Draft Report

"FTA for Enabling Readiness for Up Scaling Investments in Building Energy Efficiency for Achieving NDC Goals in Thailand"

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Report on Methodologies for Costing EE Technologies for New Buildings:

Introduction:

Energy Efficiency (EE) is a key for shifting country development paths toward lower-carbon economic growth. Specially in developing countries, there lies a vast potential for energy savings which remains unrealized even though current financial returns are strong.
Energy use and efficiency in buildings is generally characterized along end-use categories such as space heating, cooling, and lighting. EE in these end-use categories is generally determined by the design and construction (which includes the materials and components used) of a building and by the technical efficiency and operational management of a building's energy-consuming devices. Energy consumption is further influenced by variations in building function, climate, energy prices, billing methods, and occupant behaviour.

Barriers to Energy Efficiency

There are a number of barriers and challenges inherent in improving EE in buildings. Some barriers to greater EE are specific to certain stakeholder groups. For example, high transaction costs relative to returns and the perceived unreliability of repayment often deter commercial banks from financing building EE projects (ESMAP, 2014). Other barriers are sector-wide, such as energy subsidies and/or a widespread lack of data and information on EE opportunities, costs, and benefits. Addressing systemic problems such as these typically requires policy interventions and support at the national and regional level, although municipal governments can be influential in policy design and implementation (BPIE, 2010).

Financing Energy Efficiency for New Buildings

Newly constructed buildings represent the best opportunity and greatest potential for reducing heating, cooling, and lighting loads and introducing EE technologies that can pay for themselves over the course of their life cycle (BPIE, 2010).
Financing Energy Efficiency in buildings is still a major challenge. Despite the proven cost-effective opportunity to reduce energy consumption, a significant proportion of the energy efficiency improvement potential is not being realised. Several barriers and market failures inhibit energy efficiency improvements in buildings. Information failure, high subsidies, lack of technical expertise, uncertainty over savings, and externalities still characterise the energy efficiency market. In most cases, the so called "split incentive" discourages both building owners and building occupiers from investing in energy efficiency measures if direct benefits are not perceived.
Financial barriers are crucial in inhibiting investment in energy-efficient building refurbishment. Such barriers include, initial cost barrier, high transaction costs, long payback time, and risk exposure. Furthermore, traditional financing investment criteria do not apply to energy efficiency investments, lack of knowledge among finance providers of energy efficiency specificities prevents customers from accessing capital, and the absence of standardised measurement and verification practice further increases transaction costs. Due to the considerable impact of these financial barriers on the financing of energy-efficient building refurbishments, the paper focuses primarily on these barriers.

Broad Characterization of Financing EE Measures

Hierarchy

One way to make energy efficiency investments happen is through a "hierarchy" approach: the energy-using enterprise undertakes the investment project by itself, with staff members inside the enterprise providing the technical capacity and the enterprise using internal funds for financing. This

in-house solution is certainly common enough among large industrial enterprises in China, India, and Brazil. However, this solution alone continues to fall far short of meeting investment potential.

Market Based

Market-based exchanges (outsourcing arrangements) tend to be better at the specialized, one-off activity typical of energy efficiency investment. To improve market penetration and investment efficiency, therefore, governments, international organizations, and energy efficiency advocates and experts seek to devise new institutional mechanisms that can provide the needed increased specialization. These include a variety of schematically described solutions, depicting the various roles and implicit or explicit contractual relationships between different organizations that are collaborating to bring needed specialized resources/expertise and reduce transaction costs and perceived risks.

Tailor Made

The third element of the energy efficiency delivery model consists of the organizational (or "deal structuring") arrangements that must be tailored to the institutional environment within which the energy efficiency service transaction is to occur. These arrangements include such things as changing the budgeting rules facing agencies so that energy efficiency savings flow back to managers as incrementally spendable money. This seemingly simple incentive reiterates the extent to which these arrangements require specialized local knowledge. Other cases illustrate the extent to which institutions, incentives, and risk are closely related and require joint consideration of the impact of institutional arrangements upon both risk and incentives.

