

ENERGY ACCESS FOR THE URBAN POOR: PERUVIAN CASE STUDY

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ABBREVIATIONS

APEMIVES	-	Association of Small and Medium Entrepreneurs of Villa El Salvador
ASIMVES	-	Association of Timber Transformation Industries
BANVIP	-	Housing Bank of Peru
BCRP	-	Central Reserve Bank of Peru
CENERGIA	-	Centre Energy Conservation and Environment
CPE	-	Business Promotion Centre
CTE	-	Electric Price Commission
DFID	-	Department for International Development (UK)
ENACE	-	National Building Company
FONAVI	-	National Housing Fund
FONCODES	-	Social Compensation and Development Fund
INEI	-	National Institute of Statistics
IES	-	Social Solidarity Tax
ININVI	-	National Institute of Housing Research
LPG	-	Liquefied Petroleum Gas
LSMS	-	Living Standard Measurement Survey
ONUDI	-	United Nations Organism for Industrial Development
OSINERG	-	Energy Investment Supervisor Organism
PAE	-	Energy Saving Project
PEA	-	Economically Active Population
PIVES	-	Industrial Estate of Villa El Salvador
PRATVIR	-	Rural Resettlement Programmes
PRODEIS	-	Social Interest Programme
PRONAMACHCS	-	National Watershed Management and Soil Conservation Programme
SUNAT	-	Tax Authority
UPPE	-	Small Scale Productive Unit
UTE	-	Specialised Technical Unit
VES	-	Villa El Salvador

TERMS OF REFERENCE

The bulk of energy consumption in developing countries occurs in urban areas. Urbanisation is increasing pressures on the infrastructure and resources of the rapidly expanding cities of the South. Access to energy resources for cooking, heating, mechanical power and lighting, which are the basic requirements of life, impacts significantly on poor urban communities and their environment.

The choice and consumption of fuels for household energy in urban areas are complex matters, affecting household income, family health, social structure, local and national environment and technology choice. Agencies are putting increased effort into addressing these questions and there is now a need to share their experiences and ideas to promote a more sustainable and acceptable solution to problems of energy provision in urban areas.

Consequently, the UK Department for International Development (DFID) has identified energy area as a future priority for its projects on urban poverty. DFID has commissioned Intermediate Technology (IT) to identify options for increasing access for the urban poor to higher grade and more sustainable forms of energy. The outputs will be disseminated in an issue paper to assist DFID to include energy in its urban poverty programme. The outputs will also be disseminated more widely through publication in journals and reputable conferences.

The main objective for the country case study in Peru is to identify the key issues that have to be addressed in order for the poor urban communities to access higher grades and more sustainable forms of energy. In order to achieve this it is important to present the current status of urban poverty as well as access to energy in Peru.

These case studies are to cover both problems and opportunities with respect to the technical, socio-economic, legal and environmental aspects. They may illustrate success or failure of a particular initiative. Also identify the key stakeholders and role in energy scheme.

The main themes are access to energy and energy for small-scale enterprise. The Peruvian case study addresses the cross cutting themes specified for country case studies focusing on:

- Energy service provision
- Economics of urban energy
- Health and environment

EXECUTIVE SUMMARY

Liberalising energy markets is not always the best solution for all the social sectors, the marginal social sectors. Many plans and official programmes have been proposed with a clear goal of reducing poverty levels. Electrification is included as a component and in some cases is relegated to the least priority level. The government is trying to increase the rate of electrification to 50%, without considering if people live in rural or peri urban areas. It is important to identify which are the people that really need this service. On the other hand, the new focus of combat against poverty gives a more realistic and appropriate setting in order to widen the access to energy.

In this setting, many state organisations have been chosen to put in practice these policies in a quick effort to reach goals before the end of president Fujimori's second term. The strong pressure for investing millions dollars adequately in short time is probably worse than choosing bad goals.

There is not a particular obstacle that will discourage companies from providing electricity to supply peri urban areas, but any level of costs (primary investment and others operation costs) will not be covered with monthly incomes of US\$ 30 per person. In the meantime, urban poor people use kerosene and waste fuels (like wood, leafs, papers, cartons, etc.). LPG, which can now be found anywhere, especially in small businesses, is reserved for people with greater and more stable salaries, and electricity is used only for domestic lightning. Statistical evidence was found that the poorest people's decisions are conditioned by the frequency by which they earn money and not necessarily the salary level.

Small and micro enterprises that depend electricity for their process, are considering their monthly expenditure in electricity as a minor problem. Awareness campaigns on rational use of energy should not have short terms goals because changes in people's conduct are a medium term matter. In this sense energy saving projects (PAE) play a very important role.

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1 INTRODUCTION

Developing countries need energy to develop in order to raise living standards and their productivity. Nowadays there are many technologies suitable for these energy needs. Peru has signed a compromise at Rio de Janeiro and recently has signed the Kyoto Protocol, which deals with efficient use of energy and environmental issues. By 1994 the amount of people in Peru that had access to commercial energy was less than 50% and from then on the government has set out goals to increase access to 70%.

Securing higher living standards for this growing population requires rapid economic growth, further increasing the demand for energy services. This demand is augmented by structural changes inherent in the development process, especially urbanisation; the building of the commercial, industrial and transportation infrastructure; and the substitution of commercial fuels for traditional fuels. (U.S. Congress, 96:3).

There are many opportunities to use alternative energies that will save energy, reduce negative environmental impacts and decrease costs to both consumers and producers. The problem is that the transfer of this technology is not adequate and new mechanisms must be taken. There have been several governmental and institutional initiatives but there are still many barriers to overcome. Also, new technologies could provide a more efficient use of traditional fuels.

2 THE PERUVIAN CONTEXT

2.1 POVERTY AND INDIGENCE IN PERU

Poverty is defined as a situation in which a family's income is not sufficient to purchase a basic set of goods and services (which defines a pattern of consumption that reflects an average welfare). For the period between 1991 and 1994, the number of poor people in Peru decreased from 57.4 to 53.4 percent of the total population and between 1994 and 1997 this percentage decreased even more to 50.7 percent. In absolute terms it is estimated that between 1994 and 1997 the number of poor people in country decreased from 12.32 to 12.16 million.

The poorest people segment is known as "extreme poverty" or "indigence" and it is basically the population whose income does not allow them to buy a basic group of staple foods necessary to cover the minimum nutritional requirements. For the 1994-1997 period, the number of people in indigence decreased from 19 to 14.7 percent of the total population.

In Lima, the levels of evolution are far more favourable because in 1997 extreme poverty only affected 2.4 percent of the population after reaching its peak in 1991 at 10.1 percent. A second instance of positive evolution can be found in the urban area where extreme poverty was 7.5 percent in 1997, 42 percent less than the rate registered in 1994. Finally, poverty in the rural area decreased from 46.8 percent in 1991 to 31.9 percent in 1997.

The factors that have determined this decrease in poverty levels in Peru, as shown in the Living Standards Measurement Survey (LSMS)¹ for 1997, have been:

a) Food donations

During 1997, it is important to highlight the fact that 42.5 percent of households in the country have received food donations from government programs of social aid. This aid does not constitute a viable long-term strategy instead it is a transitory measure oriented to relieve the effect of poverty. Rural families have received in a bigger extent the government's aid.

b) The increase of basic services for households

It is observed that between 1994 and 1997 the percentage of households with safe water increased from 63 to 69 percent. A similar tendency has been found for the sewage utilities. The electricity services has been estimated to have reached 73.7 percent of the families in 1997 while the increase of the population that received drinking water increased from 58.2 to 64 percent between 1994 and 1997.

c) Family property increase

The increase of home appliances set, due to credits as an alternative to finance present

¹ The study of Living Standard Measurement Survey (LSMS) was established by World Bank in 1980. In Peru these studies were done by INEI (Instituto Nacional de Estadística e Informática) and CUANTO Institute realises them today.

consumption, has been the third main factor. In 1997, 92.4 percent of Peruvian households possessed a radio or stereo. From this percentage, 72.6 percent owned a television set, while refrigerator and gas stoves had 39.5 percent and 41.4 percent respectively.

The review of the poverty situation, as shown above, reveals an important decrease being more notorious between 1991 and 1994.

Nevertheless, poverty levels are still too high and its reduction has become one of the main objectives of President Fujimori's government who hopes to reduce in half the number of poor families at the end of his term.

2.2 AN OVERVIEW OF THE PERUVIAN ENERGY SECTOR

The energy policies in Latin America especially in Peru have been focused on privatisations in this sector and loosening existing regulation. This process, originated with the transfer of real cost to users since 1990, marked the end of government intervention through subsidies.

2.2.1 General background of Liquefied Petroleum Gas (LPG) consumption

Presently gas consumption nationwide is around 300 000 tons a year and it is estimated that in the next 15 years, it will raise to a million tons, as shown in recent studies.² It is probable that gas, either natural gas or LPG, will become the main source of energy in the domestic and industrial arena. At the same time, Peru is expected to reserve its Trade Balance of Gas because Peru imported 136 000 tons of LPG in 1995 to satisfy the increasing internal demand. Nevertheless, natural gas reserves have been evaluated in more than 10 million tons.

Solgas, Zeta Gas, Lima Gas, Flama Gas and Llama Gas are the main distributing companies that share the largest portion of the LPG market. 49 small companies, formal and informal take the rest of the market nationwide. The growing number of distributing gas companies has meant more competition among them, which has been causing a steady decrease of prices. The Peruvian market for natural gas has great potential for future growth is the main reason why many investors are interested.

2.2.2 General background of oil fuels

The sector of petroleum and natural gas in Peru is very attractive to investors due to country's geology for the discovery of future oil beds. Many companies are evaluating the possibility of entering to the different stages of the industrial process, which are exploration, production, transportation, refining, storing, distribution and retail sales of petroleum and by products.

² ROCA, Santiago. Perú: Destino de las Inversiones de 1997-1998, Ediciones ESAN

The stages that have had a bigger response from foreign investors are exploration and production. For the first one, it is estimated that in the next seven years around 665 million dollars will be invested.

This sector in general has been characterised for being vertically integrated meaning one company owned the different stages of the petroleum process in order to achieve more efficiency and cost reduction. However, the government during the past years has been promoting private sector participation at each stage, therefore moving away from the vertical approach. The privatisation of Petroperu, sold by parts, confirms this tendency.

