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ENERGY EFFICIENCY MARKET ASSESSMENT FOR BRAZIL

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MOVING MARKETS FOR ENERGY EFFICIENCY (MMEE)

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1 EXECUTIVE SUMMARY

This report is one of three energy efficiency market assessment reports prepared as a part of the "Moving Markets for Energy Efficiency" (MMEE) project, sponsored by the USAID Global Environment Center. The MMEE Project is designed to achieve long-term market transformation by developing the enabling framework for stimulating the delivery of energy efficiency services, and demonstrating the application of the framework in target developing countries.

The report was prepared by the MMEE project team as a result of two missions to Brazil to meet with key stakeholders, including federal and state agencies, utilities, donor organizations, industry and trade associations, consumers, financial institutions, and ESCOs. It is designed as a discussion document and will be reviewed with the MMEE Advisory Panel and in-country stakeholders to develop specific interventions to alleviate prevailing barriers to private sector-led energy investments in Brazil. After this review, the report will be revised and used as a starting point for further discussions at the MMEE Regional Workshop planned to be held in Brazil in early 2000.

1.1 INTRODUCTION

The report provides an assessment of the energy efficiency market in Brazil. The report also presents an overall view of the country's economic background with special emphasis on the energy sector. It also includes a discussion of past and ongoing energy efficiency activities and the potential for the development of a true energy efficiency market. The report uses the MMEE energy efficiency market assessment framework to identify key drivers and barriers to energy efficiency in Brazil and presents a preliminary strategy for moving the market for energy efficiency forward.

1.2 THE ECONOMY

Brazil was the eighth-largest economy in the world in 1997 with a GDP over US$ 800 billion. The GDP declined in 1998 and in 1999 it is estimated to be approximately US$ 557 billion. It is a highly diversified economy with wide variations in levels of development. Most large industry is concentrated in the south and southeast. Although traditionally the poorest part of Brazil, the northeast is beginning to attract new and much needed investment.

Brazil embarked on its most successful economic stabilization program, the Plano Real, in July 1994. Inflation--which had reached an annual level of nearly 5,000% at the end of 1993--has since dropped to its lowest level in over 40 years and is expected to be less than 15% in 1999. Brazil has accomplished this through a combination of a strong exchange rate, tight monetary policies, trade liberalization, and privatization.

Despite its recent economic problems, Brazil has shown signs of an impressive recovery. The currency has regained some its strength, the return of much feared inflation has been kept in check, and interest rates - which had reached 45% in March 1999 - had dropped to 23.5% by June 1999. Assuming Brazil's government continues with much needed fiscal reforms, Brazil should be able to return to a period of economic growth during the late part of 1999 and early 2000.

Brazil has one of the most advanced industrial sectors in Latin America. Accounting for one-third of GDP, Brazil's diverse industries range from automobiles, steel, and petrochemicals, to computers, aircraft, and consumer durables. With the increased economic stability provided by the Plano Real, Brazilian firms and multinationals have invested hundreds of millions of dollars in new equipment and technology - a large share of which has been purchased from U.S. firms. However, the country's power, transportation, and communications systems - particularly outside the more developed southern states - suffer from lack of investment and poor maintenance. The privatization of the telecommunication, energy, and transportation sectors are expected to enhance the pace at which these infrastructure problems are ameliorated.

1.3 THE POWER SECTOR

Brazil's power generation capacity currently amounts to approximately 60,756 MW. At the end of 1998, the vast majority (92.7%) of this domestic electricity generation was still in the hands of the state and federal governments. Brazil's main source of electricity comes from hydro-electric power which provides roughly 95% of the country's electrical energy.

The National Electric Power Agency (ANEEL) controls and supervises all power companies in Brazil. Eletrobrás, the government's electric utility, currently generates 60% of the country's electric power and is responsible for 64% of the nation's transmission lines. Prior to the economic crisis, Brazil's electricity demand was expanding at a relatively rapid rate of 7% per year. Most of this growth was taking place in the less-developed Northeast region of the country. These high levels of growth are expected to return after the financial crisis and to continue for the next decade. As a result, it is expected that Brazil will need to add an additional 3,650 MW per year and will require investments of US$ 8 billion to US$ 9.5 billion per year for the next 5 years, totaling an estimated US$ 50 billion over the next 10 years.

In order to most effectively deal with its rapid increase in power demand, and to alleviate its fiscal crunch, Brazil is undertaking a process of privatization of the electrical sector. Since 1995, Brazil has auctioned off US$ 20 billion of electricity assets, mostly pertaining to distribution. By the end of 1998, about 60% of distribution was controlled by the private sector, compared to just 31% a year earlier. Brazil is restructuring and privatizing its electric power sector, converting from a largely state-controlled system to a market-driven model. The nature of the market model, and the necessity of increasing overall economic efficiency, are such that this market model will push toward higher efficiency in production and use of energy. Parallel to the implementation of privatization, the government has embarked upon a process of decentralizing regulation through strengthening existing state entities and creating new state-level regulatory bodies.

Projected economic expansion of three percent per year and the corresponding growth in energy needs (e.g., electricity demand increased 6.5 percent in 1997) will impose considerable demands on Brazil's industry to implement supply- and demand-side management measures. In 1997, power shortages in large energy markets, like Rio de Janeiro, were considered as early warnings of the supply crisis.

1.4 ENERGY EFFICIENCY

In 1985, in response to heavy dependence on interruptible imported petroleum, many oil importing countries, including Brazil, shifted their energy strategy to focus on domestic sources of energy and energy efficiency. Brazil created PROCEL as a cell within its national utility (Eletrobrás) to begin focusing on energy efficiency. Since that time, PROCEL has been very active in promoting efficient use of energy and while there are many success stories, market-based mechanisms to stimulate private sector investment in energy efficiency in Brazil are largely absent.

In order to expand its energy efficiency activities, PROCEL is currently working with the World Bank to secure a loan. In addition, as per new regulations, ANEEL has selected PROCEL to be the executing entity for guiding and monitoring the investments (equivalent to 1% of the revenues of the privatized utilities) in energy efficiency projects, as required under the law. This amounts to US$ 200 million per year and it will be available for new investments in energy efficiency projects.

Financing requirements for achieving even a fraction of the overall energy efficiency potential are formidable and Eletrobrás, the government, the donors, and the privatized utilities cannot alone meet the overall capital demand. Brazil presents a strong case for an economy where market-based energy efficiency investments are the only long-term solution to the investment needs in the energy efficiency sector.

As the Brazilian economy continues to have an industry-led growth, the share of electricity-based production is going to grow. Therefore, a key driver for investments in energy efficiency is the prospect for upcoming energy shortages coupled with price increases. The economy is alarmed at the prospects of reduced or interrupted economic activity as a result of energy shortages. The industrial and commercial sectors are (i) the largest consumer of energy, (ii) offer the greatest promise of economical energy savings, and (iii) present the best opportunity for reducing emissions. Given the current operating characteristics of Brazilian companies, conservatively, one could expect that at least 15% of total energy could be economically saved -- even at current electricity prices. As the prices of electricity increase, which is expected as a result of privatization, the overall potential for electricity savings could go up significantly in the medium- to long-term. In addition, given the high cost of captive power generation, a significant potential also exists for industrial cogeneration which is now permitted under Brazilian law.

The key to realizing the energy efficiency potential at the end-use level in Brazil will eventually have to include (i) market-based investments in energy efficiency projects and (ii) the availability of attractive financing for ESCOs and other energy service companies to implement economically viable projects.

The Donor Community

In addition to the EE programs being implemented by PROCEL, a number of international donors continue to support the EE activities in Brazil. The European Union (EU), for example, has been focusing its development efforts on supporting the Brazilian states during the national energy sector restructuring. Primarily this assistance has been through ALURE, a program for the promotion of energy cooperation, which is structured to have dual Brazilian and EU direction. Initial efforts have involved workshops and regulatory assistance in the state of Bahia through ANEEL. The EU has also been involved in the preparation of feasibility studies for the World Bank energy efficiency loan. Through these activities, the EU hopes to increase European trade in energy technologies. The total aid package by the EU amounted to US$ 3.4 million in the 1997 - 98 time frame.

The Inter-American Development Bank (IDB) has been involved in two separate assistance efforts with the GOB. The first activity involves a US$ 150 million loan to Eletrobrás to support the construction of a north-south power transmission line to connect the north/northeast power grid to the south/southeast grid. This connection will allow 500 kv of optimal power supplies with less seasonal fluctuation, as hydropower generated during the rainy season in one region can be shared with the other region during its dry season. Within this loan, US$ 1.5 million has been designated for institutional capacity building, to be administered through the Independent System Operator, the Independent Planner, and ANEEL. Training activities will require US$ 650,000 for institutional capacity building funds, and the remainder will be used for technical analyses of tariff structuring and free access.

The second focus involves linking IDB's Sustainable Markets for Sustainable Energy (SMSE) program with a US$ 400 million small and medium enterprise fund, created for promoting renewable energy entrepreneurship.

The United Nations Development Program (UNDP) has been serving as trustee for PROCEL's energy efficiency fund, taking a two-percent administration fee. It is also looking to provide, in cooperation with USAID, a technical advisor to PRODEEM. The advisor will serve as a facilitator and coordinator between UNDP, the World Bank, the IDB, USAID and other donors, to maximize impact of all donor programs.

The World Bank is currently finalizing a $125 million EE project loan. This loan, with a substantial local component, promotes the implementation of energy efficiency projects, coupled with institutional capacity building.

Energy Service Companies (ESCOs)
The Association of Brazilian Energy Service Companies (ABESCO), an ESCO trade association with close to 50 members, is very active in identifying attractive energy efficiency projects and influencing energy efficiency policy in Brazil. Some of the members of ABESCO include engineering firms such as RHAC, BBL Engineeringrs, SERVETEC, etc. Many of the ABESCO members are either engineering firms with expertise in design engineering and energy audits, or they are equipment distributors. The perception of the ESCOs in the banking sector is that they are essentially equipment distributors for foreign manufacturers and therefore not independent promotors of energy efficiency. Consumers, unfortunately, also view these firms with skepticism as they view them as not being independent, given that many of them represent vendors.

Industry and Trade Associations
Two major industry associations -- National Confederation of Industries (CNI) and Federation of Industry in the State of Sao Paulo (FIESP) are very active in sponsoring activities to promote energy efficiency. Both FIESP and CNI are cosponsoring targeted regional workshops on energy efficiency and cogeneration in partnership with the Canadian Environmental Industries Association (CEIA).

1.5 ENERGY EFFICIENCY MARKET POTENTIAL IN BRAZIL

In 1998, PROCEL commissioned a study to assess the market potential for energy efficiency and opportunities for ESCOs in Brazil.

In the area of lighting and air conditioning in the commercial sector, the report estimated the total potential for annual energy savings to be 2,609 GWh or approximately 30 percent of the current energy consumption. The total monetary value

of the estimated energy savings is US$ 110.5 million, at an investment of US$ 285.6 million.

In the public sector, the report concentrated on public sanitation facilities and public lighting, which together consume approximately 17,750 GWh. The report estimates that as much as 4.020 GWh or 22.6 percent of the total energy can be saved annually in this sector with high payback investments. The monetary value of the potential energy savings is estimated to be US$ 239.2 million per year at an investment of US$ 419.8 million, representing a simple payback period of 1.75 years (or a simple rate of return at close to 50 percent per year).

In the industrial sector, the report included the most energy intensive sub-sectors in Brazil specifically companies in the non-ferrous metals, chemicals, steel, food and beverages, paper and pulp, iron alloys, textiles, ceramics, and cement sub-sectors, which, together consume approximately 48 percent of the total electricity consumption in the industrial sector.

In the chemical industry, the potential for energy efficiency was estimated to be in the range of 10 - 12 percent of total electricity at an investment of US$ 101 million with an average payback period of 2-3 years. In the steel industry, the report estimates that the total energy savings could reach approximately 12 percent of the current electricity consumption. The investment requirement for implementing key energy efficiency measures, including gas-fired cogeneration, is estimated to be US$ 96 million, with an average simple payback period of 3-4 years. In the food and beverages sector, the report estimates the total savings to be in order of 11 percent of the current electricity consumption annually, estimated to be worth US$ 19.4 million per year at an investment of US$ 33 million.

Other estimates for energy efficiency included 5.7% of the total electricity consumption in the paper and pulp sector, estimated to be worth US$ 15.8 million per year at a total estimated investment of US$ 41.3 million; 6% in the steel industry, estimated to be US$ 14 million annually at an estimated investment of US$ 42 million; 6% in the textile industry, at a total investment of US$ 7 million and the monetary value of the savings to be US$ 4.3 million annually; 11.2% in the ceramics industry, estimated to be worth US$ 3.2 million annually requiring an investment of US$ 5.9 million; and 7.3% in the cement sector, amounting to an annual savings of US$ 4.2 million.

The overall market for industrial cogeneration in Brazil is expected to be many fold and go beyond the market represented in the PROCEL study. For example, the pharmaceutical and petrochemical industries, not included in the study, are extremely energy intensive industries which offer a sizeable market for industrial cogeneration. Together, these two sectors could represent an additional market for energy efficiency investments in the range of US$ 1.2 billion with average payback, in most cases, of less than 4 years.

1.6 KEY MARKET DRIVERS AND BARRIERS

The application of the MMEE framework to Brazil has led to the identification of the following market drivers and barriers.

Macro-economic and General Business Conditions
In the case of Brazil, the political environment and the government are stable. Brazil is gradually coming out of a recent economic crisis. However, high interest rates, high inflation, and the recent devaluation of the Real have increased investor perception of risk in any kind of investments, including investments in energy efficiency.

The business climate in the country continues to be a great barrier to energy efficiency as the government has often incentivized export-led production expansion over efficiency and productivity improvements. There are no tax incentives, such as import duty reduction, for energy efficient appliances and equipment, making it difficult for distributors of foreign equipment to find a "ready" market for energy efficient technology and equipment in the private sector.

Brazil has made significant progress in reforming its legal system in recent years. However, many of the laws suffer from cumbersome or vague implementing regulations. In order for the markets to operate freely and competitively, the government needs further legal reforms.

Finally, although many government departments and agencies express a commitment to energy efficiency, this commitment is not transferred in the private sector. Brazil is a key Global Climate Change (GCC) country and the link between energy efficiency and climate change benefits has not been sufficiently articulated. Both the public and the private sectors need to appreciate that energy efficiency offers both productivity improvement and direct (or avoided) carbon reduction.

Regulatory and Policy Considerations
In the case of Brazil, there is a clear commitment to energy efficiency as evidenced by a number of projects implemented in the public sector. However, this commitment has not moved the private sector, despite some of the programs by EU (The ALLURE Program), PROCEL, GTZ, and others. The newly passed Privatization Law paves the way for a more competitive structure in the energy industry. This should provide impetus to enhanced implementation of energy efficiency as both prices and competition necessitate efficiency in energy utilization across the economy. However, despite the existence of a comprehensive Privatization Law, the implementing regulations continue to be either absent or vague. ANEEL, the national regulatory authority for electricity has initiated a number of steps to develop implementing

regulations including soliciting public comments. Earlier in 1999, ANEEL issued the implementing regulations for the use of the 1% of the revenues of utilities for both supply-side and demand-side energy efficiency projects. Currently, ANEEL is preparing comprehensive regulations for cogeneration. While considerable progress has been made in this area, the lack of clear regulations continues to be a barrier to private sector led energy efficiency.

Other areas where the Brazilian agencies are making progress include (i) appropriate energy efficiency codes/standards for appliances and equipment, (ii) market-based energy pricing, and (iii) reduction/removal of cross subsidies in the power sector. USAID is supporting a program to assist Brazil in developing an appliance labeling program. Both the World Bank and IDB are working with the regulators in the country to reform prices with the ultimate objective of reaching international levels. This area is very political and the progress is slow as evidenced by a lack of credible power purchase agreements (PPAs) and the number of IPPs.

Customer Factors

Customer perception of the value of energy efficiency continues to be one of the most significant barriers to energy efficiency market development in Brazil. There is little awareness of the benefits of energy efficiency among the consumers. Most of the EE activities have targeted the public sector and there are virtually no programs targeting the private sector users of energy. New and more efficient energy technology is viewed as a risk despite the past efforts of INEE, PROCEL, ABESCO, ABILUX, etc. In addition, the energy service providers lack the necessary credibility. Many of the ESCOs are local dealers for foreign equipment and are viewed as promoters of equipment sales rather than the benefits of energy efficiency.

There are no successful business models for the delivery of energy efficiency services. Corporate decision makers do not include energy efficiency as part of their overall strategic and business planning and EE is often viewed as an activity that may cause interruptions in facility operations.

The market for energy efficient appliances and equipment is sporadic, partially because of low energy prices and to a great extent due to the high customs duties on imports. In addition, no systematic mechanisms are in place to advertise information on energy efficient technologies and equipment and there is a high degree of perceived risk for technologies new to the Brazilian market.

Financing of EE Projects

Financing of energy efficiency projects continues to be a major barrier to energy efficiency in Brazil. The banking sector in Brazil is extremely conservative and typical financing availability is either for overdraft protection or major projects. Project financing for small projects including EE projects is virtually nonexistent. Also, commercial interest rates for short-term borrowing - typically needed for EE projects -

are prohibitive. The banking sector, in general, does not view EE project lending as attractive due to the small size of the projects and the high transaction costs associated with them. Furthermore, there is a clear lack of qualified project developers and financial intermediaries who typically develop and package bankable projects, thereby reducing the transaction costs of the financial institutions.

At the same time, the financial sector is becoming aware of the enormous market potential for energy efficiency and distributed cogeneration. BNDES, the national development bank, is currently developing a new financing facility for small and medium sized projects that could be available for energy efficiency projects as well. In addition, Credibanco, a commercial bank has shown a strong interest in pursuing the energy efficiency market along the lines of its financing for water conservation projects where the bank has gained significant experience. The creditworthiness of end-users and a lack of private ESCO financing are also strong barriers to investments even in the most viable EE projects. In the short term, financing of energy efficiency projects will be questionable as short-term interest rates are prohibitive, ranging from 15% to 30% per month.

Market Delivery Channels

Typical barriers in this area in Brazil include (i) a relative lack of local availability of technology, equipment, and products, (ii) few successful ESCOs, (iii) limited financial support to the ESCOs, and (iv) perceived risks of energy efficiency technologies. As a result, even for the most attractive EE projects, there is often limited implementation of energy efficiency and the limited capabilities of the ESCOs and technology risks essentially have not moved the market.

While the availability of energy efficient technology and equipment is generally not a constraint in Brazil, the presence and capability of ESCOs continues to be a major barrier to EE implementation. There is little emphasis on enhancing the capability of ESCOs to develop, package and finance EE projects through EPCs. In addition, the supporting infrastructure to assist ESCOs is virtually missing.

Although ABILUX and PROCEL have implemented a few EE projects, predominantly in the area of public lighting, the benefit of the transfer of successful EE technologies have not been demonstrated and documented. Therefore, new technology is perceived as risky by the consumers. Without question, the market delivery channels for EE implementation in Brazil need to be significantly developed in order to cater to the sizeable energy efficiency market.

1.7 PRELIMINARY STRATEGY FOR MOVING THE MARKET

The preliminary strategy outlined herein is summarized below.

Policy Intervention at the National Level

Policy reform is typically a slow process, especially if it involves major changes in the status quo and competing political interests. The energy sector in Brazil, for several decades, operated in a monopolistic fashion with both ownership and operation of key energy enterprises in the government's hands. The process of privatization and regulatory reform introduced in Brazil are a welcome departure from past practices that kept energy prices low, industries protected, and competition in the sector virtually absent.

With respect to energy efficiency, ANEEL requires that utilities invest 1% of their annual revenues in energy efficiency projects (both on the supply-side and at the end-use level). The utilities are required to submit their plans for the 1% fund and ANEEL has the authority for approving these plans. So far 12 utilities have submitted their plans which have been approved by ANEEL. At present, there does not appear to be a unifying objective of using the 1% fund as a mechanism to gradually transform the EE market. The process for issuing the implementing rules has also begun for the 1% requirement. In July 1999, ANEEL published the implementing regulations for public review and comment. ANEEL was open to suggestions on ways to stimulate the market by using the 1% fund as a catalyst. ANEEL also indicated that such suggestions could be included in the final rules. As part of the MMEE Project, USAID submitted specific suggestions to ANEEL and PROCEL in the form an aide memoire that could be included in the final rules.

In the area of cogeneration, ANEEL plans to take a different definition from that under PURPA and will be publishing the rules in the near future. ANEEL needs technical assistance to develop workable rules for the implementation of cogeneration. The donor community, especially the World Bank, should consider providing this assistance under the upcoming loan.

With respect to energy efficiency policy, there is considerable room for appropriate intervention. Some of the key initiatives currently under review by the MMEE project team for possible recommendation to the government include the following:

- Creation of a public/private "National Energy Efficiency and Productivity Improvement Council" or similar organization to develop a national energy efficiency policy, targets, and approaches.
- Technical Assistance to the MME Task Force on Energy Efficiency
- Policy guidance on enhancing the institutional capacity of energy efficiency NGOs, such as INEE
- Policy guidance to ANEEL to take a more proactive approach to encourage utilities to select private sector EE projects and leverage portions of their 1% funds to generate additional financing for their customers interested in implementing EE projects.

Financial Incentives to the Private Sector

Traditionally, the approaches to moving a market suffering with many barriers, such as the EE market in Brazil, require some form of financial incentives for a limited period of time to kick-start the market. These fiscal and financial incentives can be removed once the market forces are sustainable. Some of the fiscal and financial incentives that the MMEE Project may recommend to the Brazilian government include the following:

- A reduction in import duties for energy efficient appliances and equipment for a limited period of time for projects with high potential for replication
- Tax write-offs to the consumers for selected EE investments
- Government-sponsored energy audits of industrial and commercial facilities
- Cost-shared demonstration of EE projects with high potential for replicability
- Possible creation of a national energy efficiency fund, similar to Korea and Thailand
- Government-sponsored training to consumers, service providers, equipment suppliers, and ESCOs on different aspects of EE (project development, and equipment marketing

Energy Efficiency Standards

Appliance and equipment standards have often been used as tools in many countries to regulate or influence energy use patterns of consumers and move the energy efficiency market. Brazil is currently conducting analysis in preparation for developing adequate standards for household appliances. This program could be expanded to the industrial and commercial sectors and include the full array of thermal and electrical equipment such as pumps, motors, boilers, chillers, heat exchangers, etc.

Utility Initiatives

Except for the energy efficiency activities of PROCEL/Eletrobrás - mainly targeted at the public lighting subsector and audits of selected industrial and commercial facilities - there are virtually no established EE programs sponsored by the utilities in Brazil. There are no effective DSM programs. Also, traditionally, utilities have not implemented any public outreach programs to educate their customers in the benefits of EE as the prices were relatively low and the supply of power was abundant.

In addition, the utilities are not equipped to identify and select attractive EE projects that must be proposed as part of the 1% requirement under the law.

- Technical assistance to utilities on the preparation of their proposals under the 1% fund by selecting projects that will stimulate the market
- Development and implementation of effective DSM programs through collaboration of successful U.S. utilities

- Programs to educate customers on more energy efficient appliances and equipment through workshops, seminars, TV and radio advertisements, etc.
- Promotion of distributed cogeneration systems
- Utility financing of EE projects for their customers

Public Awareness and Outreach

There has been little public outreach and awareness activity in the area of energy efficiency in Brazil. PROCEL has sponsored numerous workshops and conferences in EE but they were mostly targeted at selected consumers rather than the full array of energy users across the country. Also, there is little tradition of strong NGOs and advocates of energy efficiency. This area offers significant opportunity for the MMEE Project team to influence the system in order to encourage the market. Specifically, the public outreach and awareness activity should involve all key stakeholder groups including public policy makers, regulators, utilities, service providers, vendor associations, universities, financial institutions, and NGOs. Some of the recommendations that the MMEE Project may consider include the following:

- Establishment of a unit within MMEE to manage an outreach program including EE awards, creation of the EE day, mobilization of universities and schools to introduce EE courses, promotion of training activities, EE literature distribution, implementation of a public/private EE demonstration program, etc.
- Support to NGOs to develop effective outreach programs
- Creation of a forum for utilities, consumers, service providers, and financial institutions to promote energy efficiency
- Development of specific programs aimed at the household sector and rural and isolated populations

Institutional Capacity Building in the Private sector

In order to successfully move the energy efficiency market in Brazil, considerable capacity building is needed in many key organizations that are major stakeholders in the market. Key federal and state organizations such as industry associations, ESCO associations, and vendors, can play a very important role in accelerating the energy efficiency market. However, both the management of these associations and their industry members need to be sensitized to the business benefits of energy efficiency. While, there are many individual champions for energy efficiency, organizationally, there is a lack of commitment to EE due to many of the typical reasons (relatively lower prices, industry protection policies, lack of awareness, etc.).

There is a lack of trained experts needed to develop and prepare EE projects in a manner that would attract the attention of corporate managers and financial institutions. All of this leads to the conclusion that public outreach alone, no matter how well designed, will not move the market. The corporate culture needs to be changed.

