Best Practices Guide: Economic and Financial Evaluation of Energy Efficiency Projects and Programs

Prepared for:
Energy and Environment Training Program
Office of Energy, Environment and Technology
Global Bureau, Center for the Environment
United States Agency for International Development

Implemented by:

The Energy Group
Institute of International Education
Washington, DC

Prepared by:

Econergy International Corporation
Boulder, Colorado

ECONERGY INTERNATIONAL CORPORATION

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Acronyms

COA	Certificate of Acceptance
CRF	Capital Recovery Factor
DSM	Demand Side Management
EE	Energy Efficiency
EEM	Energy Efficiency Measure
EIC	Econergy International Corporation
ESA	Energy Savings Agreement
ESCO	Energy Services Company
HVAC	Heating, Ventilation, and Air Conditioning
IIE	Institute of International Education
IPMVP	International Performance Measurement & Verification Protocol
IRR	Internal Rate of Return
LEEM	Lighting Energy Efficiency Measure
LOA	Letter of Agreement
LOI	Letter of Intent
M&V	Monitoring and Verification
MEEM	Mechanical Energy Efficiency Measure
NPV	Net Present Value
NPW	Net Present Worth
RFP	Request for Proposals
RFQ	Request for Qualifications
ROE	Return on Equity
ROI	Return on Investment
SPB	Simple Payback
USAID	United States Agency for International Development

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The material found in this Guide has been adapted from a month-long international course presented by Econergy International Corporation (EIC) to a multinational audience in Boulder, Colorado. EET would like to acknowledge the expertise and commitment of the principal authors of this Guide. They include: Evan Evans, John Paul Moscarella, Frederick Renner, and John Canfield, Tom Stoner and Christie Barnes of EIC. These individuals' commitment to providing the highest quality training materials has allowed this Guide to be of equally high quality. EET would also like to thank the Institute of International Education for their support in bringing this Guide to completion, as well as their commitment to implementing and administering quality training programs.

Introduction

The United States Agency for International Development's (USAID) Global Center for Environment has developed the Best Practices Guide Series to provide technical information on the topics of energy efficiency and the environment to support international initiatives and promote the use of clean and innovative technologies. This series of guides is adapted from coursework that was designed to develop technical leadership capacity in energy development and greenhouse gas emissions reduction that are both friendly to the environment and beneficial to economic growth. This guide is for financial decision-makers, project developers and others involved in the financing and development of energy efficiency projects. It provides the analytical tools and technical information necessary to evaluate the financial viability of energy efficiency projects. Through a contract with the Energy Group at the Institute of International Education (IIE), USAID's contractor for the Technical Leadership Training Program, Econergy International Corporation (EIC) has prepared the *Best Practices Guide: Economic and Financial Evaluation of Energy Efficiency Projects and Programs*.

IIE's Energy Group provides assistance and training to government and business leaders to develop the skills and knowledge they will need to succeed in meeting their energy management and national development goals.

EIC is a technical, financial, and economic consulting firm serving clients in the energy and environment industries. Staffed with engineers, economists, financial and policy analysts, EIC provides clients in the U.S. and abroad with broad-based and targeted assistance in the areas of Energy Efficiency Services, Project Finance and Development Services, Distributed Power Generation Services, Carbon Management Services, Utility Restructuring Services, Energy Services for Competitive Markets, and Strategic Planning and Analysis Services.

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Chapter 1

Introduction to Energy Efficiency

Energy efficiency projects can result in numerous benefits. By using energy more efficiently an organization's vulnerability to energy prices is reduced, while its cost effectiveness is improved, and the environmental impacts of electricity production are avoided.

Frequently entities must choose between investing in energy efficiency or energy supply. There are numerous issues surrounding these decisions.

Energy Supply

Investing in supply is a capital intensive undertaking, usually paid primarily in foreign exchange adding currency risk to the investment equation. Already a large part of public investment budgets, additional investments in supply can have difficult financial consequences and damaging environmental impacts. Even if the money is available, it is difficult to expand supply capacity quickly.

Increasing energy supply involves building generating facilities funded with equity and long-term non-recourse debt. The variety of funding sources includes equity from developers, investment funds, venture capitalists, utilities; and debt from capital markets, development banks, or commercial banks. Revenue is realized from the electricity generated and sold, typically through power purchase agreements with utilities. The significant direct project costs include designing, building, operating, and retiring a generation facility, while the indirect project expenses include social and environmental costs. In building additional supply capacity there are formidable performance risks, fuel cost fluctuation risks, and credit risks.

Energy Efficiency

Energy efficiency, on the other hand, reduces the need to build additional capacity by reducing energy demand. It decreases the environmental impacts of increased generation through avoided demand. Energy efficiency decreases life cycle costs to consumers while also decreasing system-wide capital costs. Efficiency can be achieved through improvements to a variety of systems including HVAC, motors, drives, lighting, and controls. Projects can be funded via grants, low-interest loans, market-rate loans, leases, or performance contracts from funding sources including Energy Services Companies (ESCOs), utilities, capital markets, equipment vendors, or development banks. Energy cost savings result in cash flows for energy efficiency projects. Direct project costs include design, installation, and maintenance of the energy efficiency measures. Energy efficiency projects tend to be on a much smaller scale than generation projects, occurring at numerous sites with highly engineered technology. The risks involved in an energy efficiency project include the possibility that actual measured savings may not meet projections, credit risk, currency risk, and the potential for facility operating changes.

Environmental Costs of Energy Use

There are a number of environmental costs associated with energy use. Electricity generation releases several pollutants into the air including air particulates that cause health problems and impair visibility, sulfur dioxide (SO_2) and nitrogen oxides (NO_X) which cause acid rain, and greenhouse gases that contribute to climate change. Additionally, generation causes water pollution and waste accumulation through ash, sludge, and radioactive waste, depending on the type of generation facility.

Cost Benefit Analysis

For the various stakeholders there are both costs and benefits associated with pursuing energy efficiency projects.

