International Energy Efficiency Financing Protocol

Standardized Concepts

Prepared by Efficiency Valuation Organization
www.evo-world.org

April 2009

EVO 40000 – 1: 2009

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EVO Vision

A global marketplace that correctly values the efficient use of natural resources and utilizes end-use efficiency options as a viable alternative to supply options

EVO Mission

To develop and promote the use of standardized protocols, methods and tools to quantify and manage the performance risks and benefits associated with end-use energy-efficiency, renewable-energy, and water-efficiency business transactions

April 2009

Dear Readers,

Recognition of energy efficiency as a powerful tool to cut operating costs, improve the economy and reduce environmental pollution has never been greater; yet, the implementation of energy efficiency measures is slow to materialize. Once the necessary legal and regulatory environments, including availability of information, are in place, the single greatest reason for this slow progress, around the world, is the absence of commercially viable financing. There is a continuing need for local banks and financial institutions (LFIs) to have standard methods to evaluate risks and quantify the benefits of energy efficiency investments. As the world's only organization solely dedicated to a Mission of providing tools to quantify energy efficiency business transactions, EVO is pleased to present this initial International Energy Efficiency Financing Protocol (IEEFP).

IEEFP is envisioned to ultimately become the global "blue print" for educating and training LFIs around the world on the special intricacies, benefits and risks of financing end-use energy efficiency projects. The objectives of IEEFP are to create a better understanding amongst LFIs of:

- how energy efficiency projects generate reliable savings in operating costs of end-use energy consuming facility owners (Hosts), and
- how such savings equate to new cash flow and increased credit capacity for Hosts to repay energy efficiency project loans and investments.

This IEEFP is intended to be a growing set of best practices, resource materials, case studies, standardized tools and guidelines for LFIs, financiers and other energy efficiency stakeholders to support their economic and financial evaluation of energy efficiency projects. The IEEFP has already been customized into a training program for Mexican LFIs, reflecting realities of their local market conditions. It is planned to continue applying IEEFP on a "grass roots" country-by-country basis. New materials and lessons learned from each development effort will be documented in EVO's *IEEFP Repository*. It is hoped that the materials in the IEEFP Repository will be incorporated into many custom bank training programs tailored to each country's or region's economic, regulatory, legal, political, business, banking infrastructure and other local conditions.

We hope that this first edition of IEEFP provides insight into the benefits and risks of financing energy efficiency projects, as well an understanding of how EVO carries out its Mission to help energy users "manage the performance risks and benefits associated with efficiency business transactions." May your insight and understanding also inspire you to become an EVO volunteer or Subscriber, participating in the further development of IEEFP in your country or region.

On behalf of the entire EVO Board, I would like to thank all those listed in the following Acknowledgments section, and the many more who contributed suggestions and encouragement enabling us to reach this point. I only dare to single out Tom Dreessen, chair of the IEEFP Committee, to thank him for his unwavering devotion to this IEEFP.

John Cowan
Chair of the Board

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2. Larisa Dobriansky, Vice Chair
3. Thomas Gebhardt
4. Shirley Hansen
5. Pierre Langlois
6. John MacLean
7. Alain Streicher
8. Cyndy Wilson

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1. Global Working Group
2. Mexican Economy Working Team
3. Thailand Economy Working Team

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EVO also wishes to acknowledge and thank the U.K. Global Opportunity Fund for the funding to complete the IEEFP-Mexico Bank Training Program, which provided the foundation for this initial IEEFP document.

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PREFACE

WHY IEEFP?

In July 2004, the UN Foundation's Energy Future Coalition sponsored a stakeholder workshop in which a broad group of experts in energy efficiency and finance met to discuss barriers to increased use of funds for energy efficiency projects. The experts agreed that local financial institutions (LFIs) lacked the guidance and expertise to feel comfortable lending money on a cash flow basis to energy efficiency projects. A consensus was reached that an International Energy Efficiency Financing Protocol (IEEFP), as proposed by Mr. Thomas K. Dreessen, could help to bridge the gap between funding sources and their financing of energy efficiency projects. The meeting further concluded there is already a number of documents, materials and other tools that could be assembled in an IEEFP Repository with relative ease.

Later that year, the Efficiency Valuation Organization (EVO) agreed to sponsor the IEEFP and began efforts to obtain funding. It formed a global working group (GWG) comprised of interested stakeholders with expertise in various aspects of energy efficiency financing to oversee development of the IEEFP. Building on Dreessen's work and the expertise of the GWG, a "blue print" for education and training of LFI personnel around the world evolved. A growing set of best practices, resource materials, case studies, standardized tools and guidelines has served as an impetus to create the IEEFP Repository. It is intended that EVO will oversee and maintain this Repository.

Mexico and Thailand were selected to be the countries for IEEFP's initial development, which encompassed research and creation of a "Best Practices" Report reflecting current methods and levels of energy efficiency financing by LFIs, and the creation of a plan to implement the IEEFP in each country. Both countries established in-country working groups comprised of all major local stakeholders who vetted all work products. A pilot program to train LFI personnel was then created and conducted in Mexico. The trainees were predominantly the lending, credit and risk analysis officers who are responsible to evaluate and approve loans within the LFIs. From this initial work and in-country feedback, the following observations can be made:

- The development experiences offered from Thailand and the pilot training program in Mexico plus a consensus from the GWG have established that LFIs need and will use an international energy efficiency financing protocol.
- To create an effective country-specific IEEFP, the impetus needs to come from in-country stakeholders and sources. Force feeding from the top down creates resistance and slows acceptance.
- There is a body of common information and associated training procedures that will effectively serve disparate cultures provided the material and procedures are modified to meet local needs.
- Further pilots to explore the application of the IEEFP framework and training materials and to refine those material and procedures, as appropriate, is needed.
- A guidance document is needed which may assist country-based working groups to modify the IEEFP materials and procedures to meet local needs in a variety of settings.
- The IEEFP work has underscored the critical need that exists worldwide for LFIs to enhance their energy efficiency and renewable energy evaluation and loan procedures. Once the LFIs "get it," such an effort will enhance economies across the globe, preserve limited natural resources and contribute significantly to environmental improvement.

This document merely summarizes and globalizes the IEEFP bank training program created and conducted in Mexico. It is designed to make LFI personnel aware of commonly-used materials and procedures available from EVO to help them realize the value of financing energy efficiency projects to their customers, the economy, the environment and their own financial institutions.

It is hoped that this document will make governments, energy agencies and non-profit energy organizations aware of the need to build capacity within LFIs that enable them to properly evaluate energy efficiency projects and provide loans on a commercially-viable basis. When recognized, we would further hope they would create energy efficiency training programs for their respective LFIs that leverage the work already done by EVO in Mexico.

An outline of the two-day **IEEFP-Mexico Bank Training Program** is below:

1. Energy Efficiency ("EE") Market Overview:
   a) Energy Supply & Demand (Global and Mexico)
   b) EE and Renewable Energy ("RE") Concepts
   c) Mexico EE and RE Opportunities
   d) Mexican Government Programs
2. EE Carbon Funding (Global & Mexico)
3. EE Technologies (Global & Mexico)
4. Mexican EE Stakeholders – Roles/Benefits/Concerns
5. ESCO Business Model
6. Mexican Financing of ESPs
7. "IPMPV" Savings Measurement
8. ESP Case Studies
9. The Investment Grade Audit ("IGA")
10. "ESP" Financing:
    a) International Structures
    b) Local Structures
13. Risk Management Strategies
14. ESP Financial Analysis Spreadsheet
15. ESP Loan Application - Presentations by Trainees

It is intended that this IEEFP will be expanded to further address among other things, the perspectives of prospective lenders, how to recruit them to this field, and how to develop energy efficiency finance as a profitable new line of business. This would include dealing with how to market financial services in the energy efficiency sector and structure programmatic relationships that can generate a flow of business with equipment vendors, ESCOs, utilities, local governments and other stakeholders.

CHAPTER 1 ENERGY EFFICIENCY FINANCING NEEDS AND OPPORTUNITIES

There is a huge and growing opportunity for LFIs to create a new market by financing energy efficiency work. Multiple sources have estimated that the current world wide potential for the financing of energy efficiency and renewable energy within existing facilities is well in excess of US$100 billion. When considering the value of energy efficiency as the most cost-effective way to reduce pollution and improve climate control, the opportunities are even greater. Unfortunately, there are several major barriers to the widespread implementation of clean and proven energy efficiency technologies that apply to virtually all stakeholders and countries around the world, summarized in the "EE Barriers" table at the end of this Chapter 1.

One of the most significant of these barriers is a lack of commercially viable financing, which is **<u>not caused by a lack of available funds</u> per se**, **but rather by an inability to access existing funding capacity at local banks and financing institutions (LFIs) on commercially-attractive terms**. This lack of access is **caused by a "*disconnect"* between the traditional lending practices of LFIs and the financing needs of energy efficiency projects**. LFIs typically apply their traditional "asset-based" corporate lending approach for energy efficiency projects that is limited to their lending a maximum of 70%-80% of the value of assets financed (or collateral provided). Unfortunately there is often little or no collateral value in the energy efficiency equipment once installed in a facility; rather, the value is the cash flow generated from the equipment after installation. To date, most LFIs (due to lack of knowledge) have not recognized nor appear to believe that meaningful cash flow can be generated from energy efficiency projects, or that such cash flow can be relied upon to repay the related loans. Consequently, LFIs generally assign no value to the cash flow generated, thus requiring Hosts to encumber their credit capacity to finance energy efficiency.

Many end-use energy efficiency projects can reduce the existing operating costs of Hosts enough to pay for 100% of the required debt service. These "paid from savings" projects, called **E**nergy efficiency and renewable **S**avings-based **P**rojects ("**ESPs**"), create substantially new credit capacity for the Hosts, which is essential for LFIs to consider in their evaluation of financing ESPs. LFIs do not seem to recognize this increased credit capacity, which is caused, in large part, by the fact that they:

- do not appreciate the broader business opportunities and economic benefits of ESPs;
- are not familiar with the unique complexities of ESPs;
- do not have the internal capacity to properly evaluate risks and benefits of ESPs; and
- are unwilling to invest in building internal capacity to properly evaluate ESPs due to the relatively small dollar size of the investment.

