ESMAP Technical Paper/07

Enhancing Access and Rural Electrification: Costs and Benefits and Willingness to Pay




ESMAP

Energy Sector Management Assistance Program

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Technical Paper ???/07

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Energy Sector Management Assistance Program

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Contents

Tables

Figures

Units of Measure

Ft	feet
kg	kilogram
km	kilometer
kW	kilo watt (s)
kWh	kilo watt (s) per hour
kV	kilo volt
Lt	liter
MW	mega watt (s)

Abbreviations and Acronyms

AEDP	Alternative Energy Development Board
ATA	automatic tariff adjustment
CV	contingent valuation
Discoms	(unbundled) distribution companies
DCR	District Census Report
ESAP	Energy Security Action Plan
ESMAP	Energy Sector Management Assistance Program
FDI	foreign direct investment
FGDs	focus group discussions
FESCO	Faisalabad Electric Supply Company
HHs	households
HIES	Household Income and Expenditure Survey
HT	high-tension
IMF	International Monetary Fund
KAPCO	Kot Addu Power Plant
KESC	Karachi Electric Supply Corporation
KPP	Khushal Pakistan Program
LPG	liquefied petroleum gas
MTDF	medium term development framework
NEPRA	National Electric Power Regulatory Authority
NPCC	National Power Construction Company
NWFP	North West Frontier Province
PESCO	Peshawar Electric Supply Company

PHIES	Pakistan Household Income and Expenditure Survey
PRSP	poverty reduction strategy paper
PSLM	Pakistan Social and Living Standards Measurement Survey
PSU	primary sampling unit
RP	revealed preference
SP	stated preference
T&D	transmission and distribution
ToR	terms of reference
UNDP	United Nations Development Programme
WAPDA	Water and Power Development Authority
WB	The World Bank
WTP	willingness to pay

Executive Summary

This study, *Enhancing Access and Rural Electrification: Costs and Benefits and Willingness to Pay,* was carried out with the prime objective of quantifying the financial and economic benefits, and costs of providing access to electricity to the rural community. The objective also included an attempt to determine the willingness of the potential consumers to pay, and their expected electricity consumption.

While different approaches were considered, the approach adopted for this study was the contingent valuation (CV) method (Annex 2) for gauging the willingness of nonelectrified households to pay for an electricity connection as well as the monthly bill. This was done by comparing nonelectrified households with electrified ones (both having similar socioeconomic backgrounds) for determining the affordability of nonelectrified households.

Through these comparisons it was discovered that the willingness to pay (WTP) of nonelectrified households was close to their affordability to pay for a connection, as well as the monthly bills.

The report contains a quantitative component based on a sample survey of 500 rural households in the districts of Sanghar, Larkana, Kohat, Buner, Khushab, Faisalabad, Jaffarabad and Lasbella of the Islamic Republic of Pakistan (referred to as Pakistan hereafter in this report). The qualitative section is based on focus group discussions (FGDs) that were conducted in the same regions to acquire an in-depth understanding of various issues related to the provision of access to electricity of rural households.

Findings from the survey of 500 rural households show the level of electrification of target areas, household energy consumption patterns, WTP and affordability of nonelectrified households, as well as some quality issues faced by households with electricity. These have been analyzed through different aspects related to electrified and nonelectrified households, such as household demographics, income and expenditure, level of electrification, and based on regional comparisons.

Household Demographics

Household characteristics were found close to what is generally found in the rural areas of Pakistan, with variances that can be attributed to the small sample size used in this study.

Most of the respondents were landowners, tenant farmers and laborers. Households on an average comprised eight members, living in a joint family system. More than half of the total respondents in both electrified and nonelectrified households had no formal education. Most had barely completed primary education.

Household durables were more or less similar between electrified and nonelectrified households, although variances in quantities were noted. Radios and sewing machines were common durables in a household, followed by televisions and motorcycles.

The monthly average income of a household was Rupees (Rs.) 8,524, which was close to the national rural average as per Household Income and Expenditure Survey (HIES) 2004-05. Households with higher income levels were mostly landowners. The number of landlords was highest in the upper income group, and lowest in the lower income group. At least 50 percent of the households reported no savings.

Energy Consumption Patterns

The most common energy sources used were firewood (by 90 percent households), followed by kerosene (83 percent), electricity (46 percent) and cow-dung (43 percent). Fuelwood was used heavily in cooking (52 percent), heating (23 percent) and water heating (22 percent). Kerosene had its common end use in lighting (88 percent), and was in direct competition with electricity. Its usage was also reported in cooking, where it reportedly acts as an igniting fuel with fuelwood.

Electricity was used mainly for lighting (89 percent), and hardly ever for heating (4 percent) and space conditioning (3 percent). It competed mainly with kerosene and liquefied petroleum gas (LPG) in lighting. However, in space conditioning, electricity had no substitute. Although expended by only one-fifth of the households in this survey, LPG was commonly used for heating (88 percent), lighting (81 percent) and cooking (16 percent). Energy consumption patterns of households showed variations across the region. For instance, LPG marked a sharp difference between the North West Frontier Province (NWFP), where it was used by 57 percent households, compared to very few (in the vicinity of one-fifth) in other provinces.

It is to be noted that while electricity was a major substitute for kerosene in electrified households in terms of lighting, it did not obviate the need for electrified households to spend on kerosene, as is evident by the fact that kerosene consumption was only slightly lower in electrified households. While a household's monthly expenditure on kerosene was

less than that of electricity, the other benefits from electricity, such as the lumen effect of an electric bulb, are not reflected in expenditure comparisons. Also, electricity had no transportation costs; and, other than lighting, even with moderate supply, it ran several basic household appliances which its conventional substitutes failed to do. In this case, televisions and sound systems are prime examples, which have been found in most electrified households across the provinces.

Electricity Price and Bill Payment Tradition

Respondents felt that energy sources were expensive, although this perception may have been clouded by their overall assessment of the inflation that they faced. Nevertheless, electricity was considered to be cheaper than other energy sources.

From the 226 electrified households, 60 percent had independent meters; 36 percent shared/joint meters; and 7 percent had no meters. The majority (91 percent) of households paid on the basis of units consumed. However, within these, only 58 percent had independent meters. It was mostly the households with independent meters that paid bills at the bank or post office, and households with shared/joint meters paid a certain amount regularly to their relatives or neighbors.

Only a very small percentage (2 percent) of households was not in the practice of paying for electricity consumed.

Connection Fee

Whether or not the connection fee was a hindrance to acquiring an electricity connection was determined by comparing the actual connection cost incurred by electrified households with the amount nonelectrified households were pay for a connection. A comparison of the actual connection cost (Rs. 3,829) with the WTP of nonelectrified households (Rs. 3,714) may assist in the assumption that nonelectrified households, keen on acquiring an electricity connection, might be willing to stretch their affordability limit by a few hundred rupees or so, for a connection. What is noteworthy is that only 7 percent households had not applied for a connection due to their inability to afford the connection fee.

The average connection fee was Rs. 2,978, which varied across the provinces. At least 45 percent households had paid over-and-above charges for an electricity connection. The over-and-above charges households reported paying were Rs. 2,098 on an average. These too were different for each province. A large majority of the households had managed to pay the connection cost from their own resources, and only 7 percent sought assistance from relatives and friends. Institutional credit assistance was not sought as no official credit facility was reportedly available or in the knowledge of the households at that time.

The possibility of making use of a credit facility offers opportunities to households. Around 50 percent of households said that they would like to avail of a loan for a connection.

Impact of Illegal Connections

Due to the small sample size, and the fact that the survey was conducted only in few selected clusters in each province, the findings especially pertaining to the extent of illegal connections cannot be projected to the provincial level. In surveys of this nature, the number of illegal connections, especially in a rural locality, is often difficult to determine. However, in an attempt to reach an estimate, the study treated "legal households" as those that have independent meters or submeters and/or receive and pay their bills at the bank or post office. These criteria were used mainly because this is the general practice of legally electrified households in the urban areas as well as in the rural. However, there is a possibility that a negligible number of legally connected households may have fallen into the category of "illegally connected."

From 226 electrified households, 71 percent were receiving electricity legally, while 29 percent were receiving electricity through illegal means. The highest percentage of illegal connections is reported to be in Balochistan (67 percent). However, this high figure is attributable largely to the fact that the clusters selected in Lasbella for the study comprised mostly illegally connected households, as was later revealed, and may, therefore, not portray the actual situation in Balochistan.

Quality Concerns

An electrified household, on an average, received 15 hours of power supply in 24 hours in summer. Breakdowns occurred six times in a month on an average, but, in Sindh especially, breakdowns were the highest – 12 times in a month – and lowest in the Punjab (three times). The duration of a power breakdown ranged from a minimum of 2.6 hours to a maximum of around 22 hours in a day, on an average.

