FINANCING & MANAGING ENERGY EFFICIENCYA KEY TO ENERGY SECURITY

Mr.Ujval R Sonone
Senior Executive-Design, Crompton Greaves Ltd
Ambad, Nashik,India

Dr Praveena S Muley
Professor
MGV's IMR,
Nashik.India

ABSTRACT

Energy is one of the major inputs for the economic development of any country. In case of the developing countries, the energy sector assumes a critical importance in view of the ever-increasing energy needs requiring huge investments to meet them. The need to provide adequate, sustainable, and environmentally sound supplies of energy to fuel global economic growth has created an imperative for increased energy efficiency measures. Sustainable economic development which is an objective shared by developed and developing countries alike, although the urgency is particularly great in the developing world, where large populations do not have access to modern energy services such as electricity and instead rely on traditional and often unsustainable energy sources such as fuel wood. Demand for global energy services to support economic growth has grown by 50 percent since 1980 and is expected to grow another 50 percent by 2030.This paper will demonstrate how Energy Efficiency measures through proper Financing modes can help in achieving Energy Security. At the end of paper, a case study is provided, which aptly shows,the importance and effectiveness of Energy Efficiency measures.

Keywords: Energy efficiency,Energy security,Energy efficiency project financing .

INTRODUCTION:

Energy is one of the major inputs for the economic development of any country. In the case of the developing countries, the energy sector assumes a critical importance in view of the ever-increasing energy needs requiring huge investments to meet them. The need to provide adequate, sustainable, and environmentally sound supplies of energy to fuel global economic growth has created an imperative for increased energy efficiency. A strategy that emphasizes energy efficiency is the most economically and environmentally sensible way of meeting the twin objectives of providing energy for sustainable development and avoiding dangerous interference in the climate system. Supplying energy for sustainable economic development is an objective shared by developed and developing countries alike, although the urgency is particularly great in the developing world, where large populations do not have access to modern energy services such as electricity and instead rely on traditional and often unsustainable energy sources such as fuel wood. Demand for global energy services to support economic growth has grown by 50 percent since 1980 and is expected to grow another 50 percent by 2030.

There are two options available to meet the increased demand for energy:

Supply more energy OR

Improve energy end-use and supply efficiencies.

Clearly, both approaches are needed. However, of the two, only energy efficiency can generate nearly immediate results with existing technology and proven policies and do so while generating strong financial returns that exceed those from investments in conventional energy supply. Simply increasing conventional energy supply is not a viable option because continued reliance on the predominant energy source, fossil fuel, exacerbates energy insecurity and raises serious environmental concerns, especially related to climate change. Deploying clean energy alternatives will be needed to meet global development and environmental objectives.

ENERGY EFFICIENCY MEANS:

Using advanced and state-of-the-art technologies to provide better quality energy services with less energy. Getting the most productivity from every unit of energy. Getting the desired energy services comfortable homes, profitable businesses, convenient transportation with less energy use, less air pollution, and lower total cost. Eliminating energy waste.

Using technology to easily reduce energy use without having to daily "remember" to do it yourself

Energy efficiency means getting more in columns A and B below for less in column C.

Column A	Column B	Column C
comfort	productivity	money
heating	affordability	pollution
quality	performance	energy
jobs	cooling	hassle
lighting	control	waste

Energy efficiency is a valuable resource that creates a win-win solution on multiple fronts.

One action = five major consumer and societal benefits. It saves consumers money, increases comfort, protects the environment, enhances the economy, and promotes national

security. When energy efficiency is combined with smart energy practices like turning off lights, TVs computers, and electronics, that you're not using all of the benefits above are compounded.

Why Energy Efficiency?

- India faces a peak power shortage of 13.6 % and energy shortage of 10.6%. To meet the existing shortage and also future demand installed capacity has to be raised to 8,00,000 MW by 2031-32.
- India has financial and natural resources constraints to add this capacity.
- India is also highly dependent on imported oil to meet the energy demand, which raises the question of energy security of the nation.
- Immense potential exists in industrial aspect of energy efficiency, particularly in the use of pumps, heating, ventilation and air conditioning and lighting areas.
- 'National Mission for Enhance Efficiency' has been adopted as one of the eight missions in National Action Plan on Climate Change, released by GoI in July 2008.
- India's potential energy efficiency market is estimated at more than US $3.1 billion!!!

