Municipal Water and Energy Efficiency Projects in India

Since the establishment of their partnerships with the Alliance to Save Energy, the Municipal Corporations of Pune and Indore have created functioning energy management teams. To date, these teams have focused upon addressing the need for comprehensive metering and monitoring policies. While Pune has experienced savings amounting to more than 300,000 kWh (Rs. 1.5 Million), Indore has demonstrated savings of over Rs 2 million per month through the implementation of efficiency measures at the Yaswant Sagar water pumping station and other municipal pumping facilities.

The Alliance to Save Energy has been active in India since 1996, supported by the US Agency for International Development (USAID), the US Asia Environmental Partnership (USAEP), the W. Alton Jones Foundation and the Honeywell Foundation. Since Alliance launched its Indian Sustainable Cities Initiatives in 1997 (see box), it has worked with the Pune, Ahmedabad and Indore municipal corporations, helping them to develop strategies to reduce energy consumption while improving the efficiency of their operations.

Sustainable Cities

Alliance launched its Indian Sustainable Cities Initiatives in 1997. Sustainable Cities municipal projects have centred around:

- developing capacity within the municipal corporations to create energy efficiency opportunities, improve quality of service, and reduce operating costs;
- mobilizing the industrial and NGO sectors to encourage adoption and promotion of energy and water efficiency projects; and
- creating pilot projects based upon public/private collaboration, that can serve as models for other municipalities interested in enacting energy efficiency measures within their everyday operations.

Municipalities and Energy

Municipalities globally dedicate a significant percentage of their budgets to providing water and street lighting services. In India, these two basic services often represent over 80 per cent of a municipality's total energy expenditures. The opportunities for savings are thus enormous.

The confederation of Indian Industry (CII) estimates that the typical Indian municipal water utility has the potential to improve water pumping system efficiency by 25 per cent. Since many municipal water utilities in India spend over 60 per cent of their budgets on energy for water pumping, the savings could be used to improve service. Similarly, street lighting often represents between 10 and 15 per cent of a typical Indian municipal budget. Pilot tests on various technologies in several Indian cities done through the Sustainable Cities programme indicate that energy savings of up to 40 per cent are both possible and highly cost effective.

Municipal officials are often aware that opportunities exist for making their water and lighting systems more efficient; however, for the most part they simply lack the means to take advantage of these opportunities.

Some of the most cost-effective opportunities identified include:

Water system efficiency opportunities:

- Leak reduction in water supply systems
- Pipe re-lining
- Capacitor installation
- Wastewater reclamation
- Installation and harmonization of high efficiency and variable speed pump drives.
- Development of public education programmes focusing upon wise water use.

Street Light opportunities:

- Load management systems (LMS)
- Timer Installation
- High-efficiency lamps

The Pune Partnership

As is common with most municipalities, the Pune Municipal Corporation (PMC) currently spends a large percentage of its annual budget on electricity to pump water. The financial and environmental costs of obtaining the required electricity and water continue to rise as water availability declines and demand increases.

The Potential for Energy Conservation

In the first phase of the Sustainable Cities Initiatives with PMC, Alliance helped in conducting an energy audit of select street lighting and pumping systems at one of Pune's three water intake stations – the Cantonment water works. The study showed that potential energy saving in excess of 20 per cent existed in the pumping facilities operated by PMC. Most recommendations provided by the audit forecast a payback period of less than three years, while some facilities did not require any investment at all, except involving modifications in maintenance and operations of the system. Additionally, the study demonstrated that energy savings of more than 30 per cent were possible in the city's street lighting and buildings.

From the recommendations of this initial study, PMC implemented certain measures to reduce energy consumption, including:

- Staggered operation of streetlights after midnight.
- Installation of timers- 80 per cent of streetlights will have timers shortly

Energy Savings Identified at Cantonment Waterworks

Results to Date

Under an ongoing programme, Alliance and the Pune Municipal Corporation (PMC) have established an Energy Management Cell (EMC) whose mission is to focus upon the implementation of energy monitoring and management systems. Initial results from this energy management effort are encouraging. Energy efficiency activities identified to this point in Pune total 4,230 MWh, with an average payback of 16 months and 4,319 tons of CO_2 avoided per year. Additionally, the Pune EMC discovered that during the year 2000, the local power supplier overcharged the municipality Rs. 2 million for electricity used to pump water at a water pumping station. PMC was charged an additional Rs 4.5 million for energy it never used.