An average household in the rural area could seldom differentiate between load-shedding and a power breakdown. Over 50 percent of the electrified households reportedly faced load-shedding, of which the majority was never informed in advance.

At least 61 percent of the legally connected households received bills regularly. However, very few households (33 percent), could tell if the bill was according to the actual units consumed. This was mainly due to the fact that most rural households were not used to reading meters.

Willingness to Pay

A comparison between the actual connection cost paid by electrified households, and the WTP by nonelectrified households for a connection, shows that nonelectrified households, on an average, are willing to pay more than what they can afford. At the provincial level, the average monthly bills nonelectrified households were willing to pay were higher than the average monthly bill being incurred by electrified households in each of the four provinces.

Overall, the WTP was highest amongst the nonelectrified households. This is not merely evident through statistical data, but also by the fact that the households had taken into account some key aspects involved in being electrified. While taking into consideration the quality of supply that would be given to them, nonelectrified households seemed also to show equal awareness of the connection fee, as well as the prevailing rates of over-and-above charges in their districts and provinces.

Demonstration Effect

It was found that nonelectrified households with electrical appliances had a greater willingness to acquire electricity compared to those nonelectrified households which did not have any electrical appliances.

Social Uplift and Income Generation

Overall, a comparison of the daily activities of females between pre- and post-electrification revealed a positive impact. Time-saving, entertainment, information and, generally, greater awareness, were key indicators suggesting improved female performance after electrification.

Income generation showed a remarkable increase mainly due to improved sewing and stitching opportunities with electric machines. Nonelectrified households were sure that electricity, despite quality issues, would increase the income level of a household.

Many were of the view that electricity indirectly gave many benefits apart from generating further income and improved the overall quality of life.

1. Introduction

This study, *Enhancing Access and Rural Electrification: Costs and Benefits and Willingness to Pay*, was awarded to AASA Consulting in December 2005 by the Pakistan office of the World Bank.

The study was formally mobilized on December 5, 2005, following which an orientation visit by the Senior Energy Specialist from the World Bank to AASA Consulting, Karachi office, took place on December 10, 2005. However, prior to his visit, several rounds of preliminary meetings had already been held between AASA Consulting and the World Bank to finalize the detailed modalities of the study and contract.

The core project team from AASA Consulting comprised a Task Manager, Team Leader, Survey Specialist and Affordability Specialist, along with members of the field and support staff.

Prior to the launch of the sample survey (500 households), a reconnaissance visit was carried out by the AASA team in order to identify villages or clusters that would be more relevant for this case study.

The villages selected were mostly recently electrified, that is, within the last three years. This was meaningful mainly to allow for pre- and post-electrification comparisons.

The data collection was done by both male and female enumerators, under the direct supervision of the AASA staff. The collected data were verified and edited where needed. However, a great deal of effort has gone into the qualitative and quantitative data collection.

It is expected that the findings of this study will provide a beginning and will help in policy making, and in assessing the extent of further research needed in some of the key issues identified in this study, particularly those related to the electrification problems faced by the rural population.

2. Pakistan Energy Sector Background

Overview

In the Islamic Republic of Pakistan (referred to as Pakistan hereafter in this report), the usage base of energy at the household level consists of coal, gas, oil, electricity and other traditional fuels in the form of fuelwood, and agricultural and animal waste. Households usually use energy for two purposes, that is, lighting and cooking. Overall, the main source of energy for lighting is electricity, and for cooking, a mix of gas, oil and wood.[1]

The world and regional comparison of some of the salient energy indicators are given in Table 2.1. It shows the rather dismal situation of Pakistan and its neighbors. The main thing to note is the very high import dependence of Pakistan as compared to other regional countries.

At present, oil and gas possess the highest share (80 percent on aggregate) in overall primary energy supplies in the country (Figure 2.1). Initially, Pakistan did not adequately

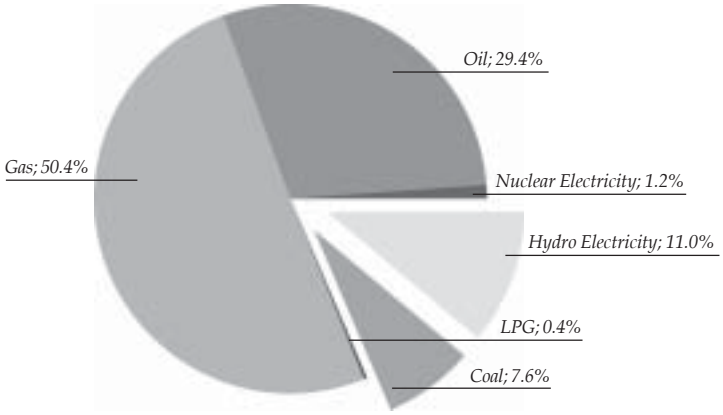
Table 2.1: World and Regional Energy Comparison, 2004

	World	*Pakistan*	*India*	*Bangladesh*	*China*	*Malaysia*
Population (million)	6,393	159	1,086	141	1,300	26
Per Capita Primary Energy Supply (Toe)	1.55	0.30	0.32	0.11	0.91	2.17
Per Capita Electricity Generation (kWh)	2,657	581	561	145	1,484	3,500
Import Dependence (%)	–	24	18	21	1	-53 (exporter)

Source: Medium Term Development Framework 2005-10, Government of Pakistan.

[1] *Pakistan Social & Living Standards Measurement Survey 2004-05, Table 4.5 and 4.6.*

Figure 2.1: Primary Energy Supplies by Source, 2004-05



Source: Pakistan Energy Yearbook 2005.

exploit oil reserves, and it had to import 82 percent of its oil need. However, recently, the government has signed a number of agreements worth US$42 million with various international companies to carry out exploration activities in the oil and gas sector. Similarly, the government is implementing and/or negotiating pipeline projects with Islamic Republic of Iran, Qatar, Turkmenistan and other Central Asian countries.[2]

It is expected that these energy development initiatives will help in combating the future energy shortage in the country.

Pakistan's Electricity Sector

At present, Pakistan has an electricity generating capacity of 19,379 mega watt (s) (MW). Thermal plants using oil, natural gas and coal account for about 64 percent of this capacity, with hydroelectricity making up 33.5 percent, and nuclear sources 2.5 percent in 2005.[3]

During the late 90s, Pakistan's power sector looked quite attractive for foreign investment. Nonetheless, the influx of Foreign Direct Investment (FDI) in the power sector has significantly declined through the years (Table 2.2).

FDI in the power sector, which was around 36 percent of the overall FDI in the country during 1997, declined to 4.8 percent in 2005. The privatization of the Karachi Electric Supply Corporation (KESC) during 2006 increased this share up to 13.7 percent, but it is nowhere near the level of 1997.

[2] *Pakistan Economic Survey, 2005-06, Chapter 15.*
[3] *Pakistan Energy Yearbook 2005, Table 5.1.*

Table 2.2: FDI Inflow in Power Sector

Year	*FDI Inflow in Power Sector (Million US$)*	*Total FDI (Million US$)*	*Share (%)*
1997	245	682	35.9
2000	67	470	14.3
2003	33	798	4.1
2005	73	1,524	4.8
2006	304	2,225	13.7

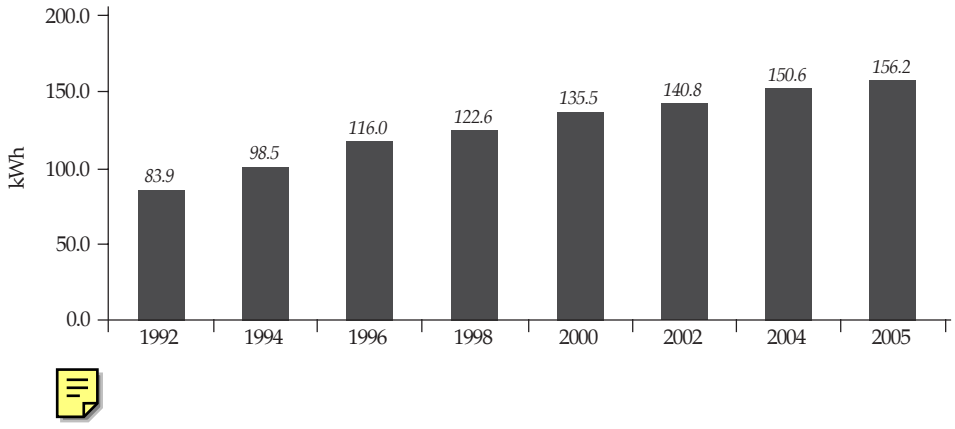
Source: Pakistan Economic Survey.

