NRDC CENTER FOR MARKET INNOVATION

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Energy Performance Optimization Guide

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About NRDC

NRDC (Natural Resources Defense Council) is a national nonprofit environmental organization with more than 1.3 million members and online activists. Since 1970, our lawyers, scientists, and other environmental specialists have worked to protect the world's natural resources, public health, and the environment. NRDC has offices in New York City, Washington, D.C., Los Angeles, San Francisco, Chicago, Livingston, and Beijing. Visit us at www.nrdc.org.

About NRDC's Center for Market Innovation

The core mission of the Center for Market Innovation (CMI) is to expand the impact of the Natural Resources Defense Council (NRDC) by creating market conditions that will redirect capital flows toward sustainable uses. We believe that engaging mainstream capital is a critical component in achieving our common goals. We do so by engaging with the business community to articulate and implement sustainable value propositions, with a current focus on energy efficiency, water management, and regenerative agriculture.

A collaborative approach between building owners and occupants is essential to optimizing the performance of commercial office buildings, and tenant demand will be a critical factor in driving the market toward optimizing commercial building performance. The Natural Resources Defense Council's Center for Market Innovation (CMI) has established a High Performance Demonstration Project (the "Project") aimed at accelerating demand for high performance tenant spaces in the commercial office market by demonstrating their economic benefits.

The Project aims to promote the compounding effect of owner/tenant collaboration, as tenants who value high performance spaces choose to locate or remain in buildings with highly efficient central systems and transparent energy management practices. As a result, building owners investing in central system energy efficiency improvements will not only garner operating savings, but will also gain competitive advantage in attracting and retaining these high value tenants.

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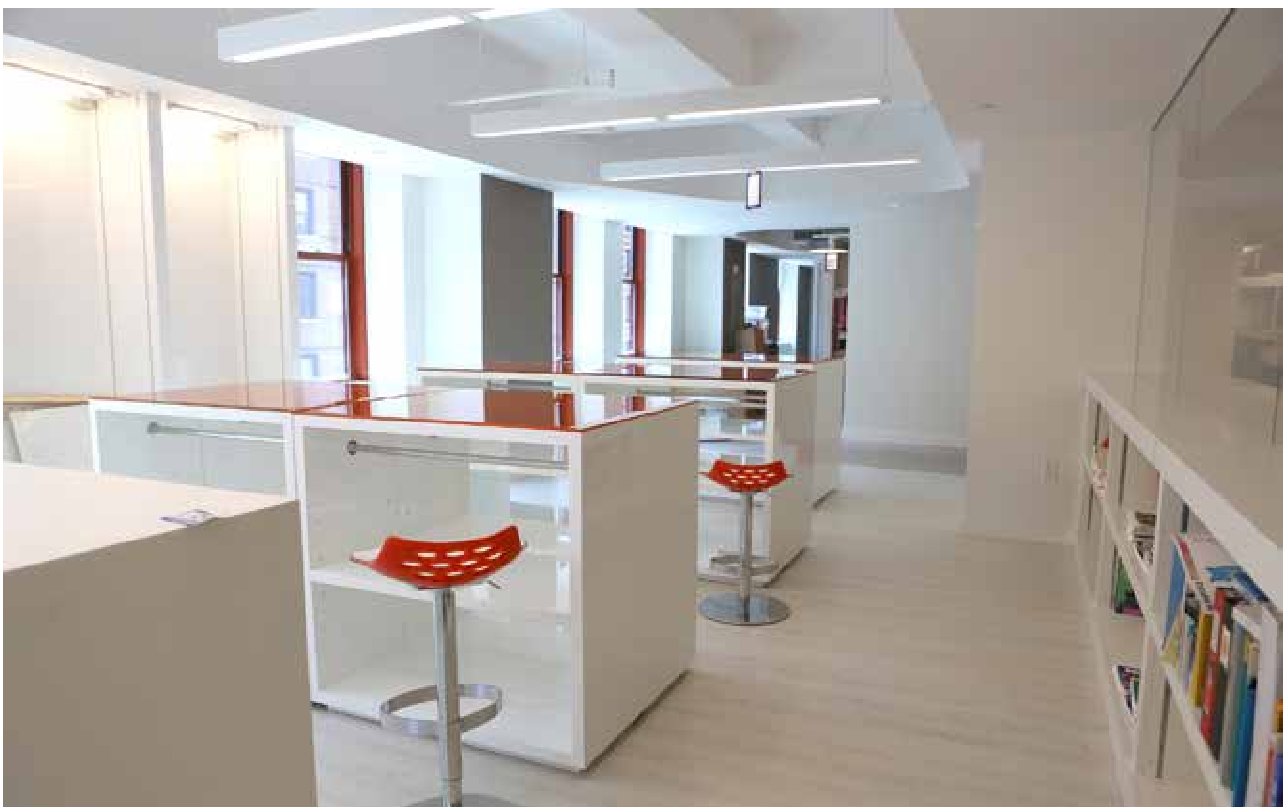
INTRODUCTION

