Delivery Mechanisms for Financing of Industrial Energy Efficiency

A Collection of Best Practices
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July 2012

Prepared for Institute for Industrial Productivity by Aequero:
The Institute for Industrial Productivity (IIP) provides companies and governments with the best energy efficiency practices to reduce energy costs and prepare for a low carbon future. Our global team and independent experts offer an integrated service package comprising technology, policy and financing components.

We are the partner of choice for companies and governments—whether the need is best practice information or a tailored approach to implementing an initiative.

The Institute for Industrial Productivity works across the globe with a near-term focus on China, India, and the USA to ensure industrial stakeholders have access to the most effective energy efficiency technology, policy and financing approaches. We do this by:

- sharing best practices and providing access to a network of international experts;
- developing original research, analysis and databases; and
- bridging the gap between government policy and industry implementation.

Companies, industry associations and governments can leverage our expertise to achieve their goals.

Many companies, industry associations, and governments are aware that increasing energy efficiency cuts costs and helps achieve sustainable economic growth, and they establish goals to boost energy productivity. The Institute for Industrial Productivity helps these organizations understand which technologies, policies and financing options will help them achieve their vision. Our integrated technology, policy and financing model and our broad network of experts makes us the partner of choice for governments, and companies that share our goal of competitive industries through a low carbon future. The Institute for Industrial Productivity is a nonprofit organization independently funded by the ClimateWorks Foundation, serving as its Best Practice Network partner for the industrial sector.
## Glossary of Terms

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<thead>
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<th>Abbreviation</th>
<th>Full Form</th>
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<tr>
<td>BGN</td>
<td>Bulgarian Lev</td>
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<tr>
<td>BoB</td>
<td>Bank of Beijing</td>
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<tr>
<td>CHEEF</td>
<td>China Energy Efficiency Financing Program</td>
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<tr>
<td>CHP</td>
<td>Combined Heat and Power</td>
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<tr>
<td>C/I</td>
<td>Commercial / Industrial</td>
</tr>
<tr>
<td>China EXIM</td>
<td>Export Import Bank of China</td>
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<tr>
<td>CHUEE</td>
<td>Chine Utility Energy Efficiency Program</td>
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<tr>
<td>CO2</td>
<td>Carbon dioxide</td>
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<tr>
<td>DEDE</td>
<td>Department of Alternative Energy Development and Efficiency</td>
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<tr>
<td>DFI</td>
<td>Development Financial Institution</td>
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<td>DPS</td>
<td>Department of Public Service</td>
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<tr>
<td>EBRD</td>
<td>European Bank for Reconstruction and Development</td>
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<tr>
<td>EBRD EA</td>
<td>EBRD Energy Audits Program</td>
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<tr>
<td>EE</td>
<td>Energy Efficiency</td>
</tr>
<tr>
<td>EEC</td>
<td>Energy Efficiency Charge</td>
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<tr>
<td>EEE</td>
<td>Econoler–EnEffect–Elana, Fund Manager of EERSF</td>
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<tr>
<td>EEPS</td>
<td>Energy Efficiency Portfolio Standard</td>
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<tr>
<td>EERF</td>
<td>Energy Efficiency Revolving Fund, Thailand</td>
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<td>EERSF</td>
<td>Energy Efficiency and Renewable Sources Fund, Bulgaria</td>
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<td>EEU</td>
<td>Energy Efficiency Utility</td>
</tr>
<tr>
<td>Eff. VT</td>
<td>Efficiency Vermont</td>
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<tr>
<td>EMC</td>
<td>Energy Management Company</td>
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<td>ENCON Act</td>
<td>Energy Conservation Promotion Act, Thailand</td>
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<td>ENCON Fund</td>
<td>Energy Conservation Fund, Thailand</td>
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<tr>
<td>ESA</td>
<td>Energy Service Agreement</td>
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<td>ESCO</td>
<td>Energy Service Company</td>
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<tr>
<td>ESPA</td>
<td>Energy Savings Purchase Agreement</td>
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<tr>
<td>EU</td>
<td>European Union</td>
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<tr>
<td>EUR</td>
<td>Euro, the currency of the EU</td>
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<td>FI</td>
<td>Financial Institution</td>
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<td>FYP</td>
<td>Five Year Plan</td>
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<td>GEF</td>
<td>Global Environment Facility</td>
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<td>GHG</td>
<td>Greenhouse gases</td>
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<td>GoC</td>
<td>Government of China</td>
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<tr>
<td>IBRD</td>
<td>International Bank for Reconstruction and Development, part of the World Bank Group</td>
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<tr>
<td>ICBC</td>
<td>Industrial and Commercial Bank of China</td>
</tr>
<tr>
<td>IFC</td>
<td>International Finance Corporation, part of the World Bank Group</td>
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<td>IIP</td>
<td>Institute for Industrial Productivity</td>
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<tr>
<td>IPE</td>
<td>Industrial and Process Efficiency, a department of NYSRDA</td>
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<td>IPMVP</td>
<td>International Performance Monitoring &amp; Verification Protocol</td>
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<td>LPG</td>
<td>Loan Guarantee Program</td>
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<tr>
<td>M&amp;V</td>
<td>Monitoring and Verification</td>
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<tr>
<td>ME</td>
<td>Metrus Energy</td>
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<tr>
<td>MEET</td>
<td>Ministry of Economy, Energy and Tourism, Bulgaria</td>
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<tr>
<td>NDRC</td>
<td>National Reform Development Commission</td>
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<tr>
<td>Acronym</td>
<td>Full Form</td>
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<tr>
<td>NYSERDA</td>
<td>New York State Energy Research and Development Agency</td>
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<tr>
<td>OBR</td>
<td>On-Bill Repayment</td>
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<tr>
<td>PACE</td>
<td>Property Assessed Clean Energy</td>
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<tr>
<td>PBF</td>
<td>Public Benefits Fund</td>
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<tr>
<td>PCG</td>
<td>Partial Credit Guarantee</td>
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<tr>
<td>PFI</td>
<td>Participating Financial Institution</td>
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<tr>
<td>PPA</td>
<td>Power Purchase Agreement</td>
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<tr>
<td>PRC</td>
<td>People's Republic of China</td>
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<tr>
<td>PSB</td>
<td>Public Service Board</td>
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<tr>
<td>RMB</td>
<td>Chinese renminbi</td>
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<tr>
<td>SBC</td>
<td>System Benefits Charge</td>
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<tr>
<td>SPDB</td>
<td>Shanghai Pudong Development Bank</td>
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<tr>
<td>TA</td>
<td>Technical Assistance</td>
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<tr>
<td>USD</td>
<td>United States dollars</td>
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<tr>
<td>VEIC</td>
<td>Vermont Energy Investment Corporation,</td>
</tr>
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</table>
Introduction and Background

Institute for Industrial Productivity

The Institute for Industrial Productivity (IIP) is a non-profit organization established by the ClimateWorks Foundation in 2010 to focus on energy efficiency (EE) for industry, the economic sector that affords the second-highest potential for greenhouse gas (GHG) reductions after power generation. IIP works in partnership with governments, utilities, industrial companies, research organizations, financial institutions, multilaterals and other stakeholders to achieve its objectives.

IIP’s work focuses primarily on energy-intensive sectors, including cement, iron and steel, chemicals, petroleum refining, and pulp and paper. A core objective is to facilitate information sharing in respect of global best practices on matters that relate to industrial EE through the development of databases of best practices in the areas of policy, technology and finance.

Project Scope and Purpose

To achieve success, industrial EE programs in IIP’s target markets – principally China, India, and the USA – will require enormous outlays of capital. Aligning capital and project needs in order to direct that capital to the right opportunities continues to be a challenge faced by actors in the industrial EE sector. There is an important role for research and knowledge development in enhancing capital flows through the design and promotion of innovative financing schemes and, in particular, vehicles for financial risk mitigation: ESCOs, risk guarantees, securitization of energy savings, green bonds and other green financing vehicles.

Industrial Energy Efficiency finance programs, by nature, have relatively narrow target audiences, to which they communicate through specialized channels. IIP seeks to get a clearer understanding of the successful attempts, to date, to stimulate large-scale flows of capital for industrial EE. It will do so by identifying the most effective public and private financing mechanisms for energy (and GHG) savings and communicating these mechanisms and practices as factsheets on its website in a user-friendly online searchable database, accompanied by program materials and documents.

Through this project, IIP aims to highlight learning/success stories of value to policy makers, officials at financial institutions, and other practitioners attempting to stimulate capital flows for industrial EE investment, in particular to small and medium enterprises, be they hosts, equipment suppliers, or ESCOs. IIP is particularly interested in products and mechanisms utilizing energy savings as an element in project financial evaluation.
Industrial Energy Efficiency and the Role of Finance

Energy Efficiency is a public good that reduces the energy supply requirement and the cost of energy supply, while extending the life of finite natural resources.

Energy efficiency is also a means to increase industrial and commercial entities’ competitiveness and profitability. The risk to a business that its competitors are undertaking EE initiatives should provide an incentive to match or better those initiatives.

Energy efficiency has also been presented by several studies, and is generally accepted, as the cheapest way to reduce GHG emissions\(^1\). From a global cost point of view (energy utilization, GHG emissions, social and environmental impacts, medium to long term effects, etc.), it should also be the cheapest way of producing output.

The reality is that there are many barriers — behavioral, policy and regulatory, information and knowledge, and financial — that slow investment in EE and, hence, the realization of EE benefits.

Energy saving is an intangible asset that is difficult to grasp and measure. A key issue with respect to the promotion of investment in and financing of Industrial EE is getting stakeholders (in particular, end-users and financiers) to grasp the concept and value of energy savings. Once that initial buy-in is secured, end-users must initiate an assessment of EE potential to provide the basis for financiers’ investment decisions in order to realize the energy savings. In the industrial sector, many EE projects have a relatively short payback period (typically 3–4 years) without additional income (e.g., carbon income) or incentive mechanisms.

However, there is inherent inertia in this process, e.g., the practice of delaying an upgrade to more efficient equipment if the existing equipment still operates. Businesses often do not make contemplated investment in energy and process efficiencies until capital equipment actually breaks down or is due for a scheduled upgrade or replacement. Getting businesses to accelerate investment decisions to capture energy and process efficiencies typically requires an external influence or education on the benefits. Given that capital investment is required to realize the energy and process efficiencies, access to investment and finance are integral components to the decision process.

Two key conditions must be in place to allow the implementation of a successful EE project: The first condition is the awareness of the most relevant and efficient solutions. This is the purpose of IIP’s work and, with respect to financing mechanisms, of this report. Without such knowledge dissemination, decision makers will not have the tools to assess EE opportunities and will continue to invest in standard solutions / projects (business-as-usual scenario).

The second essential condition is that EE solutions offer a price advantage (levelized cost spread or opportunity cost) over business-as-usual solutions (e.g., using actual utility rates or commodity prices) sufficient to make the project financially attractive and trigger the investment decision. Without an adequate levelized cost advantage, EE solutions will not reach their potential. Financing costs (that encompass and price risk) are a key component of these costs and represent one of the most important barriers to EE development.

The key issues when assessing the levelized cost spread or opportunity cost are:

i. A global approach should be required to take into account all costs, including the long-term social and environmental impacts, which can be difficult to assess; and

ii. Future uncertainty in terms of the cost of the business-as-usual solution (e.g., gas prices in the relevant market, international oil prices, regulation stability and consistency across the sector); in this regard, reducing uncertainty reduces risk and the cost associated with it.

All EE financing programs, incentives or regulations tend to focus on addressing two critical areas:

a. Facilitating knowledge dissemination and awareness amongst industrial decision makers and financial actors (through training, conferences, audits, etc.); and

b. Increasing the opportunity cost between the business-as-usual and EE solution scenarios (e.g., by increasing the cost

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differential or pricing the social and environmental impact, such as carbon emissions, or by making the investment compulsory by imposing constraints, penalties).\(^2\)

In many countries, especially developing countries, EE policies can be in conflict with other social impacts such as policies to subsidize energy prices (e.g., oil and electricity prices) to avoid social unrest.

This report addresses area (a), above, with a focus on financing solutions that lower EE solution costs by presenting the most successful industrial EE financing solutions, and addresses area (b) by detailing the best financial solutions that allow or have allowed reduction of the financial and related costs of EE solutions, hence increasing the opportunity cost of not investing in such solutions.

\(^2\) These programs also need to deal with deeper changes in mentality to reduce the risk perception associated with energy efficiency projects, through increased information dissemination and training.
Approach and Methodology

Any attempt to identify industrial EE best practice confronts the need to systematize and prioritize programs taking into consideration a broad range of factors. These include the sheer number and diversity of mechanisms that have been attempted; the range of sponsors – government, DFI, philanthropic, and private, and the consequent range of primary and secondary program objectives; and the considerable period over which solutions have been attempted, resulting in programs at different stages of development.

There are numerous forms of EE financing mechanisms and programs including:

- Grants and other mechanisms that defray costs, especially up-front costs of project development activity (e.g., grants to support energy audits and technical development of EE projects)
- Subsidies and rebates (e.g., direct subsidies for EE equipment)
- Tax incentives / credit (e.g., on purchases of specified EE equipment)
- Reduced / low interest rate loans
- Dedicated credit lines
- Risk sharing mechanisms (e.g., through provision of partial credit or first loss guarantees)

A key component of EE financing solutions is the ability to lower the inherent risks for the sponsors, so that they can get access to cheaper financing. EE financing mechanisms in this regard include:

- Credit guarantees (e.g., by a government agency or a DFI).
- Risk-sharing facilities where the risk is allocated to the most suitable party (e.g., with ESCOs) with or without first-loss compensation mechanism.

Financial incentives or support also comes from multiple sources or channels, which include:

- Utility financing programs with recovery from end-user utility bills (e.g., OBR or SBC).
- EE / equity funds providing the upfront investment.
- ESCO (or the Chinese equivalent, EMC – Energy Management Companies) providing a combined technical and financial solution.

Another challenge in comparing EE programs is that programs may be at different stages of development, thereby making a comparison of achievements difficult.

Finally, EE programs often encompass multiple objectives to reduce emissions or save energy and often include renewable energy investment targets:

- Across sectors including residential, commercial (buildings), small & medium enterprises (SME) and industrial customers, which make it difficult to isolate the allocation to the industrial sector.
- Across segments including renewable energy (RE) projects, which make it difficult to isolate the EE share.

We have narrowed the wide scope of available financial mechanisms by focusing on programs with the following criteria or parameters:

- Available sources of information such as financial solution and delivery channel, investment, saving achievements and/or objectives, when possible. This selection criteria creates an inherent bias, as it tends to favor programs that release information
- Existence or planned implementation of supporting regulation / legislation
- Financial components
- Initial focus or strong objective / achievement on the industrial sectors
- Size

Based on these criteria, twenty-four industrial EE financing programs in the targeted countries or regions were shortlisted.
A summary of the key industrial EE programs identified is set out in Appendix A.