Electricity Consumption

The number of electricity consumers has increased due to rapid urbanization, extension of electricity grid supply to unelectrified areas and village electrification. During fiscal years 1996 and 2005, the total number of consumers increased from 9.5 million to 15 million, thus registering a growth of 58 percent in the last 10 years. The main crux of this growth came from domestic users, who reported a growth of 60 percent during the same period, followed by commercial users (47 percent), others (43 percent), agriculture (22 percent) and industrial (17 percent).[4]

The domestic usage of electricity has increased rapidly (Figure 2.2). During the course of 13 years, the per capita domestic use of energy has increased from 84 kilo watt (s) per hour (kWh) in 1992 to 156 kWh in 2005, depicting an increase of 86 percent.[5]

Figure 2.2: Per Capita Domestic Electricity Consumption



[4] *Pakistan Economic Survey 2005-06, pp. 230.*
[5] *For this figure, data are taken from Power System Statistics, 30th issue, Planning (Power) Department WAPDA, Lahore, Table D-11 and Pakistan Economic Survey 2005-06.*

Presently, the main consumer base of electricity remains household users (44.3 percent) followed by industrial (29.1 percent), agricultural (12.8 percent) and other sectors (13.8 percent).[6]

Power Losses

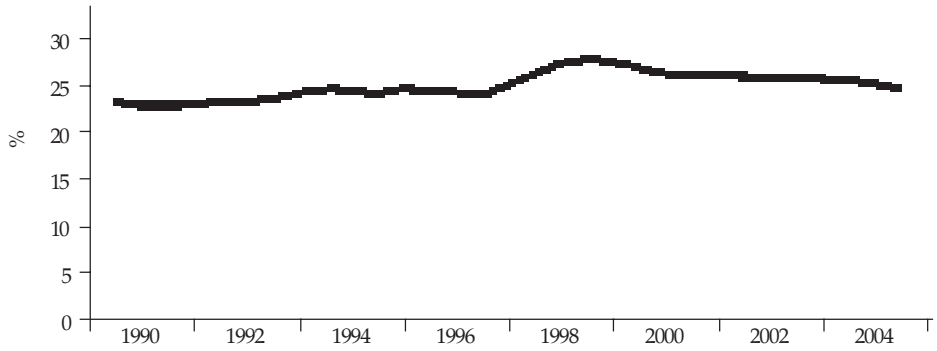
Due to poor quality transmission and distribution (T&D) and power theft, energy losses add up to about 27 percent. The Water and Power Development Authority (WAPDA) and KESC will, however, undertake a rehabilitation program, which is expected to bring down these losses to 21.5 percent by 2010.[7] Figure 2.3 plots the total WAPDA power losses during the last 16 years due to auxiliary consumption and T&D losses.[8] The pattern of losses demonstrates almost a consistent trend of between 20 percent to 25 percent during the period in question.

Power theft is a pressing issue. While it is difficult to precisely measure theft (as opposed to line loss), it is obvious that it constitutes a sizable proportion of Pakistan's overall 27 percent Transmission and Distribution (T&D) losses. In 1999, the government assigned the army the responsibility to look for illegal connections to T&D lines, and for rigged meters. As a result, revenues did increase, but power theft is just one part of the financial problems faced by WAPDA and its successor companies.

Tariff Structure and Streamlining

Electricity tariffs are determined by the National Electric Power Regulatory Authority (NEPRA). NEPRA admits that the process of tariff setting is highly complex in Pakistan. In addition, there are a number of problems which NEPRA faces in devising a healthy tariff policy. These include: (i) lack of coordination among different government organizations involved in the tariff setting process; (ii) noncompliance of rules and regulations by different government agencies;

Figure 2.3: WAPDA Power Losses



[6] *Pakistan Economic Survey 2005-06, pp. 224.*
[7] *Medium Term Development Framework (MTDF), 2005-10, pp. 415.*
[8] *Power System Statistics, 30th issue, Planning (Power) Department, WAPDA, Lahore, Table D-21.*

(iii) reluctance of concerned government agencies to give clear-cut guidelines on issues requiring government advice; and (iv) commitment and agreement on tariffs prior to involvement of NEPRA.[9] In July 2004, NEPRA announced that electricity rates would be lowered for domestic, industrial and agricultural customers in the three distribution areas of Hyderabad, Peshawar and Quetta. Besides, NEPRA introduced various initiatives such as the Automatic Tariff Adjustment (ATA), to balance the interest of consumers and of investors.

Besides the regulations by NEPRA, the government of Pakistan allocates a sizable proportion of the federal budget for tariff streamlining. For instance, the budgetary provisions of FY06 for federal subsidies to WAPDA and KESC accounting for tariff discounts, General Sales Tax and inter-distribution company (Discoms) tariff differentials, amounted to Rs. 46.6 billion which have increased to Rs. 52.5 billion in the current budget for the fiscal year 2007. This provision is approximately 60 percent of the overall federal subsidies.[10]

Privatization

In Pakistan, the electric power sector is largely State-owned. Although privatization has been under way for the last several years, it was only recently that some significant progress has been made when KESC, one of the two State-owned power utilities serving Karachi and its surrounding areas, was privatized. The other main State-owned utility has been WAPDA, which has been unbundled into four generation, one transmission and dispatch and eight distribution companies. Another public sector company – Kot Addu Power Plant (KAPCO) – was also handed over to the private sector during the fiscal year 2006.

During the third and fourth quarters of 2006, the government of Pakistan has plans to further privatize four companies, namely Faisalabad Electric Supply Company (FESCO), Genco 1 (Jamshoro), Peshawar Electric Supply Company (PESCO) and National Power Construction Company (NPCC).

Future Plans

During 2005-10, that is, the medium term development framework (MTDF) period, the power demand in the country is expected to grow by 8 percent. In order to meet the future load requirements during the period in question, 22 new projects are planned to be commissioned. These projects (eight in the public and 14 in the private sector) would add another 7,100 MW of installed capacity into the existing infrastructure.[11]

[9] *NEPRA Annual Report 2004-05, pp.11.*
[10] *Federal Budget in Brief, 2006-07, Table 26.*
[11] *Medium Term Development Framework (MTDF), 2005-10, pp. 416.*

Besides, during 2005-06, the government initiated several new projects on Renewable Energy sources (solar, wind and biomass) and set up the Alternative Energy Development Board (AEDP). The government has approved a number of recommendations under the Energy Security Action Plan (ESAP), some of which are listed here:[12]

- Encouraging the utilization of Renewable Energy, especially for remote areas;
- Development of wind and solar energy to ensure that at least 5 percent of the total power generation capacity is met through these resources by 2030;
- Installation of 100 MW wind power by June 2006 in Keti Bandar and Gharo, Sindh and 700 MW by 2010;
- Development of solar products like fans, cookers, geysers and so on and so forth, through the private sector; and
- Electrification of the entire country villages within the next three years by AEDB.

The World Bank and the Pakistan Energy Sector

The World Bank has remained actively involved in Pakistan in recent years. Since 2002, it has placed considerable emphasis on the energy sector. Such a focus entailed accelerating electric generation and distribution sector reforms with a view to restoring the sector's financial viability. In this regard, the World Bank particularly emphasized reforming WAPDA and KESC.

ESMAP

Simultaneously, through the Energy Sector Management Assistance Program (ESMAP), the World Bank has focused on promoting the role of energy in poverty reduction and economic growth in an environmentally responsible manner. ESMAP, established in 1983 under the joint sponsorship of the World Bank and the United Nations Development Programme (UNDP), is a global technical assistance program which helps build consensus and provides policy advice on sustainable energy development to governments of developing countries and economies in transition. ESMAP suggests innovative and strategic "cutting edge" solutions to governments, in the areas of both traditional and nontraditional energy use, complementing and facilitating the work of other development institutions and the private sector. Since its creation, ESMAP has operated in some 100 different countries through approximately 450 activities covering a broad range of energy issues.[13] Table 2.3 lists the projects undertaken in Pakistan under the ESMAP initiative.

[12] *Pakistan Economic Survey, 2005-06, pp. 234.*
[13] *http://www.esmap.org/esmap/site.nsf/pages/about.*

Table 2.3: List of Completed ESMAP Activities/Projects in Pakistan

Project/Study Title	*Year*	*Number*
Household Energy Assessment	1988	–
Assessment of Photovoltaic Programs, Applications and Markets	1989	103/89
National Household Energy Survey and Strategy Formulation Study: Project Terminal Report	1994	–
Managing the Energy Transition	1994	–
Lighting Efficiency Improvement Program Phase 1: Commercial Buildings Five Year Plan	1994	–
Clean Fuels	2001	246/01
Household Use of Commercial Energy	2006	320/06

Source: Report on Household Use of Commercial Energy, 320/06, List of Reports on Completed Activities, ESMAP.

In addition to ESMAP, the World Bank-assisted poverty reduction strategy paper (PRSP) initiative has laid considerable emphasis on rural electrification as a channel to deal with poverty (details under *Village Electrification*).