This Energy Performance Optimization Guide is a resource describing how to develop, quantify, implement, and measure energy performance solutions in a commercial office space. The Natural Resources Defense Council's (NRDC) Center for Market Innovation (CMI) developed, tested, and refined this process during the execution of live tenant projects included in its High Performance Tenant Demonstration Project. The goal was to find common solutions applicable across a broad spectrum of tenant conditions. The guide features three modules: Project Initiation, Value Analysis, and Implementation/Measurement and Verification. It is a framework that works together with a set of supporting tools to map out an energy performance analysis process that is integrated into each phase of the tenant's process—site selection, design, construction, and occupancy.



The guide provides an introduction to the process of evaluating the economics of energy performance for tenants, building owners, and their representatives. In doing so, real estate decision makers are encouraged to demand a straight-forward and transparent value analysis of energy and indoor environmental quality solutions to be considered in fitting out a new space upon a tenant's relocation, or retrofitting an existing space upon lease renewal.

However, the guide is designed to go beyond the introductory level, to serve as an in-depth resource providing tenants and their design teams with specific instructions and tools for incorporating the quantification of energy performance measures into standard build-out design and construction practice. The guide is intended to help build the market expertise that will be needed to meet the demand for this professional service, and to encourage a financing market to support implementation of high performance projects. By understanding the process, tenant's project teams (architects, engineers, contractors, and project managers) will have the ability to define the cost effectiveness of proposed energy performance options at the right time during the design process to inform a client's decision-making. The process is outlined to complement the milestones already taking place in the project team's carefully choreographed build-out process. Depending on the tenant space size, scope, and schedule, it is possible either to apply the process to the entire leased premises or to apply the results and learning from early phases to future floors to be built out in the same building or other spaces within the tenant's portfolio.

VALUE ANALYSIS: QUANTIFYING ENERGY PERFORMANCE DURING DESIGN

CMI is introducing the Value Analysis as the first module to the guide, as it serves to anchor the economic case for energy performance during the tenant's lease cycle. This quantitative process synthesizes the project development analysis using quantitative metrics. Energy use modeling and costing analytics are used to test energy performance scenarios and determine an optimal energy performance package. The Value Analysis includes a financial scorecard and a narrative describing the evaluation process and technical factors relating to the energy performance recommendations, and is timed to align to the tenant's design and decision-making process. This provides the tenant and its existing facilities/design team with the right information to determine tiers of good, better, and best packages of energy performance measures to incorporate into the build-out of the space.

