Evaluation of

The Energy Conservation and Commercialization (ECO) and Energy Partnership Program (EPP) Activities

for

USAID/India

by

The Southeast Consortium for International Development Washington, D.C.

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Executive Summary

This report is the result of an evaluation of two activities, the *Energy Conservation and Commercialization* program (**ECO)** and *Energy Partnership Program* (**EPP**), which are directed by the Office of Environment, Energy and Enterprise of the U.S. Agency for International Development (USAID), New Delhi, India. Both programs were designed to provide technical assistance and training to improve the energy efficiency and electric power sectors in India. At the request of the Mission, this evaluation is biased towards future energy efficiency activities rather than dwelling heavily on past and current activities in order to draw on past experience and lessons learned as a guide for future activities.

Energy is essential for economic growth, and electricity is the advanced form of energy available to a wide range of consumers. Areas without continuous access to energy and electric power do not attract the investment essential for sustained economic growth.

Energy efficiency is defined as a procedure, technology or equipment that reduces energy consumption while maintaining the level of output available to consumers. The primary objective of the ECO project is the widespread commercialization of energy-efficient technologies and services within the context of India's electric power sector and industry. The EPP is designed to establish partnerships between Indian and U.S. utilities and regulatory bodies (1) to facilitate the exchange of technologies, practices, management techniques and operating performance standards and (2) to promote a more efficient, sustainable and environmentally sound supply of energy. The Evaluation Team met with the primary electric power and energy efficiency experts at India's government agencies, private sector firms, support contractors and NGOs to review the two programs. The aim of the Team was to forward an independent and unbiased evaluation of each project and provide suggestions and ideas to improve each program. This document provides the findings, covering the two programs' relevance, effectiveness, impact, sustainability and challenges for the future.

ENERGY CONSERVATION AND COMMERCIALIZATION (ECO)

A. Relevance and Effectiveness

Observing ECO's initial project objectives from the prospective of 2005, one must admit that its aims are still on target, valid—and highly ambitious. Given the current conditions of the energy sector in India in general, and the lack of human capacity in energy efficiency in particular, the original objectives still face major barriers. The ECO project spread resources over many diverse activities at the expense of depth and full achievement of select tasks. Personnel issues and cultural insensitivities, as well as an inappropriate contracting mechanism, exacerbated these difficulties. The unexpected delay in approving India's Energy Conservation Act of 2001 seriously threw off the project timetable, and the typical personnel changes at the management level of the Ministry of Power and the Bureau of Energy Efficiency

helped to create a nebulous environment that resulted in less-than-optimal accomplishment.

However, the administrative and contractual issues that troubled ECO I have been resolved in the design of ECO II. Moreover, the experience gained by the Mission through ECO has been extremely valuable. Not only has ECO increased the Mission's understanding of the potential for energy efficiency in India, but it has shed significant light on such matters as private sector operations, rural consumer concerns, operational issues within the Electricity Regulatory Commissions, and procedures for the electric distribution and transmission entities and their interaction with consumers.

It is important to clearly understand ECO's limitations in order to improve the design and execution of successor activities. The electricity generation sector was not addressed by ECO, though that was mostly by design. More seriously, the accomplishments of the Loan Fund, which was intended to assist medium-sized companies in obtaining loans for energy efficiency projects, have been quite limited as compared to the expectations, primarily due to the lack of human capacity in the form of project developers and experienced energy efficiency service companies (ESCOMs). Thus the impact on the market has been minor, even though awareness has been growing as a result of USAID's interventions. The lack of in-depth institutional training of project developers has also limited any growth in the number and effectiveness of the ESCOMs. Maybe due to the relative limited interest of the multilateral donors in market-oriented energy efficiency activities, ECO has not leveraged any significant donor contributions beyond collaboration with the German GTZ in supporting the Bureau of Energy Efficiency (BEE). While much has been learned from the ECO I experience, knowledge which is reflected in the less ambitious, less risky and less innovative ECO II, there has been no change in the basic environment of the Indian energy efficiency scene that ECO II could take advantage of, with the exception of the shift in attention from the central government to the states, as reflected in the BEE's policies. Future effectiveness of the ECO project, including better coordination among the various stakeholders, is strongly linked to the use of a very flexible contracting mechanism to allow for changing conditions on the ground.

B. Efficiency

The efficiency of the ECO project suffered due to two major limitations: (1) the Mission's limited experience in market-oriented energy efficiency activities, its lack of awareness of the experiences of other countries (including the United States) with such activities, and its limited knowledge of the Indian energy efficiency scene, and (2) a project designer with very little real market experience in general and no Indian private sector experience in particular. This foundation gave rise to a project that spread itself too wide and thin at the cost of depth and accomplishment. In principle, the technical assistance, training and partnerships were properly targeted even though the understanding of the way the private business world operates was lacking. However, when adjustments required by changing conditions could not be implemented due to a contract that was inappropriately restrictive for market development work, ECO's efficiency in its early stages suffered significantly. While the issue of cost effectiveness is not really under question due to the nature of the

innovation and risk involved in the original ECO objectives, one must question why the Mission's contract office failed to understand the need for an alternative flexible contracting format that would have ensured much more efficient implementation. When the contractual difficulties were compounded by the inappropriate personnel appointments made by the prime contractor, the efficiency of implementation suffered quite a bit. These unfortunate circumstances did not contribute to healthy working relations between the partners. By the time the difficulties had been resolved, residual uneasiness penetrated the attitude of both Mission and contractors.

C. Impact

In spite of the above-mentioned difficulties, the impact of the ECO project has been significant—significant in terms of awareness rather than market penetration. This growth in awareness has been very widespread, covering all stakeholder entities within the public and the private sectors. Such awareness is essential for any attempt to put energy efficiency measures on a commercial footing. It is, however, difficult, if not impossible, to assess to what extent the targeted beneficiaries have taken advantage of the technical assistance, training and other activities that ECO offered. Where USAID interventions aimed at supporting ongoing energy conservation measures, the impact—i.e., strengthening and accelerating implementation—was obvious. One can argue, however, and most critics of donors do, that strengthening already ongoing activities is less important than prompting and motivating the weaker entities that are not yet off the ground?. This may be true, but how are these weaker entities to be motivated? Previous experience by the USAID Office of Energy in Washington suggests that one of the most effective ways to get targeted beneficiaries committed and involved is by creating partnerships in which both USAID and the beneficiary contribute resources towards a common goal.

Environmental impact concerns did not need to be explicitly built into the ECO project, since using energy more efficiently automatically reduces adverse impacts on the environment in terms of pollution, greenhouse gases, etc., and thus contributes to USAID's environmental objectives.

It is important to note that activities related to village electrification in the context of Demand Side Management have a positive gender impact. For cultural reasons, women often play a dominant role in electric power revenue collection. Thus ECO activities that improve the supply and quality of electricity in rural areas give women more opportunity for participation in rural community affairs.

Other donors' support for ECO activities has been almost negligible. This is not a negative reflection on the ECO project but rather due to intrinsic donor peculiarities. The World Bank, for example, has designated only 14% of its energy efficiency projects to the industrial sector (versus 54% to the power sector) for 2005–8, and these projects represent a very small percentage of the Bank's expenditures. The reason is that the Bank rates program managers on the total dollar level of the projects they manage. As a result, projects promoting energy efficiency in the non-power sector are a low priority compared to projects promoting efficiency in power plants, which require high-budget interventions.

D. Sustainability

There is little doubt that the many of the ECO-supported activities are associated with sustainable entities. Many of the activities supported by ECO have been initiated by Indian entities to begin with or are a combination of Indian- and USAID-initiated projects. The work done in Maharashtra by the ECO splinter program, ECO II, is a good example. Other entities benefiting from ECO's work, such as those associated with the Loan Fund, are viable business enterprises, and while their number is small indeed, their profitability is not in doubt. Awareness and training breed actions and these are direct consequences of ECO interventions. How one measures the cost-effectiveness of benefits to firms or organizations that have stayed viable after USAID funding has stopped is a broader worldwide issue that needs to be answered elsewhere. India's Bureau of Energy Efficiency, supported partially by USAID, is certainly here to stay, and so are the Regulatory Commissions. Some of the future activities recommended in this report, if undertaken, will have a very high probability of being sustainable and of high impact.

The only intervention that might not be sustainable is the one involving energy-efficiency building codes. Resistance to change, weak enforcement traditions and economic considerations may combine to make building code efforts non-sustainable, limiting implementation to a relative small number of privately commissioned homes. This suggests that any follow-up activities need to focus on enacting local codes, coupled with strong enforcement measures.

In conclusion, although ECO I started out as a less-than-optimal project, ECO II has made a positive leap forward. The upcoming ECO III phase, especially with the high-priority items recommended here, has the potential to make a substantial impact on the Indian energy scene, making up for what was lost in the early stage of ECO.

Possible Future Activities

To help provide analysis and feedback as a basis of recommendations for future ECO programs, the evaluation team convened a stakeholder workshop to discuss a number of ideas distilled during discussions with participants in many aspects of this program. The Team was able to develop a consensus favoring discussion of six primary topics among the experts:

- ***Energy Efficiency/Business Educational Facility***

There was a wide agreement that the acute shortage of trained energy efficiency professionals is a serious barrier to implementing this program. Moreover, the gap will increase as the requirements expand for energy auditors and energy managers as mandated in India's Energy Conservation Act of 2001. There is also a large number of experts who understand either the technical or the financial aspects of energy efficiency projects, but not both. The initiation of training at a recognizable university level in the diverse aspects of energy will help lessen this barrier. A dedicated university program must include the varied technical, financial and institutional topics required, coupled with an apprenticeship in both industry and

financial institutions to produce a new breed of energy engineers. The discussions indicated that this new training institution will be critical to effectively disseminating energy efficiency technologies during the coming decades and must be launched as soon as possible.

- ***Energy Efficiency/DSM Consulting Facility***

Successful experts in demand-side management (DSM) and energy efficiency programs in the public sector and in industry could make their experience available to a wider audience by starting a fee-based consulting group of experts. The discussions indicated that if government units are able to use the existing in-house government resources in energy efficiency, this could offer significant advantages to the energy-intensive sectors by providing dependable experts while reducing or bypassing the bidding process for support.

- ***Platform for a Think Tank***

The need for an independent think tank to provide a platform for unbiased discussions of the wide range of energy topics was debated. An issue as complex as energy conservation requires the resolution of many conflicting interests within society. Delegates agreed that a think tank would provide an independent platform where representatives from energy-related industry, utilities, policy makers, consumers, financers and advocacy groups could discuss the critical issues while isolated from external pressures.

- ***Creation of an Indian Energy Efficiency Association***

The idea of an energy efficiency association for India engendered wide support. Such an organization would provide professional status for the members, a platform for networking and advocacy, and a force for the promotion of energy conservation. There appeared to be no barriers to developing this idea beyond the need for a dedicated champion to bring this association to life. The ECO program could provide the catalytic support required to energize this concept.

- ***National Experts Database***

A centralized list of national experts and institutions with expertise in the field of energy efficiency and related topics should be developed. The idea of a unique database for energy efficiency was supported by the experts. There are currently some fragmented lists built on the basis of various and conflicting criteria, but a new, all-India energy efficiency database could be developed with ECO support using the information technology resources available within India.

- ***Capability Enhancement of Consumers Laboratories***

An independent laboratory is required that can provide valid and unbiased energy-related specifications for consumer goods, equipment, building material, etc. The discussants agreed on the need for this facility but were uncertain whether compensation from users of the information would be enough to sustain operations.

The ECO program could provide initial support for the development and operation of this laboratory.

Given that the above ideas received overwhelming support, they emerged as the main recommendations of this report.

ENERGY PARTNERSHIP PROGRAM (EPP)

Partnerships between electric utilities in USAID-assisted countries and their U.S. counterparts are intended to develop positive impacts by helping the international partners' senior executives observe and learn how similar U.S. organizations are structured, financed, managed and regulated. Partnerships also aim to establish a long-term relationship between the U.S. and international partners.

Partnerships are also intended to help U.S. executives to understand the dynamics of non-U.S. energy markets and to forge beneficial international alliances. They can help U.S. partners demonstrate their corporate social and environmental commitment, develop staff capabilities and international awareness, and compare different approaches to regulatory and reform efforts. In all these ways, the EPP is significantly contributing to the achievement of the Intermediate Result for USAID's Strategic Objective 16: "Improved Power Distribution in Selected States."

The Energy Partnership Program in India is a highly successful activity. There is no doubt that it has contributed substantially to the improvement of India's utility and regulatory concerns operations. The basic characteristics of these successful partnerships reflect the USEA's mature, well prepared and excellently implemented program. Over the years USEA has "debugged" the program, and it requires no changes in approach or new major changes in management. In general, because of the intensive and professional preparation by USEA, EPP partnerships do not fail. It is true that there might be cases in which the matching between partners is less than ideal. This is generally due to the fact that not all U.S. utilities or regulatory bodies participate in this voluntary program.

Given the relative weakness of the regulatory bodies of India's states and the increased role they must play in the very near future, it is recommended that USAID/India consider focusing new EPP activities primarily on (1) strengthening the state regulatory bodies and (2) working with small state-run electric utilities that have shown their willingness to "reform" and have the potential to significantly contribute to their service areas.

Finally, in discussions with Indian partners of the EPP it became clear that all would have benefited if one more visit (to an additional partner) could have been arranged each time the Indian delegation traveled to the United States. The logistics of this modification should be seriously considered in the future. Considering the time invested by each participant, an added day or two could provide valuable exposure to an additional venue.

If the costs are a concern, the additional expense seems to be relatively small and could be partially offset by USEA exhibiting a bit more fiscal restraint. For example, less expensive hotel accommodations could be selected.

1. Introduction

At the request of USAID/India, a team from the Southeast Consortium for International Development (SECID), of Washington, D.C., conducted an evaluation of USAID/India's *Energy Conservation and Commercialization* (**ECO**) and *Energy Partnership Program* (**EPP**) activities. The Team consisted of two international energy experts with extensive experience in operating and evaluating diverse energy-related International development programs, along with an understanding of economic development activities in India. Dr. Samuel Schweitzer, the Team Leader, has extensive experience at USAID in the design, development and operations of a wide range of energy activities around the world, with particular emphasis on India. Mr. Michael Gaffen is an economist and engineer with broad experience in energy and environmental programs at USAID, multilateral development organizations and private firms. The team met with the current and past implementing contractors for both the ECO and EPP activities in New Delhi and at several locations in India, as well as the EPP contractor in the United States. In addition, the USAID principals of the programs were consulted for guidance during the conduct of this evaluation. A detailed enumeration of the organizations and individuals contacted for discussion of their program-related activities is included in Appendix A.

