

## Can ESCOs light the way in India?

*Dr Marianne Osterkorn, International Director of the renewable Energy and Energy Efficiency Partnership (REEEP), explains how energy services companies (ESCOs) could make a major impact in promoting more efficient use of energy in India.*

Streetlighting may seem like a strange place to begin a revolution in delivering energy in a more efficient and sustainable way. But in some ways, there is no better place to start. No one to my knowledge has ever calculated how many gigawatts of power are consumed every night by the lights that line literally millions of miles of streets and roads across the globe. Yet if such ubiquitous services could be delivered more efficiently, for example by installing energy efficient light bulbs, the energy savings would be enormous and immediate, and could remove the need for huge amounts of high-carbon emitting power generation. With mitigating the impact of climate change a priority, such quick, straightforward solutions are staring us in the face. It takes perhaps three years to get a wind farm from planning to operation; a light bulb can be changed tomorrow.

Acting on a global scale to make such savings is of course an impossibility, but given the right regulatory encouragement from the government, an innovative business model and necessary financial support changes can be made at a local level. If replicated around the world, it could light the way to some significant energy savings, not just in public lighting but also in a hundred different ways across the built environment, ranging from better window insulation to solar-powered traffic lights. In the Indian state of Madhya Pradesh, far-sighted local governments are doing just this with support from energy services companies (ESCOs).

Energy efficiency is the foundation of a successful sustainable energy policy. Generating and distributing energy is an expensive business and imposes significant costs on the environment. It makes no sense for expensive energy to be wasted in inefficient equipment and appliances. In fact, saving energy is almost always less expensive than generating it. It not only saves precious foreign currency reserves being spent on importing fossil fuels, but it has also been demonstrated that reducing the energy consumption by 1 MWh costs half of expanding the network (generation-transmission-distribution) by 1 MWh. Saving energy is always beneficial for the environment. Efficiency projects are low-risk and quickly implemented, when compared to energy supply projects. They are also highly distributed solutions. By reducing loads on stressed supply networks, including at peak load times, energy efficiency improves energy security and reliability. And contrary to popular opinion, energy does not mean doing with less. This is the case for streetlighting projects as the non-operational lights will then be replaced by new efficient lights and still huge amount of savings are achieved.

The remit of the Renewable Energy and Energy Efficiency Partnership (REEEP) is clear from its name. We have put our first efforts into promoting renewables, which are currently getting a lot of attention due to oil prices. However, it can take up to five years to get a new clean energy power plant live and generating green kilowatts. Supporting generation from waste, solar, wind and small hydro is a priority, but we also recognize the need to make an impact now. Energy efficiency can be implemented at once, with immediate impacts through reduced carbon emissions and operating costs. The importance and value of energy efficiency should not be underestimated. Energy efficiency is so important because it is so effective.

Energy conservation is critical to economics such as India and China which are undergoing very rapid growth, and whose energy consumption is predicted to grow exponentially. If energy efficiency measures can be undertaken to reduce the amount of energy that is required, there will be enormous potential benefits. Energy security will be improved by reducing expensive oil imports. There will also be gains in economic development, enabling investment to go into services other than energy production and delivery, and creating jobs with minimum investments. In environmental terms, greater energy savings means lower carbon emissions and less local pollution.

ESCOs now offer a means to deliver such savings by guaranteeing both energy savings and the provisions of the same level of energy services at a lower cost. The remuneration of the ESCO is directly tied to the energy savings it achieves.

For example, a large hospital may want to cut its electricity bill of \$10,000 a month, and approaches an ESCO to see what can be done. The ESCO will look at the hospital's infrastructure, lighting,

windows, ventilation, and air conditioning, hot water, etc, and set a baseline target for what the hospital's could be reduced to if energy saving measures and equipment are implemented. The ESCO will then offer a performance guarantee to cut consumption of electricity by say \$3,000 a month. The performance guarantee is a key element of the agreement. It can be based around the actual flow of energy savings from a project, in this case \$3,000.

ESCOs have to have to be able to secure finance for the improvements in facilities that deliver the energy savings. The performance guarantee is therefore set by the ESCO at a level that will be sufficient to repay monthly loan service costs and provide the ESCO with its own margin to cover costs and profit. For example, the ESCO and the hospital agrees that the project will require a total investment cost of \$72,000. The hospital in addition to its new reduced electricity bill of \$7,000, will repay the ESCO \$2,000 per month over three years. The hospital has saved \$1,000 a month on its expenses immediately, and after repayment of the total investment, say three years, will save \$3,000 monthly, the ESCO makes a profit, and electricity consumption is cut by \$3,000 a month through the new facilities. Once the loan is repaid, the hospital is left with only the low energy bill. The ESCO has to accept some degree of risk for the achievement of improved energy efficiency in a user's facility and their payment for the services delivered is based, either in whole or in part, on the achievement of those energy efficiency improvements.