Kerosene production has been decreasing at 2 percent per year since the beginning of 1990, while LPG production has been growing yearly at 5.5 percent since 1990. These tendencies show an implicit change in preferences of families for cooking fuels.

2.2.3 GENERAL BACKGROUND OF THE ENERGY SECTOR

Considering the low consumption per capita, the levels of electrification and the need for industrialization, there is a potential growth of this sector. The process of privatisation has decreased its pace because the companies entering the market are small. Also there is general resentment for the massive sale of public utilities to foreign investors, especially Chileans, who they blame for the price increases. As a consequence, these companies are trying to maximise benefits.

The Electric Price Commission (CTE) regulates the tariffs of the electricity sector. Despite of having clearly defined objectives there are still insufficient supplies, as the market is still evolving and growing. The tariff schemes establish two segments: the regulated market which are the ones that consume less than 1 MV and the free market. The price of the regulated market is 10% less than free market. There no consideration of the origin of the energy sources. The free market is paralysed because it is not tax-exempt regarding fuels and access to funding. The electric sub-sector tends to gain more stability through free market.

3 URBANISATION: CHALLENGES FOR ENERGY ACCESS

Since the 1960s until recently there has been migration from the highlands to the capital which has made the urban population increase by more than 15 times and this has necessarily meant that the city had to be reorganised. Small houses are built in the mountains and the deserts that surround Lima and any piece of land that seemed to owned by no one.

In 1940 the urban population was about 2.4 million and by 1981 it had increased to 11 million while the rural population increased from 4.7 to 6.2 million. This was due to the migration from self-sustained agricultural communities. Also population growth is higher in people of the highlands than the natives from Lima. This also accounts for the dramatic increase in the urban population.

Probable causes are identified by Hernando de Soto in the book “El Otro Sendero: La Revolucion Informal” that contributed to migration from the highlands. The main causes were the construction of highways and the development of other means of transportation and communication and the commodities of the urban life. Also the crisis that affected agriculture between 1940 and 1945 triggered migration.

The problem of access to property rights for agricultural purposes, lower infant mortality rates in the capital, a better income, a higher level of education and finally the growth of the government and centralization of power in Lima also encouraged migration.

In the four decades, between 1940 and 1980's, the urban space has grown in more than 1200%. This growth has been mainly informal which means first they invade the piece of land, then they occupy it and later they receive the title of ownership. More than 50 percent of the houses in Lima are informal or have informal origins. There are districts like Comas, Independencia, San Juan de Miraflores and Villa Maria del Triunfo which have entirely informal origins and others like Carabayllo, El Agustino, San Juan de Lurigancho and San Martin de Porras which have mainly informal origins. The government had to recognise that these informal settlements could become formal towns.

After many years these shacks developed into houses. The growth of these areas has been impressive distinguishing among two big areas called the north cone and the south cone, located at the north and south of Lima respectively, which are called cones due to the conical shape in which the towns have grown and still continue to grow. The biggest challenges of urbanisation are to descentalize power, promote productive activities, provide access to all basic services and basically give information and education to urban poor. The will contribute to the development of these areas and raising the standards of living of many people.

More information will allow people to take better decisions about what fuel or energy sources to use. In Lima, the process of urbanisation has long started and many already have water, electricity and sewage. Many families have access to fuels such as kerosene and LPG

but their biggest problem still is their income that is a limiting factor. Nevertheless, in Lima, the province, there is still a lot of work to be done some areas still do not have electricity and other services.

3.1 ENERGY USE PATTERNS WITHIN THE HOUSEHOLD SECTOR

Energy is used for cooking, heating, mechanical power and lighting. In households people use energy for these reasons especially cooking and lighting. One of the most important is cooking food. Biomass is one of the primary fuels used for cooking in urban and poor areas worldwide. Kerosene and LPG are also widely used. People in urban areas with higher incomes can afford to switch to more efficient stoves using fuels such as kerosene, LPG and electricity. These fuels are preferred for their performance and convenience especially LPG.

Lighting plays a very important role in households because it allows people to work at night, children to do their homework and other social activities. “As rural income increases, or as people move to urban areas and gain greater access to modern fuels and electricity, lighting services and the energy used to provide them increase dramatically... The shift to electric lighting is observed where electricity has been made available.” (US Congress, 63) Electricity is used because it is cleaner and easier to use.

In Peru, the majority of people living in rural areas use traditional biomass fuel. Even in medium cities a large number of people still use biomass especially urban poor. The demand in both rural and urban houses for energy is for several services such as cooking, lighting, and heating, among others. As the cities have grown so has its demand and changes in their patterns of consumption for energy can be readily seen. In poor areas of Peru such as Cajamarca, Huancavelica and Ayacucho, the population in urban areas uses different fuels such as biomass, charcoal, wood and coal. Few studies have been made on the impact of the use of fuels in urban areas most studies concentrate on the rural poor, which are the most neglected areas.

In the province of Lima for lighting a large number used electricity about 62%, about 29% uses kerosene or petroleum, about 7.3% uses candles, about 0.8% has no lighting and less than 0.6% uses other forms of lighting. For cooking fuel less than 0.7% uses electricity, about 15% use LPG, about 32% use kerosene, 0.7% use coal, about 44.4% use wood, 6.3% use other fuels and only 0.2% do not cook.

In metropolitan Lima for lighting families use electricity, kerosene or petroleum, and candlelight. As a fuel for cooking some use electricity, gas kerosene, coal, wood, others or they do not cook.

3.2 Patterns of Domestic Energy Consumption in Marginal Urban Areas in Metropolitan Lima

Peru is a country characterised for great contrasts and marked social differences and Lima,

its capital, is the main representative of this characteristic. In this city there are many impoverished urban zones which have grown exponentially in the past few years.

The growth of these areas arose from the migration of the population from provinces to the capital to improve their living standards. The settlement of these areas was done through invasions around the capital and these cities have grown disorderly. The process of settlement was started with a small invasion, a Peruvian flag was raised and they took possession of the land by building provisional straw matted or wooden huts.

3.2.1 Methodology

The objective of the next case is the analysis of consumption patterns of fuels used for cooking in marginal urban zones in Metropolitan Lima, which constitute the population under study. The population of urban poor in Lima is around 2.5 million consider extreme poverty and poverty. A random sample was taken in three different slum areas and around 87 families were surveyed in order to confirm a similar behaviour among the families of these areas but 13 were eliminated from the sample for providing incomplete information, not having a typical behaviour or giving contradictory information.

The sample for analysis used was 74 families. The localities taken as samples were Los Pinos Housing Co-operative in San Juan de Lurigancho (located in the northern part of Lima), America Co-operative and Umamarca in San Juan de Miraflores (southern part) and Constructora Limitada Housing Cooperative in La Molina (eastern part).

The information that was obtained from the surveys was organised on tables. Then the main statistics measures were obtained for the most important variables such as income and fuel consumption.

3.2.2 Sample Description

San Juan de Lurigancho has the highest number of extremely poor people in Lima about 97,639 while San Juan de Miraflores has 38,546 in 1996. La Molina is a residential district but some parts the hills have been invaded by constructors, maids, gardeners and others that have built small houses. They lacked basic services such as safe water, electricity, sewage and telephone. Now a days, there are small villages annexed to the city have most of the basic services.

3.2.2.1 Case study: A typical family living in extreme poverty in urban marginal zone in Lima

"A typical family living in extreme poverty in a "human settlement" in Lima is generally a couple who have migrated from the same town in the highlands. Neither has finished primary school. They probably arrived in Lima at some point during the last six years with two children. Now they have five children, having lost two soon after birth as a result of constant diarrhoea.

"They live in a shack made of straw matting, at a foot of a hill, with only one bed, a small kerosene burner and a radio. The neighbourhood does not have water, sewage or electricity. A truck brings water once a week to those who have a small cement tank. This family has not been able as yet to save enough money to buy the material to build walls for their home, let alone a water tank.

"The father, in most cases, is a peddler whose income scarcely reaches US\$140 a month. His wife earns some money, probably washing clothes twice a week, bringing in around 50 additional dollars a month. In all, the family makes 27 dollars a month a person, which is below the minimum cost of a basic food basket estimated at US\$33 per month per person. As a result, the children show signs of malnutrition and are

These three urban poor communities have started as invasions of people from the highlands. San Juan de Lurigancho was founded about 30 years ago and its development has been the slowest of the three samples taken. The families surveyed almost all had electricity and used mostly gas and some used kerosene. They currently have sewage, electricity on a regular basis and water supply is provided every two days. The roads to Los Pinos Housing Cooperative are not paved and the houses seem to have been splattered on the hills. Most families started with a shack made of straw-matting now they have rudimentary brick houses while others have a small business in their homes, mainly a store called “bodega” where they sell groceries and also supply LPG.

In the America Cooperative and Umamarca in San Juan de Miraflores located in the southern part of Lima is a more recent invasion around 8 years ago most of these families had no services. Nowadays, they have water, electricity and sewage. The streets still have no names and many are not paved. Similar to San Juan de Lurigancho, many families have their small workshops at home or have a small grocery store.

Los Constructores Housing Cooperative in La Molina was created fourteen years ago and many have half built houses and live in poverty. Similar to the other two we found in La Molina people that use kerosene and LPG. There are many pieces of wood lying around because most of the families were constructors of many houses in La Molina. Sometimes they use this to make their beans but they do not collect or purchase wood on a monthly basis.

3.3 The most used cooking fuels in marginal urban areas of Metropolitan Lima

The statistic evidence found points out that the family's income is one of the many determinants in energy consumption destined to cooking. Additionally, two other factors are job stability and how frequently salaries are received. Some families receive daily and weekly salaries and this determines their choice for kerosene because their income does not allow them to buy gas. These families prefer to buy retail spending 0.3 dollars³ on a weekly basis. The average monthly income per family is 286 dollars and the average members per family is five, according to the survey's results taken on impoverished districts in the north, south and east of Lima.

³ The exchange rate is 3.37 soles per dollar.

The sample indicates that the maximum income is 1780 dollars while the minimum is only 28.5 dollars a month. Most of the families (58 percent) receive income less than 247 dollars. Among the families surveyed, the most frequent income was 178 dollars. The lower 25 percent of families receive monthly incomes that are less than 123 dollars while the upper fourth receive incomes that are more than 800 dollars.