This report distills the Team's independent evaluation of the two programs, provides some analysis and suggestions for improvement of current operations, and offers ideas for new developments. To provide context, an overview of the energy and electric power situation in India is presented in Section 2. The methodology of the Team's operation is described in Section 3. The two programs, ECO and EPP, are explored in detail in Section 4. To develop new ideas for ECO initiatives, the team initiated a stakeholders meeting for early 2005, which is reviewed in Section 5. Initiatives recommended by the meeting's participants include new activities that reflect the aims of USAID/India's Office of Energy, Environment and Enterprise and that respond to the needs of the Government of India to encourage a more responsive energy efficiency and electric power sector while improving prospects for continued economic growth.

2. Background

The availability of energy and electric power is considered essential to economic development. The world's second most populous country, India faces severe energy problems. The ineffective electric power sector continues to be one of the primary constraints to maintaining economic growth and reducing poverty in India. A large segment of India's billion people remains unconnected to the electric power system, and those who are connected receive inadequate and unreliable service. Undependable electricity is a constraint on private sector development and restricts sustainable economic growth. Electricity tariffs are distorted, with an unsustainably high degree of cross-subsidy. Tariffs do not cover the cost of providing power, and investment both to maintain and expand capacity is inadequate. The technical and commercial losses often amount to 50% of the value of the electricity generated in some states. Since the state governments are ultimately liable for the losses at their utilities, this has exacerbated the fiscal deterioration in many states. The exceptionally low tariffs still do not benefit the rural poor, who have minimal access

to electricity. The increasing demand for electric power will require a substantial investment in new generation, transmission and distribution capacity. In addition, expanding output will require burning more coal, the primary fossil fuel, which has an adverse impact on the environment and the health of the population.

Effective energy conservation technologies, training, and management are essential to reducing increases in energy demand. Moreover, improving the efficiency of electric power and energy use is a very cost-effective process: the effective increased supply that can be provided by improved energy efficiency can be achieved at less than one-fourth of the cost of constructing new capacity. To help achieve this aim, the Energy Conservation Act of 2001 was enacted to provide an effective structure and mandate energy efficiency procedures. However, the successful implementation of this edict will impact every facet of energy flow. This will require a carefully designed procedure for management, training and education, since thousands of energy auditors and energy managers will be needed throughout India.

During the National Energy Conservation Day, December 19, 2004, India's Prime Minister, Dr. Manmohan Singh, emphasized the need for energy conservation and improvements to the electric power sector:

> *In our quest to make energy patterns sustainable, energy conservation occupies a high priority. I hope that year after year, we will show progressive improvements in matters related to conservation of energy. We must increase awareness in this country regarding the need to conserve energy and to utilize scarce resources available to us in an optimal and economical manner. The rational and economic utilization of scarce resources is indeed a top national priority. The science and technology of energy conservation requires the application of knowledge to the more rational utilization of resources. I also believe that we must adopt an economically rational pricing policy that has the built-in incentive for consumers to voluntarily try and conserve energy through its optimal and rational utilization*.

3. Methodology

USAID has provided support for both public and private partners in the energy sector in India since the 1960s. The activities have focused on energy efficiency and conservation for the electric utility sector, commercial firms, and industrial plants, in addition to the residential and transport sectors. This evaluation is designed to provide an independent review of two important USAID energy programs, the ECO and EPP activities. The two international energy experts were provided by SECID to review the existing ECO and EPP activities in both India and the United States, meet with the current and previous implementing contractors, discuss the program operations with a wide range of interested parties (including government and private sector decision makers), and provide assessment of the funded operation, in addition to developing ideas for potential new activities for this sector.

Studies like this one can be deceiving. People in organizations that are financially supported by USAID may present the interviewer with a biased view because of the organization's interest in maintaining USAID support for future activities. It is

therefore incumbent on the interviewer to separate organizational self-interest from objective professional assessments of what is needed in the future. The Evaluation Team believes it was able to do so effectively.

The initial meetings took place in mid-November 2004, with the United States Energy Association (USEA) in Washington, D.C. This organization is the developer and manager of the Energy Partnership Program (EPP). USEA staff reviewed the history of their program in India and identified their operations and procedures for identifying and selecting appropriate partners for this program at utilities in both the United States and India. Subsequent discussions were held with experts at Baltimore Gas & Electricity (BG&E), a recent energy partner. The Team also observed the partnership meeting between Reliance Energy experts from Mumbai and Delhi while visiting Arizona Public Service (APS) in Phoenix, Arizona. After an initial discussion with the ECO and EPP project managers at USAID/India, the Team discussed the programs with a wide range of experts in New Delhi, Mumbai, Jaipur, Pune and other locations in India. A detailed list of experts contacted during this evaluation is given in Appendix A.

The team presented USAID with an initial summary of its activities and findings in mid-December. Based on these discussions, the Evaluation Team suggested that a stakeholders meeting be held, to help provide a framework for the future ECO program and to include the primary stakeholders involved in the energy efficiency sector in India. The meeting was designed to present a series of ideas for discussion among the experts and provide a forum for selecting appropriate topics for further support by both USAID and the relevant Indian energy community. The stakeholders meeting was held on January 19, 2005, and the topics discussed are listed in Section 5.

4. Programs

A. ECO

The aim of the Energy Conservation and Commercialization (ECO) project is to facilitate the widespread commercialization of energy-efficient technologies and services within the electric power and industrial sectors in India.

I. Introduction

ECO was launched by USAID/India in January 2000. The project was designed to support the development of policy and market interventions that would enhance the capabilities of the private, financial and government sectors to deploy market-based mechanisms for end-use investments in energy efficiency technologies and services.

ECO encompassed a market component and a policy component. The objectives of the market component were:

- Increasing the number of energy efficiency projects that achieve financial closure and become operational;
- Developing market transformation strategies and programs for key energy-efficient technologies;
- Strengthening India's energy efficiency service companies (ESCOMs).

The objectives of the policy component, which addressed regulatory and institutional reform issues at both the central and state government levels, included:

- Assisting the Ministry of Power (MoP) and Bureau of Energy Efficiency (BEE) in implementing the provisions of the Energy Conservation Act of 2001;
- Helping the MoP and BEE to introduce energy efficiency concepts in government buildings at the central, state and local levels;
- Introducing energy efficiency practices (transmission and distribution loss reduction) and demand-side management (DSM) within innovative and reforming utilities;
- Providing training for members and staff at the state electricity boards and electric regulatory commissions.

These market and policy objectives were designed to be achieved through a large number of specific activities, making the project broad, comprehensive and ambitious. Observing the initial project objectives from the perspective of 2005, one must admit that the aims are still on target, valid—and highly ambitious. Given the current conditions of the energy sector in India in general, and the lack of human capacity in energy efficiency in particular, the original objectives still face major barriers that would constitute a real challenge to the most experienced project designer and project manager. It is not surprising, therefore, that the ECO project found itself spreading resources over too many diverse activities at the expense of depth and achievement of select tasks. Personnel issues and cultural insensitivities, as well as an inappropriate contracting mechanism, exacerbated these difficulties.

The unexpected delay in approving the Energy Conservation Act of 2001, the typical personnel changes at the management level at the MoP and the BEE, and other impediments, helped to create a nebulous environment that resulted in a less than optimal accomplishment. However, the administrative and contractual issues that troubled ECO I have been resolved in the design of ECO II.

It is important to stress that structuring the field of energy efficiency to respond to the marketplace is problematic for many of the industrial countries. The United States' success in this area is relatively limited compared to that of Northern Europe and Japan. USAID had to take up this challenge with little previous institutional knowledge or experience; it should not be faulted for this lack, nor should the ECO activities be considered inappropriate. On the contrary, awareness of energy efficiency and conservation by the public and private sector in India has increased significantly through the intervention of USAID. In addition, the experience gained by the Mission through ECO has been extremely valuable. Not only has ECO increased the Mission's understanding of the potential for energy efficiency in India, but it has shed significant light on such matters as private sector operations, rural consumer concerns, operational issues within the Electricity Regulatory Commissions, procedures for the electric distribution and transmission entities and their interaction with consumers, and other related topics. This can provide a valuable resource for any energy-related activities USAID/India might undertake in the future.

Finally, it should be noted that at the request of the Mission, this report is focused on future activities, and less on historical experiences, from the perspective of ECO. Therefore, the findings and analysis are skewed toward crystallizing options for future activities with a high impact potential that are intrinsic to India, and **are strongly oriented toward** both the needs and interests of the primary stakeholders rather than expressing the wishes and interests of U.S. organizations.

II. Findings and Analysis

The Evaluation Team discussed the diverse ECO operations with a range of participants and extracted the following primary findings and analysis:

a. Evolution of ECO I to ECO II

The ECO I Project was designed with a very large number of activities to cover a broad range of the energy conservation field. At the project's inception, only a partial understanding of the energy efficiency scene in India was available at the project inception. Presumably, a very broad approach was supposed to have made up for this void of knowledge and experience. ECO I project activities were thus not prioritized in an optimal way and probably not articulated properly for the implementer. As a result, performance suffered and the widely diffused efforts could not command enough time or resources to bring many important activities to proper culmination. In retrospect, it stands to reason that the overall success and impact of ECO I could have been improved if early in the project an effective dialogue between USAID and the contactor had taken place and project adjustments had been

introduced. Nevertheless, as noted earlier, the experience and knowledge gained by USAID in the course of ECO I has been extremely helpful. Here the Evaluation Team must stress that this gain is not limited to USAID only, but extends to most stakeholders the Team has met with. This experience lends a great deal of weight to the recommendations drawn from these interviews.

In assessing the project, it is especially important to understand the effects of the contractual difficulties. The ECO I contract awarded by the Mission was one of the first contracts under the fixed-cost, fixed-time, fixed-scope deliverables mechanism. This mechanism deprived the project of the flexibility it needed to adjust to changing circumstances, especially after (the late) enactment of the 2001 Energy Conservation Act. After the Bureau of Energy Efficiency (BEE) was established in April of 2002 and introduced its Energy Efficiency Action Plan, BEE suggested that USAID align the ECO I activities with the Action Plan. This turned to be a difficult task due to the built-in contractual constraints. Consequently, USAID deleted from the ECO I scope of work those activities that could be aligned with the Action Plan. These plan-aligned activities became the basis for a separately funded cooperative contract, ECO II, with the International Institute for Energy Conservation (IIEC). The ECO II contract was, then, a collaborative effort between USAID and BEE to promote the widespread commercialization of energy efficiency technologies and services in India, with a major emphasis on:

- supporting the implementation of the BEE Action Plan;
- contributing to efficient development of the power sector;
- reducing greenhouse gas emissions, and
- building capacity for implementation of ongoing energy efficiency/DSM programs.

While this change improved relations with BEE and the Ministry of Power (MoP), it made it more difficult for Nexant, the ECO I contractor, to be an equal partner in USAID's energy efficiency work, creating unhealthy working relations.

While some of the ECO II activities have emerged directly from ECO I and, to some extent, benefited from the early experience of ECO I, the approach of ECO II has been traditional, involving more or less conventional technical assistance rather than seeking out innovative high risk approaches to overcome market barriers. Nevertheless, this support, primarily at the state level, is contributing to the sustainability of energy conservation measures. Most of the specific activities could have been defined prior to ECO I—in fact, they appear to duplicate energy efficiency tasks addressed in varied forums around the world during the past two decades. The major ECO II activities are (1) implementing DSM programs in state utilities; (2) developing a DSM best practices guidebook; (3) developing energy efficiency building codes; (4) strengthening energy conservation action plans for the State of Maharashtra; (5) Developing options for the establishment of a state conservation fund.

The ECO II contract was approved during 2004, and the contractor is in the process of implementing the tasks defined by USAID. It is anticipated that ECO II will be successful in accelerating the commercialization of energy efficiency technologies and services in India. However, some concerns have emerged about specific

activities of ECO II:

- The development of a DSM guidebook, since similar guidebooks have been available since 1990 and EPP's work has included DSM best practices exchanges. A number of best practices publications have also been issued by USAID's Office of Energy in Washington.
- A Lawrence Berkeley National Laboratory (LBNL) modeling effort linking energy efficiency savings and fiscal allocation issues in Maharashtra. This relationship is tenuous and unverified in other political entities (including California, LBNL's home state), so it would seem premature to undertake a modeling effort based on such a linkage.
- Development of an energy-efficient building code using the ASHRAE format, which is defined for the climatic conditions, building structures, fenestration, and lifestyles of the United States, not India. The extensive time and effort required to devise an energy-efficient building code standard appropriate for the widely diverse climatic conditions in India would require broad expertise in energy, architecture, environmental science, and climatology that appears to be beyond ECO II's resources.

Moreover, there has been no linkage with the EPP program. This is an unfortunate omission, because a number of these topics have also been addressed within EPP exchanges.

b. Industrial vs. electric utility activities

The industrial sector can provide a significant area for energy-efficient activities. The predominant interest in projects with energy-efficient components undertaken by the development assistance organizations has been in the electric power sector, which has a significant potential for reform; the potential of the industrial sector is less obvious. Recent information given to the Evaluation Team by Mr. Sunil Khosla of the World Bank (2 December 2004) indicates that 54% of its energy efficiency projects for the period of 2005–2008 were designated for the electric power sector and only 14% for the industrial sector (the remainder were assigned to the transport, other energy and agriculture sectors). In part, this orientation has been based on the relative size and efficiency of multilateral development bank loan operations. However, the potential for energy efficiency in the production of industrial energy, including measures which raise productivity without increasing energy inputs, is significant. This includes motors, appliances, pumps, and HVAC systems. The energy efficiency for these components can be encouraged at the point of production, in combination with the supplier. In addition, the lower life-cycle cost for energy-efficient items will cause them to be selected by consumers and chosen for promotion by marketing staff.

c. ECO Energy Efficient Loan Fund

The Energy Efficiency Loan Fund has been set up with the ICICI Bank in Mumbai to provide financing for the implementation of energy conservation measures at competitive interest rates. The primary rationale for financing energy efficiency measures is to improve the availability of credit for a new system and reduce risk to the lending organization. The aim is to implement a process that will decrease energy use by increasing productivity, reducing the production inputs while resulting in a more competitive item for consumption. However, the need for such a loan fund in this field appears to be somewhat limited. Investments are fungible and will rapidly flow to the most efficient and profitable venture, including energy-consuming entities. A competitive market will expedite the flow of new investment capital only if the risk is justified, not as a result of a mandated process. If the cost-effectiveness of a proposed energy-efficient investment is vindicated it will be implemented, in the majority of cases, without donor support. The ECO program can best amplify participation in this procedure by providing information to a wider audience and making financial facilitators familiar with the detailed requirements for this process.