Underlying the difficulties in financing energy efficiency is the low priority private sector Hosts place on investing capital or utilizing their credit capacity to finance energy efficiency versus their core business activities. The problem emanates from the relatively small investment and returns of energy efficiency projects coupled with a perception that they reflect energy and "utilities" infrastructure investments that only need to be made when if and when they break. Even energy efficiency projects with very high 25 to 50 percent IRR's are unable to compete with one-year internal hurdle rate of returns "projected" for core business investments of many large industrial Hosts.

Unfortunately, there are relatively high risk factors associated with "projected" returns on core business investments that are not properly compared to the relatively low risk of investing in energy efficiency. For example, when a Host secures a loan to increase its production capacity, the loan repayment must be reflected in new budgeted product costs. The ability of a Host to repay a loan for an increased production investment like this one depends on the market's acceptance of the product and its price – third party customers must be willing to purchase the products at the expected higher volumes and/or accept higher product prices in order for the Host's expected repayment funds to materialize. The higher costs affect the Host's competitive market position and result in a negative impact on its business that could affect the Host's ability to repay the loan.

In contrast, when a loan is secured to fund a cost-effective energy efficiency project, the loan repayment stream comes out of the avoided utility costs already being incurred by the Host. No new budget costs need to be recouped since the project pays for itself out of operating savings. Control of the available funds is an internal matter that can be monitored with relatively low risk. Further, when a loan is secured to improve energy efficiency, the net effect is reduced operating costs, which lower product costs and make the Host more competitive. The Host, in this case, improves its creditworthiness.

LFIs have two basic business functions: one is to "rent" (lend) money and the other is to provide traditional banking and financial services to its customers. Funding ESPs for a Host also provides a secure means of renting money, while providing a valuable service to the Host and its suppliers, and supporting efforts to improve our environment.

The major risks in providing an energy efficiency loan are:

- initially, the quality of the engineer's auditing abilities and calculations; then
- implementation according to design; and finally
- sustained savings and agreed measurement thereof

Acquiring or training personnel to evaluate an engineer's audit is relatively simple. If an Energy Services Company (ESCO) is involved in the ESP, the LFI's risks are significantly reduced because of the ESCO's assumption of the performance risks. An ESCO is a performance-based company that: i) develops, finances and implements ESPs on a "turn-key" basis, and ii) risks payments for its services on actual savings performance of equipment installed. The ESCO typically guarantees that energy savings from its ESPs will cover their capital and financing cost, which includes the loan repayment to LFIs. As discussed above, loans to a Host for core business activities like a production enhancement carry a far greater risk than energy efficiency due to the marketing risks and possible engineering risks.

Once LFI personnel understand the comparative business propositions and can effectively evaluate the benefits and risks of the energy efficiency measures proposed, they will find that financing energy efficiency carries a much lower risk than financing business expansions and other capital investments.

If LFIs are to fulfill their role in serving the world's energy, economic and environmental needs through greater energy efficiency, they must understand the potential market and have the ability to effectively serve it. Once LFIs understand the multiple benefits of financing energy efficiency, they can not only improve their respective businesses, but also take the lead in explaining the project economics to their customers who ultimately are the Hosts for ESPs.

ENERGY EFFICIENCY IMPLEMENTATION BARRIERS	"EE" STAKEHOLDERS AFFECTED				
BARRIER ("X" = MAJOR DEFICIENCY)	**HOSTS**	**LFIs (Debt)**	**Investors (Equity)**	**ESCOs, Vendors & Contractors**	**Public Interest NGOs & Gov't Agencies**
Fragmented and Diverse Industry	X	X	X	X	X
Inadequate Legal/Regulatory Framework	X	X	X	X	X
Lack of EE Benefit/Risk Knowledge	X	X	X		X
Lack of Commercially Viable Financing (Unattractive Terms & Not Long Tenor)	X		X	X	X
Small Investment/Benefit and High Transaction Costs	X	X	X	X	
Complex Technologies & Transactions	X	X	X		
Low Priority and Returns	X	X	X		
Limited Technical Capabilities	X		X	X	
Low (Subsidized) Energy Prices				X	X

CHAPTER 2 IEEFP BACKGROUND

In July 2004, the UN Foundation's Energy Future Coalition sponsored a stakeholder workshop in which a broad group of experts in energy efficiency and finance met to discuss barriers to increased use of funds for ESPs. The experts agreed that LFIs lacked the guidance and expertise to feel comfortable lending money to energy efficiency projects on a cash flow basis. A consensus was reached that an International Energy Efficiency Financing Protocol (IEEFP), as proposed by Mr. Thomas K. Dreessen, could help to bridge the gap between funding sources and their financing of ESPs. The meeting further concluded there are already existing documents, materials and other tools that could be pulled into an IEEFP effort with relative ease.

Later that year, the Efficiency Valuation Organization (EVO) agreed to sponsor the IEEFP and began efforts to obtain funding. It formed a global working group comprised of interested stakeholders with expertise in various aspects of energy efficiency financing to oversee development of the IEEFP.

The IEEFP is envisioned to ultimately become the global "blue print" for educating and training LFI personnel around the world on the special intricacies, benefits and risks associated with financing ESPs. It is intended to be a growing set of best practices, resource materials, case studies, standardized tools and guidelines to support LFIs and other energy efficiency stakeholders in their economic and financial evaluation of ESPs.

To realize the intent of IEEFP the first step will be to make LFI personnel aware of the business potential in financing energy projects. As the urge to meet sustainability goals mounts, energy saving projects are increasingly being bundled with renewable energy projects to help subsidize their high costs.

The second step will be to provide the materials and guidance so that LFI personnel have the confidence to utilize the necessary tools in IEEFP to evaluate their financing of ESPs.

The IEEFP guides LFI personnel through these two steps by making them aware of their business opportunities and the guidance which exists and is evolving around the world. IEEFP's "blue print" along with the cited materials are presented so that LFIs understand that this framework will then be modified to serve the unique characteristics of the financial communities in their country.

The global success of the IEEFP will be measured by the:

- extent to which guidance is adopted in various countries;
- level of energy efficiency and renewable energy financing achieved;
- realization by political and business leaders of the economic and environmental benefits achieved through greater financing; and
- recognition by LFIs of the business opportunity offered by financing ESPs.

This success will be best achieved if a conduit for sharing global best practices, resource materials and standardized tools is created and constantly updated.

IEEFP AS A REPOSITORY

It is intended that the IEEFP will continue to be developed on a "grass roots" country-by-country basis, with new materials and lessons learned from each development effort documented in an IEEFP Repository. This material will be retained and constantly updated by EVO. It is hoped that the materials in the IEEFP Repository will be incorporated into a separately developed IEEFP Bank Training Program for each country, and that these materials will be tailored to its local economic, regulatory, legal, political, business and banking infrastructure and market conditions.

It is intended that the IEEFP Bank Training Programs be focused on evaluating ESPs by providing an understanding of the "savings value" generated from energy efficiency measures. Guidance incorporated in these materials will enable LFIs to see how these savings can be considered (and relied upon) for loan repayment and increased Host credit capacity as LFIs structure their ESP loans. Training material development will specifically ignore any attempts to train LFIs on how to evaluate a Host's credit risk, as it is assumed LFIs already have this core competency.

The objective of IEEFP is to create a better understanding among LFIs of how ESPs create an attractive market for them. In addition, it is hoped that the IEEFP program will help LFI personnel appreciate how ESPs can improve the economic condition of their customers, generate sufficient savings from existing operating costs to pay for the installed energy efficiency measures, and create new cash flow and increased credit capacity for Hosts.

As part of the IEEFP effort to enhance LFIs' technical capabilities to manage loans for energy efficiency work, IEEFP highlights widely referenced techniques to measure and verify energy savings, following EVO's IPMVP guidelines. Such training will enable LFI personnel to understand how actual energy savings are documented under internationally accepted guidelines.

INFORMATION DEVELOPMENT

Recognizing the importance of a standardized financing protocol like IEEFP, Asia Pacific Economic Cooperation (APEC), the UN Foundation and EPS Capital Corp. provided seed funding for the initial development of IEEFP in two of APEC's economies, Mexico and Thailand. Mexico and Thailand were chosen because of the significant steps their respective governments had already taken to encourage the implementation of energy efficiency as an important element of their national energy strategies.
This initial development encompassed research and creation of a Best Practices Report reflecting current methods and levels of energy efficiency financing by LFIs in each economy, and the creation of a plan to implement the IEEFP in each country. The two Best Practices Reports and Implementation Plans for Mexico and Thailand were completed in December 2006 and used to help develop the IEEFP framework. These documents are available to EVO Subscribers at its website: www.evo-world.org.

EVO's Global Working Group (GWG) provided strategic input through several meetings and conference calls. The GWG reviewed standardized approaches to financing, discussed potential strategies for developing such materials, and identified other global stakeholders, experts and resources which should be consulted. GWG members represent financial institutions, lenders, developers and energy service providers. The individual members have extensive experience in developing and applying new structures and procedures to finance energy savings projects in international markets. The organizations represented by individuals who have participated in the GWG to date include: Alliance to Save Energy, Asian Development Bank, Center for Energy & Climate Solutions, Econergy International, Energy Efficiency Finance Corp., GETF, IFC, IIEC, IRG, Hansen Associates (formerly Kiona International), Lawrence Berkeley National Laboratory, NAESCO, Overseas Private Investment Corporation, Pacific Northwest National Labs, RMA, UN Foundation, USAID, US DOE, World Bank, and others.