The Value Analysis combines data generated by the Energy Modeling and Incremental Costing steps, to identify and recommend the highest value set of Energy Performance Measures (EPMs) to incorporate into the design of a tenant's new premises. Thus, it provides energy efficient alternatives to code-compliant designs and systems without diminishing effectiveness, quality, or user comfort or satisfaction:

I. **Energy Modeling** *is conducted to inform early design decisions. Results are used to recommend measures for building systems, lighting, controls, and plug loads in order to optimize energy use. The model measures the impact of potential scenarios and compares them to a baseline, code-compliant space.*

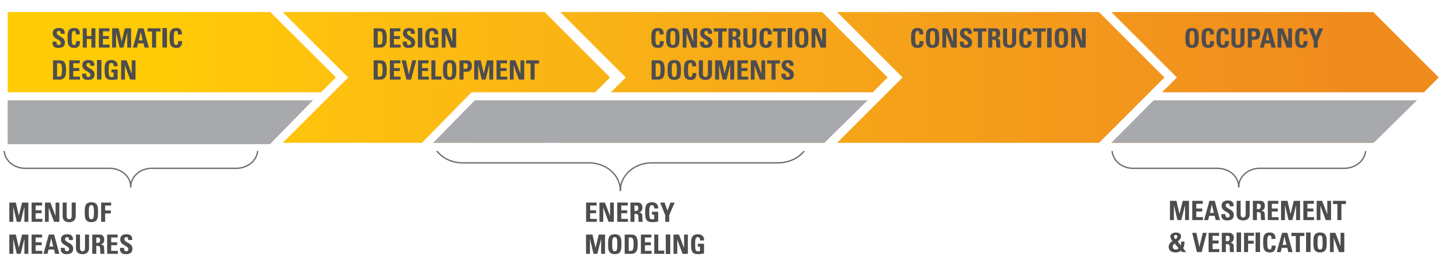
II. **Incremental Costing** *is performed to determine the additional first cost (if any) required to upgrade from a baseline design element to a high performing alternative.*

III. **Financial Analysis** *closely relates capital and operating expenses to one another by quantifying the costs and benefits. It is intended to determine the most cost effective opportunities for energy savings.*

An energy performance recommendation, documenting the evaluation process and outcomes of the energy modeling, costing analysis, and the program needs, frames the financial analysis. The Value Analysis projections quantify annual and lease-term financial impact and take into account possible incentives and tax deductions. They also determine the payback period of each measure and an optimal package of EPMs, together with the Net Present Value and Return on Investment of the optimal EPM package. The evaluators should include the project's design, facilities, construction, accounting, and management teams.

I. ENERGY MODELING

Energy modeling is a computer simulation used by engineers and architects to understand the implications of design on the energy performance of a building or tenant space. Energy modeling is a powerful tool when used early in the integrated design process. Incorporating energy modeling allows for analysis throughout the design process; it can be used in applying for potential incentives, tax deductions, and Leadership in Energy and Environmental Design (LEED) enhanced commissioning credits, and it can support post-occupancy measurement and verification and ongoing commissioning. Select an energy modeler who can partner closely with the project team to work through different design scenarios (see the sample Request for Proposal). For the purpose of a high performance tenant build-out, the energy modeling should be performed during the Design Development (DD) and Construction Document (CD) stages.



The application of the Energy Modeling tool entails the following steps:

1. SELECT A MODELING TOOL

There are many energy modeling software tools available on the market today. The suitability of a modeling tool will vary depending on a project's goals and scope, where the project is in the design process, and the tools with which the energy modeler, project engineer, and architect are most familiar. The most widely used energy modeling tool is the Department of Energy's (DOE) open source eQuest interface for the DOE-2 engine. For a list of many available modeling tools and detailed descriptions, please see the American Institute of Architects (AIA) Guide to energy modeling.[1] In order to convey streamlined modeling results, the modeler may use the *Sample Energy Model Report Template*.

2. CREATE A BASELINE ENERGY MODEL FOR THE SPACE

Energy modeling predicts the anticipated annual energy consumption of a building (or a tenant space within a building) based upon various design and operational assumptions.[2] The modeling software typically evaluates the performance of the space over a characteristic one-year period to account for seasonal differences in weather, sunlight, and occupancy. The model also incorporates assumptions regarding operations and maintenance of the space and equipment in order to develop the most accurate prediction of how the space will actually perform.