From this analysis, it can be observed that the most used cooking fuels are LPG and kerosene. These results confirm our initial hypothesis. Also electrical energy is not used for cooking by any of the families because they would have to pay a high price for it. If we analyse three cases of average families where the first family uses only LPG, the second only kerosene and the third uses electricity, and for the same amount of equivalent energy the specific spend of kerosene is 0.007 dollars, for LPG is 0.014 dollars and for electricity 0.042.

Specific cost of commercial fuels in Lima

KEROSENE					
At sea level					
Util Energy Mj	Efficiency %	Energy Required Mj	Conversion factor Lt/Mj	Price \$/Lt	Specific Spend \$
3,6	60%	5,76	0,0281	0,24	0,007
LPG					
At sea level					
Util Energy Mj	Efficiency %	Energy Required Mj	Factor Conversion Kg/Mj	Price \$/Kg	Specific Spend \$
3,6	60%	5,76	0,0231	0,62	0,014
ELECTRICITY					
At sea level					
Util Energy Mj	Efficiency %	Energy Required Mj	Factor Conversion KWH/Mj	Price \$/kWh	Specific Spend \$
3,6	30%	4,68	0,2778	0,15	0,042

Many families when asked if they would use electricity as a cooking fuel said it was too expensive and that they would have to purchase an electric stove and the handling of electrical appliances is perceived by them as highly dangerous.

Nevertheless, it can be observed that the fuel consumption tendency in the capital has been changing. Initially, many families used kerosene because it was the cheapest fuel at retail. Now, many families use gas (24 pounds) even though its unitary price is more expensive than kerosene (1 litre). At the end of the month they obtain economic benefits because gas is less expensive than kerosene on a monthly basis. There are still families that are in the transition between fuels and use both kerosene and gas.

According to the numbers obtained, the distribution of the use of fuels among the families surveyed is as shown in the graph below.

The consumption patterns among these areas are similar, with most people in urban poor areas of Lima having shifted toward the uses of LPG and kerosene for cooking and electricity for lighting.

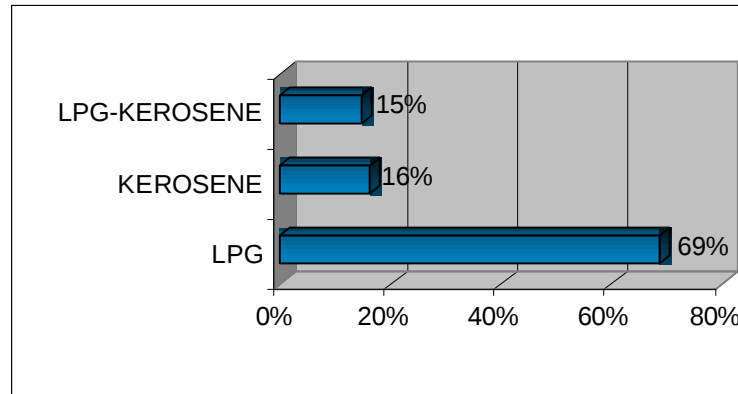


Figure 1: Consumption Fuels in urban poor sectors in Metropolitan Lima

3.3.1 The LPG Consumption

The price of this fuel has varied a lot. Even though in 1996 it increased by 18.89 percent, in 1997 the opposite occurred and its price decreased in 10.66 percent costing 7 dollars the LPG container of 24 pounds. Nowadays its price continues to decrease. The average price of the container is 5.4 dollars. This is principally due to the growing number of competitors in the distribution of this fuel as we already mentioned above.

LPG is the most used fuel of impoverished families in Lima. The highest expenditure found was 21 dollars per month according to the results obtained from the sample. The conclusions that can be drawn from this analysis is that 50 percent of the families spent less than 7 dollars and the most frequent monthly expense was 6 dollars.

In the graph below we can observe that most of the families prefer to use gas because this fuel is more convenient because of its price and ease of use. It is important to note that many people use it despite considering it dangerous, expensive, harmful or not powerful.

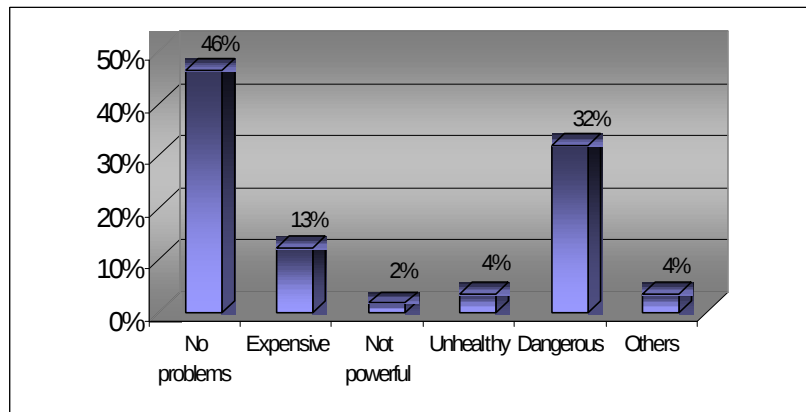


Figure 2: LPG inconveniences according to surveys.

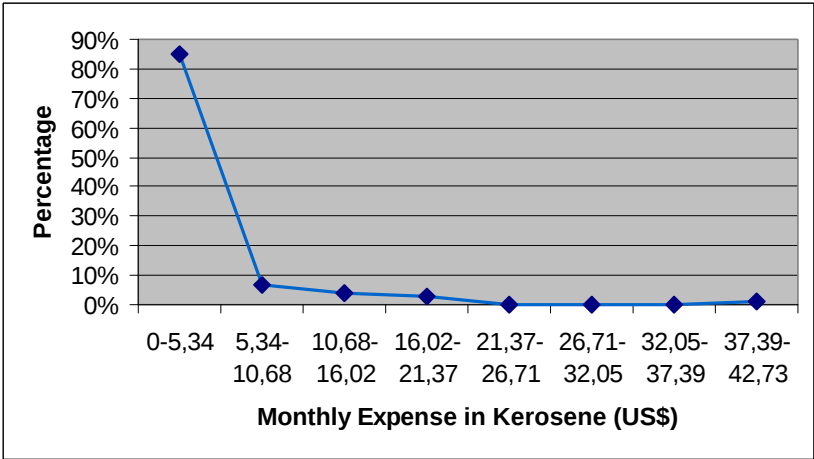
3.3.2 The Kerosene Commercialization

After LPG, kerosene is the most commonly used fuel for cooking. It is consumed at a rate of 4.5 litres monthly per capita, according to the sample taken.

The families that were interviewed that consume only kerosene (or a combination of kerosene and LPG) present a very unique characteristic. The majority of them (85 percent) have a monthly expense between 0 and 5.3 dollars; that is, the expenditure is very low. On the other hand, only the remaining 15 percent vary their expense between 5.6 and 42.7 dollars a month.

The majority of the families expense for this fuel is (85 percent) approximately in 5.3 dollars a month. The following graph may explain the tendency of the monthly expenditure for kerosene among the families surveyed.

Figure 3: Tendency of the monthly expenditure for families that use kerosene.



The price of this fuel varies in direct relationship to the price of petroleum because it is a by-product. During the last two years, its price has increased 18.5 percent and presently the average price of kerosene is 0.3 dollars per litre.

The lower consumption of kerosene in the city of Lima may be attributed mainly to the most common inconveniences mentioned by the families that have used it. The following graph shows the main inconveniences.

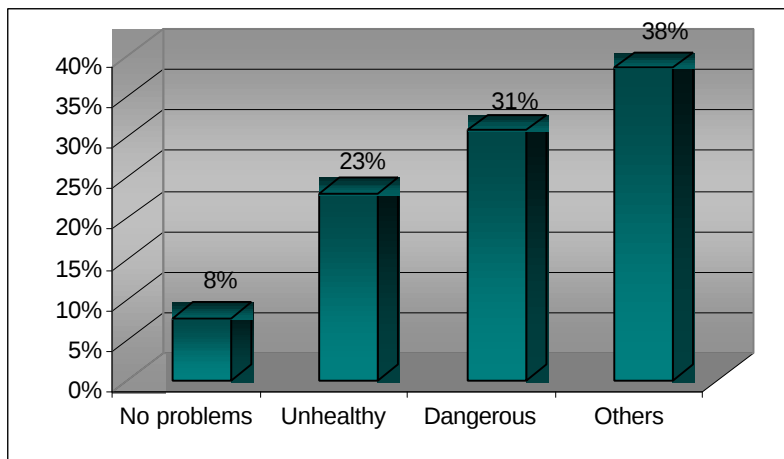


Figure 4: Kerosene inconveniences according to surveys.

It is important to mention that the last item (OTHERS) includes certain factors such as smoke that originates during the process of cooking, that not only makes the food taste poor, but also stains the walls and other cooking utensils. Nevertheless the families continue using it because they consider it appropriate for cooking certain foods such as beans that require a lot of heat. It is important to mention that the equivalent expenditure (expense that will allow a family to cover its monthly cooking necessities) in kerosene is 4.5 dollars more than the expense on LPG.

The acquisition of both fuels is not a problem. From the results of the survey, as shown on the graph below, most of the families consider that they are easy to acquire. Note that in the past many families had many difficulties purchasing gas, diminishing the demand, but now a days the strong competition among distributors has forced them to improve their distribution channels and apply aggressive sale strategies which has meant a quicker delivery and at lower costs. The main problem for purchasing kerosene has been the distances between houses and the distribution centre added to this is the difficulty of carrying it as the number of litres purchased augments.

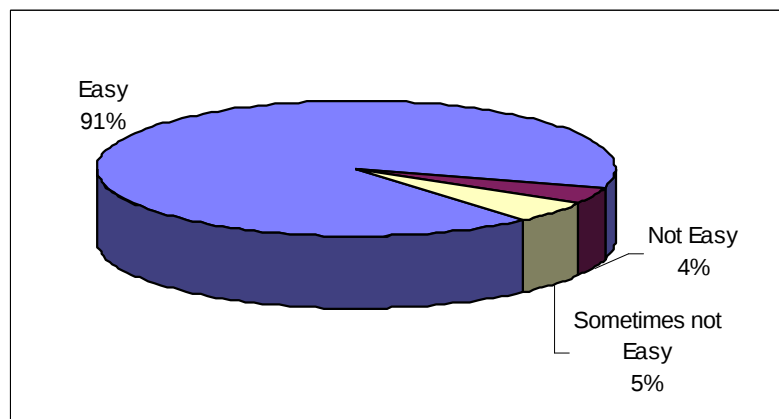


Figure 5: The acquisition of LPG and kerosene according to surveys.