Perspective	Benefits	Costs
Utility	Avoided supply costs	Utility cost of DSM measures & marketing
Ratepayer (Rate Impact Measure)	Avoided supply costs	Utility cost of DSM measures & marketing, and lost revenues
Society (Total Resource Cost)	Avoided supply costs	Utility cost of DSM measures & marketing and net customer costs
Participant	Bill savings (lost revenues for the utility)	Net customer costs
ESCO	Share of utility bill savings	Marketing, debt service to cover cost of energy efficiency measures

Chapter 2

Energy Services Company Model

Energy Services Companies (ESCOs) provide customers with a means to reduce their energy use and demand through performance-based contracting. An ESCO serves as a general contractor using standard overhead and profit margins, capable of financing and guaranteeing its performance if it serves as a design/builder. Through performance contracting, the ESCO minimizes the risk to the customer of inflated construction costs and under-achieved savings. The challenge for the ESCO is working with the customer to overcome their concerns regarding the value of the ESCO's service offerings and financial arrangements.

Historically, when pursuing an energy efficiency project large public and private clients would hire an engineering company to design the installation. The client would then issue requests for proposals (RFPs) to contractors. The engineering company then assisted the client in selecting the best or lowest cost contractor.

This procurement process of the past created problems for the client when trying to procure energy services, leading to the emergence of the ESCO. Energy efficiency project clients are not procuring an equipment installation, but instead are looking for actual results in the form of energy savings in addition to improved system performance. Under the old procurement process, the design engineer could not be held responsible for the installation by a different contractor nor could the installation contractor be held responsible for the design. Existing conditions, for example, may be substantially different than those established in the design, profoundly impacting energy savings. Under the ESCO model, the ESCO assumes the role of a design/builder, taking responsibility for the whole process.

ESCOs meet client needs to reduce costs, improve energy efficiency, manage risks, consolidate services, and enhance competitive advantage. To meet these needs ESCOs offer integrated energy services including analysis, energy and equipment, installation, monitoring, and guarantees. Contracting arrangements with an ESCO usually offer flexible terms, financing, risk management, quality assurance, verifiable performance, and follow-on service. Specific energy efficiency options vary from project to project in scale, ownership, location, technology, load factor, run-time, control type, services, and financing provided.

Fundamentally, an ESCO makes money in a fashion similar to a general contractor. ESCOs typically mark-up the cost of materials to cover overhead and profit. ESCOs will attempt to make a small margin on financing the project consistent with the credit and performance risk involved. However, an ESCO may or may not make money from financing, particularly if it is offered through a third party. Additional costs are associated with monitoring the project that typically are not embedded in the interest rate cost or the installed cost. These are usually included as a separate line item or a fee for a savings guarantee (see the section on Finance & Contract Arrangements).

Chapter 3

Performance Contracting

With shared savings, paid from savings, or guaranteed savings contracts, an ESCO's payment is realized as a portion of the energy savings. This arrangement is known as performance contracting because the ESCO will not receive its payments unless the project performs as expected. This arrangement makes it possible to borrow against future utility bill savings to pay for the efficiency measures creating the opportunity for 3rd party financiers to take part in the arrangement. Using a performance contract ESCOs guarantee at least a minimum level of energy efficiency improvement to the customer and/or utility.

Tecate Case Study: The 1st True Performance Contract in Mexico

This case study presents an energy efficiency project in Mexico that will generate carbon emissions reductions. The economics of the project are such that carbon sales are an essential source of revenue for the ESCO under the performance contract. The energy efficiency sector has tremendous business potential in Mexico, but there are financing constraints. Even relatively small projects at major industrial facilities may not gain approval from corporate officials because of competition for capital spending budgets for purposes other than energy efficiency. In response, Mexican energy services companies have begun to use the performance contracting model to improve their prospects of gaining approval from clients who can assign regular lease payments to budgets for operations and maintenance expenditures.

Facility:
Two industrial beer brewing facilities

Program Objectives:
- Customer wanted to outsource the supply of energy services
- Customer wanted to place the risk of energy infrastructure operations onto the contractor

Key Stakeholders:
- Tecate & Navajoa Breweries (the Client)
- Empresas ESM (the ESCO)

Financing Mechanisms:
- 7 year revenue stream would repay the investment, including operations costs and a profit to the ESCO
- The ESCO was a start-up company with limited assets, however, the Customer had excellent credit, making it possible for the ESCO to borrow funds to finance the project

- Performance risk was placed with the ESCO. Savings must exceed the projected minimum savings level for the ESCO to get paid.
- Funding sources:
  - $100,000 provided by a US environment fund at 15% over 5 years
  - $25,000 provided by EIC at 12% for 5 years
  - $29,000 (250,000 pesos) provided by FIDE at zero percent interest for one year
  - Carbon offsets of 5,000 tons over 5 year life of the project. The economics of the project make the carbon sales an essential source of revenue for the project.

Project Description:

- Systems were installed for controlling demand and energy consumption. Controls were installed on motors, fans, pumps, and other electric devices.
- Project cost:$160,000
- Projected energy savings:
  - 960,000 kWh per quarter over 5 years
  - $7,600 per month in winter
  - $20,800 per month in summer

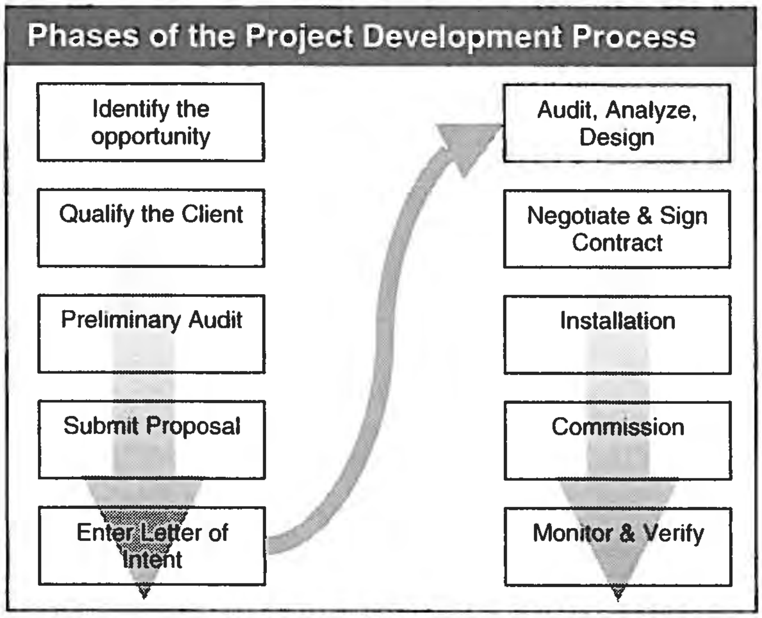
Lessons Learned:

- The strength of a client's credit can assist in obtaining financing in cases where the ESCO may be a start-up, but the project economics must also be strong.
- Carbon credits can serve as a financing mechanism for energy efficiency projects.