The energy modeling process should be discussed during schematic design, and commence at 50 percent DD. The model will compare the projected energy consumption of the tenant space—assuming certain design scenarios (incorporating different energy performance measures) – against the projected energy performance of a baseline design. The first step is to model the baseline energy consumption for the space, using existing whole building parameters and assuming minimal compliance with local energy code requirements for the tenant space. The architect, engineer, and energy modeler must discuss the possible baseline options and define the best point of comparison depending on what data metrics provide the best energy improvement values. In many cases, a tenant's business-as-usual design incorporates above-code design elements or the base building may have undergone energy efficiency retrofits, which affect the anticipated baseline energy consumption of a space. Thus, the modeler may develop an adjusted baseline, in order to account for either a building owner's recent energy capital improvements or a tenant's planned above-code design.

3. MODEL THE ENERGY PERFORMANCE MEASURES

After modeling a baseline design in the software, the team next incorporates each individual Energy Performance Measure (EPM) under consideration in early energy discussions separately into the model. This helps the team understand the effect that each specific measure has on the projected energy performance in the tenant space. EPMs may include envelope, lighting, plug load, server room energy reduction and heating, cooling, and ventilation (HVAC) strategies. The model output will include energy savings delivered in units of energy (e.g. kWh or BTU),and for a tenant energy model, the primary energy use quantified is electricity.[3]

4. CREATE A PACKAGE OF EPMS AND PERFORM ITERATIVE MODELING TO DETERMINE ITS ENERGY SAVINGS

Based on the findings of the individual EPM study, the design team will group a sensible set of measures and order them to 1) reduce loads, 2) increase equipment efficiency, and 3) address occupant behavior through controls or automated technology. Packages of measures should be grouped and modeled to delineate good, better, and best energy performance scenarios. In order to understand the interactive effects of measures within a package, the model must be run through repeated cycles incorporating a new EPM with each run, a process called *iterative modeling*. The results of iterative modeling predict the cumulative effect of implementing a package of EPMs, which accounts for interactions between individual measures that may affect overall energy consumption. For example, a unit of energy saved by utilizing daylight harvesting cannot be saved again through high efficiency lighting, thus iterative modeling would show less energy savings for this package of EPMs compared to modeling the measures independently.

The output of the model will provide estimated annual energy savings based upon the selected package of measures as compared to the modeled baseline scenario, which can be broken out into identified savings for both the tenant space and the base building systems. For example, certain EPMs may reduce the overall demand on the central building systems, including centralized conditioned air, steam, condenser, and chilled water savings. Depending on the utility billing structure in the lease, such savings are likely to accrue to the building owner (or be shared with all of the other tenants in the building). Savings from lighting, plug load, and server room EPMs typically benefit the tenant directly.

5. FINALIZE THE PACKAGE SELECTION

The team should then use the projected energy savings data from the model for potential EPM packages under consideration, combined with preliminary incremental costing estimates for the measures involved (see *Incremental Costing*), to perform a rigorous financial analysis that will determine the economic implications of the respective EPM packages (see *Financial Analysis*). The tenant and its design team should then select a final package of EPMs based on environmental (i.e. energy reduction) and economic value analyses that meet the team's performance and investment goals. At this point, the team should run a final energy model incorporating the decisions to be included in the construction drawings. The results from the final energy model may be recalibrated after construction and occupancy, and then used to verify performance of the space. If any elements of design change during construction, the model will need to be updated for the most accurate results.

