value-added technologies, products and services for energy supply, delivery and management—known to the energy sector as ESCOs
- Building code and other relevant standards organizations
- Building designers and architects
- Non-governmental organizations, including non-profits and foundations.

Members:

- Connect to experienced legal advisors, familiar with negotiating MEETS agreements
- Connect with technical advisors for their projects
- Are part of a group of companies and non-profit organizations actively working to implement MEETS internationally. They:
  - Gather
  - Collaborate
  - Learn
  - Strategize
  - Do business

APPENDIX F: FINANCIAL ANALYSIS SPREADSHEET

Projected Economics of Seattle City Light MEETS contract with the Bullitt Center

Retail Rate Escalator	PPA Escalator	Estimated Annual kWh of MEETS Energy
4.5%	2%	630,000

All cents/kWh unless noted

		Seattle City Light Revenue		Expense (EnergyTenant Income, MEETS PPA Revenue)		Contribution to Utility Ratebase	
Year of PPA	Retail Price	Per kWh	Annual ($)	Total PPA	Estimated Total PPA ($)	Per kWh	Annual ($)
1	**6.34**	6.34	$39,942	8.41	$52,983	(2.07)	(13,041)
2	6.63	6.63	$41,739	8.53	$53,728	(1.90)	(11,988)
3	6.92	6.92	$43,618	8.65	$54,487	(1.73)	(10,870)
4	7.23	7.23	$45,580	8.77	$55,262	(1.54)	(9,682)
5	7.56	7.56	$47,632	8.90	$56,052	(1.34)	(8,421)
6	7.90	7.90	$49,775	9.03	$56,858	(1.12)	(7,083)
7	8.26	8.26	$52,015	9.16	$57,680	(0.90)	(5,666)
8	8.63	8.63	$54,356	9.29	$58,519	(0.66)	(4,163)
9	9.02	9.02	$56,802	9.42	$59,374	(0.41)	(2,573)
10	9.42	9.42	$59,358	9.56	$60,247	(0.14)	889)
11	9.85	9.85	$62,029	9.70	$61,137	0.14	892
12	10.29	10.29	$64,820	9.85	$62,045	0.44	2,775
13	10.75	10.75	$67,737	10.00	$62,970	0.76	4,766
14	11.24	11.24	$70,785	10.15	$63,915	1.09	6,870
15	11.74	11.74	$73,970	10.30	$64,878	1.44	9,092
16	12.27	12.27	$77,299	10.45	$65,861	1.82	11,438
17	12.82	12.82	$80,778	10.61	$66,863	2.21	13,915
18	13.40	13.40	$84,412	10.78	$67,885	2.62	16,527
19	14.00	14.00	$88,211	10.94	$68,928	3.06	19,283
20	14.63	14.63	$92,181	11.11	$69,991	3.52	22,189
Totals		**$1,253,037**		**$1,219,664**		**$33,373**	

[25]The PPA escalator applies to 5.91 cents/kWh of the starting price. The remaining 2.5 cents/kWh is fixed over the life of the contract. This is specific to the Bullitt contract. Future MEETS PPAs will likely have a single price with a known escalator.

APPENDIX F: FINANCIAL ANALYSIS SPREADSHEET

In a traditional energy efficiency structure, Seattle City Light would have received no income from the (net zero) Bullitt Center, other than very small monthly meter and demand charges. Instead, the utility will receive more than $1.25 million in gross revenue by charging the building for the metered energy efficiency.

Note that over the life of the project, the utility receives a net benefit of $33,373 from the retail tariff collection (revenue) vs. the PPA cost. The result is that **even though MEETS results in a much deeper project, it uses no net ratepayer incentive funds to achieve that result.** In fact, we recommend that utilities and regulators simply view the MEETS PPA as a traditional PPA, for which the costs are part of rates, leaving the incentive pools untouched.

The match between retail price escalation and the (lower) escalation in the PPA, means that the tenants in the building are paying for the project – but by comparison with systems like PACE or green leases, they are protected from project risk. They only pay to the extent the project yields energy benefit that offsets the cost of energy they'd otherwise have to buy. This is entirely appropriate, given that their offices will be more comfortable, better lit, and have fresher air. In effect, efficiency energy is part of their energy supply, at normal rates. Other utility customers (ratepayers) are not subsidizing the retrofit.

In a traditional "deemed savings" energy efficiency transaction, Bullitt Foundation would have received $84,000 up front from Seattle City Light for the energy improvements in the building, but would have had no way to collect for the energy value of the savings it generated. Bullitt Foundation gave up that incentive, but is now able to collect more than $1.2 million over the twenty-year contract for that savings value. This number is estimated, based on the building performing at its design specification. What the Bullitt Foundation ultimately receives will be dependent on how the building actually performs. The better the performance, the more it will receive.

Because the transaction is economically beneficial to the utility (and its ratepayers), the investor and the building owner, and each benefits directly as more metered energy efficiency is delivered, each party is motivated to ensure that the building continues to perform optimally.

The table below describes the cash flows available to the investor in a Seattle MEETS transaction, using the Bullitt Center contract as an example:

50,000 square foot Bullitt Center with retail energy price of 6 cents/kWh

	Traditional Incentive Structure	MEETS
Total Dollar Value of Utility Payments for energy	$84,000 (incentive)	$1.22 million (PPA)
Total Utility Collections from Building for Saved Energy	$0	$1.25 million
Ratepayer Cost or (Benefit)	$84,000	($33,000)
NPV Dollar Value of Payments to Building (5% Discount Rate)	$84,000	$740,000
$NPV per Square Foot	$1.68	$14.80
Utility Payment per kWh	2.5 cents (deemed and paid upfront)	8.41 cents with escalator, as delivered for 20 years

In a similar transaction in a market with energy prices of 15 cents/kWh, the benefits of MEETS would be even more striking:

50,000 square foot office building with retail energy price of 15 cents/kWh

	Traditional Incentive Structure	MEETS
Total Dollar Value of Utility Payments for energy	$84,000 (incentive)	$2.6 million (PPA)
Total Utility Collections from Building for Saved Energy	$0	$3 million
Ratepayer Cost or (Benefit)	$84,000	($353,000)
NPV Dollar Value of Payments to Building (5% Discount Rate)	$84,000	$1.6 million
$NPV per Square Foot	$1.68	$31.60
Utility Payment per kWh	2.5 cents (deemed and paid upfront)	17.5 cents with escalator, as delivered for 20 years