(Source: World Bank)

Energy Efficiency Facts:

- One unit saved avoids 2.5 to 3 times of fresh capacity addition.
- Energy efficiency/conservation measures can reduce peak and average demand. Energy efficiency projects alone could create nearly 25,000 mw of capacity, and energy conservation projects could save 23 per cent of total generation .
- Investment in energy efficiency/energy conservation is highly cost effective. Can be achieved at less than Rs.1cr/MW

Doubling the rate of energy efficiency improvement would:

Allow the world to hold CO2 concentrations below 550 ppmv
Avoid $3.0 trillion worth of new generation
Save consumers $500 billion per year by 2030
Eliminate the same amount of energy supplied by 2,000 coal power plants
Return the globe to 2004 energy consumption levels
Drive business productivity improvements and new employment opportunities

Energy Conservation Potential in various sectors of Indian economy:

Sector	Potential %
Indian Economy as a whole	Up to 23%
Agriculture	Up to 30%
Industrial	Up to 25%
Transport	Up to 20%
Domestic and commercial	Up to 20%
Source: Planning Commission	

Areas to have substantial impact of EE:

- Electricity generation,transmission & distribution
- Industrial production and processes
- Mining
- Pumping water
- Transport equipment,mass transport
- Building design,construction, heating ventilation and air conditioning, lighting
- Household appliances

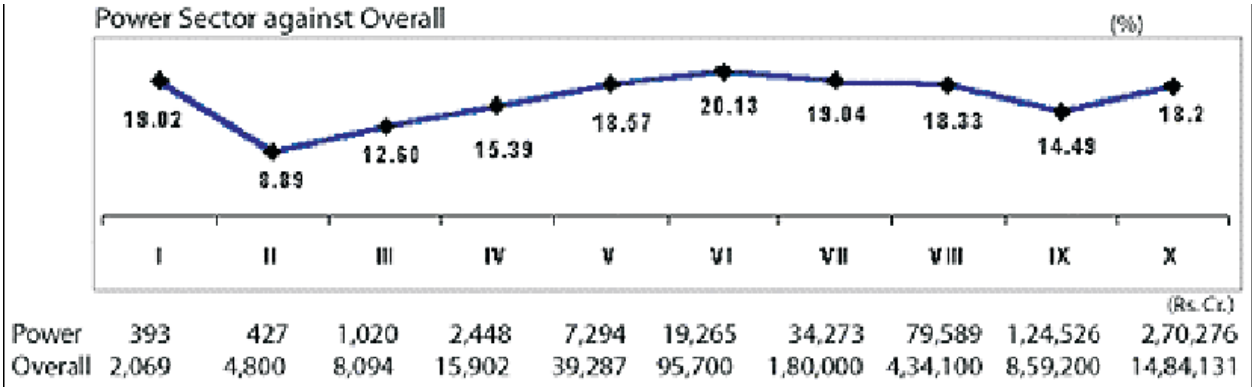
Energy Saving Potential in Industries:

Lighting	75%
Efficient Pump-sets	30%
Pulp & Paper	25%
Textiles	25%
Sugar	20%
Glass / Ceramics	20%
Fertiliser	15%
Petrochemicals	15%
Cement	15%
Iron & Steel	10%
Aluminium	10%
Refineries	10%

Source: ADB

India's Energy Needs:

The plan outlay vis-à-vis share of energy is given in below figure. As seen from the figure, 18.0% of the total five-year plan outlay is spent on the energy sector.