6. PERFORM MEASUREMENT AND VERIFICATION

When construction is complete and the space is occupied, the team may elect to implement a measurement and verification (M&V) process. It is recommended that the M&V process commence after equipment has been commissioned, all occupants are settled in the space, and a facility operations process is established. The M&V process requires the collection of actual energy consumption from meters and localized weather data, as well as verification of occupancy and operational assumptions, in order to calibrate the energy modeling tool. Once the model is calibrated, the team may use the tool to check that ongoing energy performance is in

High Performance Energy Modeling Process Overview

1. Create baseline model for the space, typically the minimum performance required by local energy code (the High Performance Demonstration Project uses ASHRAE 90.1-2007 as the baseline). May create an adjusted baseline to account for current base building energy efficiency retrofits and tenant's typical design.
2. Model energy performance measures (EPMs) individually against the baseline to evaluate the potential energy savings produced by each.
3. Select individual measures that are design-feasible and show potential energy savings to create one or more prospective package(s) of EPMs.
4. Perform iterative modeling to determine the energy savings of the package(s) of EPMs, taking into account interactive effects of measures.
5. Use iterative model results and prelminary incremental costing information to perform financial analysis, finalize the package selection, and run a final energy model.
6. After occupancy, perform measurement and verification (M&V) to calibrate the energy model, which can then be used as part of a continuous commissionng process.

line with the projections of the model and make informed operational adjustments in the space if necessary. If the building owner maintains an energy model to assess whole building energy performance, the tenant's energy model and ongoing energy use analysis may be incorporated into the master model for improved tracking of tenant energy use.

DETAILED ENERGY MODELING INPUTS AND ASSUMPTIONS[4]

General Geometry/Massing and Form

- Building shape and orientation
- Program – principal building function (e.g. small office, large office, hospital, hotel, etc.)
- Total floor area
- Number of floors
- Thermal zoning of floors (perimeters and core)
- Floor-to-floor height
- Floor-to-ceiling height

Envelope

- Window dimensions (for each orientation if different, lower vs. upper floors if different)
- Glazing sill and head height (above floor, each window type)
- Window-to-wall ratio (for each orientation if different, lower vs. upper floors if different)
- Shading geometry (for each orientation if different)
- Windows and skylights (solar heat gain coefficient, U-value and visible light transmission, frame-type)
- Wall, roof, and foundation construction/makeup
- Interior partitions, internal mass (furniture)
- Infiltration assumptions (infiltration schedule – weekday, weekend, holiday)

Internal Loads and Schedules

- Anticipated occupancy (average number of people)
- Lighting power density (average W/ft^2)
- Daylight sensors, occupancy sensors
- Plug load power density (average W/ft^2)

- Exterior lighting peak power
- Elevator (type, peak motor power, schedule of use)
- Occupancy schedule (summer/winter; weekday, weekend, holiday hours of use)
- Lighting schedule (summer/winter; weekday, weekend, holiday hours of use)
- Plug load schedule (summer/winter; weekday, weekend, holiday hours of use)
- Exterior lighting schedule (summer/winter; weekday, weekend, holiday hours of use)

HVAC Systems and Schedules

- System type (heating and cooling)
- Sizes (capacity and efficiency) or "autosize to design day"
- Distribution type (e.g. VAV terminal boxes with electric reheat, under-floor plenum, etc.)
- Thermostat setpoint and setback (heating and cooling)
- Ventilation/outdoor air requirements
- Economizers, energy recovery
- HVAC fan operation schedule (summer/winter; weekday, weekend, holiday hours of use)
- Heating schedule of operation (winter – weekday, weekend, holiday hours of use)
- Cooling schedule of operation (summer – weekday, weekend, holiday hours of use)
- Minimum outdoor-air schedule (weekday, weekend, holiday hours of use)

In more detailed analyses, modeler will also need: fan efficiency; pump type/efficiency; cooling tower type/efficiency; service water type/efficiency/volume/T-setpoint; and service hot water schedule of use.

1 "An Architect's Guide to Integrating Energy Modeling in the Design Process." The American Institute of Architects (AIA, 2012) pp. 53-75. *Available at* http://info.aia.org/aia/energymodeling.cfm.
2 Also called "Building Energy Modeling" or "BEM."
3 Some modeling software has the ability to incorporate utility rate data to provide estimated cost savings.
4 Ibid 1., p. 79.