In addition to the GWG, EVO formed a Mexican Economy Work Team (Mexico-EWT) and a Thailand Economy Working Team (Thai-EWT) comprised of key local government agencies and development banks, LFIs, ESCOs, NGOs, local bank associations and other local energy efficiency market stakeholders. These EWTs reviewed and approved their respective Best Practices Reports and IEEFP Implementation Plans.

Funding from The U.K. Global Opportunity Fund was used to execute Mexico's Implementation Plan, resulting in the creation of an IEEFP-Mexico Bank Training Program, completed in December 2007. This program incorporated market feedback from six Mexican LFIs and the various stakeholder members of the Mexico-EWT. The results of the Mexican pilot Bank training workshop were presented to interested members of the GWG at a November 12, 2007 meeting in Washington DC to solicit their input. All of this feedback was then incorporated into the final IEEFP Mexico Bank Training Program.

Pending the receipt of the needed financial support, the intended next step is to create an IEEFP-Thailand Bank Training Program by tailoring it to the local market conditions, which will offer an opportunity to assess the adaptability of the IEEFP-Mexico Bank Training Program into another culture.

CHAPTER 3 ENERGY EFFICIENCY STAKEHOLDERS

The standard categories of EE Stakeholders around the world and the types of entities within each category are as follows:

- **Hosts:**
  1. Private Sector – Buildings
  2. Private Sector – Industrial Process
  3. Public Sector – Federal Government
  4. Public Sector – Local Governments
- **Project Developers:**
  1. ESCOs
  2. Vendors
  3. Contractors
  4. Hosts
- **Financial Institutions:**
  1. Commercial Banks
  2. Development Banks
  3. International Financial Institutions
  4. Investors
- **Not-for-profits:**
  1. Non-Government Organizations
  2. Government Agencies
  3. International Agencies
- **Product & Service Providers:**
  1. Equipment
  2. Technology
  3. Contractors
  4. Consultants

The role, benefits and concerns of the primary EE Stakeholders listed above are covered in detail in each IEEFP Bank Training Program.

ESCOs are specifically addressed herein because of their unique business model that bundles multiple technologies with all the services required to deliver energy efficiency projects (ESPs) to Hosts on a paid-from-savings basis. ESCOs develop, finance and implement ESPs on a "turn-key" basis; assess, mitigate and manage associated risks; and receive payment from Hosts for their services from savings generated by the ESPs.

ESCOs are services companies, not banks. The companies limit their project investments to the working capital they need to develop the projects. They cannot afford to waste that working capital unless "reliable and "commercially viable" long-term project financing is available for their projects. Consequently, the ability to access project financing is mandatory. Several studies, including 2008 research which served as a basis for a book to be released by the Association of Energy Engineers in 2009, entitled <u>ESCOs Around the World: Lessons Learned in 49 Countries</u>, repeatedly cite the lack of project financing as the most significant barrier for ESCOs.

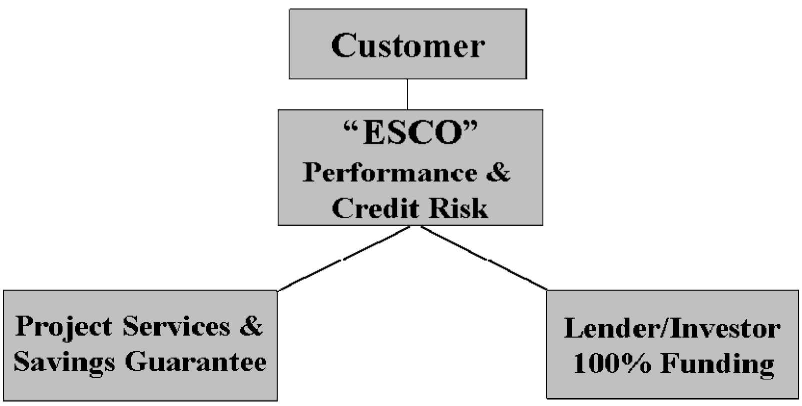
A brief overview of ESCO services is provided below, to show all their services and risks associated with delivering an:

- Investment grade energy audit (IGA)
- Comprehensive engineering design
- Project financing
- Complete installation and commissioning
- Long-term energy savings performance guarantees
- Savings measurement and verification (M&V)
- Ongoing equipment maintenance and re-commissioning (optional)

ESCOs' long term performance guarantees assure Hosts that the capital investments for ESPs will be paid from savings of their existing operating costs. The predominant savings-based structures provided by ESCOs are <u>Shared Savings</u> and <u>Guaranteed Savings,</u> summarized below.

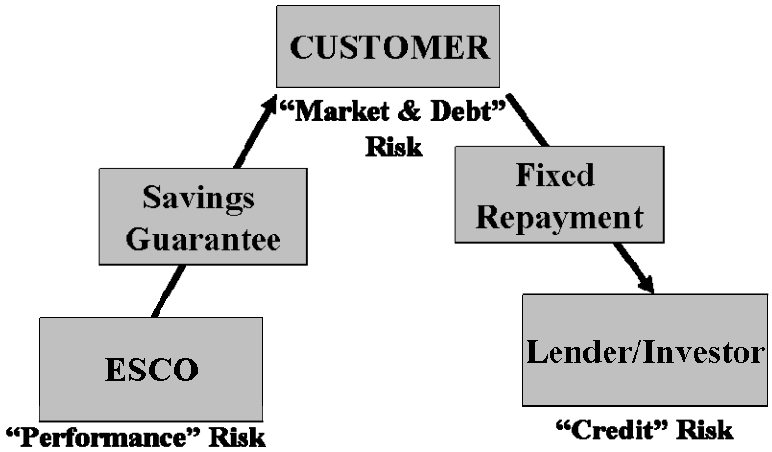
<u>Shared Savings</u> The ESCO provides all upfront capital needed for their "turnkey" development and installation of the ESPs. The Host is only responsible to repay the ESCO a defined share of the savings which the Host realizes from the ESPs. As depicted in the diagram below, the ESCO assumes the credit risk, in addition to all project performance risks. Shared Savings is the primary introductory model used in developing markets because Hosts assume no risks. However it limits long-term growth and competition within the ESCO industry because only large ESCOs with large balance sheets can access financing from LFIs for their ESPs.

Shared Savings Structure



Guaranteed Savings. As depicted below, the Host enters into a separate loan or lease with a full obligation to repay the LFI or lessor. This obligation of the Host is backed by an energy savings guarantee agreement with the ESCO. The savings guarantee demonstrates to the Host that the savings from the ESPs will generate sufficient cash flow for the Host to make the term payments for the loan/lease. This structure is very difficult to use in introducing the ESCO concept in countries or markets because it requires Hosts to assume investment repayment risk. However, it does foster long-term growth of the ESCO Industry and it is the predominant one used in mature markets like North America because smaller ESCOs do not have to provide large balance sheets or collateral in order to access financing from LFIs for their ESPs .

Guaranteed Savings Structure (90% of U.S. projects)



ESCOs can structure their payments from Hosts in many ways. One of the more risk-free ways that creates a very secure mechanism for LFIs to get repaid is a "fixed payment" based on measured or agreed savings from the project. Under this mechanism the ESA includes fixed payments from the energy user to the ESCO matched to the amount needed to amortize the ESCO's capital investment in the project. This enables the ESCO to more readily borrow against this payment stream, or even, as in a factoring transaction, sell off this payment stream to finance the project.

CHAPTER 5 MAJOR ENERGY EFFICIENCY TECHNOLOGIES

The predominant long-standing, proven end-use energy savings technologies available in buildings and industrial facilities are listed in Appendix D, along with an indication of the associated risk level **(**High to Low**)** of the related savings typically being achieved. The savings and costs associated with some of these technologies are illustrated in Appendix A, Project Examples. However, it is intended that examples for each of these technologies will continue to be accumulated on a country-by-country basis and documented into the IEEFP Repository as it is maintained and updated on a global basis by EVO.

In assessing the proposed technologies for a given project, LFIs need to be able to assess the quality of an investment grade audit (IGA). IGA guidance is given in Chapter 9. However a good IGA should report the level of risk associated with achievement of the savings predicted for each recommended measure. It should take into account the potential risk mitigation and management strategies and their costs. Such costs should be factored into the simple payback calculations.

CHAPTER 6 ENERGY EFFICIENCY FINANCING

The EE Financing Best Practices Reports for Mexico and Thailand affirmed the information provided by the GWG, which emphasized that there is very little EE loan activity beyond standard asset-based “corporate” lending to Hosts by LFIs. In fact, only a few LFIs appear to have any knowledge about energy efficiency technologies and projects. With the exception of one or two LFIs in each country, the rest did not have much knowledge about EE costs and benefits because energy savings were not a criterion used when LFIs analyzed loans for ESPs.

These findings are reflected in other countries, *both industrialized and emerging markets*. For example, large cogeneration projects were the bases for the most common type of energy lending, followed by industrial process ESPs and general building type of HVAC retrofits, such as boilers and chillers. In the majority of cases around the world there is minimal attention paid to special lending practices needed for ESPs. LFIs typically apply their traditional “asset-based” corporate lending approach for energy efficiency projects that is limited to their lending a maximum of 70%-80% of the value of assets financed (or collateral provided). Unfortunately there is often little or no collateral value in the energy efficiency equipment installed; rather, the value is the cash flow generated from the equipment after installation. To date, most LFIs have not acknowledged nor appear to believe that meaningful cash flow can be generated from energy efficiency projects, or that such cash flow can be relied upon to repay the related loans. Consequently, LFIs generally assign no value to the cash flow generated, thus requiring Hosts to encumber their credit capacity to finance energy efficiency.

Energy efficiency financing will be widely expanded by LFIs providing predominantly project-based financing with:

- no collateral requirement for creditworthy Hosts beyond the cash flow from ESPs, backed up by contractual savings guarantees from Hosts, ESCOs, vendors or contractors;
- construction financing and a minimum 7 year repayment term;
- repayment in local currency;
- reasonable “all in” financing costs (including any guarantee fees) and credit terms for creditworthy Hosts; and
- consistent, competent and timely access by Hosts, ESCOs, vendors and contractors.