Results in Indore

Alliance is partnership with the Indore Municipal Corporation (IMC) also led to the establishment of an EMC which would identify and implement energy efficiency activities. This cell has already launched a municipality –wide energy bill validation and monitoring protocol. According to existing legislation governing municipal corporations, and based on Alliance's recommendation, IMC made an allocation in its fiscal year budget for April 2001- March 2002 to cover some of EMC's expenses, giving it the financial resources to evaluate and implement energy efficiency projects. Based upon the Alliance initiatives, IMC has also opened a dialogue with a private Energy Service Company (ESCO) to evaluate and potentially install a street lighting load monitoring system (LMS) using state-of-the-art technology. Alliance provided technical assistance to IMC's energy management cell to evaluate site trials recently conducted at an Indore street light feeder facility using this LMS technology. These trials have already identified savings

opportunities of 40 per cent over the current level of energy that is being consumed by IMC for street lighting, which amounts to savings of 2 million kWh per year.

Energy Savings Identified at Contonment Waterworks

Area of Energy Savings	Energy Savings (kWhr/year)	Energy Savings (Rs/Year) @Rs 4.23/kWhr	Investment (Rs)	Simple Payback (Months)
Pumps in system not designed to work together				
Pump system No. 1	177,698	751,663	0.00	Immediate
Pump system No. 2	184,325	779,695	0.00	Immediate
Reducing pipe friction losses relining/coating at location A	745,300	3,152,619	5,780,000	22 months
Reducing pipe friction losses relining/coating, replacement of valves and pump modification	516,840	2,186,233.20	4,200,000	23 months
Overall Savings	**1,624,163**	**6,870,209**	**9,980,000**	**17 months**

Alliance has also been working with IMC to help it assess the energy savings opportunities at the Yashwant Sagar water pumping station. Initial energy bill validation exercises revealed over-billing by the state electricity company. Further studies revealed that the pumping machinery installed at the station, and the prevailing operations and maintenance methodology, have serious technical shortcomings, which resulted in very low energy efficiency and high electrical consumption per unit of water pumped (kWh/m^3). Alliance, in its ongoing support of exhaustive site trials, is assisting IMC to identify energy savings opportunities by making appropriate modifications in the pumping systems and machinery. While site trials have already been completed, detailed analysis is on. Initial analysis points to the possibility of energy savings of over 30 per cent within the existing system.

A Case for Capacity Building

While working with PMC and IMC to compile the data required to analyse efficiency opportunities, Alliance recognized that these municipal corporations lacked the institutional capacity to maximize management of their energy use. The municipal corporations did not have an adequate data collection and management system capable of demonstrating where and why energy was being used.

The lack of capacity to manage energy use at the municipal level has led to significant wastage of both energy and water, reducing the level of service and increasing costs.

Providing IMC and PMC with the expertise to manage energy, identify potential savings and implement efficiency actions, has already resulted in improved service and cost savings.

Alliance's efforts in this area are ongoing and include the following:

INTERFACE

- Assistance promoting the establishment of separate EMC within the municipal corporation to conceptualise, design, plan and implement energy efficiency projects and programmes based on periodic analysis of energy-use data;
- Creating, updating and monitoring a computerized database tracking electrical loads, energy consumption, and consumption patterns;
- Validating electricity bills by performing technical audits to verify the accuracy of the bills and where data still does not exist, checking accuracy by benchmarking the operating parameters;
- Staff training in various aspects of data management and energy efficiency.

Engaging the Private and Non-profit Sectors

Alliance also identified the potential for involving industries and NGOs in efforts to conserve energy and water. Both Indore and Pune have a strong base of companies that specialize in energy efficiency products and services that can play an important role in helping both the public and private sectors reduce energy use. There are also a number of local NGOs working to promote energy efficiency. In addition, Indore and Pune contain several industries that use large amounts of water and energy and thus are also candidates for implementing energy efficiency measures.

For example, as part of its efforts to mobilize Pune's energy efficiency industries and NGOs, Alliance has worked with the Council for Energy Efficiency Companies (CEEC), the Maharashtra Chamber of Commerce, and several ESCOs such as Honeywell, Simens, Thermax-EPS, Tata Infotech, Normex Valves, and others to establish partnerships to help PMC implement its energy efficiency plans.

Conclusion

The Alliance to Save Energy has helped PMC, IMC and their surrounding industrial sectors to better identify and address energy efficiency opportunities. With the development of EMCs, PMC and IMC are more knowledgeable of the role energy plays in their day-to-day operations. Key personnel are now more comfortable with the major energy using systems and technologies that could potentially improve efficiency. The NGO sector is increasingly involved in the efforts of the municipal corporations and the industrial base, promoting energy efficiency. Similarly, the industrial sector has become more aware of the public and private resources available locally to help improve energy efficiency.

More work needs to be done to both ensure the continued operation of these EMCs as well as to promote efficiency opportunities with the private sector. Alliance's work is ongoing, and the efficiency models developed in Pune and Indore will be used to demonstrate the benefits of water energy efficiency to a larger audience of Indian municipalities in the near future.

For more information or to receive a copy of a soon-to-be-released report on the Potential of Energy Efficiency in the Municipal Water Sector, please visit the website:

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Reference book:
The Bulletin on Energy Efficiency
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