The Loan Fund's focus on medium-size firms is also open to question. It is considered axiomatic in India that 80% of energy savings are found within 20% of mainly large enterprises. However, the Evaluation Team has found no evidence that this common statement is based on even the crudest analysis. It would have been illuminating and beneficial if ECO, perhaps with the help of the Confederation of Indian Industries, had made a rough analysis to justify the Loan Fund's large (and somehow less than successful) effort to help medium-size companies secure energy efficiency loans. There is no doubt that on a national level, the saving potential of the so-called 80% of smaller companies is significant. But if the average savings per enterprise is, in the current state of the market, too small to justify tackling the loan/implementation difficulties, than ECO would have an even stronger rationale for focusing on DSM activities and other municipal and state energy conservation opportunities.

An examination reveals a very high ratio of loan applications to loans granted through the ECO financing facility. This means that any well-prepared application grounded in normal commercial practices should be able to pass stringent and conservative (ICICI Bank) scrutiny. This fact immediately raises the question of whether a USAID loan guaranty facility was/is necessary, given the fact that the lending institution is treating the energy efficiency loan as it would any normal loan. A review of the successful energy loans indicates that they have a short payback period of less than 2 years (that is, that the energy savings were enough to enable the firm to make back its investment in less than 2 years). This would make them attractive loans for any bank, regardless of the topic. In retrospect, then, it is not clear if the risk-sharing $5M energy efficiency facility set up at ICICI Bank was necessary. An examination of the absolute number of loan applications that have been successfully processed during ECO indicates that the level of energy efficiency loans is not significant. The ECO's dedicated energy-efficiency loan funds that are now available, after repayment of current loans, could be more effectively recycled to a broader and more diverse audience.

To better understand this phenomenon, the Evaluation Team interviewed everyone involved in the ECO Loan Fund mechanism, including current and former employees of Nexant, representatives of industry, practitioners, ESCOMs, government officials and others. A consensus seems to exist among all the above that the main reason for the limited success of the Loan Fund was, and still is, a lack of qualified professionals capable of closing the wide gap between lending institutions, on one hand, and energy auditors/managers on the other. This deficiency in professional capacity is also the main reason for the lack of growth in the ESCOM sector. This in turn has limited the Loan Fund's operation and has made joining an ESCOM an unattractive career move.

A lack of awareness and motivation on the part of enterprises is also an important barrier to the market's growth. Trained energy auditors can do only so much. They can identify energy streams, point out losses, and suggest how one may use appropriate technological solutions in order to cut these losses. In the majority of cases these experts are not capable of coupling this "engineering analysis" with a fiscal/business analysis to develop the firm's motivation, increase its awareness, and improve its understanding, much less assist the firm's management in preparing a bankable loan application. In all the cases in which the ICICI Bank provided loans, it was with the assistance of experts that could translate across the technical engineering/audit and financial lending institution language barrier. The choice of the ICICI Bank, a conservative institution, could have been offset by expanding the Loan Fund to include several smaller, more dynamic and more innovative lenders, stimulating more diversity and competition. All these findings and comments apply to the various sectors, whether electric utilities applying DSM measures, private enterprises attempting to provide more efficient street lighting, industry, etc.

It is true that an attempt is being made to bridge the gap in the supply of energy efficiency professionals. Indeed, the National Productivity Council (NPC) training program for energy auditors and energy managers is an important and unique contribution to the development of an energy efficiency market. Together with the Energy Conservation Act of 2001 mandating certification, this program has provided a commendable start. However, the effort needs to be recognized as insufficient. Not only is the number of people trained by the NPC too small to meet the anticipated demand, the level of those first applying for and then failing certification is very high, and the reasons for this need to be understood. Also, this program draws heavily on practicing professionals who are interested in a "career change" and who want to become energy auditors or energy managers. No effort has been made by India or by ECO to encourage and help young people at the university entrance level and in undergraduate engineering schools to select an energy efficiency career. In any case, university study options that couple engineering with business aspects are largely nonexistent. Furthermore, when one examines the NPC curriculum it becomes obvious that its financial training covers little beyond high-school skills, such as computing compound interest. There is no requirement to learn how to prepare an investment portfolio, provide due diligence or develop a business plan. One can hardly expect new energy auditors to be equipped to translate an auditor's report into the business language that a firm's management speaks, or translate technical findings into the fiscal language spoken by lending institutions, unless specifically trained to do so. This critical shortage of professionals to meet demand

triggered by the Energy Conservation Act and to close the gap between the two "languages" requires innovative solutions, in which USAID may be able to play a major role. A consensus seems to be emerging among all stakeholders that this is a high-priority issue and that overcoming this barrier will have a dramatic and lasting positive impact on the Indian energy conservation effort.

d. Partners' responsibilities: contractor performance

Although the ECO I designers spoke of innovation and market development, they failed to introduce competition into the Energy Efficient Loan Fund by using only the ICICI Bank rather than employing several lending institutions. (This severe conceptual contradiction was likely due to limited real-world business experience.) In retrospect, the ICICI Bank was not the best choice, since it is more conservative than other banks and its practices are too costly and elaborate for small businesses and most Indian ESCOMs. To a large extent, this was recognized by Nexant, which responded by setting up an office in Mumbai (where ICICI is headquartered) to provide a middleman-type assistance similar to what most ESCOMs provide. Unfortunately, it was impossible to replace ICICI Bank, the major private bank in the country, once chosen. The selection of ICICI, coupled with the lack of competition, could have been the main reason why the Mumbai office of Nexant did not meet expectations.

e. Training requirements and impact

While training needs are relatively easy to assess, it is far from easy to measure the effectiveness of non-institutionalized training. The latter requires long-term follow-up observations to examine the impact trainees have and the progress they bring about in their specialties. Such long time horizons are inconsistent with the typical USAID short-term contract. But USAID's approach has not always been short term. During the late 1970s and early 1980s, the USAID Office of Energy in Washington, recognizing that there was a lack of highly trained energy professionals, spent much of its training budget on sponsoring graduate students interested in getting master's and doctoral degrees at the better U.S. universities. Some of these graduates now occupy high positions in the energy field.

For a variety of reasons, USAID shifted away from this "elitist" program for the few and concentrated on short-term training that targets specific needs and audiences. This change in approach had many advantages. The most important was the ability to incorporate a training component into energy projects in order to strengthen and enhance specific technical assistance activities across the board. At the same time, training contractors started to "mass-produce" many training packages, which helped them to cut costs and respond faster in a competitive environment. However, this shift (the arguments of the training contractors to the contrary) made it more difficult to tailor the training to the technical assistance tasks under consideration. Though training reached larger number of audiences, it lost some of its effectiveness.

Making a rational analysis that allows quantification of the benefits or deficiencies of this shift is almost impossible. Still, a good measure of how, in the long run, training

programs benefit the energy scene could and still can be derived from long-term observations. For example, some contractors, with the support of the Washington Office of Energy, set up alumni associations through which the progress of trainees could be anecdotally documented. There is nonetheless a strong tendency to measure "effectiveness" simply by calculating the number of workshops organized, the hours each person was trained, the number of trainees participating, etc.

By the time ECO I was contracted, USAID was starting to introduce more contracts based on performance and quantified deliverables. This mechanistic approach, on the surface, rendered tracking more effective, made contractual obligations specific, and seemingly kept project training activities on schedule. Moreover, it became advantageous for a project designer, as well as a contractor, to have as many specific training activities as possible. The former lived with the belief that the detailed specifications would give him or her control over the contractor, while the latter was happy to rush into training-hour tables, body counts, etc., and get paid accordingly.

This state of affairs expressed itself to the full in the case of ECO I. Many project activities and technical assistance elements of the project were supposed to be enhanced by training, for which the contractor was to be paid on delivery. Yet the launching of these activities depended on the introduction of policy/institutional measures by the Indian Government. When these did not materialize within the planned time-frame, the main contractor, Nexant, could realize the necessary income stream only by forcing an "out of context" implementation of training activities for which Nexant could be paid. It is therefore not appropriate to look at this aspect of contractor performance, nor is it sensible to measure how effective the training was in the original context of ECO I. The Evaluation Team can, however, albeit briefly, comment on training in the context of the dilemma forced on ECO I, as discussed above.

The subcontractor responsible for executing the bulk of the training was the International Institute for Education (IIE). The level of the courses IIE presents worldwide is very high, and ECO I's many training activities were well targeted, well run and properly focused, with good attendance and good speakers. However, as discussed elsewhere in this report, workshops are not a substitute for practically spreading desired activities in the marketplace. One may thus argue that too many workshops were built into the project. But more important, most of the workshops IIE ran were pre-packaged for cost-cutting purposes. By the time they were to be implemented they needed adjustments to actual changing conditions on the ground, conditions that could not have been anticipated at project design. However, IIE showed little flexibility when asked to make these adjustments.

As to future training activities, the Evaluation Team cannot make specific suggestions, since most of the activities recommended for the future do not really require supportive training. However, the highest-priority recommendation for the next USAID intervention in the energy efficiency/conservation field is an institutionalized training facility. Should the Mission embark, in the future, on "traditional" project activities requiring training, then the project designers must at least pay detailed attention to weaving training into project activities in a way that will assure results. USAID should encourage project designers to be more creative and

break away from the routine, be innovative and take risks with an eye to both effectiveness and quality assessment.

f. ECO III shift from central government to state focus

The DSM work with the Jaipur Distribution Company (a state entity) was initiated by Nexant under ECO I through a series of workshops and training activities. This has resulted in a heightened level of awareness among the company's senior management. Some of these employees (including women engineers) have been so much convinced in the importance of DSM measures that they have invested their own personal money in becoming energy auditors through the BEE training program. This represents a 10,000-rupee investment and is the best indication of the success of USAID's intervention. In spite of this enthusiasm, progress is hampered by insufficient data on consumer behavior. The available information on electricity consumption, type of appliances, frequency of use, etc. is incomplete. This is an example of a weakness in a state operation that USAID could address in a reasonable time at a reasonable cost. It is interesting to note here a positive side effect benefiting the academic sector. Using a local consulting firm, the Jaipur Distribution Company prepared a modest improved pump-set project (1,500 units) in the agricultural sector. The local consulting firm served as a facilitator/project developer/middleman. This activity came to the attention of the ICFAI Business School in Ahmedabad, which was able to use it as a case study. This school has already engaged in numerous training activities related to the structuring and functioning of energy service companies and the development of performance-based contracts.

Should USAID decide to embark on a traditional road of technical assistance plus related training with ECO III, then the Evaluation Team recommends that the focus be on the state level. The Energy Conservation Act of 2001 shifts much of the activities and responsibilities for energy efficiency to the states. Moreover, policy support work on the central government level, while important and tempting, can, as previous experience has shown, be very problematic. USAID project time-scales and Indian government time-scales are incompatible. In addition, the decision-making process in the government is often plagued by the replacement of key personnel, causing severe delays for donors. This implies that one should refrain from designing projects in which technical assistance is pending on policy enactments within the same project. This approach does not exclude projects that are solely policy reform projects: USAID has embarked on those in many cases.

g. Market barriers

In very broad terms, the energy efficiency market consists of *three* major groups:

1. The first and most important group comprises large companies or enterprises that recognize internally that high cost of energy can be mitigated by introducing effective energy efficiency/conservation measures. These entities, in most cases, can proceed to improve energy use using internal resources. When needed, they can employ external expertise and, if necessary, even raise funds on very

favorable terms. The National Energy Conservation Day event of December 14, 2004, demonstrated how effectively the major industries and public production enterprises have been meeting the challenge of energy conservation. For the most part, they did so independently of bilateral or multilateral organizations. Judging from the Team's interviews with some lenders, it is also clear that these enterprises had no need to avail themselves of any special funding mechanisms set up by donors. It appears that neither ECO I nor ECO II energy loans targeted these large entities—an appropriate omission. Therefore, this large enterprise group would not participate in the ECO energy loan program.

2. The second group of enterprises consists of very small enterprises which use energy very inefficiently and although they may recognize this fact, are not being managed as suitable businesses. They do not maintain proper books or apply norms that will permit them, even with USAID's help, to obtain any loans from lending institutions, due to lack of required documentation. They do not meet the quantitative preconditions of financial institutions for implementing energy efficiency programs. Therefore, this business group could not participate in the energy loan program.

3. The third group of enterprises is, of course, the one that is under discussion in the context of ECO. These are companies that can be made to understand the importance of energy conservation in terms of significant and immediate savings. Most of these enterprises often lack the in-house capability to do the energy balances (audits), translate this analysis into acceptable fiscal/business terms, prepare a business plan and present a bankable loan application. Numerous firms fit this description; the fact that only a handful of successful loans was completed by the ECO energy loan program indicates that this program was not effective.

When looking at "market barriers" at the present, it is the Evaluation Team's opinion that there are no technology/hardware barriers and no significant awareness barriers to a major leap forward in enterprise-based energy efficiency. It is sufficient to look at the daily Indian newspapers and realize the pre-occupation of the Indian government with the energy security issue. The topics in the news include purchasing of oil from fields in Russia, Indian investments in the oil and gas industry overseas, an oil/gas pipeline from Iran through Pakistan, a gas pipeline from Kazakhstan passing through Afghanistan and Pakistan, and other items in the same vein. The public is aware that energy savings/conservation is a national issue. Where a barrier may exist is in the individual enterprise that has energy savings potential. Such a firm often does not understand how to go about undertaking energy efficiency measures and how these translate into cash savings for the enterprise. There is often a need for financing as well. A well-trained and respected professional who is competent in both the technology and the financing of energy ventures is the key to crossing this barrier. This could eliminate firms' perception of financial risk as a barrier.

h. Green Buildings

The construction of environmentally sound "Green Buildings" is a growing phenomenon worldwide. Driven by a combination of corporate social image building and a need to respond to environmental pressure, this trend is positive and needs to be welcomed. (Large corporations are also driven by competition to better imbed their brand image in the public consciousness; Green Buildings are an additional way to do so.) Having an international forum "rating" these buildings, coupled with an award system, is another positive development. These trends are well on their way: they are mostly associated with a plethora of corporate resources, do not need donor funds and have an inherent awareness-developing feature: competition.