Chapter 4

Energy Efficiency Project Development Process

There are ten primary phases of the project development process. Each phase is described in detail below. In some cases, the phases have been combined for explanatory purposes.



Identify & Qualify the Client

- Identify the client
  - Possible criteria to look for are large energy users and clients with the potential for future work
  - In some instances, clients will solicit proposals, possibly using a Request for Proposals or Qualifications (RFP or RFQ)
- Qualify the client
  - Is the facility large enough?
  - Have any improvements been made recently?
  - Are the decision makers accessible?
  - Is the procurement process ESCo-friendly?
  - Client's credit history
- If OK, then proceed to next phase
- Submit an initial proposal

Preliminary Audit

- Copy all project documents to engineering
- Appoint an Audit Manager
- Hold internal meeting between the engineering and sales personnel to determine the scope of this preliminary audit
- Schedule the field audit with the customer, if applicable
- Perform brief examination of facility or conduct a telephone interview with the appropriate technical personnel in order to gather basic facility energy information
- Collect facility data including drawings, if available
- Conduct an initial evaluation of potential energy efficiency measures (EEMs) with known data
- If OK, proceed to next phase
- If not OK, write thank you letter

Submit Proposal and Enter a Letter of Intent

- In a proposal, present the initial findings to the client along with potential scenarios for proceeding
- Establish the client's financial criteria (IRR, payback time, need for capital improvements) for proceeding with the energy efficiency project
- Determine contract term and cash flow requirements for the project
- Provide client with a sample ESA to review
- Discuss financial options such as performance contracting, leasing, cash purchase, or loan
- ESCO and Customer enter a Letter of Intent or Agreement (LOI or LOA)
- Obtain credit application from the client with full financial details

Audit, Analyze & Design

- Evaluate potential energy efficiency measures (EEMs)
- Assess overall project viability using the client's financial criteria and the technical data already gathered
- ESCO's internal engineering, sales, and marketing personnel meet to re-evaluate customer expectations
- Prioritize EEMs to analyze
- Establish manpower requirements and schedules
- Determine audit equipment requirements
- Collect electrical inventory and data
- Collect mechanical inventory and data
- Assess lighting EEMs
- Assess mechanical EEMs
- Identify any factors that will prevent the project from proceeding
- Hold a meeting to develop new EEM ideas and packages with the additional technical information that's been gathered
- Analyze existing conditions
- Review EEM technology

- ❑ Develop design option ideas for MEEMs and LEEMs
- ❑ Estimate energy savings
- ❑ Estimate maintenance savings
- ❑ Estimate utility rebate amount, if any
- ❑ Estimate equipment pricing
- ❑ Estimate installation pricing
- ❑ Assess whether the project still meets financial criteria
- ❑ If the project isn't going to go forward, send thank you letter
- ❑ Hold client meeting to discuss initial audit results
- ❑ ESCO holds an internal meeting
- ❑ Collect any data still needed to complete LEEMs
- ❑ Collect any data still needed to complete MEEMs
- ❑ Conduct follow-up site visit, if necessary
- ❑ Develop schematic design
- ❑ Finalize selection of equipment
- ❑ Finalize energy savings
- ❑ Finalize rebate with utility, if any
- ❑ Confirm installed costs
- ❑ Write specifications for lighting and mechanical measures
- ❑ Initiate code review, local building codes, and compliance with safety and health regulations
- ❑ Prepare final budget and cash flow for internal review and approval
- ❑ Develop ESA, M&V plan, and baseline data
- ❑ Draft final audit document to customer
- ❑ Verify utility rates with utility
- ❑ Submit draft energy audit to financing party for approval, if applicable
- ❑ Submit draft energy audit to building engineer (technical decision-maker)
- ❑ Prepare final energy audit, taking into account any feedback from the client and financier
- ❑ Present the audit to the client with all of the decision makers present if possible
- ❑ Ask client to approve the audit and proceed to ESA if the financial criteria has been met

Negotiate and Sign Contract

- ❑ Prepare equipment lists and specifications
- ❑ Prepare savings calculation methodology
- ❑ Establish maintenance responsibility plan
- ❑ Obtain equipment warranty information
- ❑ Produce savings calculation worksheets
- ❑ Develop an Energy Services Agreement (ESA)
- ❑ Finalize negotiations with customer
- ❑ Sign ESA

Installation

- ❑ Finalize equipment design and specifications
- ❑ Hire an architectural and engineering firm to prepare construction documents, if necessary
- ❑ Solicit bids from labor subcontractors and equipment suppliers
- ❑ Submit pre-installation report to utility, if there is a rebate
- ❑ Prepare sub-contracts (double check terms and conditions with ESA)
- ❑ Select equipment and sub-contractors
- ❑ Complete code-review and approval based on construction documents
- ❑ Obtain permits, if necessary
- ❑ Schedule regular project meetings with the customer
- ❑ Set the construction schedule
- ❑ Submit invoice to financing entity for mobilization (if applicable)
- ❑ Commence construction
- ❑ Hold periodic project meetings to review subcontractor progress, reports, and invoices
- ❑ Track invoices to ensure budget compliance
- ❑ Evaluate and approve any adjustments to subcontracts to determine responsibility, timing, and payment changes (increased energy savings, for example)
- ❑ Develop punch list items to review with subcontractor
- ❑ Review punch list items with customer
- ❑ Complete utility report for post-installation and invoice for rebate, if applicable
- ❑ Generate as-built drawings and submit to client
- ❑ Receive lien waivers from subcontractors before issuing their final payment

Commission

- ❑ Perform a visual inspection of building systems to ensure that all equipment has been completely and properly installed
- ❑ Collect monitoring data to ensure the systems are working according to the intent of the design

Monitoring & Verification

- ❑ Send Certificate of Acceptance (COA) to Client
- ❑ Issue final payments to subcontractors
- ❑ Begin monitoring and verification phase which is detailed in the M&V plan in the ESA
- ❑ Issue first energy savings report
- ❑ Send an invoice to the customer

Chapter 5

Energy Auditing Overview

An energy audit is the first step in understanding how a facility uses energy. The purpose of an audit is to identify and prioritize cost-saving energy efficiency measures. Facility managers must learn how to select the best audit proposal and to make the best use of its recommendations.