Therefore, targeted capacity building is a key component of the MMEE Project strategy. Key national and state level industry organizations such as CNI, FIESP, ABESCO, ABILUX, ABRAVA, etc. need technical assistance and training necessary for promoting private sector led energy efficiency investments.

ESCO Development

Many of the ESCOs are either engineering firms with expertise in design engineering and energy audits, or they are equipment distributors. The perception of the ESCOs in the banking sector is that they are essentially equipment distributors for foreign manufacturers and therefore not independent promotors of energy efficiency. Consumers, unfortunately, also view these firms with skepticism as they may not be independent, given that many of them represent vendors. Many of these companies have performed energy audits and EE assessments for individual factories and shopping centers. However, in many cases the customers have not moved forward after the initial audits are completed despite the fact that the audits confirmed sizeable energy savings with high return on investment.

ABESCO members also expressed skeptism as to the extent to which the 1% utility fund could truly stimulate the EE market, given the traditional approach taken by the utilities and their preference to simply focus on public sector projects, e.g., public lighting. For example, ESCOs such as NEGAWATT, Union RHAC, etc. do get involved in EE projects such as air conditioning system installations, but they depend on customer financing.

While the enthusiasm of Brazilian ESCOs is high, all of them need to better understand the operational aspects of ESCOs such as business planning, performance contracting, certifications, etc. In addition, ABESCO, as the lead organization for ESCOs, needs to create a better perception among consumers. ABESCO is a promising organization, but is in its infancy and needs considerable technical assistance in a number of areas as follows:

- Institutional capacity building in business development including business planning, project development, project packaging, etc.
- Training in developing "made in Brazil" performance contracts that reflect market conditions and customer perception in Brazil
- Training in "coordination strategy" to closely work with the utilities and financing institutions to prepare bankable EE projects
- Assessment of ABESCO's organizational and operational requirements including staff, funding sources, financial planning, program implementation approaches, procedures for developing coordination mechanisms with stakeholders, including the donor community, consumer groups, capital markets, energy end-users, and Brazilian government institutions

- Development of operating plans for specific target sub-sectors for energy efficiency markets
- Development of a strategy for working with various energy funds, and taking advantage of donor credit facilities such as the Development Credit Authority of USAID, Small and Medium Industries Financing Facility of the IFC, the GEF Credit Facility, and other private energy funds, given the interest of ABESCO members in potentially becoming strong ESCOs with a capacity for financing small scale energy efficiency and cogeneration projects
- Development of an outreach program for ABESCO with PROCEL and others for building public acceptance of the profitability of energy efficiency
- Development of a coordinating strategy for ABESCO to closely work with the utilities that by law must spend 1% of their revenues in energy efficiency projects (both the supply- and demand-side), particularly this being an avenue for energy efficiency market transformation
- Development of ESCO exchange programs between Brazilian and U.S. ESCOs

Assisting ABESCO to become a strong player in the EE market in Brazil in one of the best ways to move this market in Brazil. However, it will require a strong commitment not only by ABESCO but also other major partners such as PROCEL, utilities, industry associations, and financing institutions. Therefore, targeted focus groups and seminars involving leaders from these stakeholders could play a significant role in developing a more effective climate for private sector led EE implementation in the country.

National Confederation of Industries (CNI)

CNI is a national organization that represents the Brazilian industry in conjunction with the various industrial state federations and national sector associations. Currently, CNI is working on a program under an agreement with CEIA - Canadian Environmental Industry Association, entitled "Energy Management and Reduction of Gas Emissions Responsible for Greenhouse Effect". This project concentrates heavily on energy efficiency and global climate change issues. The objective of this program, focused on medium and small industries, is to develop 6 pilot projects in energy efficiency in key energy-intensive industrial sectors, including steel mills, ceramics, textile, food, automobile parts, plastics and furniture. CNI is working with the state industry federations, such as FIESP in Sao Paulo, and others to expand the coverage of the program and to select the best pilot projects. The project is being implemented through state industrial federations (FIESP, FIERGS, FIEMG, etc.).

CNI is planning three sectorial workshops to be held in the most progressive state federations: Rio Grande do Sul, Minas Gerais and Paraná or Santa Catarina. The MMEE Project Team is closely following the CNI effort as it is the most significant private sector led EE activity in Brazil. CNI has expressed interest in working with the MMEE Project Team in sponsoring different "focus group" meetings on EE financing and EPC issues.

The following specific interventions are needed to accelerate the efforts of CNI as they will induce more EE market activity:

- Provide technical assistance to CNI management and selected members on mobilizing EE as a tool to increase productivity and competitiveness among its industry members
- Technical assistance in the development of provocative policy papers to lobby the government and regulators to change policy more favorable to energy efficiency
- Training in the development and delivery of industry-specific papers on efficient energy technology applicable to Brazilian industry
- Extensive topical seminars and workshops to demonstrate the benefits of energy efficiency and cogeneration to the industry, similar to the current CNI work with CEIA, Canada
- Development of energy efficiency equipment certification program in collaboration of programs in the U.S. (e.g., American Boiler Association certification program)
- Development of an energy auditor certification program

Federation of Industry in the State of Sao Paulo (FIESP)

The MMEE Project Team members have held numerous discussions with senior management at FIESP on energy efficiency and cogeneration issues. FIESP feels that electricity prices in Brazil will definitely increase in the future as new capacity is brought on line through IPPs using Bolivian gas. FIESP is a strong industry association with a powerful voice in public policy making and is in an ideal position to be a key local "champion" of energy efficiency. With respect to energy efficency, FIESP should be brought in as a partner in any donor assisted activity in the country. FIESP's access to major industries in the country could also be instrumental in formalizing the role and importance of EE at the highest levels in the private sector in the country.

Energy Efficiency Equipment Supplier Market Development

A number of organizations in Brazil represent equipment vendors and local distributors of foreign equipment. Among them, ABILUX and ABRAVA are key organizations. ABILUX represents manufacturers and dealers/distributors of lighting equipment such

a lamps, transformers, appliances, ballasts, etc. In order for private sector led EE to be successful, associations representing equipment vendors and distributors need to brought on board. They can have a significant role in influencing consumer choices and expanding the market for energy efficient appliances and equipment. Unlike other countries with successful EE programs, neither the utilities nor the ESCOs in Brazil work closely with vendor groups. There is a clear need to educate this group and make them partners in energy efficiency. Currently, these organizations represent the rather lithargic attitude of most consumers and equipment sellers towards the benefits of energy efficiency. Members of this organization may benefit from attending future USAID training courses in energy efficiency.

Potential Role of Financing Institutions

As mentioned earlier, availability of attractive financing continues to be a major barrier to energy efficiency implementation in the private sector. Brazilian banks have traditionally catered to financing government debt, providing short-term and high interest overdraft protection lending, asset management, and, in the case of development banks (BNDES, BNB), financing of mostly public sector projects and co financing of major projects with other financiers. Project financing for small and medium sized private sector projects is missing.

The MMEE Project Team members have held numerous discussions with a number of banks in Brazil including BNDES, Banco do Nordeste (BNB), Banco Axial, Banco Credibanco, and UNIBANCO. None of these banks currently have financing facilities that will be suitable for financing of private sector EE projects. While most of the banks appreciate the benefits of EE and the size of the EE market in Brazil, the perceived risks, the lack of supporting infrastructure, the relatively small size of the EE projects, and high transaction costs, continue to be the major barriers, resulting in little or no investment in the sector.

National Bank for Economic and Social Development (BNDES)

BNDES is the largest national development bank in Brazil, involved in financing or co-financing projects worth over US$ 20 billion annually. Currently, BNDES has no mechanism to finance many private sector projects and any projects that require investments in an amount less than R$ 7 million. BNDES has recognized that it has a very important role to play in financing a large number of small and medium size projects including EE projects. As a result, the BNDES management is considering a possible Guarantee Fund to promote small projects that could also include ESCO financing.

The BNDES effort to potentially create such a guarantee fund was slowed down by the simultaneous development of other guarantee funds: the FGPC (Guarantee Fund to Promote Competitiveness) and a small businees guarantee fund for SEBRAE. In 1998 the FGPC covered 303 projects worth R$ 40 million. The bank was disappointed by

this performance as BNDES had hoped that the fund would generate as much as R$ 250 in financing new projects. In June 1999, BNDES made changes to stimulate greater use of the FGPC, increasing coverage (from 50% to 80%), simplifying forms and procedures, and aggressively marketing the fund.

The BNDES senior staff have developed a preliminary proposal for the structure of an energy efficiency guarantee fund. The proposed guarantee fund will operate as a guarantee fund for ESCOs to finance projects that have met the PROCEL due dilligence criteria. MMEE Project Team members are working with BNDES staff in developing this concept further. The main thrust of the fund is to start financing small and medium size EE projects to demonstrate the attractiveness of the EE market. BNDES is proposing to initially start the fund with approximately R$ 2 million which should be able to leverage R$ 14-16 million of new EE projects.

BNDES would like to have the participation of utilities in the fund, applying a small part of their resources from the 1% fund. To this end, they have started a dialogue with PROCEL. However, there has been no progress thus far. One of the activities of the MMEE Project is to assist in advancing the discussions between BNDES and some of the more progressive utilities. In addition, the MMEE Project Team is assisting BNDES in exploring avenues to increase the participation of other equity sources in the fund.

The MMEE Project Team's recommendations to intervene with BNDES are as follows:

- The USAID should consider using some of the Mission's funds to provide technical assistance to BNDES in moving the guarantee fund concept towards reality. The Mission should continue its dialogue with BNDES to explore avenues to influence the establishment of the proposed guarantee fund.

- BNDES likes the idea of utility involvement in a guarantee fund and is proposing this to ANEEL through a separate initiative. However, it needs technical assistance in developing the details of a proposal to bring in capital from the utility fund as part of its EE financing initiative.

- BNDES senior staff should be encouraged to participate in the planned seminar series with CNI in order for them to appreciate the emerging EE market. This series should be helpful to them in mobilizing outside support for negotiations inside the BNDES.

- Further work is needed to explore whether the USAID's proposed guarantee fund (DCA) could participate in the guarantee fund contemplated by BNDES.

Banco Credibanco

Credibanco is a niche wholesale bank founded in 1967, with the Bank of New York as a shareholder. Credibanco will consider projects as small as R$ 1 million if the project represents potential for replication and is in a market that is growing. The bank's target markets include cogeneration and thermal power plants, revamping small hydro (500 sites just in Minas Gerais), and performance contracting and ESCO financing. Unfortunately, the bank has not seen any financiable projects from the ESCOs. The following are some of the key areas for potential intervention:

- With respect to Credibanco's potential involvement in managing the 1% utility fund in some form of collaboration, the bank felt that it would be very likely be necessary for a quasi public entity to oversee the fund management and operation. Credibanco is prepared to engage in an exercise to develop a workable framework that would permit the use of the utility funds for attractive EE projects. Credibanco, in principle, could manage such a fund once the guidelines are developed. It needs technical assistance for developing this framework which could be provided under the USAID Mission's existing ETIP Project.

2 COUNTRY PROFILE

2.1 ECONOMIC BACKGROUND

2.1.1 General Economic Summary

Brazil was the eighth-largest economy in the world in 1997 with its GDP over US$ 800 billion. The GDP declined in 1998 and in 1999 it is estimated to be around US$ 557 billion. It is a highly diversified economy with wide variations in levels of development. Most large industry is concentrated in the south and southeast. Although traditionally the poorest part of Brazil, the northeast is beginning to attract new investment.

Brazil embarked on its most successful economic stabilization program, the Plano Real in July 1994. Inflation--which had reached an annual level of nearly 5,000% at the end of 1993--has since dropped to its lowest level in over 40 years and is expected to be less than 15% in 1999. Brazil has accomplished this through a combination of a strong exchange rate, tight monetary policies, trade liberalization, and privatization.

In addition, the Cardoso Administration introduced to Congress a series of constitutional reform proposals to replace a state-dominated economy with a market-oriented one and to restructure all levels of government on a financially sound basis. Congress has approved amendments to open the economy to greater private sector participation, including foreign investors. Reforms to bring order to government fiscal accounts have made less progress--because of their greater political sensitivity--but remain under consideration by the Congress. The Administration considers these fiscal reforms as essential to sustainable long-term growth. The Plano Real has raised the income of poor Brazilians, but Brazil continues to have one of the world's most inequitable distributions of income. The administration has acknowledged the need to invest more in education and health to redress this inequity.

Market liberalization and economic stabilization have significantly enhanced Brazil's growth prospects. Brazil's trade has almost doubled since 1990, from US$ 50 billion to an estimated US$ 114 billion in 1997. The United States represents about 20% of that trade, and ran trade surpluses in 1995, 1996, and 1997 after many years of deficits with Brazil. Foreign direct investment has increased from less than US$ 1 billion in 1993 to an estimated US$ 17 billion in 1997. The United States is the largest foreign investor in Brazil, accounting for almost 34% of total foreign investment in the country. Ongoing and planned privatization in the telecommunications, energy, and mining sectors of Brazil for 1999 and 2000 is of major interest to U.S. companies.

Brazil responded quickly and decisively to the Asian financial crisis in October 1997, which brought strong pressure to bear on the domestic currency. These actions included a near doubling of interest rates, maintenance of an exchange rate policy in the face of large capital outflows, and Congressional approval of a fiscal package aimed at saving US$ 18 billion in 1998 or 2.5% of GDP. Financial markets responded positively to these measures and capital inflows, including direct investment, increased strongly. By March 1998, international reserves recovered to their pre-crisis level of US$ 62 billion.

With the floating of the real (Brazil's national currency) in January 1999, Brazil's economic program, the Plano Real, was greatly altered. The Plano Real was launched in July 1994 to fight the hyperinflation of the early 1990s, while providing for long-term economic growth and social readjustment. The cornerstone of the plan was the fixing of the real to the U.S. dollar via a crawling peg system which slowly devalued the currency by 7% per year. However, massive capital outflows beginning in August 1998, culminating in January 1999 when investors deemed Brazil was undertaking necessary fiscal reforms too slowly, caused the currency to collapse. As a result, Brazil began floating the real in mid January, and has had to seek support and funds from international monetary authorities, who have provided Brazil with a total package of US$ 41.5 billion since November 1998, of which about half had been dispersed by June 1999. Since it began floating, the real has lost about 33% of its value against the dollar, recovering from its low in February when it had lost an estimated 45% of its value.

Brazil's financial crisis has made the process of further regional integration more difficult. Launched in January 1995, Mercosur (Mercosul in Portuguese) is a regional trade pact comprised of Brazil, Argentina, Paraguay and Uruguay, with Chile and Bolivia as associate members. Since its inception, intra-regional trade and investment within the pact has grown significantly. Mercosur also has resulted in the greater coordination of regional issues, including energy concerns. Nonetheless, the crisis has raised tensions among Mercosur members since now-cheaper Brazilian goods have flowed into neighboring countries such as Argentina, worsening their trade accounts with Brazil.

Despite its recent economic problems, Brazil has shown signs of an impressive recovery. The currency has regained some its strength, the return of much feared inflation has been kept in check, and interest rates, which had reached 45% in March 1999, had dropped to 23.5% by June 1999. Assuming Brazil's government continues with much needed fiscal reforms, Brazil should be able to return to economic growth during the second half of 1999.

2.1.2 Key Economic Indicators

The key economic indicators of Brazil are listed below:

Currency:	1 Real (R) = 100 centavos
Exchange Rate (6/28/99):	US $1 = R 1.79
Gross Domestic Product (GDP) (1999E):	$557.9 billion
Real GDP Growth Rate (1998): 0.2% (1999E):	-0.9%
Inflation Rate (consumer prices, 1999E):	9.7%
Current Account Surplus (1999E):	-3.2% of GDP
Major Trading Partners (1997):	European Union, United States, Argentina, Japan
Trade Deficit (1999F):	$3.4-$5.3 billion
Merchandise Exports fob (1999E):	$53.9 billion
Merchandise Imports fob (1999E):	$ 53.2 billion
Major Exports (1997):	Manufactured products (55%), coffee(5%), iron ore (5%)
Major Imports (1997):	Raw materials/industrial (30%), capital goods (43%), petroleum and other fuels (10%)
Unemployment Rate (1999E):	8.9%
Total Foreign Debt (1998E):	$240 Billion
International Reserves (non-gold, 5/99E):	$46 billion

2.1.3 Brazil's Resources

Brazil is endowed with vast agricultural resources. There are basically two distinct agricultural areas. The first, comprised of the southern one-half to two-thirds of the country, has a semi-temperate climate and higher rainfall, better soils, higher technology and input use, reasonable infrastructure, and more experienced farmers. It produces most of Brazil's grains and oilseeds and export crops. The other, located in the drought-ridden northeast region and in the Amazon basin, lacks well-distributed rainfall, good soil, adequate infrastructure, or sufficient development capital. Although

producing mostly for self-sufficiency, the latter regions are becoming increasingly important in exports of forest products, cocoa, and tropical fruits. Central Brazil contains substantial areas of grassland with only scattered trees. The Brazilian grasslands are less fertile than those of North America and are generally more suited for grazing.

Brazilian agriculture is well diversified, and the country is largely self-sufficient in food. Agriculture accounts for 13% of the country's GDP, and employs about one-quarter of the labor force in more than six million agricultural enterprises. Brazil is the world's largest producer of sugarcane and coffee, and a net exporter of cocoa, soybeans, orange juice, tobacco, forest products, and other tropical fruits and nuts. Livestock production is very important in many sections of the country, with a large increase in the poultry, pork, and milk industries due mainly to demand changes. On a value basis, production is 60% field crop and 40% livestock.

Brazil is a net exporter of agricultural and food products, which account for about 35% of the country's exports. In 1996, farm and food exports totaled US$ 17 billion. Record levels of imports amounted to nearly US$ 8 billion. In 1994 and 1995, agricultural exports were hurt by the sharp appreciation of the Brazilian real, lack of export financing, and high taxes and port costs. On the other hand, agricultural and food imports grew substantially during this period as a result of production shortfalls, lower prices due to import liberalization and a strong currency, and increased consumer demand. In the long run, however, the annual growth of agricultural imports is expected to be more moderate in the future.

Half of Brazil is covered by forests, with the largest rain forest in the world located in the Amazon Basin. Recent migrations into the Amazon and large-scale burning of forest areas have placed the international spotlight on Brazil. The government has reduced incentives for such activity and is beginning to implement an ambitious environmental plan, and has just adopted an Environmental Crimes Law that imposes serious penalties for infractions.

Brazil has one of the most advanced industrial sectors in Latin America. Accounting for one-third of GDP, Brazil's diverse industries range from automobiles, steel, and petrochemicals, to computers, aircraft, and consumer durables. With the increased economic stability provided by the Plano Real, Brazilian firms and multinationals have invested hundreds of millions of dollars in new equipment and technology, a large share of which has been purchased from U.S. firms. However, the country's power, transportation, and communications systems--particularly outside the more developed southern states--suffer from lack of investment and poor maintenance. The privatization of the telecommunications, energy, and transportation sectors are expected to ameliorate these infrastructure problems.

Brazil has a diverse and sophisticated services industry as well. During the early 1990s, the banking sector accounted for as much as 16% of GDP. Although undergoing a major overhaul, Brazil's financial services industry provides local firms a wide range of products and is attracting numerous new entrants, including U.S. financial firms. The Sao Paulo and Rio de Janeiro stock exchanges have been among the fastest growing in the world in the last two years.

The Brazilian Government has undertaken an ambitious program to reduce dependence on imported oil. Imports previously accounted for more than 70% of the country's oil needs but now account for less than 50%. Brazil is one of the world's leading producers of hydroelectric power, with a potential of 106,500 MW.

Existing hydroelectric power provides 90% of the nation's electricity. Two large hydroelectric projects, the 12,600 MW Itaipu Dam on the Parana River--the world's largest dam--and the Tucurui Dam in Para in Northern Brazil, are in operation.
Brazil's first commercial nuclear reactor, Angra I, located near Rio de Janeiro, has been in operation for more than 10 years. Angra II is under construction, and Angra III is planned. The three reactors would have combined capacity of 3,000 MW when completed.

Proven mineral resources are extensive. Large iron and manganese reserves are important sources of industrial raw materials and export earnings. Deposits of nickel, tin, chromate, bauxite, beryllium, copper, lead, tungsten, zinc, gold, and other minerals are exploited. High-quality coking-grade coal required in the steel industry is in short supply.

2.2 THE ENERGY SECTOR

Brazil is currently the largest emitter of greenhouse gases (GHG) in Latin America. In 1991, Brazil was the fifth largest net GHG emitter worldwide. In the five-year period between 1991 and 1995, industrial carbon dioxide emissions in Brazil increased by 20 percent. Given the continuing growth and structural changes in Brazil's economy, it is likely that carbon dioxide emissions will continue to increase at an alarming pace. The USAID/Brazil Clean and Efficient Energy Strategic Objective (SO) addresses the issue of potential growth in GHG emissions as Brazil's economy expands and outgrows its current clean energy base.

In addition, Brazil has been identified as a key country in USAID's Developing Country Climate Change Action Plan (CCAP), not only because of its contribution to net global GHG emissions, but also due to a number of other factors that favor cost effective actions to reduce the GHG emissions growth rate. Specifically, Brazil: (i) is the largest and fastest growing Latin American economy, with significant potential for increasing current GHG emissions; (ii) has abundant resources for sustainable energy

production and use, particularly for biomass fuels, solar energy, wind and small-scale hydropower potential; (iii) offers locally supported energy efficiency opportunities with attractive cost/benefit ratios; (iv) has the potential to foster replicable models for clean energy development in the region; and (v) continues to show a clear commitment to significant restructuring and privatization of its energy industry under a competitive environment, including policies conducive to clean and efficient energy options.

Brazil's major goal in the power sector is to guarantee the availability and reliability of electricity to all citizens and economic activities, while converting from a largely state-controlled to a market-driven energy industry, regulated to allow for regional disparities that limit full access to electrical energy. In the next three years, Brazil's goal is to achieve a balance between attracting private investment to foster expansion needs and maintaining energy prices at a level that does not impede economic growth.

While emissions growth and global climate change considerations have not been of primary concern when expanding the power sector in Brazil, environmental precautions are taken into account when siting new generation facilities and transmission routes. Typical to other countries at similar stages of development, Brazil perceives social exclusion of those cut off from energy services as more harmful to its development than the threat of global climate change. A similar rationale applies to Brazil's perception of energy efficiency. Energy efficiency policy and related goals are driven by the need to optimize resource allocation in an economy where capital stocks are scarce, and not necessarily by global climate change concerns.

These country goals were recently confirmed when the Brazilian Congress enacted legislation that earmarks 50 percent of a federal power investment fund (the Global Guarantee Reserve Fund, or RGR) to energy efficiency, rural electrification, and low income consumer support. Additionally, since mid-1997, following a USAID recommendation, licensing regulations were established in order to direct one percent of gross annual utility revenues to energy efficiency programs, estimated at approximately US$ 200 million per year.

The Government has demonstrated its strong and continued political will to implement power sector reforms through a number of policy and administrative actions. This is especially true of those policies related to energy efficiency and expansion of rural and market-oriented energy services, all targets of the USAID/Brazil Clean and Efficient Energy Strategic Objective.

2.2.1 Highlights of the Energy Sector

Brazil is the largest country in South America, with rapidly growing oil, natural gas, and electricity markets. Brazil produces large amounts of hydroelectric power and continues to strive towards self-sufficiency in oil production. The country is a major importer of coal for its steel industry. Although progressing more slowly than originally anticipated due to the lingering financial crisis, Brazil's privatization plans are underway and are dramatically altering the makeup of the energy sector.

The Oil and Gas Sector

Brazil contains the second largest oil reserves in South America, after Venezuela. Although Brazil continues to strive for self sufficiency in oil production, it is unlikely that the country will reach this goal within the next few years, as it had previously intended. Brazil's state oil company, Petroleo Brasileiro (Petrobras), is currently producing 1.2 million bbl/d, predominantly in the offshore Campos Basin. By comparison, Brazil produced only 803,000 bbl/d in 1990. It had hoped to raise its output to 1.5 million bbl/d by the end of 2000 but this now seems unlikely due to setbacks caused by complications with new offshore production installations. The future increases in production will come through expanded drilling and investments in the deep water Campos Basin.

In 1997, the National Petroleum Agency (ANP) was created when President Cardoso signed the Petroleum Investment Law. As outlined in the law, the ANP is responsible for overseeing the process of opening up Brazil's petroleum industry to other domestic and foreign players. In addition to raising much needed capital for the government through both concessions and through the sale of certain parts of the sector, the opening of the industry is also ultimately hoped to bring about self sufficiency in oil production for Brazil. Brazil currently imports about 35% of its oil needs, mostly from Venezuela and Argentina.

Since its inception in 1953, Petrobras has had a monopoly over the rights to exploration, production, refining, distribution and the international sale and purchase of oil throughout Brazil. However, Petrobras' sole position came to an end in July 1998 when the ANP announced that more than 92% of the nation's sedimentary basins were to be put up for bidding to other oil companies. This was slightly more than Petrobras was expecting. According to ANP, Petrobras is allowed to maintain control of 52% of the profitable Campos Basin, located off the coast of Rio de Janeiro state. Campos is responsible for roughly 70% of the country's current total crude oil output. The Albacora and Barracuda oil fields are two of the largest in the Campos Basin. Petrobras has 3 years to begin start-up commercial production on the fields over which it has been allowed to maintain control. If production has not been initiated by that time the fields will revert to ANP, which then can reissue them to other companies via bidding.

