THE BUSINESS CASE FOR ENERGY EFFICIENCY & DEEP ENERGY RETROFITS

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DENVER, CO

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RMI. Creating a clean, prosperous, and secure energy future.™
## ABOUT RMI

### OUR PURPOSE
Rocky Mountain Institute (RMI) transforms global energy use to create a clean, prosperous, and secure future.

### OUR APPROACH
RMI advances market-based solutions that transform global energy use. We engage businesses, communities, and institutions to cost-effectively shift to efficiency and renewables, creating a clean, prosperous, and secure energy future.

### OUR UNIQUE TRAITS
- **Five practice areas**: Buildings, Electricity, Industry, Transportation, and Communities
- **Whole-systems expertise**: We unlock market-based solutions that can be replicated at scale and implemented today
- **An independent, non-partisan nonprofit**: We convene and collaborate with diverse partners—business, government, academic, nonprofit, and philanthropic—to accelerate and scale solutions
- **More than three decades of experience**: We have been a leader in energy efficiency and renewables for more than 30 years
Solutions within, and across, the four energy sectors.

We work in communities at all levels—campuses, cities, states, regions, the military—and entire countries.

In our work, we emphasize market-based solutions that can unlock value and enable accelerating change.
REINVENTING FIRE: U.S.

TODAY

35% OIL
26% NATURAL GAS
22% COAL
9% NUCLEAR
5% BIOASS
5% HYDRO
OTHER RENEWABLES

2050

4% HYDRO
4% HYDROGEN
23% NON CROP/LAND BIOFUELS
26% NATURAL GAS
45% WIND, SOLAR, AND OTHER RENEWABLES

Solutions within, and across, the four energy sectors. We work in communities at all levels—campuses, cities, states, regions, the military—and entire countries. In our work, we emphasize market-based solutions that can unlock value and enable accelerating change.
Lower energy bills is just the tip of the iceberg of energy efficiency’s benefits. Non-energy benefits are typically unaccounted for since they rest beneath the surface; but like an iceberg, what lies beneath the surface is in fact much greater than what is found above (i.e. energy cost savings). This “value beyond energy cost savings” (VBECS) will be produced as a result of energy efficiency measures. By accounting for VBECS, organizations will realize the full economic value of energy efficiency…and want to invest much more in it.
Take a look at this picture...it is iconic of the workplace that attracts/retains the best talent, engages employees, is healthier...and happens to achieve greater energy efficiency.

General practice today is to evaluate energy efficiency based on expected energy cost savings; however we all know these transformed spaces are better.

“A deep energy retrofit is a whole-building analysis and construction process that achieves much larger energy cost savings—sometimes more than 50% reduction—than those of simpler energy retrofits and fundamentally enhances the building value.” – RMI Retrofit Depot
Energy efficiency is the cheapest source of energy...reducing energy use ("negawatts") will be less expensive than producing more megawatts.

After tackling maximum potential for efficiency, fewer renewables are needed to meet the now reduced energy demand.
EXAMPLE: FACTORY...straight and wide pipes rather than crooked and narrow ones...put down pipes first, then machinery...if not evaluated as a system, straight/wide pipes are more expensive than crooked/narrow ones...but huge energy savings and ability to downsize motors cuts both upfront of investment and long-term operations costs

Finally, an important aspect of integrated design is to pursue the right steps in the right order.
(1) Define Needs: Define the need/service required, not the equipment or capacity needed to provide it.
(2) Identify Appropriate Measures: Identify which efficiency measures should be analyzed for a specific building and climate.
(3) Reduce Loads: Reduce loads on mechanical systems through passive design measures.
(4) Select Appropriate & Efficient Technology: Select the most appropriate system types and use the most efficient equipment available (CLICK - most people start here!).
(5) Plan System Layouts: Design systems to reduce pump and fan power.
(6) Optimize Operation: Incorporate controls and demand response measures.
(7) Seek Synergies: Assess waste streams and other resource areas (i.e. water) for possible use/reuse.
(8) Explore Alternative Power: Incorporate renewable energy technologies and green power or carbon offsets.
Piggyback on other measures that are part of the lifecycle of buildings
These nine value elements lead to a better articulation of the full value of energy-efficient buildings and should inform a structured process starting with the launch of the project, all the way through the design, financing, construction, and operation of the building.
Underfloor air \(\rightarrow\) results in more (energy) efficiently delivered air \(\rightarrow\) generates better air quality and thermal comfort \(\rightarrow\) creates employee engagement and improved employee health
An example of this methodology’s impact:
Engineering Co.
- $225 million revenue and 1,500 employees
- Seeking a deep retrofit achieving 50% energy reduction
- 1960s 300,000 SF office building it owns and occupies in California