The list of identified industrial EE financing programs is not intended to be exhaustive, as it is based on available information. Therefore, it inherently tends to exclude potential well-structured private programs where principles or sponsors may be reluctant to release information and intellectual property. As it is, the Project has faced some difficulties to access information from the sponsors of pre-selected industrial EE programs and/or to get feedback on the detailed analysis carried out, illustrating an important barrier to the dissemination of best practices within the industry.
Selection Criteria for Industrial EE Programs

Numerous criteria and drivers to identify the most efficient programs can be found in the industrial EE literature. A commonly used indicator to assess the performance of EE programs is the total amount of energy savings or emission reduction achieved (such as tons of CO2 or GHG emissions avoided), related to investment, but there are two main downsides to these measures:

- They work effectively for programs that have operated long enough to be meaningfully evaluated against their goals. For new programs, however, saving targets and budgets can be used only as measures of ambition.

- Investment and emission saving amounts are often difficult to rigorously measure and monitor, in particular due to heterogeneous reporting and monitoring processes across the programs, and also due to the often long time lag between investment and savings. Standardized and consistent recordings and measurements over the programs are not possible.

In addition, programs in different countries may measure the GHG impact against different yardsticks e.g., the grid carbon intensity in the relevant country. This undermines comparisons between programs in different countries.

The other challenge in defining performance criteria in industrial EE programs is the diversity of industry sectors that makes ‘one-size-fits-all’ criteria difficult to define.

To take account of the above, there is a need to complement performance indicators with other (often qualitative) measures, as set out below:

- Amount of energy savings or emission reduction amount (such as tons of CO2 or GHG emissions saved) related to investment
- Financial performance of projects (payback period, internal rate of return)
- Monitoring and reporting component
- Information dissemination component
- Regulatory support component
- Private sector participation (a key factor in the industrial EE sector) and, where private sector financing is combined with public sector finance, the catalytic impact (private capital leveraged per public $1 of financing)
- Tailored programs to industry sectors and local market conditions
- Effectiveness of the program in producing new investment (additionality)
- Size
- Existence of market energy prices and long-term forecast providing viability

A more detailed analysis with pros and cons for each of these criteria is presented in Appendix B.

Based on the industrial EE programs identified in Appendix A and the performance indicators proposed in Appendix B, a list of eight industrial EE programs have been selected as set out in the Table 1.

A detailed factsheet on each of these programs can be found in Appendix C.

More detailed case studies have also been developed for some of the programs (Metrus Energy and CHUEE). They are presented in Appendix D.5. Observations and Outcomes
TABLE 1: Financial Industrial EE Programs Selected for Further Analysis

<table>
<thead>
<tr>
<th>Factsheet</th>
<th>Program</th>
<th>Country</th>
<th>Financing Mechanism</th>
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<tbody>
<tr>
<td>1</td>
<td>CHEEF</td>
<td>China</td>
<td>• Credit line</td>
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<td></td>
<td></td>
<td></td>
<td>• Guarantee</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Leverage commercial financing</td>
</tr>
<tr>
<td>2</td>
<td>CHUEE</td>
<td>China</td>
<td>• Risk-sharing</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Leveraging commercial financing</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Guarantee</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Knowledge dissemination</td>
</tr>
<tr>
<td>3</td>
<td>EERF</td>
<td>Thailand</td>
<td>• Leveraging commercial financing</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Credit line</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Fund</td>
</tr>
<tr>
<td>4</td>
<td>EERSF</td>
<td>Bulgaria</td>
<td>• Fund</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Guarantees</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Credit lines</td>
</tr>
<tr>
<td>5</td>
<td>Efficiency Vermont</td>
<td>US</td>
<td>Utility Financing</td>
</tr>
<tr>
<td>6</td>
<td>NYSERDA</td>
<td>US</td>
<td>Utility Financing</td>
</tr>
<tr>
<td>7</td>
<td>Metrus Energy</td>
<td>US</td>
<td>• ESCO with performance guarantees</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Commercial bank debt financing</td>
</tr>
<tr>
<td>8</td>
<td>EBRD Energy Audits (EA)</td>
<td>Eastern &amp; Central Europe</td>
<td>• Fund</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Grant</td>
</tr>
</tbody>
</table>
Observations and Outcomes

**Industrial EE Project Development**

As with all capital investment activity, project development activity takes time and effort. In the context of an industrial EE project, the steps involve initial project identification and development, quantification of potential energy savings, arranging finance, installation and commissioning. The typical process is illustrated in Figure 1 within the light blue box.

**FIGURE 1: Industrial EE Project Development Process and External Environment**
There are numerous external factors that affect project development activity and the viability of the resulting EE project. Some of these factors are identified in Figure 1, in the beige boxes.

As noted, one of the challenges in promoting investment and financing of EE projects is that the effort requires buy-in from the sponsor’s management. Achieving this buy-in or “green light” for the investment decision requires a knowledgeable sponsor and access to information that will enable the decision-making process. This, in turn, necessitates adequate project preparation, including the quantification of energy savings (and other benefits), as well as identification of potential financing sources and products.

**Focus of Studied Industrial EE Finance Programs**

The Industrial EE financing programs that are studied in this report provide a range of financing interventions that address different challenges throughout the EE project development lifecycle. This is illustrated in Figure 2.

The finance programs are structured in different ways to address specific aspects of the project development activity(ies) in the context of the market circumstances. These can be categorized into six principal financing categories — (a) financing of technical development (energy audits etc), (b) on-lending programs, (c) risk sharing programs, (d) interest subsidy structures, (e) loans and co-finance facilities, and (f) capital cost rebates / buy-down. The finance programs studied within this report are allocated to their respective categories in Table 2.

Some financing programs contain multiple elements of these basic structures (e.g., NYSERDA – technical assistance aimed at financing technical development plus capital cost rebates). A separate category (g) is included for programs that provide a “one-stop shop” (e.g., Metrus Energy which acts as an EE / energy savings facilitator).

In general, most programs access some form of public finance either (a) from tax revenue (EERF) or a System Benefits Charge (SBC) or equivalent (e.g., NYSERDA, Eff. VT) or (b) public finance agencies, including DFIs (e.g., CHEEF, CHUEE, EERSF,
A number of the finance programs, particularly those in developing countries, also endeavour to address aspects of the external environment to create a supportive environment for EE investment. These programs are typically focused on:

- The creation of an enabling policy and regulatory environment for EE (e.g., CHEEF);
- Disseminating knowledge and developing capacity among end-users (e.g., CHUEE) and FIs (e.g., CHEEF, EERF);
- Expanding the availability of finance in support of EE (e.g., CHEEF, CHUEE); and/or
- Promoting market sophistication (e.g., CHUEE).

Figure 3 illustrates the studied EE finance programs’ collateral initiatives aimed at creating an enabling environment.

### Issues identified and Lessons for EE Finance Program Design

In the conduct of the review and analysis of the selected EE finance programs a number of macro-level issues were identified which are, by and large, common to all programs.

#### Market context

Market context is fundamentally critical to the success of EE finance programs. In some instances, external factors such as government policy, regulation and incentives to support EE may be the determining success factor for EE finance programs rather than the design, inherent structure or implementation of the program itself. For example, the CHEEF and CHUEE programs implemented in China benefited from favourable prevailing government policy and a drive by the GoC to reduce energy intensity through policies aimed at accelerating investment in EE.

Although less reliant on policy and incentives than renewable energy, EE investment is sensitive to shifts in government policy and regulation and changing market circumstance.

### TABLE 2: Categorization of Studied Finance Programs

<table>
<thead>
<tr>
<th>Reference</th>
<th>Program Categories</th>
<th>Financing Program(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
<td>Financing of energy audits and technical development:</td>
<td>EBRD EA, EERSF, NYSERDA</td>
</tr>
<tr>
<td>(b)</td>
<td>On-lending programs:</td>
<td>CHEEF, EERF</td>
</tr>
<tr>
<td>(c)</td>
<td>Risk sharing / partial credit guarantees:</td>
<td>CHUEE, EERF</td>
</tr>
<tr>
<td>(d)</td>
<td>Subsidized interest rate:</td>
<td>EERF</td>
</tr>
<tr>
<td>(e)</td>
<td>Loans and co-financing:</td>
<td>EERF</td>
</tr>
<tr>
<td>(f)</td>
<td>Capital cost buy-down incentive / rebate:</td>
<td>NYSERDA, Eff. VT</td>
</tr>
<tr>
<td>(g)</td>
<td>One-stop shop energy services:</td>
<td>Metrus Energy (ME)</td>
</tr>
</tbody>
</table>

**Note:** The exception is Metrus Energy which is funded entirely by the private sector.

FIGURE 3: Studied EE Programs Collateral Initiatives Aimed at Creating Enabling Environment


**Flexibility in program design**

Caution is needed in designing industrial (and other) EE finance mechanisms for developing countries, especially those countries at an early stage of evolution in EE financing. Market analysis and studies conducted to provide input to program design may be outdated by the time EE finance programs are implemented due to changes in market context.

If EE finance programs do not have flexibility built in, they may not be able to adapt to changing market circumstances resulting in the failure of the program to achieve desired outcomes and, to the extent that public finance is utilized, a waste of that valuable resource. For example, the EERSF in Bulgaria only survived tumultuous changes in market conditions between the design and implementation phases because of flexibility built into the program design and, equally important, a willingness on the part of stakeholders to permit the adaptation of the facility to respond to those market changes.

**Developed vs. developing market models**

Developed markets tend to have more sophisticated finance markets and regulatory regimes, enabling more sophisticated financing mechanisms in support of EE; e.g., ESCOs and the emergence of efficiency service contractors, such as Metrus Energy in the US.

Equally, as markets develop and governments and citizens place an increasing value on standards of living and environmental protection, states may implement a levy on energy to defray the costs of meeting EE and other policy objectives e.g., PBFs implemented by many US states, including in New York and Vermont that finance, respectively, NYSERDA and Eff. VT.

Developing countries tend to have more constraints on sourcing funding through PBF-type charges and typically have less sophisticated markets for finance and EE service providers. In these markets more rudimentary financing products are more appropriate often backed by funding form DFIs (e.g., CHEEF, CHUEE, EERSF, EBRD EA).

Another challenge that exists in fast-growing developing economies is to get end-users, investors and FIs to pay attention to opportunities in EE. In fast-growing markets investors and lenders are often focused on growth opportunities and overlook the potential or need for cost management and efficiency. This results in waste and poor competitiveness if/when a market downturn occurs.

**Integrated programs that offer more than just finance are more successful**

Most programs examined for this report, especially those implemented in developing countries, provide collateral services that are needed to develop and enable the market in which they operate (see pp. 15–16 and Figure 3). Collateral initiatives that appear to be particularly effective are those that enable knowledge transfer to and capacity building for end users and FIs.

Well-focused technical assistance programs that defray the cost of energy audits and the technical development of projects, in combination with a finance program, or as a lead into a financing program, are also demonstrated to be highly effective e.g., EBRD EAs. This program has served as a model and provision for technical assistance to support energy audits is now built into most EBRD-sponsored commercial / industrial (C/I) EE programs.

**Transaction scale and costs**

A perpetual challenge with EE financing is the relatively small scale of most projects relative to the energy and effort and transaction costs expended in delivering the projects. This is especially true for projects that are project-financed or financed off balance sheet, as the contractual frameworks and due diligence necessary to support such transactions are significantly more rigorous than for balance sheet financing.

The small size of transactions has also, at times, negatively impacted industrial EE finance programs that seek to co-finance EE projects side-by-side with other FIs (e.g., as was the experience of EERSF in Bulgaria) as the level of effort and cost required exceeds the perceived return.

**On balance sheet vs. off-balance sheet finance**

A corollary of the section above is that the majority of industrial EE financing continues to be done based on “name lending” i.e., based on the creditworthiness of the project sponsor. This is especially true in developing countries where finance markets are less sophisticated.

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5 Thailand has successfully used petroleum tax revenues to fund the ECON Fund which supported the EERF.
While some efforts to promote a move to off-balance sheet financing mechanisms (e.g., project financing) and/or to accelerate the development of energy service providers (e.g., ESCOs) have achieved success, often programs in developing markets have reverted or been adapted to the default model of “name lending”. As a consequence, many industrial EE finance programs, particularly those in developing countries, have failed to reach the SME sector and smaller and lower credit quality end-users.

In addition, project finance and other off-balance sheet finance structures are inherently more expensive than on-balance sheet financing. Higher finance charges eat into the energy savings benefits of industrial EE projects and extend payback periods. This may have the effect of raising the bar for the project sponsor’s investment decision (although for project sponsors unwilling or unable to assume additional balance sheet liabilities, there may be no other option).

**Collateral over EE equipment**

A key impediment to accessing project finance and other off-balance sheet finance structures is the difficulty in obtaining security over industrial process and EE equipment funded by EE finance programs. There are at least two issues that arise: (a) The equipment resides on the customer’s property which has typically been used as collateral to secure financing provided by senior lender(s) and (b) the new industrial process and EE equipment is often an integral part of the customer’s overall facility and will have higher value if sold as part of that facility but a much lower value if sold separately. Additionally, in a bankruptcy or liquidation scenario the EE financier will need to enter the premises, which is likely to require consent of senior lenders, to remove the equipment and will bear the cost associated with removing that equipment. Moreover, the relatively higher design and engineering costs of energy efficiency projects result in proportionately lower equipment financing.

Absent specific collateral, the EE financier’s ranking for payment in a bankruptcy or default scenario would be pari passu with other unsecured creditors. Attempts to elevate the ranking of EE financing in the US through legislative (e.g., PACE) and other priority structures (e.g., On-Bill Repayment or OBR) have encountered resistance from senior / secured lenders and lender associations.

**Tax incentives**

Governments often use tax incentives such as depreciation allowances to direct investment to priority sectors e.g., R&D, renewable energy. Providing accelerated tax depreciation and, potentially, additional depreciation allowances for EE equipment retrofits and for new process equipment that is more efficient would likely significantly increase investment in the sector. For example, current EE investment in the US is disadvantaged relative to investment in photovoltaic solar capacity additions despite the fact that EE investment is, arguably, more beneficial to the economy.

**Estimating energy savings**

A critical component in the EE project development process is the quantification of potential energy savings. This underpins the investment and financing of EE measures. As noted, EE finance programs that provide parallel technical assistance to enable technical development of projects, including the quantification of EE opportunities, have generally enjoyed greater success (e.g., the EBRD EA, NYSERDA).