The Evaluation Team finds it difficult to justify the spending of development assistance funds on a well-established, ongoing and sustainable activity that already attracts worldwide interest. Consequently, the Team can not recommend any Green Building activities in future projects, including energy conservation projects or environmental projects. The Team cannot justify dissemination activities related to Green Buildings either. However, any future project the Mission considers should seek opportunities to encourage the Green Building movement by providing access to information and expertise and by lending USAID's name as appropriate. All are non-cost activities that could be easily incorporated in a future ECO III project. To a large extent, the current ECO project is already doing so, and the Mission should be commended for not ignoring this positive energy-environment trend.

i. Relation to the World Bank

The power sector in India has extensive capacity shortages, frequent blackouts, poor reliability and deteriorating physical and financial conditions. World Bank support to the power sector is designed to encourage the states to undertake a wide range of power sector reforms. The aim is to reduce the state governments' involvement with the operation of the power sector, establishing an independent state regulatory framework, reducing subsidies, enacting cost-recovery tariffs, using energy-efficient technologies, and restoring financial independence via restructuring. Reform efforts have focused on Orissa, Haryana, and Andhra Pradesh. In addition, the multilateral development agencies, including the World Bank and Asian Development Bank, are planning to transfer new energy efficiency planning studies from the Ministry of Power directly to the cognizant agencies on the state level. The World Bank has indicated the need to increase energy knowledge resources within India and plans to augment partnerships with research and academic institutions to develop analytical work, expand information collection, and disseminate the findings to a wide audience.

A relatively small World Bank Energy Efficiency Project is currently available to provide $5 million for financing energy efficiency loans for the industrial and commercial sector. IREDA (Indian Renewable Energy Development Agency) has been the primary entity for providing incentive financing for both energy conservation and renewable technologies by the World Bank. IREDA has also attracted bilateral and multilateral financing from the World Bank Global Environment Facility and the Asian Development Bank (ADB), in addition to KFW (the German Credit

Establishment for Reconstruction, i.e., the German development bank) and the Danish agency for development assistance. Although this loan program has been extended to 2006, it has been ineffective in attracting a meaningful level of interest or of active loans due in part to high transaction costs, uncompetitive loan rates, long loan-processing times, and inability to fund higher-risk, small-sized enterprises. The World Bank and ADB plan to continue emphasizing energy efficiency as an essential component for each new energy and electric power project, and ECO III can and should provide support for this effort.

II. Conclusions

As noted earlier, improved energy efficiency in India is essential if the economy is to emerge successfully into the competitive world market. The Evaluation Team includes the following thoughts for consideration during the preparation of the next phase of the ECO program.

a. Once ECO II work ends, the Mission should continue supporting energy efficiency–related activities. Such activities are important given the likelihood of a future general energy shortage in India. However, the Mission needs to find a contracting framework for future activities that strikes the right balance of Mission control vs. contractor flexibility. While the contracting mechanism applied to ECO I turned out to be too restrictive, it is the opinion of the Evaluation Team that the contracting mechanism applied to the ECO II project (a cooperative agreement) may have been too lax. It may have allowed the contractor, the International Institute for Energy Conservation (IIEC), to rush into copying activities from the United States without enough adaptation to the Indian reality. For example, the work on building codes raises two major questions. First, are building codes enforceable in India? Second, is IIEC team experienced enough in this area? A cooperative agreement often allows the contractor to move too fast, making it difficult for Missions to properly examine proposed activities, particularly when the Mission may lack in-house expertise. Consequently, a midway contracting mechanism should be considered in the future. Some appropriate checks and balances should be introduced, especially if ECO II–type activities are to be continued. Obviously this would require an understanding contract officer who fully appreciates the critical need to respond to demands for technical support as they evolve on the ground. Also, most contractors will respond well to a detailed outline of principles, priorities and mode of operation. A cooperative agreement is less than ideal if the Mission wants to retain strong leadership. The contract process should be negotiated for a defined framework of required topics while allowing flexibility during the life of the contract.

b. The ECO II activity to develop a DSM best practices guidebook, while useful in principle, has been misguided. One of the core objectives of the EPP, the other USAID program discussed in this report, is the enhancement of best practices in the Indian electric utilities. Any best

practices undertaking by the ECO II contractor, the International Institute of Energy Conservation (IIEC), should have been closely coordinated with the EPP activities in India. This would have produced, most likely, a much better DSM handbook. To the extent possible, the Evaluation Team strongly recommends that the Mission consider EPP as a vehicle for review of the handbook.

c. While the task of developing options for an energy conservation fund in Maharashtra is a positive activity of ECO II, it is recommended that an attempt be made to find a linkage with the ICICI Bank Loan Fund, even though the latter is an all-India fund. A mechanism may be devised to enhance the operation of any future Maharashtra conservation fund.

d. The DSM activities have focused primarily on the consumers of electric power; however, this could be expanded to include more the producers of industrial products like motors and appliances and other energy consuming industrial devices. While potential government-mandated energy labeling of devices is important, working with manufacturers to produce more efficient devices, often at the same cost, can be very beneficial. Some vendors, like lightning device manufacturers, have recognized the potential for win-win results from energy conservation commercialization and are actively involved in doing so via up-front credit to customers, to be repaid with savings (e.g., loans to municipalities for low-energy street lights).

e. The energy efficiency loan fund can continue to provide support from the recycled funds available from ICICI and encourage an expanded outreach program. Alternatively, additional funding mechanisms can be used to reach a wider audience. However, if an energy-related loan is valid, any good bank will finance it at the prevailing rate for that size organization; if not, the subsidized loan would not be suitable either. In the view of the Evaluation Team, which is based on discussions held with the ICICI Bank, the IREDA fund, CII and others, it is not the prevailing interest rates that are a barrier to commercialization of energy conservation measures. It is rather the lack of trained professionals who are capable of preparing proper loan applications. As discussed earlier, the situation calls for energy efficiency professionals who understand the language of the loan institution and the business language of the enterprise management and thus can translate energy flows and balances into both languages. Soft loans can be very helpful and serve as an incentive but are not critical. This was seen years ago in the United States, when a Solar Bank was established to provide low interest loans. The Solar Bank was no more successful than the ICICI Bank loan facility. It is worth mentioning here that while USAID may view the interest rates of the ICICI Bank loan facility fund as being "soft," conversations held by the Evaluation Team in Mumbai with the former employees of the Nexant financial cell in Mumbai indicate that this is not the case and that comparable interest rates are available from other banks. Both former employees are actively engaged as "project developers" going between enterprises and loan facilities helping applicants secure energy conservation loans. Unfortunately, these

two go-between professionals are an insignificant moving force. As noted earlier, all the loans granted by the ICICI fund apparently generated enough energy savings to repay the investment in a fairly short period, and that this was a much stronger motivator than the differential between prevailing interest rates and the "soft" rates. The Evaluation Team firmly believes that the loan process will be significantly improved when professional project developers enter the market and more lending institutions participate. This is common practice in all other energy project development in which "middlemen" play key roles.

This raises the question: is a loan fund really necessary when plenty of competing lending institutions exist? The Mission may want to consider an informal round of discussion with ICICI Bank, IREDA, CII, the above former Nexant employees and the one or two leading ESCOMs in India to answer this question and to reconfirm the above findings of the Evaluation Team.

f. The performance requirement for the contract should be flexible, permitting adjustments to suit the inevitable changes in the requirements. However, the contractor will require a measure of control and assuredness of payment at a predictable rate.

g. The training requirements for energy and energy efficiency will be continuous, both to maintain knowledge in an evolving field and to introduce new entrants to baseline data. India produces more engineers annually than any other country. However, their knowledge of the energy sector in general and energy efficiency in particular is deficient. Short-term courses, forums and targeted training are the traditional approach for instant erudition. The Evaluation Team suggests that a new IIE (Indian Institute of Energy) be developed with multifacility locations, Internet-based distance learning, a defined curriculum, and a nationally recognized testing and accreditation process for each graduate. Instruction should be at the upper-level undergraduate or graduate level. A two-semester program with active internships at financial, industrial, or electrical facilities would be required to insure hands-on experience. This facility would produce world-class energy engineers with a strong export potential for the expanding world market, similar to that for the Indian IT sector.

h. The shift in USAID energy efficiency support from the central government to states is appropriate at this stage in the evolution of energy policy for India. The penetration of energy policy and programs at the central government level has reached the saturation point, and the programs planned should be effective in helping to achieve the stated aims. However, the energy efficiency gap at the state and local level is wide, and small expenditures of support would provide strong energy efficiency improvements, particularly in the rural states.

i. The market appears to be the only long-term barrier to the use of energy-efficient technology. Energy efficiency programs could be considered a low-risk, high-return endeavor, and the Mission should encourage a market-based response, particularly in a realistic tariff environment. The

market barriers to enterprise-based energy efficiency programs can be removed by eliminating or mitigating the risk perceptions involved. This is obviously related to the discussion in (c) above. Ill-prepared loan applications on one hand, and loan officials with limited understanding of energy efficiency on the other hand, create wrong perceptions. By launching a cadre of well-educated "bilingual" professionals and providing better training to loan officials (training done by Indian leading ESCOMs?), the Mission will go a long way toward removing barriers to commercialization.

In reviewing many of the ECO I and ECO II activities, it is apparent that both USAID and the contractors preferred to support enterprises and local programs that have been already launched by stakeholders, are on the right track and are consistent with the aims of USAID. It is an understandable temptation: encourage the "good guys" and do not let them fail. USAID (and the contractors) can then show success and use these successes to highlight what needs to be done and how to do it. The Evaluation Team questions this approach in the following sense. Supporting ongoing trends is unobjectionable but must be done only in a limited way, since these activities are in most cases likely to go on, succeed and become visible without the involvement of donors. Running with the winners is pleasant, but insufficient to bring about sustainable change. USAID needs to break new ground and encourage "movers and shakers" and permanent forces that will advance the energy efficiency objectives. USAID and its contractors, as well as consultants, need to be innovative and think "out of the box."

It is not appropriate to spend limited development assistance funds on changes that are already taking place **unless** it is possible to use this support to bring about more changes, in ways not limited to exposition in workshops and study tours. It is critical to find ways to duplicate positive changes on the ground by involving permanent forces of profit, career building and competition. Without these there will be no energy efficiency/conservation market. Conventional approaches will not suffice, and while ECO I was supposed to introduce "innovations" through a financial facility, that mechanism by itself was not innovative—and the fate of its predecessors was not encouraging. Stories like that of the failure of the Solar Bank in the United States years ago and of the Indian Renewable Energy Development Agency in India, as well as elsewhere, should have better guided the ECO I project designers. As for ECO II, it is a "safe" project devoid of much innovation.

IV. Recommendations

This section contains two sets of recommendations. The first summarizes specific suggestions for follow-up activities and the second summarizes management and administrative issues.

Follow-up recommendations

The technical recommendations listed below reflect the wide range of interviews, discussions and presentations from which the Evaluation Team benefited. The list has been prioritized in accordance with the Team's interpretation of the stakeholders' views. At the same time, they also reflect the request of USAID for a prognostic

assessment. The team's overall recommendation is to choose a bold new direction for the continuation of ECO, a direction focusing on a very limited number of objectives and activities. However, given the constraint of USAID's prior obligations, political considerations, etc., USAID may decide to keep some of the ongoing activities.

a. Energy Efficiency/Business Training Facility

India's Energy Efficiency Act of 2001 mandates extensive new national requirements for energy conservation. Large numbers of energy auditors and energy managers will need to become available to implement this legislation over the next several years. It is recommended that training in energy efficiency be institutionalized. A dedicated new facility should be established at the graduate/undergraduate level to provide a broad, relevant curriculum to support a lifetime career for these new energy efficiency professionals. There are no existing facilities in India that can provide energy experts of the quality and quantity required.

This institute must provide individuals who are conversant with both the technical and financial aspects of energy efficient projects. These professionals must have the capabilities to initiate a project and move it through financing to final product implementation. This training should be achieved by strengthening the existing engineering schools and/or management institutes to include an energy efficiency module within their existing curriculum to meet the anticipated market demand. It should include hands-on apprenticeship programs in industry and financial institutions. Not only will such a training facility supply more energy professionals for the Indian marketplace, but it could also attract students from elsewhere in Asia and/or develop Indian expertise for export to neighboring Asian countries.

Pro: Institutionalizing training will provide India with the cadre of necessary professionals of high standing who will increase awareness of and facilitate investments in energy efficiency. It will allow the BEE to discharge its legal obligations and build up India's presently almost nonexistent ESCOM companies.
Con: The implementation of this recommendation will encounter the sensitivity of the Indian government counterpart institution. It is recommended that only one Indian government agency be involved and that it not be the Ministry of Power, but rather the ministry dealing with higher education.

b. Energy Efficiency/DSM Consulting Facility

There are a number of organizations and individuals that have been successful in implementing energy efficiency projects within India. It is recommended that a dedicated facility, embracing this expertise, be established that can help implement energy conservative measures as part of a special DSM experts consulting facility. The successful operations involving the Noida distribution company, the Maharashtra Energy Development Agency (MEDA) and others can provide a support base for this operation, which can be a successful self-sustaining fee-based enterprise.
Pro: A consulting facility will have the financial/commercial motivation and the capacity to commercialize energy efficiency measures in the marketplace. It

will overcome the difficulty of assisting weaker entities and make use of the best expertise in the country.
Con: Since this facility is a fee-for-service entity in which consultants from the public sector as well as from private enterprises will sell their services, extra legal care needs to be taken (in regard to liability issues, etc.) to ensure that the facility can operate efficiently, like any private sector company.

c. Platform for a Think Tank

Creativity springs from the synthesis of ideas. It is recommended that a dedicated platform for an energy efficiency think tank be developed. This will allow the discussion and intellectual resolution of the diverse interests facing energy efficiency concepts throughout India and make the resulting options part of the wider community discourse. The facility could be either independent or part of the educational institute recommended in item (a). Such a platform would allow leaders to bring together experts in the various sectors of energy conservation for longer periods of time than is available at conventional conferences and workshops.