Essential ingredients for a successful energy audit process include the support of the top management, teamwork, and communication among all of those involved. Some pitfalls to avoid are the gross over- or under- estimating of energy and cost savings that may result from a lack of understanding of the building systems and its interactions, inaccurate or incomplete gathering of system and operating data, and a bias of the auditor.

There are several types of energy audits, listed in order of increasing scope and therefore cost: Preliminary Audits, Utility Cost Analysis, Standard Energy Audit, and Detailed Energy Audit. Audits will usually culminate in an energy audit report that must be easily readable and digestible by both technical and non-technical audiences. The report should include charts and graphs to display information graphically whenever possible. All assumptions should be clearly stated and explained. Recommendations must be as clear as possible and include quantitative detail.

Audit Type	Description
Preliminary Audit	This type of audit consists of a one day site visit to collect an overall facility profile and information on major energy using systems and equipment. Recommendations resulting from a preliminary audit include low to no-cost actions that can provide immediate energy use and/or operating savings.
Utility Cost Analysis	The purpose of this type of audit is to analyze the operating costs of the facility, and determine the potential for energy efficiency retrofits. The auditor may also perform a preliminary audit to familiarize himself with the facility. Utility data and the facility's utility bills are analyzed for the past several years to identify patterns of energy use, peak demand, and weather effects. This information is used to identify energy savings potential, calculate the energy utilization index, and determine the incremental cost of each unit of energy.
Standard Energy Audit	This audit is a comprehensive analysis of the energy systems of a facility. It includes both a preliminary audit and utility cost analysis. In addition, the standard energy audit includes the establishment of baseline energy use, evaluation of energy measures in terms of energy and cost savings and cost effectiveness. Off-site, the auditor establishes the building's operational characteristics through drawings and discussions with building managers. Standards and codes are reviewed

	and building and equipment use schedules are established. On-site, an inventory is taken of all the energy consuming equipment nameplate ratings of energy consumption. Metering equipment is installed to verify the equipment's energy consumption. Based on the drawings, site survey, and utility analysis, the auditor creates a baseline energy model. Potential energy savings measures are then evaluated for their efficiency and payback.
Detailed Energy Audit	The detailed energy audit follows essentially the same steps as the standard audit, however, it is broader in scope and usually takes more time. Computer simulation tools are typically employed, and more detailed metering of consumption is undertaken. The economic analysis involves an integrated systems approach which accounts for interactions in implementing multiple retrofit measures, such as lighting and HVAC.

Life Cycle Cost

LCC is the total discounted (present worth) cash flow for an investment with future costs during its economic life

$$LCC = CC + \sum C_n / (1+r)^n - SV / (1+r)^t$$

Where:
CC = initial capital cost (capital, labor, overhead)
C_n = operating cost (O&M, fuel, tax and interest) in year n
SV = Salvage Value (in year t)

Introduction to End Use Analysis

Energy Use

$$Energy\ use = \sum_{i=1}^{i=n} Q_i \cdot I_i$$

Where:
Q_i = quantity of energy service i
I_i = intensity of energy use for energy service i (in kW, MWh/m^2-year)

End use demand forecasting is important because it provides the fundamental basis for planning energy purchases or efficiency improvements. The forecasting method used has a significant impact on projection results. Projections are used to evaluate the potential of "conserved energy" (the demand-side resource) and provide a baseline for estimating savings. You can perform end use analysis using a bottom-up approach that relies on engineering costing methods as opposed to "top down" macroeconomic estimations. Some of the assumptions of this approach are that demand is for energy services, not energy commodities, and that energy efficient technologies can be identified and installed. This approach may identify many inefficiencies in the present energy system, as well as indicating that improving those inefficiencies can have zero or negative life cycle costs.

Quantity of Energy Services

$$Q_i = N_i \cdot P_i \cdot M_i$$

Where: Q_i = quantity of energy service i
N_i = number of customers or units in a facility eligible for end-use i
P_i = penetration (% of units or customers) of end-use service i (can be > 100%)
M_i = magnitude or extent of use of end-use service i (hours/yr, m^2, etc.)

Specific definitions of *N*, *P*, and *M* are flexible and depend on end-use and sector.

Q reflects "non technical" aspects of energy demand, unlike i, which is related to the end-use technologies

Baseline Growth Projections

If all parameters effecting total energy use remained stable during the project life, one would expect only a uniform cyclical annual pattern due to seasonal weather variations. However, baseline energy use can be expected to grow (or decrease) according to projected changes in the actual rate of production, hours of operation, etc. These deviations should be accounted for by normalization in the monitoring process. Similarly, building occupancy, weather and other non-technical parameters can vary and should be normalized. Energy savings are the actual, no-project (base) case, not the projected base.

Chapter 6

Financial Analysis

In conducting financial analyses of energy efficiency projects a cash flow analysis is performed, the internal rate of return (IRR) is calculated for each measure, and the measure packages are evaluated using net present value (NPV). The cash flow analysis for each measure lists the year to year costs and savings for all implementation, operation, maintenance, and disposal costs, as well as the energy and demand savings over the life of the equipment. This analysis includes the initial investment costs and estimated annual savings in maintenance costs. An IRR is then calculated for each measure and each option's profitability is determined against a hurdle rate. The hurdle rate gives you a minimum payback period as well. The IRR for each measure is compared against the hurdle rate. Efficiency measures are then prioritized and different option packages are compared using Net Present Value (not IRR). The options that maximize cash flow are at the top of the list. Those options that are considered marginally profitable can still contribute to maximizing the energy efficiency of a project and should be evaluated using NPV and IRR.

Economic Terminology

Discount Rate

The discount rate measures the time-value of money exclusive of inflation.

For example

$$\$(1993) = \frac{\$(1999)}{(1+f)^n}$$

Where:
n= number of years (1999-1993=6)
f = annual inflation rate, 1993-1999

The REAL (inflation-corrected) discount rate (r) is:

$$(1 + r)(1 + f) = 1 + r_n$$
$$r_n = r + f * r + f$$
$$r = (r_n - f) / (1 + f)$$

In energy efficiency project analysis the discount rate is very important. Since energy efficiency investments are measured by consumers' implicit discount rates, they require a high rate of return on investment, indicating high risk. These investments may appear risky to the consumer due to lack of information and resulting uncertainty. However, for society, efficiency is a low-risk investment that deserves a low discount rate. In finance theory the time value of money is thought to increase with greater risk and uncertainty.