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<tr>
<th>Before</th>
<th>After</th>
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<tbody>
<tr>
<td><strong>ROI:</strong> 7.6%</td>
<td>55% 24% to</td>
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<tr>
<td><strong>Payback:</strong> 13 years</td>
<td>6 months to 4 years</td>
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<tr>
<td><strong>NPV:</strong> - $2.25 Million</td>
<td>+ $3.4 to $16.8 Million</td>
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<tr>
<td><strong>Risk:</strong> Not fully</td>
<td>Complete fully</td>
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Source: How To Calculate and Present Data: Retrofit Value for Owner-Occupants. Rocky Mountain Institute, January 2014
• RMI and CoreNet Global are collaborating to enable practical and profitable ways to achieve net-zero energy corporate real estate (CRE) portfolios
• Download the report from here:
  http://www.rmi.org/next_gen_energy_management
We want to show today that there are significant business opportunities remain for the rest of the world’s major companies to set and achieve higher energy management goals. The key for these companies is to become more active energy consumers by identifying opportunities for energy efficiency, power load flexibility, and renewable power generation investment. Although energy management may not be a top CRE or company priority, there are key links between next generation energy management and the ideal CRE vision for your company. Our 11 next generation energy management strategic solutions outline practical action items to capture real business value. You can use the 11 strategic solutions proposed in our paper to:

- Get organized;
- Capitalize upon specific opportunities; and
- Optimize your overall approach to this multi-billion dollar business opportunity.

**Leverage energy management for business goals:**
Although energy management may not be a top CRE or company priority, there are key links between next generation energy management and the ideal CRE vision for your company.

**11 strategic solutions:** Our 11 next generation energy management strategic solutions enable companies to set and achieve higher energy goals that approach net-zero energy and create significant business value.
NEXT GENERATION ENERGY MANAGEMENT IS "NET-ZERO ENERGY"

- **Next generation energy management and performance**: A level of energy performance that approaches net-zero energy across the portfolio of corporate facilities.

- **Net-Zero Energy Portfolio**: A real estate portfolio that generates renewable energy (either on or off the building sites) equal to the amount of energy used for building operation, or in other words a 100 percent renewable energy powered buildings portfolio.
We’re here to show that Next Generation Energy Management provides an approach to help companies attain the ideal CRE vision.
• The world has changed since our 2007 report with CoreNet Global in a way that further enables investment in CRE energy management that approaches net-zero energy.
Questions for reflection
1. What would the ideal CRE portfolio look like and what would the benefits be to a company?
2. What would it take to achieve this ideal?
• An ideal CRE portfolio is likely one that creates value for a company by addressing the following...

- **Costs**: ensures low, predictable operating costs indefinitely
- **Business Needs**: meets the current and future needs of the company; maintain flexibility
- **Employees**: not only attracts/retains employees but also enables employee engagement, productivity, and health
- **Reputation**: demonstrates company’s values and brand to stakeholders
- **Innovation**: makes use of the best available technological and financial innovations to maximize profits
- **Risks**: offers resilience in light of current and forthcoming regulations; meets company commitments
• **More cost-effective solutions**: Lower cost of and improvements in technologies are creating more overall cost-effective solutions (e.g., LEDs and smart building technology) for increasing efficiency

• **Growing value of healthy and productive buildings**: Most building owners now cite occupant health and wellbeing as the most important factors motivating investments to increase overall building performance

• **Workplace transformation**: Two-thirds of workplaces are either in the process of implementing or planning a workplace transformation program, which creates opportunities for increased energy performance

• **Rapidly improving technologies**: Technology solutions are enabling continuous information flows that are actionable, which supports improved energy management

• **New finance mechanisms**: Financing solutions have evolved and more external capital is now available at low- or no- cost, on- or off-balance sheet, for energy management investment

• **Local leadership**: There is a growing number of net-zero cities and communities
• Customer demands: Retail and business customers are increasingly demanding sustainability performance
• Shareholder demands: Growth of enterprise-wide sustainability measurement indicates shareholder demand
• Attracting and retaining employees: Millennials want to work for companies that help improve society
• Keeping up with other companies: 24 companies of the Global Fortune 100 have set specific renewable energy targets—either a percentage of energy, capacity (MW), or level of investment
• Power reliability: Extreme events like Superstorm Sandy have taken down the electricity grid and increasingly put companies at risk; moreover, many companies increasingly have operations in regions with low grid reliability, such as India
• National regulatory requirements: Increasing stringency of national commercial building codes globally; U.S. federal government requires all new federal buildings entering the planning process in or after 2020 to be net zero by 2030
• Local regulatory requirements: Increasing stringency of national commercial building codes across U.S. states; California now requires all new commercial buildings to be net-zero energy by 2030 after revision to Title 24 building standard
• **Increase in customer choice**: Technological, regulatory, and market dynamics the past few years have enabled unprecedented levels of customer choice