FINANCING OPTIONS

The primary financing options available for Hosts to finance ESPs are:

- Internal funding through Host capital budgets, which are rarely accessible to private companies due to stringent internal “hurdle rates;”
- Loans from LFIs that utilize Hosts’ borrowing capacity and allows the LFI to have full-recourse against Host for loan repayment, thereby rendering it an on balance-sheet transaction;
- Lease from a third party entity (as a lessor) that utilizes Hosts’ borrowing capacity and allows the lessor full-recourse against the Host for all lease payments, also creates an on balance-sheet transaction; and
- Shared savings and guaranteed savings structures provided by ESCOs with a guarantee of cash flow for the Host, discussed in Chapter 4.

PROJECT FINANCE STRUCTURES

Several structures used to finances around the world have been incorporated in the IEEFP Bank Training Program. One of them is illustrated in Appendix C with the intent that many other illustrations will be added on a continuing basis as part of the IEEFP Repository.

GUARANTEE MECHANISMS FOR LFIs

Several types of partial credit risk guarantee mechanisms are provided by development banks to LFIs around the world. Because the IFC/GEF program is one of the few that has been targeted at energy efficiency, it is presented in detail during the IEEFP Bank Training Program, and illustrated in Appendix D with the intent that many other illustrations will be added to the IEEFP Repository.

CHAPTER 7 ENERGY EFFICIENCY FINANCING RISKS AND SOLUTIONS

When Hosts install equipment with greater energy efficiency, they want to know how long it will take for the savings to pay for the project costs. These concerns are even more pronounced when an ESCO is involved and a guarantee has been made that the savings will pay for the project within a specified time frame. When relying on the savings to pay for a project, the Host or the ESCO incurs a risk that the predicted savings will not be achieved.

The primary risk in financing ESPs, where some portion or all of the repayment is based on savings, occurs when the actual savings are not sufficient to repay the investment plus the targeted return to the investor/lender. An equally major credit risk associated with the Host is the potential of going out of business and/or not making savings payments due from the projects to the investor/lender. It is assumed that LFIs in each country are capable of assessing the long-term creditworthiness of Hosts, and therefore, standardized procedures for assessing credit risk are not addressed in the IEEFP. However, the performance risks associated with savings being produced from the ESPs are typically not known to LFIs and are, therefore, the focus of the IEEFP.

MAJOR PERFORMANCE RISKS OF ESPs

In their lending procedures, all LFIs consider risks as they assign interest rates. In programs paid from savings (whether a performance contract or not), consideration must be given to the risk of not delivering the estimated savings. Performance risks typically can be classified in relation to the three major phases of the project: 1) development; 2) implementation; and 3) operation. The major risks during each of these phases are identified below, and are covered in detail during the IEEFP training.

Development Phase:

- Estimated savings are not realistic;
- Budgeted implementation cost is not realistic; and
- Host does not proceed to implement the project.

Implementation Phase:

- Not installed according to design and savings specifications;
- Cannot be installed for the budget implementation cost;
- Completion deadline not met;
- Commissioning requirements not met;
- Does not comply with local regulatory requirements; and
- Technology/equipment does not work properly.

Operation Phase:

- Savings cannot be measured and verified;
- Estimated savings are not achieved;
- Changes in Host's facility or operations; and
- Required operations & maintenance not performed.

Contract Risks:
There are also contract risks that affect all of the above phases when any of the parties do not adhere to their contractual responsibilities.

RISK MITIGATION STRATEGIES

The primary strategies for mitigating each of the above major risks are listed below, with a detailed explanation provided in the IEEFP Bank Training Program. Though the risks occur at particular phases of project development, mitigation actions should be planned long before the possible occurrence of the risk.

Estimated Savings Are Not Realistic

- Ensure that an investment grade audit (IGA) is properly prepared and "independently" reviewed by technically competent energy engineers (see Chapter 9);
- Utilize a multi-level and independent savings estimate review process during the IGA; and
- Estimated savings are reconciled to performance requirements of all contractors/vendors.

Budgeted Implementation Cost Is Not Realistic

- Estimated design/build costs are reconciled to performance requirements of all contractors/vendors; and
- Fix major M&V, O&M and other costs with contractors.

Project Not Installed According to Design and Savings Specifications

- Utilize experienced project managers, engineers, contractors and ensure they are involved at the IGA phase;
- Bond major contractors;
- Utilize job cost control system and have project managers review progress on a frequent basis;
- Impose rigorous commissioning procedures on contractors, including performance specifications ; and
- Hold back some portion of payments due to installing contractors until commissioning and other performance terms are met.

Technology or Equipment Does Not Work Properly

- Require demonstrated previous results from any technology contributing significant savings to ensure it is a "proven" technology;
- Contractually assign all major technology and technical risks to the applicable contractor or vendor by specifying performance requirements to be achieved as a condition for payment; and
- Ensure each major contractor/vendor has adequate financial capacity to cover their respective level of technical risk.

Savings Cannot Be Measured and Verified. (Typically M&V is associated with performance contracting. However, all energy efficiency projects should consider whether the achieved savings reflect those predicted by the energy auditor.)

- Ensure an M&V Plan (see Chapter 10) is developed during the IGA phase. The M&V Plan defines how the ESP's performance is to be evaluated. Savings evaluation dictates the payments due from the Host, though payments are often levelized and adjusted periodically to actual results.
- If possible, seek an M&V Plan which uses special meters to isolate the project energy use from the total facility energy use. Such an approach, called "Retrofit Isolation" may minimize possible future debates over energy savings achievement. (see IPMVP Option A or B in Chapter 10)
- To control project costs and risks, a performance contract may have a short one or two year savings proof period, after which period all parties agree that savings are as originally proven.

- Any performance contract should clearly reference the M&V Plan in enforceable language, defining roles of the Host and M&V service provider (normally the ESCO) throughout the Reporting Period.

Estimated Savings Are Not Achieved

- Ensure the savings calculation methodology is clearly articulated in the applicable contracts pursuant to the M&V plan.
- Energy Savings should be reconciled to the units of energy saved and the Host's applicable energy/utility prices, (including any taxes, levies and surcharges).
- If the baseline period energy prices are not established as "Floor Prices" in the savings calculation methodology (as suggested in the Risk Mitigation Checklist of Chapter 11), the ESCO or any other entity being "paid from savings" will receive less savings if energy price decreases. However, it is important to understand that a price reduction does not truly affect a Host's realization of savings from an EE investment since the Host will realize more than enough savings with price reductions on their total energy bill. In fact, paying an ESCO at less than the Floor Price would unfairly benefit the Host at the total expense of the ESCO.
- Any potential operating and maintenance (O&M) savings should be documented in the IGA based on the direct cost eliminated from the Host's current operating costs.
- Ensure the M&V Plan is followed, particularly monitoring for changes within the facility since baseline energy was recorded. To enable monitoring for facility changes the M&V Plan (see Chapter 10) should contain a record of baseline facts such as:
    a. ***Equipment***: Inventory of all energy consuming items
    c. ***Independent Variables:*** such as outdoor weather (degree days) or industrial plant production volumes
    d. ***Baseline Operating Conditions*** such as***:***
        - Buildings: Explicit standards of comfort and levels of service for heating, cooling, lighting levels, hot water temperatures, humidity levels, and/or any special conditions for occupied and unoccupied areas of the Site.
        - Industrial Sites: Product types, production patterns or shifts per week
    f. ***Operating Expenses*** if tracking savings therein:
        - Maintenance expenses may include costs for historical bulbs, ballasts, filters, chemicals, outside maintenance contracts, etc.
        - Labor may include cost of employees eliminated from payroll
        - Fixed overhead for manufacturing productivity gains. Ensure utility prices used in computing payments cannot drop below some minimum price, usually the price at the time of contract signing.
- Ensure that the Host is supplied with a thorough operations and maintenance manual regarding all energy sensitive aspects of the energy efficiency project, and that staff are regularly trained on procedures.
- Procedures should be in place for Host and ESCO to routinely inspect all operational aspects of the facility which affect energy savings.
- Ensure there is a mechanism in any performance contract to ensure the ESCO remains involved with energy savings and reviews every variance from plan with the Host.
- If applicable, ensue any guarantee of savings is provided by an ESCO of sufficient financial depth to cover any realistic shortfall. Experienced or well-trained and managed ESCOs rarely have shortfalls relative to their guarantee. Any such shortfall is likely a small fraction of the estimated savings, so catastrophic failure is highly unlikely when dealing with a well qualified ESCO using good risk management procedures.

Changes in Host's Facility or Operations

- Have clear contract and M&V Plan language that defines roles for monitoring and recording appropriate facility conditions throughout the saving reporting period, and adjusting the baseline accordingly;
- Ensure that M&V Plan defined tasks of monitoring facility conditions and operations are carried out routinely. Any necessary special adjustments should be made to the baseline at least annually so that adjustments can be recorded and funded from the relevant fiscal year of the Host.

Required Operations & Maintenance not Performed

- Have contract language that either allows IGA estimated savings to be used or permits the investor/lender to hire a third-party firm to perform O&M and charge it back to the responsible party (typically the Host).

Contract Risks

- Ensure that all contracts are legally enforceable, have clarity of terms and responsibilities of all parties, provide for allocation of each major risk to the party best able to control/manage such risk, and have reasonable and achievable major technical and financial terms. See Chapter 8 for more details.

IEEFP's main objective is to create understanding among LFIs of how ESPs generate reliable savings from existing operating expenses of Hosts.

Key contractual terms will vary with the project structure. Direct purchase of energy efficiency equipment, even when assembled into a comprehensive program, can be handled by a conventional financing agreement. Services are usually handled through conventional construction or maintenance contracts. The most complex ESP contracts are those which serve performance-based projects.