While it is acknowledged that every EE project is different and requires a tailored solution specific to the end-user, the particular facility and the market in which it operates, the development of a database recording actual experience against expected energy savings would support both end-users’ investment decisions and financiers’ assessment of potential energy savings.

The parallel development of standards for reporting energy savings and emissions reductions would also benefit this initiative and would have the collateral benefit of enabling EE actors to compare and assess the success of industrial EE programs.

**Looking beyond EE**

Most EE finance programs focus on quantifiable electricity and, in some instances, on other energy savings (e.g., gas usage, fuel switching and use of CHP) that may be achieved through retrofits at existing facilities. Some innovative programs (e.g., NYSERDA) extend coverage to the EE component of process improvements and new installations through a productivity comparison (output per unit of energy input) that may be achieved at the new installation relative to what is being achieved at the existing facility (pre-installation baseline).
Consideration might also be given to expanding EE programs to capture other resource efficiencies e.g., water usage. Complexities may exist, however, (a) in developed countries e.g., for PBF and OBR schemes, as water is typically supplied by a different utility, and (b) in developing markets where water is generally heavily subsidized (even more so than energy), undermining the economic rationale for efficiency measures.

**Sustainability**

The most effective EE finance programs are those that (a) are supported by sustainable public financing (e.g., PBFs that support programs such as NYSERDA and Eff. VT), (b) achieve self-financing within the program lifecycle (e.g., EERSF) or (c) engender sufficient confidence among private and other market actors such that these actors expand their activities to fill the gap left by the withdrawal of the public finance (e.g., CHEEF).
Conclusions / Recommendations

Each EE finance program analyzed in this report encompasses two key characteristics that EE program developers for the industrial sector should focus on:

- An increase in energy efficiency market awareness within the industry and/or the financing sector. This allows programs to move forward and to get access to decision makers. Such initiatives may take the form of technical assistance, energy audits / assistance with technical development of projects, conferences or training.

- Increasing the opportunity cost of not investing in EE solutions. This brings EE solution costs at par or below the business-as-usual solution costs, thereby facilitating the recognition of the value of energy savings. Such recognition helps to trigger the EE investment decision. These initiatives may take different forms, including the introduction of SBC or equivalent schemes, tax incentives, caps and/or pricing mechanisms in respect of GHG emissions.

Table 3 illustrates these industrial EE drivers, the solutions and products typically utilized to deliver outcomes. It also allocates

<table>
<thead>
<tr>
<th>Key EE investment Drivers</th>
<th>Solutions/Scope</th>
<th>Products</th>
<th>Program Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market Awareness</td>
<td>Awareness within industry sector</td>
<td>Technical assistance, Energy audits, Conferences, Training / capacity building</td>
<td>CHUEE, Eff. VT, NYSERDA, EBRD EA, EERSF</td>
</tr>
<tr>
<td></td>
<td>Awareness within financial sector</td>
<td>Private-market financing supported by public money and/or guarantees (e.g., ESCO)</td>
<td>Risk-sharing, Leveraging commercial financing, Guarantee, Knowledge dissemination</td>
</tr>
<tr>
<td>Increasing business-as-usual solution costs</td>
<td></td>
<td>SBC and equivalent, Carbon tax, EE targets / penalties, Subsidy reductions</td>
<td>NYSERDA, Eff. VT</td>
</tr>
<tr>
<td>Decreasing EE solution costs</td>
<td></td>
<td>Cheap financing (grants, low-interest rate loans, etc.)</td>
<td>CHEEF, EERSF, Efficiency Vermont, NYSERDA, EBRD EA</td>
</tr>
<tr>
<td>Decreasing uncertainty / risk</td>
<td></td>
<td>Risk sharing facilities, guarantees</td>
<td>EERSF, CHUEE, EERSF, ME</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Long-term stable and consistent policies</td>
<td>Eff. VT, NYSERDA</td>
</tr>
</tbody>
</table>
the studied programs based on this framework.

The opportunity costs of industrial EE solutions should increase over time as more efficient equipment becomes cheaper and business-as-usual solutions become less cost effective, especially against a backdrop of increasing energy costs. Nevertheless, there is a need to accelerate investment in industrial EE by enabling decision makers to get access to financing that reflects the investments’ beneficial effects to society and the environment, as well as reducing risk.

Long term, stable and consistent EE policies do help the development of industrial EE projects, but probably to a lesser extent than residential projects. The industrial market is extremely sensitive to return on investment and probably less affected by ideological drivers or marketing actions. Consequently, private sector involvement is critical for the success of industrial EE programs as it also provides strong focus on self-funded programs that deliver profitable projects.

While conducting the analysis of the various EE financing programs for this report, a number of best practice characteristics emerged. These include:

- Financing programs need to be tailored to the market in which they are to operate and to the specific sectors intended to be promoted.
- Programs should be designed in a manner that enables them to adapt to changing market circumstances and to evolve as the EE finance market evolves. This is especially important in dynamic developing country markets where significant changes may occur over a relatively short timeframe.
- Programs that reduce transaction costs, e.g., through defraying the cost of energy studies and technical development, sharing risk and/or buying-down the cost of equipment and/or finance, tend to be most successful, especially if combined with market awareness initiatives.
- Finance programs that are stand-alone, without collateral initiatives to create awareness and motivate decision makers, are insufficient.
- Sustainability is critical — public finance programs need to be designed to be or become self-financing or enable private actors to step-in to fill the gap left by public finance at the expiry of the program.
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The EISA 2007 also ratified the EO 13423.


The 2010 State Energy Efficiency Scorecard, Colin Sheppard and team, October 2010.


Western Balkans Sustainable Energy Financing Facilities, European Bank, March 2011.
## Appendix A – Key Industrial EE Programs Identified

<table>
<thead>
<tr>
<th>Ref</th>
<th>Program</th>
<th>Country</th>
<th>Description / Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>China Energy Efficiency Financing Program (CHEEF) I and II</td>
<td>China</td>
<td>Credit Line Financing with local bank and World Bank support and China Ministry of Finance sovereign guarantee to encourage EE project loans for medium and large industries and ESCOs. Initiated in 2008 with Phase II ending in 2014.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Funding from World Bank (IBRD) and local financing institutions (EXIM Bank and Huaxia Bank for CHEEF I and Minsheng Bank for CHEEF II).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>IBRD provided USD100 M to each PFI that had to match at least the same amount.</td>
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<tr>
<td></td>
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<td></td>
<td>As at March 2011, IBRD distributed USD 95 million (M) that leveraged USD 393 M from Exim, Huaxia Bank and industrial enterprises (total of USD 488 M).</td>
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<td></td>
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<td>Current investments will reduce CO2 emissions by 4 M tons per year once the projects are in operation.</td>
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<td></td>
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<td></td>
<td>Target of 5.05 M tons reduction (CHEEF I).</td>
</tr>
<tr>
<td>2</td>
<td>Global Environment Facility (GEF) -funded Energy Efficiency Promotion in Industry Project (CEEPI)</td>
<td>China</td>
<td>Implemented in 2011 for 4 years. The project includes 4 key components: policy support, capacity building through training and certification, demonstration project implementation and information dissemination.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>USD 4 M grant from World Bank / GEF and total project cost of USD 24 M (including World Bank).</td>
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<tr>
<td></td>
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<td></td>
<td>To strengthen the institutional capacity of rational energy use in key industrial sectors in China (no specific emission reductions).</td>
</tr>
<tr>
<td>3</td>
<td>China Utility-Based Energy Efficiency Finance Program (CHUEE) I &amp; II</td>
<td>China</td>
<td>Initiated in 2006 by World Bank/IFC. Services include marketing, project development, technical advisory services and equipment financing for commercial, industrial, institutional and multi-family residential sectors.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Risk-sharing facility where IFC takes 75% of the 1st losses (10%) and 40% of 2nd loss (i.e., of the residual 90%), shared with Chinese participating banks (ICBC and Bank of Beijing).</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>As of June 2009, 98 projects were financed from participating bank loans of USD 512 M and USD 197 M of guarantees (mainly for large industrial customers) reducing GHG by 14 M CO2 tons per year (slightly in excess of initial target).</td>
</tr>
<tr>
<td>Ref</td>
<td>Program</td>
<td>Country</td>
<td>Description / Product</td>
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<tr>
<td>4</td>
<td>China End-Use EE Project (EUEEP)</td>
<td>China</td>
<td>Co-operation between Chinese Government, UNDP and GEF aimed at promoting EE in industrial sectors and buildings by removing barriers to applications and practices. Objectives to reduce carbon emissions by 12 M tons and energy consumption by 19 M toe. The project was launched in 2003 but officially started in 2005 with the expectation to end in 2009.</td>
</tr>
<tr>
<td>5</td>
<td>China Energy Efficiency Promotion (CEEP)</td>
<td>China</td>
<td>Developed by World Bank/GEF and the Chinese Government to establish Energy Management Companies (EMC, equivalent to ESCOs) and information dissemination in China. Phase I (1998–2003) involved the creation of two EMC pilots offering energy audits, planning, choosing EE technologies, project finance, procurement and installation of equipment, testing, operation and maintenance. Financing mainly through loans from World Bank and GEF for a total investment of USD 89 M. 1,475 projects were carried out for a total of USD 160 M for a total reduction of 1.45 M tons CO2 / year. Phase 2 (2003–2008) involved setting up loan guarantees from GEF to let financial organization avoid credit risk hence encouraging private financing. 76% of the total investment went to industrial projects (based on 2006 survey) representing USD 271 M.</td>
</tr>
<tr>
<td>6</td>
<td>Indian Renewable Energy Development Agency (IREDA) EE Financing Scheme</td>
<td>India</td>
<td>Government company established in 1987 to promote, develop and provide financial assistance to EE projects. Program ran from 2004 to 2006 with the aim to provide equipment and project financing, and loans to industrial, commercial and municipal customers. 80% depreciation in first year on energy efficiency equipment and concessional excise and customs duty on notified energy conservation equipment to promote energy efficiency. Mostly RE projects were funded for a total of c.USD1.4 billion and very few EE projects.</td>
</tr>
<tr>
<td>7</td>
<td>Bureau of Energy Efficiency (BEE) Partial Risk Guarantee Fund (PRGF) – Not implemented yet</td>
<td>India</td>
<td>Risk-sharing fund to be started in 2012 to provide partial guarantee (10% first loss, 50% pari passu thereafter) to industrial, commercial and municipal customers. Maximum guarantee of c.USD 7 M and total funding of c.USD 18 M.</td>
</tr>
<tr>
<td>8</td>
<td>ADB Industrial Energy Efficiency Project (IEEP)</td>
<td>India</td>
<td>Program ran from 1995 to 2000, through ADB loans to Industrial Development Bank of India (IDBI) for on-lending for EE projects to energy intensive industrial sectors. Total funding from ADB of USD 150 M for a total of 26 projects catalyzing an estimated amount of USD 1,064 M. ADB indicated that it was not possible to evaluate the EE improvement achieved.</td>
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<tr>
<td>Ref</td>
<td>Program</td>
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<td>Description / Product</td>
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<tr>
<td>9</td>
<td>Thailand EE Revolving Fund (EERF)</td>
<td>Thailand</td>
<td>Fund established by the Thai Government in 2003 to facilitate commercial loans for industry and building EE and RE projects and ESCOs. DEDE manages the fund (ENCON, mainly funded through a tax on oil imports and domestic producers and government subsidies) that supports credit lines made available at no interest to 11 commercial banks which provide low-interest loans (up to 4%) for EE projects (up to 7 years and USD 1.4 M per project).&lt;br&gt;By April 2010 (phases I &amp; II and part of phase III of the fund), EERF financed 335 EE projects and 112 RE projects, for USD 453 M saving USD 154 M in energy costs.&lt;br&gt;During phases I and II of the fund (2003-2008), USD 84.7 M of loans allowed to finance USD 180.5 M of projects, which saved USD 73.8 M in electricity (USD 31.3 M) and oil (USD 42.5 M) consumption.</td>
</tr>
<tr>
<td>10</td>
<td>IFC-Mitsubishi Risk-Sharing Facility</td>
<td>Thailand</td>
<td>Agreement signed in December 2011 between Bangkok Mitsubishi UFJ Lease Ltd. and IFC where IFC share the credit risk on Bangkok Mitsubishi UFJ energy efficiency solutions for companies investing in projects that reduce GHG emission and use sustainable energy. Possible products are leases, installment sales and Energy Services Companies (ESCOs) for investment in energy efficiency and renewable energy. Expected total amount of new leases of USD 70 M over 12 years.</td>
</tr>
<tr>
<td>11</td>
<td>Kasikorn Bank K-Energy Saving Guarantee Program</td>
<td>Thailand</td>
<td>Equipment leasing / hire purchase financing and/or long-term loans aimed primarily at EE projects under management of an ESCO, which provides integrated services / consultancy and energy-saving performance guarantee. K-Bank finances up to 100% of project investment (including ESCO service and consulting fees) for customers with annual sales above c.USD 1.7 M.</td>
</tr>
<tr>
<td>12</td>
<td>IFC / GEF Commercializing Energy Efficiency Finance (CEEF) Program</td>
<td>6 EU countries</td>
<td>Risk Sharing facility designed to promote commercial financing of EE programs covering capital investments aiming at improving EE in buildings, industrial processes and other energy end-use applications. Targeted countries included Hungary, Czech Republic, Slovak Republic, Latvia, Lithuania and Estonia. IFC (executive agent) and GEF providing guarantees to local financing institutions (50% pari passu risk-sharing structure). 829 projects for a total investment of USD 208 M were financed by 14 local FIs through a total amount of USD 49.5 M of guarantees and achieving an estimated 145,700 tons per annum of CO2 emission reductions (excluding leveraged projects).</td>
</tr>
<tr>
<td>Ref</td>
<td>Program</td>
<td>Country</td>
<td>Description / Product</td>
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<tr>
<td>13</td>
<td>KfW EE Program and Energy Turnaround Financing Initiative</td>
<td>Germany</td>
<td>Loans to finance energy efficiency measures in Germany with favorable interest rates for large commercial German and foreign enterprises (turnover between EUR 500 M and EUR 3 billion). Loans (within a bank consortium) with up to 3 repayment-free years and 100% disbursement to large enterprises investing in EE projects.</td>
</tr>
<tr>
<td>14</td>
<td>Bulgarian Energy Efficiency Fund (BgEEF), later renamed Energy Efficiency and Renewable Source Fund (EERSF)</td>
<td>Bulgaria</td>
<td>Fund designed by the World Bank with strong private sector involvement and management. Financial products include: credit and partial credit guarantees. EERSF financing of corporate programs of approx. USD 9 M as at end 2011. As at end 2011, 40 projects financed for corporate clients for total project size of approx. USD 8.6 M.</td>
</tr>
<tr>
<td>15</td>
<td>EBRD Industrial Energy Efficiency Program</td>
<td>Eastern Europe and Russia</td>
<td>Established in 2003 to provide free energy audits, technical assistance and credit lines to local bank to support funding (loans). EBRD technical assistance is provided through in-house or local/external experts. From 2003 to 2007, 50 energy audits and 5 training programs conducted, leading to the development of 61 projects for a total EBRD contribution of EUR 750 M and saving the equivalent of the electricity produced by a 2,500 MW plant and 5.5 M tons of CO2.</td>
</tr>
<tr>
<td>16</td>
<td>EBRD EE Audits Programs</td>
<td>Eastern and Central Europe</td>
<td>EBRD / Central European Initiative Trust Fund carried out pre-investment capacity building activities in central and eastern Europe starting from 2004 with the aim to implement EE through EE audits, training and involvement of local management. From 2005 to 2008, the Energy Audits Programs have led to a total investment of EUR 201 M in EE projects, saving 1.3 M tons of CO2 per year and 15.4 M GJ per year.</td>
</tr>
<tr>
<td>Ref</td>
<td>Program</td>
<td>Country</td>
<td>Description / Product</td>
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<tr>
<td>18</td>
<td>Efficiency Vermont (Vermont State)</td>
<td>US</td>
<td>Portfolio of EE services provided by Efficiency Vermont to utility end-users with targets and budget approved by state regulator. Energy Efficiency Charge (EEC) included in electric rates for all customers. Total electric utility EE program budget of USD 34 M in 2010 (USD 2.1 M for gas programs). Savings of 5% and 1% of sales in 2005 and 2006 achieved 311 GWh saved during 2006-2008 vs. a target of 262 GWh. Objective of 360 GWh of cumulative savings for the 2009-2011 period (equiv. 6.75% of electricity sales). 2.2% target in 2012-2014.</td>
</tr>
<tr>
<td>19</td>
<td>California State</td>
<td>US</td>
<td>Utilities propose industrial EE programs to the California Public Utilities Commission (CPUC) that sets policies, targets and approves spending levels. Energy audits, financial incentives based on calculated energy saving or installation of specific equipment, technical assistance, energy planning tools and consulting services. USD 756 M spent by California electric utilities in 2009 on EE programs. 2010 budget of USD 1.16 billion for electric programs and USD 339 M for gas. Funding from a Public Good Charge (PGC) collected on electricity and gas bills. 2,293 GWh net saved in 2009. 2010-2012 objectives of 7,000 GWh gross of electricity savings and 150 MMTh gross of gas.</td>
</tr>
<tr>
<td>20</td>
<td>New York State Energy Research &amp; Development Authority (NYSERDA)</td>
<td>US</td>
<td>Funding from a System Benefits Charge (SBC) paid by all customers on their utility bill. It amounted to USD 150 M per year from 2002 to 2006 and USD 175 M from 2006 to 2011 (including approx. USD 13 M for gas programs) with 75% allocated to electricity and gas EE programs. The SBC was increase from 2008 to 2011 to approx. USD 334 M per year. Total state and utility EE program budget for 2010 were USD 584 M and USD 48 M for electricity and gas. Electric utilities saved 950 GWh in 2009. Objective to reduce state’s electricity consumption by 15% of forecast levels by 2015 and 14.7% of estimated gas usage by 2020</td>
</tr>
<tr>
<td>Ref</td>
<td>Program</td>
<td>Country</td>
<td>Description / Product</td>
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</tbody>
</table>
| 21  | Metrus Energy | US          | Company founded in 2009 to develop, finance, own and operate large EE projects for commercial and industrial clients in partnership with ESCOs.  
Metrus Energy funds 100% of project cost (through equity and third-party debt providers) and receives payments from customers based on avoided energy use and reduced Opex. ESCOs install the EE project, provide long-term maintenance and guarantee project performance.  
As at May 2012, Metrus Energy has financed over USD 8 M of EE upgrades for BAE Systems and has approx. USD 98 M of future project opportunities. |
| 22  | Ford Aligned Business Framework (ABF) | US + 60 countries | Program launched in 2005 by Ford Motor Company to establish targets and processes with Ford’s selected suppliers. Ford worked with its suppliers in collaborative partnerships to collect data, establish common industry guidance and reporting format for GHG emissions.  
Initiative total cost and GHG impacts are not available. |
| 23  | Trust Fund for Electric Energy Savings (FIDE) | Mexico       | Private trust fund based in Mexico established for 18 years and providing technical support and financing, energy audits and assessments, acquisition and installation of energy efficient equipment |
| 24  | EE Improvement Assistance Scheme | Singapore    | Co-funding scheme to support companies in the manufacturing and building sectors to carry out energy audits. Funding up to 50% of engaging an expert or ESCO. |
### Appendix B – Key Performance Indicators for Industrial EE Programs