• **Improving economics of microgrids**: On-site renewable energy generation and storage to create a “microgrid” is becoming economical, especially on islands (high energy prices) and areas with plenty of resource (e.g., biomass in Brazil)
- Next generation energy management aligns with your ideal CRE portfolio, and this table shows how/why
- And it is only becoming easier to make next generation happen
• In our report, we outline three overarching strategic steps that will lead your company towards Next Generation Energy Management
1. **Organize**: lay the appropriate foundation for pursuing next generation energy management and performance → 3 solutions

2. **Capitalize**: seek out opportunities for profitable energy management investment → 5 solutions

3. **Optimize**: wring the most value out of the other solutions → 3 solutions
• Thanks, Mike!
• I will now delve into the 11 strategic solutions we provide in our paper...beginning with the first step: Organize
• The purpose of the three “Organize” solutions is: to lay the appropriate foundation for pursuing the next step in building energy performance
• The first step is to garner C-suite support for next generation energy management
• Likely already have support for a certain level of energy management; now it is about establishing support for the next generation...which should be considered every few year anyways
• Mike went through how lots of changes in world necessitate and enable this next generation...need to identify the most important of these changes for your company and how to move forward
Getting on the path to next generation performance across the real estate portfolio can include a mix of four options...think of them as that can be pulled/adjusted over time to reach net-zero:

I. **Energy efficiency**: can include focused programs or policies (such as installing LED lighting and controls in all office spaces) and creating long-term energy plans using a deep energy retrofit approach. Some measures are no/low-cost and provide short-term wins for energy savings; others involve more tangible building upgrades.

II. **On-site generation**: sources like solar PV should be considered because it can be cost-effective and directly attributed to greenhouse gas reductions, although this option is limited b/c may not be possible to reach all of a building’s energy demand on-site (data centers, tall office buildings)

III. **Flexibility or storage**: can reduce peak power consumption, provide other valuable services to the electrical grid operators, and make the power supply much more resilient in the face of severe storms and electrical grid failure. It can be accomplished with building energy mgmt controls, building materials that store thermal energy, and batteries that store power from on-site generation when it is not needed.

IV. **Green power purchasing**: Green power purchasing is the next available option and comes in many forms, each with their pros and cons.

The right mix of these four measures will of course vary company-by-company

Nevertheless, EE should be pursued first as it is one of the most cost-effective measures, especially when considering additional values beyond energy cost savings (which I'll discuss in a bit more detail later)

**Deutsche Bank**: maintains carbon neutrality in operations since 2013...first through EE investments and on-site generation, and then offsetting the remaining carbon emissions by purchasing electricity from certified renewable energy sources

Here is a photo of DB’s “Twin Towers” in Frankfurt, Germany...where major EE improvements were achieved
• 3rd step to Organize for next gen is to make sure to have an energy manager and creating an team of energy champions that span multiple departments
• This multi-disciplinary team will provide a comprehensive perspective on energy from across the organization, create a foundation for energy-related communication and implementation, and build broad-based support for energy goals…which will help motivate C-suite to follow through with these goals with needed funding/attention
• It is crucial that team members (and eventually people across the organization) are properly incentivized (ideally by including performance assessments to energy goals). It is also essential to have proper training in place: e.g., making source the O&M team knows how to use new technologies intended to support EE goals.
• Kohl’s: implements energy efficiency with a multi-disciplinary team
  • Energy team executed several successful “low-hanging fruit” energy efficiency projects that very profitable…attracted the interests of Kohl’s finance department
  • To get needed funding for larger projects, needed more funding. Then thought about how to improve communication with Finance department
  • Became an opening on the energy team, and decided to bring on
people from the finance department onto the energy team.
• We will now shift to Step Two: Capitalize
• The following five strategic solutions will help companies like yours seek out opportunities for profitable energy management investment
There is a fundamental shift in way buildings are being operated, just as we’ve experienced in the way we produce written documents.

Smart building controls *investment* expected to triple in next few years.