Pro: India will benefit from a dedicated high-level, independent forum to impact national energy conservation policy by bringing to bear the possible consensus of all stakeholders.
Con: There are several existing institutes in India which have provided forums, discussions and locations for intense debate on a number of energy issues. These institutes may compete with and/or oppose the creation of a strongly independent platform. Along with the necessity for independent financial resources, such opposition might become a political (rather than a technical) challenge.

d. Creation of an Energy Efficiency Association and a National Database

It is recommended that an association of energy efficiency professionals in India be established to provide collective support, networking, and advocacy mechanisms that can power the promotion of energy conservation. This organization can provide its members with the key information and leadership skills they need to stay competitive within the evolving energy industry. The association can help maintain the professional status of energy professionals by giving them opportunities for networking and interacting with colleagues; encourage professional training with seminars, conferences and online training; provide awards for exceptional accomplishments, and help make employment information available. The institution of a national database of energy efficiency experts is essential for India's states and enterprises, which will require individuals with substantial qualifications to implement energy conservation edicts in industrial and government sectors. Sustainability of such an association is essential. Combining subscription fees with income from workshops and publications could serve as a sufficient source of income. A helpful model could be the U.S. Association of Energy Engineers, which is self-sustained. If needed, USAID should facilitate a visit by the organizers of the Indian association to attend a board meeting of the U.S. association in order to better understand how it operates and its potential application to India.

One need not exclude energy conservation experts in the petroleum sector from the broader energy efficiency community. Therefore, it is also recommended that a careful examination be made of potential linkages with India's Petroleum Conservation Research Association.

Pro: An association will enhance professional standing of practitioners, serve as an advocacy group, disseminate information, and represent the energy efficiency community in dialogues with both local and central government organizations.
Con: The cost of developing and operating this database could be a constraint, but the advantages would balance this expense. Note that the database must be periodically vetted to remove disqualified individuals. Furthermore, there is the legal and practical issue of who decides what individual is qualified.

e. Enhancement of Consumer Laboratories' Capacity

It is recommended that India's existing testing/certification facilities be upgraded and strengthened to meet the broad need for unbiased, independent evaluation. The availability of accurate, valid and up-to-date information and data on energy efficiency is essential to help consumers procure the most appropriate items. This should include a wide range of home appliances, thermal and electrical devices, and common systems used to increase energy efficiency.

Pro: Strong independent laboratories will fill the acute need for specifications and performance data for energy efficiency technology devices, giving information for consumers to consider and compare before purchasing.
Con: It is questionable if sufficient independent funds can be raised by the consumer community to maintain unbiased analysis.

Recent strong statements by the Prime Minister of India on the role of energy in maintaining the country's growth and the importance of energy conservation need to be recognized as the backdrop to these recommendations. In addition, the *World Bank: Investment Climate Assessment 2004* study of India indicated that India's expensive, inadequate, inefficient, undependable and unreliable electric power system is a bottleneck to foreign direct investments and places India at disadvantage from the international perspective. Furthermore, the recent CIA assessment of world economic prospects for 2020 ("Mapping the Global Future: Report to the National Intelligence Council's 2020 Project," December 2004; ISBN 0-16-073-218-2 www.cia.gov/nic) stresses energy as a critical element and points out that the role of trained engineers in India will need to be increased in order to sustain the expected high rate of growth. These geopolitical considerations should be viewed by USAID as supporting these recommendations.

Management and Administrative Recommendations

The following set of recommendations deals with project design and management, contracting, and other non-technical issues.

a. Advisory Committee. Any large-scale, complex contract that impacts a wide spectrum of stakeholders should have an advisory committee composed of key stakeholders, the program manager, and representatives of the Mission's contracts and programs offices. Moreover, it should be USAID's responsibility to make the advisory committee an active part of the program. This responsibility should not rest with the implementing contractor.

ECO I did have an advisory committee that could have been an effective tool in steering the project—guiding USAID and the contractor by serving as a consultative body. But while the committee was convened a couple of times, the Evaluation Team could find no evidence that it had been well utilized. It is not possible to be certain what a proactive committee's impact would have been. The Team can, however, speculate about what a skilled USAID manager could have tried to do. The committee could have been made an active management tool. Lessons learned and problems, technical and managerial, could have been shared with the stakeholders and USAID management in real time. Individual members as well as the committee as a whole could have been used to influence NEXANT, at an early stage, to move fast and make necessary personnel changes. The committee might also have encouraged the USAID contract officer to make necessary contractual changes when it became apparent that most of the planned activities were in a bottleneck, pending the issuance of the Energy Conservation Act. This might have helped to forestall many of the problems that plagued ECO I. While this is only a speculation, it does not absolve USAID from failing to use the committee more effectively. There is no doubt that making use of an advisory committee is a time-consuming responsibility and if the committee is not to be utilized properly, USAID would have been better off having no committee at all.

b. Contracting Mechanism, Performance and Management

It is recommended that during project design a strong collaboration be established with the contracts office to ensure that the contracting officer understands the nature of the project and its requirements. This will ensure the correct contract mechanism and proper measurables.

Any contracting mechanism for a project whose aim it is to introduce and fund innovative approaches to energy conservation through a partnership between the public sector (policy) and the private sector (investment) needs to be able to facilitate and not hinder the implementation of the project's objectives. Experience throughout USAID-assisted countries indicates that the timing of public-sector events—in particular, the enacting of new policies—is a highly political matter that does not lend itself to predetermined USAID timetables. Nor will events in the private sector, events that are associated with new concepts and innovation, move according to a USAID project schedule. Most development projects need the dynamic flexibility associated with this recognition. USAID/India failed to do so. The Evaluation Team recognizes that USAID **must** have a control and tracking mechanism associated with any project/contract. At the same time, the contractual agreement must allow both the contractor and the project manager to perform adjustments in a way that is

compatible with events evolving on the ground. Without this provision, legal constraints will spring up, giving rise to obvious conflicts between USAID and the contractor, fostering mistrust and leading to a poorly executed project.

Unfortunately, such a constraining situation plagued ECO I from the start. One example, already alluded to, will suffice. The Indian Energy Conservation Act, a cornerstone of the ECO project, went into effect a year after the project was initiated, although it had been anticipated that the Act would be introduced during the contract pre-award period. This halted many of the project activities dependent on the Act, constraining both the contractor and the Mission, since adjustments within the contractual mechanism were very difficult to make. Yet the contractor needed to be paid against deliverables. Payrolls needed to be met and expenses needed to be covered. With this inflexible framework, the contractor inevitably went ahead with an endless series of predetermined workshops and training activities, disrupting the integrity of the project by detaching the training/workshop activities, time wise, from the activities they were to support. Obviously, this has created friction, distrust and an extremely difficult working relation which have contributed to unjustified criticism by USAID.

As to meaningful measurables, it maybe instructive to quote directly from USAID India's website related to the training under ECO: "Over 2,500 person-days of training (including 3 study tours to the United States) have been organized for executives of utilities, regulatory agencies, financial institutions, ESCOMs, manufacturers, central and state policy makers." Is the measure of 2,500 person-days a meaningful measure reflecting content and success, or is it treating a development project on the same level as the manufacturing of paper clips where one can quantify production per unit time, shipments per month, etc.?

In the view of the Evaluation Team, some of the problems associated with the early period of ECO I could have been avoided if the Mission's contracts office had taken the time and made the effort to understand the nature of the proposed project. It seems that the contracts office had unrealistic expectations or refused to recognize that project activities whose execution depends on the speed at which the Indian government launches new policies or establishes new organizational units (like the Bureau of Energy Efficiency) require wide contractual flexibilities. These are realities imbedded in the local culture, which the Mission must have been aware of after so many years of work in India. Instead, for reasons the Team could not learn, the Mission decided on making this a fixed-cost, fixed-time, fixed-scope deliverable-based contract, under which the contractor, NEXANT, was to be paid on the basis of fulfillment of predetermined deliverables. This was a serious mistake when other, more suitable, fully proven contractual mechanisms existed—e.g., a level-of-effort contract. This unfortunate situation, coupled with poor staffing decisions and some other cultural insensitivities on the part of the contractor, soured relations between NEXANT and the Mission and set the stage for a split that created ECO II.

c. Private Sector Representation in Project Design. The majority of USAID personnel have no hands-on private sector business experience. Most consulting firms that support USAID have only limited marketplace experience. Any major project designed to impact the private sector, initiate and encourage investments, and stimulate creative entrepreneurship must realistically accommodate local business practices and conditions. To ensure that local practices, constraints and requirements are well accounted for, it is necessary to have adequate input from the host country business community. This requires USAID to ensure that an experienced local consultant, with appropriate private sector experience, is a member of the project design team.

d. Creativity and Risk. Creativity and risk-taking should be encouraged in projects that are intended to break new ground. It is inevitable when taking risks that some activities will fail regardless of good intentions and high level of implementation. The contractual mechanism with the implementing contractor(s) must accommodate such a set-up without de-motivating the contractor and certainly not penalizing the contractor for taking agreed-upon risks or/and introducing innovative ideas**.**

e. Collaboration with other USG Agencies. The merits of working with U.S. Government agencies should carefully be examined. It should not be assumed, a priori, that this is beneficial. Collaboration with laboratories such as Oak Ridge and LBL looks very good on the surface, but looking back and examining what real impacts such collaborations have had on the ground should serve as cautionary guidance.

Most U.S. Government agencies dealing with energy and environment, other than USAID, are basically domestic agencies, even though they often have offices dealing with international affairs. For example: the U.S. Department of Energy (DOE) is the agency designated to sign bilateral energy agreements with other countries. In most cases, DOE has less than adequate financial resources to implement these agreements. Moreover, in most cases DOE technical staff (mainly in the National Laboratories) has very limited experience and knowledge related to USAID-assisted countries. To discharge DOE's responsibilities under bilateral agreements, pressure is often exerted on Missions (as well as on USAID in Washington) to fund technicians in the National Laboratories to do work unrelated to USAID programs. This kind of pressure should be resisted, and most often is. When interests do converge, the Mission must carefully examine the merits of collaboration in terms of the knowledge the U.S. agency brings to the table, the cost as compared to using USAID consultants, and the management burden involved. Experience in the former USAID Office of Energy shows that in spite of internal USG political pressure, it is possible not to collaborate with other USG agencies if such a position is in the best interest of the Mission.

f. Partnership between USAID and the Private Sector. Projects dealing with the private sector and benefiting the marketplace should be cost-shared with the Indian private sector. Costs need not necessarily be shared via a contribution of money. It can be done in kind—e.g., by undertaking specific project activities, contributing personnel, etc. It is, however, logical for USAID to expect and receive

cost-sharing contributions from the private sector in India, since the country is among the upper tier of USAID-assisted countries, with a relative prosperous and aggressive private sector. Cost-sharing serves a very important additional purpose. It provides a validation that the activities undertaken by USAID are appropriate, meaningful and properly targeted and assures active participation by the partners who will continue the tasks after USAID has completed the project.

B. EPP

I. Introduction

The Energy Partnership Program (**EPP**) is a well-established international USAID program. Partnerships between electric utilities in USAID-assisted countries and their U.S. counterparts are intended to develop positive impacts by helping the international partners' senior executives observe and learn how similar U.S. organizations are structured, financed, managed and regulated. Partnerships also aim to establish a long-term relationship between the U.S. and international partners. In India, for example, where EPP has been operating since 1996, the objectives of the program for Indian utilities include the following:

- Gain knowledge about market-based planning, energy sector restructuring, and other issues from peers in U.S. organizations;
- Learn and adopt international standards and best practices for energy-sector regulation;
- Establish advisory relationships to discuss improved practices for operating and managing changes occurring in the energy sector;
- Compare different approaches to energy-sector regulatory and reform efforts;
- Improve management and organizational operations;
- Increase energy performance and efficiency in energy supply and utilization.

Partnerships are also intended to help U.S. executives to understand the dynamics of non-U.S. energy markets and to forge beneficial international alliances. They can help U.S. partners demonstrate their corporate social and environmental commitment, develop staff capabilities and international awareness, and compare different approaches to regulatory and reform efforts. In all these ways, the EPP is significantly contributing to the achievement of the Intermediate Result for USAID's Strategic Objective 16: "Improved Power Distribution in Selected States."

In India, three types of recent development impacts are noteworthy:

First, the partnerships appear to be making their Indian partners more self-sufficient in performing their functions without the assistance of others, tasks that they had previously relied on outside consulting/experts to help accomplish.

Second, Indian partners are patterning some of the changes they are making on the practices of their U.S. partners. India's Andhra Pradesh Electricity Regulatory Commission, for example, adopted new divisions of management and labor and produced a new annual report design, both based on those of its U.S. partner.

Third, partnerships are giving Indian partners more confidence, autonomy and credibility in independent decision making.

The Evaluation Team conducted a series of interviews/meetings in the United States (before departing for India) and a significant number of lengthy interviews/meetings in India, attaining a good overview of the EPP-India benefits, impact and

achievements. The list of the entities and individuals the Team met with are included in Appendix A.

II. Findings and Analysis

India's EPP is sponsored by USAID/India and executed through a cooperative agreement with the US. Energy Association (USEA). The Indian EPP has, for the first time in the history of the EPP, expanded the partnership to include not only the electricity utility but also its regulatory body in a number of states. By doing so, the program has by created an efficient mechanism for communication between the electric utility and its regulator, both in India and in the United States. This will enhance future understanding between all partners, and the USAID/India Mission, as well as USEA, should be recognized for this innovation.

The critical issues affecting the electric utilities and the regulatory commissions in India are well known and amply documented. It will suffice here to note that the utilities are in a transitional period, given their recent "unbundling" (decentralization) and partial privatization, while the regulatory commissions are generally weak and not operating effectively in all of the states. The EPP program, in the opinion of the Evaluation Team, has been very successful in helping both utilities and regulators during this difficult time. Highlighting a few findings will illustrate some of the contributions and impacts of this program on both sides.

- The partnership between North Delhi Power Limited (NDPL) and Baltimore Gas & Electric (BG&E) and their respective regulators has had a positive impact in the United States, since it created a more effective framework for a dialogue between BG&E and the Maryland Public Utility Commission. One significant benefit to India resulted from the visit of NDPL to the Training Center of BG&E, which has unique "hands on" facilities which did not exist at NDPL. Consequently the Delhi utility, using its own resources, created a similar facility (with appropriate adjustments for the local conditions). This center filled a gap in the Indian scene for effective training and rapidly became a model regional training center for other Indian electric utilities to use.