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – Amount of energy savings or emission reduction amount (such as tons of CO2 or GHG emissions saved) related to investment</td>
<td>Provides a uniform measure and the potential to select the programs with the lowest emission reduction costs. Works well for long established programs with track record of achievements</td>
<td>Requires rigorous and homogenous measurement and monitoring of GHG reductions and associated spending. Does not work well for newly established programs due to uncertainty on achievement of targeted savings and spending. Does not account for projects targeting information dissemination, training, marketing, etc.</td>
</tr>
<tr>
<td>2 – Financial performance of projects (payback period, IRR)</td>
<td>Allows to select programs and projects with the shortest payback period (and often proven technologies) that are likely to be selected by industrial customers</td>
<td>Tends to preclude programs with R&amp;D component or with more innovative technologies. Difficulty in accessing this information which may be regarded as commercially sensitive</td>
</tr>
<tr>
<td>3 – Monitoring and reporting component</td>
<td>Critical component that programs should include allowing (i) baseline assessment and (ii) improvement measurement.</td>
<td>Could be difficult to monitor ‘soft’ results such as public awareness or company know-how improvement. Need standardization of monitoring and reporting process to allow fair comparison</td>
</tr>
<tr>
<td>4 – Information dissemination component</td>
<td>Level of awareness within an industry sector is key to develop EE programs: available technologies, sources of information and support, management involvement, etc.</td>
<td>Could be difficult to assess the level of information disseminated by a particular project if it is not the primary focus of the program; inherently may involve a subjective judgment</td>
</tr>
<tr>
<td>5 – Regulatory support component</td>
<td>Key component of the program that could take the form of compulsory targets, policies, non compulsory guidance with or without incentives and/or rewards / penalties</td>
<td>Does not fit successful programs that are economically viable without regulatory intervention</td>
</tr>
<tr>
<td>6 – Private sector involvement</td>
<td>Key component for long term success of EE programs</td>
<td>Some less mature markets are not ready for private sector only programs</td>
</tr>
<tr>
<td>If private sector involvement: Catalytic impact (private capital leveraged per public $1 of financing)</td>
<td>Provides leverage of private finance</td>
<td>May be affected by nature of market / level of sophistication of financial markets and financing barriers inherent in market</td>
</tr>
<tr>
<td>Indicator</td>
<td>Pros</td>
<td>Cons</td>
</tr>
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</tr>
<tr>
<td>7 – Tailored programs to industry sectors and local market conditions</td>
<td>Wide spectrum of industry sectors does not allow a “one-size-fits-all” approach so tailored programs have greater chance of success</td>
<td>Could limit the size of the program to a particular sector</td>
</tr>
<tr>
<td>8 – Effectiveness of the program to make the investment happen (additionality)</td>
<td>Allows to judge whether the program effectively triggered the investment / actions vs. an investment that would have happened without the program</td>
<td>Difficult to get real answer from the decision makers</td>
</tr>
<tr>
<td>9 – Size</td>
<td>Larger scale programs have a bigger impact on environment and energy savings</td>
<td>Some smaller scale promising programs might be ignored</td>
</tr>
<tr>
<td>10 – Existence of market energy prices and long-term forecast providing visibility</td>
<td>Long-term data and forecast facilitate investment decision as they provide financial benchmark</td>
<td>Some programs / projects are profitable over market horizon.</td>
</tr>
</tbody>
</table>
Appendix C – Industrial EE Factsheets
### China Energy Efficiency Financing (CHEEF)

<table>
<thead>
<tr>
<th>Program Type</th>
<th>Country/Region</th>
<th>Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEEF I</td>
<td>China</td>
<td>May 2008</td>
</tr>
<tr>
<td>CHEEF II</td>
<td></td>
<td>June 2010</td>
</tr>
<tr>
<td>CHEEF III</td>
<td></td>
<td>October 2010</td>
</tr>
</tbody>
</table>

**Objective(s):**
Increase the availability of commercial financing in support expanded investment for EE in medium and large-sized enterprises in China.

**Energy Efficiency/GHG Goals:**
Target to reduce energy intensity by 20% between 2006 and 2010 (eleventh five year plan (FYP)) and an incremental 16% by 2015 (twelfth FYP).

**Sectors Targeted:**
Industrial (medium and large) (I & II)
Buildings (III)

**Barriers Addressed:**
Main barrier addressed:
- A lack of commercial financing for EE projects — aggregate financing required to achieve the 20% target by 2010 is estimated at USD 50 billion.
- Lack of technical knowledge and institutional capacity among the financial institutions
- The perception of high technical and financial risks — in particular with respect to the project performance i.e., the expected future savings.
- The relatively small size of EE projects and commensurately high transaction costs, requiring a programmatic approach.
- A heavy reliance on on-balance sheet financing that requires a track record from borrowers and/or collateral; both of which favour large scale investors and project developers. The concept of project finance for EE projects had not gained traction in China.

**Financing Mechanism(s):**
Financial intermediary lending mechanism whereby an IBRD loan is made to GoC and on-lent to Chinese PFIs which is, in turn, on-lent to sub-borrowers (end users implementing EE projects).
- **CHEEF I** 2 large IBRD loans of USD 100 M to the China EXIM and Huaxia Bank. 1 GEF grant of USD 13.5 M for technical assistance (TA) to the government to support national EE policy and to the participating banks to build capacity in EE finance.
- **CHEEF II** IBRD loan of USD 100 M to Minsheng Bank was approved in June 2010.
- **CHEEF III** IBRD loan of USD 100 M to EXIM Bank to pilot financing to energy service companies (ESCOs) to enable an expansion of EE investment into the building sector.
Collateral Support provided (if any):
Technical assistance to the GoC (National Development and Reform Commission (NDRC)) to support national EE policy and to the participating bank to build capacity in EE financing.

Eligibility Criteria:
Key Features of Energy Conservation Investment Lending:

Borrower Eligibility: enterprises should be medium and large total revenue > RMB 30 M (based on last statement of income, less than 2 years old).

By CHEEF III eligibility includes (i) industrial of all sizes; (ii) ESCOs; (iii) building owners (and district heating & cooling).

Project Eligibility: Renovation and rehabilitation (adjustment, replacement or extension) of existing physical component(s) and system(s) with the objective of achieving higher energy efficiency. Installations must be within the existing footprint of borrowers facilities i.e., no new land acquisition required for the project.

The cash flow benefit arising from energy savings associated with the sub-project must alone be sufficient to repay the total investment cost of the sub-project within a period of 10 years.

PFI’s Credit Criteria: No credit enhancement was provided meaning that PFIs’ absorbed all of the borrowers’ credit risk. PFIs’ credit criteria continued to rely heavily on the sub-borrowers’ credit rating and also to follow the eligibility criteria required in the Operational Manual.

Average Size, Payback Period and Type of EE Investments:
The average project size was around USD 20 M. Financing comprised equity from end-users (sub-borrowers), the IBRD loan (on-lent by PFIs) and debt contributions from PFIs. The end-users (sub-borrowers) contribute about 30 percent of project costs in equity. The required leverage ratio of the IBRD loan to PFI’s contribution is 1:1 under CHEEF I, and increased to 1:2 under CHEEF III.

Terms and Conditions: The IBRD loan is on-lent by the GOC to three banks: USD 200 M to EXIM, USD 100 M to Huaxia, and USD 100 M to Minsheng, using IBRD terms. The banks in turn on-lend the funds to industrial enterprises and/or ESCOs for energy conservation investment subprojects at market rate.

Total Funding:
USD 400 M in credit lines provided to GOC and on-lent through 3 Chinese banks (Huaxia, China EXIM and Minsheng).

Major Activities:
Credit lines for Chinese banks and GEF support for technical assistance to government as well as government advisory programs to support technical transition.

The majority of sub-projects for CHEEF I and II were directed to waste heat recovery projects in cement, iron/steel and chemical sectors.

Key Results:
At the end of 2011 after three-year implementation of the CHEEF I project, two PFIs (China EXIM and Huaxia Bank) have invested USD 577 M in industrial energy efficiency, of which USD 115 M was from IBRD. This leveraged USD 462 M from two PFIs and industrial enterprises, achieving a leverage ratio of 1:4. These investments are expected to save energy equivalent to 1.7 M tonnes of coal and reduce CO2 emissions of 4.2 M tonnes.

The leverage ratio achieved for CHEEF III is expected to be higher given the increased ratio of PFI finance to the IBRD on-lending (2:1 vs. 1:1 for CHEEF I).

The CHEEF program has played an important role in increasing the PFIs interest and capacity and in mainstreaming EE financing among Chinese banks. The IBRD financing also leveraged additional financing for EE to two of the participating banks from KfW, AFD and EIB.

Lessons Learned:
• Results, so far, indicate that credit lines combined with technical assistance contribute to increasing the participation of commercial financial institutions. There is also a high propensity for commercial financial institutions to revolve funding back into EE financing.
• Having the support from the government and strong signal concerning EE commitments was key in bringing success (i.e. in this case the 11th Five Year Plan with very strong EE targets, combined with government funding of USD 15 billion for EE sector between 2007 and 2009).
• The TA program has been critical in ensuring the sustainability and independence of the project.
• This program has not addressed the over-reliance of banks on on-balance sheet financing. As a consequence, project funded by the program were mostly large industrial projects such as waste-heat recovery / iron & steel. These results are similar to the experience on CHUEE.
Contact(s):
pmo@cheef.org.cn

Reports/Publications:
China Energy Efficiency Financing Project Appraisal Document (PAD)
CHEEF Aide Memories
Proposed Additional Financing (World Bank, 2011)
China Utility Energy Efficiency Program (CHUEE)

<table>
<thead>
<tr>
<th>PROGRAM TYPE</th>
<th>COUNTRY/REGION</th>
<th>TIMEFRAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partial risk guarantee supported by a technical assistance and information dissemination program</td>
<td>China</td>
<td>MAY 2006</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SPONSORING AGENCY</th>
<th>COUNTERPART AGENCY</th>
<th>IMPLEMENTING AGENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>International Finance Corporation (IFC), supported by funding from Global Environment Facility (GEF).</td>
<td>Chinese commercial banks.</td>
<td>FC with three Chinese commercial banks – Industrial and Commercial Bank of China (ICBC), Bank of Beijing (BOB) and Shanghai Pudong Development Bank (SPDB)</td>
</tr>
</tbody>
</table>

**Objective(s):**
The principal objectives of the program were:

- Risk sharing facility through a partial credit guarantee to banks, combined with a technical assistance program to build the banks’ in-house knowledge and capacity.
- Technical assistance to the market partners for project development and facilitation of introductions to potential financiers.
- Information dissemination program as well as technical assistance to energy end-users; to increase their knowledge and capacity to tap into ESCOs and banks.