Village Electrification

The rural/village electrification program is an integral component of the total power sector development for the purpose of increasing productive capacity and the socioeconomic standard of 68 percent of the population living in rural areas.

Although the village electrification program remained under way for several years, it was not until 2004 when the government gave considerable weight to village electrification as a separate channel to alleviate poverty that resources were allocated for it. With the help of the International Monetary Fund (IMF) and the World Bank, Pakistan embarked upon a new poverty eradicating initiative called PRSP in 2001. Initially, there were 11 areas in which the government planned to allocate resources, and village electrification was not one of them.

In 2004, the federal government allocated Rs. 1.42 billion to the village electrification program under PRSP, which was increased to Rs. 4.4 billion in 2005 – a more than 200 percent increase. This increase in investment in rural electrification resulted in 74 percent of the rural population using electricity for lighting as given in the Pakistan Social and Living Standards Measurement Survey (PSLM) 2004-05. During the fiscal years 2004 and 2006, the government planned to electrify an additional 15,000 villages. It is expected to facilitate: (a) the establishment of agro-based and cottage industries which will help in economic uplift, poverty alleviation and job opportunities; (b) the improvement in the living standards of the rural

population; (c) the increased pumping of sub-soil water for domestic and agricultural purposes that will enhance productivity; (d) the provision of support to rural women in terms of labor; and (e) the reduction in rural/urban inequities and slowing down of the migration of rural population to urban areas.[14]

The village electrification status is given in Table 2.4. The number of villages electrified has increased from 62,127 in 1995-96 to 99,595 by the end of the third quarter of 2005-06, depicting an increase of 60.3 percent.

It is important to note that during 1995-96 and 2002-03, village electrification grew at an average of 3.3 percent per annum, whereas during 2003-04 and 2005-06, the average annual growth of village electrification stands at an impressive 11 percent. Under the Khushal Pakistan Program (KPP), the government is starting various initiatives regarding employment generation and poverty reduction through various channels including rural electrification. Table 2.5 presents the number of KPP schemes allotted for rural electrification during the

Table 2.4: Village Electrification Status

Year	*Realization in Current Year*	*Progressive Total*	*(Numbers) Growth (%)*
1995-96	4,957	62,127	8.7
1996-97	2,441	64,568	3.9
1997-98	1,383	65,951	2.1
1998-99	1,232	67,183	1.9
1999-2000	1,109	68,292	1.7
2000-01	1,595	69,887	2.3
2001-02	1,674	71,561	2.4
2002-03	2,246	73,807	3.1
2003-04	7,193	81,000	9.7
2004-05	9,467	90,467	11.7
2005-06 (July-Mar)	9,128	99,595	10.1

Source: Pakistan Economic Survey 2005-06, pp. 231.

[14] *Poverty Reduction Strategy Paper, Annual Progress Report 2004-05, PRSP Secretariat, MoF, Government of Pakistan, pp. 19. (http://www.finance.gov.pk/poverty/home.html).*

Table 2.5: Rural Electrification Schemes Under KPP

Year	*No. of Schemes on Rural Electrification*	*Total No. of Schemes Under KPP*
FY05	2,827	5,613
FY06 Q1	722	1,677
FY06 Q2	390	1,174
FY06 Q3	685	1,790

Source: PRSP Reviews, various issues.

It is evident that during FY05, almost 50 percent of the total KPP schemes were related to rural electrification. Schemes under this sector still had significant weight during the third quarter of FY06 (38 percent).

3. Study Objectives, Approaches and Limitations

The study was conducted with the prime objective of quantifying the financial and economic benefits and costs of providing access to a rural or peri-urban community; in addition, it aimed to determine the willingness of potential consumers to pay, and their expected consumption.

Varying Approaches to Studies on Willingness to Pay

There are two broad categories of approaches which can be used to compute the value to consumers (and other beneficiaries) of reform in the provision of energy services:

The *revealed preference in surrogate market approach* is based on what people do to cope with the absence of a market for the good they need; hence, it is also named the coping cost method or the averting expenditure method.

The *stated preference approach,* which is based on what people say when they are asked directly about the good in question. This is often referred to as contingent valuation (CV) method especially when used in the context of environmental amenities.

Revealed preference approaches rely on observed behavior toward some market good that possesses a connection to the nonmarketed good of interest. Stated preference approaches, meanwhile, rely on answers to specifically designed surveys relating to the nonmarket good in order to understand the basis of the demand.

In the CV (stated preference) approach, survey respondents are asked to state their preferences concerning these actions. The choices made by respondents are analyzed in a manner similar to the choices made by consumers in actual markets. In both cases, the economic value is derived from the choices observed either in an actual market, or in a hypothetical market created in the survey (Carson 2000) which provide a list of references. For example, respondents may be asked if they would agree to pay a specified monthly increase in their electricity bill in exchange for improved service reliability.

The willingness to pay (WTP) approach measures the price of electricity the consumers are willing to pay. WTP is established through CV methods (estimating consumer WTP in a hypothetically improved power supply scenario) based on a bidding game approach. The main advantage of the CV method is that it generates a comprehensive measure of the total value of electricity supply to consumers. The success of the method in estimating the WTP depends on the extent to which respondents are well informed, and are able to assess the total value of the electricity and the services provided.

Approach Adopted

While different approaches were considered, the approach adopted for this study was the CV method (Annex 2) for gauging the willingness of nonelectrified household s to pay for an electricity connection as well as the monthly bill. This was done by comparing nonelectrified households with electrified ones (both having similar socioeconomic backgrounds) for determining the affordability of nonelectrified households.

Through these comparisons, it was discovered that the WTP of nonelectrified households was higher than their affordability to pay for a connection as well as the monthly bills.

Similarly, in the questionnaire for women, their daily activity chart from electrified households (with a particular socioeconomic background) in both pre- and post-electrification situations have been compared with the daily activity chart of women from nonelectrified household thus computing the expected net benefit in daily hours saving in a post-electrified situation for women of nonelectrified households.

Limitations of the Study

There are a number of limitations to this study, which relate to sample size, time and budget, and are discussed below.

Sample Size: One of the main limitations of the study was the limited sample size of 500 households. This sample size was restricted to capturing diversity of the households, that is, seasonality and geographic spread. It also gives a conservative qualification to simplified findings at a national level.

Time: Initially, the study was envisioned to be completed in four months, and that, perhaps, was another contributing factor for this conservative sample size. Similarly, one of the reasons why we excluded off-grid rural electrification from the scope of work was due to the limited time factor.

Budget: Considering the scope of the study and the availability of the budget, a larger budget would have allowed us to undertake a more comprehensive analysis of rural electrification.

In the light of these limitations, the results of this work should be considered indicative, and should be reconfirmed through more rigorous analysis. It should also be recognized that given the relatively small sample size and limited resources, this work may not fulfill the stringent requirements of a comprehensive WTP study.

4. Findings of Sample Survey

Findings from the survey of 500 rural households[15] reveal the level of electrification of the target areas, household energy consumption patterns, the demand for electricity, WTP and affordability of nonelectrified households, as well as the quality issues faced by electrified households and their WTP for improved quality of power supply. These have been analyzed through different aspects of electrified and nonelectrified households, such as household demographics, income and expenditure, level of electrification, and are based on regional comparisons. Analyses of these aspects are centered on energy consumption patterns of the electrified households, and the willingness to acquire electricity for a certain price by nonelectrified clusters. The section firstly describes some of the key characteristics of the households that were targeted to know their socioeconomic background, and then moves on to energy, specifically electricity, and issues related to it.

Household Demographics

A total of 500 rural households selected in the eight districts across the four provinces were evaluated for their basic characteristics (Table 4.1). The distribution was almost equal between electrified and nonelectrified household, although slight variations were observed across the provinces, especially Balochistan, which had more nonelectrified households.

The total sample is also distributed by the level of electrification in the surveyed clusters to gauge the variance in respondents' profile across these levels. The levels are upper (over 66 percent households [HHs] electrified), middle (34-66 percent HHs electrified) and lower (up to 33 percent HHs electrified). In the overall sample, therefore, 64 percent households fell in the lower electrification level, around a quarter in the upper, and 13 percent in the mid-level category.