Energy Security:

The basic aim of energy security for a nation is to reduce its dependency on the imported energy Sources for its economic growth. India will continue to experience an energy supply shortfall throughout the forecast period. This gap has widened since 1985, when the country became a net importer of coal. India has been unable to raise its oil production substantially in the 1990s. Rising oil demand of close to 10 percent per year has led to sizable oil import bills. In addition, the government subsidises refined oil product prices, thus compounding the overall monetary loss to the government. Imports of oil and coal have been increasing at rates of 7% and 16% per annum respectively during the period 1991-99. The dependence on energy imports is projected to increase in the future. Estimates indicate that oil imports will meet 75% of total oil consumption requirements and coal imports will meet 22% of total coal consumption requirements in 2006. The imports of gas and LNG (liquefied natural gas) are likely to increase in the coming years. This energy import dependence implies vulnerability to external price shocks and supply fluctuations, which threaten the energy security of the country. Increasing dependence on oil imports means reliance on imports from the Middle East, a region susceptible to disturbances and consequent disruptions of oil supplies. This calls for diversification of sources of oil imports. The need to deal with oil price fluctuations also necessitates measures to be taken to reduce the oil dependence of the economy, possibly through fiscal measures to reduce demand, and by developing alternatives to oil, such as natural gas and renewable energy.
Some of the strategies that can be used to meet future challenges to their energy security are :

Building stockpiles
Diversification of energy supply sources
Increased capacity of fuel switching
Demand restraint,
Development of renewable energy sources.
Energy efficiency

Although all these options are feasible, their implementation will take time. Also, for countries like India, reliance on stockpiles would tend to be slow because of resource constraints. Besides, the market is not sophisticated enough or the monitoring agencies experienced enough to predict the supply situation in time to take necessary action. Insufficient storage capacity is another cause for worry and needs to be augmented, if India has to increase its energy stock pile. However, out of all these options, the simplest and the most easily attainable is reducing demand through persistent energy conservation and energy efficiency efforts.

Financial Mechanisms to facilitate energy efficiency investments:

There are a wide range of financial and economic mechanisms or instruments that may be implemented to facilitate investment in energy efficiency projects as listed in below table. These mechanisms have an impact on investment decisions or on an entity's ability to invest by helping to reduce the overall costs of the energy efficiency investment (easing the decision to invest) or by facilitating financing of the investment (reducing barriers to and costs of commercial financing).

Types of financial mechanisms

Type of financial Mechanism	Example/Type
A) Tax Policy	1) Taxes
	2)Tax incentives
B) Subsidies	1) Subsidies (Non-Tax)
C) Lending Programs	1) Bank Loans
	2) Soft Loans / Revolving Funds
	3) Guarantee Funds
	4) Energy Efficiency "Bank Windows"
D) ESCOs (Energy Service Companies)	1) Guaranteed Savings
	2) Shared Savings
	3) Pay from Savings
	4) Other

The range of financing programs and mechanisms available in India have included technical assistance and pilot programs implemented by donors and multilateral banks, lending schemes implemented by commercial banks and public institutions, and government-backed market interventions. Below provides an overview of financing options that have either been implemented in the recent past or are currently available in India for financing EE projects. These schemes include donor and multilateral financing, commercial bank lending, and government supported and public-sector finance.

Brief description and availability of various EE financing projects and schemes:

DONOR AND MULTILATERAL FINANCING			
Agency	Financing project or Mechanism	Sector or purpose	Comments
World Bank	Second Renewable Energy Project	For EE and renewable energy	Completed
ADB	Industrial Energy	Efficiency Project Industrial EE	Completed

COMMERCIAL BANK LENDING			
Agency	Financing project or Mechanism	Sector or purpose	Comments
World Bank loan through ICICI Bank	USD 5 million, 7 to 9% annual interest, 3 to 5 year terms	EE for industry	Completed
YES Bank	USD 10 million, 3 year terms, normal interest rate	Industry, commercial, agriculture, and SMEs	Completed
State Bank of India	5 to 7 years term, normal interest rate	For all sectors	Loans available, subject to Bank's norms
IREDA	Line of credit	For all sectors that meet set criteria	World Bank line of credit completed, regular financing available
ECO housing finance	0.5 to 1.5% interest rebate for housing that meets criteria	Housing sector in Pune and Mumbai	Recently initiated
GOVERNMENT-SUPPORTED AND PUBLIC-SECTOR FINANCE			
Agency	Financing project or Mechanism	Sector or purpose	Comments
Urban development funds	At conventional rates of interest	For municipal sector, street lighting, water works	Beginning made with ESCOs in two states
State energy conservation funds	Preliminary stage of development.	Sectors to be identified	Some international donors active