As already mentioned, most of the families have undergone a transition in the consumption of fuels. First they used kerosene and then LPG. When asked if they would use another fuel, the majority's response was no because most of the people are happy with the efficiency of their fuel.

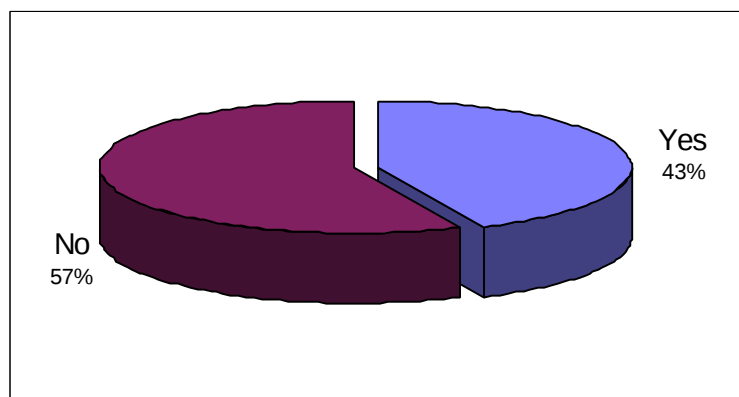


Figure 6: Would you use another fuel?

The remaining 43 percent affirmed that they would use another fuel if and only if the substitute fuel would have a lower price, comfortable and safe to use.

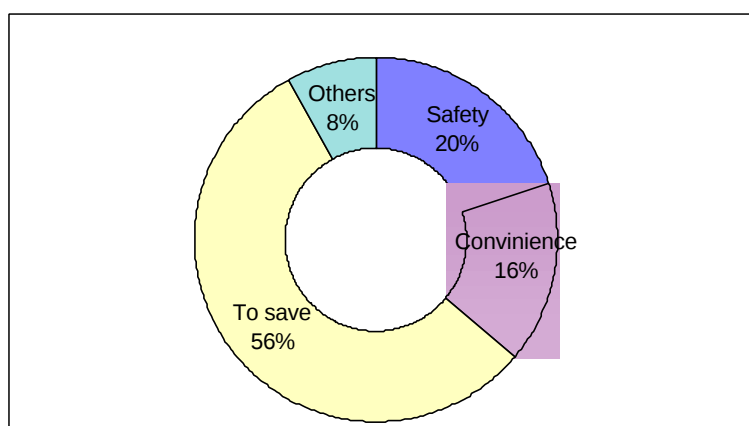


Figure 7: Reasons for using another fuel.

When asked, "if the price of the fuel used for cooking decreased would you change your consumption?" the response demonstrated that the consumption decisions remained constant. The families do not consider it necessary an additional expense due to their restricted family income.

No family surveyed uses electricity for cooking, this is mainly because it is expensive. Most families that live in these areas have an average of two light bulbs per household, a refrigerator, a television set and a radio. They spend in electricity around 5.06 percent of their total income (an equivalent of 9.26 dollars and an average 115.74 kWh).

3.4 The role of taxes and subsidies

In the past there were many subsidies on petroleum and derivatives. In 1990, with a new

government there was great worry about the public businesses and the first measures taken were to correct the severe price distortion that the subsidies and taxes had created. Since then it has been the policy of this government not to give subsidies. In November of 1992, the Law of Electrical Concessions was passed and since then in this sector there have been no subsidies because the object was to promote fair competition.

There is a selective tax on the consumption of fuels that has an unequal structure that distorts the efficient allocation of resources because the tax is higher on gasoline and less on diesel and kerosene. This affects the demand considering that the internal production of both diesel and petroleum is not enough. Also, coal has a 10 percent tariff while kerosene has half the tariff of gas. Businessmen ask for more coherence in the tax application in the different products in the hydrocarbons sector. All consumers have to pay sales tax, which is 18 percent of the product's value.

3.5 Public Utilities

The energy sector in Peru comes from a monopoly and a highly integrated structure. However, this structure has been disintegrated through privatizations and the establishment of a regulatory competition. Presently, it has been divided into four stages: generation, transmission, distribution and commercialization and the tangible effects of more competition can be seen. Despite this tendency, some companies dedicated to the distribution of electricity are interested in participating in other stages of the industrial chain such as Luz del Sur, a distribution company, which will participate in electricity generation projects.

It is expected that the structure of the electricity sector will change as a consequence of the interconnection in all the country. The new structure will allow the existence of more than 10 generation companies. In this situation, the sector will become more competitive and the users will be able to purchase energy from any of the generators. This is the reason why these companies will follow strategies to distinguish from each other through the reduction of costs and becoming more efficient.

The main clients of the electricity sector are households and businesses. Some big energy consumers generate their own electrical energy for example Shougan and Southern Peru. The tariffs are divided into two types: the free market and the regulated market. In the free market, the user companies and the companies that generate electricity determine both the price and the quantity of energy that will be used. In a regulated market, a great number of small consumers who have no negotiation power with the generation companies receive prices from the companies or by some regulatory institution.

The future competition of electricity will be the Camisea gas and when this project is operating it could massively supply the energy demand which is basically concentrated in the department of Lima. The Camisea gas will compete directly with the electricity energy providers.

In general the development strategies of electricity companies are directed toward getting a bigger portion of the market. The opportunities are broad because the generation of electricity is not sufficient to cover the current demand.

In Lima two companies share the distribution of electricity: Luz del Sur and Edelnor. Both companies are told the maximum prices they can charge by the Electric Price Commission (CTE) and are constantly supervised on the quality of the service by the Energy Investment Supervisor Organism (OSINERG). These companies are under the obligation through the Law of Electric Concessions to make studies and/or constructions pertaining the signature of the concession contract, preservation and maintenance of constructions and installations so they are adequate shape, apply regulated prices according to law dispositions, among others.

These companies have split the market of Lima in two big areas: north and south. The north is supplied by Edelnor while the south is supplied by Luz del Sur. Edelnor charges a slightly higher price than Luz del Sur. Public lighting is also higher in Edelnor. Many families from both the north and south complained that in these urban poor areas they pay for public lighting but it is too dim and deficient. Many families felt that they were being charged more than they had used.

According to the CTE in North Lima, the fee for energy in December 1998 was 7.75 cents of a dollar per kWh which in South Lima the fee was 7.70 cents of a dollar. The survey revealed that the fee in the North varied from 7.65 and 7.77 cents of a dollar while in the South 7.72 and 10.79 cents of a dollar (according to receipts from the different slums). The average price per kWh is around 0.08 of a dollar. The fee charged is called BT-5, which is the fee for residential areas.

3.5.1 Case Study: The Feelings of an Urban Poor Family about Electricity Bills

Maria Rivas is a young mother whose husband recently lost his job. His daily family income is around 2 dollars since he has to sell informally on the streets. She does not work because she stays home to take of her two children, a four year old son and a seven year old daughter. Maria says her family is going through a very rough time and her electric bill is still high.

She no longer uses her refrigerator on because she has no food to store in it. She uses a gas stove and tires to save her hardest. The only electric appliances she has are a small television set, a radio, and a refrigerador. She says she is not sure how she is going to pay her bill next month and that her husband cannot find a new job. He used to work at a car shop. When we asked Maria if she would use some other fuel she said "only if it cheaper."

For families whose income has been reduced and see their access to electricity reduced due to rigid prices of electrical energy, the best solution for them is to ask for disconnection of

the service until they are able to afford it. Law establishes the maximum price and it is very unlikely that privately owned electrical companies that are in pursuit of profits or benefits will reduce their prices.

Another solution to this problem would be switching to a cheaper source of energy or use different fuels to as a saving strategy as shown in the next case study.

3.5.2 NORTHERN DISTRIBUTION COMPANY: EDELNOR

Edelnor is presently the distributing company which provides the north of Metropolitan Lima with light, the constitutional province of Callao, and the provinces of Huaura, Huaral, Barranca and Oyón. The area of concession of Edelnor is mainly the industrial areas of Lima and some of the most populated districts of Lima and in area it is about 2440 squared kilometres.

3.5.2.1 CASE STUDY: USING DIFFERENT FUELS AS A SAVING STRATEGY

Catalina García lives with her husband and her four sons. Her husband has a permanent job while two of her sons have occasional jobs. She has a small brick house in San Juan de Lurigancho one of the poorest districts in the northern part of Lima.

She has two stoves a gas stove and a kerosene stove. She usually uses LPG in order to cook meals for her family but she uses kerosene when she wants to cook beans or lentils because she says this uses up a lot of fuel. Catalina buys one LPG container of 24 lbs per month which only lasts for 20 days and an average of 4 liters of kerosene per month. She sometimes uses kerosene when she does not have the money to purchase LPG.

Catalina has no problem finding LPG because she has a small store two blocks from her home or she can call the distributing company which will bring her a container for no extra charge. She said that a couple of years ago it was very hard to get these fuels. She has to buy kerosene at the gas station which is not so near from her home.

When asked if she would use electricity to cook she answered quickly: "It is too expensive." Her electricity bill \$36.47 which she considers extremely high and she is charged a series of things in her bill such as compensatory interest (having paid on time her bills), maintenance and reposition, public lighting, among others. She complains about public lighting because she considers it too dim and deficient.

3.5.3 SOUTHERN DISTRIBUTION COMPANY: LUZ DEL SUR

Luz del Sur is also a private company that distributes electricity to more than 640000 clients in Lima and its sales are around 270 million dollars. The area of concession is around 3000

square kilometres and includes 30 of the most important municipalities and reaches about 3 million inhabitants.

The distribution of sales is about 40 percent in the residential area, 21 percent in the commercial, 25 percent in the industrial area and 14 percent in other areas.

3.5.3.1 CASE STUDY: USE OF COOKING FUEL SOUTH OF LIMA

Teresa Rivas is a housewife that lives with her husband and her son on a rented lot which they share with a group of the owner's relatives in Umamarca, San Juan de Miraflores. Her husband works as a social worker in a hospital owned by the government and his salary is 119 dollars a month. Teresa stays home to take care of her 5 year old son and at the same time she makes rudimentary ice creams out of fresh fruit called "marcianos" which she sells each at 10 cents of a dollar.