Households were almost equally distributed across the household income levels that ranged from below Rs. 5, 000 to above Rs. 8,000 a month. The average rural household income

[15] *For the purposes of this survey, a household has been defined as one that has persons sharing a common kitchen. More specifically, members of such a household have a combined household income and expenditure.*

Table 4.1: Main Characteristics of Sample Households, by Province

	Overall	*Punjab*	*Sindh*	*NWFP*	*Balochistan*
Total Households	500	123	122	127	128
Household Electrification Status					
Electrified	46	51	45	49	38
Nonelectrified	54	49	55	51	62
Total	**(100)**	**(100)**	**(100)**	**(100)**	**(100)**
Electrification Level of Villages					
Upper (above 66% HH)	24	15	33	20	27
Middle (34-66% HH)	13	28	1	14	8
Lower(up to 33% HH)	64	58	66	65	66
Total	**(100)**	**(100)**	**(100)**	**(100)**	**(100)**
Income Status of Households					
Upper (above Rs. 8200/month)	34	27	41	36	31
Middle (Rs. 5,001 to Rs. 8,200/month)	30	35	14	34	38
Lower (up to Rs. 5,000/month)	36	38	45	30	31
Total	**(100)**	**(100)**	**(100)**	**(100)**	**(100)**
Average Monthly Household Income	8,524	7,926	9,245	8,110	8,821
Average Per Capita Monthly Income	1,065	1,132	1,320	1,013	1,102
Education Level of Households					
Upper (above 20 years)	16	24	22	6	13
Middle (11-20 years)	17	28	18	13	9
Lower (1-10 years)	32	36	23	50	19
No Schooling	35	12	37	31	59
Total	**(100)**	**(100)**	**(100)**	**(100)**	**(100)**

Source: AASA Consulting.
Note: All figures are column percentages except base count. Percentage base is all households.

was Rs. 8,524. Sindh showed the highest average of Rs, 9,245, while Punjab was lowest at Rs. 7,926. Based on this income distribution, the monthly per capita average came to Rs.1,065, which is not even one dollar a day. A similar income distribution range is observed in Pakistan Household Income and Expenditure Survey (PHIES) 2004-05.[16]

[16] *Pakistan Rural Rs. 7,929; Punjab Rs. 7,941; Sindh Rs. 7,467; NWFP Rs. 8,516; Balochistan Rs. 7,980. Household Integrated Economic Survey 2004-05, Table 8.*

One-third of the male and female members in the selected households did not have any schooling, and an almost equal number had achieved only lower primary education.

A rural household family size was eight, which is close to the national rural household family size average of 6.8[17] occupying plots ranging from 100-2,000 yards (Table 4.2). However, most households comprised two to three rooms and the rest of the space was used for various other purposes. The majority of the households surveyed was found to be independent and

Table 4.2: Percentage of Households by Housing Characteristics, by Province

	Overall	*Punjab*	*Sindh*	*NWFP*	*Balochistan*
Total Households	500	123	122	127	128
Total Population #	4,648	878	986	1,302	1,482
Average Household Size	8	7	7	8	8
Characteristics of Residence					
Independent	87	94	75	95	82
Shared	13	6	25	5	18
Ownership					
Owned	73	72	85	97	39
Inherited	1	6			
Joint Family Owned	12	19	15	1	13
Rent-free	14	3		2	48
Plot Size of House (sq yards)					
Below 100 Yards	2		6	1	2
101-500 Yards	25	11	9	31	47
501-1,000 Yards	36	50	25	39	31
1,001-2,000 Yards	20	28	20	28	5
2,001-5,000 Yards	15	8	39	1	11
Above 5,000 Yards	3	3	2	2	4
Number of Rooms in the House					
Single Room	16	12	12	10	30
Two Rooms	37	31	50	33	34
Three Rooms	20	24	22	22	14
Four Rooms	14	14	11	20	12
Five Rooms	7	11	3	7	5
Above Five Rooms	6	8	2	8	5
Total	**500**	**123**	**122**	**127**	**128**

Source: AASA Consulting.
Note: All figures are column percentages except base count. Percentage base is all households.

[17] *HIES 2004-05, Table 1.*

self-owned. The survey did not find any case of rented accommodation; however, 14 percent of the respondents were living in rent-free[18] premises. Renting accommodation is generally rare in the rural areas of Pakistan, as also confirmed by the PSLM 2004-05.[19]

Most housing units were self-owned across the provinces,[20] except in Balochistan, where 48 percent of the respondents were living on rent-free premises. Plot sizes varied significantly, although a common range for all provinces was between 500 and 2,000 yards. Sindh, however, showed greater majority in larger plot sizes. Overall, at least two to three rooms were a common sight in most households, except in Balochistan, where the majority of the housing units comprised a single room.

Households were also evaluated on availability of basic amenities of life which primarily included availability of electricity, sources of potable water, and common means of telecommunication. Around half of the total households had electricity, which included 50 percent connected to the main grid and 7 percent receiving grid electricity through neighbors.

As presented in Table 4.3, potable water was available to 75 percent households through their own arrangement (in-house wells, hand pumps), and to 25 percent through tap water

Table 4.3: Percentage of Households by Basic Amenities, by Province

	Overall	*Punjab*	*Sindh*	*NWFP*	*Balochistan*
Total Households	500	123	122	127	128
Electricity Source					
Using any Electric Source	46	51	45	49	41
Directly Connected with Grid	50	61	68	54	20
Connected with Grid Through Neighbor	7	1	1	2	23
Electric Generator	1				2
Potable Water Source					
Through Water Scheme	25		7	49	52
Own Arrangement	75	100	93	51	48
Communication					
Having Telephone Connection	4	4		9	3
Having Mobile Phone	13	32	8	12	2

Source: AASA Consulting.
Note: All figures are percentages except base count. Percentage base is all households.

[18] *Houses given to peasants by landlords for free accommodation are referred to as rent-free.*
[19] *Rented accommodation in rural areas is 1.3 percent: PSLM 2004-05 Report, Table 4.1, pp. 55.*
[20] *In rural Pakistan, ownership of residential premises does not necessarily imply that the owner is in possession of a legal title. Ownership of the premises is assumed for the person or family who have been in possession of the premises for several generations.*

provided by the local government.[21] Means of modern communication were not available to a majority of the households. However, cellphones were available to 13 percent households, and only 4 percent households had landline telephone connections. Cellphones were more common due to the unavailability of landline coverage in most of the selected areas.

For the purpose of this study, a household is considered electrified if it avails of electric power through any means, such as through generator, battery, through neighbor or direct connection with the grid. Interestingly, more households in the nonelectrified areas had availability of tap water provided by the local government (Table 4.4). This unusual phenomenon could be attributed to higher incidence of tap water connections in the nonelectrified clusters of Balochistan and NWFP.

Household Durables

Table 4.5 presents a list of common durables in the electrified and nonelectrified households. Radios and sewing machines were the most common of durables in households followed by TVs and motorcycles. Motorcycles were more common in Punjab than in the rest of the provinces, which may be an indicator of greater economic activity in the province.

Table 4.4: Percentage of Households by Basic Amenities, by Province

	Overall	*Electrified*	*Nonelectrified*
Total Households	500	226	274
Electricity Source			
Using any Electric Source	46	100	
Not Using any Electric Source	54		100
Directly Connected with Grid	50	100	0
Connected with Grid Through Neighbor	7	15	
Electric Generator	1		1
Potable Water Source			
Through Water Scheme	28	14	34
Own Arrangement	72	86	66
Communication			
Having Telephone Connection	4	7	1
Having Mobile Phone	13	13	14

Source: AASA Consulting.
Note: All figures are percentages except base count. Percentage base is all households.

[21] *Tap water is available to 23 percent of the rural population: PSLM Report 2004-05, Table 4.7, pp. 61.*

Table 4.5: Percentage of Households by Ownership of Household Durables, by Province

	Overall	*Punjab*	*Sindh*	*NWFP*	*Balochistan*
Total Households	500	123	122	127	128
Household Durables					
TV	19	27	26	9	15
Radio	42	20	48	53	47
Tape Recorder	18	4	27	32	9
Video Recorder & Player	2	4	1		3
Computer	1	2			
Washing Machine	2	5		4	
Sewing Machine	39	41	42	40	34
Microwave Oven	0	1			
Fridge/Freezer	3	5		4	2
Electric Motors	1	4			
Fodder Cutter Machine Electrical	1	3			2
Water Suction Machine Electrical	2	6			2
Air Cooler	1	2		1	
Motor Cycle/Bike	17	46	10	2	12
Motor Car/Jeep	2	3	1	2	2
Tractor	4	7	7		1
Telephone	6	12	4	6	1
Others	16	23	1	6	34
Nothing	17	16	14	21	15
Total	**100**	**100**	**100**	**100**	**100**

Note: All figures are percentages except base count. Percentage base is all households.

The incidence of watching TV was lowest in NWFP, at 9 percent, which could be attributed to increased radio usage in that province.

Overall, both electrified and nonelectrified households had more or less the same durables, but with variation in quantities.

There were several items – mainly electrical appliances – that were unlikely to have existed in nonelectrified households (Table 4.6). Some of the nonelectrified households were reportedly in possession of a TV and sound equipment. The presence of a car, radio or sewing machine was likely as these were not necessarily dependent on electricity. More nonelectrified households had radios (52 percent), as in the absence of television, it was the prime source of entertainment and information. Sewing machines are also a common household asset in rural areas. In this study, more households in the nonelectrified areas reported having sewing machines, though they were mainly nonelectric.