- The partnership between India's Reliance Energy and Arizona Public Service (APS) has been equally successful. For the Arizona utility, the interaction with their Indian colleagues allowed a re-examination of their own approach to local problems and demonstrated to APS how their Indian partner is solving similar problems with fewer resources. For Reliance Energy the interaction with APS was a validation of the approach they have taken to collect revenues from fringe customers. This interaction revealed the fact that some operational software used by Reliance is better suited to APS's needs than the software currently used in Arizona. As a result, Reliance provided the code to APS, thus improving operations for their U.S. partner. This is an example of the partnership providing positive technical support for U.S. and not just Indian participants.

- The Evaluation Team participated in a joint working meeting on November 16, 2004, at APS in Phoenix, Arizona, between the Reliance delegation and their APS counterparts. The meeting was also attended by a representative of USEA.

(An example of the APS meeting notes recorded by USEA is provided as Appendix B.) The Evaluation Team was impressed by the high level of the technical discourse, which indicated meticulous preparation on the part of both delegations. Furthermore, the openness and frankness of the participants at the meeting was impressive. For example, APS related the details of a recent (July 4, 2004) fire at a local Phoenix transformer station. This fire spread rapidly between several of the transformers at the site with adverse consequences for APS. The transformer station has since been rebuilt with firewalls installed between individual transformers. As it turned out, Reliance Energy has clear regulations requiring firewalls between all units in a transformer station. The details were presented to APS, which is considering adding this safety design as a standard feature for their facilities. This is another illustration of the potential benefit the partnership program can offer to **both** country participants.

- The partnership between the Delhi Electricity Regulatory Commission (DERC), the Public Utilities Commission of Ohio, and the New Jersey Board of Public Utilities is another illustration of the benefits of the EPP. The DERC has entered the partnership at a very early state of existence, having no previous experience or expertise. The meticulous process adopted by the USEA in preparing a short list of U.S. regulatory entities, based on criteria prepared by DERC, has allowed the selection of appropriate U.S. partners, building confidence inside the organization of the Indian partner. The visit to the United States by the Indian delegation also exposed the delegates to the broader business practices in the United States and has been beneficial in helping DERC overcome the initial hurdle of starting a regulatory commission from a zero knowledge base.

- The partnership with North Delhi Power and BG&E included an excellent exchange on security concepts designed to mitigate potential threats to the operations of utility facilities from inside and outside the organization. This included an overview of the changed perspective since 9/11 on security, transport, hazardous materials movements and communications. Effective methods of metering and of monitoring and mitigating energy theft were exchanged between both sides.

- It is important to mention here the issue of gender equality. Women have been noticeably absent from participating in this partnership program, but awareness of this gap could provide an opportunity for positive encouragement of diversity for selected individuals who have the potential to move into management at the electric utility or energy agency. This issue has been problematic in the electric power sector, as well as in the oil, gas and coal sectors, for many years. These are areas of expertise in which women in the United States as well as in the developing countries have not been participating in a meaningful way. Dealing with this issue downstream, i.e., at the workplace and at a high level of management/operations, has been ineffective. One needs to deal with the cause of the problem and not with the symptoms. The issue may be handled more effectively and properly by USAID considering a separate program, in conjunction with the energy industry, to encourage and train women to enter the field through study at management, power/mechanical and electrical engineering schools. Exposing young women to the challenges, the importance and the benefits of doing so would be in the center of this program.

Having said this, it is important to note that in activities related to village electrification and revenue collection activities in rural communities, women often play dominant roles. In components of other USAID projects, such as the ECO project, this participation improves electricity distribution and increases revenue collection, since women are actively involved in rural community affairs. This is true in India as well as in other Asian and African countries assisted by USAID.

- Assessing the cost-effectiveness of each partnership activity could be helpful. However, the cost-effectiveness of the partnership cannot and should not be measured by the number of professionals traveling across the ocean and being "trained." Such quantification often leads to both distortion of the achievements and inappropriate implementation by contractors eager to be paid "according to performance." While this is not the case here, where a cooperative agreement is the underlying implementation mechanism, USEA could nevertheless be asked to develop some acceptable economic criteria for measuring the effectiveness of the program for USAID to consider. For example, qualitative measurements might include the level of dispersion of information after each exchange within each organization, particularly at the decision-making level. Defining these criteria better could help USAID Missions to assess the relative cost-efficiency of the EPP's activities.

III. Conclusions

The Energy Partnership Program in India is a highly successful activity. There is no doubt that it has contributed substantially to the improvement of India's utility and regulatory concerns operations. The basic characteristics of these successful partnerships reflect the USEA's mature, well prepared and excellently implemented program. Over the years USEA has "debugged" the program, and it requires no changes in approach or new major changes in management. In general, because of the intensive and professional preparation by USEA, EPP partnerships do not fail. It is true that there might be cases in which the matching between partners is less than ideal. This is generally due to the fact that not all U.S. utilities or regulatory bodies participate in this voluntary program. This is to be expected and is intrinsic to such a program. Sometimes, a partnership stumbles due to last-minute cancellation of travel or other logistics problems on the part of the Indian partners. Such cancellations may stem from internal politics, unexpected changes of availability, or a shift in priorities for the individuals involved. While costly and disruptive, these concerns are impossible to predict or prevent, even with meticulous preparation and a signed commitment from each partner. Such occurrences must be accepted as a "built in" expenditure that one must live with.

The benefits derived from the EPP need to be looked at in the context of the specific changes taking place in Indian electric utility sector. New regulatory bodies are being established on a national and state level. Often they are without appropriate first-hand knowledge and experience. Transmission and distribution entities, whether privately owned or state-owned, are operating in a new environment and are facing challenges that need to be overcome in a relative short time-frame. Power shortages and rising fuel costs continue to place heavy pressure on generation utilities to

improve their operating practices. While there is no shortage of qualified Indian professionals, the intellectual discourse offered by the EPP can provide an important and effective means to increase experience, self-confidence and improved practices in the Indian electric power sector.

IV. Recommendations

The increased self-confidence within the Indian electric power industry, the high level of the professionals in the sector, and the effective linkages between Indian professionals and energy entities in the United States and elsewhere suggest that India may have graduated from the need to receive help through the EPP across the board. The ubiquitous use of information technology in India is a powerful tool for continuing and building on the success of the EPP. Consequently, the Evaluation Team suggests the following:

- Given the relative weakness of the regulatory bodies of India's states and the increased role they must play in the very near future, it is recommended that USAID/India consider focusing new EPP activities primarily on (1) strengthening the state regulatory bodies and (2) working with small state-run electric utilities that have shown their willingness to "reform" and have the potential to significantly contribute to their service areas.

- Now that the unbundling of the power sector has not created social upheaval and that more Indian legislators better understand the need for further reform of the utility sector on one hand, and the importance of the oil/gas shortage on the other hand, the time is ripe for USAID/India to work effectively with legislative representatives to improve their international perspective. USAID should consider including legislators, whenever possible, as members of the utility or regulatory exchange teams. To some extent this has been done in the past—for example when the former Minister of Power in the Delhi Government, Ajay Maken, visited the United States along with the team from the Delhi Regulatory Commission. Such an expansion will enhance the perception and understanding of the Indian Participants as to what has to be done to improve the Power Sector operation.

- The Electricity Act of 2003 contains provisions to support electrification of rural areas; in fact, the Government of India is aiming at complete electrification of households in the next five years. Almost 56% of rural households do not currently have access to electricity, and in many states in India as much as 80% to 90% of the rural population lack access to electricity. Where electricity is available the quality is often poor and unreliable. This could provide an opportunity to initiate partnerships with vigorous electric utilities from rural states in India to help improve this dire situation. The Electricity Act of 2003 also provides for the preparation of a national policy for rural electricity supply by institutions, user associations, cooperative organizations and NGOs. This could provide a vehicle for USEA to assist in this effort by initiating new partnerships with similar U.S.-based planning and research organizations.

- The need for diverse public information and policy support is evident at the Rajasthan Electricity Regulatory Authority, located in Jaipur, a rural region where

education and information about electric tariffs and energy conservation is lacking. The consumers appear to have little understanding of the relationships between electricity costs, tariffs and consumption patterns. An example is the tendency of farmers to buy the least-cost pumps for agriculture needs. These pumps are also the most energy-inefficient, but life-cycle costing information is not available or unreliable, making it difficult for the farms to make good decisions. The regulatory mandate for energy conservation information is currently undefined for this region but could be helped by an appropriate partnership initiative.

- Finally, in discussions with Indian partners of the EPP it became clear that all would have benefited if one more visit (to an additional partner) could have been arranged each time the Indian delegation traveled to the United States. The logistics of this modification should be seriously considered in the future. Considering the time invested by each participant, an added day or two could provide valuable exposure to an additional venue. If the costs are a concern, the additional expense seems to be relatively small and could be partially offset by USEA exhibiting a bit more fiscal restraint. For example, less expensive hotel accommodations could be selected. Though Indians are known for their gracious and generous hospitality, and it is natural for their American hosts to wish to show the same hospitable spirit, most Indian participants indicated that they could manage, and indeed expected to manage, with less comfortable accommodations than those USEA has provided.

5. Stakeholders Meeting: Findings and Analysis

In the midpoint of this evaluation, in the course of broad discussions with USAID, energy experts, government decision makers and others involved in energy efficiency and conservation activities, the Team noted an apparent consensus emerging regarding the most critical needs of the energy conservation community. In reflecting on this fact, the Team decided to consider organizing a stakeholders meeting to ascertain whether such a consensus indeed exists, and if so, to take advantage of the presence of the key stakeholders to vet these ideas.

The Mission was supportive of such a meeting. In addition to the vetting and the development of a sense of ownership that such a meeting imparts, it also offered the advantage of opening the door to bringing stakeholders early into the concept and design process—and beyond—for ECO III. For USAID this may provide assurances that the interventions planned are consistent with the host country's needs. Moreover, such a gathering may gain friends for the upcoming program who down the road will help USAID with obstacles during implementation.

The Team, in collaboration with the Mission, developed a number of ideas for presentation and discussion by the stakeholders. The discussions were designed to provide an open forum for further dialogue among those with a broad understanding of this topic within India. It was recognized that if a consensus, complete with a prioritized list of topics, emerged from this meeting, then the stakeholders would have assisted in defining the future direction and scope of the ECO program. The ideas presented for discussion at the stakeholders meeting on Jan 19, 2005, were:

- *Energy Efficiency/Business Educational Facility*
- *Energy Efficiency/DSM Consulting Facility*
- *Platform for a Think Tank*
- *Creation of an Indian Energy Efficiency Association*
- *National Experts Database*
- *Capability Enhancement of Consumers Laboratories.*

The meeting was well attended. Furthermore, almost all of the attendees took part in the discussions. The agenda and the list of participants are included as Appendix C and E respectively. The above six ideas, slightly elaborated, are given in Appendix D as presented at the meeting. All attendees concurred with the priority of the recommendations as they have been presented. Strong support was expressed for the first five ideas. There were some reservations whether much can be done to enhance the capabilities of the existing consumer laboratories in India (recommendation 6), particularly if they are to remain properly independent. However, this idea was not rejected.

Energy Efficiency/Business Educational Facility. As one would expect, the discussion of the first topic indicated a wide agreement that the acute shortage of well-trained energy efficiency professionals is a serious barrier. All agreed that increasing the availability of professionals who can provide a bridge between the energy consumers who need and want to introduce conservation measures and the

lending institutions that facilitate investments will make a major contribution to India's energy efficiency. At present, energy services companies are not growing and taking root, and the Bureau of Energy Efficiency will be hampered in discharging its obligations in accordance with the Energy Conservation Act. Not only is existing demand unsatisfied; awareness building is also needed, and it is likewise limited by a shortage of such professionals. Institutionalizing training at a recognizable university level will remove this major barrier to the financing and deployment of energy conservation measures in the marketplace. Undergraduate university education, coupled with a strong hands-on apprenticeship in industry **and** in lending institutions, will provide India with a new breed of energy engineers and fill a gap which is so severe on the national level. This institutional training is not intended to replace the current NPC activity targeted at professionals seeking a career change.

The discussions indicated that such an institute is a critical requirement whose parameters must be carefully defined, since the design and implementation of a new institute will impact many sectors. The emerging energy efficiency market will be constrained by the lack of critical skills that only a specialized institution can provide. A concern exists that though the market will create the demand for energy efficiency experts, several years may elapse before the training of this new cadre of professionals is completed. A short-term alternative form of additional training can be provided by part-time certification courses for practicing engineers, energy efficiency training at vocational institutes, and energy efficiency electives at existing engineering facilities. The gap between energy and financing expertise can also be approached by training bankers and financial experts in the energy efficiency and related engineering concepts and awareness. The broader requirements for energy auditors and managers to understand concepts outside their current curriculum should be addressed. There are a number of state and government training institutions which could also participate in this training requirement.

There was fairly wide agreement that such a training program should be considered as part of undergraduate engineering degree programs (perhaps specifically within India's better engineering schools), coupled with hands-on apprenticeship elements.

Energy Efficiency/DSM Consulting Facility. The idea of establishing a for-fee consulting facility to help firms and public entities replicate experience gained was discussed with interest. The discussion revealed the desire not to limit this activity to DSM alone, but rather to consider including other sub-sectors of energy efficiency as well. Discussants supported spreading experience and success by doing, rather than by telling, and encouraged finding ways of involving industry. It was felt that the experience gained at institutions like the Noida company, MEDA, and others that have implemented effective energy efficiency measures must be disseminated on the ground, not just at presentations and workshops. Professionals with the experience and expertise must be encouraged to go out into the field and assist, for a fee, other institutions that are too weak to do this on their own. A consulting-type facility that will allow the effective utilization of these professionals can be a powerful mechanism to spread energy efficiency measures. This is true primarily at those institutions and other entities needing help. The advantage of such a facility is twofold: first, the facility and its consultants will be perceived as more trustworthy; second, a process using such facility will in most cases eliminate the need for a

tender, save time, and eliminate unqualified bidders. A case in point is the work done by MEDA for the Pune municipality.

The discussants indicated that expertise should be available, but that it must target the energy-intensive sectors instead of diversifying over a wide range of industries. A series of models and pilot projects for energy efficiency could be developed for replication by a number of experienced entities beyond Noida and MEDA. The energy managers and auditors of the large companies could provide background support for small to medium-sized companies within each industry. The support fee requirements for some weak companies could be supplemented by the successful members.