II. INCREMENTAL COSTING

Cost is a critical component in evaluating the financial implications of incorporating various energy performance measures (EPMs) into a tenant build-out project. When designing a high performance space, oftentimes the team will consider EPMs that are not stand-alone design features, but rather changes to a standard design that increase energy efficiency. Therefore, it is important to determine the additional sums (net of cost avoidance from reducing loads and equipment) that will be incurred when implementing a high performance design as compared to the relevant baseline budget. This difference is referred to as the *incremental cost* of the high performance design.

The party best positioned to perform the EPM incremental costing analysis will typically be the tenant's general contractor, but in some cases the tenant may choose to retain a third party costing consultant. To ensure consistency of results throughout the High Performance Tenant Demonstration Project, CMI retained SKANSKA to perform (or peer review) the costing analysis for each of the participating tenant build-out projects.

DETERMINE THE BASELINE COST

Depending on the tenant's design intent, business-as-usual construction budget, and timing of the analysis, the baseline budget may be:

1. Cost of a standard, code compliant design, if no design is yet in place; or
2. Project costs per a business-as-usual budget, if the tenant plans to implement quality or performance standards above a basic code-compliant design as part of the tenant's typical design prototype or design already in progress.

In order to determine the incremental cost of each EPM, the team must first determine the baseline cost for the equivalent design as outlined above. The design used to estimate the baseline costs should be consistent with the design the project team has selected for the corresponding energy model. Thus, if the team uses a code-compliant baseline to model energy savings from an EPM, the incremental costing should also utilize a code-compliant design to establish the baseline cost. However, if the energy model uses an adjusted baseline that accounts for above-code design features or quality standards, the incremental costing should use the project as-designed drawings and specifications as a baseline. It is important that the costing baseline is consistent with the energy modeling baseline so that the projected energy savings accurately map to an associated incremental cost.

DETERMINE THE INCREMENTAL COST

To begin the incremental costing process, the project team must provide the general contractor with the following information:

1. Architectural, electrical, and mechanical drawings as designed by the architect
2. Specifications for all relevant equipment included in the as-designed drawings
3. Energy Modeling Report, including descriptions of proposed EPMs
4. Any additional information, specifications, or details the team has about proposed EPMs
5. Any relevant base building information

Determining incremental costing is a collaborative process among the energy modeler, the project engineer, and the general contractor. As it is usually not realistic for a project to pay for two full sets of drawings (one baseline and one high performance), estimates to install the EPMs must be based upon the design in the energy model, likely specifications, and the engineer's best information. If the project team engages in the Value Analysis process early enough to determine a possible package of EPMs, measures can be incorporated as alternates to the as-designed construction drawings for improved costing accuracy.

Using the design drawings, specifications, and EPM information, the contractor will obtain construction bids from the various subcontractors involved. The estimates should isolate the cost of each individual EPM, even if its impact is spread across several trades, to allow the project team to individually analyze the incremental cost of each measure (see the sample *Costing Summary Sheet*).

The direct construction costs should first be identified and isolated and then markups should be applied to the differential cost. The incremental cost of an EPM should net out avoided costs from reducing energy loads and equipment from any additional sums required to install energy cost saving equipment. See the example costing below:

	EXAMPLE ITEM		ESTIMATE
(1)	Estimated Direct Construction Cost for Baseline Design		$5,000
(1)	Estimated Direct Construction Cost for EPM		$7,500
(2)	**Incremental Cost without Markups**		**$2,500**
(3)	Local Tax on Materials Only	8.75%	$110
	Design Contingency	8%	$200
(4)	General Contactor GC's and Fees	10%	$250
(5)	Bonds and Insurance	2%	$50
(6)	**Incremental Cost with Markups**		**$3,110**

Notes:
(1) Estimated direct construction costs include subcontractor overhead, profit, and fee. Does not include local sales tax.
(2) Incremental cost without markups between the baseline design and high performance design.
(3) Includes local sales tax on materials only. Assumes 50 percent of the incremental cost is materials and a tax rate of 8.75 percent.
(4) General contractor's general conditions (GC)/management costs and fee.
(5) Payment and performance bond and general contractor's liability and builder's risk insurance.
(6) Total estimated incremental cost including markups between the baseline design and high performance design..