Teresa was a nurse but since she stopped working, her family had to save in many things so that is why she uses LPG as a cooking fuel which costs 7 dollars a month. It is the cheapest fuel and because she considers it safe enough to be using around her son and she considers it to be very convenient. She considers it is very easy to access because along her housing cooperative called Umamarca located on the southern part of Lima there are many small scale convenient stores which provide LPG. She says she would not use another fuel and her family income would not allow her to even consider using electricity as a cooking fuel.

The lot in which they live is 250 square meters but they share it with five teenagers that also have a hut in front of theirs made out of wood and other materials.

3.6 HEALTH AND ENVIRONMENT

In developing countries, in the urban areas there is growing concern due the high levels of air pollution and water supplies are also polluted. That is why in the past few years there has been a growing concern about environmental issues nationwide and worldwide. There is a general consensus that if energy was used more efficiently it could provide several benefits. It is important to highlight that technology usage is also crucial. Sometimes inefficient cooking stoves or burning grasslands can contribute to degrade the environmental. The use of fossil fuels and chloroflourocarbons can worsen the Greenhouse effect problem.

The World Bank and other institutions have made it clear that issues such as energy efficiency and ecological damage are important in their agenda. Studies about energy efficiency have demonstrated that least efficient fuels are crop residues and wood. The most efficient fuels are LPG, biogas and kerosene. This is the main reason why in urban and

some rural households with higher incomes, families use of kerosene and LPG because it is more convenient. The use of wood and biofuel contributes to “deforestation, soil erosion and reducing soil fertility....” Although biofuel may be supplied from forests, woodlands, among others, it can be used in more sustainable ways. (World Bank, 1996:22-23)

3.7 TRANSITION TO MODERN FUELS

Recent studies agree that as income increases in both urban and rural areas there is a more intense use of modern fuels. Even in our study made about Lima we were able to find that many people were changing from kerosene to LPG and that in the past they had used traditional fuels such as wood, charcoal, crop residues among others. “The initial dependency on biofuels in home eventually gives way to the use of electricity for lighting and fossil fuels for cooking.” (World Bank, 1996:25)

In Lima an important factor contributing to the use of LPG and kerosene has been the amount of competitors and distributors that have made the access to these fuels very easy. Many of the families under study emphasized that in the past they had problems finding their fuels but now there are so many small scale grocery stores and a with the boom of gas stations it is very easy to buy. The price of these fuels does not vary significantly in the different due to the constant competition among distributors.

3.8 CONCLUSIONS

Most families use LPG and kerosene in cooking. The tendency in the capital has been to substitute kerosene and wood for LPG. People with lower incomes consume kerosene, while other urban poor families still use both LPG and kerosene, but a very large number only uses LPG. Some people in these slums prefer buying Premium Gas from Solgas that costs 10.39 dollars per container than using electricity. Many of these families come from very poor origins so they save a lot and do not like to spend unnecessarily. This is the main reason why if the price of the fuel decreased they would continue consuming the same amount of fuel for cooking.

Many families surveyed would not use another fuel other than gas and kerosene because of the convenience of these fuels. Many of gas consumers would return to kerosene if and only if the price of LPG increased dramatically because they prefer LPG. The main reason why some families still use kerosene is because their income does not allow them to purchase LPG, which must be purchased in bulk. There are people that receive salaries on a weekly or daily basis. This is why these families prefer to regularly buy retail 1 litre of kerosene which costs approximately 30 cents of a dollar or spend 95 cents per gallon (4 litres), than approximately 6.23 dollars on a 24 lbs LPG container for a full month.

Lima is passing through a transition stage. It is probable that the consumption of kerosene will tend to disappear and that LPG will continue to become a primary source of energy for cooking in the urban poor areas.

As years have gone by, some families have acquired services such as electricity, sewage and water, but these services can be improved. For public lighting we found out that in many cases it is deficient because the power is too low. Many families complain that bills do not reflect their consumption. This is one more reason why many people are unwilling to use electricity for cooking.

4 ENERGY IN SMALL SCALE PRODUCTIVE UNITS

The Small Scale Productive Units (UPPEs) include the definitions of micro business and small business and one of the most used variables for its segmentation is the number of workers. In Latin America, the small business is classified for having less than 50 workers including the entrepreneur, his relatives and employees while the micro business has less than 10 workers.

It is interesting to point out that the relative participation of the sectors involved in the economic activity varies according to its “size”. Mining, construction, service and transportation are the sectors where most of the companies are large whilst the businesses called “small” come generally from the industrial sector. On the other hand, the micro businesses are dedicated exclusively to trade and manufacture.

In the city of Lima there are 775,259 UPPEs, which provide employment to 1 330 917 people, this figure represents a high percentage of the PEA of Lima. The most important economic sector is trade (66.6%), followed by the service sector (11.5%) and industry (9.5%). In the following table, in each sector, the main economic activities are shown as well as the employment generated by each one of the activities:

SECTOR	No.	ACTIVITY	EMPLOYMENT	% OF THE SECTOR
TRADE	1	GROCERIES AND BEVERAGES	206,467	26.2
	2	FRUITS AND VEGETABLES	165,489	21.0
	3	CLOTHING AND SHOES	114,266	14.5
	4	PREPARED FOODS, BREADS, CAKES AND CANDIES	135,543	17.2
INDUSTRY	1	CLOTHING INDUSTRY	55,035	31.8
	2	TIMBER AND RELATED PRODUCTS	35,652	20.6
	3	MACHINE TOOLS	26,479	15.3
	4	PRINTER'S	15,403	8.9
	5	SHOES	11,768	6.8
SERVICE	1	RESTAURANTS AND COFFEE SHOPS	93,116	47.0
	2	REPARATIONS	60,030	30.3
	3	PERSONAL SERVICES	22,784	11.5
	4	LAUNDRY	11,491	5.8
TRANSPORTATION	1	TRANSPORTATION	40,004	100.0
CONSTRUCTION	1	CONSTRUCTION	72,110	100.0
TOTAL	15	ACTIVITIES	1 065 637	80.1

Source: “Encuesta a Unidades Productivas de Pequeña Escala en Lima Metropolitana”. Investigación realizada por el Banco Central de Reserva del Perú (BCRP) y AID.

In the industrial sector, the sub-sector that occupies the second place in terms of number of workers is the Timber and Related Products. The industrial estate PIVES concentrates around 12% of the total of workers that are dedicated to carpentry, a situation that happened in less than 10 years, and constitutes one of the most successful experience in micro-industrialisation nationwide and is being proposed as a model to be imitated in other cities.

For this reason it is important to know the process by which this entrepreneurs “pioneers of the desert” had access to electricity for the development of their activities, in a peri urban area of Lima in the agitated context of socio-economic changes.

Additionally, the Timber Transformation Industries in PIVES have acquired an important level of organisation through the Association of Timber Transformation Industries (ASIMVES), becoming one of the strongest in most successful trades within Association of Small and Medium Entrepreneurs of Villa El Salvador (APEMIVES).

ASIMVES has 180 members and the industrial activity has gained significance, generating 4,500 jobs (an average of 18 workers per company). The average monthly consumption of raw material is equivalent to 1,485.89 tons of sawn timber and 30,000 sheets of plywood a month, according to figures provided by the association itself.

The members of this trade face various problems such as a limited capacity to business management, marketing the products, a limited supply of skilled labour and obsolete technology, among others. Currently, the access to electricity does not constitute a fundamental problem among entrepreneurs in this sector but it was when they started.

4.1 INDUSTRIAL ESTATE OF VILLA EL SALVADOR (PIVES)

4.1.1 BACKGROUND

In 1987, during the government of President Alan Garcia, 27 industrial estates were created by law, of which only the Industrial Estate of Villa El Salvador (PIVES) remains today and is operating successfully. Barren lands were allocated to entrepreneurs willing to commit themselves to pay for them over ten years, although this term was later extended for a further year. Ten years later, in 1997, they obtained cleared title deeds to their properties and now are eligible for credit.

PIVES has had to overcome many obstacles since it began, mainly due to terrorist activities. The worst terrorist attacks were the assassination of the popular leader Maria Elena Moyano (1992) and the attempt to kill the Mayor of El Salvador, Michel Azcueta (1993), that marred the prestige initially gained by the Industrial Estate.

There are now 1,200 entrepreneurs generating 15,000 jobs, organised in the following seven trades: shoes and related industries, textiles, food processing, handcrafts, timber and related products, smelting and machine tools. With the success of the Industrial Estate, the

Municipality created at the end of 1997 the Business Promotion Centre (CPE) of Villa El Salvador. Its main aim was promoting the development of micro and small-scale companies in the PIVES.

There is a growing concern to strengthen the industrial activity of the district that has the to challenge overcome competition both internal and external as well as the quality requirements which are greater now that when they started.

4.1.2 ACCESS TO ENERGY

Villa El Salvador (VES) was barren land that was settled as a transfer of families mainly from the districts San Juan de Miraflores and Surco. That is, after 27 years it can be said that the VES is the first industrial district of Metropolitan Lima.

PIVES started its activities in 1989, lacking all basic services even electricity supply; nevertheless it had a subterranean net for the distribution of electrical energy. The country was facing a strong deficit of the electricity supply. Mainly due to the demand increase caused by the deterioration of the distribution infrastructure and the strong growth of consumption that was fuelled by a subsidy over 50% of the fees (3.78 and 0.98 dollar per kWh for industrial and residential use shown respectively in the table below). During this time, the activities of generation, transmission and distribution nationwide were taking care by Electroperu and eight regional state-owned companies.

ELECTRICITY AVERAGE PRICE Cents of dollar per kWh		
YEAR	Residential	Industrial
1989	0.98	3.78
1990	1.91	6.34
1991	3.42	5.52
1992	5.20	5.92
1993	5.12	7.00
1994	10.65	6.41

Source: Energy and Mines Ministry

Between 1987 and 1996, the regional company called “ELECTROLIMA” was in charge of the distribution and commercialisation of electricity in VES. During this period electricity service was characterised by voltage fluctuation and energy supply restrictions schedules. Additionally, the actions of terrorist groups worsened the situation because of the “cupos”⁴ imposed on entrepreneurs and constant power cuts as a result of attacks against high-tension towers. In 1992 positive results from harsh anti-terrorist policies resulted in the capture of the leader of the most radical terrorist group Shining Path. In the economic aspect, the government started eliminating the distortions existing in the Peruvian market and let the prices be determined by market forces through mechanisms such as “Electric Concessions

⁴ Cupo is the payment of a quota to terrorist groups in exchange for security.