The first round of bidding for those blocs not left under Petrobras control occurred in June 1999. On June 15-16, 1999 the ANP sold the exploration rights to 12 of the 27

blocs being tendered for a total of US$ 180 million. These blocs, which are extremely large (the average size of each area is 1,800 square miles, equivalent to 225 blocs in the Gulf of Mexico), were sold to 10 foreign firms, as well as to Petrobras, which won 5 of the 12 blocs. Of the foreign firms, Italy's Agip won the most blocs, totaling four. Companies such as Unocal, Texaco, Amerada Hess, Argentina's YPF, and Esso (the local subsidiary of US-based Exxon) also made successful exploration bids, some acting in alliance with Petrobras. Most of the bids came for relatively unexplored but highly coveted areas in over 6,560 feet (2,000 meters) of water off Brazil's Atlantic coast. For example, BP-Amoco had a winning bid of US$ 7.4 million for a large offshore bloc located 186 miles (300 km) away from the mouth of the Amazon river. The firms, which will have between 4 and 9 years to begin production within the areas, are still negotiating with the government for more lenient regulations on tax and foreign exchange controls. Second round bidding for the other blocs is planned for sometime in 2000.

By the end of 1999, the Brazilian government is expected to sell a minority stake, amounting to 31.7% voting stock, in Petrobras. The sale of this stock will leave the government with the minimal share required to maintain voting control, just over 50%. The financial crisis has slowed the sale of this stock, while Petrobras' share prices have significantly fallen since its high of 325 Reals in late 1997. The potential sale is made more difficult by the fact that company revenues have fallen since the devaluation of the real, by the large amount of short term debt which Petrobras needs to pay, and by the political resistance to raising domestic petroleum prices. In addition, Petrobras has cut its budget for 1999 by US$ 900 million, to US$ 1.8 billion. According to constitutional guarantees, Petrobras is not allowed to be fully privatized; however, this issue may be revisited in the future.

Overall, Brazil is expected to need an estimated US$ 38 billion worth of investment in its oil sector between now and 2002. To help meet this investment demand, Petrobras has signed about a dozen oil development partnerships with private firms. For example, in October 1998, Petrobras signed its first upstream participation agreement with a U.S. firm when it and Coastal Corporation, along with two other partners, agreed to begin operations in the offshore Camamu Basin. Recently, the signing of joint venture and foreign partnership agreements has been slowed due to Brazil's recent financial difficulties and concerns regarding repatriation of profits. Nonetheless, Petrobras is expected to sign an additional 15 joint ventures by end of 1999. One such deal involves a 30% stake by Esso and a 35% stake by Petrobras to develop the Albacora Leste field, in the Campos Basin. Other consortium partners will include Texaco, Royal/Dutch Shell as well as Japan Petroleum Exploration Co, Ltd. and Marubeni Corporation.

In addition to liberalization of Brazil's upstream oil sector, changes are underway to allow foreign and other domestic firms to compete with Petrobras in the downstream sector of the industry. Petrobras currently needs to import certain petroleum products

which it cannot supply sufficiently for the domestic market. In May 1999, the ANP allowed companies to import higher-quality fuel oil at market prices. According to law, ANP must free imports of gasoline, diesel, jet fuel and other petroleum products by August 2000. Further downstream deregulation should allow other firms to enter into the growing import market or to develop manufacturing capacities of their own.

Brazil still produces an estimated 200,000 bbl/d of ethanol from sugarcane, which is used predominantly for transportation. This program relies heavily on government subsidies, which in recent years have been drastically cut. Recently, there has been political pressure to renew funding for the ethanol program; however, the need for the federal government to undertake drastic fiscal cuts has slowed the initiative.

Due to the country's economic slowdown, Brazil currently is experiencing an excess supply of natural gas, just the opposite situation from the excess demand it was facing early in 1998. The creation of transborder pipelines to import gas and the further development of domestic sources of natural gas, specifically in the Amazon (Urucu) and Campos (Rio de Janeiro State) basins, has added to the increased supply, while economic recession and the delay in the construction of several gas-fired power plants has slowed demand.

With the first stage of the Bolivia-to-Brazil (BTB) natural gas pipeline completed in February 1999, potential gas supply to Brazil increased significantly. The first stage of the BTB pipeline connects the interior of Sao Paulo state to Bolivia and was completed in February 1999, and began deliveries in July. When fully completed, the Bolivia-Brazil gas pipeline will connect Rio Grande in Bolivia with Porto Alegre, Brazil in the State of Rio Grande do Sul, over a distance of 1,432 miles (1,177 miles in Brazil and 255 miles in Bolivia), passing through Puerto Suarez on the border with Bolivia, Mato Grosso do Sul, São Paulo, Paraná, Santa Catarina and Rio Grande do Sul. The pipeline initially was expected to deliver an estimated 1 billion cubic feet per day (Bcf/d) of gas to Brazil, and up to 2 Bcf/d within the first five years; however, Brazil's economic difficulties which have slowed demand growth for power from 6% in the mid 1990's to 4.7% in 1998, have lessened the need for natural gas.

As a result, Petrobras, which currently owns the Brazilian side of the network, is renegotiating with Bolivia's state-owned gas company YPFB the capacity and price at which Brazil will purchase natural gas. In addition, the construction of several new power plants, which were expected to be major off takers of the imported gas, has been delayed due to the lower demand and the current difficulty of obtaining adequate financing for the projects. Initially, nine large gas-fired power plants, which were to be constructed within Brazil, were expected to consume 40% of the imported Bolivian gas.

Despite this current oversupply, it is believed that the situation is only temporary and that demand will increase once the economic recession passes. Given this, there is discussion to create additional pipelines, including several to connect Argentina's gas supply with southern Brazil. One pipeline, referred to as the Gasoduto Cruz del Sur (Southern Cross), would be fed by Argentina's Neuquen and Austral fields and would stretch for 575 miles with a capacity of 20 Mmcf/d, through Uruguay to the Brazilian state of Rio Grande do Sul. The cost has been estimated at US$ 400 million.

Another recently planned pipeline, led by an international consortium, would create a US$ 265 million, 615-mile pipeline from the Argentine/Brazil border city of Uruguaiana to the Brazilian city of Porto Alegre. Construction is scheduled to begin by the end of 1999 and deliveries would start by 2004. The pipeline, with a capacity of 12 Mmcf/d, would link up with the BTB pipeline and would feed the petrochemical and power-generating industries. In addition, U.S.-based Enron Corp. has received permission to construct a 390-mile spur pipeline from the BTB to feed a 240 MW gas-fired power plant which it is constructing in Cuiaba, Brazil. Overall, Brazil's gas pipeline network should extend to an estimated 6,875 miles by 2010.

In accordance with Brazil's national privatization agenda, plans are underway to privatize parts of the country's natural gas sector. Because Brazil maintains a highly federalized government system, many state governments are now shouldering heavy fiscal responsibilities. In an effort to raise necessary working capital, state governments have begun to sell their state natural gas distributing companies.

The most successful of these state sales has been the April 1999 purchase by Britain's British Gas (BG) of a controlling stake in Sao Paulo's state natural gas distributor, Comgas. The winning bid by BG and its partner Royal Dutch / Shell of US$ 992 million was more than double the minimum asking price of US$ 441 million. U.S.-based Enron, which owns minority stakes in Rio de Janeiro's two gas distributors, had the second highest bid of US$ 770 million. As a result, BG gained control of more than 62% of Comgas's voting shares. Comgas currently serves 300,000 customers; BG hopes to increase this customer base to 500,000 within 10 years by investing more than US$ 200 million over the next two years to expand Comgas's network and services.

BG's high bid for Comgas helped significantly to renew confidence in Brazil and its ability to quickly overcome its financial crisis. It also showed that foreign investors were again able to access international capital markets for projects in Brazil. With the winning bid, BG becomes the fifth major player in the Brazilian natural gas market and should encourage greater domestic competition. The other already established players in Brazil's market are Petrobras, Shell, Enron, and YPF. BG's partner in Comgas, Shell, which took a 5% stake in the purchase, is already a major shareholder in the Bolivian portion of the BTB gas pipeline, which will supply Comgas.

The Coal Sector

Due to the high ash and sulfur content and low caloric value of its domestic coal, Brazil imports a significant amount of coal from the United States and Australia. Nonetheless, recoverable domestic reserves are estimated at approximately 13.1 billion short tons of lignite and sub-bituminous coal, the second largest coal reserves in Latin America. Production in 1998 was approximately 5.6 million short tons.

Coal is used predominantly for Brazil's domestic steel industry, with a small portion burned to generate electricity. A 1996 study by the International Energy Agency (IEA) concluded that Brazil will continue to be one of the world's major coal importers during the next 10 to 15 years, with imports possibly doubling by 2010. The country's steel industry is expected to remain the largest domestic coal consumer for the foreseeable future. Brazil plans to increase its use of steam coal (both domestic and imported) for electric power generation.

The Power Sector

Brazil's power generation capacity currently amounts to around 60,756 MW. At the end of 1998, the vast majority (92.7%) of this domestic electricity generation was still in the hands of the state and federal governments. Brazil's main source of electricity comes from hydro-electric power, providing roughly 95% of the country's electrical energy. Along with Paraguay, Brazil maintains the world's largest hydro complex, the Itaipu facility with a capacity of 12,000 MW. Brazil's remaining electricity generation capacity comes from coal and an ever-increasing amount from natural gas. Brazil expects to raise its power generation capacity to 96,200 MW by the year 2007.

The National Electric Power Agency (ANEEL) controls and supervises all power companies in Brazil. Eletrobrás, the government's electric utility, currently generates 60% of the country's powers and is responsible for 64% of the nation's transmission lines. ANEEL has given Eletrobrás the responsibility of executing the national electric power policy. This includes coordinating and supervising the expansion and operation of the generation, transmission and distribution systems. In addition to setting national power policy, Eletrobrás assists in financing the expansion of the power sector, making it the second largest agency for long-term financing in the country.

Prior to the economic crisis, Brazil's electricity demand was expanding at a relatively rapid 7% annual pace. Most of this growth was taking place in the less-developed Northeast region of the country. These high levels of growth are expected to return after the financial crisis and to continue for the next decade. As a result, it is expected that Brazil will need to add an additional 3,650 MW per year and will require investments of US$ 8 billion to US$ 9.5 billion per year for the next 5 years, totaling an estimated US$ 50 billion over the next 10 years. To most effectively deal with its

rapid increase in power demand, and to alleviate its fiscal crunch, Brazil is undertaking a process of privatization of the electrical sector.

Since 1995, Brazil has auctioned off US$ 20 billion of electricity assets, mostly pertaining to distribution. By the end of 1998, about 60% of distribution was controlled by the private sector, compared to just 31% a year earlier. Privatization of Brazil's electric power sector has gone through high and low periods since its initiation. In late 1997 and early 1998, private companies were buying state electric distributors at prices on average 40%-60% higher than the minimum asking bid. However, in April 1998, concerns were raised when no companies were able to put forward the minimum bid for a state electricity company due to their inability to raise proper financing for what was thought to be an overvalued utility. In July 1998, these fears were allayed when Enron offered US$ 1.27 billion for Elektro, an electricity distribution company in the state of Sao Paulo. The offer by Enron, which has become a major purchaser in Brazil's natural gas and electricity sectors, was almost twice the minimum established price.

However, since the financial crisis in August 1998, state utilities have been obtaining prices closer to the minimum asking bids. For instance, in September 1998, the government sold 42% of Gerasul, an Eletrobrás subsidiary, for the minimum price of 945 million Reals to the only bidder, a consortium headed by the Belgian power developer Tractebel. Furthermore, although Brazil plans to auction off 24,200 MW of generating capacity during 1999, investors still remain cautious. This hesitation is mainly because the Brazilian government is unwilling to link electricity tariffs to dollar pricing. Instead, tariffs have been frozen in nominal terms, meaning that since the floating of the real in January 1999, tariff rates have effectively been cut by a third.

In another attempt to meet growing power demand, Brazil has begun integrating parts of its transmission network with neighboring countries. In early 1998, a contract was signed between Brazilian state power companies Enersul and Furnas and the Chilean firm Endesa allowing for the importation of up to 2,000 MW of electricity from Argentina. The construction of transmission lines and a station to convert Argentine power to the Brazilian current is presently underway. Meanwhile, Bolivia also is analyzing the possibility of selling electricity to Brazil.

To better accommodate the purchase of electricity both domestically and from its neighbors, Brazil is currently in the process of creating a wholesale energy market, roughly similar to the system Argentina has had for the past 7 years. Under such a system, generation, consumption and prices would follow free market conditions, and would allow for quicker responses to the fluctuations of supply and demand.

In January 1999, Brazil completed the full integration of the nation's two electricity grids. The North/northeast electricity grid, which has an installed capacity of 14,686 MW, was connected with the South/Southeast/Midwest grid, with its 42,706 MW

capacity. Together, the two grids supply around 98% of the country's needs. The interconnection project cost an estimated US$ 700 million. Brazil also has plans to expand its power transmission network by building more than 2,500 miles of new transmission lines.

2.2.2 Power Sector Restructuring and Privatization

Brazil is restructuring and privatizing its electric power sector, converting from a largely state-controlled system to a market-driven model. The nature of the market model and the necessity of increasing overall economic efficiency are such that this market model will push toward higher efficiency in production and use of energy. Thus, Brazil's energy sector is in a transitional phase, in which policy development and implementation is critically time-sensitive. Although Brazil has created other regulatory bodies, there is virtually no tradition of independent regulation in the country to ensure quality, access, and fairness of energy services, or to enforce the rights and responsibilities of consumers and providers with regard to clean energy options. There is also a strong need to improve the coordination and collaboration among a large number of federal and state energy regulatory agencies, ministries, private environmental institutes, NGOs, etc.

Parallel to the implementation of privatization, the government has embarked upon a process of decentralizing regulation through strengthening existing state entities and creating new state-level regulatory bodies. The current Ten-year Plan of Eletrobrás, the national electric utility, is the latest edition of an annually updated document that served in the past to focus Eletrobrás' resources and those of its subsidiaries. Centralized government planning previously required that Eletrobrás organize, plan, finance, build, and operate the entire electric power system. Now, however, the Ten-Year Plan (*Plano 2015*) is developed by the Ministry of Mines and Energy. Eletrobrás continues to be directly responsible for implementation.

Under the new planning process, the power sector market structure is shaped through privatization legislation, the decision making authority granted to new regulatory agencies, investment decisions of privatized utilities, Brazilian and foreign investors, development and commercial financing agents, and private power developers. The decisions made in the past by Eletrobrás alone for siting and building new power facilities will now involve a number of additional partners in the private sector.

The privatization implemented by the GOB as of February 1999 is summarized in Exhibit II-1. The government has made a significant progress in its privatization program since February 1999. Exhibit II-2 presents the government's plan as of May 1999 for further privatization of the power sector. Exhibit II-3 provides additional details of Brazil's energy sector privatization.

2.2.3 Energy/Economy Relationship and Price Structure

At the present stage of development, the Brazilian economy exhibits a clear trend of increasing levels of energy intensity. Projected economic expansion of three percent per year and the corresponding growth in energy needs (e.g., electricity demand increased 6.5 percent in 1997) will impose considerable demands on Brazil's industry to carry out supply- and demand-side management measures. In 1997, power shortages in large energy markets like Rio de Janeiro were considered as early warnings of the supply crisis. Major cities in the Amazon region are also under energy rationing schedules (Manaus and Santarém). If the Government of Brazil (GOB) and regulatory agencies are not successful in guiding the market and the privatized utilities to reduce the risk of power shortages, repeated shortages could threaten the implementation of Brazil's privatization schedule as well as economic growth.

Most of the last large potential hydropower sources in the proximity of dense load regions (i.e., the south and southeastern regions of Brazil) have already been developed. *Plano 2015* indicates that the necessary additional installed power plant capacity will come from the remaining hydropower projects in the Southeast and Midwest of Brazil, and untapped resources in the Amazon River Basin (26,318 MW), imported natural gas (5,146 MW), nuclear energy (2,618 MW), coal (1,800 MW) and renewable energy. If the GOB and the regulatory agencies are not successful in guiding the market and the privatized utilities to develop significant efficiency programs and short-term increases in generating capacity, the risk of power shortages could threaten Brazil's economic growth. This would, in turn, not only call into question the implementation of Brazil's electricity sector privatization schedule, but also public support for the GOB's larger sector reform effort.

EXHIBIT II-1: SUMMARY OF ENERGY SECTOR PRIVATIZATION

Company	Auction Date	Equity Value (US$ millions)	Stake Acquired (US$ millions)
Escelsa	July 1995	774	387
Light	May 1996	4,073	2,036
Cerj	November 1996	838	587
Cemig	May 1997	7,308	1,053
Coelba	July 1997	3,195	1,598
D2 (CEEE)	October 1997	1,509	1,373

D3 (CEEE)	July 1997	1,637	1,485
CPFL	May 1997	6,650	2,731
Enersul	November 1997	1,169	565
Cemat	November 1997	477	353
Energipe	November 1997	601	520
Cosern	December 1997	778	606
Coelce	April 1998	1,646	686
Metropolitana	April 1998	5,962	1,777
Celpa	July 1998	756	388
Elektro	July 1998	2,730	1,273
Gerasul	September 1998	1,610	801
Bandeirante	September 1998	2,738	816

Source: *Financial Times*

EXHIBIT II-2: PROPOSED PRIVATIZATION PROGRAM OF THE GOB IN THE ENERGY SECTOR--AS OF MAY 1999 (1999-2000)

State Company	Expected Date of Sale
CESP - Parana Grande	May 1999
CESP - Paranapanema	June 1999
CESP - Tiete/Pardo	June 1999
Saelpa	First Half of 1999
Celpe	Second Half of 1999
Copel	Second Half of 1999/2000

Celesc	Second Half of 1999/2000
Cemar	First Half of 2000
Furnas	Second Half of 1999
Chesf	Second Half of 1999
Electronorte	Second Half of 1999/2000
Manaus System	Second Half of 1999/2000
Boa Vista System	Second Half of 1999/2000
Cepisa	First Half of 2000
Ceron	First Half of 2000
Electroacre	First Half of 2000
Ceal	Under Discussion
Transmission Assets	Under Discussion

Source: *Financial Times*

EXHIBIT II-3: DETAILS OF THE PRIVATIZATION OF BRAZIL'S ENERGY SECTOR

Company	MW	MWh	DATE
FEDERAL PROGRAM			
ELECTRICAL ENERGY			
Distributors			
Cia. Energética de Alagoas – CEAL		1760	By October 99
Cia. Energética do Piauí S/A – CEPISA		1260	By December 99
Centrais Elétricas de Rondônia S/A – CERON		1040	1º Sem/2000
Centrais Elétricas do Estado do Acre – ELETROACRE		320	1º Sem/2000
Generators			

Manaus Energia S/A			2º Sem/99
Centrais Elétricas S/A – FURNAS 1	5.570		2º Sem/99 *
Centrais Elétricas S/A – FURNAS 2	4.633		2º Sem/99 *
Cia. Hidrelétrica do São Francisco – CHESF 1	6.420		2º Sem/99 *
Cia. Hidrelétrica do São Francisco – CHESF 2	4.574		2º Sem/99 *
Cia. Hidrelétrica do São Francisco – CHESF 3	1.500		To be determined
Centrais Elétricas do Norte – ELETRONORTE (Tucuruí)	4.356		2º Sem/99 *
STATE PROGRAM			
ELECTRICAL ENERGY			
Distributors			
Sociedade Anônima de Eletrificação da Paraíba – SAELPA		1940	By July 99
Cia. Energética de Pernambuco – CELPE		6940	By October 99
Cia. Energética do Maranhão – CEMAR		2190	By December 99
Cia. Paranaense de Energia S/A – COPEL		15125	By April 2000
Generators			
Cia. de Geração do Tietê	2.653		To be determined
Cia. de Geração do Paranapanema	2.152		July 1999
Cia. de Geração do Paraná	6.218		To be determined
GAS DISTRIBUTION			
COMGÁS			April 1999

(*) Item 27 of the agreement Brazil – IMF, signed on 3/08/99.

Source: ANEEL

The wholesale energy prices for energy in Brazil continue to be below long-run marginal costs. This has resulted in a twofold impact: (i) large energy consumers have little or no financial incentive to invest in energy efficiency; and (ii) energy producers are hindered from investing in efficient generation and T&D technologies that may have a higher initial capital cost but lower overall cost, when compared to other sources, such as renewable energy.

With inflation rates under control and electricity prices increasing (11.8 percent in 1997), the opportunities for energy efficiency measures are considerable, both in energy supply systems and in end-use applications. Privatization of the fixed generation assets and the competitive forces put in play by restructuring will gradually force increases in bulk energy prices towards their full economic recovery cost, a need recognized by the GOB to attract foreign investors. This underlying trend of costs and prices for energy will greatly improve incentives and consumer willingness to use energy more efficiently. By reducing effective demand for energy through cost-

effective savings, it is possible to significantly reduce the need for additional fossil-fuel generating capacity.

Under the new regulatory climate, rural communities currently served by subsidized power from state-owned utilities will be subject to a decrease in the quality of the service while unserved rural communities may wind up even further behind if utilities use a conventional approach to the problem (i.e., grid extension). In this scenario where decentralized, local, and clean generation solutions are not customarily examined or promoted, the GOB plans to focus on the promotion of the adoption of market-based practices for clean energy by key actors. In order to achieve increased adoption of clean energy solutions and reach key actors, a balance between top-down and bottom-up approaches will focus on the areas of policy, financing, training and technology, where major barriers were identified.

In summary, the accompanying and wide-ranging structural and regulatory changes now underway in the power sector in Brazil will help determine the role to be played by environmentally friendly options, such as efficiency measures and increased use of renewable energy in Brazil's energy future.

2.2.4 Fossil Fuel Related Carbon Emissions

Brazil is considered a major contributor to global climate change due to deforestation and burning that takes place in the Amazon and the Savanna zone. Carbon emissions in Brazil in 1996 were 71 million metric tons and are estimated to increase in 2020 to 208 million metric tons. Brazil has signed and ratified the United Nation's Framework Convention on Climate Change. A historical summary of carbon dioxide (CO2) emissions from fossil fuel use in Brazil is shown in Exhibit II-4 with a projection for the year 2020.

EXHIBIT II-4: FOSSIL FUEL-RELATED CARBON EMISSIONS IN BRAZIL (in millions of tons of carbon)

Component	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	2020
CO2 from coal	10.34	10.39	10.50	9.16	10.81	9.78	7.40	7.47	7.65	8.06	8.05	20
CO2 from natural gas	2.03	2.10	2.34	2.38	2.56	3.01	3.04	3.17	3.29	3.86	4.19	64
CO2 from petroleum	45.08	45.15	46.64	46.15	46.96	48.17	53.96	58.53	61.07	62.41	65.04	124
Total CO2 from all fossil fuels	**57.45**	**57.64**	**59.48**	**57.70**	**60.33**	**60.96**	**64.40**	**69.17**	**72.01**	**74.33**	**77.28**	**208**

Sources: DOE/EIA (historical data), Brazilian Embassy (2020 projection)

2.2.5 Key Institutions

A large number of public and private sector organizations are involved in energy sector activities in Brazil. The MMEE Project Team has held discussions with key officials from a number of organizations. The following are the most important organizations including those involved in energy efficiency activities.:

- The Ministry of Mines and Energy (MME), Secretariat of Energy (SEN)
- Eletrobrás
- Petrobras
- National Agency for Electric Power (ANEEL) and selected state regulatory agencies
- National Program for Electrical Energy Conservation (PROCEL)
- National Center for Power Research (CEPEL)
- National Energy Development Program for States and Municipalities (PRODEEM)
- Investor and Public Owned Power Utilities (Concessionaires)

A brief description of the key functions of these organizations follows.

The Ministry of Mines and Energy (MME), Secretariat of Energy (SEN)

The Ministry of Mines and Energy (MME) is the Government of Brazil's (GOB) executive branch agency responsible for energy infrastructure in the country. Under Brazil's constitution, the provision of electric power is an obligation that the GOB takes on and guarantees to the people of Brazil. The provision of electric power by non-GOB entities is a new phenomenon and requires the granting of a concession by the GOB to an electric power provider. MME supervises and controls the development of energy resources and monitors all activities related to the power sector. MME is also

responsible for energy policy, as well as the quality and reliability of energy services, and energy sector infrastructure necessary for Brazil's economic growth. MME is also responsible for how Brazil positions itself in Climate Change related issues insofar as it relates to the energy sector. by counseling and consulting with the Brazilian Ministry of Foreign Affairs on Brazil's international position on GHG and Climate Change.