**Energy Efficiency/GHG Goals:**
No specific targets identified; but general target to increase commercial financing into EE.

**Sectors Targeted:**
Large Industrial

**Barriers Addressed:**
- Information barrier on the end-users’ side as well as a lack of know-how / capacity among Chinese commercial banks on EE financing.
- Lack of financial and technical skills in industries to prepare investment grade or bankable EE project proposals.
- High risk perception surrounding intangible nature of EE projects (i.e. lending against energy savings with no collateral to support financing) coupled with risk aversion among Chinese banks.

**Financing Mechanism(s):**
Partial risk guarantee fund

- Partial credit guarantee – provided by IFC to address financial risk issues and reduce risk aversion of the participating banks.
- Technical assistance to EE stakeholders – assisting them to assess their facilities’ EE potential and to structure their EE projects.
- Market outreach and information dissemination – to create market momentum and increase the general awareness of EE in the market.

**Collateral Support provided (if any):**
The program was designed as a USD 215.5 M facility, which included a USD 16.5 M grant component from GEF and another USD 3 M from other donors aimed at technical assistance.

**Eligibility Criteria:**
Based on bank’s loan eligibility criteria which evolved and improved with TA component of the facility.
China Utility Energy Efficiency Program (CHUEE)

Total Funding:
USD 197 M in guarantees resulted in USD 512 M of loans and triggered USD 936 M EE investment in aggregate (IEG, 2010).

Major Activities:
Industrial EE programs.

Key Results:
- Total number of projects: 98
- Number of participating companies: 78
- Leverage achieved of USD 3.75 of private sector finance (loan and equity investment) for each USD 1 of public finance guarantee.
- Although the program was designed with a prudent / conservative default rate of 2.5%; there were no defaults (compared to the experience of Chinese commercial banks default rate of 1.14%)
- The projects financed concentrated on heavy industries: steel (37%), Chemicals (20%); Cement (17%); as well as cooking, food and glass, but the average size of the projects were relatively large at USD 5.7 million.
- Estimated GHG reductions of 14 mt CO2e.
- The program failed to tap into the SME sector.

Lessons Learned:
- Flexibility is needed in the program design to respond to unexpected challenges and opportunities. In this case, although the CHUEE program was designed as a utility–based support program, it evolved as a program to support financial institutions due to the misalignment of stakeholder interests in the original concept.
- A combination of multiple approaches in the program is more likely to succeed. Although guarantees are necessary they might not be sufficient to increase investment in EE.
- Government buy-in and market readiness are important factors in success of program: The timing of CHUEE coincided with the focus of the Chinese government on energy efficiency, which was outlined in the eleventh five year plan.
- Aligning interests with the private sector is key. Although generating EE financing opportunities is the immediate objective of the program, sustainability off EE financing efforts by the Chinese counterparts is of equal importance. It therefore helps to define an exit strategy for the development finance agency from the start.

Contact(s):
Alex Ablaza (IFC), Russell Sturm (IFC), Calvin Xu (former IFC)

Reports/Publications:


Other Comments:
The CHUEE program is regarded as a success in the China EE market. Many have tried to emulate this example since it was first implemented.
**Energy Efficiency Revolving Fund (EERF), Thailand**

<table>
<thead>
<tr>
<th>PROGRAM TYPE</th>
<th>COUNTRY/REGION</th>
<th>TIMEFRAME</th>
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</thead>
<tbody>
<tr>
<td>Dedicated credit line to commercial banks to fund EE projects at low interest rates</td>
<td>Thailand</td>
<td>2003 - 2011</td>
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<tr>
<th>SPONSORING AGENCY</th>
<th>COUNTERPART AGENCY</th>
<th>IMPLEMENTING AGENCY</th>
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</thead>
<tbody>
<tr>
<td>Royal Thai Government</td>
<td>11 commercial banks (initially six when the fund was launched)</td>
<td>Department of Alternative Energy Development and Efficiency (DEDE) in charge of implementing EE under the ENCON Act. DEDE signed a contract with each bank specifying the terms and conditions of DEDE loans to the bank and the reimbursement of DEDE by the bank.</td>
</tr>
</tbody>
</table>

**Objective(s):**

To facilitate investment in EE by helping commercial banks to develop appraisal procedures and provide low-interest rate loans for EE projects.

**Energy Efficiency/GHG Goals:**

No minimum level of energy saving was required. Government of Thailand has a stated objective to reduce energy intensity by 25% between 2005 and 2025.

**Sectors Targeted:**

For industrial projects, criteria included improvement of combustion efficiency of fuels, prevention of energy loss, recycling of energy wastes, reduction of power peak demand, use of EE equipment, etc.

For buildings, criteria included reduction of heat from sunlight, room temperature at appropriate level, use of quality material, efficient use of lighting, use of control systems, etc.

**Barriers Addressed:**

- Access to funding at competitive rates for upfront costs of EE projects
- Knowledge diffusion through banks as they were incentivized to finance EE project at attractive financing rates and were encouraged to develop EE business lines to gain access to ENCON funding.

**Financing Mechanism(s):**

Funds from DEDE / ENCON Fund were provided as program loans to commercial banks through EERF at zero interest for amounts of THB 100 – THB 400 million (c.USD 3.2 million – USD 12.7 million). Banks on-lent this financing and were allowed to charge interest up to 4% to cover their costs and risk.

Once a project was identified (by owner, an ESCO or other service provider), it is submitted to EERF through a bank which conducts an appraisal / financial analysis prior to submission. If successful, the project is then submitted to DEDE by the bank with a repayment plan. Once implemented, the borrower repays the loan principal and interest to the bank, which repays the principal to DEDE ENCON Fund. The owner provides regular reports to DEDE on energy saving achievement.

EERF loans may be used to cover costs of purchase and installation of equipment, design, import taxes and duty, etc. as defined in the ENCON Act.

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1 The Energy Conservation Promotion Act (ENCON), enacted in 1992, set up energy conservation and renewable energy policies, including the ENCON Fund financed from a tax on all petroleum products sold in Thailand.
Collateral Support provided (if any):
Not provided.

Eligibility Criteria:
Criteria as defined in the ENCON Act:

For industrial projects, they include improvement in combustion efficiency of fuels, prevention of energy loss, recycling of energy wastes, substitution of one type of energy by another type, more efficient use of electricity through improvement in power factors, use of EE machinery or equipment, operation control systems and materials, etc.

For projects in buildings, criteria include reduction of heat from sunlight, efficient air-conditioning, use of EE construction materials, efficient use of light, use and installation of machinery, equipment and materials contributing to energy conservation, use of operation control systems for machinery and equipment, etc.

Subsidized interest loan size limited to USD1.4 M per project (up to 100% of total cost) and a loan term limited to 7 years.

No minimum level of energy savings required.

Total Funding:
Initial size of the fund was THB 2 billion (c.USD 63 M) but reached USD 261 M at September 2010 including USD 27.5 M allocated for renewable energy projects.

Major Activities:
EERF supported mainly industry and building sector projects. 67% of the projects between 2003 and 2009 were related to change to higher efficiency equipment.

Key Results:
By April 2010, 335 EE projects and 112 renewable energy projects were financed by EERF for a total of USD 453 million (including USD 210 million from the EERF) generating USD154 million of annual energy cost savings.

Lessons Learned:
- Capacity building: EERF has allowed commercial banks to become familiar with EE project financing and, in doing so, promoted EE development to industrial and commercial customers.
- Project pipeline: EERF allowed commercial banks to get access to new projects by offering very competitive loans.
- Low interest finance: Customers could get access to financing at lower interest rates than internal funding.
- Efficient loan processing procedures: EERF also provided simplified procedures for project appraisal and loan processing.
- Customer creditworthiness: As the banks were taking all the credit risk, they only lent to creditworthy customers focusing on the sub-borrower’s balance sheet, hence limiting EE project opportunities. The implication is twofold: (i) the facility did not encourage cash flow lending (project finance) and (ii) penetration of the facility to the SME and less creditworthy customers was limited.
- Lack of ancillary products / risk-sharing: Broadening the scope of the EERF such as with credit enhancement solutions, risk guarantees (especially to attract ESCOs) and increasing the size of loans would help to capture a higher number of opportunities.

Contact(s):
Department of Alternative Energy Development and Efficiency (DEDE)
Energy IT Group
DEDE IT Centre, 3rd Floor, Building 6
17 Rama 1 Rd, Kasatsuk Bridge
Pathumwan, Bangkok 10330
Thailand
Tel No.: + 662 223 0021 – 9

Reports/Publications:
Bulgaria Energy Efficiency And Renewable Sources Fund (EERSF)

**Objective(s):**

The Fund’s main objective is to support the identification, development and financing of viable EE projects, resulting in substantial reduction of greenhouse gases (GHGs), and to improve Bulgaria’s energy intensity, which in 2005 was twice the average of EU countries.

**Energy Efficiency/GHG Goals:**


**Sectors Targeted:**

General increase in investments for EE – program addresses corporate clients, municipalities, hospitals and universities.

**Barriers Addressed:**

Gap in commercial financing to implement EE saving potential:

- The relatively small size of EE projects compared to energy supply projects or other conventional bank loans made them unattractive for commercial financing.

- Banking structure that was not favorable to EE financing: a low market competition in the banking sector meant that banks could charge very high interest rates and require a high level of collateral for loans made, which was not conducive to EE lending.

- Low level of information and capacity among commercial banks on EE finance that led to a perception among financial institutions that EE finance entails high risk.

- Absence of energy services companies.

**Financing Mechanism(s):**

USD 10 M of equity financing supporting loans and partial credit guarantees for individual projects and portfolio guarantees for ESCOs and residential complexes. ESCO and residential portfolio guarantees structured as a first loss product covering up to the first 5% of defaults.

**Collateral Support provided (if any):**

In-house technical evaluation capacity.

**Eligibility Criteria:**

10% equity contribution by end-user if co-financing provided by commercial bank; 25% equity contribution by end-user for stand-alone financing by EERSF. Individual per project guarantees capped

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1 Some grant funding also provided by NGOs and under corporate social responsibility (CSR) programs.
Bulgaria Energy Efficiency And Renewable Sources Fund (EERSF)

at BGN 800,000 (C. USD 500,000).

**Total Funding:**
USD 10 M (GEF); USD 1.8 M (Bulgarian Government); USD 2 M (Austrian government).

**Major Activities:**
Partial Credit Guarantees (PCG): not over USD 500,000, up to 70% of the project cost
Investment (Sub-Loan) Financing Facility.
Technical Assistance (TA).

**Key Results:**
Key results at the end of the IBRD/GEF project in March 2010:
- Approximately 852 loans with a total loan value: USD 16 M and total investment of USD 24 M.
- Energy savings (over lifetime) from these loans were 0.09 mtoe, and the GHG-savings at 0.9 mtCO2e.
- 31 guarantee deals of about $2.0 M, and catalyzing total investment of $15 M.
- Energy savings were 0.02 mtoe, and the GHG savings at 0.1 mtCO2e.
- The average simple payback period was 4.7 years. The typical loan size was USD 250,000–USD 500,000.
- EERSF reached self-financing through a ratio of 133% annual income from project operations divided by annual operating costs, achieving the objective for EERSF to evolve into a revolving fund.

**Lessons Learned:**
- **Market context:** Context assessment key before choosing what kind of mechanism to put in place.
- **Flexible program:** Flexibility in EERSF’s operation was critical, enabling it to respond to significant market changes and competition that occurred between project inception and implementation.

- Small projects not attractive for co-financing model: Co-financing proved not to be very attractive by local banks for EE projects, due to their small size – only about US 45 cents was leveraged from private finance sources (principally end-user equity) for each $1 of EERSF finance.

- “Name lending”: Risk-sharing program also did not generate much interest from commercial banks also due to “name lending” by banks i.e., banks lend based on the reputation of and experience with the borrower; although the leverage impact for the partial guarantee program was far greater than for the loan product with over $5 of private finance for each $1 of EERSF partial credit guarantee.

- **Role of government policy:** Increased government policies were needed before the program was able to tap into the building sector.

**Contact(s):**
Energy Efficiency and Renewable Sources Fund
4 Kuzman Shapkarev Street
1000 Sofia
Phone: +359 2 81 000 80

**Reports/Publications:**


**Other Comments:**
Program needed to respond to changing market circumstances underscoring the need for flexibility in program design and implementation.

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2 By June 2012 EERSF reported 126 project loans with an aggregate project size of BGN 53.4 million (USD 35 M) supported by BGN 36.6 M (USD 23.6 M) of EERSF financing.
# Efficiency Vermont

<table>
<thead>
<tr>
<th>PROGRAM TYPE</th>
<th>COUNTRY/REGION</th>
<th>TIMEFRAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Efficiency Utility using EE funds funded by EE charge collected from all utility bills</td>
<td>Vermont, United States</td>
<td>2009 - 2011</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SPONSORING AGENCY</th>
<th>COUNTERPART AGENCY</th>
<th>IMPLEMENTING AGENCY</th>
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</thead>
<tbody>
<tr>
<td>Vermont Public Service Board (PSB) authorized by the Vermont Energy Act of 2009. Vermont PSB created the Energy Efficiency Utility (EEU) Efficiency Vermont to use Public Benefits Funds (PBF) to finance EE programs.</td>
<td>Vermont Energy Investment Corporation (VEIC) runs the EEU Efficiency Vermont. VEIC is overseen by the Vermont PSB, which competitively select a non-profit contractor for 3 years (period 2009-2011).</td>
<td>Vermont Energy Investment Corporation (VEIC) manages the funds according to EE programs defined by the Vermont Department of Public Service (DPS).</td>
</tr>
</tbody>
</table>

**Objective(s):**
Support EE programs across the state through funding from utility users.

**Energy Efficiency/GHG Goals:**
Initial target of 360,000 MWh in energy savings from 2009 and 2011 (about 6.75% of Vermont’s electric energy needs).\(^1\)

**Sectors Targeted:**
Large industrial, business, retail and domestic customers.

**Barriers Addressed:**
- Conflict that arises when state regulators mandate utilities whose revenues are tied to electricity sales to promote energy efficiency reductions in electricity (and thus, revenues)
- Lack of funding for EE project upfront investment, now provided through charges collected from utility bills
- Lack of incentives / objectives that Efficiency Vermont addresses through energy saving targets set up by the state of Vermont (Vermont PSB) hence creating the drive for achieving them
- Lack of awareness of EE solutions that are addressed through, e.g., energy management program that large customers have to implement or training, conferences and technical assistance funded by EEU Efficiency Vermont

**Financing Mechanism(s):**
Vermont Efficiency receives funds from Vermont PSB which collects charges (Energy Efficiency Charge – EEC) from all utility bills. The funds are used to finance EE programs across the state through direct financing (purchase of EE equipment, rebates, etc.), R&D programs and services or grants / loans.