Platform for a Think Tank. The discussions of the platform for a think tank reflected widely disparate interpretations of what a think tank is all about. It took some time to sort out the difference between a community-wide Internet "blog"–like facility for every stakeholder and an independent policy contemplation forum. Once the idea was clarified as a policy-influencing concept, the discussions started to converge and wide support was expressed. While many independent research institutions in India do investigate and recommend policies, these outcomes are not evolving from within the energy efficiency community. Any issue as complex as energy conservation in a diverse, open society like India involves the need for resolution of many conflicting interests. What seems to be missing is a dedicated platform where representatives of manufacturers, utilities, policy makers, consumers, lenders, advocacy groups, etc., can jointly spend a prolonged period of time free from organizational pressures. This would generate conflict resolution agendas for the community at large, be a depository for "corporate knowledge"—countering the negative consequences of short-term appointments—and maybe enhance the knowledge base of the participant's institutions. Such a facility could be considered as part of the training institution discussed above.

Creation of an Energy Efficiency Association and a National Database. There was nothing but full support for the idea of getting a national energy efficiency association going. Discussions have been held on this issue in the past, and USAID consultants, in collaboration with German Technical Cooperation (GTZ), have highlighted some guiding principles for such an organization after holding extensive discussions with industry representatives. The idea never came to fruition because of the unavailability of a dedicated champion. No barriers or difficulties, real or perceived, have been revealed during the discussions, and it was opined that USAID could serve as a capable catalyst to bring such an association into life. The merits of any professional association are obvious. It provides, among others, professional status, networking, advocacy mechanisms, and a force for the promotion of energy conservation. The time has come to accelerate the formation of an Indian association dedicated to energy efficiency.

As to the database, this is meant to be a centralized listing of experts in the field of energy efficiency, initially a modest effort. Perhaps each state energy agency can collect local data and the Association will maintain the national record. The database could also be kept at the Confederation of Indian Industries or even at the future training institution(s). The idea of a centralized database was supported by all, with a consensus in support of centralizing information not only on available practitioners

but on validated successful projects, too. The concept must be carefully developed since the need, as all agreed, is acute. The listings should range from the corporate level to individuals. It was pointed out that a number of energy efficiency databases exist that can and should be collected should this activity be undertaken. It was also pointed out during the discussions that currently there are some partial databases that use conflicting criteria, provide different results and have internal incompatibilities. Also, a concern was expressed that any database that might provide "negative" data could spark litigation; this issue needs attention.

Capability Enhancement of Consumer Laboratories. With the increased need to provide energy efficiency specifications of consumer goods and other efficiency equipment, including specifications related to energy conservation in buildings, it is clear that independent testing is critical. While a number of such laboratories exist, it is appropriate to examine their unbiased independence on one hand and their abilities to meet future demand on the other. Any perceived deficiency needs to be removed and their operations strengthened. At the onset of the discussion participants seemed to feel a need to distinguish between the concept of an independent testing laboratory that provides basic data to consumers (which was the topic under discussion), and a testing laboratory that certifies standards (and is usually dependent on government support). The discussions indicated that independent and unbiased laboratories are essential sources of energy efficiency data, but sustainability is a major concern. There have been a number of labs in the private sector that have failed due to lack of financial interest while government-funded labs have flourished. Participants felt that a lab must be self-sustaining, and that funding must come from the consumers of the information and data; however, this has not been a successful model in India. It was suggested that a broader concept lab, focusing on the sustainability, energy efficiency, and cost competitiveness of products, could be more viable.

Conclusions and Recommendations

During the entire meeting, and cutting across all topics, the discussions also dwelt on implementation issues. While this was not called for on the agenda, it nevertheless constituted an expression of support for the ideas presented. At the same time, it highlighted many issues and guiding principles that will require careful attention when follow-up work is undertaken. This aspect of the discussion not only confirmed the validity of the six ideas that the meeting focused on, but also reflected enthusiasm for going one step further to develop the ideas discussed. This is evident from the participants' willingness to serve as ad hoc working teams in developing a set of "development/implementation principles" for each topic. The composition of these groups is given in Appendix F.

Evaluations, of course, generally end with a report—and the process of improvement represented by the evaluation often comes to a temporary halt at the same point. Indeed, a considerable time may elapse between the adoption of the report's recommendations and the actual taking of the next steps by USAID. This is usually the result of the need to have stakeholders examine, comment on and vet these recommendations. The Evaluation Team suggests that USAID take advantage of the unique opportunity presented by the discovery of such a broad consensus to move

forward on the Team's and the stakeholders' suggestions in parallel to the finalization of this report.

6. Appendices

Appendix A: Contacts

(will be transmitted later as a non Word document)

Appendix B: EPP APS-Reliance Exchange Notes (partial sample)

Trip Notes
Reliance to APS and TP
November 15–19, 2004

Participants – India

Prashun Dutta
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Participant – USEA

Tricia Williams

Participants – APS

Scott Gudeman – Manager, T&D Business Integration
Larry Daniel – Director of Construction
Pete Atwell – Director of Maintenance (substation and distribution lines)
Stan Sierra, Manager, T&D Asset Management
Tommy Friddle, Manager, Distribution Operations
Earlene Burris
John Culwell, Section Leader Corporate Security

Participants – Tacoma Power

Steven J. Klein, Superintendent
Dave Ward, Assistant Transmission & Distribution Manager
Rachel Allen, Professional Engineer, Transmission & Distribution – Planning
Diane Lachel, Government & Community Relations Manager, Click! Network
Paul Svoboda, Real Time Energy Trader
Diane Brignone, Lead Trader, Real Time Energy Trading
Andrew Evancho, Senior Utility Economist
Larry Hoffman, Utility Economist
Bill Privett, Assistant Manager, Transmission & Distribution – Substations
Cathy Leone-Woods, Assistant Manager, Transmission & Distribution - Planning
Tuan Tran, Special Project Engineer, Transmission & Distribution - Planning
Megan Queen
Randy Karr
Joe Gillespie
Nick Tomanelli

Discussed FERC mandates with transmission in particular – siting. Reliance wants info on RTOs and FERC's attempts to create them.

Larry Daniel – Director of Construction
Pete Atwell – Director of Maintenance (substation and distribution lines)

RTO – scheduling, dispatching of transmission. Argument is that APS and area are already doing it at operational level – why put another layer of bureaucracy to cost more money? If linked grids, then would be more benefit.

Do not outsource any maintenance except tree trimming. Will contract trenching etc. but for most part due it better than others. Will contract some construction on an as need basis – most civil work is contracted out (digging etc.).

3000 employees are at nuclear plant. About 2400 employees for admin, meters, construction, everything.

How is APS organized? 5 divisions with distribution, construction, maintenance in each division. Each division is independent from a distribution level (meters, cust svc, etc.). What activities are centralized? HR, procurement, financial, legal, planning, transmission, regulatory.

Each division is a profit center? Roughly – should be but not quite. Phoenix has the most people so the other regions are not profit centers cuz their cost of doing business is much higher but has the same rate. Basically Phoenix is subsidizing the more rural areas.

Central group for planned maintenance? Set up maintenance programs and mandate standards and programs to divisions to perform this particular function (Stan tomorrow – is asset manager).

Cost plus basis for returns. Only have obligation to serve first 1000 feet from nearest service point, after that, customer pays. Adding on new customer is cost effective becomes more important with open access in distribution.

UK regulator – deep and shallow connection costs to deal with this issue of open access/competition.

Equipment changed is caught at division or central? If cable fault in a division, is fixed at division level (day to day). If have to replace large section (major), is organized at central level and work might be done by central also.

Have high SAIFI feeders from central level.

Reliance recently reorganized. Central is asset management and larger corporate initiatives; divisions have operations and maintenance and day to day maintenance, meter to cash, customer service. Question of how central and division coordinate cuz central has priority on major projects.

Does the volume of construction require duplicate set ups in the divisions? Yes. A division may have 8 3-man crews.

Are you complying with performance standards? Divide it between metro and state (takes a while to respond) but get judged on combined standard by regulators. Paid a penalty for non-compliance? Not yet, doesn't have a financial consequence now but will someday.

Do you have GIS? Yes. All customers mapped? Majority but have some backlog due to new customers but mostly there. CIS has link with GIS and trouble call center. EZRI platform for GIS. Would like to get to a GPS system. Use ESRI for trouble call? No, have another system for OMS. Moving towards new distribution automation system (remote switching, trouble call, etc.) through ABB system. May combine T and D in one group.

Operating substations and T lines that are jointly owned, if capacity gets reduced, who's power flows through it? In proportion to ownership. Who operates and maintains lines? Depends on whose service territory it is in – put in construction agreement.

Do you have a central transmission company? No.

Reliance wants to see distribution automation system. At what voltage level can you trip transformers? Distribution feeders at the feeder level. SCADA up to 12 kv and automation of capacitor banks.

Largest single phase transformer is 167 kva single phase pole mount. Largest pad mounted single phase is 167 – three phase up to 2000kva.

Meter reading is optically downloaded. Not AMR cuz have to physically go to meter. Meters are Schlumberger. Mixture of electric mechanicals (commercial), hybrids and solid state. Majority buying now is solid state.

Financial – Earlene Burris

300,000 customers on ebilling to turn off hard copy.

Average is a 30 day bill. Can estimate bills.

How do you bill if a meter is burned? Take last year's same month, previous month last year and this year. Laid down by regulators? In negotiations right now with estimating process. Was an agreed upon standard.

Prepaid meter concept? Customer can choose to pay in advance but no formal plan. Very costly.

Total losses non-technical? .16% of revenue.

Billing software is IBM and modified it. What platform?

Only give one month – then disconnect notice. Working on redoing disconnect bill so it is more obvious. Then put a door hanger on customer's door that says they have 24 hours to pay or be disconnected (80% pay after receiving this).

Charge $25 for residential reconnect; $35 for commercial. Field visit to put door hanger is $15 fee. Field charge to disconnect is $15. Disconnect pulls meters, puts boot on and locks it.

Discussions on moving without paying – applying for new connections at new place, how to recover revenue. Lots of issues of who is responsible for paying and the issue of moving for Reliance.

New deposit campaign – if they move, with first delinquency, send them a notice saying they will owe a deposit if they don't pay right away.

Meter reader routes optimized? Yes.

Average salary for meter readers? Paid very well, so collusion would be low.

How do you assess consumer if meter was 20% slow for 6 months? Can only go back 3 months.

Tuesday, November 16, 2004

Security – John Culwell, Section Leader Corporate Security

Nuclear security? India is moving towards private companies owning but may not be able to afford security. Is it paid for by government? No, utility covers. NRC has required stringent security – APS had to hire 100 new security. Feds talking about putting it under government (Homeland Security) but APS against cuz don't want

more regulation. More concerned about someone doing something with the waste, not with someone getting in.

How do you protect it against airstrikes? Outside containment building could take direct hits from 2 simulataneous 747 – would have to come in at an angle which would reduce impact. Rebar is 6 inches in diameter.

Helicopter overflights, drive bys of transmission lines, subs inspected once every 30 days.

Don't believe technology has reached level where convergence of physical and computer security is viable.

Post 9/11 now have to pay attention to changing nature of threats faced; do threat assessments (also from theft perspective – can ID where theft is likely to occur) and identify countermeasures to mitigate threats. Business recovery policies have been revised and enhanced. Do have violent confrontations with people who are cut off (shootings – more violent than it was).

Now recirculate air inside APS buildings so not exposed to biochemicals etc from outside.

9 major co-owned substations with SRP.

After transformer problem, now will you be keeping them in inventory? It was so huge and expensive – will take 2 years to replace transformer that they borrowed. Doesn't really make good business sense to keep one but such political pressure that now APS will have one spare on site. Do the utilities in the area use the same equipment (standardized)? Have agreements with utilities for inventory, assistance during disasters, etc.

Redundancy in generating plants – can burn gas or oil too.

Protect key personnel in company? Yes.

Energy Theft – John Culwell, Section Leader Corporate Security

Taken very aggressive approach in benchmarking within company and with other utilities. Used to prosecute everyone but all APS got was a lot of paperwork for minimum gain. Not selective in prosecution – but don't file on people who can't afford to pay. Will prosecute if they violate integrity of system if they tap illegally.

Do a lot of statistical sampling – allows APS to direct resources. Problems with small commercial tend to be the worst (especially small grocery stores).

APS estimation of losses is based on regulator's methods – APS claims they don't know how to do this so is creating problems.

Get great deal of help from field and meter readers.

1.72% of meters had diversion activity. .518% revenue lost to diversion/theft = $8 million loss (not including wholesale and industrial). Have a team of people assigned to each industrial customer (uses at least 1MW of power/month). Commercial customer brings in a document indicating a partnership or incorporated entity (not based on usage).

Measuring meters (each one represents average of 1600 meters and an average of $8600 for commercial; $1100 for residential).

Historical bill comparison, employee leads, meter testing programs (must be within + or – 1%), computer analyses, and telephone "hot lines" to detect energy theft. Bench testing at company level.

Only recycle meters with old accounts (pull a meter cuz account closed, then test it and put it in existing service) – for new accounts only use new meters.

Benchmark with EEI. Pretty close or better than other utilities in number of cases of theft (APS is higher, lower in cost of prosecution).

After one case of seal tampering, put a lock ring on the meter.

Laws to deal with theft? Until August 29, 2004 theft of electricity was not illegal. Before: using theft of service (hard to determine how much the person stole), and whether tampering was reckless. Now ARS 13-3723 is more specific. APS now does not have to prove it – if you are the beneficiary of the service, than you are presumed that you are the one who tampered with it.

Don't have widespread AMR – have a pilot program now. One area of interest is that inside meter can go as high as 200 degrees F. Remote disconnect of AMR is of interest to keep meter readers safe.

157 meter readers make 49,000 reads a day.

Who's responsibility is the inside wiring of the house? Electrical inspector (government – city or county provides the service) inspects before APS can install a new meter.

What are provisions of law for theft? Used as hammer to follow through with provision (paying the bill) – could go to jail for a year.

19 similar laws in the US states.

Transmission

John Lucas – Manager, Equipment
Pete Atwell – Director of Maintenance

Maintenance Practices and Frequency

Moving toward Reliability Center Maintenance (RCM)

Preventive maintenance schedules by APS or NERC? APS, each utility has own maintenance. Based initially on manufacturers' requirements then adjust for APS environment.

Questions on RCM approach. Look at criticality of equipment, how much load it carries, and fault currency; prioritize equipment on that and then determine how often maintenance needed for the equipment.

Types of breakers? Mixture: vacuum, oil, air blast etc.

SFA is Westinghouse (SF6) – 2 pressure breaker.