A few commercial EE financing mechanisms have been recently implemented in India. The first bank to launch such an initiative was the State Bank of India under the Project Uptech, and this was soon followed by lending facilities at Canara Bank and Union Bank of India in 2004. The Board of Directors of the Bank of India and the Bank of Baroda approved their respective EE schemes in 2006.Two private sector banks, ICICI Bank and Yes Bank, have also undertaken initiatives to finance EE projects. It is important to note that most of the commercial EE financing schemes available in India have concluded or are close to being concluded. In general, banks have decided to roll EE projects into their overall portfolio and use general lending criteria and requirements to evaluate EE projects. Comparison among EE schemes offered by key commercial banks is given in below table.

Comparison among EE schemes offered by key commercial banks:

Description	ICICI Bank	State Bank of India	Yes Bank	IREDA
Sectors financed	Commercial, Industrial, SME, Public	Industrial, SME	Commercial, Industrial, SME, Agriculture	Commercial, Industrial, SME, Agriculture

Technology financed	EE Service, industrial EE equipment (boilers, waste heat recovery), lighting	Industrial cogeneration	Industrial EE equipment (cogeneration, boilers, waste heat recovery)	DSM (installation of capacitor banks),17 industrial EE equipment in sugar and cement mills, waste heat recovery
Lending to new customers	Yes	No	Case By Case	Yes
Term of loan	3 to 5 years	5 to 7 years	3 years	6 to 10 years
Interest rates	7 to 9%	Commercial	Not Applicable	10 to 12%
Penalties and rebates	Yes	Yes	Not Applicable	Yes
Collateral requirements	Depends on type of project, risk, etc.	Existing lien through working capital engagement	Assets or Guarantees	Extension of charge on the assets provided as security for the existing advance, including the extension of grantee cover where available

ESCOs: The need of the hour for Energy Efficiency in India:

An ESCO is a company that provides integrated energy services to its customers (mainly large energy users, but also utilities), which may include implementing energy-efficiency improvement projects, on a turnkey basis. An ESCO provides performance and savings guarantees, and its remuneration is directly tied to the energy savings achieved. An ESCO ensures that savings are achieved through its projects because they are focussed on and motivated to ensure large savings that can be sustained. Since energy efficiency improvement is their primary business, projects are more likely to be implemented than through in-house teams where such activity is a secondary or even a tertiary responsibility. There are some barriers to the growth of ESCOs in India, but these can be overcome. ESCOs can help Indian industry become cost competitive in the global marketplace.

What is an ESCO?

Energy Services Companies (ESCOs) originated in France before the Second World War when engineers evolved this mechanism as a means to providing expert services to reduce heating bills of property owners and occupiers that could be paid from savings. The concept moved from Europe to the USA in the 1970s. Thanks to the pressure from Regulators who demanded that Electric Utilities adopt Demand Side Management and undertake Integrated Resource Planning before sanctioning the costs of new power plants as part of the electricity rates, ESCOs became popular. Many Utilities themselves

established or took over ESCOs and this business model became quite successful after an initial period of evolution. A recent estimate of the US ESCO market is US$ 6 billion (mainly under the US Federal Government sponsored Federal Energy Management Program (FEMP)). There are over 100 active ESCOs in that country. From the USA the concept has travelled to many countries and there is a great interest in ESCOs in emerging market countries. An ESCO designs, implements and finances energy efficiency and energy conservation projects on behalf of its customers on a guaranteed performance basis. The project design is such that the savings will usually be large enough to service the debt assumed to implement the measures and leave a surplus that is shared between the customer and the ESCO. An ESCO risks its payments on the performance of the measures implemented and the equipment installed. Because the payments to an ESCO are contingent upon the magnitude of the actual savings, ESCOs are often called Performance Contractors. Some ESCOs may even finance projects, recovering their investment from the resulting savings. In other words an ESCO is a single-window solution to all aspects of energy efficiency improvement.