III. FINANCIAL ANALYSIS

Building upon the outputs of energy modeling and incremental costing, financial analysis helps to assess the proposed investment in energy performance measures (EPMs) by quantifying the costs and benefits, closely relating capital and operating expenses to one another.

1. IDENTIFY THE FOLLOWING INPUTS:

USER INPUT	LIKELY SOURCE
Baseline Energy Consumption (kWh)	Energy Model
Modeled Energy Reduction (kWh)	Energy Model
Total Area, Tenant Space (ft^2)	Lease Document
Lease Period (years)	Lease Document
Utility Base Rate $/kWh	Utility Company or Building Owner
Utility Escalation Rate (%/year)	Industry Projections
Incremental First Cost of EPMs ($)	Contractor Costing
Energy Efficiency Incentives ($)	City, State, and Federal Programs; Utility Companies
Discount Rate (%)[1]	Tenant

2. IDENTIFY GOALS AND EVALUATION METRICS FOR INVESTMENT IN ENERGY EFFICIENCY:

EVALUATION METRIC	LIKELY RANGE
Adjusted Payback Period (Net of Incentives)	3 to 5 years
Return on Investment	> 20%
Internal Rate of Return	> Discount Rate

DEFINITIONS:

Payback Period is the length of time required to recover the cost of an investment. The payback period of a given investment or project is an important determinant of whether to undertake the investment or project, as longer payback periods will typically require longer investment horizons.

PAYBACK PERIOD FORMULA: $\frac{\text{INCREMENTAL FIRST COST}}{\text{ANNUAL ENERGY COST SAVINGS}}$

Return on Investment (ROI) is a performance measure used to evaluate the efficiency of an investment or to compare the efficiency of a number of different investments. To calculate ROI, the benefit (return) of an investment (net of initial cost of investment) is divided by the cost of the investment; the result is expressed as a percentage or a ratio.

ROI FORMULA: $\frac{\text{NET PRESENT VALUE}}{\text{ADJUSTED INCREMENTAL FIRST COST}}$

Return on investment is a popular metric because of its versatility and simplicity. That is, if an investment does not have a positive ROI, or if there are other opportunities with a higher ROI, then the investment should be not be undertaken.

Net Present Value (NPV) is the difference between the present value of cash inflows and the present value of cash outflows. NPV is used in capital budgeting to analyze the profitability of an investment or project.

Internal Rate of Return (IRR) is the discount rate often used in capital budgeting that makes the net present value of all cash flows from a particular project equal to zero. Generally speaking, the higher a project's internal rate of return, the more desirable it is to undertake the project. As such, IRR can be used to rank several prospective projects a firm is considering. Assuming all other factors are equal among the various projects, the project with the highest IRR would probably be considered the best and undertaken first.

3. IDENTIFY AND REGISTER FOR ALL QUALIFYING ENERGY EFFICIENCY INCENTIVES, OFTEN AVAILABLE FROM:

3.1 City, State, Federal Programs [Federal tax deduction under § 179D may allow for accelerated depreciation ($0.30-$1.80 / ft^2 of tenant build-out)]

3.2 Utility Companies

3.3 State Energy Offices

4. FOR EACH ENERGY PERFORMANCE MEASURE (EPM) IDENTIFIED, EXTRACT THE FOLLOWING:

4.1 Annual Energy Use Reduction (kWh) from the Energy Model

4.2 Incremental First Cost from the Contractor's Costing

Energy Performance Measure	Annual Energy Use Reduction		Annual Energy Cost Savings	Incremental First Cost	Simple Payback
Plug Load Reduction	**37,757 kWh**	4.1%	$5,664	**($24,700)**	4.4 years

4.1

4.2

5. FOR EACH EPM, CALCULATE THE FOLLOWING:

5.1 Annual Energy Cost Savings (Annual Energy Use Reduction x Utility Base Rate)

5.2 Simple Payback[2] (Incremental First Cost / Annual Energy Cost Savings)

5.3 Consider these outputs when combining individual EPMs into tiers of good, better, and best "Packages of Measures" to incorporate into the design of the space.