Law”. This law constitutes the new regulatory framework for the electric sector and whose main objective is promoting private investment in the energy sector. Meanwhile the entrepreneurs of PIVES had a restriction in terms of quantity and quality of electricity that contributed to the low levels of business activity in the area.

Between 1992 and 1997, the entrepreneurs started to feel the benefits of progress in terms of internal pacification it could felt in the socio-political environment and according to the economy as a whole was adjusting the productive apparatus to the purchasing power of consumers. During these years the many businesses of the carpenters of PIVES were able to grow. While the price of electricity was increasing, the relative importance in electricity within the cost structure started to lose importance for those entrepreneurs who knew how to adapt to the country’s new economic context. Nevertheless those who understood that it was a sustained growth of the demand, and preferred to postpone any effort to reconvert, re-invest and/or to settle financial debts, the things resulted completely different. Regretfully, the low level of instruction and limited access to information was decisive.

In 1997, the new regulatory frame allowed ELECTROLIMA to divide in two distributing companies that became private companies, one of these companies was called “Luz del Sur” that took care of the distribution of electricity in the southern area of Lima where the district of Villa el Salvador. This company immediately started to execute its compromise of investment and the reduction of losses, changing the subterranean distribution system in PIVES for the aerial distribution system due to the excessive losses. This change did not mean an additional expense for the entrepreneurs. However, it was accompanied by a tariff recategorization that had a retroactive effect on invoicing, generating a debt for past consumption that until now these entrepreneurs are paying after a lawsuit with the distributing company.

4.1.3 IMPLICATIONS OF THE ACCESS TO ELECTRICITY.

Carpentry is not one of the activities that has developed after the arrival of electricity⁵ in PIVES, due to the entrepreneurs that decided to move to VES brought their own know how, equipment and tool. Nonetheless, to the extent that the socio-economic conditions of the environment allowed it, the access to a reliable supply of electricity has made it possible to use machines and tools with characteristics which have not only allowed a substantial increase in the productivity of the labour but also diversify their production. Specifically, the wood industry is the activity that has higher capital productivity and occupies the second place with respect to labour productivity⁶. Regretfully, this process has not meant necessarily the homogenous growth of all the businesses of PIVES, as will be shown ahead.

4.2 CASE STUDY 2a:

Jorge Urbina is a carpenter owner of the business FIDELSA which has specialised on the fabrication of livingroom furniture. When he arrived at PIVES in 1987 he had been given a 500 m² lot, 4 workers (wife and sons) y 2 machines. Nowadays, the company's growth and development have been poor considering that they have the same installed capacity and the same number of workers.

Mr. Urbina atributes his slow growth to the constant increase of prices of raw materials, the lack of credit for capital, elevated taxes and lack of courses on business management.

After the interview with Mr. Urbina, it was evident that the limited growth experienced by his business has been the product of his lack of initiative and vision, and also his hope in the government to make all the reforms in favour of businesses. For that reason, it can be affirmed that the availability of reliable sources in the electricity supply is a necessary factor but not sufficient to ensure success of entrepreneurs' initiatives. In Mr. Urbina's opinion neither the Government nor ASIMVES carry out their functions.

It is important to mention that the entrepreneurs of VES received support from many non-profit organisations such as technical, legal, financial-economic consultancy services, among others.

The next case shows the opposite situation found in PIVES. Muebles CA.SA.GO started as a small business and presently has become a medium business (considering the classification lines above) and one of the most known inside and outside of VES for the quality of its products.

4.3 CASE STUDY 2b:

Carlos Sarmiento is a 45 year old man and is the owner of the business Muebles CA.SA.GO.. He has studied some courses of architecture, carpentry and wood carving. The success of this entrepreneur has been notorious. When he arrived to VES he only had 4 machines, 12 employees and a 500 m² piece of land. Currently, his business works with 15 machines, 80 employees and 2800 m² of land.

He states that energy has been important for the increasing volumes of production. The incidence of the cost of electricity has been a conquerable problem, as shown below:

Energy as a % of production costs

<i>Articles</i>	<i>Before</i>	<i>Currently</i>
<i>1 chair</i>	5%	1%
<i>1 display set</i>	10%	6%
<i>1 livingroom set</i>	15%	9%
<i>1 dinningroom set</i>	20%	12%

Since its creation Muebles CA.SA.GO. has developed a technique in the production of its furniture. Its major achievement has been the quality recognition of its productos at VES.

The case described above shows that the lack of a reliable energy source could have been an obstacle for the growth if the entrepreneurial skills of businessmen are given. Unfortunately, Mr. Sarmiento's case is 1 among 180 reason why he is qualified as

outstanding. Nevertheless, the success of PIVES lies in the success of those entrepreneurs in between Mr. Urbina and Mr. Sarmiento. Currently, the access to a reliable service and reasonable prices of electricity, thanks to a new legal framework, makes it evident that the sustained success of PIVES the access to energy is no longer a problem. Appropriate business management and adjustment to a changing socio-economic environment should be taking into consideration in order to replicate this experience in other cities.

4.4 OLD PROBLEMS, NEW CHALLENGES.

The Timber Transformation Industries, after facing different problems to adjust to a changing socio-economic environment, now they have a challenge to adapt their productive structure to satisfy the market requirements and eventually enter new markets. This implies finding new specialisation areas and achieving quality standards far more demanding than presently. In this sense, one of the most serious problems that the entrepreneurs face is the humidity of timber especially in winter. This forces them to break contracts, or even worse they are forced to receive products and give refunds because after short time of use the furniture has deformed.

The alternatives that the entrepreneurs have to resolve this problems negotiation is required with the timber suppliers at the level of trades in order to demand certain standards of humidity or at the level of trades install a centre for the treatment and storage of timber. Either alternative implies an increment in the price of the raw materials. Nevertheless, the quality levels are not guaranteed at this level because they still need to improve certain processes such as finish and new designs.

The solution to this type of problems is going to require a delicate management of the energy needed in the sense that accessing higher levels of quality will achieve also competitive prices of products.

In 1987, the entrepreneurs of Villa El Salvador started to become formal businesses despite having to face high costs⁷ (De Soto, 1986: 174); likewise, lacking all basic services such as water and sewage, electricity, telephone and the infrastructure such as roads, public lighting, etc. Nowadays thanks to government policies, they have most of these services and these no longer represent a difficulty for production. The new problems they face are:

- Technological, the search for new forms of technology to satisfy new productive necessities as well as improvement of technical capacity to select and acquire better equipment.
- Technical, lack of qualified labour with respect to the production technique, product designs, etc.
- Administrative, one of the major problems they face is the lack of permanent business management consultancy, as well as the lack of entrepreneurial initiatives

⁷ “...the total cost of the access to the small formal industry for a person is 1231 dollars, equivalent to 32 times the minimum wage”.

guided towards the search of new markets.

- Financial, one of the problems entrepreneurs in VES claim to have is the inflexibility of the credit conditions and its requirements demanded by banks, above all those who have not experienced a noticeable growth in their productive capacity, capital, labour, etc.

One of the proposals presented for the development of Micro and Small Businesses is the integration of the businesses to constituting a stronger sector. “In the developed countries the small businesses are integrated to big and medium business constituting a solid and diversified private sector is one of the requirements for the harmonic, equitable, decentralized and sustainable development⁸”. In the international panorama there are five ways to integrate the small and micro business to the rest of the economy: *subcontracting, franchising, merging, Government purchasing and National System of Promotion of Small and Micro Business*.

⁸ Fernando Villarán, Vice president of SASE (Servicios para el Desarrollo).

5 GOVERNMENT POLICIES TO PROMOTE ACCESS TO ENERGY

Between 1985 and 1990, the pace of investments in the energy sector did not keep any relation to the population growth rate. One of the factors that contributed to limit investment both private and public was the insecure climate generated by terrorism because of the constant attacks on the productive infrastructure.

In the same manner, the ranking of public expense postponed the financial resource allocation needed to maintain operating the productive infrastructure. Also the excessive price distortions made for "...convenient reasons or a false sense of social sensibility"⁹ determined that the technical calculations were substituted for lower tariff levels deliberately lower than the real costs. Also the inefficient macroeconomic management was manifested in a uncontrollable price raise that finished diminishing the poor results of financial and economic management of public and private businesses that registered constant deficits that in turn generated a destructive spiral effect on the energy sector and society as a whole. Therefore, the prevalence of policies in which the government has a protagonist role despite its noble social objectives also put the energy sector in a very delicate position.

The panorama above required radical decisions to be taken by the government. It began by redefining the policy's objectives in the sector. As a result the most important change was the enactment in 1992 of the Electric Concessions Law and the Hydrocarbons Law with the main objectives to promote the private investment where prices are determined by market forces. In Peru, during this year, from every 10 Peruvian only four had access to electricity. The goal of the government for the year 2000 was to provide access to seven out of ten people.

In December talareños started to use natural gas in their homes.

Energy supply diversifies thanks to new rules.

The first contract of concession to provide a distribution of natural gas through a gas pipes was signed November fifth 1998 in Talara. The Gas Company of Talara (Gastalsa) will be in charge of providing this fuel to 17 thousand homes in that city.

According to information provided by this company, the contract was signed by the General Director of Sub-sector Hydrocarbons in the Ministry of Energy and Mining, Pedro Touzetti Gianello. In order to cover the distribution service of natural gas in households a distribution network in the District of Pariñas in the city of Talara. The construction will have a cost of five million and 500 thousand dollars. The pipes will be installed in nine months.

The company that will provide the fuel to Gastalsa will be the Electrical Company of Piura (Epsa). The contract will allow Gastalsa to buy about 500 thousand cubic feet of natural gas, volume that can cover for now the demand in Talara. The manager of Gastalsa said that the service will first focus on households and in the future will provide gas to the commercial sector and the industries in the area.