A typical ESCO project includes the following elements:
Investment grade energy audit;
Identification of possible energy saving and efficiency improving actions;
Comprehensive engineering and project design and specifications;
Guarantee of the results by proper contract clauses
Code compliance verification and guarantee;
Procurement and installation of equipment;
Project management and commissioning;
Facility and equipment operation & maintenance for the contract period;
Monitoring and verifications of the savings results; and
Project financing.

While the ESCO will ensure all the above actions, the ESCO may not necessarily conduct all the work itself. Some work can be and is subcontracted; however, the ESCO has to ensure project implementation and be responsible for the result.

How to finance ESCO Projects:
A number of financing options are available for Energy Performance Contract Projects.
These include:
Bank Financing
Direct Customer Financing
Public Financing (bonds)
ESCO or third party financing

Benefits of using an ESCO's services to customer:

A customer derives a number of benefits through engaging an ESCO. Benefits of using ESCO include:
1) The customer does not need to commit its own human and financial resources into non-core activities like energy efficiency improvement.
2) High probability of reduction in energy costs because the ESCO's remuneration is contingent upon savings being actually achieved and measured.
3) The ESCO service fee is paid from the savings achieved, so there is no burden on existing cash flows, in fact there is usually a net positive cash flow throughout the relationship with the ESCO.
4) The customer benefits from the latest energy efficiency expertise and technology

5) The ESCO can arrange financing for the project
6)The ESCO can arrange grant financing, potential subsidies and other public investment incentives as carbon credits.
7)Most importantly, energy savings can begin to affect the company's profitability rather than remain as a project in some engineer's pending folder.

Making ESCOs popular in India:
ESCOs in India face a number of surmountable barriers that need to be worked on. Most of the barriers will fall with the lapse of time as the market becomes more familiar with the business, but some do need action by large organisation or the Government.
The concept is new and not widely known. Many customers find the model too good to be true, and believing that there is some "catch" in it, do not risk engaging an ESCO to help them.
Customers are reluctant to sign a long-term contract, which unfortunately has to be a long document to cover all the eventualities that might arise during the association of the customer with the ESCO. Successful cases of ESCO-Client projects will help customers to surmount their fears about such relationships.
There are too few ESCOs in India. This is largely because there are very few persons who have the technical, financial and contracting knowledge to be able to deliver a good service.
Most ESCOs are small companies with limited geographical reach who cannot meet the most common demand that they invest in the projects promoted by them.
Customers often want the contractual guarantees to be backed up by Bank Guarantees. This places an enormous demand for capital to be locked up to provide the collateral to be placed with banks that will extend the guarantee. This could be overcome by the creation of Guarantee Funds by a suitable Government agency or a large bank, insurance company or a financial institution.
As mentioned earlier, perhaps the greatest barrier to energy efficiency improvement in India is that this is still considered to be the engineer's domain. Getting CEOs and CFOs interested in energy efficiency improvement will certainly give a fillip to ESCOs.
Following case-study is one of successful energy efficiency projects carried out in India. It was carried out in collaboration with an ESCO to save energy through performance contracting. This example will highlight common trends in the Indian ESCO industry.

CASE STUDY:
LILAVATI HOSPITAL PROJECT THROUGH AN ESCO SUDNYA IND. SERVICES

Company Details:
Lilavati Hospital is one of the largest multispecialty hospitals in India,with state-of-the-art medical and research facilities. The building houses several energy intensiveactivities, like laundry and sterilization. The central air-conditioning system was the biggest consumer of electricity, accounting for more than 60 percent of the hospital's energy usage.