Various financing models adopted by both developed and developing countries to mainstream energy efficiency in new construction are

- Energy Performance Contracts
- Utility DSM programs
- Preferential Loans
- Funding from Multilateral Institutions
- Energy Efficiency Loan Financing and Loan guarantee scheme and
- Risk sharing models.

A detailed description of each model is presented in subsequent part of the report.

Energy Performance Contracts (EPC):

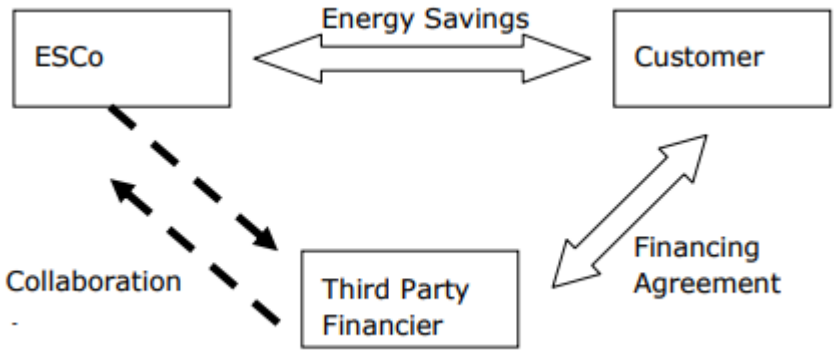
Energy Performance Contracting (EPC) is a financing model which allows to finance energy saving measures in buildings from the achieved cost reductions. Under an EPC arrangement an Energy Service Company (ESCO) implements energy measures, and uses the income from the cost savings to repay the costs of the project, including the costs of the investment. The ESCO guarantees the cost savings to the building owner in the contract and takes over the financial and technical risks of implementation and operation of the entire project (EESI 2020). Typically the ESCO services within an EPC are inclusive of financing, planning and installation of energy saving measures in a building. Operation and maintenance as well as training of the users are also often included in the process as well. EPC is a means to deliver infrastructure improvements especially to facilities whose owners lack investment capital, engineering skills, manpower or know-how to implement the measures themselves. Thus, EPC delivers an integrated energy improvement and management package from one qualified service company, allowing the clients to focus on their core business.

The core feature of EPC financing includes;

- Guaranteed saving on the energy saving measures,
- Financing by a third party, which is generally an ESCO.

Example of EPC Model in US:

In the United States the ESCO typically finances a new project for a time period of 7-10 years. The projects revolve around improving the energy efficiency in the buildings, maintaining the new systems (Graz Energy Agency Ltd). The project gets sanctioned through an EPC contract between an ESCO and the consumer and the energy savings are mostly guaranteed. The project is considered performance- based when the ESCOs is tied to the amount of energy saved and to the guaranty underlying the project.



Source: Comparison and Evaluation of Financing Options for Energy Performance Contracting Projects

Utility DSM Program

Demand-side management (DSM) programs consist of the planning, implementing, and monitoring activities of electric utilities which are designed to encourage consumers to modify their level and pattern of electricity usage. The primary objective of most DSM programs is to provide cost-effective energy and capacity resources to help defer the need for new sources of power, including generating facilities, power purchases, and transmission and distribution capacity additions.

Demand Side Management (DSM) programs uses financial incentives to slow demand growth on condition that the incremental cost needed is less than the cost of increasing supply. Such DSM measures provide an alternative to building power supply capacity. The type of financial incentives comprise of rebates (subsidies), tax exemptions, reduced interest loans, etc.. Under this scheme, greenhouse gas (GHG) emissions associated with the production of electricity are capped and electricity retailers are required to meet the target partially or entirely through energy efficiency activities.