The Secretariat of Energy (SEN) carries the Minister's delegated responsibilities in these areas with regard to the energy sector. The MME and SEN currently lack much of the needed structure to manage the process adequately, and are, therefore, creating the National Energy Policy Council (NEPC). The soon-to-be implemented NEPC will deal with macro-energy policies, including division of federal/state responsibilities. The committee will include a wide range of ministries representatives and be chaired by MME. SEN will be NEPC's executive secretariat. The key role of both SEN and NEPC is to establish a coordinated policy framework for Brazil's energy resources and to advise on aspects relating to the energy sector. Specific responsibilities of MME/NEPC/SEN with regard to the restructured electricity sector will be as follows:

- Formulate policies and regulations to implement and disburse national subsidies for rural energy development;
- Provide input to the Ministry of Environment in establishing environmental policy for the sector;
- Establish policy on electricity conservation (implemented through regulation and sponsored projects);
- Sit on the governing bodies of Federal Holding, Sector Financing, Indicative Planning, Independent System Operators, and Sector Services organizations;
- Propose changes in sector legislation for approval by the Congress;
- Nominate the Board of Directors of ANEEL for approval by Congress;
- Nominate directors for the Federal Holding, Sector Financing and Indicative Planning organizations; and
- Exercise ownership functions for federal shareholdings on behalf of the Ministry of Finance.

Traditionally, SEN and other parts of MME have been staffed with officials seconded from Eletrobrás, Brazil's national utility holding company. There is a critical need to strengthen the policy-making function within SEN and the NEPC, so that these organizations can become operational and exercise their respective roles without support from Eletrobrás. Sector privatization and the importance of distinguishing the

government's roles as policy maker, regulator, and owner of those elements of the industry that will not be privatized, means that MME's capability as a policy maker needs to be strengthened by providing additional skilled and qualified staff and managers. As part of its strategy, the USAID Mission intends to assist MME, SEN, and NEPC as it increases the number of specialist staff by providing specific training and an energy advisor on sector policy issues, focusing on clean energy.

Eletrobrás

In 1996, some 64 utilities provided electric services to approximately 40 million users. These utilities operate under the jurisdiction of the Ministries of Mines and Energy, whose National Electric Power Agency (ANEEL) controls and supervises all power companies in Brazil. ANEEL has charged Eletrobrás with executing the national electric power policy. This includes coordinating and supervising the expansion and operation of the generation, transmission and distribution systems, which is critical to the power sector given the large number of power companies in Brazil. In addition to executing the power policy, Eletrobrás finances the expansion of the power sector, making it the second largest agency for long-term financing in the country.

Eletrobrás has four subsidiaries. These are: 1) Electronorte, which operates in the North and Midwest regions of the country, 2) CHESF, which operates in the Northeast region, 3) FURNAS, which operates in the Southeast and Midwest regions; and 4) Electrosul, which operates in the South and Midwest regions.

Eletrobrás is also a minority stakeholder in the remaining power utilities, which are controlled by their respective State governments and by a single city government utility. Some of these State utilities include: Cemat, Enersul, Energipe, Ceal, Coserne, Cepisa and Ceron. Also, Eletrobrás holds 50 percent of the capital of Itaipu Binacional (ITAIPU) -- the bi-national electricity company between Brazil and Paraguay; controls shares in Nuclen Engenharia S.A. (NUCLEN) -- the Brazilian nuclear organization; and supplies most of the funding to the Electric Energy Research Center (CEPEL) -- which conducts research for the development of power generation, transmission and distribution technologies.

Additionally, private companies operate a smaller segment of the electricity sector. The largest of these private companies include LIGHT and CERJ in the State of Rio de Janeiro, and ESCELSA in the State of Espirito Santo. Exhibit II-5 shows several of the electricity generating companies in Brazil, including their capacities and market share.

EXHIBIT II-5: ELECTRICITY GENERATING COMPANIES IN BRAZIL

Company	Capacity (MWe)	Market Share (percent)
Eletrobrás	23,747	39
FURNAS	8,511	14
CHESF	8,360	14
Electronorte	3,666	6
Electrosul	3,210	5
ITAIPU	12,600	21
CESP	9,434	16
Others	6,467	11
CERMIG	4,600	8
COPEL	3,337	6

As mentioned earlier, hydroelectric power continues to dominate Brazil's electricity generation mix. The dominance of hydroelectric power in electricity generation in Brazil is due to: 1) the great hydroelectric potential that exists, 2) limited domestic petroleum and natural gas reserves, and 3) the low quality and quantity of domestic coal reserves. Thus, within the last decade, increases in thermal capacity have been limited to small, isolated facilities for the purpose of complementing the existing hydroelectric system. This included utilization of the existing low quality, limited coal resources in the southern part of the country. A breakdown of the installed thermal capacity is shown in Exhibit II-6.

EXHIBIT II-6: BRAZIL'S INSTALLED THERMAL ELECTRIC CAPACITY

Fuel Type	Capacity (MWe)
Petroleum and Natural Gas	3,150
Coal	1,040
Biomass Co-Generation (sugar cane bagasse)	850
Total	**5,040**

Source: Brazilian Embassy, 1998

Brazil has approximately 1,000 diesel-fired generation operations scattered across the interior of the country. Of these, approximately 80 percent are in the Northern region and the balance is in the Midwest region. Petroleum and natural gas-fired facilities serve population centers in the Southeast region (50 percent), in the Northeast region (25 percent), in the capitals of the North region (22 percent), and in the South (3 percent). Of these, the FURNAS facility at Santa Cruz (608 MWe) and the ELECTROPAOLO facility at Piratininga (470 MWe) are the largest.

Coal-fired facilities, which are located in southern Brazil, range from 20 MWe to 538 MWe, and include facilities located at Rio Grande do Sul, Santa Catarina and Parana. Of the power stations that are fired with crushed sugar cane, 45.7 percent of the capacity is located in the state of Sao Paulo, 16.5 percent in Alagoas, and 13.6 percent in Pernambuco. The remainder of sugar cane-powered capacity is scattered across the Northeast, the Southeast, the South and the Midwest.

Brazil's 10 Year Expansion Plan (1994 to 2004) foresees a market growth for energy of 4.2 percent/year in the period 1994/1999 and 4.9 percent/year in the period 1999/2004. Under the plan, Brazil's total installed capacity will grow from current levels to 90.2 GWe in 2006, with the hydroelectric share declining from approximately 86 percent to 83 percent, and the thermoelectric share growing from approximately 8 to 17 percent over the same period.

During the 10 year period, approximately 28,000 miles of transmission lines and 96,000 MVA in substations will be added to interconnected and isolated regional systems. A new Spanish- and Chilean-owned venture, Cien, is planning to construct a US$ 350 million, 315-mile transmission link between Brazil and Argentina, although a construction schedule has not yet been reported.

Between 1994 and 2004, an estimated 4,079 MWe of thermal capacity will be added and 20,374 MWe of hydroelectric capacity will be added for a total of 24,353 MWe of new capacity. The schedule for increasing the total capacity in Brazil is shown in Exhibit II-7.

EXHIBIT II-7: PLANNED INSTALLED CAPACITY IN BRAZIL TO THE YEAR 2004

Year	Total Thermal Capacity (MWe)	Total Hydroelectric Capacity (MWe)	Total Capacity (all sources) (MWe)
1994	4,378	49,603	53,981
1995	4,404	51,629	56,033
1996	4,935	52,958	57,893
1997	5,254	53,800	59,054
1998	5,523	55,667	61,190
1999	6,012	58,723	64,735
2000	7,462	60,933	68,395
2001	7,522	60,989	68,511
2002	7,639	62,913	70,552
2003	8,379	67,122	75,501
2004	8,457	69,877	78,334

Source: Eletrobrás, Brazil (1998)

The largest power stations under construction and planned by Eletrobrás in the South, Southeast, and Midwest regions are shown in Exhibits II-8 and II-9. Exhibit II-10 shows the largest power stations planned in the North/Northeast Region.

EXHIBIT II-8: LARGEST POWER STATIONS UNDER CONSTRUCTION

Power Station	Capacity (MWe)	Type	Estimated Date of Operation
Porto Primavera	1,814	Hydroelectric (Parana River)	May 1997
Ita	1,450	Hydroelectric (Uruguai River)	June 1999
Salto Caxias	1,240	Hydroelectric (Iguacu River)	June 1999
Angara II	1,309	Thermal	December 1999
Candiota III	350	Thermal	December 2002

Source: Eletrobrás, Brazil (1998)

EXHIBIT II-9: LARGEST POWER STATIONED PLANNED IN THE SOUTHEAST/MIDWEST REGIONS

Power Station	Capacity (MWe)	Type	Estimated Date of Operation
Machadinho	1,200	Hydroelectric (Uruguai River)	September 2003
Garbi *	900	Hydroelectric (Uruguai River)	December 2004
Capim Branco	600	Hydroelectric (Araguari River)	September 2003
Cana Brava	450	Hydroelectric (Tocantins River)	September 2002
Irape	420	Hydroelectric (Jequitinhonha River)	March 2003
Replan I	350	Thermal	December 2002
Sapucaia/Anta	316	Hydroelectric (Paraibo Do Sul River)	June 2003
Cebalao	194	Hydroelectric (Tibagi River)	September 2003

Source: Eletrobas, Brazil (1998)

EXHIBIT II-10: LARGEST POWER STATIONS PLANNED IN THE NORTH/NORTHEAST REGIONS

Power Station	Capacity (MWe)	Type	Estimated Date of Operation
Tucurui II	2,450	Hydroelectric (Tocantins River)	January 2002
Serra	1,328	Hydroelectric (Tocantins River)	December 2004
Itapebi	375	Hydroelectric (Jequitinhonha River)	January 2003
Sacos	114	Hydroelectric (Formoso River)	January 2003

Source: Eletrobrás, Brazil (1998)

Petrobras

Petrobras, currently a 51-percent government-owned company, represents a monopoly in Brazil's petroleum sector. Petrobras has three distinct subsidiaries: 1) Petrobras Internacional S.A. is responsible for global exploration and production, marketing, and chemicals; 2) Petrobras Quimica S.A. is responsible for petrochemicals; and 3) Petrobras S.A. is responsible for natural gas distribution. Petrobras is the world's 15th largest oil and natural gas company and a leader in deepwater drilling and the use of floating production systems and sub sea completions. Petrobras has set many deepwater drilling records since it began exploring Brazil's continental shelf in the 1970s.

The Campos Basin, located southeast of Rio de Janeiro, accounts for most of Brazil's oil reserves and current production. In 1995, three of its fields – Marlim, Marimba and Albacore -- produced more than one-fourth of Brazil's oil. Other promising areas for development include the offshore Ceara Basin (in northeastern Brazil) and the onshore Urucu field (in the Amazon Basin). Brazil's recent exploration activities have been fairly successful. In 1995, Brazil added 3.7 barrels of new oil reserves for every barrel of oil produced. In 1996, Brazil had two deepwater discoveries in the Campos Basin that increased oil reserves by 640 million barrels.

In June of 1999, ANP, Brazil's National Petroleum Agency held a lease sale during which 12 of 27 blocks were bid upon. Bidders offered more than US$ 180 million in initial bids for exploration and production rights to these blocks. ANP had previously

predicted investments from the sale totaling US$ 1.2 billion. Exhibit II-11 shows the winning offers for each of the 12 blocks.

Petrobras and Venezuela's PDVSA are studying the acquisition of a refinery in the Caribbean area that would process Venezuelan crude for import to Brazil through a terminal to be constructed in northern Brazil. They have developed a joint venture with the 500,000 b/d Amarada Hess refinery in St. Croix and have also looked at a refinery in Trinidad for expansion. Brazil's Bahia state may be the first private enterprise refinery in Brazil through a joint venture between Companhia Petroquimica do Nordeste (COPENE) and Petrobras at a cost of US$ 600 million.

Exhibit II-11: WINNING BIDS IN BRAZIL'S RECENT LEASE SALES

Basin/Area	Winning Bidder(s)	Bid (US$ millions)
Campos 3	Petrobras*, Agip, YPF	3.43
Santos 4	Agip	75.3
Campos 5	Texaco	3.3
Espiritos Santo 1	Esso	10.7
Santos 3	Amerada Hess*, Kerr-McGee, Petrobras	10.2
Campos 6	Petrobras	2.8
Camamu-Almada 1	Petrobras*, YPF	0.46
Santos 2	Texaco	15.8
Campos 4	Agip*, YPF	28.6
Potiguar 1	Agip	4.4
Espirito Santo 2	Unocal	17.8
Foz do Amazonas	BP Amoco*, Esso, Petrobras, Shell, British-Borneo	7.3

* Source: *Oil & Gas Journal*

National Agency for Electric Power (ANEEL) and Selected State Regulatory Agencies

The Agência Nacional de Energia Elétrica (ANEEL), or National Agency for Electric Power, is the recently established Federal Power Regulatory Agency. The closest U.S. parallel to the structure of ANEEL is the Federal Energy Regulatory Commission (FERC) in the United States. Relying on the structure of the previous organization, DNAEE, or National Department of Electric Energy, a now-extinct MME department, ANEEL started to function in December 1997. ANEEL is establishing the regulatory regime necessary to provide the right signals to the market to support the national energy policies promulgated by NEPC.

ANEEL regulates the power sector, sets guidelines for tariffs and rate-making, approves tariffs, and has the authority to grant concessions to service providers (i.e., concessionaires, permissionaires, retailers, independent power producers, and self producers). Such an authority resembles a licensing or authorization power to grant a private agent the right to use a public commodity (like water in a river) to generate, transmit, or distribute power. The licenses may be granted to all parties interested in the power sector (e.g., transmission companies, distribution companies, and retailers). ANEEL is also charged with establishing competition among the actors, as well as reliability and cost effectiveness of service, including service to rural areas. ANEEL's other mandates include a gradual decentralization of regulatory authority to existing and newly established State public utility commissions based on their current capacity and capability to be able to perform the new functions. In addition, ANEEL is responsible for monitoring the public and the newly privatized distribution utilities on the proper and effective use and reporting of the one percent energy efficiency fund as required under the law.

As has been seen in various Brazilian states (Ceará, Rio Grande do Sul, Rio de Janeiro, São Paulo and Bahia) once state regulatory agencies are established, they require intense technical advisory services in order to ensure long-lasting and effective performance. There is a great need for technical assistance and training in strengthening existing state regulatory agencies and establishing new state regulatory agencies, as well as in providing requisite technical support to state regulators and their staff. Ideally, regulatory advisory assistance could be established where two or three agencies could be the focus of such assistance. This combined approach would consider individual advisory assistance at the state level, but would also provide joint training and advisory assistance where regulators and staff from different states could meet and share their experiences, concerns, and solutions.

National Program for Electrical Energy Conservation (PROCEL)

PROCEL is MME's preferred arm for the design and implementation of the country's program for energy efficiency. Although officially PROCEL falls under the responsibility of MME, in practice, Eletrobrás runs the program through PROCEL's Executive Secretariat in Eletrobrás headquarters in Rio de Janeiro. In the coming months, PROCEL may merge with Brazil's Electric Power Research Center (CEPEL) to form a research and technical institution reporting directly to SEN/NCEP. PROCEL has been quite successful in achieving its goals and also in coordinating actions with bilateral and multilateral agencies and donors such as CIDA, the World Bank, the European Community (ALURE Program), and the United Nations Development Program (UNDP). PROCEL is well organized and well connected with all the agents in the power sector (utilities, ESCOs, INEE, ANEEL, Eletrobrás, MME, NGOs, industry, and others).

In general, although PROCEL has capable staff and extensive equipment, it needs assistance in designing and implementing state of the art efficiency programs, as well as monitoring and verification programs to track the success of its programs. The USAID Mission in Brazil has funded an energy efficiency advisor to work with PROCEL, and envisions continuing that assistance, as well as assistance to ANEEL to coordinate the inclusion of energy efficiency into Brazil's new regulatory policy framework. More specifically, PROCEL has requested USAID's assistance in a number of areas as follows:

- To assist PROCEL and ANEEL program the funds resulting from the one percent energy efficiency levy which are to be targeted towards energy efficiency. PROCEL is quite aware that it will have to develop an effective coordination procedure with state regulatory commissions to enforce the one percent energy efficiency mandate on both public and private utilities; and

- To develop effective implementation and evaluation plans for an Energy Efficiency Loan to Brazil, currently under preparation by the World Bank PROCEL is charged with developing the technical proposal to the World Bank, and coordinating the implementation of projects to be funded under the loan.

National Center for Power Research (CEPEL)

CEPEL is the equivalent in the U.S. of the Department of Energy's (DOE) national laboratories, and the Electric Power Research Institute (EPRI). Like PROCEL, CEPEL is also operated through Eletrobrás. As noted above, in the coming months CEPEL may merge with PROCEL to form a research and technical organization reporting directly to SEN.

National Energy Development Program for States and Municipalities (PRODEEM)

PRODEEM is MME's program for rural off-grid energy services. PRODEEM is governed by an inter-ministerial council, and operated by MME. PRODEEM has representatives or offices in every state of Brazil, and also agreements with state utilities, NGOs and private sector foundations for project identification, design, implementation, and monitoring. It has been successful in implementing "social" residential renewable energy projects (give-away of solar panels and solar water pumps) using federal funds. PRODEEM is now trying to take advantage of the regulatory reforms in Brazil by shifting to a more market-oriented approach, with better monitoring of private-sector participation. It is also expanding its existing agreements for project identification, design, implementation, and monitoring to increase outreach. MME is currently planning to provide support for the establishment of an Executive Secretariat for PRODEEM to more effectively accomplish its transition to a market-based approach.

The Inter-American Development Bank's Sustainable Markets for Sustainable Energy (IDB/SMSE) program is trying to establish an Action Plan with PRODEEM. This is somewhat in parallel with the World Bank's preparation of an integrated commercial/social rural electrification (ICSP) loan for the northeast of Brazil (i.e., the states of Ceará, Bahia, and Minas Gerais). The USAID Mission is providing assistance to PRODEEM through a Policy Advisor based in PRODEEM facilities. This Policy Advisor is assisting PRODEEM in a number of areas including the following:

i. Policy in preparation for PRODEEM's restructuring; and
ii. Institutional contacts with World Bank and IDB/SMSE.

Investor and Public Owned Power Utilities (Concessionaires)

USAID has a special interest in three states (Ceará, Bahia and Minas Gerais) that are currently the target states for the World Bank Integrated Commercial/Social Power loan to finance rural decentralized clean power. The utilities in these States are COELCE, COELBA, and CEMIG (Ceará, Bahia and Minas Gerais respectively). COELCE (Ceará) is a state-owned utility and is slated for privatization in 1998-99. COELBA (Bahia) was privatized in 1997. The state government of Minas Gerais sold 51 percent of CEMIG shares in 1997.

As noted above, new private owners of utilities are not particularly interested in investing in rural markets (either extending the grid or servicing consumers by rural decentralized power) because such investments have typically a low return on investment compared to capital investment opportunities. In remote areas, quite often the least cost option for energy services is local generation, usually a clean source such as small hydro, biomass, or residential solar power. State governments are increasingly aware that, in order to integrate the rural population in the development process, they must have a mechanism to provide rural power that is not now readily available from new private utility owners. However, the traditional high cost of rural services is frequently greater than the capacity of customers to pay for service. Subsidies are unpopular and non-sustainable, and urban consumers generally do not like to pay more for power, allowing the utility to recover their average cost plus a premium. Moreover private utilities are unwilling to accept other service providers in their exclusive concession area. Therefore, while this segment of the market is not attractive because of low investment returns, it also is not exposed to competition as utilities protect their service areas. PRODEEM, the World Bank, and IDB/SMSE are exploring small and micro enterprise approaches to rural service, involving sub-concessions called permissionaires. Through assistance with ANEEL and PRODEEM, USAID plans to work with the World Bank, IDB/SMSE, the utilities, and local entrepreneurs to develop this and other alternative approaches for rural electrification.

2.2.6 Selected Donor Activities

One key to the success of the integration of renewable and clean energy practices into the restructuring of Brazil's energy sector will be the coordination and complementarity of USAID programs with those of the other donors active in Brazil. The following is a brief summary of the activities of some of the key bilateral and multi-lateral donors in the energy sector in Brazil.

GTZ, Germany

Germany's Gesellschaft für Technische Zusammenarbeit (GTZ) has provided support to Institute for Sustainable Development and Renewable Energy, IDER, an NGO, for the installation of a pilot project involving fifteen photovoltaic (PV) pumping systems in remote villages of the state of Ceará, through a cooperative project the Companhia Energética do Ceará (COELCE) and the State Planning Department.

In the state of Minas Gerais, GTZ also contributes to CEMIG's electrification program -- "Luz de Minas" -- which includes the implementation of a pilot PV program for rural electrification. Under this program, CEMIG provides and installs stand-alone PV systems in isolated farms, houses, and communities, and provides all the needed maintenance. The initial focus of the Luz de Minas program was to conduct research and development on the deployment of stand-alone PV applications, but the program is now commercially focused, and the costs of the technology and implementation have been considerably reduced over the course of the initial phase of the program.

Another project, the Morro Camelinho wind power station, Brazil's first, came on-line in 1994 and was co-financed by the state of Minas Gerais and GTZ. The project provided basically free power to the consumers. Unfortunately, the wind quality is only good on mountain tops, and populations concentrated in valleys where there is water access and some protection from the winds. As a result, wind systems for small individual houses proved rather uneconomical.

European Union (EU)

The European Union (EU) has been focusing its development efforts on supporting the Brazilian states during the national energy sector restructuring. Primarily this assistance has been through ALURE, a program for the promotion of energy cooperation, which is structured to have dual Brazilian and EU direction. Initial efforts have involved workshops and regulatory assistance in the state of Bahia through ANEEL. The EU has also been involved in the preparation of feasibility studies for the World Bank energy efficiency loan. Through these activities, the EU hopes to increase European trade in energy technologies. The total aid package by the EU amounted to US$ 3.4 million in the 1997-98 time frame.

The second phase of the EU's program is under development, and is anticipated to involve US$ 5 million in assistance. The EU will form a partnership with COELBA, the state of Bahia's energy utility, to promote renewable energy, especially solar power. This will be accomplished primarily through promotion of entrepreneurship and working with permissionaires.

Inter-American Development Bank (IDB)

The Inter-American Development Bank (IDB) has been involved in two separate assistance efforts with the GOB. The first activity involves a US$ 150 million loan to Eletrobrás to support the construction of a north-south power transmission line to connect the north/northeast power grid to the south/southeast grid. This connection will allow 500 kv of optimal power supplies with less seasonal fluctuation, as hydropower generated during the rainy season in one region can be shared with the other region during its dry season. Within this loan, US$ 1.5 million has been designated for institutional capacity building, to be administered through the Independent System Operator, the Independent Planner, and ANEEL. Training activities will require US$ 650,000 for institutional capacity building funds, and the remainder will be used for technical analyses of tariff structuring and free access.

The second focus involves linking IDB's Sustainable Markets for Sustainable energy program with a US$ 400 million small and medium enterprise fund, created for promoting renewable energy entrepreneurship. As PRODEEM undergoes restructuring, the IDB hopes to use these funds to strengthen market-oriented rural renewable energy options in Ceará, Bahia, and Minas Gerais.

United Nations Development Program (UNDP)

The United Nations Development Program (UNDP) has been serving as trustee for PROCEL's energy efficiency fund, taking a two-percent administration fee. It is also looking to provide, in cooperation with USAID, a technical advisor to PRODEEM. The advisor will serve as a facilitator and coordinator between UNDP, the World Bank, the IDB, USAID and other donors, to maximize impact of all donor programs.

The World Bank

The World Bank is currently developing two loans to support the privatization of the energy sector in Brazil. One loan, which promotes energy efficiency programs, will be funded at a total of US$ 120 million, and will disperse funds through either Eletrobrás or PROCEL to power utilities for energy efficiency projects. This project is being proposed for Board approval in early October 1999.

The second loan, called the Integrated Commercial/Social Power loan for the northeast of Brazil, focuses on bringing renewable energy, primarily off-grid solar residential power, to isolated rural communities. Funds will total US$ 100 million, and will be programmed through PRODEEM. USAID was involved in the preparation of three of the five preliminary studies that led to this loan.

3 ENERGY EFFICIENCY PROGRAMS AND POLICIES

3.1 CURRENT STATUS

In most developed countries, energy efficiency is often linked to the resultant reductions in carbon dioxide emissions. In developing and newly industrializing countries, during the last two decades, the domestic and worldwide demand for products emphasized production growth at the expense of efficient production, as most export-oriented industries in these countries were subsidized by their respective governments. Energy efficiency was often not emphasized as a profitable business. In 1985, in response to heavy dependence on interruptible imported petroleum, many oil importing countries, including Brazil, shifted their energy strategy to focus on domestic sources of energy and energy efficiency. Brazil created PROCEL as a cell within its national utility, Eletrobrás, to begin focusing on energy efficiency as a way to reduce energy consumption per unit of production. Since that time, PROCEL has been very active in promoting efficient use of energy and while there are many success stories, market-based mechanisms to stimulate private sector investment in energy efficiency in Brazil are largely absent.

As mentioned earlier, the GOB has developed an Energy Sector Strategic Plan (Plano 2015) which illustrates the country's strategy for meeting its demand for energy between 1998 and the year 2015. As part of this comprehensive plan, the government has set a long-term goal for PROCEL to reduce the overall consumption of electricity in the country by 11% by the year 2015. As of 1997, the total investment by PROCEL in energy efficiency programs stood at R$ 76 million, resulting in an avoided investment of R$ 2.6 billion in new power capacity.