Simple Payback

Simple payback (SPB) is the time required for the sum of the cash flows from the annual savings to cover the initial cost (without discounting). This is an indicator of liquidity and risk.

$$SPB = \frac{CC}{D} = \frac{\text{Capital Cost}}{\text{Annual Savings}}$$

Internal Rate of Return

Internal Rate of Return (IRR) is the discount rate (r) at which net present worth of present and future cash flows (NPW) equals zero.

$$P = 0 = \sum \; F_n/(1+r)^n$$

where P, F_n are known,solve (by iteration) for IRR, or use function @IRR.

For uniform annual savings (D) over n years resulting from a present capital expenditure CC:

$$P = 0 = CC - \frac{D}{CRFn,\ irr} \quad \text{or} \quad CRFn,\ irr = \frac{D}{CC}$$

where $CRF = \frac{r}{[1-(1+r)^{-t}]}$

Capital Recovery Factor (CRF) is the ratio between uniform annual savings and the present value of the cash flow stream. This is the minimum value of savings which makes the investment cost effective.

Financial Example of a Typical Performance Contract

Customer Perspective

Hospital 400,000 sq. ft. Annual Utility Bill: $700,000

ECMS Cost	Cost	Savings	Payback
Lighting	$350,000	$116,667	3 years
Controls	$200,000	$80,000	2.5 years
Thermal Storage	$150,000	$37,500	4 years
Repairs	$20,000	$1,333	15 years
Total Value	$720,000	$235,500	3.1 years

ESCO Perspective

Total Price	$720,000
Lighting	(245,000)
Controls	(140,000)
Thermal Storage	(105,000)
Repairs	(14,000)
Design	(72,000)
Overhead	(72,000)
Profit/Loss	$72,000

Lender Perspective

Years	yr. 1	yr. 2	yr.3	yr. 4	yr. 5	yr. 6
Savings	235,500	235,500	235,500	235,500	235,500	235,500
Pmt of Sav	140,861	140,861	140,861	140,861	140,861	140,861
M&V	5,000	5,000	5,000	5,000	5,000	5,000
Net Pmt.	145, 861	145,861	145,861	145,861	145,861	145,861

ROI for lender: 12%
Customer Cost of Capital: 13.5%
ROE if Lender is the ESCO: 16.8%

Chapter 7

Overview of Risk in Energy Efficiency Projects

Project Sponsor Risk

The project sponsor, the ESCO, is the developer or seller of energy services to the energy end-users or clients of the local utility. The sponsor is responsible for system design, construction, construction costs, and system performance over the contract period as well as the risks associated with these responsibilities.

Construction Risk

Project sponsor and construction risks are linked. When construction begins, the risk increases sharply as funds are advanced to purchase materials, and employ labor. This is when construction financing charges begin to accumulate. Construction costs could be greater than expected due to delays, equipment unavailability, and other unforeseen events which may increase the investment cost or possibly bankrupt the ESCO. The risk of delay in obtaining customer approval and sign-off on the Certificate of Acceptance (COA) can be a significant risk to the ESCO, since this impacts payment and revenue recognition.

Country & Sovereign Risk

Country risk includes any politically motivated embargo or boycott of a project. Additionally, there may be circumstances where the host country cannot permit transfer of funds for debt service due to economic problems. Similarly, political and regulatory risks can affect all aspects of a project.

Environmental Risk

Often large energy users may possess hazardous materials or have processes, that, if interrupted, could cause environmental damage. Additionally, environmental hazards may be encountered during installation in the form of asbestos, or indoor air quality issues, as well as lamp and ballast disposal considerations. Some ballasts contain PCBs which are harmful to people and the environment and are regulated in some countries. Disposing of large quantities of fluorescent lamps may also be regulated due to their hazardous qualities when disposed of in large numbers.

Performance & Persistence Risk

It is possible that disputes may arise regarding the actual energy savings achieved, particularly in the event that changes are made in operations at the facility, or if there are changes in the energy rates. These changes can be devastating to the success of a project. This is why it is essential that the methodology be agreed to in contract documents for calculating, measuring, and verifying actual energy savings, as well as addressing methods to resolve disputes. Persistence of energy savings may be effected by equipment performance both today and tomorrow.

Contractual Liability

It is important to ensure against contractual liability by including clear language in the agreement to address liability issues and methods for dispute resolution. Consider what would happen if a facility is closed down due to environmental hazard, flood, or war. What happens in the event a worker is harmed during construction? Some terms in the contract should articulate its enforceability and indicate clear contractual intentions in order to avoid widely differing interpretations.

Currency, Inflation & Interest Rate Risk

Changes in a currency's exchange rate and valuation can seriously impact the viability of an energy efficiency project if the financing is across currencies. Lenders can sometimes hedge this risk. Similarly, inflation risk can be a factor in some project financing, necessitating that language be included in the contract to make adjustments according to inflation rate fluctuations. Additionally, interest rate risk will exist due to assumptions embedded in the project financials.

Risks Facing the Client

The client faces risks in assessing the ESCO since the success of the project lies with them. It is essential that clients check the ESCO's references. The client should have an internal technical employee work with the ESCO as a way of mitigating risks associated with the ESCO in addition to insuring that all assumptions are clearly articulated.

Risks Facing the ESCO

The ESCO is the ultimate project sponsor and carries all the associated risks. Additionally, performance contracts are very costly to sell, develop and install with substantial risks of losing sunk costs in an otherwise very low margin and competitive business.

Typically, energy efficiency projects are relatively small with technology constraints usually limiting the project size. The transaction costs of smaller projects are disproportionately high since any investment requires initial feasibility and due diligence work. As a result, pre-investment costs including financing, legal and engineering fees, consultants, and permitting costs, have a proportionately higher impact on the costs of projects. Time contributes to the risks faced by the ESCO since the development time from inception of a project to actual cash flow can be extremely long.