⁹ CTE. Situacion Tarifaria del Sector Electrico Peruano (1998:12)

The combat of poverty as well as the improvement of living standards for all Peruvians is a priority of current government policies. The methods used to achieve these policies are diverse and can be summarised in:

- The construction of social infrastructure (medical posts, schools, electricity distribution net, etc.)
- The creation of funds to finance services such as food, nutrition, health, family planning, etc.
- The dissemination of information of better use of resources.
- Price policies according to supply and demand.

After transferring the responsibility to the market to provide society with goods and services, the government is now concentrating on the implementation of alternative mechanisms that will make possible the achievement of this policy and consolidate reforms taken till now. In this recent venture, the government is learning by trial and error. This is why it is important to know this process, and the following cases show this dynamic process.

5.1 ACCESS: MORE QUALITY THAN QUANTITY OF INVESTMENT. THE CASE OF NATIONAL HOUSING FUND (FONAVI)

5.1.1 BACKGROUND

The National Housing Fund – FONAVI, created in June 1979 at the State’s initiative, began operating under the administration of what was then the Housing Bank of Peru (BANVIP). Its objective was to gradually meet the housing requirements of workers, based on their income. During this period, FONAVI was used to finance more conventional housing programmes for the benefit of urban sectors; 0.5% of these funds were invested in research (through ININVI) and 10% on rural resettlement programmes (PRATVIR).

FONAVI became a source of finance generated by contributions made by employers, who in keeping with current legal provisions (D.L.22591, D.L.497, D.L.25981, D.S. No. 113-79 and D.S. No. 08-92-PCM) held back a fixed percentage of workers’ salaries. Initially, the amount retained was 7%, but this rate has changed on various occasions.

In April 1992, the administration of this fund was transferred to the Ministry of Housing and Construction and a Specialised Technical Unit (UTE-FONAVI) was created to manage it. Subsequently, in May that year, the National Housing Fund, also referred to as FONAVI, was created within the Ministry of the Presidency. Unlike its predecessor, this fund was aimed at gradually meeting the housing requirements of workers by financing sanitary facilities, the electrification of human settlements, the construction, expansion and refurbishing of community and recreational centres in rural and urban fringe areas, relieving urban blight and resurfacing local and inter-district roads. This significantly broadened the

objectives of FONAVI, turning it into one of the main government instruments to improve the effectiveness of the struggle against poverty, for which sizeable funds were required.

In August 1992, when the regulation was approved, the UTE-FONAVI began its activities as an autonomous entity in economic, administrative, technical and financial terms, responsible for managing FONAVI funds.

5.1.2 CHANGE: A CONTRIBUTION BY A TAX.

The government has started a gradual process of replacing the compulsory contribution to FONAVI with an extraordinary solidarity tax (IES) of a temporary nature. Supposedly this process should reduce the tax rate, depending on the availability of fiscal funds. This tax will be administered by the Tax Authority (SUNAT), whilst the Ministry of Economy and Finance will manage the pending projects portfolio.

Since this is a “compulsory contribution” and not a tax, the funds raised under this concept are recorded in national accounts as “non-tax income”. The funds raised have been following an upward trend, as in 1990 they were equivalent to slightly less than 3% of the State’s total “Current Income”, compared to 7% at present. This substantial increase is due to the noticeable improvement since the SUNAT took over the management of these funds, which were previously collected exclusively through the Banco de la Nacion.

5.1.3 SPENDING PATTERNS.

The contemporary interpretation of the term “housing” is the place in which human beings develop under adequate social and cultural conditions (habitat), meeting our basic needs and maintaining a decorous lifestyle. In this sense, it does not only include the actual dwelling and basic services, but also the aspects that provide opportunities for social and cultural development, such as access roads, community centres, markets, medical posts, etc. Consequently, any government project designed to meet any of these needs can be interpreted as a State investment in housing.

Hence the new priorities established in 1992 for FONAVI funds, causing subtle changes in the nature of the initial objectives. UTE - FONAVI thus became a financial entity as autonomous as government plans would permit, operating outside the financial system and therefore gaining the required flexibility. The government thus obtained an important source of finance; therefore it was necessary to establish new agreements in order to place loans with other entities. The State chose to work with such State agencies as Pronamachacs¹⁰, Regional Electricity companies, PRODEIS¹¹, FONCODES¹², etc., and to

¹⁰ PRONAMACHCS is the National Watershed Management and Soil Conservation Programme of the Ministry of Agriculture, which received 5% of the annual funds raised by FONAVI for PRATVIR purposes (Site Preparation and Rural Housing Project).

¹¹ PRODEIS is the Social Interest Programme of the Ministry of Energy and Mines, aimed at expanding the electrical frontier and operating as a financial intermediary between 1993 and 1996, to finance Small-scale Power Systems, sub-transmission lines, primary lines and networks and secondary networks.

maintain the agreements in force with ENACE¹³ and the different companies providing sanitary and water supply services throughout the country.

As far as public entities were concerned, transfers were made to finance previously approved projects, which were negotiated directly by the interested parties and expedited by intermediaries who also screened the technical dossiers. Finally, once the project was approved, FONAVI would issue a resolution to that effect and disburse the respective funds through the intermediary entity. The expense was interpreted as a “supervised loan”, which implied that the public entities mentioned above not only had the capacity to supervise the works but also the loan, from the time of its qualification until its recovery.

Direct and specific allocations were also made. The following was the structure of direct loan disbursements from FONAVI to public entities between 1992 and 1995, expressed in millions of dollars.

DIRECT LOAN DISBURSEMENTS OF FONAVI AND PUBLIC ENTITIES (1992 to 1996) (In Million dollars)					
CONCEPTS	TOTAL	1992	1993	1994	1995
Direct disbursements	609.9	22.6	109.2	247.9	230.2
Electrification projects	328.8	16.6	57.4	132.0	122.8
Water and sewage projects	281.1	6.0	51.8	116.0	107.4
Disbursements to public entities	574.0	79.9	76.5	197.1	220.5
SEDAS-Provinces	87.2	12.8	23.1	33.1	18.1
SEDAPAL	44.0	9.9	11.3	10.3	12.4
ENACE	249.7	17.6	29.4	83.1	119.5
Core housing	85.5	13.0	2.6	33.4	36.5
Supervised loans	164.2	4.6	26.8	49.7	83.1
Banco de Materiales	160.4	6.8	12.6	70.5	70.5
Ministry of Housing and Construction	32.8	32.8			
Specific disbursements	52.5	4.3	27.4	12.5	8.3
PRONAMACHCS-PRATVIR (DL 25742)	15.9		7.4	3.6	5.0
PRODEIS	14.3		7.2	7.1	
Reconstruction of houses affected by terrorism	2.2		0.4	1.7	0.1
Cachimayo DSE 045-PCM/93	12.0		12.0		
Special Project “Ciudad Pachacutec”	0.2	0.2			

¹² FONCODES is the Social Compensation and Development Fund of the Ministry of the Presidency.

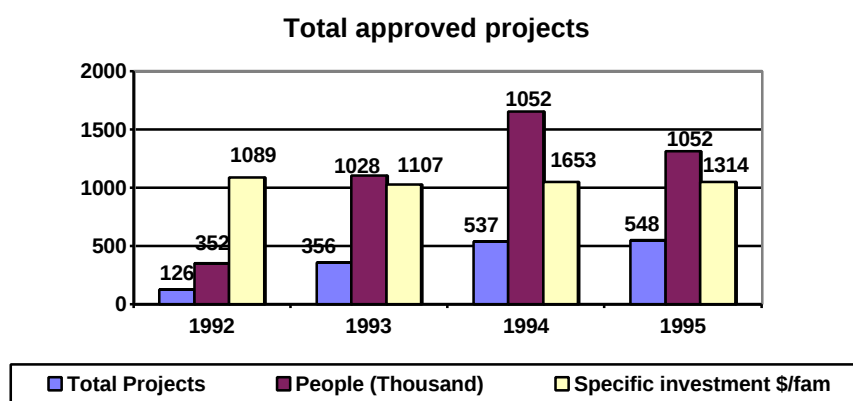
¹³ ENACE is the National Building Company of the Ministry of Housing and Construction.

D.S. N° 010-87-VC	4.6	4.0	0.4	0.1	0.0
Relief of urban blight	3.1				3.1
TOTAL	1,236.4	106.8	213.1	457.5	459.0

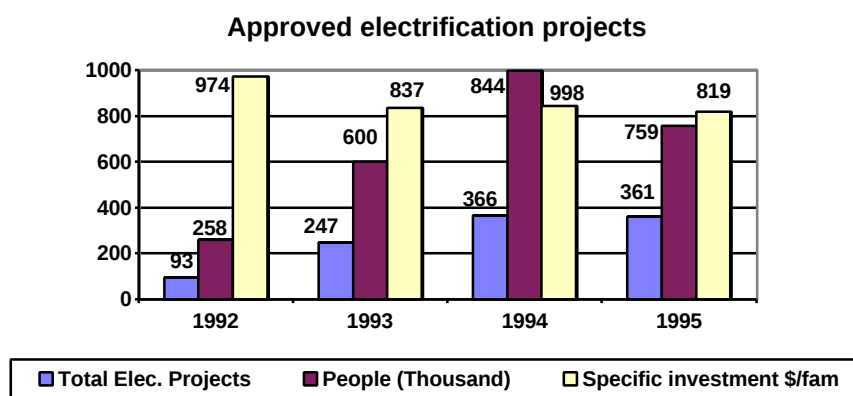
Source: Peru in Numbers, 1996

Electrification projects were financed with direct loans channelled through public entities such as Regional Electricity Companies, Prodeis, Pronamachcs and Foncodes, which made the allocation of funds extremely flexible. Such was the case of the 138 kW, 95 kilometre Cachimayo – Abancay transmission line, which cost more than US\$ 100,000 per kilometre and for which FONAVI funds were transferred by means of a “Supreme Decree” issued by the Ministry of the Presidency. This proved the flexible manner in which the destination of these funds was determined.

A change in the target population also occurred since 1992, showing preference for dwellers of rural and urban fringe areas, in keeping with the government’s decision to relieve poverty. Consequently, priority was placed on urban upgrading and basic service projects, whereas large housing programmes and mortgage loans were considered of secondary importance.



Source: Annual Reports of UTE-FONAVI for 1992-1995



Source: Annual Reports of UTE-FONAVI for 1992-1995

During the 1992 – 1995 period, approved loans were concentrated in Lima, the capital city (22.4% of the total amount placed), the department of Puno (13.3%) and finally Piura and La Libertad (9.5% each).