Project Details:
The impetus for the project came from the hospital's senior managers, who were eager to implement energy-efficient measures to reduce energy costs and optimize their central air-conditioning and building services. The vice president of operations, Mr. Prakash Mhatre, introduced the ESCO, Sudnya Industrial Services, to the management. The hospital conducted a survey of its utilities and an energy audit of its facilities and then asked Sudnya to help provide turnkey solutions for energy savings through a pilot project,linking the remuneration to Sudnya to the savings achieved.Sudnya analyzed the data from the

past three years, including energy consumption, oil temperature, water pressure, and condensation. It determined that the air-conditioning system could be upgraded quickly and effectively and provided demonstrable results, thereby making it suitable for a pilot project. Sudnya held a seminar for the plant operators and engineers at the hospital, at which they discussed available options and the advantages of the proposed solution. The ESCO then developed an energy-saving program and solicited and evaluated proposals for the equipment, remaining involved throughout the implementation process. The ESCO was able to ease the hospital management's initial concerns and to guarantee the savings. Lilavati Hospital financed the entire project, which cost approximately INR 6 lakhs (USD 12,000) and used this figure to determine the amount of the guarantee

Action Taken:
Because the hospital requires air-conditioning twenty-four hours a day, two variable-frequency drives were installed on the pumps to ensure continuous operation. The staff was trained in operating the equipment, and the hospital reports that the pumps are now more efficient, quieter, and less prone to breakdowns.

Measurement and Verification:
Sudnya worked with the staff at Lilavati to establish a baseline and developed robust measurement and verification (M&V) protocols to avoid any disputes.The company monitored the pumps every hour for more than three months, establishing baselines and fine-tuning the operating parameters. After the pumps were installed, the ESCO rigorously monitored their performance, which met the client's requirements.

Results:
Lilavati Hospital has realized energy savings of 20 to 40 percent and cost savings of approximately INR 8.5 lakhs (USD 17,000) annually, and over a three-year period, this resulted in energy savings of 618,210 kWh and cost savings of more than INR 26 lakhs (USD 49,000).58 Table 5 is a cash flow analysis of the project, showing the payback during the first year and a net cash flow of 1.7 lakhs (USD 3,400) at the end of the first year.

Year	0	1	2	3	4	5	6	7	8	9	10
Inflow											
Energy cost savings		0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Outflow											
Initial cost	0.6										
Less depreciation		0.60									
Net income		0.25	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Tax (30.5%)		0.08	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
Cash inflow after tax	-0.6	0.17	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59
Cumulative cash flow		**0.17**	**0.76**	**1.36**	**1.95**	**2.54**	**3.13**	**3.72**	**4.31**	**4.90**	**5.49**

CASH FLOW ANALYSIS (INR MILLION), LILAVATI HOSPITAL PROJECT:

Those factors regarded as crucial to the project's success were the commitment of the hospital's senior management and the strong M&V protocol, which helped avoid disputes.Lilavati Hospital is extremely satisfied with the ESCO's performance and is currently in the second phase of implementing more energy-efficient activities.

Cost-Benefit Analysis, Lilavati Hospital Project:

Investment: INR 6 lakhs (USD 12,000)

Annual Savings: INR 8.5 lakhs (USD 17,000)

Payback: Nine months

RECOMMENDATIONS:

The paper concludes with a set of recommendations for improving the investment climate for EE. Establish systematic data collection mechanisms. There is a lack of good data on EE potential, investments, energy savings, and details of loan performance parameters. This lack of data poses a significant hurdle to scaling up EE investments and designing new investment products. Data collection protocols and reporting frameworks need to be implemented at various levels, starting from the facility and utility level, up to the level of the state nodal agency, and finally at the national level through the agencies like BEE.

REFERENCES:

Financing Energy Efficiency in India, a report by USAID (United States Agency for International Development), November 2008

Improving Energy Efficiency in Industry in Asia- a Review of Financial Mechanisms, a report by United Nations Environment Program Division of Technology, Industry and Economics, June 2006 (Website : www.energyefficiencyasia.org)

Implementation of Energy Efficiency in SME clusters (Energy Conservation and Commercialization (ECO-III) Project) a report by USAID and BEE (Bureau of Energy Efficiency), February 2009

Bureau of Energy Efficiency (Website: www.bee-india.nic.in)

Encyclopedia of Energy - McGraw Hill Publication