Energy utilities are often considered as the best qualified to be involved in the design and implementation of DSM programs. They have ready access to detailed information about the energy consumption patterns of their customers that are needed in determining the most effective projects. Also, they have a direct link with their customers and are often seen by them as a reliable source of information on energy efficiency products and services

Example of Utility DSM Model in Australia

In 2004, the Ministerial Council on Energy of Australia endorsed the National Framework for Energy Efficiency (NFEE) which defines directions for energy efficiency policy and programs in Australia (MCE, 2004). NFEE includes regulatory measures such minimum energy performance standards (MEPS) for equipment, and minimum energy efficiency design standards for the building code. Other

measures are designed to develop awareness of general consumers by requiring audits for large energy consumers and disclosure of building energy performance. One of the most controversial measures discussed was the announcement of a complete phasing out of incandescent lamps by 2009. The first stage of the phase-out plan was the introduction of an import restriction on incandescent general lighting service (GLS) light bulbs used for general lighting purposes from 1 February 2009. This was followed by an expected retail sales ban from November 2009. From this date 2009, all light bulbs sold had to meet the new 3 minimum energy performance standards of 15 lumens per watt (lm/W) .

In Australia, energy labeling and MEPS are regulated by the states. However, relevant state legislation is based on a nationally endorsed "model regulation", developed through the National Appliance and Equipment Energy Efficiency Committee (NAEEEC). In 2005, new MEPS levels were negotiated with the industry and these levels are broadly harmonized with US 2001 MEPS levels.

Preferential Loans

Through a preferential loan, governments or private institutions establish advantageous interest rates to incite customers to adhere to a particular scheme. In most cases, preferential loans are built through public-private partnership where the government provides a fiscal incentive to the bank which in turn offers a preferential interest to its customers.

Example of Preferential Loan Model in France

Some private actors, following a marketing line for a greener image, started promoting reduced rate mortgages and loans for energy efficient buildings. In France the Banque Populaire d'Alsace Lorraine initiated a preferential loan scheme in 1992 called PREVair Eco-Habitat. With these loans, the bank voluntarily reduced its margins in an effort to promote the construction of eco-friendly homes and eco-friendly refurbishment of existing homes. 1 Although initially launched as a strictly private sector mechanism, PREVair soon evolved into a Public-Private Partnership for certain projects. The French energy efficiency and environment agency (ADEME) agreed in 2003 to subsidise part of the loans. Up until 1999 the PREVair used a double financing mechanism: ◎

- Loans were financed via an ethical savings account called CODEVAIR, which enabled small investors to invest in environmentally friendly projects on the understanding that rates of return would be slightly lower than for ethically unconstrained investments; ◎
- The bank made an additional contribution by reducing its margin to 2.75% (instead of 4% for regular 15- year loans granted by the banks: a reduction of 1.25%) .
- The money received from CODEVAIR allowed that interest rate to drop to 1.75%

Funding from Multilateral Institutions

Multilateral Development Banks (MDBs) and Development Finance Institutions (DFIs) play a catalytic role in bringing private investment into developing regions. Their goals are to help the private sector gain confidence and to lower capital costs via co-investment in climate projects in emerging markets. Financing through multi-lateral institutions can take the form of debt financing, equity funding or grants and guarantees. MDBs and DFIs have adopted several strategies, including:

- Making projects available and known to private developers
- Demonstrating successful models in new areas and high-risk projects through co-investing
- Providing guarantees and risk insurance to the private sector in case of political instability, government insecurity, or other issues

- Creating new instruments that allow the aggregation of smaller climate projects in order to attract large institutional investors
- Acting as financial intermediaries to help commercial banks increase lending through concessional finance structure, risk sharing, credit enhancement, and due diligence

Example of Funding from Multilateral Instituions in Bangaldesh

The impact of multilateral funding can be seen in the case of the Multilateral Investment Guarantee Agency (MIGA), which is a member of the World Bank Group. MIGA's mandate is to promote developmentally sustainable foreign direct investment into its developing member countries. It does this by providing political risk insurance (guarantees) against certain non-commercial risks to cross-border investments, as well as by providing dispute resolution services for guaranteed investments.