Risks Facing the Lender

The lender needs to make several assessments regarding the technological integrity of the ESCO's work including the audit, design, and M&V plan. Measuring the value of the technological recommendations requires engineering competence, but the standards of evaluation are germane and common. The lender must also assess the client's creditworthiness since both the ESCO and the lender depend upon the client's ability to pay over the contract period. The ESCO is the credit risk only during the construction period. In order to mitigate its potential exposure, the lender should include assumption rights in the financing documents. However, the lender may have difficulty in its ability to take over the project in the event the ESCO is failing to perform.

Chapter 8

Finance & Contract Arrangements

There are several different financing sources for energy efficiency project financing. These include utility demand-side management programs, the customer, a third party financier, the ESCO, or a combination of these.

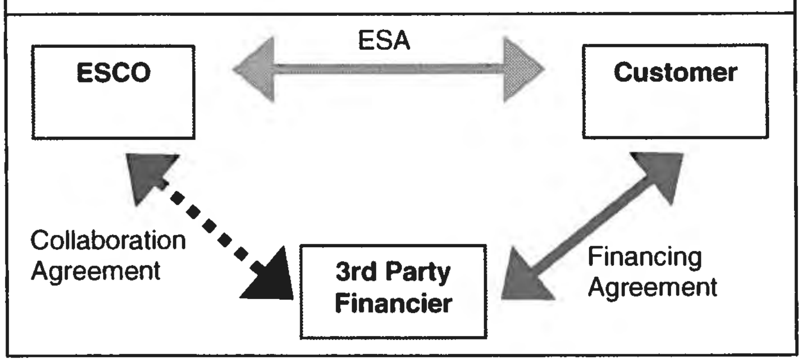
Evaluation Factor	Cash Purchase	Loan	Capital Lease	Operating Lease	Performance Contract
Balance Sheet	On	On	On	Off	Off
Initial Payment	Percentage	Down pmt	None	None	None
Payments	Progress or all at install	Fixed	Fixed	Fixed	Variable or Fixed
Ownership	Owner	Owner	Owner	Lessor	Contractor
Tax Deductions	Depreciation	Depreciation, Interest	Depreciation Interest	Lessor	Contractor
Performance Risk	Owner	Owner	Owner	Lessor	Contractor

Adapted from: Financing Your Energy Efficiency Upgrade, US EPA 430-B-97-003, October 1997.

Financing Options: Cash

This is the simplest method of energy efficiency project financing and makes sense if the customer has cash reserves and a strong balance sheet. All cost savings realized from the upgrade are immediately available to the customer and the customer is able to realize the tax benefit of the equipment's depreciation. However, the client incurs an opportunity cost because it doesn't have that capital available for other investments. This financing method is good for relatively inexpensive and simple efficiency measures that are likely to pay for themselves in about a year. The contractual arrangement is typically structured as a fixed cost contract or possibly a per unit cost guarantee.

Illustration of contract and financing arrangement relationships for one scenario using leases, loans, or cash contract and may be accompanied by a savings guarantee.



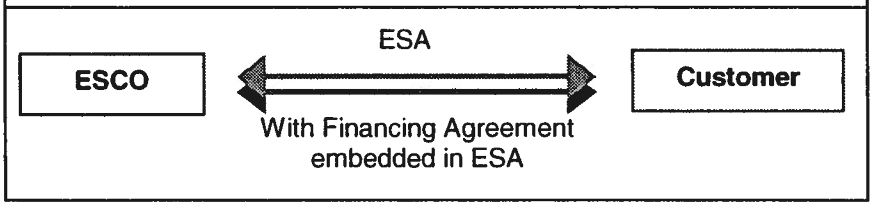
Financing Options: Loan

A loan may be obtained to finance the project. In financing an energy efficiency project, a bank may ask for a personal guarantee from the ESCO owner if the ESCO is receiving the financing and passing it through to the customer. The lender's goal is for the client or ESCO to make minimum payments no matter what, so lenders may require up to a 40% down payment on loans for energy projects. Lenders consider energy efficiency projects to be high risk which results in less leverage, higher interest rates, and a shorter debt term.

Financing Options: Performance Contracting

This option is attractive to the customer because he has no up-front cost since the project is paid for out of the energy savings from the efficiency project. The ESCO provides the financing and assumes the performance risks associated with the project. Until the project has been fully paid for, the ESCO owns the upgraded equipment. That means that the equipment asset and debt do not appear on the customer's balance sheet. Performance contracting relies on the financial strength of the building owner, and the cost savings potential of the project. Performance contracting is an operating budget issue more than a capital budget issue despite the upgraded equipment provided through the project. Capital budgeting may typically require board approval, and may be decided upon only periodically. On the other hand, the utility payments are already in the operating budget, so any savings through the implementation of efficiency measures may free funds for discretionary spending. Under a performance contract, after the energy efficiency upgrade, the funds that were used to pay the energy bill cover the new energy bill and the payment to the ESCO, and generate positive cash flow for the customer. Under a "shared savings" performance contract, the customer and the ESCO divide the cost savings according to the contract documents. A "paid from savings" performance contract sets the customers share of the savings at a fixed level, while the ESCO payments fluctuate according to actual savings.

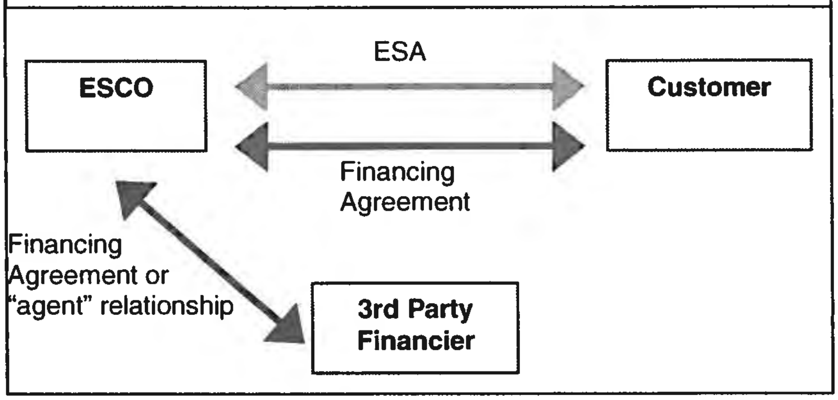
Illustration of contract and financing arrangement relationships for performance contracting scenario.