Energy Performance Measure	Annual Energy Use Reduction		Annual Energy Cost Savings	Incremental First Cost	Simple Payback
Plug Load Reduction	37,757 kWh	4.1%	**$5,664**	**($24,700)**	4.4 years

5.1 Calculation:
37,757 kWh x $0.15/kWh

5.2 Calculation:
$24,700 / $5,664

6. FOR EACH PACKAGE OF MEASURES:

6.1 Extract the Annual Energy Use Reduction[3] (kWh) from the Energy Model

6.2 Calculate Energy Cost Savings (Annual Energy Use Reduction x Utility Base Rate)

6.3 Sum the Incremental First Costs of all included EPMs

6.4 Calculate Simple Payback without Incentives (Incremental First Cost/Annual Energy Cost Savings)

ENERGY PERFORMANCE MEASURE	ANNUAL ENERGY USE REDUCTION		ANNUAL ENERGY COST SAVINGS	INCREMENTAL FIRST COST	SIMPLE PAYBACK
Envelope	31,464 kWh	3.5%	$4,720	($21,850)	4.6 years
Lighting	65,117 kWh	7.1%	$9,768	($47,500)	4.9 years
Plug Loads	37,757 kWh	4.1%	$5,664	($24,700)	4.4 years
Heating	58,915 kWh	6.5%	$8,837	($43,700)	4.9 years
Cooling	98,496 kWh	10.8%	$14,774	($59,850)	4.1 years
Ventilation	18,696 kWh	2.1%	$2,804	($13,300)	4.7 years
Package of Measures	**310,445 kWh**	**34.0%**	**$46,567**	**($210,900)**	**4.5 yrs**
	6.1		6.2	6.3	6.4

7. APPLY FOR ALL REGISTERED ENERGY EFFICIENCY INCENTIVES IN ACCORDANCE WITH THE SELECTED PACKAGE OF MEASURES:

[Note that under many incentive programs, the Energy Modeling and Value Analysis processes described herein will allow tenant to qualify for a higher level of financial incentives.]

7.1 Calculate the Adjusted Incremental First Cost (Incremental First Cost minus Energy Efficiency Incentives)

8. DOWNLOAD CMI VALUE ANALYSIS TOOL BETA AND USE IT TO CALCULATE THE FOLLOWING:

8.1 Adjusted Payback Period (Net of Incentives)

8.2 Return on Investment

8.3 Internal Rate of Return

EXAMPLE VALUE ANALYSIS TOOL BETA SHOWING USER INPUTS AND VALUE ANALYSIS			
USER INPUTS		**VALUE ANALYSIS**	
Baseline Energy Consumption	912,000 kWh	Lease Period Energy Savings	$487,191
Modeled Energy Reduction	310,445 kWh	Adjusted Incremental First Cost	($171,000)
Total Area, Tenant Space	95,000 ft^2	Adjusted Payback Period	3.6 years
Lease Period[4]	10 years	Net Present Value (NPV)	$158,223
Utility Base Rate	$0.15/kWh	Return on Investment	93%
Utility Escalation Rate	1%/year	Internal Rate of Return (IRR)	25%
Incremental First Cost of EPMs	($210,900)		
Energy Efficiency Incentives	$39,900		
Discount Rate	7.0%		

1 Tenant's minimum acceptable rate of return on investment.
2 Simple Payback period does not account for Utility Rate Escalation or time-value of money.
3 Due to the interaction among individuals EPMs, the Energy Use Reduction for the Package of Measures is unlikely to equal that of the sum of the individual EPMs.
4 Consider possible extensions to the initial Lease Period.

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