There are 2 programs for large industrial customers:
- Customers who pay an annual EEC > USD 5k can transfer up to 70% to self-administered EE programs.
- Customers who pay annual EEC above USD 1.5 M are (i) exempted from EEC, (ii) have to pay an annual fee of USD 50k, (iii) have obligation to spend at least an annual average of USD 3 M over 3 years on EE investments and (iv) have to present an energy management program with annual objectives.

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\(^1\) American Council for an Energy-Efficient Economy.
Efficiency Vermont

Collateral Support provided (if any):
Compensation to VEIC are subject to meeting energy saving targets. They are negotiated between VEIC and Vermont PSB.

Eligibility Criteria:
Not specified.

Total Funding:
Efficiency Vermont financed USD 101.3 M of EE projects between 2009 and 2011.

Major Activities:
Business sector (air conditioning, industrial processes, motors, HVAC, etc.) and residential sector (ENERGY STAR’s Home Performance program).

Key Results:
Vermont is ranked fifth overall in the American Council for an Energy-Efficient Economy (ACEEE) scorecard and first for state utility energy efficiency programs.

Based on Efficiency Vermont 2011 Savings Claim, the program achieved between 2009 and 2011, 304,000 MWh of energy savings representing USD 315 M benefits and 2,135,000 tons of CO2 avoided.

Efficiency savings from 2011 initiatives represented 1.91% as a share of Vermont’s overall electricity needs in 2011.

Savings in the Business New Construction and Existing Business markets in 2011 amounted to 56,000 MWh (about 52% of the 2011 total resources benefits of 108,000MWh), delivering total resource benefits of USD 54 million (53% of the 2011 total benefits of USD 101.5 M).

The cost of delivered energy efficiency in 2011 was US 4.3 cents/kWh compared to the US 12.1 cents/kWh cost of electricity supply.

The average return on investment for efficiency improvement made by business customers in 2011 was 70%.

Lessons Learned:
Lessons learnt from the previous assessment period and developed in the 2012 annual plan:

- Importance of engagement with customers using different approaches and to improve relationship with partners to ensure availability of suitable products and equipment
- Comprehensive approaches combining information / technical assistance (e.g. cost sharing of engineering analyses, pilot technology testing, site visits, education and information, etc.) and financial assistance (e.g. purchase of equipment)
- Key segments are lighting, HVAC, pumps and motors (e.g. variable frequency drives), refrigeration and building insulation
- The EEU principles and the selection of an independent administrator allowed a fairer allocation of EE projects and funding across the state and removed potential conflict of interest
- Efficiency Vermont is moving to a 20-year plan for budgets and goals that will be reviewed every 3 years

Contact(s):
Efficiency Vermont, 128 Lakeside Avenue, Suite 401, Burlington, VT 05401. See also: www.efficiencyvermont.com

Reports/Publications:
Efficiency Vermont Annual Report 2011
Efficiency Vermont Annual Plan 2012
Efficiency Vermont 2011 Savings Claim, issued 1 April 2012.
New York State Energy Research and Development Authority (NYSERDA)

Objective(s):
NYSERDA is tasked with using innovation and technology to solve some of New York’s most difficult energy and environmental problems in ways that improve the State’s economy. It has one of the broadest mandates among EE administrators in the US.

In the context of Industrial EE, NYSERDA supports the adoption of EE through technical assistance and audit programs as well as through incentive mechanisms for retrofits at existing facilities and for new constructions. NYSERDA’s stated goal is to return in energy-efficiency improvements as much of SBC contributions by utility customers as possible.

Energy Efficiency/GHG Goals:
IPE’s overall goal is to help customers develop and implement continuous improvements in order to lower energy costs and become more competitive in the marketplace. Specific energy savings goals set at an aggregate level for electric and gas programs under the EEPS programs are:

Electric: 2,762 GWh
Gas: 4,015,132 MM Btu

1 New York System Benefit Charge Programs Evaluation and Status Report, Quarterly Report to the Public Services Commission, Quarter Ending March 31, 2011.

Sectors Targeted:
Incentive schemes available for:
- Both new construction and existing facilities (retrofits)
- Manufacturing facilities
- Data centers
- Electricity and natural gas savings

A broad range of industrial sectors targeted, including: Plastics and Packaging, Chemicals, Petrochemicals, Metals, Paper and Pulp, Transportation, Biotechnology, Pharmaceutical, Food and Beverage, Mining and Mineral Processing, General Manufacturing and Equipment Manufacturers.

Barriers Addressed:
Provide customers with the opportunity to recover SBC contributions through EE initiatives.

Promote cost sharing of energy audits and technical assistance to identify EE and productivity efficiency opportunities.

Defray cost of installation of EE equipment, reducing customer
Financing Mechanism(s):

Energy Audits: Conduct of energy audits for small customers with annual electricity bills <USD 75,000. Subsidized Energy audit fees of USD 100 (annual electric bill <USD 25,000) or USD 400 (annual electric bill USD 25,000 – 75,000). Audit fees refunded if audit recommendations are implemented.

Flexible Technical (FlexTech) Assistance and Technical Assistance: Customized energy studies targeted at medium to large customers through a cost-sharing mechanism, typically on a 50-50 share. Under FlexTech, customer selects pre-approved engineering firm and NYSERDA and Customer share costs. Under the TA the customer selects its own service provider and NYSERDA reimburses the customer for 50% of cost upon approval of the final report.

Existing Facility and New Construction Incentives: In addition to energy audits and technical assistance, NYSERDA also provides a subsidy to defray the cost of retrofits and process improvements at existing facilities as well as new constructions that provide for efficiency improvements through its IPE program. The program works as follows:

1. NYSERDA’s staff and consulting team works with the customer to establish an appropriate baseline for each project.

2. The energy savings resulting from process improvements (retrofit / new construction) is measured against the baseline to determine the annual energy savings which is multiplied by the incentive rate to derive the NYSERDA incentive, capped at 50% of the project cost or USD 5 million per facility per year for electric incentives and up to USD 1 million per facility per year for natural gas incentives. Incentive rates for 2012 are as follows:

<table>
<thead>
<tr>
<th>Incentive Type</th>
<th>Utility</th>
<th>Upstate</th>
<th>Downstate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process &amp; EE</td>
<td>Electric</td>
<td>$0.12/kWh</td>
<td>$0.16/kWh</td>
</tr>
<tr>
<td></td>
<td>Natural gas</td>
<td>$15/MMBtu</td>
<td>$20/MMBtu</td>
</tr>
<tr>
<td>O&amp;M</td>
<td>Electric</td>
<td>$0.05/kWh</td>
<td>$0.05/kWh</td>
</tr>
<tr>
<td></td>
<td>Natural gas</td>
<td>$6/MMBtu</td>
<td>$6/MMBtu</td>
</tr>
</tbody>
</table>

3. NYSERDA typically pays a maximum of 60% of the incentive when installation is complete. Progress payments also are available on this installation payment for costs incurred to support installation (design, equipment purchase, etc.).

4. The remaining 40% of the incentive generally is paid when the project’s electricity savings have been measured and verified (M&V). M&V periods are generally one to two years, although accelerated performance payments can be considered in some cases.

5. NYSERDA bears the costs associated with M&V.

Research & Development: NYSERDA provides funding to develop and demonstrate cutting edge technology (e.g. for development, production and commercialization of clean-energy technologies).

Collateral Support provided (if any):

Energy audits / FlexTech and technical assistance.

Eligibility Criteria:

Customers must pay into the SBC on their electric and/or natural gas bills with the utilities listed below to be eligible.

<table>
<thead>
<tr>
<th>Incentive Type</th>
<th>Utility</th>
<th>Elec</th>
<th>Gas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Downstate</td>
<td>Brooklyn Union Gas Company</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Consolidated Edison Company</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>KeySpan Gas East Corporation (KEDNY/KEDLI)</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Upstate</td>
<td>Central Hudson Gas &amp; Electric Corporation</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>National Grid Generation</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>National Fuel Gas Distribution Corporation</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>New York State Electric &amp; Gas Corporation</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Orange and Rockland Utilities, Inc.</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Rochester Gas and Electric Corporation</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Project eligibility is determined by electricity (and gas) savings. Projects that improve manufacturing process productivity e.g., increase throughput / productivity (electricity use per unit of production), reduce scrap / waste may also be eligible for their energy efficiency / savings component.

Energy audits aimed at small customers <USD 25,000 annual electric bills.

FlexTech and technical assistance aimed at medium to large
customers USD 25,000 – 75,000 in annual electric bills.

Incentives are provided on a first-come first-saved basis up to 2015 to projects that meet the criteria.

**Total Funding:**
NYSERDA is primarily funded by rate payers through the SBC, established on 20 May 1996.

NYSERDA has approximately USD 167 million of funding available through to 2015 for studies and installations at manufacturing and data center facilities. Of this amount, approximately USD 93 million is allocated to electric efficiency and USD 35 million is allocated to gas efficiency projects, both are available for manufacturers and data centers.

NYSERDA will invest up to USD 5 million per facility per year for electric incentives and up to USD 1 million per facility per year for natural gas incentives. Incentives are paid based on annualized energy savings and are currently capped at 50% of project cost.

**Major Activities:**
Energy audits (small customers).

FlexTech / TAs (medium to large customers) focus includes:
- Feasibility studies
- Energy master plans
- Energy procurement
- Retro-commissioning
- Energy advisor consulting
- Incentive schemes available for:
  - Both new construction and existing facilities (retrofits)
  - Manufacturing facilities
  - Data centers
  - Electricity and natural gas savings
  - Examples of target activities, include:
    - Lighting
    - Chillers and refrigeration
    - Variable frequency drives (VFD)
    - HVAC

- Motors
- Interval Meters
- Gas efficiency
- Process improvements – scrap / waste reduction, throughput increases

**Key Results:**
New York is ranked fourth in the American Council for an Energy-Efficient Economy (ACEEE) scorecard. New York State currently has the second highest energy costs in the US and the third highest average electricity rate (US 15.27 cents/kWh vs. the national average of US 8.9 cents/kWh)

By the end of 2011, NYSERDA reported that more than USD 2.3 billion of SBC funds had been allocated to support the full range of NYSERDA-administered Energy Efficiency Portfolio Standard (EEPS) programs.

USD 246 million NYSERDA spending on Commercial and Industrial (C/I) initiatives between July 2006 and December 2010 resulted in customer co-funding of USD 862 million – $3.5 for each NYSERDA $1 spent.

Cumulative savings from Commercial and Industrial (C/I) initiatives were as follows:

- **Electricity savings:** 1,433 GWh/year
- **Capacity savings:** 466 MW per year
- **Natural gas savings:** 167 B Btu

The calculated levelized benefits and costs per kWh are below:

<table>
<thead>
<tr>
<th>Benefit / Cost</th>
<th>US cents / kWh</th>
<th>Ratio of Benefits / Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity benefits</td>
<td>12.9</td>
<td></td>
</tr>
<tr>
<td>Aggregate costs (NYSERDA + customer)</td>
<td>7.3</td>
<td>1.8</td>
</tr>
<tr>
<td>NYSERDA costs</td>
<td>1.6</td>
<td>8.1</td>
</tr>
</tbody>
</table>

**Lessons Learned:**
The SBC program has been in place in New York since 1998, initially supporting the $mart Energy program and later the EEPS programs.

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3 New York System Benefit Charge Programs Evaluation and Status Report, Quarterly Report to the Public Services Commission, Quarter Ending March 31, 2011.
• **Project size:** There is a need for a balance between the cost of M&V procedures and the size of EE projects. NYSERDA offers a Pre-qualified Incentive program intended for smaller, less complex projects (incentives limited to USD 30,000) which obviate the need for M&V.

• **Estimating savings:** NYSERDA pays a significant proportion of the cost share at installation. Establishing benchmarks for energy savings is therefore critical and requires periodic review of benchmarks which form the basis for anticipated energy savings (electricity and gas).

• **Program evaluation:** Given the allocation of public funds (SBC) appropriate governance, transparency and evaluation procedures are critical. A 2008 review of program evaluation established more systematic procedures involving oversight.

• **Program structure and financing:** NYSERDA’s EE program aimed at C/I entities does not provide financing; rather it is structured as a cost sharing program (maximum of 50% based on energy savings achieved) that pays 60% upon completion of installation and 40% following verification of energy savings i.e., post one year of M&V. C/I counterparts must therefore raise EE financing either from their own resources (internally generated cash flow) or third party financing. NYSERDA programs do not provide risk sharing facilities; this limits the development of opportunities through other channels, such as ESCOs.

**Contact(s):**
NYSERDA  
17 Columbia Circle,  
Albany, New York 12203-6399  
Tel: +1 518 862 1090

**Reports/Publications:**
New York System Benefit Charge Programs Evaluation and Status Report, Quarterly Report to the Public Services Commission, Quarter Ending March 31, 2011
Metrus Energy

**PROGRAM TYPE**

One-stop shop, providing financing through private sector equity and debt and technical solution through ESCOs with performance guarantees.

**COUNTRY/REGION**

United States

**TIMEFRAME**

Company founded in 2009

**SPONSORING AGENCY**

Metrus Energy finances, owns, and operates EE projects

**COUNTERPART AGENCY**

Commercial banks and ESCOs

**IMPLEMENTING AGENCY**

Metrus Energy and ESCOs

**Objective(s):**

Promote, finance and develop EE retrofit projects through provision of a procurement vehicle (partners, expertise) and funding (equity and debt) to commercial and industrial customers enabling them to finance EE projects off-balance sheet with no capital outlay by the host entity.

**Energy Efficiency/GHG Goals:**

20+% energy savings; preference to assess opportunities for deep energy savings and facilitate realization of such savings.