Specifically, the PROCEL program included an aggressive publicity campaign, incentives to electrical appliance manufacturers, and other end-use consumers of Eletrobrás (the parent organization of PROCEL). Virtually all of the funding for the PROCEL initiatives has until recently come from the Eletrobrás budget. The PROCEL program did not address captive power generators, the potential for cogeneration in the industrial and commercial sectors, and private sector led energy investments in the form of EPCs and ESCOs. In order to address these energy efficiency opportunities, PROCEL is currently working with the World Bank to secure a loan. In addition, as per new regulations, ANEEL has selected PROCEL to be the executing entity for guiding and monitoring the investments (equivalent to 1% of the revenues of the privatized utilities) in energy efficiency projects. It is anticipated that PROCEL will monitor projects implemented under this fund which is equivalent to US$ 200 million.

The procedural aspects of managing these revenues and ensuring that they are invested in energy efficiency projects as required by the new law have not been fully addressed. The MMEE Project may be able to offer specific recommendations to the GOB based on models used in other countries regarding the ways that these funds could leverage private sector investments in energy efficiency.

The opportunities for energy efficiency exist in both the supply and distribution of electricity as well as at the end use level. The supply-side (generation and T&D) is managed by a much smaller number of suppliers/managers and major industrial companies (including those with large captive power systems). These stakeholders are generally more tuned to the market conditions as they understand and appreciate that energy savings can be transformed into profits. Also, many of these large multinational firms operate in the internationally competitive environment where cutting energy losses in their operations directly improves the competitiveness of their products and profitability. In Brazil, most of the large multinational companies continue to be monopolistic and in some cases state-owned. They are very protective of their markets which can often act as inhibitors to market-led investments in energy efficiency at the end-use level.

While the key large enterprise sector represents fewer establishments with total assets exceeding US$ 200 billion, the end-use sector consists of a large number of small and medium size users with estimated assets of US$ 300 billion. These individual end-users are generally less informed and more reluctant to implementing end-use energy efficiency. It is this sector that typically requires some form of intervention to facilitate energy efficiency investments. The intervention can take the form of fiscal and financial incentives ("The Carrot Approach"), regulatory controls and penalties ("The Stick Approach"), demonstration programs and training, and education and publicity. The end-use sector in Brazil is comprised of a large number of household, commercial, and industrial users of electricity. It is these users for which a targeted program needs to be developed.

In addition, the financing requirements for achieving even a fraction of the overall energy efficiency potential are formidable and Eletrobrás, the government, the donors, and the privatized utilities cannot alone meet the overall capital demand. Brazil represents a strong case for an economy where market-based energy efficiency investments are the only long-term solution to the investment needs in the energy efficiency sector. In the interim, however, Eletrobrás, PROCEL, the donors, and the distribution utilities can meet the critical need for preparing and facilitating market investments in energy efficiency through EPCs and ESCOs.

A key driver for investments in energy efficiency is increased demand for power generation. Within the Brazilian economy, the industrial and commercial sectors together consume a majority of the electricity generated in the country. These sectors have been growing at a rapid pace in recent years. For example, in 1996, the commercial and industrial sector grew at the rates of 5.1% and 5.5% annually respectively. At the sub-sector level, for instance, the automobile production grew by 17% in 1997, whereas the sales of electrical appliances grew at the rate of 22% in the same year. Despite the recent economic problems, Brazil anticipates continuous growth in both the commercial and industrial sectors, thereby imposing extensive demand for new energy.

Another strong indicator of the planned growth in the economy is the planned investment of some US$ 25 billion in new production capacity by the country's 33 major business groups during the 1998-2001 period, representing an average annual investment in excess of US$ 6 billion over the next 4 years. The overall investments planned for the power sector during the same period are approximately US$ 25 billion or US$ 6 billion in generation and transmission and distribution systems.

In 1997, the electricity consumption in Brazil was 6.5% higher than in 1996. Based on data compiled by Eletrobrás, the industrial sector comprised the largest share of the overall growth (45%). The household sector and the commercial sectors were the next largest consumers of electricity at 27% and 135 respectively of the total consumption. Together, the industrial, commercial and public sectors consume approximately 72% of the total electricity and offer the best prospects for energy efficiency gains.

Within the commercial sector, the key energy consumers are super markets, department stores, and appliance and general stores. Of these, the super markets represent approximately 70% of the total sales and are excellent candidates for implementation of energy efficiency programs. In the service sector, comprising of hospitals, hotels, and water sanitation companies, the hospitals and hotels are major consumers of electricity and appear to be the best prospects for energy efficiency.

As these statistics indicate, industry is (i) the largest consumer of energy, (ii) offers the greatest promise of economical energy savings, and (iii) presents the best opportunity for reducing emissions. As the Brazilian economy continues to have an industry-led growth, the share of electricity-based production is going to grow. Therefore, industry will become an increasingly larger contributor of carbon dioxide. At the same time, it will also require a much larger share of the overall investments available for energy efficiency. As can be seen industry offers the best prospect for both reduction in carbon dioxide emissions as well as sizeable energy savings opportunities.

Although, sporadically, different donor groups, consultants, and NGOs have developed estimates for the potential of energy savings at the sub-sector level (chemicals, hotels, paper and pulp, etc.), there is no comprehensive assessment of the overall potential for

energy savings in the entire industry in Brazil. However, given the current operating characteristics of Brazilian companies, conservatively, one could expect that at least 15% of total energy could be economically saved even at current electricity prices. As the prices of electricity increase, as expected as a result of privatization, the overall potential for electricity savings could go up significantly in the medium to long term. In addition, given the high cost of captive power generation a significant potential also exists for industrial cogeneration which is now permitted under Brazilian law.

In the commercial sector, comprising of shopping centers, apartment buildings, hotels, office buildings, and hospitals, the opportunities for energy savings are also similar to those in the industrial sector. However, this potential is far from being realized. There are no systematic energy audits of these buildings and the equipment and technology, in most cases, is outdated. Other reasons for a lack of energy savings include: a lack of preventive maintenance programs, inadequate or little available financing, a lack of emphasis attached to energy as cost of overall operations, etc.

Notwithstanding the potential opportunities for energy savings, the main reason for a lack of energy savings investments continues to be the absence of a knowledge base. Most end-users, especially the small and medium size users (commercial and industrial) are simply not aware of the benefits of energy efficiency. Accordingly, there is little monitoring of energy use in most factories and establishments.

The situation in the household sector is no different. In fact, the awareness of energy savings potential is the lowest in this sector and so is the incentive to invest in purchasing energy efficient appliances, as this sector, by and large, pays the lowest electricity tariffs. Nonetheless, the household sector also represents significant opportunities for energy savings. Eletrobrás, through utility-sponsored programs, has made considerable headway in this sector. However, a significant potential for additional energy savings continues to exist in this sector as well.

The key to realizing the energy savings potential at the end-use level in Brazil will eventually have to include (i) market-based investments in energy efficiency projects and (ii) availability of attractive financing for ESCOs and other energy service companies to convince themselves regarding the profitability of energy efficiency services as a profitable business. The current process of structural reform in the energy sector in Brazil will pave the way for the development of ESCOs as a powerful tool for market-based energy efficiency services.

3.2 REGULATORY CLIMATE

Given the recent increases in the price of electricity, not only the utilities but also the consumer, is beginning to develop an interest in energy savings. The utility-sponsored DSM programs in Brazil focus on peak period load management and public lighting where tariffs are below cost. Since 1998, the GOB has shifted its policy to allow the consumer a greater voice in the development of a market-based energy efficiency industry.

The privatization of the power sector has already resulted in the sale of several distribution utilities, with many more slated for privatization in 1999 and 2000. In addition, the mandatory requirement for all utilities to invest 1% of their total revenues in energy efficiency projects has opened the way for utility-sponsored energy efficiency investments throughout the country. The new law permits private power generation, private industrial cogeneration, and concessions for small power units (SPUs). Although, a number of rule-making and procedural issues need to be fully formulated, Brazil has taken a bold step toward opening all stages of the power sector (generation, transmission, distribution, wholesale, etc.) for private participation. Undoubtedly, as the experience in other countries demonstrates, this will lead to a more efficient electric power sector in country. It will, however, also lead to higher energy prices as the new prices must be consistent with production costs and the profit margins of private power developers and distributors.

From the standpoint of energy efficiency, in an open power market with higher energy prices, ESCOs are the ideal vehicles to facilitate market-led investment in energy efficiency investments. In addition, the banking sector in Brazil is also beginning to realize that financing of energy efficiency projects could prove to be a sizeable market in the near term. BNDES, the largest development bank in Brazil has established a new cell with the specific responsibility to develop a new portfolio and strategy for the bank to cater to this emerging market. Other development banks such as the BNB in Northeast of Brazil have also shown a great deal of interest in financing energy efficiency projects. However, some of these institutions are not familiar with the process of packaging and evaluating energy efficiency projects which are typically small and are not considered attractive by the financing institutions because of their large transaction costs relative to their sizes.

While the prevailing banking regulations do not prevent the local banks to undertake financing of energy efficiency projects, bank policies have typically dictated financing of large relatively risk free investments and relending on loans financed by the World bank and IDB. The other area of extensive business of these banks is relending on high interest, short-term overdraft protection type loans through local commercial banks. The banking climate, however, is changing in response to the new demand for capital for energy efficiency projects. BNDES is taking a lead in this area.

Industrial cogeneration is also becoming an attractive market in Brazil. Discussions with FIESP, the Federation of Industries in Sao Paulo, the largest industry association in Brazil, indicate that a large number of their members are now looking at possible gas-fired cogeneration systems. Once again, the Privatization Law in Brazil has cleared the way for promoting cogeneration whereby the local cogenerators and utilities can enter into contracts for supply of excess electricity to the utility grids at pre-negotiated prices. A number of discussions are underway between large industries and BNDES for financing of cogeneration systems in the range of 10-25 MW.

Based on the Project Team's review of the current regulatory climate in Brazil, it appears that there are no major regulatory impediments to the implementation of energy efficiency, industrial cogeneration and IPP projects in the country. However, Brazil does not have much experience with the process of granting licenses to cogenerators and concessions to IPPs. In addition, as the regulatory authority is transferred from ANEEL - the federal regulator - to state-level utility regulators, one would expect certain procedural and jurisdictional issues to slow down the permitting and licensing process. Under technical assistance from USAID and the World Bank, ANEEL is currently engaged in developing the procedures for the transition of the regulatory authority to the states with the assistance provided by PricewaterhouseCoopers.

3.3 POTENTIAL FOR ESCO APPROACH

The overall market potential for energy efficiency investments in the industrial, commercial, and public lighting sectors by ESCOs under EPC schemes in the near term, has been estimated to exceed US$ 60 million. This estimate is a very conservative estimate and excludes the investments needed in the (i) residential sector and (ii) industrial and commercial cogeneration sector which is several fold. ESCOs offer a viable option to capture this market. However, significant constraints exist for ESCOs to take off. These include (i) the capabilities of the ESCOs, (ii) a lack of supporting infrastructure, (iii) a considerable lack of financing, (iv) customer perception of EE technologies, and (v) a lack of market delivery mechanisms. All of these barriers are discussed in Chapter V of this report. The role appropriate interventions to address these barriers are discussed in Chapter VI in this report.

3.4 KEY IN-COUNTRY PARTNERS AND STAKEHOLDERS

As mentioned earlier, a large number of federal government agencies, state government agencies, private industries, industry associations, research organizations, universities, NGOs, donor agencies, donor-supported groups, development banks, etc. are involved in different aspects of the energy sector in Brazil. With respect to energy efficiency, a number of partners and stakeholders will have a great role and our Project Team has begun discussions with a number of them to develop a strategic partnership in order to (i) conduct a highly visible and successful ESCO workshop, and (ii) ensure sustainability after the MMEE Project is completed.

The success of this project in Brazil will require the support of and endorsement from a number of key organizations in Brazil. Within the government/utility sector, the following agencies will be invited to participated in some form in order to make the ESCO workshop successful:

- The Ministry of Mines and Energy (MME)
- Secretariat of Energy (SEN)
- National Energy Policy Council (NEPC)
- National Agency for Electric Power (ANEEL) and selected state regulatory agencies
- MME's Centers of Excellence in Regulation of Energy Markets (Centros de Excelência em Regulação de Mercados de Energia - CERME)
- Selected major electric utilities, particularly those in Rio de Janeiro and Sao Paulo

In addition, a number of government and donor supported organizations will have a major stake in the stimulation of private sector led energy efficiency market. The Bechtel Project Team is closely working with many of these entities, especially the following:

- National Program for Electrical Energy Conservation (PROCEL)
- National Center for Power Research (CEPEL)
- National Energy Development Program for States and Municipalities (PRODEEM)

Other stakeholders/partners will include key financial sector institutions. Two of the key financial institutions with a strong stated interest in energy efficiency are as follows:

- Brazilian National Bank of Economic and Social Development (BNDES)
- CREDIBANCO
- UNIBANCO

- The Northeastern Bank of Brazil -- Banco do Nordeste -- (BNB)

Other regional banks will also be identified as potential partners for USAID-sponsored activities in the area of energy efficiency, in hopes of developing linkages well beyond the MMEE Project.

A number of industry associations, research organizations and non-profit foundations will also have a major role to play in the MMEE Project. Some of the most noteworthy organizations already selected by the project Team include the following:

- Fundacao Brasileira Para O Desenvolvimento Sustentavel (FBDS), a non-profit environmental foundation engaged in climate change research and policy formulation
- Instituto Nacional De Eficiencia Energia (INEE), a leading private sector non-profit organization exclusively devoted to energy efficiency and its linkage with GCC
- Associacao Brasileira das Empresas de Servicos de Conservacao de Energia, (ABESCO), the Association of Brazilian Energy Service Companies
- Confederation for National Associacao Brasileira da Industria de Iluminacao (ABILUX), the Brazilian Association of Lighting Industry
- International Energy Initiative, a consulting firm in energy efficiency
- Federacao das Industrias do Estado de sao Paulo (FIESP), the largest Industry association in Brazil, located in Sao Paulo

While the above represents a fairly comprehensive list of potential partners and stakeholders in any activity addressing energy efficiency in Brazil, including the USAID-funded MMEE Project, clearly as the project Team approaches the timing of the proposed ESCO Workshop in Brazil, more interested partners/stakeholders will surface and will be invited to participate in the project.

4 ENERGY EFFICIENCY MARKET POTENTIAL

There is no comprehensive and systematic assessment of the overall market for energy efficiency and the opportunities for ESCOs in the Brazilian economy. In early 1998, PROCEL, with support from the European Union-sponsored ALURE Program, engaged a local consultant to develop preliminary estimates for the magnitude of the market for energy efficiency in different sectors of the Brazilian economy. Based on the consultant's findings and analysis, PROCEL issued a report -- "Estimated Market for Energy Service Companies in Brazil" -- in April 1998. The report focused on energy consumers in the commercial, industrial, and public sectors as those representing the potential market of ESCOs.

Some of the key findings of this report as relevant to the MMEE Project are summarized below.

4.1 COMMERCIAL SECTOR

In the PROCEL report, the commercial sector market segments included shopping centers, super markets, hotels, and hospitals. The report examines the market for energy savings in the lighting, air conditioning, and cogeneration areas within these energy consuming sub-sectors. The report estimates the overall energy savings, the required investments, and the monetary value of the energy savings potential.

Exhibit IV-1 and IV-2 provide a summary of the energy efficiency market potential in the commercial sector. The key target markets in the commercial sector included shopping centers, hospitals, supermarkets, and hotels. Exhibit IV-3 provides estimates for the market for cogeneration in selected subsectors in the commercial sector.

EXHIBIT IV-1: MARKET FOR ENERGY SAVINGS IN LIGHTING AND AIR CONDITIONING SYSTEMS IN THE COMMERCIAL SECTOR (*)

Sub-sector	Electricity consumption (GWh/year)	Potential for Conservation (GWh/year)	Investment (1,000 US$)	Savings per year (1,000 US$)
Shopping centers	950	380	12,960	5,300
Supermarkets	1,548	851	68,800	27,500
Hotels	5,100	714	170,000	62,000
Hospitals	1,014	284	33,800	15,700

Source: Energy efficiency companies and consultants working in each sub-sector.

Note: (*) This estimate refers to the following group of units, considered viable to introduce measures for efficient lighting and air conditioning under energy performance contracts: 72 Shopping Centers, 860 Supermarket shops, 850 Hotels and 169 Hospitals.

EXHIBIT IV-2: ESTIMATED INVESTMENTS AND SAVINGS IN COMPANIES ABLE TO ESTABLISH EPC CONTRACTS IN THE COMMERCIAL SECTOR

Sub-sector	Number of Companies Able to Establish Energy Performance Contracts (*)	Investment per Unit (1,000 US$)	Savings p.a. (1,000 US$)
Shopping Centers	72	180	73
Supermarkets	860	80	32
Hotels	850	200	73
Hospitals	169	200	73

Source: Energy efficiency companies and consultants working in each sub-sector.

EXHIBIT IV-3: ESTIMATED MARKET FOR COGENERATION IN SELECTED SUBSECTORS OF THE COMMERCIAL SECTOR

Sub-sector	Unit	Market for Cogeneration (units)	Investment (US$ million)	Savings p.a. (US$ million)
Shopping Centers (1)	144	22	86	21.5
Hotels (2)	344	103	309	62
Hospitals (3)	169	85	255	51

Source: Energy efficiency companies and consultants working in the area of cogeneration for the commercial sector.

Note: (1) number of Shopping Centers in the country (144); (2) number of Hotels in the following categories: Luxury (18), Very Comfortable (58) and Comfortable (248) in the country; (3) number of Private Hospitals (169) in the country, considered able to establish energy performance contracts.

In the area of lighting and air conditioning, the study included 72 shopping centers, 860 supermarkets, 850 hotels, and 169 hospitals throughout Brazil. Based on potential for energy savings potential in typical establishments, the report estimated the total potential for annual energy savings to be 2,609 GWh or approximately 30 percent of the current energy consumption in these establishments. The total monetary value of the estimated energy savings is US$ 110.5 million annually, at an investment of US$ 285.6 million.

- The typical investments per unit needed to realize the potential energy savings were estimated to be US$ 180,000 per shopping center, US$ 80,000 per super market, US$ 200,000 per hotel, and US$ 200,000 per hospital, on an average. The typical per unit value of annual energy savings was estimated to be US$ 73,000 per shopping center, US$ 32,000 per super market, US$ 73,000 per hotel, and US$ 73,000 per hospital, on an average.

- For estimating the potential for energy cogeneration, the report selected 22 shopping centers, 103 hotels, and 85 hospitals as the best prospects in the country for implementing economic cogeneration systems. For these establishments, the report estimates the total annual energy savings value to be US$ 21.5 million for shopping centers, US$ 62 million for hotels, and US$ 51 million for hospitals. The total investments required to achieve these savings through cogeneration are estimated to be US$ 86 million for shopping centers, US$ 309 million for hotels, and US$ 255 million for hospitals. This represents the total value of the energy savings to be US$ 134.5 million per year at an overall investment of US$ 650 million in new cogeneration systems, or a simple payback period of 4.8 years.

4.2 THE PUBLIC SECTOR

The PROCEL study included basic sanitation facilities and public lighting as part of this sector in its analysis of the potential for energy savings. Public buildings could not be included as part of the study due to a lack of consistent information. However, it should be noted that public buildings represent a very promising sector for energy efficiency investments and in fact some of early demonstration candidates may very likely come from the public buildings.

Exhibit IV-4 provides the market estimates for public lighting and basic sanitation subsectors developed as part of this study.

EXHIBIT IV-4: ESTIMATED MARKET FOR ENERGY EFFICIENCY IN PUBLIC LIGHTING AND BASIC SANITATION

Sub-sector	Electricity consumption *(GWh/year)*	Potential for conservation (GWh/year)	Investment (US$ million)	Savings p.a. (US$ million)
Basic Sanitation Authorities	8,750	1,320	19.8	79.2
Public Lighting	9,000	2,700	400	160

Sources: Barbosa (1997); Procel.

The report's key findings are summarized below:

- The total amount of electricity consumed per year in the public sanitation facilities and public lighting sub-sector is 17.750 GWh. The report estimates that as much as 4.020 GWh or 22.6 percent of the total energy can be saved annually in this sector through simple, high payback investments

- The monetary value of the potential energy savings is estimated to be US$ 239.2 million per year at an investment of US$ 419.8 million, representing a simple payback period of 1.75 years, or a simple rate of return of close to 50 percent per year.

As can be seen, this sector offers the most attractive opportunities for EPCs for private ESCOs in Brazil.

4.3 INDUSTRIAL SECTOR

In the industrial sector, the report included only the best prospect candidates in various sub-sectors. Specifically, the study included: 17 non-ferrous metals companies, 11 chemicals companies, 36 steel companies, 33 food and beverages companies, 19 paper and pulp companies, 8 iron alloys companies, 14 textile companies, 20 ceramic companies, and 9 cement companies for the assessment of the potential for energy savings.

The industry sub-sectors selected for the study together consume approximately 48 percent of the total electricity consumption in the industrial sector. For each of the sub-sectors, the study considered specific energy efficiency measures. While these measures differed somewhat from sub-sector to sub-sector, the most common measures to all of the sub-sectors included: maintenance, implementation of variable speed operating systems, retrofit of motors and engines, gas injection in induction type motors, control systems, and furnace optimizations.

Based on specific assumptions regarding the current state of the Brazilian industry and the typical practices in similar facilities in developed countries with highly efficient industry operations, the report estimated the potential for energy savings within each of the sub-sectors.

Exhibits IV-5, IV-6, and IV-7 provide the market estimates for energy efficiency and cogeneration in the industrial sector.

EXHIBIT IV-5: POTENTIAL ESCO MARKET IN THE INDUSTRIAL SECTOR

Sub-sector	Consumption of electricity (GWh)	Potential for conservation (GWh)	Investment in efficiency (US$ million)	Potential for savings p.a. (US$ million)
Non-Ferrous Metals	29,166	738	23	13.2
Chemicals	15,079	1,561	101	41
Steel	14,683	1,182	96	40
Food and Drink	12,893	1,357	33	19.4
Paper and Cellulose	9,886	559	41.3	15.8
Iron Alloys	6,617	336	28.6	14
Textile	5,979	358	7	4.3
Ceramics	2,172	244	5.9	3.2
Cement	3,655	265	7.2	4.2

Source: Eletrobrás-FDTE (1991), with figures updated by PROCEL for 1997, based on information from energy efficiency companies and consultants in each sub-sector.

EXHIBIT IV-6: ESTIMATED INVESTMENTS AND SAVINGS IN COMPANIES ABLE TO ESTABLISH EPC CONTRACTS IN THE INDUSTRIAL SECTOR

Sub-sector	Number of companies able to establish energy performance contracts(*)	Investment per company (1,000 US$)	Savings p.a. (1,000 US$)
Non-Ferrous Metals	17	1,375	375
Chemicals	11	1,500	420
Steel	36	3,000	475
Food and Drink	33	800	400
Paper and Cellulose	19	500	125
Iron Alloys	8	900	290
Textile	14	500	225
Ceramics	20	300	100
Cement	9	800	180

Source: Energy efficiency companies and consultants working in each sub-sector.

EXHIBIT IV-7: ESTIMATED POTENTIAL FOR COGENERATION IN ENERGY INTENSIVE INDUSTRY (MW)

Sub-sector	Technical potential	Market potential in 2003

		Self generation	IPP
Sugar and Alcohol	4,000	1,175	25
Refineries	4,189	431	*3,758*
Other large industries	4,196	3,025	440
TOTAL	12,385	4,631	4,223

The results of the report are summarized below.

In the non-ferrous metals industry, the report estimates the total value of potential energy savings to be US$ 13.2 million per year at a total investment of US$ 21.2 million, representing an average simple payback period of 1.6 years. The actual payback period varies between 4 and 24 months depending upon the energy efficiency measure. However, all energy efficiency measures yield a simple payback period of less than 2 years.

In the chemical industry, the potential for energy efficiency has been estimated to be in the range of 10-12 percent of total electricity consumption. For the 11 companies included in the PROCEL study, the report estimates that this saving can be achieved at an investment of US$ 101 million with an average payback period of 2-3 years. The largest savings result from the implementation of cogeneration which also requires the lion's share of the total investment (US$ 48 million out of US$ 101 million).

In the steel industry, the report estimates that the total energy savings could reach approximately 12 percent of the current electricity consumption. The investment requirement for implementing key energy efficiency measures including gas-fired cogeneration is estimated to be US$ 96 million, with an average simple payback period of 3-4 years. Of this amount, an estimated US$ 63 million will be needed for new gas-fired cogeneration systems. The second largest investment (US$ 14.7 million) is needed for the installation of automatic control systems.

In the food and beverages sector, the report estimates the total savings to be in order of 11 percent of the current electricity consumption annually, estimated to be worth US$ 19.4 million per year at an investment of US$ 33 million. This offers a simple average payback period of 1.7 years. The largest investment is required for the overhaul and reform of the internal distribution systems, estimated to be US$ 14 million.