The most common contracts used to develop, finance, implement and operate ESPs are listed below. Some sample contracts are listed in Appendix D:

1. Financing Agreements:
   - Loan (lease) and security
   - Construction and long-term promissory notes and/or leases
   - Assignment of all assets
2. Construction and Maintenance Agreements:
   - Between contractors and ESCO or Host
   - Contractor responsible to install/service equipment within stipulated price, timeline and other terms
3. Energy Services Agreement (ESA) for savings-based structures:
   - Between ESCO and Host
   - ESCO responsible for turnkey development, financing and implementation of ESPs
   - Host pays from savings
   - ESCO savings guarantees if a Guaranteed Savings structure
4. Agreements when ESPs are financed/owned by special purpose entities (SPEs):
   - Construction (ESCO/contractor)
   - Recognition and assignment to SPE (Host)
   - Assignment of all rights (ESCO)
   - Operation and performance guarantees (ESCO)
   - Shareholder agreement (equity investors)

Any ESCO contract should have a clear scope of work that specifies all energy savings measures and services, including:

- Scope of the IGA, unless performed under separate contract,
- Retrofit equipment details: manufacturer, quantity and location, plus description of any modifications to existing site equipment,
- Project financing requirements in exchange for Host obligation to make payments from Savings (Savings Payments),
- M&V Plan for determining Host savings payments
- The date of commencement of savings payment
- Construction responsibilities to engineer, procure, and construct the project.
- Maintenance responsibilities: Need to have clear definition of Host and ESCO responsibilities to maintain the equipment affecting savings, which will often be more than simply the equipment installed under the project.
- Any applicable terms developed in the IGA.

Any ESP financed from savings should specify all terms and conditions for the investor/lender to be paid from savings, including:

- Structure

- Conditions for buying down the cost of renewable energy systems
- Host savings payments
- Repayment amount
- Term and termination

A dispute resolution method should be defined for any technical aspects related to the savings, implementation or performance of the contracted measures.

Maintenance responsibilities for the contracted measures should be identified. Frequently, the Host is made contractually responsible for maintaining all measures, which have replaced existing equipment, according to the vendor's manuals and to conduct specified procedures needed to assure achievement of agreed upon savings.

Other major conventional contract terms may need to be customized for:

- Warranty
- Construction responsibilities for ESCO (or contractor) and Host
- Completion definition
- Hazardous substances
- Implementation cost increases and responsibilities
- Contractor terms and responsibilities
- Event of force majeure and resolution
- Events of default and remedies
- Insurance coverage
- Indemnification
- Assignment rights

It is intended that this portion of the IEEEP will be significantly expanded over time to include a Respository of generic contracts and terms used in different countries around the world. One such contract is a Performance Contract used by US government agencies found at the following internet address: http://www.deq.state.mt.us/Energy/EESchool/ModelEPC.htm

CHAPTER 9 INVESTMENT GRADE AUDIT

An investment grade audit (IGA) is the technical and economic foundation for any successful ESP. It is a detailed document that estimates all savings and costs for each energy savings or renewable energy measure. It is usually prepared at the same time that the M&V Plan is developed and may contain the M&V Plan (see Chapter 10). Its goal is to provide the Host with sufficient information to judge the technical and economical feasibility of the recommended measures.

An IGA should minimally include:

- a listing and a detailed description of each recommended measure, with energy and other savings, design and construction cost, annual O&M costs and simple payback;
- analysis of baseline energy data relative to other comparable facilities and to important independent variables such as weather or production;
- allocation of baseline energy use to each energy using system;
- a full description of the data gathered, analysis performed, and all assumptions for each measure; and
- a discussion for each recommended measure of the costs and savings risks, and risk mitigation costs.

An IGA should also include:

- Details sufficient to define the scope and plan of each measure
- Bases for the calculations of savings and costs for each measure
- Clearly identify the inputs and outputs for any modeling software so that another expert can approve the work
- Any potential non-energy operating and maintenance (O&M) cost savings (or increases)
- Any potential productivity gains from new equipment
- M&V Plan for each measure or the entire project, or linkage to the separate M&V Plan
- Clarification of interaction/dependencies between measures
- Schedule of work
- Amount of expected savings during construction period
- Impacts of the proposed measures on the work environment or production rate and quality
- Approximate impact of each measure on the site's "carbon footprint," or C_{O2} emissions
- Financial analysis including:
  - Spreadsheet depiction over the life of the project of estimated cash flows showing: savings by energy type, other operating cost changes, interest and principal.
  - Risks associated with achieving savings and risk mitigation/management costs;
  - Project cost breakdown for labor, contractors, materials and equipment, miscellaneous items (e.g. permits, bonds, taxes, insurance), overhead and profit; and
  - All assumed financial terms including interest rate, current energy prices, any escalation rates, payment terms to lender, investor
  - Estimated *Net Present Value* of total cash flow benefits to the Host, and discount rate used.

There are many published references on the methods and contents of an IGA. One for IGAs of buildings is ASHRAE's Procedures for Commercial Building Energy Audits RP-669 (2004). IGAs for industrial process facilities are different than for buildings in the following major ways:

- Include a wider scope and advanced technologies
- Include a more unique set of EE technologies and measures
- Require performance measurements for major energy consuming devices before selecting retrofits
- Energy consumption correlated to products and level of production, rather than to weather

The following shortcomings are often found in IGAs:

- Improper use of current energy and demand prices
- Incomplete understanding of operating patterns of various elements in the facility
- Incomplete (or excess) allocation of all energies to all energy using components/systems
- Predicted savings unreasonable relative to baseline energy allocated to components
- Incomplete energy-consuming equipment inventory
- Inadequate consideration of the proposed measures' impacts on work environment/process
- Unclear description and identification of the retrofit scheme
- Overestimated savings on combination of all measures
- No consideration of offsetting increased O&M costs
- Incomplete consideration of all feasible proven technologies for efficiency or renewable energy
- No comparison to similar facilities
- Insufficient consideration of the impact people, especially O&M staff, may have on the project

CHAPTER 10 MEASUREMENT AND VERIFICATION

The primary purpose of measurement and verification (M&V) is to establish and report project benefits and savings achieved. Proper reporting enables the project developer (possibly an ESCO), Host and financier to clearly judge performance, decide corrective actions if any, and process appropriate financial payments. Proper measurement and verification of savings is critical to successful ESPs. There follows a summary of good (M&V) practice, as defined in EVO's widely referenced International Performance Measurement and Verification Protocol (IPMVP).

IPMVP Background

IPMVP was initiated by the U.S. Department of Energy, with a volunteer committee of industry professionals in 1996. It specifically aimed to provide broadly accepted guidelines and methodologies for assessing savings in energy efficiency projects to enable financiers to fund ESCO projects in U.S. federal facilities. IPMVP is now maintained and disseminated by EVO, a volunteer led non-profit entity with active participants around the world. It is published in a number of languages and freely available at www.evo-world.org.

In summary, the IPMVP:

- defines broadly accepted M&V Options and terminology for measuring savings;
- is a framework designed for energy engineers and Hosts to develop M&V plans for specific commercial and industrials; and
- allows maximum flexibility in creating M&V plans that meet the needs of individual ESPs, while adhering to the principles of accuracy, completeness, conservativeness, consistency, relevance and transparency.

M&V Methods

Normally energy savings cannot be directly *measured*, since savings represent the absence of energy use. Instead savings are *computed* using energy measurements taken before and after the. These measurements usually must be adjusted to ensure that changes in use of the facility do not cloud the effect of the project.

Savings computation will normally be done by subtracting the energy measured after project installation from the energy consumption that would have occurred if the project had not happened (the adjusted baseline). The financial value of the energy savings is determined using agreed utility prices (including any taxes, levies and surcharges).

Energy (Cost) Savings = Adjusted baseline energy cost - Reporting period energy cost

IPMVP defines four generic methods (called Options A, B, C and D) to cover the range of possible ESPs, allowing users to balance measurement accuracy with M&V cost:

Retrofit Isolation - Looks only at the savings of the retrofitted equipment or affected system, independent of the energy use of the rest of the facility:

- OPTION A - Retrofit Isolation using measurement of the key performance parameter(s), and estimation of all others.
- OPTION B - Retrofit Isolation using measurement of all parameters affecting energy use or energy use.

Whole Facility - Looks globally at savings of a whole facility, considering the total energy use without assessing the performance of retrofitted equipment or systems.

- OPTION C - Whole Facility, using data from utility bills or meter readings.
- OPTION D - Calibrated Simulation, using valid computer simulation tools**.**

M&V Plan

An M&V Plan should be prepared for each, or for each specific energy efficiency measure if using a Retrofit Isolation Option A or B. The Plan should contain all the items listed in IPMVP's Chapter 5, summarized here:

- selected IPMVP Option (A, B, C or D),
- all baseline data: energy, independent variables (e.g. weather, production volumes) and facility design and operating characteristics affecting energy (e.g. indoor temperature/ventilation/light level),
- any analysis (or models) correlating baseline energy with independent variables,
- any negotiated (or stipulated or unmeasured) energy, maintenance, or other operating cost savings,
- utility prices, and price adjustment methods for future periods,
- meter reading, maintenance and calibration procedures, if not using data from utility companies,
- any estimated parameters used in calculations,
- the exact savings computation procedures that will be followed,
- expected costs and accuracy,
- quality assurance techniques, and
- duties of the Host and ESCO in monitoring changes to the facility during the reporting period.

Savings Reports

Savings reports should be prepared routinely in order to properly manage results and cash flow. Savings reports should follow the project's M&V Plan and contain all the items listed in IPMVP's Chapter 6, summarized here:

- raw data for the reporting period (energy and independent variables),
- description of any facility changes warranting adjustments to the baseline, and calculation of the necessary adjustment,
- energy price used, and
- computed savings in energy and monetary units.