As an international partnership focused on stimulating the marketplace for energy efficiency through successful policies, regulations and financial models, the REEEP is promoting ESCOs as a means to increase the implementation of energy efficiency systems. Our mandate is replication, achieved through the collaboration of governments, businesses and NGOs. Once we have identified a successful model that supports energy conservation, such as the ESCO, we seek to adapt and apply it across the world, particularly in developing countries. Currently the REEEP network, which acts as a clearing house for best practice, is implementing ESCO projects in Brazil, Mexico, South Africa, the Philippines, China and India.

It is in India that the ESCO model is being applied to deliver energy savings in streetlighting. Municipal streetlights represent a significant proportion of energy consumption in India, and the burden of the service falls on the electricity boards of each state. Streetlighting consumes energy during evening peak period, and in some municipalities the electricity use is not metered. This provides no incentive for municipalities to improve efficiency. Furthermore, utilities have to offer electricity for streetlighting at a cheap rate, resulting in financial losses which prevent them from making investment in more sustainable lighting systems.

In Madhya Pradesh, the REEEP is working with Econoler International of Canada, one of the first ESCOs in the World and a pioneer in the field of energy efficiency, on a project to support the development of a sustainable financing mechanism for the implementation of energy-efficient streetlighting projects in the cities of Bhopal, Gwalior and Jabalpur in the state of Madhya Pradesh Electricity State Electricity Board (MPSEB), its subsidiary, Central Discom, and local municipal corporations. It is estimated that streetlighting is consuming around 5 percent of the whole electricity consumption of the state, and REEEP believes that a 30-40 percent reduction in energy consumption for Streetlighting in Madhya Pradesh is a realistic target. To achieve this reduction, we aim to promote the engagement of national and local investors, financial institutions and capital markets in improving energy conservation and cost savings in streetlighting within the state.

"The project is replicating the innovative work already carried out in the cities of Indore and Ujjain by Econoler International working with the MPSEB," said vMr Hakim Zahar, Vice President of Econoler International. MPSEB recognized that streetlighting was one of the supply sectors in which it was losing money. Although there was some initial skepticism within MPSEB that anything could be done to rectify the situation, it decided to proceed because any savings that were achieved would result in a financial benefit. Econoler developed comprehensive demand-side management (DSM) modules to develop savings. These were then implemented in close cooperation with locals DSM Cells created by MPSEB, the municipalities and West DISCOM. The outsourcing of 100 percent of the project costs to an ESCO was among the elements that attracted both MPSEB and the municipalities.

Two technologies were tested under the DSM module. First was an energy-efficient fluorescent light tube with electronic ballast consuming 28 to 30 W to replace the existing tubes magnetic ballast consuming 48 to 52 W. Second was a load monitoring system offering a range of energy-efficient functions: power factor correction; voltage adjustment, especially during the peak time; automatic on/off switches fro the system of the system; and reduction by 10 percent of the lighting level during low circulation time, for example after midnight for some areas of the city.

The savings achieved with the two tested technologies are around 39 percent of the consumption of the whole streetlighting network of the cities of Indore and Ujjain. For Madhya Pradesh, the streetlighting peak load is around 35 MW with a total peak reduction estimated at 11 MW and an energy saving of 43.2 GWh.

Mr Zahar explained that the ESCO concept used for the streetlighting modules in Indore and Ujjain was a "shared saving" model. The cities keep 20 percent of the savings and will allocate the remaining 80 percent to reimburse the investment made by the ESCO over a period of up to 32 months. This pay-back period depends upon the wishes of the cities to upgrade and replace non-operational lights within the same project. The Indore municipality also replaced approximately 20 percent of its fixtures with a waterproof model. After the pay-back period, the municipalities will see their expenses for electricity consumption reduced by 39 percent. The municipalities are also saving on the spare parts for the upgraded part of the streetlighting, as these will be provided during the pay-back period as an integrated component of the ESCO contract.

We hope that the REEEP project can finalise the financial mechanism to support this type of ESCO project. The actual financial scheme included a 7 percent grant from the Canadian International Development Agency (CIDA) to support this initiative in addition to taking in charge all the fees of Econoler International for the whole project. For the replicated scheme in Bhopal, Gwalior and Jabalpur, this grant will be replaced by a Clean Development Mechanism (CDM) contribution. The two modules already implemented in Indore and Ujjain could also benefit from a substantial CDM contribution subject to agreement with the stakeholders. This could not be achieved for the initial modules due to lack of awareness of the CDM mechanism.

Gaining access to financial markets is a major barrier to ESCOs, even when some of the investments they propose would have payback periods as short as 18-24 months. They are considered risky because they are new. This is an area where REEP can be helpful, providing proven financial models under which ESCOs deliver increased energy efficiency. For example, ESCOs from developed countries could go into partnership with Indian ESCOs to undertake the capital investment and keep part of the benefit in return. REEEP is also aiming to establish investment funds with expertise in this area. In the short term, bundling projects such as are underway in streetlighting in Madhya Pradesh could also help make ESCOs more attractive to financiers.