The next sector evaluated in the report was the paper and pulp sector. In this sector, the study has estimated the potential for energy savings to be approximately 5.7 percent of the total electricity consumption. These savings are estimated to be worth US$ 15.8 million per year at a total estimated investment of US$ 41.3 million. The largest investment (US$ 31.8 million) is required for the installation of new cogeneration systems.

In the iron and steel industry, the report estimates the total electricity savings potential to be approximately 6 percent of the total electricity consumption. The monetary value of the savings is estimated to be US$ 14 million annually at an estimated investment of US$ 42 million, representing an average simple payback period of 3 years. The largest investment (US$ 20.8 million) is needed for the implementation of exhaust gas based cogeneration systems.

The textile industry offers the most promising sector for fast payback energy efficiency investments. The report estimates that the potential for near-term electricity savings is approximately 6 percent of the total electricity consumption. These savings can be realized at a total investment of US$ 7 million and represent the monetary value of the savings to be US$ 4.3 million, yielding an average simple payback period of less than two years.

In the ceramics industry, the potential for electricity savings is estimated to be 11.2 percent over the current level of electricity consumption. The monetary value of these savings is estimated to be US$ 3.2 million annually requiring an investment of US$ 5.9 million.

The last sector included in the study was the cement sector. The report estimates the overall near-term potential for energy savings to be in the range of 7.3 percent of the current levels of consumption. For the firms included in the study, this amounts to an annual saving of US$ 4.2 million annually at an estimated investment of US$ 7.2 million. These investments represent an average simple payback period of 1.7 years.

As the above analysis indicates, the potential for energy savings in the industry in the near term varies in the range of 6-13 percent per year and the payback period for the required investments to be less than 4 years (and less than 2 years in most cases). Therefore, this offers an attractive market for ESCOs even under the prevailing electricity prices. This market is expected to grow significantly as additional investments become even more attractive in market-based electric power supply system.

It should be noted that the overall market for industrial cogeneration in Brazil is expected to be many fold compared to the market represented in the PROCEL study. For example, the pharmaceutical and petrochemical industries, not included in the study, are extremely energy intensive industries and offer a sizeable market for industrial cogeneration. Together, these two sectors could represent an additional market for energy investments in the range of US$ 1.2 billion with average payback, in most cases, of less than 4 years.

5 KEY MARKET BARRIERS AND DRIVERS

As part of its overall methodology to assess the barriers and drivers to energy efficiency, the MMEE Project Team developed a generic framework to categorize the barriers and drivers in a manner to facilitate the development of targeted interventions for removing some of the key barriers. In subsequent phases of the MMEE Project, this framework was applied to three countries (including Brazil) selected for further assessment. The key elements of the framework include the following:

- Macroeconomic and Business Conditions
- Regulatory and Policy Considerations
- Customer Factors
- Financing of Energy Efficiency Projects
- Market Delivery Channels

Within each of these key elements, the MMEE Project Team conducted a detailed assessment of (i) key factors influencing successful delivery of energy efficiency services, (ii) barriers to energy efficiency, (iii) past efforts to address these barriers, (iv) results and lessons learned, and (v) actions needed to move the market. The relevance of the key elements of the framework is discussed below.

5.1 MACROECONOMIC AND BUSINESS CONDITIONS

A number of macro-economic and general business conditions are pre-requisites to the successful and sustainable implementation of energy efficiency programs by the private sector. To justify investments in the energy efficiency market, private sector organizations need to be able to anticipate (i) a large market potential, (ii) manageable business risks, (iii) market conditions conducive to the development, (iv) financing and implementation of projects, and expected returns on investment commensurate with the risks.

Some of the key factors that represent minimum criteria for successful private sector operation in the energy efficiency market include (i) a stable political environment, (ii) a stable or growing economy, (iii) an adequate financial and business infrastructure, (iv) a non-cumbersome and enforceable legal system (v) a reasonable taxation policy, (vi) a stable currency, (vii) low interest rates, (viii) business practices and culture conducive to energy efficiency, and (ix) a national commitment to global climate change concerns.

Typical barriers to political stability include constant change in national governments and related policy changes, and other de-stabilizing factors such as terrorism. The lack

of political stability will constrain market activities, particularly investments in capital projects. Also, lack of political stability will discourage the inflow of foreign capital and technology. Typical methods to overcome political instability include economic and political restructuring, as well as international monetary assistance. A growing or stable economy will be conducive to markets that are characterized by reasonable interest and inflation rates and a relatively stable currency, all of which are favorable to private sector investment and operation. Many developing countries are experiencing economic difficulties resulting in low growth or declining economies. Markets in such countries may create hardships for successful business operation due to high rates of inflation, which in turn lead to high interest rates, and unstable currencies.

The economic conditions described above will limit the interest of the private sector in making EE investments. Potential methods to overcome such barriers include macro-economic assistance. Economic incentives may also be provided to EE projects to make them more attractive to the private sector.

The successful operation of the private sector in delivering EE services will be contingent upon the existence of a legal system that will facilitate contracts between end-use customers and EE service providers. Typical barriers include inadequate legal infrastructure and/or the lack of capability to rapidly enforce the contractual obligations.

An inadequate legal infrastructure will seriously limit the ability of the private sector to engage in market activities to deliver EE services. The key approach is the refinement of the judicial system to provide quick and non-cumbersome enforcement of contractual and legal obligations.

The existence of a basic business and financial infrastructure will be a pre-requisite to private sector activities in the marketplace. Inadequate financial and business systems will tend to discourage market activities by the private sector. A good example of this situation was during the transition of the countries in Central and Eastern Europe to market-based economies in the early 1990s. The lack of the basic financial and business infrastructure will seriously inhibit private sector market activities and will discourage the inflow of foreign capital and technology. Typical approaches to develop the needed financial and business infrastructure include economic restructuring and macro-economic financial and economic assistance.

A reasonable taxation policy will allow the private sector to achieve returns on investment. Some developing countries have high tax rates and depreciation policies that limit the after tax income to the private sector. Also high taxes on repatriation of profit will discourage inflow of foreign capital. Tax barriers will limit the investment and capital flow into EE projects. Typical methods to overcome this barrier include (i) tax reform to reduce tax rates to comparable international levels, (ii) establishment of

tax policies that attract foreign capital, and (iii) provision of tax incentives to encourage investment in EE projects

A stable currency can be helpful to the private sector because it facilitates inflows of capital and technology and reduces the risk of investment in foreign technology and/or services. Many developing countries are characterized by currencies that are unstable relative to the internationally accepted currencies (such as the US Dollar). If the devaluation rate of the local currency relative to the Dollar is high, this will be an important barrier to foreign investment and technology transfer. While the currency stability is governed by macro-economic factors, the effects of high rates of devaluation may be offset by protecting investments in EE projects from the currency devaluation risk.

In order for the private sector to successfully provide energy efficiency services, the recipients of these services (the end-users of energy), must be willing to accept such services. This requires a business ethic and culture accepting and promoting EE options.

In some countries, the existing business culture inhibits energy efficiency projects. This could be caused by a lack of understanding of energy efficiency, by a focus on production rather than on cost control, and in some cases the reluctance to accept services form external service providers. The business culture may limit the demand for and the acceptance of energy service providers. Typical approaches to overcome this barrier include provision of education and information to end-users on the benefits of energy efficiency, and the implementation of demonstration projects that provide case studies and "business models" of EE service delivery.

Energy efficiency options offer some of the most cost-effective approaches to meet GCC goals. A national commitment to addressing GCC concerns may, therefore, provide a significant motivation for EE projects. The lack of a demonstrated commitment to mitigation of GCC issues will provide no signal (or perhaps a negative signal) to market implementation of EE projects. A demonstrated commitment to GCC issues will create additional demand for EE services. The lack of such a commitment will limit such demand. The most effective approach to overcome this barrier is for the national government to articulate and demonstrate the commitment to GCC, to demonstrate the benefits of EE to GCC, and to tie the GCC and economic development issues to EE.

In the case of Brazil, the political environment and the government are stable. Brazil is gradually coming out of the recent economic crisis. However, high interest rates, high inflation, and the recent devaluation of the Real have increased investor perception of risk in any kind of investments including energy efficiency.

The business climate in the country continues to be a great barrier to energy efficiency as the government has often incentivized export-led production expansion over efficiency and productivity improvements. There are no tax incentives, such as import duty reduction, for energy efficient appliances and equipment, making it difficult for distributors of foreign equipment to find a "ready" market for energy efficient technology and equipment in the private sector.

Brazil has made significant progress in reforming its legal system in recent years. However, many of the laws suffer from cumbersome or vague implementing regulations. In order for the markets to operate freely and competitively, the government needs further legal reforms.

Finally, although many government departments and agencies express a commitment to energy efficiency, this commitment is not transferred in the private sector. Brazil is a key Global Climate Change (GCC) country and the link between energy efficiency and climate change benefits has not been sufficiently articulated. Both the public and the private sectors need to appreciate that energy efficiency offers both productivity improvement and direct (or avoided) carbon reduction.

5.2 REGULATORY AND POLICY CONSIDERATIONS

The role of the private sector in delivering energy efficiency services can be facilitated if there is a national commitment to energy efficiency. The typical barrier is the lack of a demonstrated national commitment to EE (and related environmental and GCC) issues. In the absence of a national commitment to EE, there is limited interest, motivation and/or activities on the part of end-users and energy service providers, relative to EE implementation. The governments can take one or more of a number of actions to demonstrate the national commitment to energy efficiency. These include (i) public statements by national leaders on the importance of EE in meeting national goals and commitments, (ii) passage of national energy efficiency legislation, (iii) creation of a national energy efficiency agency, and (iv) implementation of EE options in government facilities.

Traditionally, energy entities in developing countries have been publicly owned. Increasingly, there is a trend towards restructuring and privatization of publicly owned energy organizations. If energy organizations are privatized, they are likely to be more market-driven and, therefore, are more likely to engage in the implementation of cost-effective EE activities, either by themselves or in cooperation with other private sector entities.

Developing countries face a number of issues and barriers relative to privatization of energy entities. Many public sector energy organizations suffer from significant operating inefficiencies and are financially weak. They also view their business as being very narrowly focused (generally on energy production, transportation and/or distribution) and are not interested in energy efficiency. Short of significant external pressures (from regulatory mandates, national legislation, and/or international financing agencies such as the World Bank), they are unwilling to implement or promote any EE activities. Publicly owned energy organizations are likely to not only undertake few or no EE activities, but are also likely to present barriers to private sector implementation of EE. Restructuring and privatization of energy organizations, currently underway in many developing countries, can be an effective way to overcome some of the barriers. Combined with national energy efficiency legislation and appropriate regulatory initiatives, privatization can be instrumental in providing the appropriate market signals and incentives for these organizations to implement or facilitate implementation of EE activities.

Even with restructuring and privatization, many energy organizations (particularly transmission and distribution businesses), will be regulated by some type of regulatory agency. The structure and form of the regulation will provide incentives and disincentives to energy efficiency activities of such organizations. In many cases, the regulation of transmission and distribution entities provides incentives for investments in energy supply options and discourages investments or promotion of EE activities. These types of regulations create barriers to EE investments by the energy entities as well as by other private sector parties. Many different types of regulatory incentives/disincentives can be established to encourage or facilitate EE activities. Examples include:

- requiring the establishment of DSM plans
- mandating the assessment and implementation of all cost-effective EE options prior to investments in distribution facilities
- establishing "standards of performance" that include energy efficiency
- providing performance-based incentives for EE activities

The establishment of codes and standards for energy using facilities, products, technologies, and equipment serves to promote increased energy efficiency in the marketplace by:

- providing information to consumers
- eliminating inefficient equipment and products form the market
- providing a signal to manufacturers and suppliers
- establishing more energy-efficient facilities

Typical barriers include the challenges in determining the appropriate codes and standards, and the difficulties in implementing and enforcing the codes/standards. The

lack of codes and standards leads to inefficient building stock and appliances and equipment. Typical methods to overcome this barrier include: (i) establishment of standards and codes for commercial buildings, domestic appliances, commercial energy equipment, and industrial energy equipment, and (ii) establishing testing and certification facilities and institutions

In many developing countries, the pricing of energy is determined by social and political priorities. Such pricing practices provide the incorrect market signals and often limit the investments in EE projects. The provision of the appropriate pricing signals, based on the true cost of supplying energy, will facilitate the market implementation of EE options. The presence of subsidized energy prices is often a major barrier. Incorrect pricing signals distort the benefit to cost ration of EE options and generally limit the implementation of EE options. Pricing and tariff reform, such as the introduction of marginal cost pricing, time of use rates, etc. will lead to the correct pricing signals. The absence of price subsidies and/or cross-subsidies will provide the appropriate price signal to the market. Energy prices in developing countries are often characterized by the presence of subsidies and cross-subsidies. The effect of subsidies is to distort the price signal and make markets inefficient. Pricing reform can be used to remove the subsidies and cross-subsidies.

In many developing countries, certain energy efficient products, technologies, and equipment are not manufactured locally and have to be imported. If there are significant tariffs/duties on imports of equipment, the cost-effectiveness of these products/technologies is affected. Many developing countries impose significant tariffs/duties on imports. Tariffs and duties will inhibit imports and therefore limit the transfer of energy-efficient technologies. Typical methods to remove this barrier include removal of tariffs/duties, or exemption of EE equipment, products and technologies from tariffs/duties.

In the case of Brazil, there is a clear commitment to energy efficiency as evidenced by a number of projects implements in the public sector. However, this commitment has not moved the private sector, despite some of the programs by EU (The ALLURE Program), PROCEL, GTZ, and others. The newly passed Privatization Law paves the way for a more competitive structure in the energy industry. This should provide impetus to enhanced implementation of energy efficiency as both prices and competition necessitate efficiency in energy utilization across the economy. However, despite the existence of a comprehensive privatization Law, the implementing regulations continue to be either absent or vague. ANEEL, the national regulatory authority for electricity has initiated a number of steps to develop implementing regulations including soliciting public comments. Earlier in 1999, ANEEL issued the implementing regulations for the use of the 1% of the revenues of utilities for both supply-side and demand-side energy efficiency projects. In September 1999, ANEEL is preparing comprehensive regulations for cogeneration. While considerable progress

has been made in this area, the lack of clear regulations continues to be a barrier to private sector led energy efficiency.

Other areas where the Brazilian agencies are making progress include (i) appropriate energy efficiency codes/standards for appliances and equipment, (ii) market-based energy pricing, and (iii) reduction/removal of cross subsidies in the power sector. USAID is supporting a program to assist Brazil in developing an appliance labeling program. Both the World Bank and IDB are working with the regulators in the country to reform prices with the ultimate objective of reaching international levels. This area is very political and the progress is slow as evidenced by a lack of credible power purchase agreements (PPAs) and the number of IPPs.

Finally, the market for energy efficient appliances and equipment is sporadic, partially because of low energy prices and to a great extent due to the high customs duties on imports. Rationalization of energy prices, coupled with some relaxation in energy efficient equipment and appliances, would prove to be a great market driver for energy efficiency.

5.3 CUSTOMER PERCEPTIONS

Increasing the level of awareness of EE benefits among end use customers and their operating staff lead to higher interest in EE to improve economics and enhance productivity. On average, typical end use business customers and their technical staff are not fully aware of EE benefits to their business. Usually, EE is seen as a way to reduce costs only, and therefore does not receive adequate attention especially if the energy bills do not represent a significant part of their operating costs. The effect on market delivery is a limited adoption to EE and a lost opportunity of improving productivity and other operating issues such as visual and thermal comfort, and renovating equipment. The approach to removing this barrier is to create an increasing awareness about economic, operating, and environmental benefits at various levels. These include the following:

- the customer decision making level albeit the business owner or the financial managers,
- the technical level among operating professionals, energy managers, and the less educated labor that are typically manually operating energy using equipment,
- the manufacturing and distributors level of knowledge needed for marketing EE related products adequately, and
- the investment community to further their understanding of the importance of EE to the business community beyond reducing costs

Available information on EE technologies and other related products and services are necessary to increase the adoption of EE by end-users. Difficulty in obtaining information or the inadequacy of technologies eliminates any potential incentives to those in the decision making loop to consider EE. As a result of this barrier, the customer, market delivery channels, and investors are often reluctant to embrace EE products and services if they view them as state-of-the-art or out-of-the-lab solutions especially in the case of a conservative business community. Additionally, the lack of readily available information on EE products, services and implementation approaches contribute to the earlier barrier of awareness. Typical approaches used in many countries include an easy access to information on technologies, products and services to both decision makers on the receiving end and the service providers to insure further acceptance of EE. Several methods have been useful in the past. These include the following:

- Ongoing seminars on EE technologies and new market products
- Software resources
- Using the Worldwide Web as a base to direct interested parties to information sources
- Product exhibits and displays in various business and industry meetings
- Creating an EE center to host all relevant information
- Training of professionals and market delivery channels

It is important that the perception of risk on EE technologies be accurate and reflect the potential benefits to have a positive influence on the market. Lack of knowledge or experience with EE result in end-users unwilling to take an unknown risk especially if it could mean creating problems interfering with their business interests. In developing countries where the business community is risk averse, this may create a serious barrier and create a chilling effect toward any new EE technology or product. Increasing awareness of the true risk of EE technologies is critical to their adoption in new markets. In addition to educating customers and end-users, the investment community has to be provided an accurate assessment of this risk so that their investment decisions can be appropriately made. Most technologies necessary to reduce the majority of energy consumption in developing countries are proven and their benefits have been documented and demonstrated in various locations. The best sources are case studies and demonstration projects.

End-users have to have a positive view of the credibility of the EE service providers and the value they bring. End-users are not accepting EE service providers either because they don't appreciate the value or because they have more economic options such as resorting to the used equipment market and other less efficient means. When the market does not value the benefits of using service providers like ESCOs, the result is less activities on EE in general and on ESCO market in particular. Basically, the market then stays the course. Customers and end-users need to be aware of what different service providers (ESCOs and others) can bring, and highlight the value of

their services. Promoting the benefits of performance-based services, project finance, investment sharing, and integration/out-sourcing, and improved productivity and performance need to be marketed to end-users to mitigate the effect of the status quo.

Linking EE initiatives to Global Climate Change furthers the appreciation of its societal and more global benefits. Typically, the policy makers and market players are not concerned with GCC or do not have enough information on its adverse impact. As a result, this lack of knowledge lowers the priority of EE on the political and economic map. Linking the benefits of EE to emission reduction and depletion of the Ozone layer through Government awareness campaigns, seminars, guides and research materials, can all be very effective ways to overcome this barrier.

EE project implementation have to create minimum problems for customers and limited interference with their regular business operation. Generally, this acts as a great deterrent to end-users to buy EE services as the installation of EE projects disrupts customer operation and business functions. Therefore, the customer is discouraged from considering EE options. In any hardware related upgrades, installation and site specific requirements create challenges to service providers. Developing a well thought out plan of implementation factoring all operational issues will increase the end-user's comfort that projects can go smoothly.

The process by which decisions are made are unique to each industry, size of business, type of business, management style, and many other factors. Energy management decision authority will determine the likelihood of whether EE is adopted. Decisions on equipment upgrade or capital investments are often made by business professionals with no knowledge of energy use. These decisions are made based on direct cost/benefit analysis limiting other factors from being included. As a result, less EE options are considered. Marketing of EE should not be limited to energy operators and engineers. Business owners and financial managers should be targeted due to their authority on decision making. The identification of local "champions" in the customer's organization helps aligning the EE benefits with those of the business interest of the target customer. Identifying "champions" and promoters of EE in end-users' and public organizations will also create the initial momentum to adopt EE practice.

The availability of business models providing win-win situations will attract more players and service delivery outlets to consider EE initiatives. Additionally, it will catch the attention of investors and financial institutions. The most common barrier is that the business culture and infrastructure are not supportive to create successful models. This results in an alienation of EE from the business community and prevents the development of new delivery approaches and mechanisms. One approach is to

design and implement creative demonstration projects and pilot transactions and delivery models to provide testimonial evidence to the business community at large.

Economic attractiveness of EE projects is often determined by how short is the payback in developing countries. This is because the customers are not considering all their EE options due to focusing on quick and high return investments. This particular element was found to be a barrier in the U.S. and Canada too. Unless customers have had previous experiences with EE projects, they tend to lean toward the shortest payback until they develop more comfort with this type of investment. This barrier can be overcome through publicizing past successful examples and case studies as well as credible information on the various long payback investments and their total benefits in order to gradually educate customers.

Although outside capital can be directed to EE projects, availability of internal capital can increase the possibility of considering EE options especially small and medium size measures. However, EE is low on the priority list of customers organizations, and therefore, can't compete well on scarce capital. EE gets lower priority and is often neglected, especially when the customer's credit exposure is maximized, and/or the project is not significant in size to warrant a bank loan. Typical methods to overcome this barrier include (i) creating financing options for small and medium size projects including leasing; and (ii) creating 100% long-term financing vehicles.

The business community appreciates the energy component in the overall business costs. However, energy costs are a small percentage of business budget, resulting in a lower priority to consider EE options. One approach is to provide information to key personnel within public and private end-users on the added value of EE -- either on increased productivity or increased asset value as a result of renovation/upgrade.

Lowering transaction costs encourage end-users to pursue EE initiatives. High transaction costs due to either managing the EE project implementation or venturing into a medium to long term performance contract with ESCOs are considerable barriers to EE. This discourages the customer from pursuing integrated delivery approaches such as ESCO offerings or other means with high project management costs. Several approaches can be helpful in overcoming this barrier. These include the following:

- Bundling projects to reduce cost per project
- Government procurement
- Utility programs
- Bulk purchasing

Customer perception of the value of energy efficiency continues to be one of the most significant barriers to energy efficiency market development in Brazil. There is little awareness of the benefits of energy efficiency among the consumers. Most of the EE

activities have targeted the public sector and there are virtually no programs targeting the private sector users of energy. New and more efficient energy technology is viewed as a risk despite the past efforts of INEE, PROCEL, ABESCO, ABILUX, etc. In addition, the energy service providers lack the necessary credibility. Many of the ESCOs are local dealers for foreign equipment and are viewed as promoters of equipment sales rather than the benefits of energy efficiency.

Other significant barriers include the anxiety factor of the consumer with respect to reliability of service, availability of spare parts for new equipment, locally available qualified contractors, etc. Furthermore, even among ESCOs, the perception and the trend is to operate more as contractors rather than true ESCOs. In other words, ESCOs do not have access to financing and ESCO proposals are often not considered credible or financially viable transactions.

The financial viability and economic attractiveness of energy efficiency has not been demonstrated to the consumers. As a result, most consumers are not able to evaluate the attractiveness of EE investments compared to other investments. This is typically true in industries that would rather invest in production expansion than in energy efficiency.

Currently, in Brazil, there is a virtual absence of targeted programs to promote energy efficiency to the private sector. This, combined with relatively low energy prices and the perceived high transaction costs for EE projects, has resulted in the country losing an enormous market potential for energy efficiency and cogeneration. Recently, FIESP has created an Energy Committee to promote energy efficiency and cogeneration among their members and INEE in collaboration with CEIA, Canada has conducted a number of regional workshops for industry to promote the benefits of cogeneration. These programs will clearly help. However, there is a strong need for a commitment at the national level to promote energy efficiency nationwide in partnership with local champions.

5.4 FINANCING OF ENERGY EFFICIENCY PROJECTS

Energy end-users generally have limited capital resources for implementing EE projects. The private sector delivery of EE services can, therefore, be facilitated if other funds are available for financing EE projects. Energy service companies and others can use such funds to offer a package of services related to implementation of EE options.