The tools noted in this section should be part of any loan evaluation procedure. These procedures should be reviewed in detail with LFIs during an IEEFP Bank Training Program. A summary of the needed procedures is provided below.

GENERAL LOAN GUIDELINES

- The typical building savings for comprehensive energy projects is 25 percent of total utility cost
- No rule of thumb percentage savings for industrial sites has been established
- Annual repayment of debt and equity should not exceed 75 percent of predicted annual savings (except for low-risk technologies like lighting)
- Simple payback is not very relevant; it typically looks only at a first year and ignores risk management costs and life cycle benefits

RISK MITIGATION CHECKLIST

- The IGA is completed and reviewed by a technically competent third party, and applicable technical aspects and associated risks are properly articulated in enforceable language as a basis for any implementation contract.
- Methodologies are clearly defined for later contract language:
  - Baseline conditions
  - Savings calculation
  - Savings payments
  - Baseline and future adjustments
  - M&V protocol
  - Floor values for energy price, site use, production levels, etc.
- Host is credit worthy
- Savings estimates are reconciled with total energy utilization of the site
- Multi-level and independent savings estimate review processes are used
- Contracts are "balanced" to assign risks to the party best able to assume/manage each risk
- All Permits, licenses and other regulations are met
- ESCO/contractor's experience is adequately referenced, demonstrated and documented
- Budgets and timelines are reconciled with all contractors, equipment suppliers, consultants and construction approval authorities
- Construction advances are based on completed work
- Needed debt service levels approximately 80%, or less, of estimated Host savings payments
- Proven and applicable technologies are used

IGA CHECKLIST

- Energy prices used to estimate savings are based on actual historical costs, rate structures and consumption levels
- Equipment energy usage has been reconciled with baseline energy data covering all modes of facility operation
- Operations and usage patterns for different areas in the facility are clearly identified and considered
- Risks related to achieving predicted savings for each measure are identified and mitigation/management costs established

- The bases for implementation costs have been clearly identified
- The inputs and outputs for any modeling software are clearly identified so that another expert can approve work
- It is clear why and how savings are to be achieved for each measure
- It is clear what form of retrofit is proposed for each measure and what the advantages will be
- All economically viable EE measures have been addressed
- Impacts of the proposed measures on the work environment or production rate/quality have been assessed
- Net benefit to the organization's physical portfolio has been calculated

LOAN APPLICATION CHECKLIST

When an ESCO presents a loan application to an LFI loan committee, it is recommended that the following issues be addressed, and should be part of an IEEFP training program.

- Project economics
  - Savings calculation by measure and by utility
  - M&V Plan
  - Construction schedule and timeline
  - Cost detail by measure and by contractor (or ESCO)
- Project financing structure
  - Describe structure, equity and debt
  - Repayment terms and conditions
  - Parties and their responsibilities
- Host information
  - Demonstrated creditworthiness
  - Impact from project regarding benefits, concerns, etc.
  - Contract responsibilities, terms and conditions
- Information on ESCO and each major sub-contractor
  - Financial condition, years in business, etc.
  - Experience with work scope and technologies
  - Contract responsibilities, terms and conditions
- Loan request details
  - Amount
  - Repayment term
  - Desired interest rate
  - Credit risk assessment and mitigation strategies
  - Forms of security, assignments, collateral, etc.

CASH FLOW WORKSHEET

A proprietary Cash Flow Worksheet was provided by EPS Capital Corp. to trainees at the Mexican pilot training program. Any IEEFP workshop for bank personnel should include hands-on evaluation of a paid-from-savings "Loan Proposal" and the related ESP Case Study. During such training a cash flow worksheet or something similar should be made available to bank trainees at all IEEFP training programs.

CHAPTER 12 ABBREVIATIONS AND DEFINITIONS

Abbreviations

APEC	Asian Pacific Economic Cooperation
EBRD	European Bank for Reconstruction and Development
EE	Energy efficiency
ESCO	Energy services company
ESP	Energy efficiency and renewable energy savings-based project
EU	European Union
EVO	Efficiency Valuation Organization
GWG	Global Working Group
HVAC	Heating, ventilation and air-conditioning
IEEFP	International Energy Efficiency Financing Protocol
IFC	International Finance Corporation
IFIs	International financial institutions
IGA	Investment grade audit
IPMVP	International Performance Measurement and Verification Protocol
LFIs	Local banks and financial institutions
Mexico-EWT	Mexican Economy Work Team
O&M	Operation and maintenance
M&V	Measurement and verification
PGM	Performance risk guarantee mechanism
PCG	Partial credit guarantee
REEEP	Renewable Energy & Energy Efficiency Partnerships
SENER	Mexico's Department of Energy
Thai-EWT	Thailand Economy Working Team
VSDs	Variable speed drives

Definitions

Energy Efficiency: A minimization of energy use in a cost effective and environmentally sensitive manner in order to provide the required internal environment and services (CIBSE, 1998). Building internal environment is specified in terms of temperature, relative humidity levels, ventilation, hot water, lighting and equipment requirements (Good Practice-Guide 79; 1998).

Energy Services Company (ESCO): A Company that: i) develops, finances and implements energy efficiency and savings-based renewable projects (ESPs) on a "turn-key" basis, and ii) risks payments for its services on actual savings performance of equipment installed.

Hosts: Owners of existing end-use energy consuming facilities where ESPs are installed.

The following Case Studies illustrate the breadth of EE technologies and industries as well as each of IPMVP's Four M&V Options that have been implemented ins around the world. It is expected that many more Case Studies will be developed over time and posted on EVO's website for access by EVO Subscribers.

A.1 Hospital

- **Project Summary**

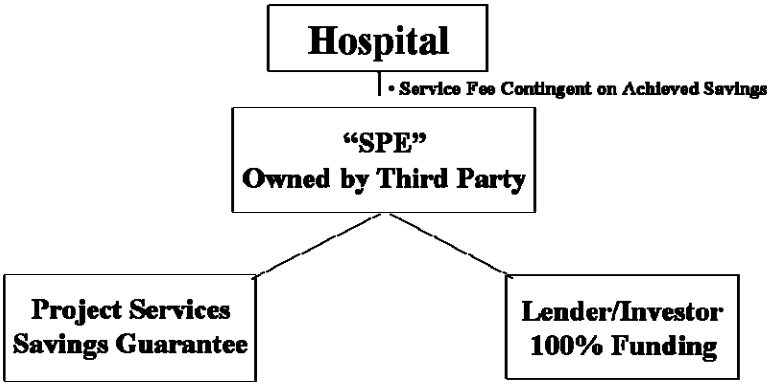
Savings Measure	Total Cost (w/o financing)	Annual Savings	Utility Rebates	Simple Payback
Water	$ 559,075	$ 253,244	--	2.2
Lighting	1,675,955	406,305	600,000	2.6
Steam System	419,090	329,208	--	1.3
Power Factor	25,172	11,492	--	2.2
Sterilizers/DHW	26,489	4,360	--	6.1
Chiller Plant	3,235,592	245,232	855,145	9.7
				Years
TOTALS	**$ 5,941,373**	**$ 1,249,841**	**$1,455,145**	**3.6**

- **Project Highlights**
  - New 3,200 ton Chilled Water Plant
  - Lighting, Steam Traps & Water Measures
  - US$5.9 million Investment
  - *US$1.45 million in Grants and Rebates*
  - US$1.25 million Energy Savings per year
  - Simple Payback = 3.7 Years (after Grants)
  - Non-recourse "Paid-From-Savings" Financing

- **Project Cash Flow**

AMOUNT FINANCED:	US $						
Total Construction Price	$5,941,372						
Construction Interest	167,193						
Finance Fees	127,681						
Legal Fees	177,279						
Total Construction Financing	6,413,525						
Utility and Freon Rebates Received	(1,455,155)						
"NET FINANCING NEEDED"	4,958,371						
Payments Made To Client	71,323						
AMOUNT FINANCED BY AHB	$5,029,694						
							12 YEAR
	2000	2001	2002	2003	2011	2012	TOTAL
Gross Savings Estimate:							
Phase 1 Total		$ 832,315	$ 1,004,609	$ 1,074,665	$ 1,228,048	$ 1,240,328	$ 13,642,512
Phase 1 Rebates Paid to Client	600,000						600,000
Phase 2 Total		237,423	245,232	285,337	348,917	351,406	3,816,897
TOTAL GROSS SAVINGS	600,000	1,069,738	1,249,841	1,360,002	1,576,965	1,591,735	18,059,409
Base Fee Payments to Lender		(233,331)	(752,715)	(790,224)	(511,198)	(20,436)	(7,839,468)
M&V Payments to ESCO	-	(83,232)	(134,145)	(99,987)	(59,803)	(1,635)	(1,078,712)
ANNUAL CASH BENEFIT	$ 600,000	$ 753,176	$ 362,981	$ 469,791	$ 1,005,964	$ 1,570,664	$ 9,141,228

- **Financing Structure**



- **"Savings Fee"** was only paid when actual measured and verified savings are achieved (contingent)
  - Base Fee: Investment Repayment and Cost and Profit to Operate SPE
  - Variable Fee: % of Actual Measured & Verified Savings
- **M&V Approach =** OPTION "A"
  - Actual Before/After Measurements at Installation
  - Stipulated Usage Factors
- **M&V Summary**

Savings Measure	Item Measured	Level Measured	Item(s) Stipulated (based on post actual)

Water	Gallons	Sample	Toilets = # Flushes
			Showers = # & Time

Lighting	kW	Sample	Hours of Use (based on actual logged use)
Steam Traps	Steam Loss	Sample	Extrapolated Actual
Power Factor	Utility Bill	100%	Annual Savings
Sterilizer	Steam Loss	100%	Annual Savings
Chiller Plant	kW/Ton	100%	Ton Hours