In Bangladesh, MIGA is backing a financing package arranged by HSBC of the United Kingdom to Ashuganj Power Station Company Limited (APSCL), a state-owned utility. The financing is for the construction of the 450-megawatt combined-cycle gas-fired Ashuganj South power plant, which is expected to provide nearly 12,000 households with electricity. The Ministry of Finance of Bangladesh has provided an unconditional sovereign guarantee covering debt obligations of APSCL under its loan agreement with HSBC.

Other multi-lateral agencies include World Bank, African Development Bank, Asian Development Bank, European Investment Bank, EBRD, Inter-American Development Bank.

Loan Financing and Loan guarantee

Loans are another possible financial solution. The principal motivation for a lender is to earn a return on financial capital. They do so by advancing the money to a borrower, under conditions which ensure the return of the capital at, or by, the end of the loan. Lending money to governments or banks is associated with near-zero risk of loss of capital, but provides the lowest returns. As such, lenders require information about borrowers' income capacity before making the loan. Lending on an unsecured asset involves greater risks, and lenders will require higher interest rates.

Government or private parties can provide full or partial loan guarantees on owner default, reducing risk of financing commercial energy savings performance contracts. Lending money to individuals and firms carries a more significant risk and therefore lenders will require a higher rate of interest and possibly other collateral security in order to provide the loan. The uncertainties surrounding energy savings projections do not allow investors to project incoming cash-flows. As such, they do not factor in the increased credit capacity of consumers.

Risk Finance

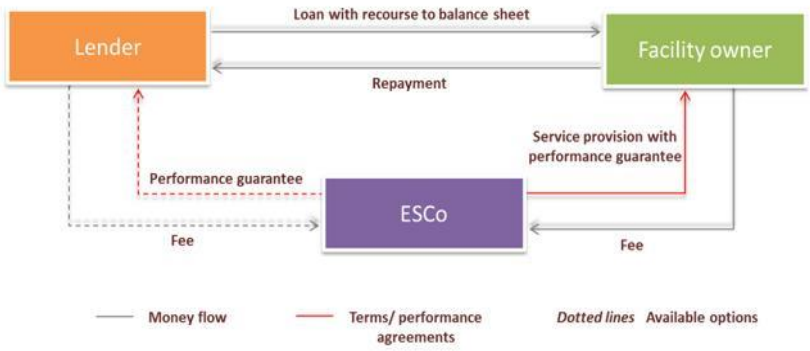
Risk sharing models, by contrast to debt financing, relies on a project's cash flow expectations. The principle behind project financing is to spread the risk between the different actors. A typical project finance structure includes a wide array of contracts between the different actors that transfers the risk. It is often structured in a way which prevents any sponsors from bearing the entire risk alone. If structured properly, the risk-sharing feature allows the project sponsors to avoid listing the project on any of their corporate balance sheets.

Key types include political risk guarantees covering specifically defined sovereign or political risks, mezzanine finance allowing the conversion of debt to equity on performing loans, securitization of loans to help scale up financing, and energy service companies (ESCOs) as a vehicle for risk aggregation in relation to energy efficiency. The following are a few examples of such models.

Guaranteed saving model:

A performance guarantee by the project implementing ESCo provides some risk sharing benefits to the facility owner. Credit worthiness of the owner is still required since the lender deals with the owner directly.