Contractual Arrangements: Savings Guarantee

A savings guarantee can be entered into with the ESCO separate from an installation agreement and is recommended if the contractual arrangement is not a performance contract. Performance contracts already include an implicit savings guarantee. A savings guarantee reduces the customer's risk by guaranteeing that energy cost savings will meet or exceed an established minimum dollar value. The guarantee acts like an insurance policy where the customer pays a premium that compensates the guarantor for the performance risk and monitoring costs.

Illustration of contract and financing arrangement relationships for one scenario using leases, loans, or cash contract and may be accompanied by a savings guarantee.



Financing Options: Capital Lease

Under a capital lease, installment payments are made for the equipment and, in most cases, the customer doesn't have to lay out any initial capital. The client owns the equipment and may take deductions for depreciation and for the interest portion of the payments. A capital asset and associated liability are recorded on the client's balance sheet.

According to America's Financing Accounting Standards Board there are four criteria that must be met for a lease to be considered a capital lease:

1. Ownership of the property transfers to the customer at the end of the lease term
2. Lease contains a bargain purchase option
3. The term of the lease covers 75% or more of the estimated economic life of the equipment
4. The value of the lease equals or exceeds 90% of the fair market value of the equipment at the beginning of the lease.

If the lessor doesn't pay taxes on the interest from the leases, the effective rates are less than market rates. The lessor does not pay taxes on the interest from these leases, so the rates are lower then typical market rates.

Financing Options: Operating Lease

Under an operating lease, the lessor owns the equipment and claims any tax benefits associated with the depreciation of the equipment. At the end of the contract term the customer can purchase the equipment at fair market value (or at a predetermined amount), renegotiate the lease, or have the equipment removed. An operating lease is also known as an "off balance sheet" lease.

Chapter 9:

Creating an ESA

Several ingredients are critical to an Energy Services Agreement (ESA). The primary elements that should be included or considered for inclusion in an ESA are listed and briefly explained below. In general, the contract will be defined by the financing arrangement that has been chosen, however there are numerous contractual terms that should be included in any ESA.

Financing Terms

1. Basic Financing Terms to Include
   a. Contract amount
   b. Term of the contract
   c. Indicate who is responsible for any sales tax
   d. Contact information for invoicing purposes
   e. Late payment treatment
   f. How to resolve invoicing disputes
   g. Indicate how often the client needs to provide updated financial information and what is required
2. Payments if a Cash Contract
   a. Mobilization fee if applicable
   b. Progress payments based on percentage of completion
   c. If retainage is called for, include the percentage to be retained from each invoice and what triggers the release of that money
   d. 100% of the contract sum must be paid within 30 days of the Certificate of Acceptance (COA)
3. Payment terms if a Performance Contract
   a. First payment is usually due within 30 days of the COA
   b. Payments are based on estimated savings until actual savings are verified under the first energy savings report
   c. Savings numbers should be reconciled periodically and any discrepancies should be invoiced or split accordingly
   d. Indicate the frequency and number of payments
   e. Establish the threshold level of savings
4. Payment terms if a Lease
   a. If it's a 3rd party lease, then there are usually several related contract documents
      i. Lease documents from the financier
      ii. Installation contract with the ESCO
      iii. Savings guarantee (if applicable)
   b. Early buy out amounts, termination fees, and contract continuation clauses should be included for each contract
   c. Identify financed amount
   d. Attach an amortization schedule
   e. Residual value of the equipment
   f. Indicate senior vs. subordinated debt

   g. Indicate whether secured or unsecured debt and what the security is
   h. Upon execution of the COA the financier begins invoicing the client, and the ESCO gets paid by the financier
5. If Utility rebate is involved
   a. Utility timelines effect the project's eligibility and schedule
   b. Address how the rebate amount effects the contract sum
   c. Address what happens if the actual rebate amount differs from what has been estimated
6. Contingency
   a. Is a portion of the budget in contingency?
   b. What happens if the contingency is not used?

Construction Terms

1. Scope of Work
   a. Detailed description of measures and any associated work (repairs, painting, disposal of old equipment, etc.)
   b. Equipment quantities
   c. Client approval procedures throughout the process
   d. Commissioning procedures
   e. Training
2. Installation and procurement schedule
3. Handling of Change Orders
4. Description of the operations and maintenance plan that will be provided with the COA
5. Standards of service
6. Whether subcontracting is permitted and what discretion the client has in disallowing subcontractors or individual employees
7. All applicable provisions in the ESA should be required to be included in any subcontracts
8. Details regarding access to the facility
9. Certificate of Acceptance
   a. Used for sign-off by the client at completion of the project installation indicating that everything is in working order
   b. Date of project acceptance triggers the monitoring and verification to begin, thereby beginning the payments to the ESCO under a performance contract

Savings Performance

1. Monitoring and verification methodology
2. Formula for calculating savings
3. Baseline calculations and adjustments
4. Client needs to sign off on baseline usage
5. Client must provide ESCO with energy use data in a timely manner throughout the term of the contract
6. Client must notify the ESCO of material changes to the equipment or operations
7. ESCO should be allowed a certain period of time to remedy any technical problems
8. Address who will bear the risk of change in energy prices
9. Reporting conventions and frequency
10. Responsibilities for operations and maintenance of M&V equipment

Warranties

1. ESCO may provide a warranty on labor and materials for a set period of time
2. ESCO should obtain warranties for the same period of time from the subcontractors and equipment manufacturers
3. Equipment warranties should be transferred to the customer upon transferring title to the equipment

Other Terms

1. The customer should represent that it owns the premises and intends to use the premises in a manner similar to its current operation for the term of the agreement
2. If the customer is the owner, but there is a different tenant, then the ESCo may want to obtain a certificate of tenant authorization
3. If the customer is a tenant, then a landlord or mortgagee waiver should be obtained
4. How the project is being financed, will dictate who might take a security interest in the equipment
5. Ownership of the equipment will transfer to the customer upon full payment, and will vary by contract arrangement

Legal Requirements & Notification

1. Compliance with governing law and standard practices, including any applicable permits, licenses, or regulatory approvals to perform the work
2. Identify what jurisdiction of law the contract will be interpreted under
3. Detail how to notify the other party of changes in the contract and who they should be addressed to

Representations

1. Each party must have the appropriate authority to sign and execute the contract
2. In some cases a Corporate Resolution or Certificate of Partners may be called for
3. Attest to having no suits or proceedings pending that will adversely effect the party's ability to perform its obligations
4. Represent that government approvals are not required to execute this agreement, or that such approvals have already been obtained