Table 4.6: Percentage of Households by Ownership of Household Durables by Household Electrification

	Overall	*Electrified*	*Nonelectrified*
Total Households	500	226	274
Household Durables			
TV	19	30	10
Radio	42	30	52
Tape Recorder	18	22	15
Video Recorder & Player	2	4	0
Computer	1	1	0
Washing Machine	2	5	
Sewing Machine	39	24	52
Microwave Oven	0	0	
Fridge/Freezer	3	5	0
Electric Motors	1	2	
Fodder Cutter Machine Electrical	1	2	1
Water Suction Machine Electrical	2	3	1
Air Cooler	1	1	
Motor Cycle/Bike	17	27	9
Motor Car/Jeep	2	2	2
Tractor	4	2	5
Telephone	6	8	4
Others	16	11	20
Nothing	17	20	14
Total	**100**	**100**	**100**

Source: AASA Consulting.
Note: All figures are percentages except base count.. Percentage base is all households.

It is highly likely that an electric appliances in a nonelectrified household may have been brought from abroad by a member of the household working overseas – in the hope that the area would be electrified in due course – or through gifts or in dowry.

Educational Attainment

Educational attainments of respondents are presented in Table 4.7. More than half of the total respondents in both electrified and nonelectrified households had no formal education. In general, respondents were uneducated, and only few had completed primary education. No significant difference was observed in the context of education between electrified and nonelectrified households (Table 4.8).

Table 4.7: Percentage of Households by Educational Attainments, by Province

	Overall	*Punjab*	*Sindh*	*NWFP*	*Balochistan*
Total Households	500	123	122	127	128
Educational Level of Respondent					
No Formal Education	56	41	56	65	63
Initial Education	4	3	3	4	7
Primary Incomplete	5	3		11	7
Primary Complete	13	15	20	9	8
Secondary Incomplete	7	11	9	4	6
Secondary Complete	7	7	10	6	4
Inter	5	17	1		2
Graduate	2	3	1	1	2
Postgraduate	1		1	1	2
Total	**100**	**100**	**100**	**100**	**100**

Source: AASA Consulting.
Note: All figures are percentages except base count. Percentage base is all households.

Table 4.8: Percentage of Households by Educational Attainments by Household Electrification

	Overall	*Electrified*	*Nonelectrified*
Total Households	500	226	274
Educational Level of Respondent			
No Formal Education	56	56	56
Initial Education	4	4	4
Primary Incomplete	5	4	6
Primary Complete	13	14	11
Secondary Incomplete	7	7	8
Secondary Complete	7	7	6
Inter	5	3	6
Graduate	2	3	1
Postgraduate	1	1	0
Total	**100**	**100**	**100**

Source: AASA Consulting.
Note: All figures are percentages except base count. Percentage base is all households.

Occupational Profile

As shown in Table 4.9, a majority of the respondents in the target households were small landlords, tenant farmers and laborers.[22] Regional variations were observed, but only to a small extent. For example, in Punjab and NWFP, ownership of land was more common than tenant farming, something very common in Sindh and Balochistan. This showed that almost 70 percent of the rural population belonged to the agricultural sector. In Sindh specially, 90 percent of the occupations were related to agriculture.

Looking at occupational characteristics in the light of electrification (Table 4.10), no sharp differences were observed, but the prevalence of a slightly larger labor force is noted in the electrified areas, which may be indicative of slightly better employment opportunities resulting from electrification. This finding cannot be attributed to the cause and effect of pre- and post-electrification. At the same time, the number of landowners is also smaller compared to that in a nonelectrified area. Self-cultivation is more common in nonelectrified areas (47 percent) than in the electrified ones.

Table 4.9: Percentage of Households by Occupation of Main Earning Member, by Province

	Overall	*Punjab*	*Sindh*	*NWFP*	*Balochistan*
Total Households	500	123	122	127	128
Occupation of the Chief Earner					
Tenant Farmers	24	3	43	2	46
Landlord	41	50	48	54	12
Owner-cum-tenant	4	11		3	2
Permanent Laborer	7	13	4	3	10
Casual Laborer	4	9	2	3	4
Unemployed	3	4		5	2
Private Services	3	3	1	3	6
Shopkeeper/Store Worker	2			1	5
Handicrafts/Pottery	7	6	2	7	13
Overseas Employment	3	1		10	
Occupation not Mentioned	2			9	
Total	**100**	**100**	**100**	**100**	**100**

Source: AASA Consulting.
Note: All figures are percentages except base count. Percentage base is all households.

[22] *Agriculture still accounts for the largest source of employed workforce. The share of agriculture in employment has increased from 43 percent in 2003-04 to almost 45 percent by mid of 2005-06. Economic Survey of Pakistan, 2004-05.*

Table 4.10: Percentage of Households by Occupation of Main Earning Member by Household Electrification

	Overall	*Electrified*	*Nonelectrified*
Total Households	500	226	274
Occupation of the Chief Earner			
Tenant Farmer	24	32	16
Landlord	41	33	47
Owner-cum-tenant	4	3	4
Permanent Laborer	7	10	4
Casual Laborer	4	5	5
Unemployed	3	3	3
Private Services	3	3	4
Shopkeeper/Store Worker	2	0	2
Handicrafts/Pottery	7	7	7
Overseas Employment	3	2	4
Occupation not Mentioned	2	1	4
Total	**100**	**100**	**100**

Note: All figures are percentages except base count. Percentage base is all households.

Table 4.11 reveals the occupation by income level of the respondents. Households with higher income levels suggest greater land ownership. The number of landlords was highest in the upper income group, and lowest in the lower income group. For tenant farmers, it was the reverse. Similarly, more laborers are found in the lower income groups compared to the upper one.

Household Income and Expenditure

The income and expenditure analysis shown in Table 4.12 reveals that a majority (38 percent) of the households belonged to the middle income group earning Rs. 5,000-10,000 on a monthly basis. This was the case in all provinces except Sindh, where only 20 percent of the households belonged to the middle income group.

At the same time, 36 percent of the households were incurring an expenditure of Rs. 5,000-10,000 a month, and 31 percent below Rs. 5,000 a month. This is why, 50 percent of the households reported no savings. Interestingly, savings were being generated by less than a quarter of the households, up to Rs.3,000 a month (Table 4.12).

Monthly income and expenditure was only slightly different between electrified and nonelectrified households, the latter being Rs. 318 more in average income, and Rs. 246 in expenditure, as presented in Table 4.13. As can be observed, more electrified households earn up to Rs. 5,000 compared to nonelectrified households. But more nonelectrified households fall in the higher income range of Rs. 5,000-20,000, which is attributable to greater prevalence of landlords and remittances in nonelectrified areas (Table 4.10).

Table 4.11: Percentage of Households by Occupation of Main Earning Member by Household Income

	Overall	*Income Status of Household*		
		Upper (Above Rs. 8,200)	*Middle (Rs. 5,001-8,200)*	*Lower (Up to Rs. 5,000)*
Total Households	500	169	151	180
Occupation of the Chief Earner				
Tenant Farmer	24	14	19	37
Landlord	41	52	42	31
Owner-cum-tenant	4	2	4	5
Permanent Laborer	7	1	7	13
Casual Laborer	4	3	3	7
Unemployed	3	1	4	3
Private Services	3	5	5	1
Shopkeeper/Store Worker	2	2	3	1
Handicrafts/Pottery	7	13	7	3
Overseas Employment	3	7	2	
Occupation not Mentioned	2	2	5	1
Total	**100**	**100**	**100**	**100**

Source: AASA Consulting.
Note: All figures are percentages except base count. Percentage base is all households.

Table 4.12: Percentage of Households by Income/Expenditure Group, by Province

	Overall	*Punjab*	*Sindh*	*NWFP*	*Balochistan*
Total Households	500	123	122	127	128
Household Monthly Income					
Below 2,500	4	3	4	5	5
2,501-5,000	32	35	41	25	27
5,001-10,000	38	41	20	46	46
10,000-20,000	21	16	30	20	17
Above 20,000	5	5	6	4	5
Total	**100**	**100**	**100**	**100**	**100**
Average Monthly Household Income	8,524	7,926	9,245	8,110	8,821
Household Monthly Expenditure					
Below 2,500	9	13	9	9	6
2,501-5,000	40	51	45	26	40
5,001-10,000	36	29	32	45	36

(continued...)