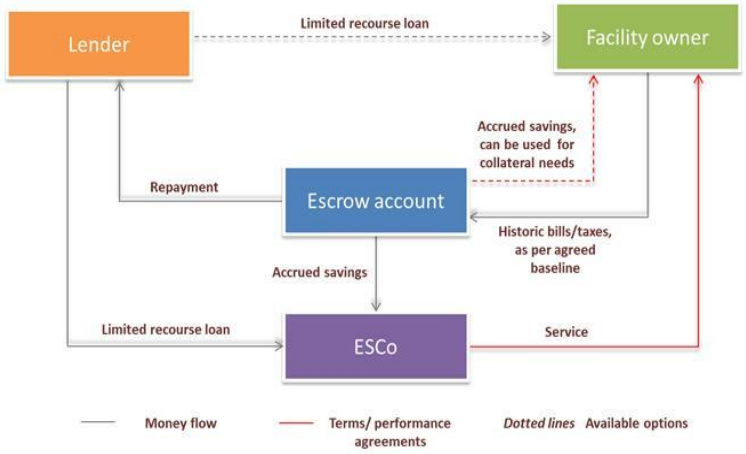
Figure 1: Guaranteed saving model



Source: *CERTs, 2012)*

Shared saving model: ESCo invests and assumes higher risk than the facility owner. This type of model is implemented where the credit worthiness of the facility owner is an issue. The owner pays up all accrued saving into an escrow account and all repayments of finance are channelled through it.

Figure 2: Shared saving model



Example of Risk Finance in India:

Certain risk sharing models can be implemented and promoted by the government as well. In June 2008 the Government of India announced its National Action Plan on Climate Change (NAPCC), which includes a Mission on Enhanced Energy Efficiency (NMEEE). One of the key elements of the NMEEE aimed at industry is the establishment of a Framework for Energy Efficient Economic Development (FEEED), which mainly focuses on developing fiscal and investment guarantee instruments to promote energy efficiency. FEEED includes a Partial Risk Guarantee Fund (PRGF) which is a risk-sharing mechanism that provides commercial banks with partial coverage of risk exposure against loans issued for energy efficiency projects.

The PGRF is a risk-sharing mechanism which lowers the risk to the lender by substituting a portion of the risk of the borrower by providing guarantees. Guarantees provided are a maximum of 50% of the loan amount or INR 300 lakhs, whoever is less.

In the case there is a default, PGRF will

- Cover the first loss up to 10% of the total guaranteed amount
- Cover the remaining default amount on equal footing basis up to the maximum guaranteed amount
- PFI shall take guarantee from the PRGFEE before disbursement of loan to the borrower.

Projects that are eligible include those that will achieve a demonstrable energy savings and mitigation in emissions of greenhouse gases; have a method for monitoring and verification of emissions and savings; be a new project; uses viable technology developed with competent energy audit/feasibility studies; implemented by BEE empanelled ESCO on performance contracting mode and; complies with environmental, health and safety standards.

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TERI has a Sustainable Building (SB) Group which has vast experience in the building sector for providing green design assistance to design teams at conceptual stage of projects. CRSBS offer services for enhancing the design of buildings and selection of climate responsive building materials. These interventions optimize the building systems through resource efficiency and reduced operational costs, ultimately improving the environmental footprint of the building. SB group of TERI also conducts building energy audits and recommends retrofit measures for improvement of energy efficiency in existing buildings. TERI has also helped develop an indigenous rating for green buildings called GRIHA, (Green Rating for Integrated Habitat Assessment), which has been adopted by the Ministry of New and Renewable Energy, and supported as a national rating system for India. This rating covers new constructions, large developments and existing buildings. Over the years, SB has contributed to formulation of enabling policies, norms and standards, and providing technical support for implementation of the various codes and standards at the national and sub national levels. Presently, TERI is supporting a number of State governments in the implementation of Energy Conservation Building Code (ECBC) through handholding and amendments in their building bye laws.

Apart from consultancy SB also conducts regular training programs for green buildings, energy conservation & energy efficiency, and sustainable habitats.SB has a dedicated team of professionals from varied backgrounds such as architecture, electrical and mechanical engineering, environmental & energy. It has pan India presence with established offices at Delhi, Mumbai and Bangalore.

The Energy and Resources Institute
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