Typical barriers in this area include the limited amount of funding available from banks or other financial institutions to finance EE projects. Due to limited knowledge of EE projects among financial institutions and the small size of typical EE projects (relative to energy supply projects), project financing is often difficult for EE projects. These barriers limit the availability of funds for implementing EE projects. Typical methods to overcome this barrier include the following:

- Educating financial institutions on the nature of EE projects and their inherent benefits
- Providing examples of the economic and financial characteristics and low risks of many EE projects
- Obtaining funds from donor agencies
- Providing funds from the national budget
- Requiring distribution utilities to collect and set aside funds for EE projects

If financial institutions understand EE projects and are willing to consider providing funds for such projects, the private sector entities offering EE services can work with the financial institutions to develop a package of services attractive to the end-users. However, most financial institutions in developing countries generally do not have a good knowledge, understanding or experience with EE projects. Therefore they tend to have limited interest and capability to provide funds for EE projects. This limited availability of funds constrains the ability of EE service providers to offer comprehensive services. Typical approaches to overcome this barrier include the following:

- Providing information to local financial institutions on the nature of EE projects and their financability
- Providing special funds dedicated to EE financing

The typical size of an energy efficiency project is small relative to energy supply projects (such as power plants, transmission and distribution facilities, natural gas pipelines, etc.). Therefore, successful delivery of EE services requires the ability of the financial institutions to finance such small projects. However, the costs of financial due diligence and preparation of transaction documents for small projects often make these projects very difficult to finance. This limits the availability of funds for EE projects. Several approaches can be used to remove or reduce the effect of financing barriers. These include the following:

- Aggregation of small projects into a package for financing
- Providing loan guarantees to reduce the risks to the financial institutions, thereby reducing the costs of due diligence
- Facilitating the provision of technical performance guarantees

The energy service providers need to assess the technical and financial feasibility of EE projects efficiently and effectively in order to develop bankable project proposals. The costs involved in identifying and qualifying EE projects, and conducting the needed feasibility assessments are high relative to the size of the investment in the EE equipment or products. EE service providers often lack the knowledge and understanding of the needs of financial institutions. The costs of hiring financial consultants to develop financing proposals can be quite significant. All these factors make the costs of preparing bankable project proposals relatively high. These barriers limit the ability of EE service providers to access traditional financing sources. Typical methods to overcome this barrier include the following:

- Aggregation of small projects into a package for financing
- Programmatic approaches to financing
- Technical assistance to EE service providers for preparing bankable projects

Financing of EE projects will be facilitated if the end use customers are creditworthy. Enhancing the creditworthiness of end use customers, therefore, will be beneficial to EE service providers. Many owners of facilities with economically attractive EE projects may not be considered creditworthy by financial institutions due to their small size, weak financial structure, or lack of experience with project financing. These barriers limit the potential for project financing of EE projects. Credit enhancement is an approach used to improve the prospects of financing EE projects. Credit enhancement techniques may include:

- Aggregation of end-users to develop a large project portfolio
- Loan guarantees

Financing of energy efficiency projects continues to be a major barrier to energy efficiency in Brazil. The banking sector in Brazil is extremely conservative and typical financing availability is either for overdraft protection or major projects. Project financing for small projects including EE projects is virtually nonexistent. Also, commercial interest rates for short-term borrowing typically needed for EE projects are prohibitive. The banking sector, in general, does not view EE project lending as attractive due to the small size of the projects and the high transaction costs. Furthermore, there is a clear lack of qualified project developers and financial intermediaries who typically develop and package bankable projects, thereby reducing the transaction costs of the financial institutions.

At the same time, the financial sector is becoming aware of the enormous market potential for energy efficiency and distributed cogeneration. BNDES, the national development bank, is currently developing a new financing facility for small and medium sized projects that could be available for energy efficiency projects as well. In addition, Credibanco, a commercial bank has shown a strong interest in pursuing the

energy efficiency market along the lines of its financing for water conservation projects where the bank has gained significant experience. The current plans of both of these banks are discussed later in Chapter VI of this report.

In the short term, financing of energy efficiency projects will be questionable as short-term interest rates are prohibitive, ranging from 15% to 30% per month.

5.5 MARKET DELIVERY CHANNELS

The supporting market delivery channels are crucial to moving markets, assuming that the regulatory and financing infrastructure is in place. Specifically, the key elements of an effective market delivery system include (i) the availability of energy efficiency technology, products, and equipment, (ii) abundant presence of competent energy service companies (ESCOs), (iii) supporting infrastructure to assist the ESCOs in penetrating the market, and (iv) demonstrated success of the transfer of energy efficiency technologies.

Typical barriers in this area include (i) a lack of local availability of technology, equipment, and products, (ii) few successful ESCOs, (iii) limited financial support to the ESCOs, and (iv) perceived risks of energy efficiency technologies. As a result, even under the best circumstances there is often limited implementation of energy efficiency and the limited capabilities of the ESCOs and technology risks essentially do not move the market. A number of actions can be taken by the governments and private sector to facilitate the creation of effective market delivery channels. these include the following:

- procurement of technology and equipment with a "good house-keeping seal" (i.e., independent certifiers)
- incentives to local manufacturers to enter into joint ventures with foreign manufacturers to produce/assemble equipment and products locally
- Institutional support to ESCOs and ESCO associations including training, capacity building, and collaboration with foreign ESCOs
- selected technology demonstration and adaptation projects to promote energy efficiency and reduce risk perception

While the availability of energy efficient technology and equipment is not a constraint in Brazil, the presence and capability of ESCOs continues to be a major barrier to EE implementation. There is little emphasis on enhancing the capability of ESCOs to develop, package and finance EE projects through EPCs. In addition, the supporting infrastructure to assist ESCOs is virtually missing.

Although ABILUX and PROCEL have implemented a few EE projects, predominantly in the area of public lighting, the benefit of the transfer of successful EE technologies

have not been demonstrated and documented. Therefore, new technology is perceived as risky by the consumers.

Without question, the market delivery channels for EE implementation in Brazil need to be significantly developed in order to cater to the sizeable energy efficiency market.

6 PROPOSED STRATEGY TO MOVE THE MARKET

6.1 POLICY INTERVENTION AT THE NATIONAL LEVEL

Policy reform is typically a slow process especially if it involves major changes in the status quo and competing political interests. The energy sector in Brazil, for several decades, operated in a monopolistic fashion with both ownership and operation of key energy enterprises in the government's hands. The process of privatization and regulatory reform introduced in Brazil are a welcome departure from past practices that kept energy prices low, industries protected, and competition in the sector virtually absent.

Given the new role of ANEEL, the decentralization of regulatory authority away from the federal government to states, and the ongoing sale of electricity distribution companies to operate in a competitive environment, Brazil's energy sector needs to prepare itself for potential shortages and price increases in the short term. A complicating factor is that implementing regulations need to be developed to facilitate the restructuring and privatization process throughout the energy sector.

With respect to energy efficiency, ANEEL requires that utilities invest 1% of their annual revenues in energy efficiency projects (both supply-side and at the end-use level). The utilities are required to submit their plans for the 1% fund and ANEEL has the authority for approving these plans. So far 12 utilities have submitted their plans which have been approved by ANEEL. The total value of all the projects submitted by the utilities under the 1% requirement is R$ 213 million, greater than the minimum 1% requirement under the law which comes to R$ 179 million. Most of the end-use EE projects concentrated in public lighting; very few projects were in the industrial and commercial sectors. ANEEL has not received proposals from the remaining 52 utilities. Exhibit VI-1 provides a summary of the projects submitted by the 12 utilities.

At present, there does not appear to be a unifying objective of using the 1% escrow-rate as a mechanism to gradually transform the EE market. The great danger has always been that the utility programs would be a pulverized collection of disconnected projects. This seems to be what has happened with the first round of projects

The process for issuing the implementing rules has also begun. In July 1999, ANEEL published the implementing regulations in a 140 page document for public review and comment. Also, the draft manual containing rules for the second year is being currently reviewed. ANEEL was open to suggestions on ways to stimulate the market by using the 1% fund as a catalyst. ANEEL also indicated that such suggestions could

EXHIBIT VI-1: SUMMARY OF ENERGY EFFICIENCY PROJECTS PROPOSED BY 12 UTILITIES UNDER THE 1% FUND REQUIREMENT (1999)

CONCESSIONARIA	1% DA RAO (R$ MIL)	VALOR DO PLANO (R$ MIL)	ENERGIA CONSERVADA (GWh/ano)	DEMANDA RETIRADA DA PONTA (MW)
BANDEIRANTE	17,774	19,306	51,53	13,52
AES-SUL	5.843	5845	31,73	9,05
CELPA	3.687	3.016	16,05	4,47
CEMAT	3.011	3.939	45,44	42,43
CEMIG	26.455	25.469	29,11	33,52
CERJ	7.350	19.847	70,93	14,48
COELBA	9.173	9.343	66,16	14,55
COELCE	5.438	7.375	22,68	3,64
COSERN	1.999	2.502	8,97	2,67
CPFL	17.729	16.202	39,30	16,82
ELEKTRO	9.049	8.473	20,34	9,45
ENERGIPE	1.631	1.699	12,47	2,64
ENERSUL	2.555	5.643	25,69	6,54
ESCELSA	5.002	6.876	27,27	9,17
LIGHT	22.600	38.336	123,03	26,10
METROPOLITANA	35.990	33.515	92,89	25,81
RGE	5.278	6.78	57,65	16,50
TOTAL	179,869	213,491	741,24	251,36

be included in the final rules. As part of the MMEE Project, USAID submitted specific suggestions to ANEEL and PROCEL in the form an aide memoire that could be included in the final rules. The following is the text of the comments submitted by the Team to ANEEL and PROCEL.

PROGRAMS AND FINANCING MECHANISMS - Programs characterized by activities that promote and foster the participation of private entities in the development, financing, implementation, operation and maintenance of projects. Will be given special attention to those projects that can contribute to induce multiplicity in number and nature of the agents involved in the market of energy efficiency, and that may avoid concentration of power in regional markets and/or a reduced number of agents.

In these projects can be included studies, analysis, diagnosis and similar activities necessary to the implementation of private financing mechanisms or compound directed to the reduction of transaction costs and/or leverage of private resources (or of international bodies), promoting, ordering and standardizing financing procedures that allow reduction of costs of development and financing of energy efficiency projects.

Possible modes of finance mechanisms: 1 - Guarantee fund or co-signer's agreement with clear criteria of risk handling; 2 - Loan Fund; 3 - Compound Loan Fund (combined privileged lines with commercial credit lines).

(The above text is a free version of the one in Portuguese sent by USAID to PROCEL and ANEEL)

In the area of cogeneration, ANEEL plans to take a different definition from that under PURPA and will be publishing the rules in the near future.

6.1.1 Energy Efficiency Policy

With respect to energy efficiency policy, there is considerable room for appropriate intervention. The MMEE Project Team is considering a number of potential interventions, some of which may be recommended to the GOB for consideration. Some of the interventions currently under review include the following:

- Creation of a public/private "National Energy Efficiency and Productivity Improvement Council" or a similar organization to develop a national energy efficiency policy, targets, and approaches.

- Technical Assistance to the MME Task Force on Energy Efficiency

- Policy guidance on enhancing the institutional capacity of energy efficiency NGOs, such as INEE

- Policy guidance on ANEEL to take a more proactive approach to encourage utilities to select private sector EE projects and leverage portions of their 1% funds to generate additional financing for their customers interested in implementing EE projects.

6.1.2 Financial Incentives to Private Sector

Traditionally, the approaches to moving a market suffering with many barriers, such as the EE market in Brazil, require some form of financial incentives for a limited period of time to kick-start the market. These fiscal and financial incentives can be removed once the market forces are sustainable.

While large firms such as Coca Cola, Kaiser, etc. in Brazil are implementing EE projects in their facilities without any government subsidy, the vast majority of small and medium size firms simply do not understand the business benefits of implementing EE in their facilities. This is the market that needs to be targeted by the GOB as the focus of any future efforts.

Some of the fiscal and financial incentives that the MMEE Project may recommend include the following:

- A reduction in import duties for energy efficient appliances and equipment
- Tax write-offs to the consumers for selected EE investments
- Government-sponsored energy audits of industrial and commercial facilities
- Cost-shared demonstration of EE projects with high potential for replicability
- Possible creation of a national energy efficiency fund, similar to Korea and Thailand
- Government-sponsored training to consumers, service providers, equipment suppliers, and ESCOs

In the commercial sector, for examples, buildings in Sao Paulo (hotels, shopping centers, apartment buildings, office buildings, etc.) offer the best potential for large and highly economical EE investments. GOB may consider a strategy to cultivate the building managers of major buildings to serve as a useful link between the ESCOs and the consumers.

6.1.3 Energy Efficiency Standards

Appliance and equipment standards have often been used as tools in many countries to regulate or influence energy use patterns of consumers and move the energy efficiency market. Brazil is currently conducting analysis in preparation for developing adequate standards for household appliances. This program could be expanded to the industrial and commercial sectors and include the full array of thermal and electrical equipment such as pumps, motors, boilers, chillers, heat exchangers, etc.

USAID is already assisting the GOB through another program in this area. Therefore, it is not likely that the MMEE Project would make any specific recommendations in this area.

6.1.4 Utility-sponsored Initiatives

Except for the energy efficiency activities of PROCEL/Eletrobrás, mainly targeted at the public lighting subsector and audits of selected industrial and commercial facilities, there are virtually no established EE programs sponsored by the utilities in Brazil. There are no effective DSM programs. Also, traditionally, utilities have not implemented any public outreach programs to educate their customers in the benefits of EE as the prices were relatively low and the supply of power was abundant. Given the privatized environment and the potential upcoming shortage of power, the utilities need to take an aggressive approach to sponsor EE initiatives. Some of the initiatives being considered by the MMEE Project Team for possible recommendations to utilities in Brazil include the following:

- Development and implementation of effective DSM programs
- Programs to educate customers on more energy efficient appliances and equipment
- Promotion of distributed cogeneration systems
- Utility financing of EE projects for their customers

In this context, the MMEE Project may also recommend an extensive exchange program between Brazilian and U.S. utilities.

6.1.5 Public Awareness and Outreach

There has been little public outreach and awareness activity in the area of energy efficiency in Brazil. PROCEL has sponsored numerous workshops and conferences in EE but they were mostly targeted at select consumers rather than the full array of energy users across the country. Also, there is little tradition of strong NGOs and advocates of energy efficiency. This area offers significant opportunity for the MMEE Project Team to influence the system in order to encourage the market. Specifically,

the public outreach and awareness activity should involve all key stakeholder groups including public policy makers, regulators, utilities, service providers, vendor associations, universities, financial institutions, and NGOs. Some of the recommendations that the MMEE Project may consider include the following:

Establishment of a unit within MMEE to manage an outreach program including EE awards, creation of the EE day, mobilization of universities and schools to introduce EE courses, promotion of training activities, EE literature distribution, implementation of a public/private EE demonstration program, etc.

- Support to NGOs to develop effective outreach programs
- Creation of a forum for utilities, consumers, service providers, and financial institutions to promote energy efficiency
- Development of specific programs aimed at the household sector and rural and isolated populations

There are numerous successful models of EE outreach programs that can be customized to Brazil with little effort. The key will be to convince the national planners that such a program is needed as there seems to be the feeling in some circles that the market will just follow given the government's electricity sector restructuring and privatization process.

6.2 INSTITUTIONAL CAPACITY BUILDING IN THE PRIVATE SECTOR

In order to successfully move the energy efficiency market in Brazil, considerable capacity building is needed by many key organizations that are major stakeholders in the market place. Key federal and state organizations such as industry associations, ESCO associations, and vendors, can play a very important role in accelerating the energy efficiency market. However, both the management of these associations and their industry members need to be sensitized to the business benefits of energy efficiency. While, there are many individual champions for energy efficiency, organizationally, there is a lack of commitment to EE due to many of the typical reasons (relatively lower prices, industry protection policies, lack of awareness, etc.).

Over the last several years, PROCEL has worked with a few industry leaders such as Coca Cola, Volkswagen, etc. on promoting energy efficiency projects. Also, PROCEL has held many seminars on the subject for a wide variety of consumers, planners, business leaders, and utilities. While these efforts have been successful, they have not led to a sustainable corporate culture dedicated to EE. In addition, there is a lack of trained experts to develop and prepare EE projects in a manner that would attract the attention of corporate managers and financial institutions. All of this leads to the conclusion that public outreach alone, no matter how well designed, will not move the market. The corporate culture needs to be changed. Therefore, targeted capacity

building is a key component of the MMEE Project strategy. Key national and state level industry organizations such as CNI, FIESP, ABESCO, ABILUX, ABRAVA, etc. need technical assistance and training necessary for promoting private sector led energy efficiency investments.

6.2.1 National Confederation of Industries (CNI)

CNI is a national organization that represents the Brazilian industry in conjunction with the various industrial state federations and national sector associations. At CNI, energy sector activities are handled by the Infrastructure Council and the Industrial Competitiveness Business Unit. Its focus is directed to issues related to energy policy and legislative actions. Special attention is given to energy efficiency initiatives that have a significant positive impact on the environment.

Currently, CNI is working on a program under an agreement with CEIA - Canadian Environmental Industry Association, entitled "Energy Management and Reduction of Gas Emissions Responsible for Greenhouse Effect". This project concentrates heavily on energy efficiency and global climate change issues. The objective of this program, focused on medium and small industries, is to develop 6 pilot projects in energy efficiency in key energy-intensive industrial sectors, including steel mills, ceramics, textile, food, automobile parts, plastics and furniture. These sectors have been selected as their consumption of fossil fuels is above 50% of their energy balance. Two of the more representative facilities in each of these sectors will initially be chosen based on preliminary energy audits of the facilities. The pilot program will consist of the following phases:

- 1st phase - to identify barriers to industrial energy efficiency in Brazil;
- 2nd phase - to evaluate the needs for training in the industry (CIDA will cooperate in the training process);
- 3rd phase - to discuss the technologies available in other countries through a series of 6 workshops focused on the identification of more appropriate EE technologies for the implementation of the selected pilot projects.

CNI is working with the state industry federations, such as FIESP in Sao Paulo, and others to expand the coverage of the program and to select the best pilot projects. Close collaboration among the CNI, state federations, universities and utilities has already been established in the States of São Paulo, Rio Grande do Sul, Parana and Minas Gerais.

The project is being implemented through state industrial federations (FIESP, FIERGS, FIEMG, etc.) selected for their capacity and commitment (as is the case with the

PROCEL program, which has the same managers at the state federation level). One or two sectors have been chosen in each state. The sectoral concentration includes textiles, food processing, wood products, ceramics, plastics, furniture products, foundries and automobile parts.

CNI members expect that each of the projects will be taken forward to financing, taking two or three pilots at a time. The Canadian consultants are working on developing financing sources, but financing is clearly still not resolved. In addition to this effort, the CNI project includes specific activities to assess the barriers to successful implementation of EE projects that may result in the need for targeted training.

CNI is planning three sectorial workshops to be held in the most progressive state federations: Rio Grande do Sul, Minas Gerais and Paraná or Santa Catarina. After these workshops, several energy audits will be undertaken, which will be closely linked to the training effort. The first day of these workshops would be used to discuss barriers and ways of overcoming them. The second day will be technology oriented.

The MMEE Project Team is closely following the CNI effort as it is the most significant private sector led EE activity in Brazil. CNI has expressed interest in working with the MMEE Project Team in sponsoring different "focus group" meetings on EE financing and EPC issues.

The following specific interventions are needed to accelerate the efforts of CNI as they will induce more EE market activity:

- Provide technical assistance to CNI management and selected members on mobilizing EE as a tool to increase productivity and competitiveness among its industry members
- Technical assistance in the development of provocative policy papers to lobby the government and regulators to change policy more favorable to energy efficiency
- Training in the development and delivery of industry-specific papers on efficient energy technology applicable to Brazilian industry
- Extensive topical seminars and workshops to demonstrate the benefits of energy efficiency and cogeneration, similar to the current CNI work with CEIA, Canada
- Development of energy efficiency equipment certification program in collaboration of programs in the U.S. (e.g., American Boiler Association certification program)
- Development of an energy auditor certification program

CNI is in a position to play a major role in both mobilizing the consumer opinion as well as in moving the industry members to adapt more energy efficiency technology in

Brazilian industry. MMEE Project Team members are working closely with MMEE and assisting them in adaptation of new approaches to accelerate the introduction of energy efficiency and cogeneration in the market. CNI will also be a major partner with follow on work in Brazil under the MMEE Project.

6.2.2 Federation of Industry in the State of Sao Paulo (FIESP)

FIESP is a major state-level industry association in the State of Sao Paulo, the state with the greatest concentration of industry in the country. The MMEE Project Team members have held numerous discussions with senior management at FIESP on energy efficiency and cogeneration issues. FIESP feels that market-based energy efficiciency programs have worked very well in several countries, with a long term impact. The current vision of EE in Brazil is very limited. The backbone of successful programs is effective demonstration of EE projects and FIESP feels that this model will work in Brazil. Therefore, FIESP stressed the need for a well targeted EE demonstration program.

FIESP expressed a strong interest in supporting the MMEE effort -- including offering in-kind support such as their facilities and secretarial help -- in any future MMEE events in Sao Paulo.

FIESP feels that electricity prices in Brazil will definitely increase in the future as new capacity is brought on line through IPPs using Bolivian gas. Therefore, the economy needs to prepare itself and EE is one of the best ways to keep demand under control and increase the competitiveness of the Brazilian industry.

FIESP members are concerned about future energy shortages and energy price increases. Very few new generation projects are being brought to conclusion or are underway Therefore, the industry is worried - and this fear is escalating the implementation of economically inefficient diesel-fired captive power generators by industry.

Natural gas combined cycle plants cost about US$ 35-36/MWh, which is much more than the current bulk supply price. In addition, there are currency exchange rate risks, given the recent devaluation of the Brazilian Real. Electricity supply contracts (i.e. prices) can only be changed, at present, once a year. This could mean serious exposure if there is a devaluation at the beginning of the year. These uncertainties are strong barriers to any investments in the energy sector including energy efficiency.

FIESP is an active advocacy body on energy issues. For example, during the recent rule making process for the utilization of the 1% utility revenues, FIESP presented specific responses to ANEEL on the need for both supply- and demand-side energy efficiency. It addition, FIESP is strongly advocating the need for a clear national

energy policy that will increase electricity supply, rationalize energy prices, and reduce the threat of a shortage.

FIESP acknowledged that generally the industry is not very interested or focused on energy efficiency. Apart from the fact that energy is relatively cheap in Brazil, another reason for this lack of focus is that most firms are too wrapped up with their operational problems. FIESP does not think that private bankers will finance EE projects in the near future. There is only short-term "overdraft" financing available from most banks which is not conducive to EE project financing. Most Brazilian banks are quite comfortable recycling government debt. There is a dire need for action on the part of the public development banks such as BNDES, BNB, UNIBANCO, Caixa Economica Federal (CEF), etc. to create new financing facilities to cater to the EE market.

FIESP is a strong industry association with a powerful voice in public policy making and is in an ideal position to be a key local "champion" of energy efficiency. With respect to energy efficency, FIESP should be brought in as a partner in any donor assisted activity in the country. FIESP's access to major industries in the country could also be instrumental in formalizing the role and importance of EE at the highest levels in the private sector in the country.

6.2.3 ESCO Development

ABESCO is the only organization in Brazil that represents companies that want to be ESCOs. Currently, ABESCO has 44 members. Some of the members of ABESCO include engineering firms such as RHAC, BBL Engineeringrs, SERVETEC, etc. Many of these firms and other ABESCO members are either engineering firms with expertise in design engineering and energy audits, or they are equipment distributors. The perception of the ESCOs in the banking sector is that they are essentially equipment distributors for foreign manufacturers and therefore not independent promotors of energy efficiency. Consumers, unfortunately, also view these firms with skepticism as they may not be independent, given that many of them represent vendors.

Many of these companies have performed energy audits and EE assessments for individual factories and shopping centers. However, in many cases the customers have not moved forward after the initial audits are completed despite the fact that the audits confirmed sizeable energy savings with high return on investment. All of the firms feel that often PROCEL ends up competing with them. Also, the lack of availability of attractive financing continues to be the greatest constraint to private sector EE implementation and ESCOs have no financing of their own. Therefore, the ESCOs feel that some type of a guarantee fund was critically needed to stimulate the market.

ABESCO members also expressed skeptism as to the extent to which the 1% utility fund could truly stimulate the EE market, given the traditional approach taken by the utilities and their preference to simply focus on public sector projects, e.g., public lighting. For example, ESCOs such as NEGAWATT, Union RHAC, etc. do get involved in EE projects such as air conditioning system installations, but they depend on customer financing.

Another ESCO, BBL Engineering, is a 20 year old company with a strong business in the water sector for a number of municipalities. It has ongoing business with SABESP, the Sao Paulo Water Utility, to reduce water losses. During the last two years, the firm has added energy optimization as a new component in water projects. The firm is very interested in expanding its business in the EE area and has started conducting energy audits for industrial facilities under a contract with PROCEL for a number of industrial facilities and for PETROBRAS. They are also working for PROCEL in the automative sector for five auto companies (Ford, GM, VW, Mercedes, etc). Although many attractive EE projects have been prepared by this firm, none of them is implemented as no attractive financing is available from private banks in the country.

SERVETEC, another ESCO, is an air conditioning company with 30 year's experience. It is the largest firm in this business in the country. During the last 4 years, the firm decided to expand the range of its services in the EE and cogeneration area. It is exploring a potential partnership with Bradley, a US engineering firm with experience in small cogeneration systems as an ESCO. It represents absorption technology from Themax (India). SERVETEC can finance EE projects in the range of R$ 30,000 - 100,000. Currently, SERVETEC is working on a 3.5 MW cogeneration project for Sao Paulo Paper. Sixty percent of the financing for the project is coming from Caterpillar which is the equipment supplier, the remaining 40 % of the financing is being provided by SERVETEC. The firm is now concentrating on developing small energy conservation projects requiring investments in the range of R$ 50,000 - 100,000 each. This is perhaps the most successful example of a true ESCO in Brazil. However, even this firm is struggling as there are no local sources for EE financing.

A number of small performance contracts type projects are being done sporadicaly, primarily in the area of public lighting by NEGAWATT. Recently the firm completed an EE project for a school through a 22-months performance contract.

Recognizing the difficulties faced by its members, ABESCO has taken a strong policy advocacy role. For example, recently ABESCO protested to PROCEL that PROCEL's approach to EE lacks a recognition of the consumer and market mechanisms. In fact, PROCEL, instead of transforming markets, acts as an inhibitor to market-based initiatives. This hurts potential ESCOs in developing their businesses. Several examples of recently delayed projects were cited including the Pao de Acucar Project, the Coca Cola Project, the VW Project which were developed by ABESCO members over the last several years.