(...Table 4.12 continued)

	Overall	*Punjab*	*Sindh*	*NWFP*	*Balochistan*
10,000-20,000	12	6	12	17	13
Above 20,000	3	1	2	3	5
Total	**100**	**100**	**100**	**100**	**100**
Average Monthly Household Expenditure	6,540	5,094	6,399	7,392	7,217
Household Monthly Saving					
No Savings	50	19	47	76	56
Up to 500	6	11	6	2	7
501-1,000	6	8	5	5	5
1,001-2,000	11	21	7	3	11
2,001-3,000	18	25	20	13	13
Above 5,000	10	15	16	2	8
Total	**100**	**100**	**100**	**100**	**100**
Male Earners per HH					
Average	2.2	1.6	2.4	2.3	2.5
Female Earners per HH					
Average	.5	.0	.3	.0	1.5

Source: AASA Consulting.
Note: All figures are percentages except base count. Percentage base is all households

Table 4.13: Percentage of Households by Income/Expenditure Group by Household Electrification

	Overall	*Electrified*	*Nonelectrified*
Total Households	500	226	274
Household Monthly Income			
Below 2,500	4	5	4
2,501-5,000	32	42	23
5,001-10,000	38	29	46
10,000-20,000	21	17	24
Above 20,000	5	7	3
Total	**100**	**100**	**100**
Average Monthly Household Income	8,524	8,349	8,667
Household Monthly Expenditure			
Below 2,500	9	12	7

(continued...)

(...Table 4.13 continued)

Overall	*Electrified*	*Nonelectrified*	
2,501-5,000	40	47	35
5,001-10,000	36	26	44
10,000-20,000	12	10	13
Above 20,000	3	4	1
Total	**100**	**100**	**100**
Average Monthly Household Expenditure	6,540	6,405	6,651
Household Monthly Saving			
No Savings	50	52	48
Up to 500	6	7	6
501-1,000	6	5	6
1,001-2,000	11	10	11
2,001-3,000	18	18	17
Above 5,000	10	8	12
Total	**100**	**100**	**100**
Average Monthly Savings	1,984	1,944	2,016
Male Earners per HH			
Average	2.2	2.2	2.2
Female Earners per HH			
Average	.5	.5	.5

Note: All figures are percentages except base count. Percentage base is all households.

Summary

The demographic profile of households was found close to what is generally found in the rural areas of Pakistan, with exceptional differences in certain characteristics which cannot be compared with national statistics due to the small sample size of this study.

Most respondents were landowners, tenant farmers and laborers. More than half of the total respondents in both electrified and nonelectrified households had no formal education. Most had barely completed primary education. Households on average comprised eight members, living in a joint family system.

Household durables were more or less similar between electrified and nonelectrified households, although the variance in quantities was noted. Radios and sewing machines were common durables in a household, followed by televisions and motorcycles.

The monthly average income of a household was Rs. 8,524. Households with higher income levels were mostly landowners. The number of landlords was highest in the upper income group and lowest in the lower income group. At least 50 percent of the households reported no savings.

Energy Uses and Household Consumption Pattern

This section presents findings on the electricity consumption pattern of the households by different end uses and its comparison with the consumption pattern of other energy sources. Electricity consumption was envisaged for lighting, space cooling – running fans and coolers – and other electrical appliances. Consumption patterns have been calculated on a monthly basis.

End Uses of Energy Sources

This study found energy sources (Table 4.14) being used for purposes such as lighting, cooking, space conditioning and for running electrical appliances. Space conditioning is defined as cooling or heating of a particular space within the house, for which electrical appliances, such as fans, heaters, air coolers and air conditioners may be brought for use. However, in electrified households surveyed in this study, space conditioning was limited mostly to fans.

Table 4.14 presents the use of energy sources by percentages of households surveyed, along with their end uses. The most common energy sources used in rural areas are firewood

Table 4.14: Energy Sources by Different End Uses in Surveyed Households

	Electricity	*Kerosene*	*LPG*	*Fuelwood*	*Cow-dung*	*Charcoal*
Total Households	500	500	500	500	500	500
HH Using Energy Source						
# HH	226	413	101	448	217	65
%	46	83	20	90	43	13
End Uses						
Lighting	89	88	81	4	1	3
Heating	4	0	88	23	15	44
Cooking	3	11	16	52	81	45
Space Conditioning	3	0	0	0	0	
Water Heating	1	0	1	22	4	8

Source: AASA Consulting.

(90 percent), followed by kerosene (83 percent), electricity (46 percent) and cow-dung (43 percent).[23]

End uses of each of the energy sources identified in the areas surveyed were found to be as follows:

Fuelwood: Heavily used in cooking (52 percent), heating (23 percent) and water heating (22 percent).

Kerosene: Its common end use is lighting (88 percent), in direct competition with electricity. Interestingly, its usage has also been reported in cooking, in which case it acts as an igniting fuel for fuelwood.

Electricity: Used for lighting (89 percent), heating (4 percent), space conditioning (3 percent) and cooking (3 percent). It competes mainly with kerosene and liquefied petroleum gas (LPG) in lighting. However, in space conditioning, electricity has no substitute amongst these energy sources. For heating and cooking, electricity is found to be rarely used (4 percent) and (3 percent), respectively. This is because heating and cooking with electricity requires greater and steady voltage, which makes it expensive for rural users. Also, cheap alternatives are available in the form of LPG, charcoal, firewood and cow-dung, which are excessively used for heating and cooking.

Cow-dung: Cow-dung cakes are common fuel for rural households, and are expended for cooking purposes (81 percent) and heating (15 percent).

LPG: Although used by only one-fifth of the households in this survey, LPG is commonly used for heating (88 percent), lighting (81 percent) and cooking (16 percent).

Energy Sources by Province

Over 90 percent households in Sindh, NWFP and Balochistan used fuelwood as against only 73 percent in Punjab (Table 4.15). Kerosene consumption too was high across the provinces, but highest in NWFP and Balochistan, due mainly to climatic reasons. Electricity consumption was lowest in Balochistan, but close to equal in the rest of the three provinces.

LPG marked a sharp difference between NWFP (57 percent) and the rest of the provinces. Cow-dung showed little utilization in Balochistan, as against around 50 percent in the other provinces.

[23] *Computations based on HIES 2001-02, firewood is consumed by 78 percent of the rural population, kerosene (54 percent) electricity (65 percent), and dung cake (36 percent).*

Table 4.15: Percentage of Households by Source of Energy, by Province

	Overall	*Punjab*	*Sindh*	*NWFP*	*Balochistan*
Total Households	500	123	122	127	128
Sources					
Firewood	90	73	97	95	94
Kerosene Oil	83	75	67	89	98
Grid Electricity	46	51	45	49	38
Cow-dung	43	48	63	50	13
LPG	20	6	14	57	5
Crop Waste	17	48	1	20	2
Charcoal and Coal	13	6	37	3	8
Wax/Candle/Lights	13	10	29	2	11
Others	3	4	7	2	1

Source: AASA Consulting.
Note: All figures are percentages except base count.. Percentage base is all households.Multiple response question. Percentages may not add up to 100.

Energy Sources in Electrified and Nonelectrified Households

The consumption of conventional energy sources for lighting (kerosene and LPG) was higher in nonelectrified households compared to electrified ones (Table 4.16). What is interesting is that kerosene did not show a sharp decline in electrified households (68 percent) compared

Table 4.16: Percentage of Households by Source of Energy by Household Electrification

	Overall	*Electrified*	*Nonelectrified*
Total Households	500	226	274
Sources			
Firewood	90	82	96
Kerosene Oil	83	68	95
Grid Electricity	46	100	
Cow-dung	43	48	39
LPG	20	15	25
Crop Waste	17	27	10
Charcoal and Coal	13	4	21
Wax/Candle/Lights	13	20	7
Others	3	2	4

*Note:*All figures are percentages except base count. Percentage base is all households.Multiple response question. Percentages may not add up to 100.

to nonelectrified ones (95 percent). This was because kerosene also served as a standby fuel for lighting in electrified households in times of power outages.

However, the difference in consumption of other energy sources may not necessarily be attributed to the presence of electricity in households. It may be noted that more electrified households used candles (wax) compared to nonelectrified ones. This occurrence has to do more with candles serving as a backup during power outages, rather than being used as a primary fuel for lighting in nonelectrified households.

Energy Sources by Level of Electrification

Prior to the commencement of the sample survey, preliminary visits were made to the target rural districts to identify potential rural clusters for the study. Preliminary findings helped categorize clusters into upper-level (over 66 percent households electrified), mid-level (34-66 percent households electrified), and lower-level electrification (up to 33 percent households electrified). However, during the actual survey, respondents were asked about the level of electrification in their areas. Their responses varied from the level of electrification of clusters determined initially. The findings presented by the level of electrification are based solely on their perception of electrification in their area.