- **Appropriateness of M&V Approach:**
  - Large facility with continuously variable conditions
  - Actual Before/After Measurements verified key parameter
  - Control system in place provided stipulated usage factors
  - On-going measurement not required
  - Verified equipment remains in place and operating.
- **Advantages of using Option A:**
  - Cost effective for the numerous hospital operational variables
  - Actual changes verified with statistically valid samples
  - Easy to administer
- **Disadvantages of using Option A:**
  - Inaccuracy created by stipulated usage factor
  - Not reconciled to total utility usage
  - Does not track on-going facility changes

A.2 Textile Mill

- **Existing Energy Systems**
  - 2 Coal-fired Steam Boilers (30/35 Tonnes/hr)
  - Steam Use for Manufacturing process heating and On-site electric power generation
  - 2/3 of plant's kWh is self-generated
  - 1/3 of plant's kWh is purchased from utility

- **Existing Fuel Consumption**

TYPE OF FUEL	COAL (Tonnes/yr)	ELECTRICITY kWh/yr
Self-Generated kWh	68,073	39,400,000
kWh from Utility	-	19,350,000
TOTAL per Year	68,073	58,750,000

PROJECT SUMMARY (US$)

#	Savings Measure	Cost to Implement	Annual Savings	Payback Years
1	Pocket Ventilation Pre-heat	$ 100,000	$ 45,000	2.2
2	Pumping Power Reduction	892,000	318,000	2.8
3	Refining Power Reduction	882,000	267,000	3.3
4	Wastewater Aeration Power Reduction	110,000	33,000	3.3
5	Steam Condensate Optimization	696,000	312,000	2.2
6	On-site Power Generation Upgrade	2,320,000	790,000	2.9
	TOTALS	$ 5,000,000	$ 1,765,000	2.8

- **Key Project Aspects**
  - Extensive interaction with Client Operators
  - Well defined implementation details
  - Clearly defined M&V Plan with measured Baseline for each savings measure
  - Financial Plan
  - Critical reviews with Client Executive Management
  - Formal approval process

- **Project Benefits Achieved**
  - Provided Positive Cash Flow to Owner
  - Financed out of Existing Operating Expenses
  - Owner received newest "Proven" Technologies
  - Reduced Greenhouse Gas Emissions
  - Reduced Work Stoppages - Reliable Power
  - Improved Product Quality
  - Provided Additional Production Capacity

- **Customer Benefits Achieved**
  - Increased Company's Competitiveness
  - Improved Profitability and Cash Flow
  - More Production Capacity
  - Deemed an Environmental "Player"
  - Ability to Pursue New Markets
  - Introduction to New Financial Sources

- **Environmental Benefits Achieved**
  - Reduce 31,217 Metric Tonnes (MT) of CO_2 per year or 312,170 MT over the estimated ten-years of the Project for a very low cost of approximately US$0.313 per MT of CO_2 equivalent.
- **M&V Approach =** OPTION "B"
  - Before/after measurements
  - Continuous monitoring based on actual usage
  - Use of newly-installed meters & instruments
  - Each Savings Measure had specific measurements and baseline
  - Steam savings - meter to measure steam energy
  - Electricity savings - meter to measure kWhs
- **"M&V" Summary**

Savings Measure	Item Measured	Level Measured	How often Item Measured
Pocket Ventilation Pre-heat	Steam	100%	Continuous
Pumping Power Reduction	kW/kWh	100%	Continuous
Refining Power Reduction	kW/kWh	100%	Continuous
Wastewater Aeration	kW/kWh	100%	Continuous
Steam Condensate	Steam	100%	Continuous
On-site Power Generation	kW/kWh	100%	Continuous

- **Appropriateness of M&V Approach:**
  - Large facility with continuously variable conditions
  - Actual Before/After Measurements verify savings
  - Savings isolated from total energy costs
  - On-going measurement required to verify savings based on changing process operations
- **Advantages of using Option B:**
  - Savings correlate with process changes
  - Actual savings verified with metered usage
  - Meters useful for other process optimization activities
  - Less performance uncertainty (risk) for customer
- **Disadvantages of using Option B:**
  - Expensive to install and monitor meters
  - Not reconciled to total energy costs
  - Difficult to establish baseline relationships between production variables and energy consumption

A.3 Steel Mill

PROJECT SUMMARY (US$)

#	Savings Measure	Cost to Implement	Annual Savings	Payback Years
1	Variable Speed Drives on Slurry Pumps	$ 1,000,000	$ 300,000	3.3
2	Dry Magnetic Separators	2,500,000	1,225,000	2.0
3	Furnace Burner and Control Upgrades	4,500,000	1,800,000	2.5
4	New Roller Screen Technology	1,000,000	175,000	5.7
	TOTALS	**$ 9,000,000**	**$ 3,500,000**	**2.6**

- **M&V Approach** = OPTION "B"
  - Before/After Measurements
  - Continuous Monitoring based on actual usage
- **M&V Summary**

Savings Measure	Item Measured	Level Measured	How often Item Measured
VSDs on Slurry Pumps	kW/kWh	100%	Continuous
Dry Magnetic Separators	Iron Ore Yield & kW/kWh	100%	Continuous
Furnace Burner & Controls	Fuel/MT of steel	100%	Continuous
Ore Separation Roller Screens	kW/kWh	100%	Continuous

A.4 Commercial Building

PROJECT SUMMARY (US$)

#	Savings Measure	Cost to Implement	Annual Savings	Payback Years
1	Lighting System	$ 900,000	$ 202,000	4.5
2	Energy Efficient Motors	350,000	62,000	5.6
3	Ventilation & Cooling System Controls	1,000,000	296,000	3.4
4	Energy management & training	55,000	40,000	1.4
	TOTALS	**$ 2,305,000**	**$ 600,000**	**3.8**

- **Project Highlights**
  - The energy bill of year 1999 US$2.5 million
  - The energy bill of year 2001 US$1.9 million
  - Savings US$0.6 million
  - Occupancy was unchanged for the baseline period, and for the duration of the project Project implemented in 2000
- **M&V Approach** = OPTION "C"
  - Whole Facility approach, using main electric utility meter data
  - Weather/energy relationship determined for 1999 baseline.
  - 2001 utility consumption data compared to baseline model to show savings
- **Appropriateness of M&V Approach**
  - Large-scale project
  - Important energy saving (20% or more)
  - All weather, occupancy and building parameters affecting energy usage can be clearly identified (baseline and after implementation)
  - Adjustments factors are simple
  - Individual measurement not required
  - Soft savings measures included (training)
- **Advantages of using Option C:**
  - Performance of the entire building, including savings measures
  - Interactive effects between EE measures automatically accounted
  - Annual feedback on actual results
  - Reconciled with total energy costs
  - Tracking of facility changes, for baseline adjustments and savings reporting, assists energy cost budgeting
- **Disadvantages of using Option C:**
  - Monthly reports show too much variability for 'real time' feedback. Annual reports are less impacted by variations.
  - Cannot separate savings measures from other uncontrolled energy impacts
  - May be difficult to apply where savings are small (<10%)
  - May require special review of facility and operations to identify and quantify necessary baseline adjustments

APPENDIX B GUARANTEE MECHANISMS FOR LFIs

IFC/GEF Commercializing Energy Efficiency Finance Program

The International Finance Corporation (IFC), the private investment agency of the World Bank, collaborated with the Global Environment Facility (GEF) to promote and get LFIs comfortable with financings and ESCOs. They created a guarantee program for LFIs that has become one of the most successful partial credit risk guarantee programs around the world. It is called the IFC/GEF Commercializing Energy Efficiency Finance ("CEEF") program, and it shares a portion of the credit risk on the equipment financings funded by LFIs. This guarantee program, and several others that can possibly be incorporated to help LFIs overcome their concerns about financings, will be reviewed and covered in each country-specific IEEFP Bank Training Program.

An overview of the CEEF program that has been implemented by IFC/GEF is as follows:

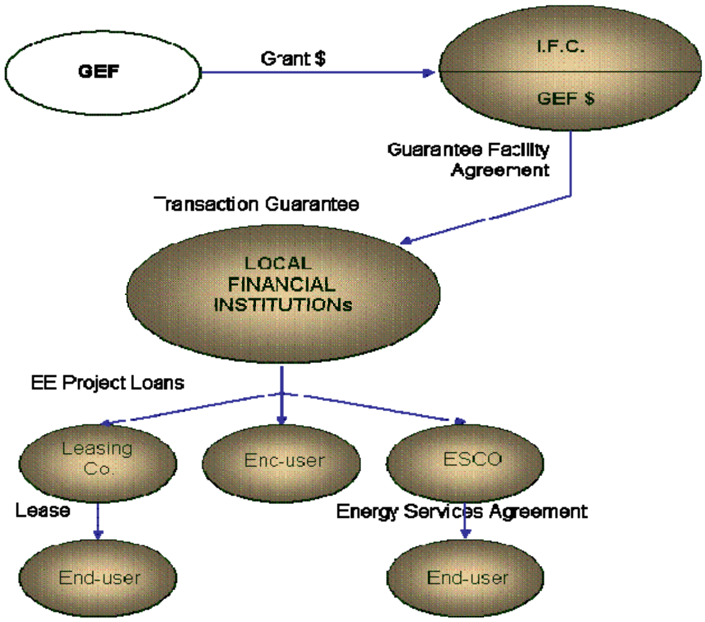
- Operating in 6 Eastern European countries
  - Pilot program started in Hungary in 1997
  - Expanded to 5 new countries in 2003
  - New China Program in 2006
- GEF funding with IFC covers the guarantee reserves
- Financial products for various sectors that include:
  - Variety of Building Hosts
  - ESCOs
  - District Heating companies
  - Cogeneration Companies
  - Small-scale Biomass and Wind Companies
  - Industrial Facilities
  - Small and Medium-sized Enterprises ("SMEs")
  - Municipal/public sector
  - Hospitals
  - Multi-family and single-family residential
- Typical projects included: heating and cooling production optimization, automated controls and heat distribution, and efficiency improvements to lighting systems and industrial processes.
- Range of transaction sizes allowed:
  - Single transaction guarantee maximum = US$1.875 million
  - No minimum, portfolio approach for small deals