Does age have a great affect on cables? Age is big factor in underground. All cables from 25 years on is all earmarked for replacement. Already done over half of system. Oil filled are older and haven't had many problems with them (also loaded less than others). Dutta says had study that said age not as much as a factor (but are only 70% loaded). Would reconfigure system to take load off cables that are at 100% - add feeders. Average loading is 50-60% but summer is much higher.

Discussed cable faults – Bombay due to moisture, Delhi due to overloading.

Had 256 different types of breakers – kept spares for any types that had more than 50 on the system. Eliminated a lot of the 2s and 3s breakers through changing them out due to age or lack of spare parts.

Switching to open air from gas breakers.

Went for GIS for maintenance or due to space constraints? Both.

Kelman Breaker Analyzer of interest to Reliance. It gives footprint of breaker to compare over years to determine.

SF6 gas moisture content – device that pulls a small sample of SF6 to see if water is getting in system and breaking down the dielyctic.

All new relays are microprocessors – all 230 kv and above will be microprocessors. 70% of distribution are electromechanical. 80-90% of stations have SCADA.

How do you isolate fault on 12 kv feeders? Just breaker; have fault indicators in cabinets is a CT on individual phases. Relay at substation will also indicate.

Moving towards electronic controlled series capacitor banks to reduce maintenance.

Had lots of problems with valve batters – use lead acid.

How do you measure internal cell resistance (batteries)?

Distribution system is radial except for downtown which is a ring operating as a radial system.

Face problems with unbalance? Yes, have problems with ground currents – monitor and if they start seeing an increase they'll go balance a transformer or reconfigure the system. Minimum ground current is 180 amps (trip at that) but start looking at it at 100 amps.

Have auto-reclosers? How do you place them? If a feeder breaker cannot see the end of the line, will put auto-reclosers in. How many transformers on a distribution feeder? Load feeders up to 10 MW.

Face problems with underground transformers with rain? Not much rain here. What is need for underground? Many cities will not allow overhead/outside.

Use Switzer SCL for relays – consider they are the best and less expensive. Thinks he's trying to go international – might want to contact them for membership.

If customer requests 3 phase but has low usage, do you have to give it? They have to pay extra.

Questions of who owns street lights, how metered (isn't), who maintains? Bombay is now saying groups of street lights should be metered.

Voltage sag problems due to long feeders? Use regulators and capacitor banks to control that. Haven't looked at distributed generation? Have. Built some solar but most remote locations are grid connected.

Discussion of West Wing – 4 banks of transformers; 500 kv, 345, and 240. 3 banks of 500 MVA each for total of 1500. Lost 4500 MVA in the July 4 transformer fire. Took 3 days to put in new control cable to get two banks back up. Took about 20 days to get single phase transformer from BPA. Fuji was the manufacturer – brought 2 engineers in to help with installation. Restored power to that bank by August 9.

Insurance doesn't cover lost revenue.

Have smaller mobile transformers.

Questions about manned substations.

Site Visits
Visited meter shop, saw testing facilities, underground fault locating equipment, equipment yard (single and triple phase transformers – pad mounted and pole).

General Discussion
Total loss is 9% at APS.

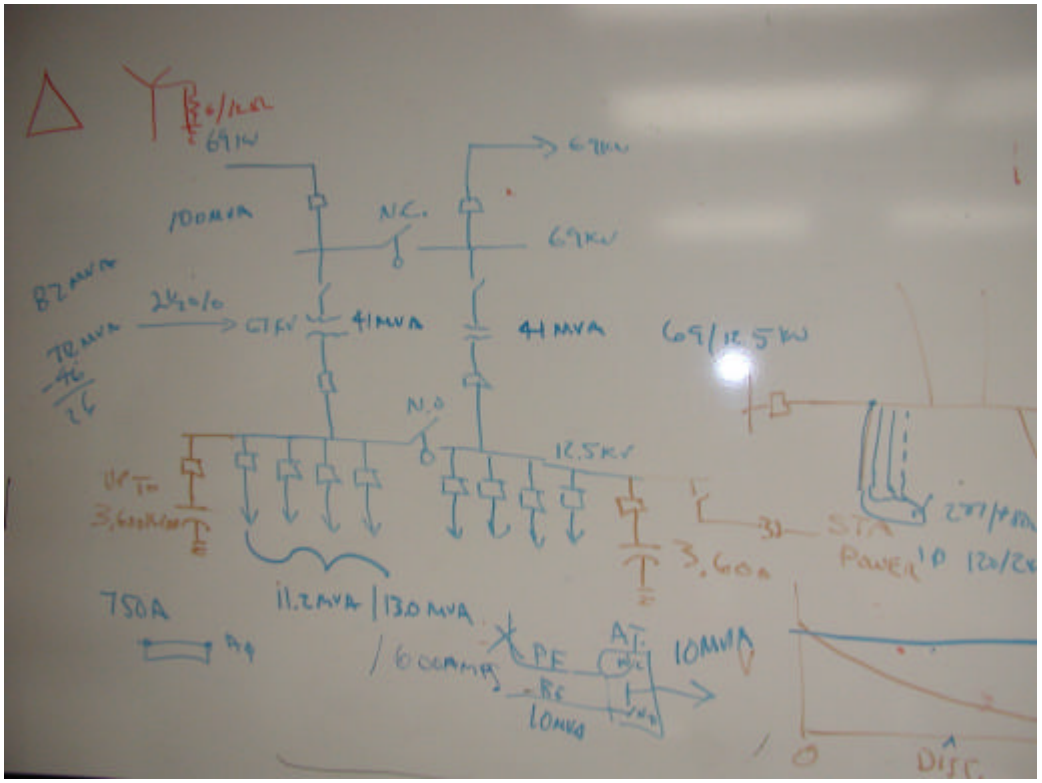
Asset Management – Stan Sierra
Distribution operations planning (short term – current operating year) and distribution planning (long term) – both centralized.

Load forecast more for system planning, not power procurement.

How do you forecast 10 years out? First 3 years pretty accurate but after that difficult. For distribution develop an expenditure development plan for 7-8 years for infrastructure. Put capital money down today for land for substations/siting due to increase in pricing.

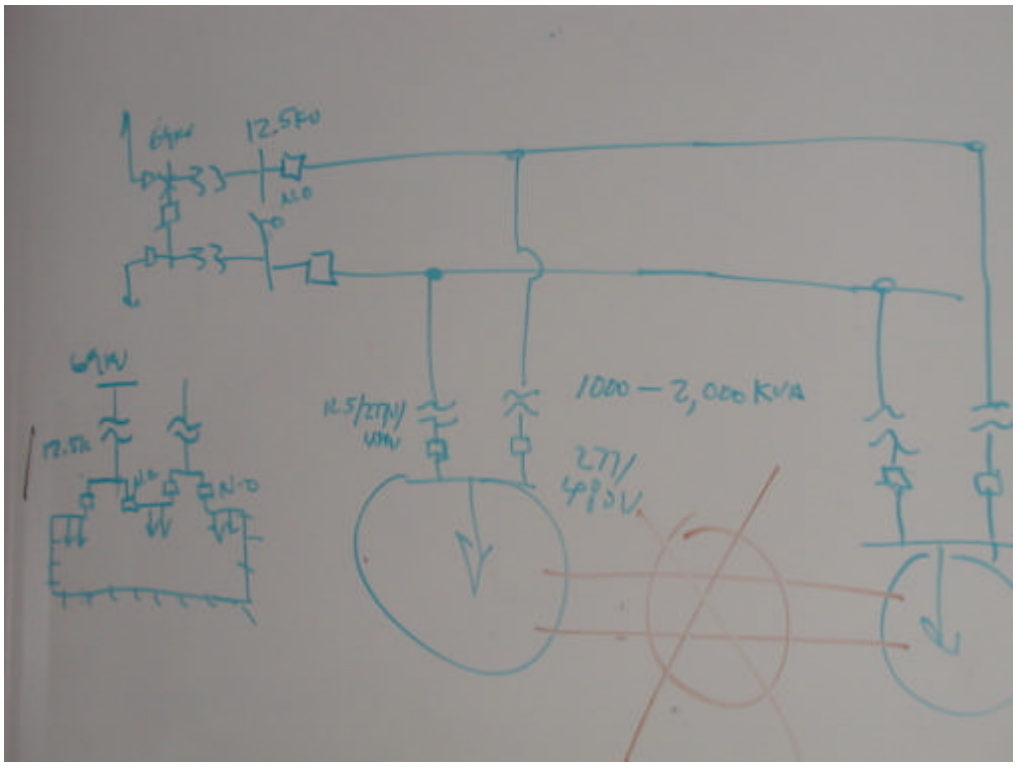
Use land use plans to determine city's plans to expand (future land use) – are usually pretty accurate. Problem in India is that lots of unplanned expansion going on which makes it hard to predict load (slums in particular). Also use contractors' plans.

Distribution substations – delta on high side, wye on secondary. Design for 2 transformers interconnect with 4 feeders (11.2 MVA). Use all aluminum conductors but don't use much ACSR. Put poles close together in the metro area so don't need ACSR. Use a lot of shunt capacitors on feeder for voltage regulation (capacity is 1200 kvar – looking at 1800 kvars).



Installed capacity to demand ratio – no ratio, just design to 72 MVA – if more, than use 3 transformers. Don't worry about no load or full load losses on APS system. Dominant factor is capital investment cost.

Network system – put bus tie (69 kv breaker) for spot network. Spot secondary network because power flow isolated to certain customer. Dedicated network feeders. Dutta said this is far more expensive option than theirs. Parallel transformer at secondary site so customer has no momentary interruption (for hospitals, high rises, etc.).



Question from Dutta about looking at new technology down the line and training staff to deal with it in the future. APS has a technology organization which looks at all types – always looking for more automation.

Specs for equipment is responsibility of substation group or standards group.

Don't get full cost recovery. Regulators lowered rate of return to 11.5%. In cost plus tariff scenario – Reliance says this leads to utilities spending more – before you invest, regulators will not allow you to invest in anything until prove that it is of benefit to consumers. APS: only happens when we go in for rate increase. Their control is that they say how much APS can put into rate base – rest has to come out of profit so can't arbitrarily spend what we want.

APS: competition lead to lower rates – rates decreased over last 10 years. Growth helped with revenues so didn't need change in rate. Long term fuel contracts and procurement. Luxury of low interest rates too – refinanced to drive prices down.

Data Center – Reliance wants more info. Dutta has instructions to put one in place.

How is telecom done? Any vendor using? No operating center – have a switchboard. Limited telecom group that deals with radio frequency and go through local vendors for phone service.

BPA sells data on equipment it has tested – has a massive testing facility.

Appendix C: Stakeholders Meeting Agenda

USAID-India

ECO Stakeholders Meet

Facilitated By Development Alternatives
Venue: Maple Room, India Habitat Centre
Wednesday, January 19, 2005

AGENDA

09.45 a.m. – 10.00 a.m.	Tea and Coffee	
10.00 a.m. – 10.15 a.m.	Opening Remarks by USAID	
10.15 a.m. – 10.25 a.m.	Introduction of Participants (Facilitator)	
10.25 a.m. – 10.55 a.m.	Topic No. 1:	Energy Efficiency / Business Educational Institute;
10.55 a.m. – 11.15 a.m.	Topic No. 2:	Energy Efficiency / DCM Consulting Facility
11.15 a.m. – 11.30 a.m.	Tea	
11.30 a.m. – 11.45 a.m.	Topic No. 3:	A Platform for a Think Tank
11.45 a.m. – 12.00 p.m.	Topic No.4:	Creation of an Energy Efficiency Association & a National Experts Data Base
12.00 p.m. – 12.15 p.m.	Topic No. 5:	Capability Enhancement of Consumer Laboratories
12.15 p.m. – 12.55 p.m.	Other Issues and Next Steps	
12.55 p.m. – 13.00 p.m.	Note of Thanks – USAID	
13.00 p.m. – 14.00 p.m.	Buffet Lunch	
14.00 p.m. – 14.10 p.m.	Adjournment	

Appendix D: Stakeholders Meeting Discussion Ideas

(Will be attached last)

Appendix E: Stakeholders Meeting Participants

(will be transmitted separately as a non-Word document)

Appendix F: Ad Hoc Working Groups

1 *Energy Efficiency/Business Educational Institute*

Mr. A. T. Kusre
Mr. Satish Sabharwal
Mr. Niranjan Khatri
Mr. R K Ghosh
Dr. G. C. Datta Roy
Mr. A. Kaupp
Mr. A. K. Asthana

2 Energy Efficiency/DSM Consulting Facility

Mr. B. P. Mukherjee
Dr. G. C. Datta Roy
Ms. Nisha Menon
Mr. K. S. Venkatagiri
Mr. Pankaj Sharma
Mr. A. K. Asthana

3 Platform for a Think Tank

Mr. Satish Sabharwal
Mr. K. S. Venkatagiri
Ms. Shruti Bhatia
Dr. G. C. Datta Roy & Ms. Nisha Menon

4A Creation of an Indian Energy Efficiency Association

Mr. B. P. Mukherjee
Mr. K. S. Venkatagiri
Ms. Shruti Bhatia
Mr. A. Kaupp
Mr. J. K. Mehta
Mr. A. K. Asthana

4B National Experts Data Base

Mr. K. S. Venkatagiri
Ms. Shruti Bhatia

5 Capability Enhancement of Consumer Laboratories

Mr. Satish Sabharwal
Dr. I.P.S. Paul
Mr. R. C. Dhup

Appendix G: List of Acronyms

ADB	Asian Development Bank
APS	Arizona Public Service
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
BEE	Bureau of Energy Efficiency
BG&E	Baltimore Gas & Electricity
CIA	Central Intelligence Agency
CII	Confederation of Indian Industries
DERC	Delhi Electricity Regulatory Commission
DSM	Demand Side Management
ECO	Energy Conservation and Commercialization
EPP	Energy Partnership Program
ESCOM	Energy service company
GTZ	Gesellschaft für Technische Zusammenarbeit (German development agency)
HVAC	Heating, ventilation & air conditioning
IIE	International Institute of Education
IIEC	International Institute of Energy Conservation
IREDA	Indian Renewable Energy Development Agency
ICFAI	Institute of Chartered Financial Analysis **<Analysts?>** of India
IT	Information technology
KfW	Kreditanstalt für Wiederaufbau (German development bank)
LBNL	Lawrence Berkeley National Laboratory
MEDA	Maharashtra Energy Development Agency
MoP	Ministry of Power
NDPL	North Delhi Power Limited
NGO	Non-governmental organization
NPC	National Productivity Council
SECID	South East Consortium for International Development
USEA	United States Energy Agency