If the financial model proves successful, the potential exists to further develop energy efficiency by introducing regulatory systems that encourage saving-by-design. For example, regulations could be put in place to stipulate that any extension of streetlighting projects include a revision of allocated budget to accommodate energy saving modules, and to encourage private sector participation by ESCOs.

A further advantage of ESCOs is that they work at the local, micro level and the model can easily be adapted to different environments where energy is used and savings are possible. It is hoped that the MPSEB will develop sufficient capacity in working with ESCOs to be able to launch other energy-saving projects in the future. An element of Econoler's project with the MPSEB involves installing energy saving water pumps to generate savings in electricity supply to the agricultural sector and LT waterworks pumps. The ESCO is replacing the inefficient pumps with new energy saving models. Hundreds of inefficient water pumps are currently at work in Indore and Ujjain.

The extension of ESCO projects to such areas bears out REEEP's belief that ESCOs can equally support social objectives, as they offer a mechanism to bring together communities, business and financial parties to make progress on social and environmental objectives. For example, elsewhere in India the REEEP is working to establish an ESCO to create a commercially viable market for solar photovoltaic technologies to serve the rural poor. There are many opportunities in the field of renewable energy provision in India that are currently being held back by a lack of funding and private money. By setting up ESCOs comprising local entrepreneurs, retailers and dealers, renewable products and services can be brought to areas where hitherto renewable technology barely made a mark. The potential of ESCOs to use demand-side management programs to involve previously disempowered peoples makes them an ideal economic vehicle for the promotion of energy efficiency services, enabling communities to enter into market that has hitherto been closed to them.

Currently the ESCO market in India is just beginning to gain momentum. A major challenge in the initial streetlighting project in 2003 was to attract existing and potential new ESCOs to work with the designed scheme, as there were hardly any assessed ESCOs operating in Madhya Pradesh. It was possible to find a way round this by getting other Indian ESCOs to establish representation in the state by creating "Energy centers" in Indore and Ujjain.

A further barrier to the development of ESCOs is lack of awareness of their potential among energy consumers; particularly municipalities, and commercial and industrial sector operators. These customers need third party support to explain the concept and enable them to fully understand the responsibilities and duties of the parties. It is essential that trust is built up between the parties involved, particularly the municipal governments, and that guarantees are kept to. The ESCO model could break down if any of the parties do not respect it.

The ESCO concept is a win-win concept and deserves to be publicized as widely as possible so that other municipalities and electricity boards in India can learn from it. To this end, the REEEP also intends to develop awareness and disseminate the success stories with Madhya Pradesh and across other states. The Principal Energy Secretary of Madhya Pradesh has already expressed willingness to expand it to larger scale program.

If the ESCO model could be replicated across every municipality in India, the savings could be very great indeed. The potential for replication elsewhere is clear. REEEP is currently considering a "city twinning initiative," pairing up municipalities both in the developed and developing world to replicate experience. The more projects are developed, the more experience can be built up and the easier it will be to obtain finance. REEEP believes that the most effective way of obtaining investment portfolios with profits shared among investors.

Energy efficiency implemented at a local level offers one of the most promising means to use energy sensibly and to limit the extent to which growing economies need to use more heavy-emitting fossil fuels, particularly for power generation. Unfortunately governments around the world have tended to focus on large-scale supply solutions, which have the momentum of powerful industrial players behind them and well-developed paths for project financing. Governments see energy supply projects as providing a large return for a relatively small input of effort on their part. Energy efficiency on the other hand, requires policies and programs that stimulate many smaller scale, distributed investments. However, these are more difficult to finance; they require that more players are involved, and they require different kinds of expertise to correctly target the investments – expertise that may or may not be available locally.

This means that globally there has tended to be little development of ESCOs, and REEEP is now endeavoring to redress this imbalance. REEEP will focus on identifying successful business models for ESCOs and replicate these as appropriate. ESCOs are able to harness private sector entrepreneurship to accelerate the uptake of energy efficiency measures. ESCO trade associations already exist in Korea, Japan, Brazil and Beijing which could work with REEEP projects to create a regional network to encourage ESCO development and energy efficiency projects.

The Indian streetlighting projects may be relatively small in scale compared to the total amount of energy consumed in India. But these are examples of how ESCOs, with the support of partnerships like REEEP and the skills of experienced international consultants like Econoler International, have the potential to make a very real difference. Through the continued development of ESCOs the REEEP believes it will be possible to bring more energy-efficient technology to the areas that need it most and provide the crucial financial support for this important mechanism to flourish.

For more information on REEEP's work with ESCOs go to [www.reeep.org](http://www.reeep.org) .  
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#### **Reference Book:**

[Indian National Science Academy](#)  
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