**Sectors Targeted:**

- Industrial companies (e.g. manufacturing, food, energy intensive industries)
- Private higher education and health care (non tax exempt entities)
- Offices of big corporates / owner-occupiers (e.g. Fortune 500 companies)
- Commercial real estate

**Barriers Addressed:**

- Access to funding / credit
- Knowledge diffusion / public awareness
- Optimized risk allocation between parties involved

- Combined financial / technical solution
- Facility-wide, and ongoing assessments to enable for deep energy savings — facilitate realization of such savings over horizons that exceed customers’ payback constraints

**Financing Mechanism(s):**

Metrus Energy provides 100% financing using a mix of equity and debt. Credit enhancement products are used when available, and the creditworthiness of the customer is taken into account. Collateral is limited to the residual value of the installed equipment.

An Energy Service Agreement (ESA) is signed between the customer and Metrus Energy (typical duration between 5 to 10 years, with periodic buy-out windows), during which the client pays a service charge to Metrus Energy based on actual project performance and energy savings (typically below the standard utility rate originally paid by the client).

**Collateral Support provided (if any):**

Installed equipment. Lending conditions mainly based on client creditworthiness.

**Eligibility Criteria:**

Targeted segment (see 10) and projects above USD 750,000.
Total Funding:
Goal to fund USD 75 M in projects by end 2013 with opportunity for more.

Major Activities:
- Building automation & controls
- Lighting retrofits & controls
- Compressed air (leak detection & repair)
- Utility tariff rate optimization
- Heating, ventilation, & air conditioning (HVAC)
- Chiller replacement & system improvements
- Boiler replacement & system improvements
- Pumps, fans, motors, drives
- Cogeneration (onsite generation)

Key Results:
Typical pay-back period between 3 and 7 years.

A typical case may be illustrated by the Energy Service Agreement signed in 2010 with BAE Systems, an UK aerospace and defense contractor. Metrus Energy and BAE implemented EE measures at several BAE US facilities including equipment replacement, building automation, lighting retrofits, and operational improvements. The program produced the following outcome:

- USD 200,000 in annual utility savings
- 1 M kWh avoided
- 30 k therms of natural gas avoided
- 400 tons of CO2 avoided

Various non-energy savings (e.g. reduced maintenance expense).

Lessons Learned:
- Knowledge diffusion is key as many opportunities to save energy are missed due to lack of access to the right technologies, partners or solutions required to address the full range of savings opportunities. Metrus Energy provides a combined financial and technical solution with performance guarantee on the equipment as a ‘one-stop shop’ for EE solutions. Metrus Energy uses its partnership network of contact to access clients
- The lack of clarity in regulation, incentives and targets for EE programs / projects and emphasis on more expensive RE solutions undermine the realization of EE opportunities. Specific EE targets and regulation should be made clearer. Incentives equivalent to e.g., solar depreciation credits would lead to a significant expansion in EE
- Access to credit can be an issue especially with non-recourse finance and the limited collateral available. A strong network of expertise and lending partners help to get access to debt financing. It means that the SME sector and smaller and lower credit quality customers struggle to get EE projects financed. Some of the incentives at federal, state or local level could be used to provide guarantees to lenders or elevate the priority of payments (e.g., PACE, OBR) in order to broaden access to EE funding.
- Metrus Energy concept allows a sensible risk allocation among industrial clients, funders and installers and operators where each project participant is allocated the risk he is most suited to bear. The combination of ESCOs, ESPC and access to non-recourse debt financing allows the emergence of such a solution. In less developed markets, other support would likely be required such as third-party guarantee and/or risk-sharing facilities.

Contact(s):
Sam Lines, Project Development Director
European Bank for Reconstruction and Development (EBRD) Energy Audits Program

<table>
<thead>
<tr>
<th>PROGRAM TYPE</th>
<th>COUNTRY/REGION</th>
<th>TIMEFRAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical assistance facility to support conduct of energy audits.</td>
<td>Central and Eastern Europe.</td>
<td>2002 pilot program, expanded in 2004 with funding from CEI.</td>
</tr>
</tbody>
</table>

**SPONSORING AGENCY**

European Bank for Reconstruction and Development (EBRD), funding support from the Central European Trust Initiative (CRI) Trust Fund as well as other donors.

**COUNTERPART AGENCY**

Engineering and environmental consulting firms.

**IMPLEMENTING AGENCY**

EBRD

**Objective(s):**

In 2002 EBRD initiated a pilot Technical Assistance Program designed to provide its clients with dedicated international expertise to help them implement energy efficiency through energy audits and targeted training.

**Energy Efficiency/GHG Goals:**

No targets specified.

**Sectors Targeted:**

Energy audits and capacity building.

**Barriers Addressed:**

The EBRD region is characterized by high energy intensity (2-5 times more than the EU average and a host of other challenges to the implementation of EE projects. The EBRD Energy Audits program endeavors to address some of the front-end challenges in the EE sector, including:

- Integration of EE financing into bank mainstream lending activities.
- The lack of awareness of the benefits of energy saving by investment industrial/commercial decision-makers.
- Small size of EE projects relative to other lending.
- A lack of data on internal energy usage and operational parameters of systems and processes.

- High EE lending transaction costs.

**Financing Mechanism(s):**

Energy Efficiency Audits Frameworks are carried out as Technical Cooperation (TC) assignments. TC projects provide the backbone for large capital investment projects, allowing for the dissemination of capital and knowledge in the region.

The TC is offered in the form of a grant-type assistance to support project preparation activities e.g., pre-feasibility studies, feasibility studies, pre-loan audits, environmental engineering etc (see below).

**Collateral Support provided (if any):**

By its nature the, EE Audit is merely preparatory a activity. This activity is nevertheless a crucial first step that enables EBRD to identify and prioritise potential EE projects that qualifies for subsequent investment / financing by EBRD and its development partners.

**Eligibility Criteria:**

Industrial facilities with loan applications pending at EBRD. Explicit criteria for approval of underlying loan principally, creditworthiness of customer. Terms of EE financing same as those of underlying loan without additional collateral. Potential for project replicability also an important consideration. EE projects allocated ratings based on EE potential – projects with greatest EE potential prioritized.

**Total Funding:**

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Between 2004 and 2009 CEI allocated EUR 1.2 million to TC EE projects. EBRD report that the first two Energy Audit Programs financed by CEI resulted led to EE investments of EUR 87.3 million1.

**Major Activities:**
TCs are typically aimed at the following project preparatory activities:

1. Pre-feasibility studies
2. Feasibility studies
3. Sector / environmental engineering
4. Management training / capacity building programs
5. Pre-loan audits

In particular, Energy Audits, which are the core activity of the program, typically encompass the following activities:

a. Energy efficiency audit
b. Prioritization of EE investment plan
c. Energy management assessment
d. Local involvement and management (capacity building)

**Key Results:**
Between 2004 and 2009 the CEI funded Energy Audits Program identified EUR 201 million of potential investments that would lead to total energy savings of 15.4 million GJ/year and abatement of 1.3 mt CO2/year.

EBRD reported the aggregate impact of 4.7 mt CO2/year reduction in GHG emissions from 29 significant energy efficiency projects (including EE with capacity expansion and RE/EE funds and credit lines) committed to in 2011.

**Lessons Learned:**

1. High return from EE Audits: For relatively low capital outlay (TC assignments), EBRD is able to identify and prioritise potential EE opportunities among clients and direct investment to those opportunities that will realize the highest return; program average 50:1 EE investment to program expenditures.
2. Independence of EE Auditor: This is critical to have an external and impartial result and to achieve buy-in from local management. EBRD or International expert paired with local technical firms.

3. Challenges with reliable data collection: The lack of accurate/reliable data on some facilities leads to challenges in estimating actual energy usage during energy audits and, therefore, in estimating the capital expenditure and potential savings. Sensitivity analysis is necessary to assess potential risks in this regard.

4. Developing country challenges: Often in developing countries modern state-of-the-art equipment is installed side-by-side with obsolete equipment impacting the efficiency and productivity of production process, which is determined by the least reliable process component. This may require the EE auditor to step outside the strict boundaries of an EE audit and take a holistic perspective of the production process and opportunities for productivity improvement.

5. Capacity building: Capacity building / training of local management and service firms is critical to enable local management (i) to assist in identifying EE opportunities, (ii) to achieve buy-in from local management for the EE initiative and (iii) to ensure management capacity to implement EE initiative and operate and maintain EE installations to realize anticipated energy savings. Hence, energy management training for participating companies has been added to project-oriented EE assessment.

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Tel: +44 20 7338 6000
Fax: +44 20 7338 6100

**Reports/Publications:**

**Other Comments:**
The EBRD program is regarded as best practice among EE audit programs and is presently being emulated by other agencies (as well as private sector entities) in other markets. The Energy Audits initiative was a precursor to subsequent Sustainable Energy Finance Facilities (SEFFs) implemented by EBRD in Eastern Europe and former Soviet Union (FSU) countries under the EBRD Sustainable Finance Imitative, which provided for embedded technical assistance, including energy audits.

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Appendix D - Case Studies
Scene Setting

Country Context
In 2008, the People’s Republic of China (PRC) became the world’s largest CO2 emitter and the largest consumer of energy. The energy demand of the country increased over 100% in less than a decade with 50% of its energy consumption derived from the industrial sector. While the country consumed less than half as much energy as the United-States in 2000, estimates show that on current trends, it will consume 70% more than the United States by 2035. The share of the country’s energy demand in global energy consumption went from 11% in 2000, 19% in 2009 and is set to reach 23% in 2035 (WEO, 2011).

China promulgated in 2006 and 2011 the 11th and 12th five-year plans (FYP) that made energy efficiency (EE) a priority for the country, both in the industrial and building sectors.

The total investments needed to meet the targets of the 12th FYP are estimated over USD 50 billion. The financing gap to reach these targets is still important. Facing this gap, the government has been implementing incentives for higher investments in EE through government guarantees and capacity building programs.

Barriers
The main obstacles identified by the government in getting increased EE financing in China were:

- Lack of information and knowledge among end-users and industrialists on the advantages of energy efficiency technologies;
- Small size of projects, perceived as too much trouble for minimal profit;
- Perception that EE projects entail large risks.

Financial Mechanism

Objective
The main objective of the China Utility-Based Energy Efficiency Finance Program (CHUEE) was to increase overall investments in energy efficiency. To do so, the program put two mechanisms in place: a partial guarantee mechanism, and technical assistance for finance partners, ESCOs, and end-users.

Program Structure
The International Finance Corporation (IFC), with the help of the Global Environmental Facility (GEF), has been in charge of implementing the program, involving three main components:

1. Partial Risk Guarantees,
2. Technical Assistance Programs,
3. Market outreach through information dissemination.

The first round of the scheme involved a USD 15 million fund from the GEF to guarantee the first loss under the loan facilities and to provide the technical training. This in turn enabled the IFC to provide extend guarantee facilities for over USD 215 million to three main Chinese banks: the Industrial and Commercial Bank of China (ICBC), the Shanghai Pudong Development Bank (SPDB), and the Bank of Beijing (BoB). Figure 1 below details items 1 and 2 of the mechanism; i.e. the loan guarantee program and the technical assistance. Although originally designed as a utilities cooperation program, the scheme evolved into a risk guarantee mechanism, as research outlined this as the main financing gap.
Case Study A: China Utility-Based Energy Efficiency Finance Program (CHUEE)

Guarantee Facility
The partial loan guarantee component of the mechanism included the IFC covering 75% of the risk for the first 10% of the loss (i.e., First Loss); the remaining 25% of the First Loss was borne by the commercial banks. For the remaining 90% of the loss, the IFC covered 40% of the risk, with the commercial banks bearing the remaining 60%.

The underlying idea behind this transaction structure was to cover commercial banks, while training them in the specificities of energy efficiency projects. As illustrated, contingency financing in the form of loan guarantee program (LGP) such as the CHUEE provide loan guarantees and technical help to financial institutions (FI). By providing its guarantee against loan losses, the CHUEE program mitigates the loan risk for the participating financial institutions and achieving leverage on the GEF / IFC capital deployed.

Technical Assistance
Through the technical assistance (TA) component of CHUEE, the IFC builds capacity and knowledge of local commercial bankers in the technicalities and specialties of energy efficiency financing. The training was not confined to local bankers. It also included other market players such as ESCO managers. The main goal of the TA was to familiarize the three commercial banks with EE financing. This included introducing project finance lending products, lending to ESCOs, savings based lending, etc. Also, consultants hired by the program provided project–by–project reviews of the energy efficiency projects for the banks that used the risk-sharing facility. The IFC also extended its TA to ESCOs and project developers.

Market Outreach and Information Dissemination
Market outreach and information dissemination were notable achievements of the program and have contributed significantly to its sustainability. The IFC set out to increase the general awareness of EE technology, services, and successful projects in the market through the organization of conferences and information dissemination to increase the general awareness on EE technologies and knowledge on best practices. The program also helped to overcome the asymmetry of information about EE. On the one hand, ESCOs, equipment vendors and engineering companies had ample knowledge of energy efficiency. On the other, their clients and financiers had little or none.
Case Study A: China Utility-Based Energy Efficiency Finance Program (CHUEE)

Achievements

It is estimated that IFC committed USD 104 million to ICBC as guarantees that leveraged USD 210 million of their funds in industrial EE loans. As such, the project has contributed to the reduction of 5 million tonnes of CO2 emissions yearly. The estimated overall CO2 savings for CHUEE I, II, III were 14 Mt (IEG, 2010).

By June 2009, the program had undergone an independent evaluation that underlined:

- Total number of projects: 98
- Number of participating companies: 78
- Total loan amounts: USD 512 million
- Total project investments: USD 936 million
- Guarantees provided: USD 197 million.

The first program that was guaranteed by IFC, to ICBC, had committed all guarantee funds of more than USD 60 million within a year, through 50 loans to 35 companies. IFC thus decided to reallocate the GEF money for more guarantees. That new mechanism became CHUEE II. Overall investments in energy efficiency financing in China increased significantly since the beginning of the program, and particularly since the beginning of CHUEE II (from December, 2007). Beyond the guarantee facilities, the technical assistance in designing the credit lines and procurement, together with EE audits, were instrumental in convincing the banks of the necessity of the EE financing.

While the program design had assumed a default rate of 2.5%, there were no defaults under the CHUEE guarantee program.¹ The TA and outreach activities of CHUEE covered 47 banks and FIs, 14 utilities, 67 equipment suppliers, 72 end users, and 135 ESCOs. Similar guarantee programs and technical assistance have been implemented in the other regions by the IFC, notably in Eastern Europe.