Another inhibitor to market-based EE implementation is that big firms often have a complex decision making process for maintenance and EE-type projects. The key question is -- how do you convince a customer to decide to make investments once the energy savings potential on economically viable terms has been demonstrated through a facility audit? This suggests that the customers' risk perception is deep rooted and needs to be corrected.

ABESCO feels that a more appropriate role for PROCEL would be for it to act more like a financial agent and let the ESCOs be in the business of developing and implementing attractive EE projects.

In the area of the 1% utility fund, ABESCO members had a number of comments. They have strong misgivings about the allocation of 0.75% of revenues for supply-side efficiency projects. Any electric distribution company should implement such projects as part of their normal business. Being privatized, most utilities will be under greater pressure to become more efficient. Therefore, the allocation of this fund for supply-side efficiency may be better channeled to demand-side and end-use efficiency projects. This may give even greater boost to market transformation.

So far, no ESCO-type contracts have resulted under this 1% provision. The ABESCO members feel that the concept of a Guarantee Fund (Fundo de Aval) will go a long way in promoting ESCO development in the country. Up to 70% of stalled EE projects could be activated with such a fund.

While the enthusiasm of Brazilian ESCOs is high, all of them need to better understand the operational aspects of ESCOs such as business planning, performance contracting, certifications, etc. In addition, ABESCO, as the lead organization for ESCOs, needs to create a better perception among consumers. ABESCO is a promising organization, but is in its infancy and needs considerable assistance in a number of areas as follows:

- Institutional capacity building in business development including business planning, project development, project packaging, etc.
- Training in developing "made in Brazil" performance contracts that reflect market conditions and customer perception in Brazil
- Training in "coordination strategy" to closely work with the utilities and financing institutions to prepare bankable EE projects
- Assessment of ABESCO's organizational and operational requirements including staff, funding sources, financial planning, program implementation approaches, procedures for developing coordinating mechanisms with stakeholders including the donor community, consumer groups, capital markets, energy end-users, and Brazilian government institutions

- Development of operating plans for specific target subsectors for energy efficiency markets
- Development of a strategy for working with various energy funds, and taking advantage of donor credit facilities such as the Development Credit Authority of USAID, Small and Medium Industries of the IFC, the GEF Credit Facility, and other private energy funds, given the interest of ABESCO members in potentially becoming strong ESCOs with a capacity for financing small scale energy efficiency and cogeneration projects
- Development of an outreach program for ABESCO with PROCEL and others for building public acceptance of the profitability of energy efficiency
- Development of a coordinating strategy for ABESCO to closely work with the utilities that by law must spend 1% of their revenues in energy efficiency projects (both the supply- and demand-side), particularly this being an avenue for energy efficiency market transformation
- Development of ESCO exchange programs between Brazilian and U.S. ESCOs

Assisting ABESCO to become a strong player in the EE market in Brazil in one of the best ways to move this market in Brazil. However, it will require a strong commitment not only by ABESCO but also other major partners such as PROCEL, utilities, industry associations, and financing institutions. Therefore, targeted focus groups and seminars involving leaders from these stakeholders could play a significant role in developing a more effective climate for private sector led EE implementation in the country.

6.2.4 Energy Efficiency Equipment Supplier Market Development

A number of organizations in Brazil represent equipment vendors and local distributors of foreign equipment. Among them, ABILUX and ABRAVA are key organizations. ABILUX represents manufacturers and dealers/distributors of lighting equipment such a lamps, transformers, appliances, ballasts, etc. ABILUX has had considerable success in the area of public lighting projects implemented by many municipalities in the country. Essentially, they operate as contractors to supply- and install lighting equipment in public building and streets. ABILUX members do not have any capacity to offer financing nor are they able to access commercial market financing despite the fact that the projects are commissioned by municipal and state governments.

ABRAVA represents firms involved in air conditioning, refrigeration, and ventilation equipment sales and contracting. Its main business is in distributing equipment. ABRAVA did not show any particular interest in or knowledge of energy efficiency. Also, ABRAVA did not know much about USAID or other donor programs in EE. They do not see EE as a driver to their business. Their approach is to respond to market demand for equipment. There is an absence of any enthusiasm in the organization to be proactive to create market demand for energy efficient equipment and system.

In order for private sector led EE to be successful, associations representing equipment vendors and distributors need to brought on board. They can have a significant role in influencing consumer choices and expanding the market for energy efficient appliances and equipment. Unlike other countries with successful EE programs, neither the utilities nor the ESCOs in Brazil work closely with vendor groups. There is a clear need to educate this group and make them partners in energy efficiency.

Currently, these organizations represent the rather lithargic attitude of most consumers and equipment sellers towards the benefits of energy efficiency. Members of this organization may benefit from attending future USAID training courses in energy efficiency.

6.3 POTENTIAL ROLE OF FINANCING INSTITUTIONS

As mentioned earlier, availability of attractive financing continues to be a major barrier to energy efficiency implementation in the private sector. Brazilian banks have traditionally catered to financing government debt, providing short-term and high interest overdraft protection lending, asset management, and, in the case of development banks (BNDES, BNB), financing of mostly public sector projects and co financing of major projects with other financiers. Project financing for small and medium sized private sector projects is missing. This is precisely the window where most EE projects fall. As a result, apart from public lighting and a few EE projects implemented by major multinational firms, through their own resources, the private financial sector is virtually inactive in this area.

The MMEE Project Team members have held numerous discussions with a number of banks in Brazil including BNDES, Banco do Nordeste (BNB), Banco Axial, Banco Credibanco, and UNIBANCO. None of these banks currently have financing facilities that will be suitable for financing of private sector EE projects. While most of the banks appreciate the benefits of EE and the size of the EE market in Brazil, the perceived risks, the lack of supporting infrastructure, the relatively small size of the EE projects, and high transaction costs, continue to be the major barriers, resulting in little or no investment in the sector.

A summary of the brief financial sector review as it pertains to the EE market is provided below. The MMEE Project Team has concluded that two of the major banks in Brazil, BNDES and Banco Credibanco, are actively considering instituting financing mechanisms that will cater to the EE market. This offers the MMEE Team the greatest opportunity to collaborate with these two institutions to address EE financing, the most significant barrier to EE in Brazil.

6.3.1 National Bank for Economic and Social Development (BNDES)

BNDES is the largest national development bank in Brazil, involved in financing or co-financing projects worth over US$ 20 billion annually. Currently, BNDES has no mechanism to finance many private sector projects and any projects that require investments in an amount less than Real 7 million. BNDES has recognized that it has a very important role to play in financing a large number of small and medium size projects including EE projects. As a result, the BNDES management is considering a possible Guarantee Fund to promote small projects that could also include ESCO financing. Discussions of such a fund began within the bank management in 1997. The basic idea was that it would cover those projects proposed by ABESCO found to be economically attractive based on an independent technical and financial evaluation by PROCEL or another credible entity.

The BNDES effort to potentially create such a guarantee fund was slowed down by the simultaneous development of other guarantee funds: the FGPC (Guarantee Fund to Promote Competitiveness) and a small businees guarantee fund for SEBRAE. In 1998 the FGPC covered 303 projects worth R$ 40 million. The bank was disappointed by this performance as BNDES had hoped that the fund would generate as much as R$ 250 in financing new projects. In June 1999 BNDES made changes to stimulate greater use of the FGPC, increasing coverage (from 50% to 80%), simplifying forms and procedures, and aggressively marketing the fund.

With the FGPC in place, BNDES management has a serious question as to the usefulness of another, more specific, guarantee fund for just EE projects. One argument given is that a specific fund might be more attractive to international agents and promote joint venture EE projects between foreign and Brazilian firms (particularly ESCOs). The BNDES staff believes that it is important to have a specialized financing facility for the ESCO market.

The BNDES senior staff have developed a preliminary proposal for the structure of an energy efficiency guarantee fund. Exhibit VI-2 illustrates the proposal being developed by BNDES. The proposed guarantee fund will operate as a guarantee fund for ESCOs to finance projects that have met the PROCEL due dilligence criteria. MMEE Project Team members are working with BNDES staff in developing this concept further.

In principle, the concept is sound but it needs further development. Furthermore, in order for the fund to be successful, BNDES would need to put in place an aggressive program to market ESCOs and develop EE projects. The guarantee fund proposed by BNDES would have various sources of capital including grants, low return, low risk capital; higher return, higher risk capital, etc., with BNDES as the final guarantor.

The main thrust of the fund is to start financing small and medium size EE projects to demonstrate the attractiveness of the EE market. BNDES is proposing to initially start the fund with approximately R$ 2 million which should be able to leverage R$ 14-16 million of new EE projects.

BNDES would like to have the participation of utilities in the fund, applying a small part of their resources from the 1% fund. To this end, they have started a dialogue with PROCEL. However, there has been no progress thus far. One of the activities of the MMEE Project is to assist in advancing the discussions between BNDES and some of the more progressive utilities. In addition, the MMEE Project Team is assisting BNDES in exploring avenues to increase the participation of other equity sources in the fund.

The senior management of BNDES continues to have skepticism in the success of the fund given consumer reluctance and risk perception to implement EE projects. Given these doubts by the bank's senior management, it will be necessary to have strong interest from other actors (public and private) in the market, such as USAID, ABESCO, INEE, CNI, ANEEL, PROCEL etc. Once a guarantee fund is established it should be aggressively marketed in the private sector, different from what has happened in the past in the EE sector in Brazil where the focus was almost entirely public sector projects.

Exhibit VI-2: Proposed Structure of Energy Efficiency Guarantee Fund (BNDES)

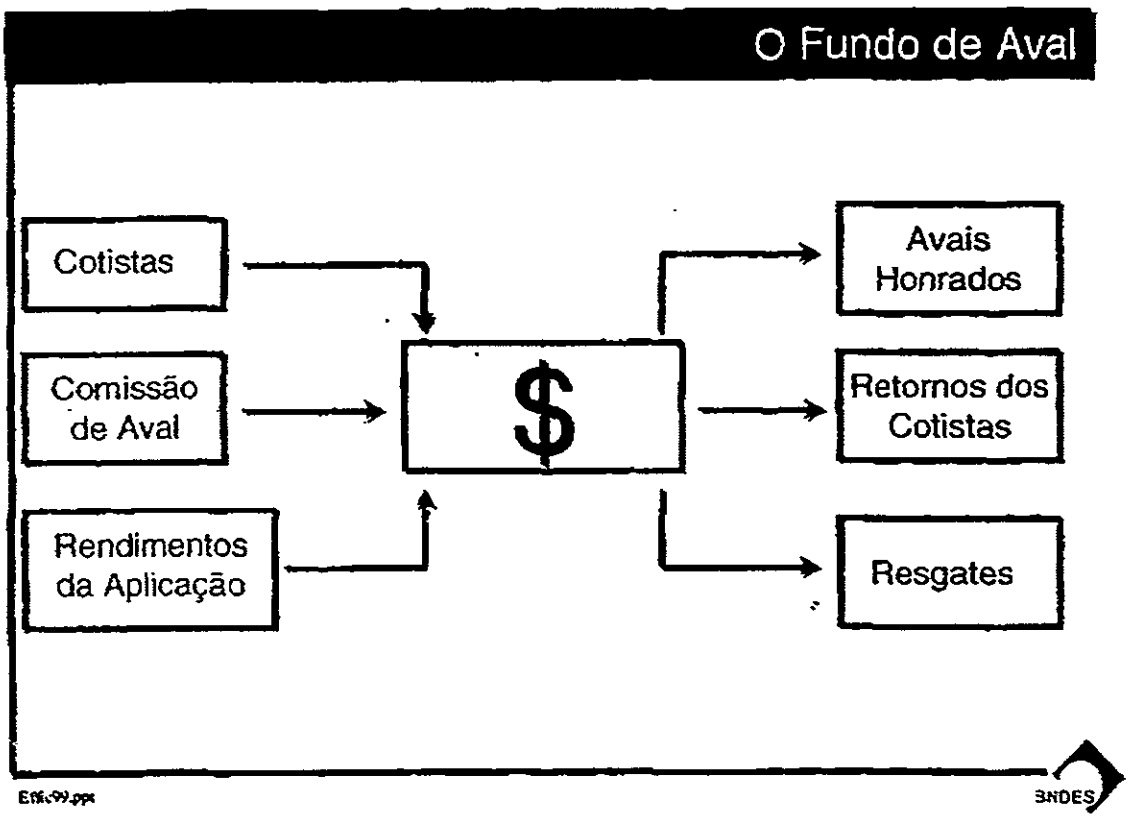
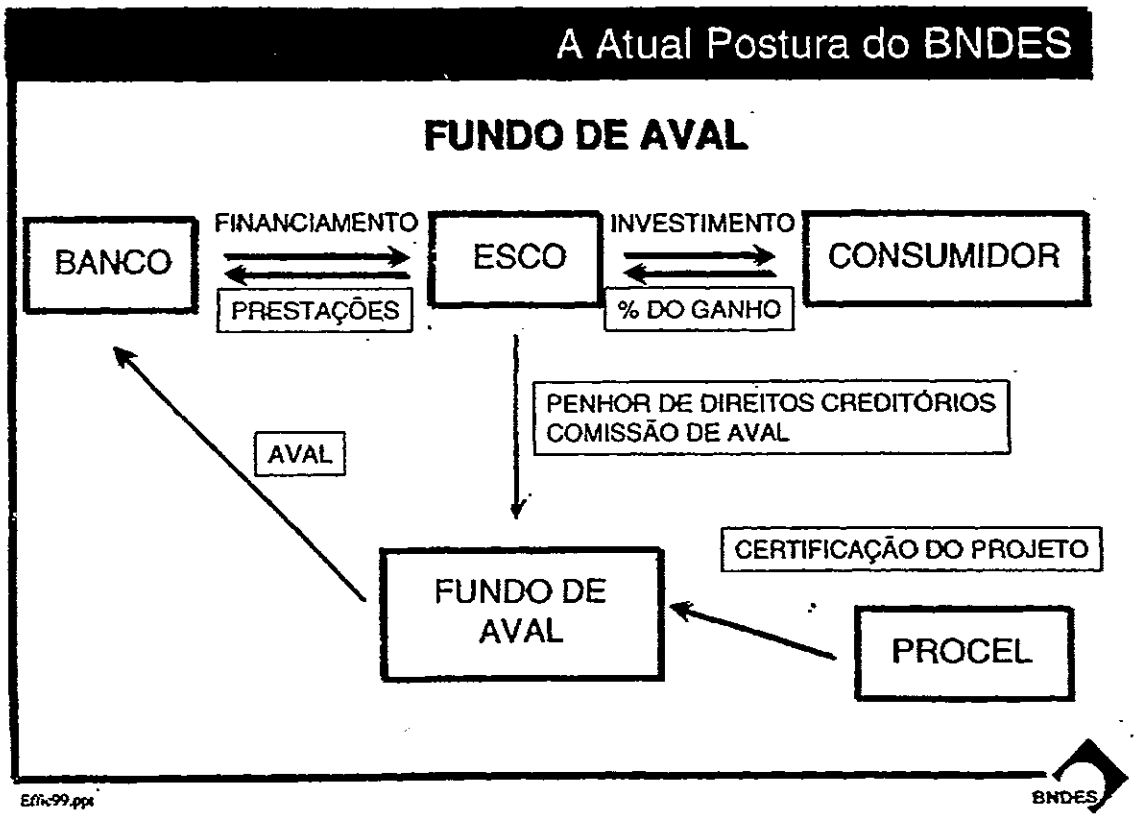


Exhibit VI-2: Proposed Structure of Energy Efficiency Guarantee Fund (BNDES) (Continued)



The MMEE Project Team's conclusions with respect to BNDES are as follows:

- The USAID should consider using some of the Mission's funds to provide technical assistance to BNDES in moving the guarantee fund concept towards reality. The Mission should continue its dialogue with BNDES to explore avenues to influence the establishment of the proposed guarantee fund.

- BNDES likes the idea of utility involvement in a guarantee fund and is proposing this to ANEEL through a separate initiative. BNDES fully endorsed the intervention by the MMEE Project Team to include this issue as part of the final rules for the utilization of the 1% fund.

- BNDES senior staff should be encouraged to participate in the planned seminar series with CNI in order for them to appreciate the emerging EE market. This series should be helpful to them in mobilizing outside support for negotiations inside the BNDES.

- Further work is needed to explore whether the USAID's proposed guarantee fund (DCA) could participate in the guarantee fund contemplated by BNDES.

6.3.2 Banco Credibanco

Credibanco is a niche wholesale bank founded in 1967, with the Bank of New York as a shareholder. It has made R$ 1 billion in loans as an onlending bank for BNDES during the last five years and is a significant lender to projects involving the US Ex-Im Bank lending. The bank also deals with derivatives and asset management. It participated in the first environmental loan which also involved US Ex-Im Bank financing. It also works with the IFC on a case-by-case basis. However, the bank finds IFC's small loan program too full of pre-conditions, and often unworkable.

Credibanco will consider projects as small as R$ 1 million if the project represents potential for replication and is in a market that is growing. The bank's target markets are as follows:

- Cogeneration and thermal power plants
- Revamping small hydro (500 sites just in Minas Gerais)
- Performance contracting and ESCO financing

Unfortunately, the bank has not seen any financiable projects from the ESCOs. ESCOs are seen as a weak link, reduced to being equipment vendors. They are also viewed as expensive, as they must pass on their added costs for representing manufacturers on to the consumers, i.e., the buyers of energy efficiency services.

The following are some of the key findings and conclusions about the bank's operations.

- The bank's view is that the Fundo de Aval is not a good idea as good projects do not need it and there is potential of abuse of a guarantee fund by pushing unattractive or unsustainable projects. Also, the management of the fund will be rather complicated, given the limited experience of the banks in Brazil in this area.

- With respect to Credibanco's potential involvement in managing the 1% utility fund in some form of collaboration, the bank felt that it would be very likely necessary for a quasi public entity to oversee the fund management and operation. Credibanco is prepared to engage in an exercise to develop a workable framework that would permit the use of the utility funds for attractive EE projects. Credibanco, in principle, could manage such a fund once the guidelines are developed.

- The bank also stressed that there is a considerable lack of expert "project developers" in Brazil. However, it did not see this as much of a barrier to private sector EE investments. Once the demand for EE appears, the bank feels that the project developers would quickly gear up to meet this demand.

- The bank cited the Caixa Economica Fund, which had simple criteria and rules and worked very well. This fund was directed towards the suppliers of construction equipment and materials.

In summary, the MMEE Project Team found Credibanco to be a very progressive bank with a strong interest in the EE market and the MMEE Project. This bank could serve as a good local "champion" for the MMEE Project workshop in Brazil and some of the key project finance officials could even play a role in the design of the country workshop, including the preparation of appropriate papers on ESCO financing, project financing, and EE project development. Credibanco appreciates the need for commited players to get the market transformation started. This would come in very handy as the MMEE Project proceeds further in Brazil.

6.3.3 UNIBANCO

UNIBANCO is a commercial bank with a current investment portfolio of 50 projects with a total of R$ 10 billion. Most of these are large projects such as toll roads, water supply, etc. In the energy sector the bank has stakes in some electricity distribution companies and thermal power plants and natural gas. UNIBANCO is the largest intermediary for BNDES project investment - near the limit for individual banks.

In selected cases, the bank has considered projects as small as R$ 1.5 million, particularly in the water sector. Despite small fees (R$ 45 thousand) the bank felt that funding small projects in the water sector was justifiable because they are interested in this sector as it offers a long-term sustainable potential for new business. If EE is marketed well with the banks, they could also attain this position over time.

UNIBANCO participated in a program with ABILUX to finance public lighting projects. However, the program did not take off. Only two applications were received by the bank for loans: -- one for R$ 500,000 for a lighting project and another whose origin was not related to the program. The primary reason for this was that there was a lack of effective marketing of the program by ABILUX. The limitations of manufacturers' associations as vehicles to change markets were discussed by the MMEE Project Team. In the case of ABILUX, some major manufacturers do not regard the association as that important and pursue their markets independently of the association. It is UNIBANCO's strong belief that ABILUX and other vendor associations in Brazil need extensive training in marketing energy efficient equipment in Brazil.

UNIBANCO felt that there is a need for an increased role for government, especially BNDES, in transforming the EE market. However, UNIBANCO does not accept Brazilian government guarantees for financing projects. Without a doubt, project financing is needed to promote EE investments in Brazil. For "project financing" to work there is a need for more equity than is available currently, in order to increase the coverage ratio. The Team discussed the USAID's Development Credit Authority (DCA) and found that while it is an interesting idea, it has not been marketed well in the financial sector and has not gotten off the ground.

UNIBANCO feels that private equity funds will be interested in financing attractive EE projects which offer 20-25% return on equity. However, many of these EE projects are not packaged well enough to be attractive to such investors. The primary reasons for this, based on the bank's perceptions of this market, are follows:

- Energy saving is invisible and is misunderstood by consumers.
- ESCOs in Brazil are inadequate in terms of their capability and capacity to undertake EE projects. They are primarily engineering companies that do not know how banks operate in the Brazilian environment and the ESCO

model will face great difficulties. Most ESCOs in the US are linked to utilities. In Brazil, utilities are not yet interested in efficiency and are, therefore, against the development of ESCOs. The bank recommended that ABESCO should be strengthened as a business organization and encouraged to develop stronger ties with the utilities. Also, it should proceed to get some form of international certification in order to enhance its credibility in the market.

- Banks are generally more confident in the ultimate client and are reluctant to do business through financial intermediaries or ESCOs. At the same time, the bank agreed that having to give financing to a buyer firm acts as a strong disadvantage for marketing energy service products. It greatly increases the transaction costs and the risks for the ESCOs.

- The bank's experience with ABILUX reinforces the MMEE Project's assessment of the capabilities of ABRAVA and ABESCO. Manufacturers' associations have still not awoken to the potential for promoting energy efficiency and the banks have too much on their plate to take a lead in developing EE projects. Therefore, it reinforces the Team's perception of the need for skilled project developers in Brazil.

- Concerning the proposed utility billing and collections procedures, the bank felt that it would be helpful if the utility contracts could be designed so that electricity service could be cut off to consumers in cases of non-payment. This is politically difficult to implement, but is badly needed for full cost recovery needed by many utilities in the privatized environment.

- The bank strongly felt that currently there is no leadership in Brazil for championing EE projects. There is a clear need for a leadership group close to the consumer and market as opposed to the traditional approach of big government/utility planning which has not resulted in market sustainability.

6.3.4 Banco Axial and Terra Capital

Banco Axial is a "boutique" investment bank, with 36 staff. It's mission is to show that one can make money improving the environment. It specializes in forest resource projects and activities in the less developed regions of Brazil. The bank has developed the Terra Capital Fund. This fund is to start with US$ 100 million equity from investors that can work in a 15-20 year horizon.

Energy is on the back burner in this bank as an investment area. The bank does not have many full time staff members and operates by hiring interns from different countries. Currently the bank is developing a sustainable forestry project (the biggest

in Brazil) in Itacoatiara in the Amazonas state. There is a good potential for a 50-60 MW project using residues.

The bank strongly feels that Brazilian firms need to have a commitment to obtaining international certifications for clean, certifiable, and biodegradable products, such as ISO 14000, not only for export market acceptability, but also to be able to obtain low cost financing.

This bank could be an innovative partner further down the line, though it will emphasize more renewable energy supply-side issues (including cogeneration and generation with residues) than end-use efficiency. The bank has strong fund-building skills which could be useful for moving the EE market. It has good contacts with regional banks which may be more innovative than the larger national banks and may be more open to financing small-scale projects. One example of a smaller regional bank is Banco de Ribeirão Preto - BRP that could be very interested in financing small scale regional EE projects. The potential involvement of this bank in the MMEE Project needs to be explored further.

6.3.5 Banco do Nordeste (BNB)

BNB is 51% owned by the federal government and has its main office in Fortaleza. It operates as a regional development bank, providing small loans and credits in a market not served by BNDES. BNDES provides loans and credits with a minimum size of R$ 7 million. BNB was created by the government to serve the northeast region of the country which is heavily rural and needs significant development. The bank is extensively involved in funding renewable energy projects that cause local development. The bank has strict criteria for project selection and funding. Energy efficiency projects can qualify for bank loans only if they are small projects and are directly linked to local development. BNB has a large customer base and some of these customers are excellent candidates for EE projects.

With respect to the MMEE Project, BNB could play a role in motivating some of their customers to participate in the workshop. The MMEE Project Team members may need to visit the northeast region to assess the size and characterstics of the EE market prior to assessing the role that BNB could play in the workshop in Brazil.

The BNB managers were not very knowledgeable about the Brazilian EE market and the role that ESCOs could play in promoting market-based EE investments. There is an opportunity for involving BNB loan officers in ESCO training. This is due to the

bank's style as a development bank. This means that its staff need to be trained in the subject, perhaps to a greater degree than most banks at this stage.

The Next Steps Under the MMEE Project

Currently, the MMEE Project Team is preparing an action plan for the next stage of the project. This action plan will include the follow-up activities for Brazil based on the inputs from key stakeholders in the country.

7 ANNEX I: KEY CONTACTS IN BRAZIL

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