The major terms of the CEEF Program are:

- EE Eligibility: All types - private and some public sector
- Guarantees: up to 50% of loan principal, *pari passu*, subordinated recovery, first loss and portfolio guarantees used
- Maximum Guarantee Per Transaction: US$1.875 M; maximum term = 8 years
- Guarantee Fee: 1.40 - 1.75% of guarantee liability/year
- Guarantee Claims: payment 90 days after Bank loan acceleration; Bank effects recovery; recovered monies distributed pro rata net recovery costs
- IFC rated "AAA": LFI Reserve requirements reduced proportional to guarantee, which boosts the LFIs' ROE
- Qualified LFIs: LFIs are selected by IFC based on origination and marketing skills
- Funding levels:US$15 million in GEF reserves, up to US$75 million IFC investment total guarantee capacity = US$90 million

- Technical Assistance: Funding is provided to all parties for technical assistance needed to prepare projects & build their development capacities
- Approval Procedures:
  - ***Portfolio****:* guarantees < US$50,000; LFI can automatically include loan under guarantee, according to agreed underwriting guidelines
  - ***Streamlined:*** guarantees US$50,000 to US$500,000; 15 day no objections approval process, according to agreed underwriting guidelines
  - ***Standard:*** guarantees US$500,000 to US$1.875 million; 30 day approval process, individual project reviews

A diagram depicting the CEEF structure is below:



Key Lessons Learned in IFC/GEF's first Hungary program:

- A different financial product approach for each major EE end-use sector is needed to create specialty designed products that meet the separate niche credit features of target sectors (e.g. multi-family housing, district heating);
- Implementation procedures need to be streamlined;
- Engage and educate LFI staff continually; involve multiple departments and branches; and have lead person for: i) credit and policy and ii) origination and marketing
- Technical Assistance is critical with LFIs and EE businesses to increase transaction volume.

APPENDIX C FINANCING STRUCTURES

Municipal Street Lighting Financing Structure (Hungary)

Key Features:

- Target market: small municipalities
- Small ESCO, manufactures and installs streetlight systems
- Multi-project credit facility, with bank, ~US$1 million, supported by IFC guarantee
- ESCO agreement with end-users calls for fixed payments, which can readily be assigned to Bank
- Bank “looks through” ESCO to credit of municipality
- Standard underwriting guidelines
- Electric utility provides maintenance

APPENDIX D MAJOR ENERGY EFFICIENCY TECHNOLOGIES

The following list of predominant, long-standing, proven energy efficiency technologies is intended as a reference list for investors. In each case the typical associated level of risk is indicated in bold italics within the parentheses.

- High efficiency lighting ***(Low)***
- Heating ventilation air conditioning (HVAC) upgrades ***(Med to High)***
- New automated building and HVAC controls ***(High – difficult to measure)***
- Variable speed drives (VSDs) on motors fans and pumps ***(Med to High)***
- High efficiency chillers ***(Low)***
- High efficiency boilers ***(Low)***
- Combustion and burner upgrades ***(Low)***
- Fuel switching ***(Low if prices are stipulated)***
- Water conservation; i.e., toilets, showers, faucets ***(Low)***
- Heat recovery and steam traps ***(Low)***
- Power factor correction ***(Low)***

The following end use savings technologies are unique to industrial facilities:

- New automated process controls ***(Low)***
- Heat recovery from process air and water ***(Low)***
- Cogeneration used for peak shaving ***(High – many variables)***
- Water recycling ***(Low)***
- Process equipment upgrades (***Low to High)***
- Process changes ***(Med to high - depending on technology)***

Shown below are key aspects of some of the most commonly applied technologies listed above, with their typical simple paybacks (= total implementation cost ÷ annual savings).

Lighting (2 to 3 year simple payback):

- Most frequently presents the largest cost-effective potential for EE improvement in buildings.
- State-of-the-art fluorescent lamps and ballasts can reduce maintenance costs as well.
- Daylight controls and natural day lighting design reduce energy and improve visual comfort.
- Retrofits for existing fluorescent fixtures include electronic ballasts, T8 lamps, and reflectors.
- Meeting rooms and other intermittently occupied spaces can garner significant energy savings with the use of timers and occupancy sensors.
- Smaller impact opportunity includes security lighting, including stairwell lighting, exterior nighttime security lighting, and exit signs.

Motors (3 to 5 year simple payback):

- High efficiency electric motor replacements usually pay back when a motor is running for long periods at high load, or at the end of motor life.
- The cost premium over standard motors normally can be recovered in less than 2 years.
- Important to size motor to actual load profile, to improve efficiency and control electrical power factor.

VSDs (3 to 5 year simple payback):

- Applied to motors, pumps and fans
- Matches motor use to variable operating load
- Can save 40 percent in power consumption
- Can be packaged with controls
- Extends motor life

HVAC (2 to 8 year simple payback)

- HVAC systems provide year-round thermal comfort in buildings.
- In humid climates, HVAC systems remove moisture from the air to maintain comfort and to control indoor air quality for people and sensitive equipment.
- Largest energy user in commercial buildings, approximately 50 percent of total energy consumption and 33 percent of total electrical consumption.
- Packaged air conditioners are usually old, poorly maintained and inefficient in existing buildings.
- New packaged units can increase efficiency and indoor comfort
- Proper sizing of HVAC equipment is a major opportunity, since full-load operation is more efficient than part load operation. Consider fan capacity reduction or staging of 2 smaller units rather than partial loading of one large unit.
- Install VSDs on HVAC motors
- Balance air and water supply systems to remove trouble spots demanding inefficient system operation
- Improve maintenance
- Eliminate simultaneous heating and cooling
- Install economizers and direct digital controls
- Variable air volume conversions versus constant air flow
- Ventilation reduction
- Unoccupied shutdown or temperature setback/setup (controls)

Chillers (5 to 10 year simple payback):

- Central chillers provide cold water distributed to process loads or to building air handlers to condition the indoor environment.
- New chiller models are typically 30-40 percent more efficient than existing equipment.
- Two major categories: 1) electric chillers and 2) gas-fired chillers
- Retrofit lead chiller(s) (base load) to high efficiency
- Manage chiller and condenser settings to minimize compressor energy
- Optimize pumping energy for distribution of chilled water
- Optimize HVAC operation to:
  - Improve temperature/humidity control
  - Eliminate unnecessary cooling loads
- CFC reclamation program/inventory. Chiller replacement may achieve both CFC management and energy efficiency objectives.

Boilers (1 to 5 year simple payback):

- Two types of boilers:
  Steam boilers
    - Typically where high pressure steam is needed
    - Common in older large building (like hospitals)
    - Inefficient way to produce hot water

  Hot water
    - Most efficient way to produce hot water
- Replace steam with hot water boilers for hot water heating loads
- Improve maintenance

- Optimize operation/staging in multiple boiler plants
- Optimize boiler controls
- Tune or replace burners
- Add small “pony” boilers for low loads:
    - Reduced fuel consumption/energy costs
    - Reduced emissions
    - Reduced maintenance costs
    - Higher reliability

Heat Recovery (2 to 4 year simple payback):

- Heat recovery devices to capture waste heat from water, process heat and exhaust air to re-use it for preheating:
    - building intake air
    - boiler combustion air
    - boiler feedwater
    - inlet water for domestic hot water

New Automated Building and HVAC Controls (3 to 5 year simple payback):

- Old controls may still be pneumatic systems based on compressed air
- New electronic controls are more precise, reliable, greater capabilities
- Can automate lighting, chiller, boiler and HVAC operation:
    - Load shedding
    - Optimal start/stop/warm up
    - Ventilation control
- Whole-building energy management system comes with other advanced control technologies:
    - security, fire and life safety
    - alarm monitoring and report generation
    - preventative maintenance scheduling
- Equipment selection depends on needs and budget
- Select system that will allow opportunities for planned future facility expansion
- Retrofits are possible with pneumatic system
- Remote monitoring/metering capabilities

Building Shell and Fenestration (3 to 10 year simple payback):

- Roof insulation, combined with reflective roof coatings in warm climates, reduces energy consumption and can often be combined with capital projects
- Review building pressurization for proper ventilation:
    - Balance exhaust and intake air quantities
    - Add weather-stripping on doors and windows
    - Seal cracks and unnecessary openings
- Window films to reduce solar heat gain and/or heat loss
- Replace windows with more energy efficient glazing

The levels of risk and the range of paybacks noted above are relative to each other. Actual values will vary significantly by facility, related technologies, and the level of energy efficiency expertise of the operation and maintenance personnel. The most consistent risk and payback information will be associated with technologies that are most “people impervious,” e.g. roof insulation.

APPENDIX E CONTRACT SAMPLES

E.1 Energy Services Agreements (ESCOs)

It is expected that sample agreements will be provided to EVO on an on-going basis by EE stakeholders around the world and posted in the IEEFP-Repository for access by EVO Subscribers.

E.2 Construction Agreements (Contractors)

It is expected that sample agreements will be provided to EVO on an on-going basis by EE stakeholders around the world and posted in the IEEFP-Repository for access by EVO Subscribers.

E.3 O&M Agreements (Contractors)

It is expected that sample agreements will be provided to EVO on an on-going basis by EE stakeholders around the world and posted in the IEEFP-Repository for access by EVO Subscribers.

E.4 M&V Agreements (Contractors)

It is expected that sample agreements will be provided to EVO on an on-going basis by EE stakeholders around the world and posted in the IEEFP-Repository for access by EVO Subscribers.

E.5 Energy Engineering Consulting Agreements (Consultants)

It is expected that sample agreements will be provided to EVO on an on-going basis by EE stakeholders around the world and posted in the IEEFP-Repository for access by EVO Subscribers.

EVO thanks its current Primary Subscribers:

San Diego Gas & Electric Company

Southern California Edison