One of every ten dollars disbursed by UTE-FONAVI was invested exclusively in electrification projects of different types. The funds were channelled in different ways, as shown below:

UTE-FONAVI INCOME AND ALLOCATIONS 1992 - 1995 PERIOD (In millions of dollars)	
CURRENT INCOME	1,426.0
ELECTRIFICATION EXPENDITURE:	
Pronamachcs-Pratvir	17.5
Prodeis	15.6
Transmission lines 60 kW. Cachimayo – Abancay	12.0
Electrification projects with Distribution utilities	365.3
Sub total for electrification	410.4
Total allocations of UTE FONAVI	1,349.4

As far as income during the same period is concerned, UTE-FONAVI registered an annual average equivalent to US\$ 350 million. Loans were equivalent to about 95% of the total income for each year within the period mentioned above. The balance is recorded in the

financial statements as a surplus for each respective fiscal year, which implies an accrued capital exclusively from income of about 15% a year, on average. Clearly, this rate could have been a lot higher if the funds had been subjected to financial management, through risk operations (bonds, shares, lines, etc.), as occurs in any financial entity. This reveals the limited capacity for placing loans or identifying projects.

At the close of the period under evaluation, the recovery portfolio was estimated at US\$ 450 million a year and the payment arrears of that portfolio exceeded 40%. Nevertheless, the payment arrears rate is not a valid management indicator, due to the fact that the government has condoned all pending debts to UTE-FONAVI after its announcement early this year that the FONAVI contribution would gradually be eliminated. This reveals the government's intention to concentrate on a more vertical management of funds.

5.1.4 Lessons learned.

The objective of this funds were to develop indispensable infrastructure to create, facilitate and improve, in an adequate and progressive manner, the housing conditions in peri urban and rural areas. The reduction of the purchasing power and the lack of employment disqualified the "supervised credit" as financial alternative because in a recessive economy, policies to relieve poverty should consider subsidies for investment.

The high level of public expense that these programmes to relieve poverty involved required an effective supervision. In the case of electrification projects financed by UTE-FONAVI were too flexible and proof of this are the errors presented soon after delivery the projects which forced users to pay unexpected reparations. As one of the advisors of the current government said, "the main beneficiaries of these programmes were the contractors, that was why FONAVI programme was shutdown." The importance of the volume of investment made is considerable but it is also important to verify the effectiveness of the investment in terms of the increase of access to energy. Regretfully, this is not being done.

5.2 SAVING ENERGY PROJECT (PAE)

5.2.1 ¿WHAT IS PAE?

The PAE is a project implemented by the Energy and Mines Ministry to promote the rational uses of energy in all the economic sectors of the country as well as the use of renewable energy such as solar and wind energy.¹²⁰

If is it beneficial now, could it still be beneficial in the future.

On October 1994, the Energy and Mines Ministry (MEM) created PAE to face a potential deficit of electricity that was foreseen would occur in 1995 and 1996 and was estimated to be 90 MW in peak consumption hours. The deficit would occur as a result of the economic recovery of the country and the probable lack of rain that year. PAE decided to face the problem by implementing the National Saving Energy Campaign whose result allowed to overcome this situation.

Considering the valuable benefits obtained so far (18 percent and 9 percent of the growth of the number of users and the reduction of 16 percent and 7 percent in the in the average residential consumption in 1995 and 1996 respectively), MEM has decided to extend indefinitely this campaign for the same reasons its being done in developed countries 25 years ago. The reasons are to increase the availability of energy at low cost, improve competitiveness of the country, preserve natural resources such as petroleum and gas and protect the environment.

5.2.2 LIGHT WE SAVE, LIGHT WE GIVE

One of the most publicised slogans of the Saving Energy Campaign made by PAE was “light we save, light we give” This is an institution that works with other entities such as the Education Ministry, Centre of Energy Conservation and Environment (CENERGIA), among others. The advertising campaign was aggressive and used television, radio and press in order to help improve electrical energy consumption patterns of the population.

Also, an information campaign was done where approximately 2 million pieces containing information of things related to energy saving such as pamphlets, calendars, pens, agendas, among others. In addition to this, a telephone exchange about energy saving was implemented.

Also a demonstration campaign where interactive modules such as giant light bulbs, in which people could verify personally the electricity consumption of different home appliances and learn how to be use energy. These were exhibited at supermarkets, malls, schools, and universities, among others. Additionally, Energy saving was an item included in the education syllabus.

Another way to reduce the demand for electricity was to substitute incandescent light bulbs for energy saving bulbs. Thanks to the dissemination and promotion activities more than one million bulbs in the last three years that has generated a 60 MW power saving.

This campaign was successful because the consumption of an average family was reduced in 20 percent. Also the economic, social and environmental benefits that the country gained were substantial. Saving 50 million dollars a year, access to electricity was given to more than 400 000 families with almost the same consumption of past years, around 630 000

petroleum barrels a year were not consumed and the emissions decreased in 280 000 TM of CO₂ and 2 500 TM of SO₂ . The best thing was that during 1995 and 1996 there was no energy rationing.

5.3 COMBAT EXTREME POVERTY: AN EFFECTIVE WAY TO INCREASE ACCESS TO ENERGY AND ALSO BETTER LIVING CONDITIONS. PLANS OF THE MINISTRY OF THE PRESIDENCY.

“It is a fact that extreme poverty exists and we know its magnitude and origin, because it constitutes our foremost and greatest challenge” said President Alberto Fujimori. The main aspect of the fight against poverty is to generate work and income.

The characteristics of the strategy to follow are stable economic growth, implementation of an efficient social investment programme, consideration of the specific regional characteristics of the country, a strategy against poverty that empowers women and national commitment according to the Ministry of the Presidency.

It is important to support and promote certain sectors in order to achieve economic growth. Agricultural exports, expansion of tourism have a potential to generate employment and income (foreign currency) for the country. The mining and hydrocarbons sector given their power to generate the foreign currency so necessary to closing the country's balance of payments' gap.

The strategy of the sector outlines three basic lines of action which are social assistance, social infrastructure and economic infrastructure. In economic infrastructure, the main outputs have been ways of access, small-scale irrigation and small-scale electrification. For small-scale electrification the estimated social investment has been \$121 million.

ESTIMATION OF THE REQUIERED SOCIAL INVESTMENT FOR 1999 to 2000		
Outputs of the strategy	Investment in Million dollars	%
Nutrition and family planning	470	17
Schools	580	21
Health posts and centres	144	6
Water and sewage	540	20
Ways of access	440	16
Small scale irrigation	405	15
Small scale electrification	121	5
Total	2,700	

The effectiveness of the lines of action and products identified, required an appropriate institutional framework, in order to reach:

- An efficient achievement of the goal.
- A formulation of standard criteria for setting goals, evaluation and monitoring.
- A joint co-ordination in terms of both the products and actions against wasted efforts.
- An assurance that actions in the fight against poverty.

The executive institutions involved are INFES, INADE, SEDAPAL, FONCODES, FONAVI (up to 1997) and CTAR's (Local governments).

6 CONCLUSIONS

The government policy of the President Fujimori was directed to the opening of the market. This opening involved the economy as a whole and the energy sector was no exception. The changes in the energy sector started with the enactment of the Electricity Concessions Law and Hydrocarbons Law, which was a turning point along with the opening of the market and liberalisation of this sector through the privatisation of the different stages in production which are generation, transmission and distribution. It was necessary to adapt the institutional apparatus and create new organisms for new roles such as COES, OSINERG, DEP, etc.

As mentioned above, the National Plan of Electrification was carried out to facilitate access to energy, without distinction if the people are from peri urban or rural areas. This policy was harshly criticised because the extension of the electricity grid has been sometimes done without considering the specific necessities of the population. It does not focus on the right alternative for each community not necessarily meaning the expansion of the grid. The solution could involve the uses of appropriate technologies and therefore, the efficient use of resources.

To some extent, the change in policy has been positive because it promotes competition and this has brought a better service that is regulated by law regarding quality and no limit on energy consumption. Access now is relatively easier but the urban poor perceive that the prices are high and that the companies charge inappropriate fees. Some cannot afford to pay these bills. After having subsidies on the electricity charges, people were shocked when the real prices were charged. The negative side has been that the real prices have proved to be too high for extremely poor populations. From this moment on, the lack of government policy to confront this type of problems led to certain government entities to experiment with renewable energy sources to fulfil the necessities of the population where it is not profitable for the private sector.

Many urban poor families in provinces other than Lima have little access. It is important to note that the development of Lima being the capital of Peru has been quicker than other intermediate cities. In order to improve access to energy in Peru, the government has carried out activities to combat extreme poverty such as infrastructure (medical posts, schools, etc.). Not only government but also parallel activities carried out by different entities (NGO's, International Agencies, etc.) have contributed to expand access to energy. In order, to make it easier for people to access there should be economic growth and job creation through productive activities that will help improve living standards.

Education is also an important factor to improve living standards for example entrepreneurs can take better advantage of opportunities, generate more jobs and economic growth. Also providing more information about the different aspects of energy access is important for people so they can take adequate decisions of the different fuels used for cooking and lighting. As a government employee from OSINERG said, most people are unaware of their rights and duties as energy consumers. This is also another way to increase access to

appropriate energy.

7 RECOMMENDATIONS

a) In terms of policy:

- Define the energy supply situation for people without access. In terms of fuels used for cooking or domestic lightning, their costs and their health and environment impacts.
- Define a pricing and tax policies.
- Permanent evaluation of current policy and its achievements.
- Monitoring the progress in extending supply energy services.
- Avoid unsustainable policies, in legal, economics and social terms.

b) In terms of price energy:

- Avoid uniform national pricing policies.
- Support incentives for sustainable access.
- Widely promotion of the bill items.

c) In terms of finance:

- Avoid credits for investment, especially with poorest people, it is better to define transparent subsidies since the project's beginning.
- Avoid subsidies without its respective financial support.

d) In terms of institutions involved:

- Encourage local initiatives and projects, in order to support creation of small energy services enterprises.
- Encourage initiatives to use renewable energies in peri urban.
- Strong monitoring of government agencies involved in programmes and projects.
- Strong Technical supervision of projects: money spent in supervision now is money saved tomorrow in spare parts and costly equipment reparations.

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