The major shortcoming that was underlined in the official IFC evaluation of the three CHUEE programs was that they were mostly captured by large industrial projects with steel representing the largest proportion of projects (37%); chemicals (20%) and cement (17%), which, arguably, could have been implemented without the CHUEE program. In addition, CHUEE did not manage to tap into the smaller projects; the average size of CHUEE projects being USD 5.7 million, relative to an expectation that 60% of the loans would be less than USD 200,000 at the program design stage. The program evaluation revealed that, in fact, loans of this size represented less than 10% of the portfolio.

Finally, little, if any, savings-based financing was done, as the large sponsors all had sufficiently strong balance sheets to obviate this step (i.e., the Chinese banks reverted to ‘name-lending’).

Lessons

Interviews and discussion with key participants that were conducted by an IEA study in 2010 underlined that contingency financing has been very successful in raising the interest and involvement of private financial stakeholders in China (IEA, 2010). Conversations with IFC analysts emphasise that in the second round of investments, awareness had been raised within commercial banks that were turning to the IFC to be part of the scheme.

The scheme and its results underline three main lessons:

_The implementation of CHUEE has allowed the IFC to trigger a sustainable investments circle. Building the capacity of financial institutions was key in sustainability of the project_

Many factors explain the success of the program including: the increased training and capacity building within banks. As underlined by IFC participants in the process, on average all the local bank personnel who participated in the transactions have been promoted at least once or twice since the start of the mechanism (December 2008, personal conversation with IFC staff). As it is, although the initial phase of the programs was conducted after specific training and guidance, the following phases were led directly by local banks (IEA, 2010).

Loan guarantees were helpful in getting the private sector’s initial involvement, however, indirect training and capacity building, as well as information dissemination and awareness raising, were the key elements in making the initiative sustainable. The eagerness of non-participating local banks to participate in the second and third round of investments stands as a testimony of the effectiveness of these elements.

_Government support and market readiness are important_

The support from the government was another key element in

¹ While the default rate of China’s commercial banks was 1.14% in 2010.
the success of the mechanism. The Chinese policy context can sometimes be difficult for foreign investments. It is usually very difficult for foreign investors to successfully implement investment and financing programs in China. The fact that IFC was allowed to cover over 75% of the risk in their deal structure with national banks was exceptional. Preliminary discussions between the IFC and the government overcame this potential obstacle and were key in securing the deals.

Flexibility in the program design and careful selection of private sector partners played an important role in meeting the program objectives

It is often the case that between the time a program is designed to the moment it is implemented, market conditions change. When CHUEE 1 and 2 failed to meet IFC’s goals in terms of additionality, transaction size, scope to SMEs and ESCOs, and savings-based lending, the IFC reacted with flexibility and developed CHUEE 3 to better address those elements. By shifting away from the original plan of implementing a scheme in partnership with utilities, CHUEE demonstrated that when the interests of the different partners are not aligned with each other and with the overall program objectives, the results are likely to be affected and project objectives not met, and that it is best to reconsider the program structure (IEA, 2011).

The results from the CHUEE program are very encouraging. The very few instances of project default reinforce the importance of broadcasting success stories to ensure adequate risk evaluation of EE projects.

References


Scene Setting

Introduction: Metrus Energy

Metrus Energy is a US-based company founded in 2009 that develops, finances, owns and operates large energy efficiency (EE) projects for commercial and industrial clients in the US.

The company is backed by Gogreen Capital, a European venture capital firm, and has developed banking partnerships with Citibank, Siemens Financial Services and Bank of America, among many others, allowing the company to provide both equity capital and third-party debt to large-scale EE projects.

Metrus Energy has also developed relationships with Energy Service Company (ESCO) partners such as Siemens, Johnson Controls, Ameresco and McKinstry to design, construct, maintain and guarantee EE project performance.

Country Context

Despite the fact that China has recently overtaken the US in terms of total energy consumption and carbon emissions¹, the US remain one the highest energy consumers and carbon emitters per capita². The industry sector represents the highest but declining share of primary energy consumption with 20% in 2010, down from 35% in 2000³.

The US does not presently mandate energy intensity or carbon emission targets at the national level. The majority of the industrial

EE activity in the US is therefore driven by utilities, state level entities and the private sector⁴.

A key national policy is the American Recovery and Reinvestment Act of 2009 (ARRA) that authorized USD 3.2 billion for Energy Efficiency and Conservation Block Grants (EECBG – see below), USD 3.1 billion for the State Energy Program (SEP – see below) and other grants for worker training and career development in EE⁵. Other relevant policies include the Executive Order (EO) 13423 signed in 2007⁶, the Energy Policy Act of 2005⁷, the Energy Independence and Security Act of 2007⁸, the Emergency Economic Stabilization Act of 2008.

Each policy promotes the development of EE, mainly through financial support such as tax reductions / exemptions, rebates, loans or other funding (in particular for Research & Development). More recent attempts to pass additional legislation have not been successful⁹.

Key EE programs include:

- The Energy Efficiency & Conservation Block Grant (EECBG) Program that provides USD 3.2 billion of federal grants to EE programs for local governments and states. The program is managed by the Office of Energy Efficiency and Renewable

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¹ World Bank Database, US = 5.5 billion of tonnes of CO2 vs. China = 7.0 billion (2008 figures).
⁶ EO 13423 requires federal agencies to reduce energy intensity by 3% per annum up to 2015 compared to 2003 baseline.
⁸ The EISA 2007 also ratified the EO 13423.
⁹ Such as the American Clean Energy Security Act of 2009 that set a 5% EE target by 2020. Although it did not become law, it is used as guidance for state EE incentives / targets.
Metrus Energy

Energy (EERE) of the DOE\(^{10}\) and funded through the ARRA.

- State Energy Program (SEP) with a budget of USD3.1 billion in grants, mainly targets state and local government buildings and domestic consumers.

Other key national initiatives include:

- The National Action Plan for Energy Efficiency (NAPEE), a private-public initiative that was released by the DOE and the EPA in 2008 and that includes a vision for 2025 targeting a reduction of energy demand by 50\%\(^{11}\).

- The State and Local Energy Efficiency Action Network (SEE Action) is an initiative led by the federal government to facilitate state and local EE projects / programs. The Industrial Energy Efficiency and Combined Heat and Power Working Group within the SEE Action has set a target of 2.5\% average annual reduction in industrial energy intensity by 2020\(^{12}\).

The majority of these policies and programs focus on residential and commercial sector type of projects but could nonetheless encompass industrial processes (e.g. industrial building refurbishment, HVAC\(^{13}\) improvement). The industry sector, especially large enterprises, mainly relies on economically viable private initiatives such as Energy Service Companies (ESCOs)\(^{14}\), with some support from state government policies such as:

- Industrial Assessment Centers (IAC) created by the DOE around the US that provide free EE audits to small- and medium-sized manufacturers.

- Energy Efficiency Resource Standard (EERS) that are mechanisms developed in 26 states\(^{15}\) under which annual EE targets are set for electricity and gas service providers (percentage reduction of energy use). Design and implementation details vary by state based on legislation (mandatory or voluntary) and state utility regulators (for example Vermont has an annual target of 2.5\% savings).

In 2010, states and utilities invested over USD 811 million in industrial EE programs out of nationwide spending of USD 1.1 billion. It is estimated that the ARRA funding accounted for 20\% of the total (USD 228 million)\(^{16}\).

**Barriers**

Key barriers to the development of large-scale industrial EE programs in the US include:

1. Access to funding allowing project finance / off-balance sheet procurement\(^ {17}\)

2. Knowledge of which technologies, products, solutions are available and key partners that could provide them — this is especially relevant to complex EE projects in the industry sector

3. Industrial players often undervaluing efficiency as a resource

4. Lack of clear legislation / policy obligations supporting EE programs (see below)

5. Public awareness and competitors (dash-for-green / CSR effect)\(^{18}\)

Also, renewable energy (RE) and EE policies and incentives are often combined in US legislation making specific EE targets unclear and difficult to monitor. Targets are often set as investment amounts to be spent without a clear link to energy savings. Finally, the proliferation of legislation at different levels (federal, state and local), including the recently failed legislative initiatives, do not help to clarify best practices, methodologies and means for exploiting EE opportunities.

**Financial Mechanism**

**Objectives**

Metrus Energy’s key objective is to promote, finance and develop EE retrofit projects through provision of a procurement vehicle (partners, expertise) and funding (equity and debt) to commercial and industrial customers that can then finance EE projects off-balance sheet and effectively invest in energy savings below their energy costs.

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\(^{10}\) US DOE, EERE Network News, March 2009.


\(^{12}\) SEE Action website (www.eere.energy.gov).

\(^{13}\) Heating, Ventilation and Air Conditioning.

\(^{14}\) The ESCO market for EE projects and services exceeded USD5.1 billion in 2011, of which 73\% were conducted for municipal, universities, schools and hospital (MUSH) market. The total market is expected to reach USD16 billion in sales by 2020 (Pike Research, 2012).

\(^{15}\) As at May 2011.

\(^{16}\) American Council for an Energy-Efficient Economy (ACEEE), Press release, April 2012.

\(^{17}\) Off-balance sheet financing had long been a standard financing mechanism for IEE, allowing ESCOs and other third parties to finance industrial EE at host sites without the financing being reported on the hosts’ balance sheets and thus affecting asset/liability ratios and borrowing capacity. The rationale, that the host paid only for energy savings and, in fact, had no contingent liability for the equipment financing, was swept away by Sarbanes–Oxley, the legislation passed to promote transparency in corporate finance in the wake of ENRON’s abuse of off-balance sheet financing to mislead investors and regulators.

\(^{18}\) Corporate Social Responsibility.
Metrus Energy works in partnership with ESCOs to design, construct, maintain and guarantee project performance. ESCO partners include Siemens, Johnson Controls, Ameresco and McKinstry.

Metrus Energy also invests its own capital as equity participation in projects and partners with third party debt providers to raise debt finance, including Citibank, Siemens Financial Services, and Bank of America.

Key targeted customers are from the private sector and include:

- Offices of big corporates / owner-occupiers (e.g. Fortune 500 companies)
- Industrial companies (e.g. manufacturing, food, energy intensive industries)
- Private higher education and health care (non tax exempt entities)
- Commercial real estate.

Typical contracting / ESCO partner expertise includes:

- Building automation and controls
- Lighting retrofits and controls
- Compressed air (leak detection & repair)
- Utility tariff rate optimization
- Heating, ventilation, and air conditioning (HVAC)
- Chiller replacement and system improvements
- Boiler replacement and system improvements
- Pumps, fans, motors, drives
- Cogeneration (onsite generation).

**Mechanism**
Metrus Energy signs an Efficiency Services Agreement (ESA) with clients, eliminating upfront investment cost barriers by using private sector finance and EE partners. The mechanism is described in the Figure 1 above.

The ESA contractual arrangement between Metrus Energy and its
Metrus Energy provides 100% financing using a mix of equity and debt. Credit enhancement products are used when available, and the creditworthiness of the customer is taken into account. Collateral is limited to the residual value of the installed equipment.

Projects are identified through Metrus Energy's own relationships and through its partners (e.g. ESCOs and contractors). Metrus Energy provides 100% of the funding requirement (own equity and private sector bank debt) and enters into an EPC / turn-key construction contract with ESCOs and/or contractors, which sign a long-term maintenance contract with the customer. ESCO / contractors guarantee the performance of the installation to the client and to Metrus Energy through an Efficiency Services Performance Contract (ESPC) agreement.

The equipment is owned by Metrus Energy. Metrus Energy is also typically responsible to pay for some of the maintenance costs based on the ESA signed with the client.

Process
A baseline is agreed at the beginning of the contract (base outdoor temperature, average energy consumption over the past years, current industrial process energy performance, etc.). Measurement and verification (M&V) are based on protocols such as the International Performance Measurement & Verification Protocol (IPMVP), which has been adopted by North America’s energy service companies as the industry standard approach to M&V.

The typical ESA duration is between 5 to 10 years (with periodic buy-out windows), during which the customer pays a service charge to Metrus Energy based on actual project performance and energy savings (typically below the standard utility rate originally paid by the client) that are quantified in a report prepared by Metrus Energy at the end of each billing period.

There are two methods of assessing actual performance / energy savings used:

1. Fixed savings: agreed energy savings approved prior to signing the contract. The savings are fixed for the duration of the contract and can be defined by engineering analysis (stipulated) or by measurement before and after installation (one-time measurement).

2. Ongoing monitoring: Energy savings are measured at each billing period based on actual performance and can vary over time.

Metrus Energy’s key process steps are set out in Figure 2 above.

Budget
Metrus Energy's funding objective is USD75 million by end of 2013 and has developed a pipeline to hit that target and beyond. Its targeted project size is above USD 750,000.

Achievements
Energy saving target is typically 20+%, but can vary widely based upon specific installation / building needs and opportunity. Typical pay-back period are between 3 and 7 years.

A typical case may be illustrated by the Energy Service Agreement signed in 2010 with BAE Systems, an UK aerospace and defense contractor. Metrus Energy and BAE implemented EE
measures at several BAE US facilities including equipment replacement, building automation, lighting retrofits, and operational improvements. The program produced the following outcome:

- **USD 200,000** in annual utility savings
- **1 M kWh** avoided
- **30 k therms of natural gas** avoided
- **400 tons of CO2** avoided
- Various non-energy savings (e.g. reduced maintenance expense).

**Lessons**

Metrus Energy is a young company (founded in 2009) but based on substantial work already carried out; the following lessons can be drawn:

- Knowledge diffusion is key as many opportunities to save energy are missed due to lack of access to the right technologies, partners or solutions required to address the full range of savings opportunities. Metrus Energy provides a combined financial and technical solution with performance guarantee on the equipment as a one-stop shop for EE solutions. Metrus Energy makes use of its partnership network (e.g., ESCOs) to access new customers.

- The lack of clarity in regulation, incentives and targets for EE programs / projects and the emphasis by policymakers on RE solutions (e.g., solar) undermines the realization of EE opportunities. Specific EE targets and regulation should be made clearer.

- Access to credit can be an issue especially with non-recourse finance and the limited collateral level. A strong network of expertise and lending partners help to get access to debt financing. Nevertheless, the smaller and lower credit quality customers struggle to get access to EE project financing. Some of the incentives at federal, state or local level could be used to provide guarantees or to raise the priority of payments for EE initiatives (e.g., PACE, OBR) in order to broaden the access to EE financing.

- The Metrus Efficiency Service Agreement allows hosts to pay for energy savings as an operating cost, without incurring any liability for equipment financing.

- Metrus Energy concept allows a sensible risk allocation among industrial clients, funders and installers and operators where each project participant is allocated the risk he is most suited to bear. The combination of ESCOs, ESPC and access to non-recourse debt financing allows the emergence of such a solution. In less developed markets, incremental supports may be required such as third-party guarantees and/or risk-sharing facilities.