ESCO Insurance

1. Require comprehensive commercial general liability
2. Worker's compensation limits are usually stipulated by the laws of the location where the work is being performed
3. Automobile insurance covering all owned and hired vehicles
4. Certificates of insurance must be sent to the customer by the ESCO's insurance agent

5. Notice of any changes to the policy or cancellation of the policy must be sent to the customer within an amount of time detailed in the contract
6. The customer should be named as an Additionally Insured on the ESCO's policy for the term of the contract

Customer's Insurance

1. Coverage on the equipment must be carried by the customer and should name the equipment owner as loss payee (usually the ESCO until title to the equipment transfers to the customer). In this case, the customer must provide a certificate of insurance naming the ESCo as loss payee.
2. Customer should name ESCO as an Additional Insured

Bonds

1. In some cases the customer may require that the ESCo obtain a Performance Bond
2. Performance bonds must be obtained prior to commencement of installation
3. A bond covers the installation period only and will terminate upon execution of the COA
4. The bond should be in the amount of the contract
5. Usually obtained through an insurance company
6. Include the cost of the bond in the contract

Events of Default

1. Nonpayment
2. False or misleading representations
3. Failure to meet terms and conditions of contract
4. Failure of the customer to perform required maintenance on the equipment

Remedies Upon Default

1. Available legal remedies
2. Termination of the contract through proper legal process and collection of any associated termination value, or removal of the equipment
3. Right to cure
4. Indicate how long the party has to cure the event of default if possible
5. Address who is responsible for payments associated with the cure

Assignment

1. The ESCo may want to assign the agreement or grant a security interest in the equipment to another party
2. Provisions should be included in the contract as to how the assignment would take place
3. Customer must be notified of the assignment
4. The ESCo's obligations under the contract do not typically transfer to the assignee

Hazardous Materials

1. Hazardous materials, such as asbestos or leaking PCB ballasts may be encountered in the course of performing the work
2. Work shall stop until the customer disposes of those materials
3. ESCo will notify customer in writing of the hazardous materials

Lamp & Ballast Disposal

1. Usually taken care of by the ESCo through its subcontractors
2. Some lamps and ballasts contain hazardous materials and their disposal may be regulated
3. For liability reasons, the ESCO should never take ownership of the hazardous materials
4. It is recommended that the customer contract with a qualified disposal company that may be suggested by the ESCo. The whole disposal process should be well documented by all parties.

Severability

1. In the event that any provision of the agreement is declared unlawful, all other provisions will remain in force
2. There may be provisions in a DSM contract that need to be included in the ESA
3. Year 2000 issues (Y2K), if applicable
4. Force Majeure clauses address when events beyond the control of the parties effect the project

Chapter 10

International Monitoring & Verification Standards

International Performance Measurement & Verification Protocol (IPMVP) is based on work originally funded by the US Department of Energy. It covers retrofits in existing buildings as well as new construction, including water efficiency measures and greenhouse gas emissions reduction measures in addition to energy efficiency.

Why M&V?

An international monitoring and verification standard such as IPMVP standardizes the methods for quantification of savings. It facilitates risk management and project finance by allocating risk to the appropriate party. IPMVP increases both reliability and the amount of savings while reducing transaction and financing costs. Strong M&V is a good investment, typically adding about 5% to the total project cost while delivering 20% to 30% greater cost savings. Incremental M&V costs are usually recovered in months, not years.

The scope of the IPMVP includes the M&V needs of all players. It performs the role of verification in performance contracting by establishing procedures for verifying baseline conditions, post-project conditions, and long-term savings. The procedures in the IPMVP cover a range of facilities including residential, commercial, institutional, and industrial facilities and processes. The IPMVP includes techniques for calculating whole-facility savings. The procedures in the IPMVP are consistent across all similar projects and are internationally accepted, impartial and reliable. They include methods for investigating and resolving disputes.

Resources for Further Information

Association of Energy Engineers
http://www.aeecenter.org/

Building Energy Check-up
http://www.ase.org/checkup/business/main.html

Electric Power Research Institute (EPRI)
http://www.epri.com/

Energy Central online information service
http://www.energycentral.com/

International Institute for Energy Conservation
750 First Street, NE
Suite 940
Washington, DC 20002 USA
http://www.iiec.org

National Association of Energy Service Companies
1615 M Street, NW, Suite 800
Washington, DC 20036
USA
Tel: (202) 822-0950
Fax: (202) 822-0955
http://www.naesco.org

Project Financing Sixth Edition
Peter K. Nevitt and Frank Fabozzi
Euromoney Publications 1995

United States Energy Information Administration
http://www.eia.doe.gov/

World Energy Efficiency Association
910 17^{th} Street, NW, Suite 1010
Washington, DC 20006
USA
Tel: (202) 778-4961
Fax: (202) 463-0017
http://www.weea.org

Financing Resources

Asian Development Bank (ADB)
6 ADB Avenue, Mandaluyong
Metro Manila, P.O. Box 789
1099 Manila
Philippines
Tel: (632) 4444 (in the Philippines)
(632) 711-3851 (international)
Fax: (632) 741-7961
(632) 632-6816

The African Development Bank
Rue Joseph Anoma
01 B.P. 1387, Abidjan 01
Cote d'Ivoire
Tel: (225) 20-44-44
Fax: (225) 21-77-53
http://www.afdb.org

European Bank for Reconstruction and Development (EBRD)
One Exchange Square
London EC2 A2EH
United Kingdom
Tel: (44-171) 338-6000
Fax: (44-171) 338-6100
http://www.ebrd.com

International Finance Corporation (IFC)
2121 Pennsylvania Ave., NW
Washington, DC 20433
USA
Tel: (202) 477-1234
Fax: (202) 474-4384
http://www.ifc.org

Inter-American Development Bank (IDB)
1300 New York Avenue, NW
Washington, DC 20577
USA
Tel: 202-623-1000
http://www.iadb.org

The World Bank
International Bank of Reconstruction and Development
1818 H. Street, NW
Washington, DC 20433
USA
Tel: (202) 477-1234
Fax: (202) 477-6391
http://www.worldbank.org

U.S. Agency for International Development
Office of Energy, Environment & Technology
Global Bureau Environment Center
Washington, D.C. 20523-1810

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