Technology has advanced significantly over recent years, and costs have been coming down.

Technological leaps in the “internet of things” is making it much easier to manage large amounts of energy data and use these data to improve building performance.

These SMART BUILDINGS help their owners and managers improve asset reliability and performance in many ways such as identifying and detecting issues.

Not only leads to energy savings, but also helps maintenance teams productivity and space utilization.

**Tesco**: uses smart building technologies to reduce energy use and costs.

- In a pilot with IBM in one of its Ireland stores, the company used advanced data analysis tools to reduce refrigeration energy use costs. This pilot led to better assessments of large, complex energy use data sets and resulted in a 20 percent energy use reduction from refrigeration. If applied across all of its stores, these improvements would save the company €20 million.

- The information is enabling a 1,000 person maintenance team to efficiently respond to issues in its stores.

- Tesco using various data analysis tools to work to halve energy use per SF by 2020 in stores…and ultimately reach carbon-neutral by 2050 (already has 6 carbon-neutral stores).
How can you create healthy and productive buildings? You could have cafeterias serving healthier food or encourage people to take the stairs. But there are also ways to encourage health and productivity as well as save energy.

The workplaces that next generation energy management produces are BETTER workplaces; EE is not just about energy savings.

Research suggests that 6 types of measures that support EE as well as health and productivity, creating business value.

Here are a few examples:
- Improved and more efficiently delivered airflows improves not only air quality—improving health and reducing sick days—but also thermal comfort (which increases productivity)
- With increased daylighting, the exposure to views of nature will help reduce occupant stress levels
- Open workplaces provide efficient lighting and thermal comfort...also encourage more physical activity and collaboration
- **Google**: is leveraging energy efficiency measures to improve health and productivity
  - Because the company wants healthy, happy employees—due to the business outcomes like greater innovation, retention, and performance—it considers a range of options to create healthy workplaces. EE is one of the levers to get health and productivity, and is weighed equally among other performance indicators.

**Tools and methodologies**:
- JLL Green + Productive Workplace
- Gensler Human Capital Calculator
- RMI Deep Retrofit Value Practice Guide
• Fast evolving external funding for energy management investments is beginning to reshape the landscape for next generation performance
• Worth your time to consider the full swath of available financing options
• More and more capital finance options are becoming available and practical at a portfolio scale
  • Promising capital finance options include energy service performance contracts (ESPCs), energy service agreements (ESAs), power purchase agreements (PPAs), and operating leases
  • ESPCs have historically operated in the public and institutional sectors and will need to overcome their perhaps unfounded distrust in the private sector in order to expand. ESAs are new, evolving, and to date only available for investment-grade credit quality. PPAs and operating leases for on-site power generation, where available, can in some cases provide companies with reduced bills for no upfront costs and all the environmental benefits.
  • PACE financing has emerged as a potentially powerful source of capital for borrowers and is currently available in over 500 US cities and towns; now has a presence in Canada
  • Traditional capital sources are always an options as lenders become more familiar with the benefits of EE
• Hilton Los Angeles/Universal Studios: used PACE financing to achieve its recently completed $7 million deep energy retrofit
  • Driven by a goal to improve the comfort and experience of hotel guests as well as to meet Hilton sustainability standards
  • What’s notable: this project added net operating income exceeding $13 million and increased the estimated value of the property by more than $30 million
• For this next solution, we’re saying that it is important for energy managers to support workplace mobility and density efforts.
• And here’s why: Both the real estate and auto industry are simultaneously learning the same lesson...do not want to use energy that is unnecessary.
• Cars historically have big, clunky steel creatures with big engines to move around the weight rather than just you. Similarly, for buildings, we have a lot of underutilized space and we are spending a lot of energy heating/cooling/lighting that space for really no value-add. Just like how BMW lightweighted the i3 to enhance performance, the question how can we lightweight our buildings in coordination with energy management efforts.
• We’re already seeing this happen with office workers per square foot significantly decreasing over the past few years, however it is happening in a way that is not always taking energy into consideration, which can lead to sub-optimal results
• **Unilever**: is improving space utilization and EE together
  • Use of open-plan workplaces, desk-sharing, etc. led to a 13 percent reduction in electricity purchased per occupant and a consolidation of offices
  • Unilever has a 2020 goal to cut energy purchased per occupant In half compared to 2010 for offices in its top 21 countries, and sees workplace density efforts as a key part of reaching this goal
It is important to capitalize on opportunities for landlords and tenants to work together. Companies that work with their landlords to incorporate green lease provisions will have much greater success at achieving their energy performance goals. The most important lease clauses to address include:

I. Building and tenant space construction
II. Maintenance and tenant operations
III. Operating cost pass-throughs

Implementing green lease provisions requires educating leasing and legal staff on what should be included in leases and why, and the cost impacts. It also requires incentivizing staff to follow-through and verifying the impact on energy performance.

**PwC**: works with building owners to reduce greenhouse gas emissions

- In order to streamline its effort to meet its greenhouse gas reduction goal, PwC has created standard negotiation terms for tenancy.
- Before the company takes occupancy, PwC negotiates with landlords to encourage them to implement sustainability measures.
- The company leverages a standard lease that contains clauses for LEED certification, energy and water efficiency, indoor air quality, and green cleaning products.
- PwC then tracks an array of key performance indicators to assess its progress.
- And this is a key strategy for PwC to reach its 30% GHG emission reduction goal by 2016.
- PwC was recognized as a Green Lease Leader by Dept. of Energy.
• In the third and final step towards reaching Next Generation Energy Management, we offer three strategic solutions that will help your company wring the most value out of the other solutions I have already described.
• Need to think about energy management opportunities in a more holistic and value-based way

• Well-structured energy management investment yields value beyond energy cost savings alone. It is important to consider these non-energy benefits in a formal way as part of the decision-making process…to put these non-energy benefits on your radar screen and begin to capture them. RMI in fact offers a methodology to do this in our Deep Retrofit Value practice guide.

• Must develop a process to identify all of the positive impacts the investment would make for the company, then identify the stakeholders for those impacts and engage them on how to optimize the investment for everyone involved…as well as consider all of the risks

• AT&T: integrates energy efficiency’s multiple benefits into decision making to drive investment…which from 2010 to 2013 has saved AT&T $191 million in annual energy costs
  • Pursues the “intelligent integration of multiple benefits into a single expenditure.”
  • When AT&T thinks about the value of LED lighting and controls, for example, it considers the multiple benefits the investment provides and the company stakeholders that would receive them
  • This decision-making process emphasizes that LEDs and controls do not just result in reduced energy costs but also lower maintenance costs, provide better information about space utilization, and lead to greater workplace comfort and productivity – all of which stakeholders across different departments want, making them willing and able to contribute to a pool of funding to ensure the investment in LEDs
• There are several advantages to measuring net zero at the portfolio level. For instance, multi-building systems offer opportunities for taking advantage of diverse power load shapes, heat requirements, and opportunities for renewable energy production. Just as automakers can meld many models’ fuel economies into a fleet average, so too can corporations achieve net-zero status in aggregate even though some individual buildings may do better or worse.
• Key variables that indicate where and when the next generation energy management solutions discussed above are most appropriate:
  • Length of hold
  • Owned vs. leased
  • Building life cycle
• The way you can think about investing in next generation across a CRE portfolio is similar to how automakers convert the fuel economies of many car models into a fleet average
• **World Business Council on Sustainable Development (WBCSD) Toolkit**: offers helpful guidance on specific actions for portfolio-wide investment allocation
Companies must collaborate in order to share best practices and catalyze the market to meet their demand for renewable energy purchasing. But companies are still facing many shared challenges, which must be overcome to spur large investment in renewables. This isn’t the first time that collaboration was needed among businesses. In the mid- to late 1800s, railroad companies faced shared coordination issues. For example, the clock in each town said something different. Through coordination, a standard time was then established...benefitting all of these companies, even though they were competitors.

So what is happening for renewables. Some corporate occupiers have found value through joining industry groups to share general energy management best practices. Some companies are beginning to collaborate through industry groups such as the DOE Better Buildings Alliance, and specifically around renewable energy purchasing there is The Buyer’s Principles, which espouse six criteria that would significantly help companies meet their ambitious purchasing goals.

The Buyer’s Principles:
1. Greater choice in procurement options
2. Cost-competitive options
3. Access to longer term, fixed price contracts
4. Access to new projects that reduce emissions beyond business as usual
5. Streamlined third party financing
6. Cooperating with utilities and regulators

The Buyer’s Principles: collaborating to enable renewable energy purchasing
• We think that the business case for high energy performance buildings can be leveraged to push the envelope with energy codes
• The opportunity is there for business, and is ripe for boosting bottom lines
• Nevertheless, action is moving slower than necessary to address energy and climate challenges of the present day
• Policies like energy codes can therefore help spur action among building owners and investors to better account for and capture the business value of high energy performing buildings
• Questions, comments, and further discussion?
Creating a clean, prosperous, and secure energy future