Hence, over 90 percent electrification in a mid-level electrification cluster (Table 4.17) should be seen as a likely finding. The analysis of energy sources through different levels of

Table 4.17: Percentage of Households by Source of Energy by Village Electrification

	Overall	*Electrification Level of Village*		
		Upper (above 66% HHs)	*Middle (34-66% HHs)*	*Lower (up to 33% HHs)*
Total Households	500	118	63	319
Sources				
Firewood	90	90	75	93
Kerosene Oil	83	64	60	94
Grid Electricity	46	92	95	19
Cow-dung	43	62	29	39
LPG	20	11	14	25
Crop Waste	17	6	59	13
Charcoal and Coal	13	3	2	19
Wax/Candle/Lights	13	29	13	7
Others	3	3	3	3

Note: All figures are percentages except base count. Percentage base is all households. Multiple response question. Percentages may not add up to 100.

electrification also shows more kerosene consumption due to greater number of nonelectrified households in the low-level electrification area.

Household Energy Consumption

Energy consumption patterns of households are presented in Table 4.18. On average, a household consumed 66 units of electricity in a given month, for a monthly expenditure of Rs. 264. Per capita household consumption averaged Rs. 33 for 8.25 units consumed. Kerosene, a key substitute for electricity, was the chief energy source for lighting in nonelectrified households. Its consumption averaged 5 liters (Lt) a month per household for a cost of Rs. 157. Apparently, the kerosene cost per month is less than that of electricity, but, electricity, at the same price as kerosene (Rs. 157), is proven to give far higher benefits in terms of lighting.

Expenditure on fuelwood reached Rs. 717 per month on average. This was far on the higher side, but may be attributable to excess consumption in the winter months of February and March during which the survey was conducted. Due to its very limited competition with electricity, fuelwood had almost equal consumption between electrified and nonelectrified households. A household's monthly LPG consumption was 5 kg for Rs. 250. This is higher than the national average of Rs. 167.5[24] due mainly to the LPG average for this study being calculated on a user base. Also, LPG was used primarily for lighting (90 percent) in NWFP – fewer households consuming LPG in other provinces – hence, its consumption does not reflect its use for other purposes. It was nearly the same between electrified and

Table 4.18: Energy Consumption of Households per Month

	Overall			*Electrified*			*Nonelectrified*		
	Qty	*Unit (Rs.)*	*Exp (Rs.)*	*Qty*	*Unit (Rs.)*	*Exp (Rs.)*	*Qty*	*Unit (Rs.)*	*Exp (Rs.)*
Total Households									
Energy Sources									
Grid Electricity (units)	66	4	264	66	4	264			
Kerosene Oil (lt)	5	32.8	157	4	32.8	128	5.24	32.8	172
Firewood (kg)	239	3	717	235	3	705	242	3	727
LPG (kg)	5	50	250	5	49	245	5	51	254
Cow-dung (kg)	96	1	96	86	1	86	104	1	104

Note: All figures are averages except base count. Figures in parentheses are number of valid (nonzero) observations.

[24] *(HIES 2001-02).*

Table 4.18A: Per Capita Energy Consumption of Households per Month

	Overall			*Electrified*			*Nonelectrified*		
	Qty	*Unit (Rs.)*	*Exp (Rs.)*	*Qty*	*Unit (Rs.)*	*Exp (Rs.)*	*Qty*	*Unit (Rs.)*	*Exp (Rs.)*
Total Households									
Energy Sources									
Grid Electricity (units)	8.25	4	33	8.25	4	33			
Kerosene Oil (lt)	0.56	32.8	19.6	0.5	32.8	14.2	0.65	32.8	21.3
Firewood (kg)	30	3	90	29.3	3	89	30	3	90
LPG (kg)	0.56	50	28	0.56	49	27.4	0.56	51	28.5
Cow-dung (kg)	13.5	1	13.5	12	1	12	13	1	13

Source: AASA Consulting.
Note: All figures are averages except base count. Figures in parentheses are number of valid (nonzero) observations.

nonelectrified households. Cow-dung consumption averaged 96 kg overall, but, it was higher in nonelectrified households at 104 kg. Its average cost was Rs. 96 per month for a household.

Electricity Consumption by Province

Provincially, while the averages for NWFP and Balochistan are closer to the overall average, those of Punjab and Sindh show considerable variation (Table 4.19). Household consumption by province reveals consumption only in lighting, whereas, in NWFP, electricity has also

Table 4.19: Percentage (response-based) of Households Using Electricity by Purpose and Province

	Overall	*Punjab*	*Sindh*	*NWFP*	*Balochistan*
Total Households	226	63	55	62	46
Total					
Grid Electricity #	226	63	55	62	46
Row %	89	25	22	24	18
Average Monthly Expenditure (in rupees)	264	152	409	255	259
Grid Electricity					
Lighting	89	98	100	70	100
Heating	4			10	
Cooking	3			9	
Cooling	3	2		8	
Water Heating	1			3	

Source: AASA Consulting.

been used for cooking and space conditioning, which indicates electricity supply adequate enough to allow for operating heating or cooling appliances. This is not the case in other provinces. This may also point to the possibility that NWFP electricity consumers, faced with harsher climatic conditions, especially during winter, may be resorting to using electricity due to it being more convenient than, for instance, fuelwood, which may be more difficult to use during the formidable weather months.

Sindh, on the other hand, while showing consumption in lighting alone, reveals monthly electricity household expenditure which is the highest amongst the four provinces. Although, looking at the electrical appliances commonly found in a household in Sindh, it can be seen that the appliances are more or less the same as in the other provinces. Excessive expenditure in Sindh, therefore, may indicate use of other high-watt appliances, such as fodder-cutter machines, or electric motors for tube wells, and so on and so forth, that were not mentioned by the Sindh households, mainly to avoid disclosure of appliances being used for commercial purposes, which entail high electricity tariff.

While a household's monthly expenditure on kerosene appears to be lower than that of electricity, when considered in light of the lumen effect generated by an electric bulb, far greater amounts of kerosene need to be spent in order to create an equivalent effect. This factor was not reflected in the households' perception of the kerosene price compared with electricity. Similarly, other proven benefits from electricity were also not taken into consideration. Electricity, for example, eliminates transportation costs; also, other than lighting, with even moderate supply, electricity runs several basic household appliances. In this case, televisions and sound systems are examples, which have been found in most of the electrified households across the provinces.

Fuelwood

Fuelwood was a common fuel for a majority of the rural households across all provinces. Even in households connected to the grid, fuelwood was a much-needed energy source for cooking and heating, as is shown in Table 4.20. Because electricity, as found in this study, was mainly used for the purpose of lighting, and not heating, its direct competition with fuelwood was negligible. However, it can be added that the availability of fuelwood pre-empted the use of electricity for heating, especially in places where electricity quality was found comparatively better to allow it to be used for heating purposes.

Not all households purchase fuelwood – most households chop it from nearby forests. However, its cost was calculated based on the price at which it is sold in the market of a particular region.

Fuelwood was mainly used for cooking, and often supplemented by cow-dung and crop waste. The monthly expenditure of a household comes to Rs. 717 on an average. However, a steep rise is seen in NWFP (Rs. 1,204) which is attributed mainly to the excess demand for heating, driven by climatic conditions. Sindh and Punjab, on the other

Table 4.20: Percentage (response-based) of Households Using Fuelwood by Purpose and Province

	Overall	*Punjab*	*Sindh*	*NWFP*	*Balochistan*
Total Households	274	60	67	65	82
Total					
Firewood #	264	56	63	64	81
Row %	53	11	13	13	16
Average Fuelwood Expenditure (in rupees)	717	535	233	1,204	894
Firewood					
Cooking	52	84	87	41	39
Heating	23	9	4	29	29
Water Heating	22	7	1	29	27
Lighting	4		7	2	5

Source: AASA Consulting.

hand, expend fuelwood mainly in cooking, unlike NWFP and Balochistan, where fuelwood was used largely for heating reasons. Very few households across the provinces reported fuelwood use in lighting.

Kerosene

Kerosene usage is presented in Table 4.21. Kerosene was also used for cooking in NWFP and Balochistan by 38 percent and 25 percent households respectively. Fuelwood was also consumed heavily for space heating and warming purposes.

Table 4.21: Percentage (response-based) of Households Using Kerosene by Purpose and Province

	Overall	*Punjab*	*Sindh*	*NWFP*	*Balochistan*
Total Households	274	60	67	65	82
Total					
Kerosene Oil #	261	57	61	62	81
Row %	89	19	21	21	28
Average Kerosene Expenditure (in rupees)	157	170	197	120	173
Kerosene Oil					
Lighting	88	100	89	82	85
Cooking	11		8	18	14
Others	1		3		
Heating	0				1

Source: AASA Consulting.

Nonelectrified households relied mainly on kerosene for lighting, as is revealed by its consumption breakdown in Table 4.21. However, 11 percent responses also confirmed kerosene to have a certain element of consumption in cooking, which was mainly for igniting purposes or as a standby fuel, mainly in NWFP and Balochistan.

The average expenditure on kerosene of a household comes to Rs. 157 a month. In other words, 88 percent of this amount goes toward lighting, and 11 percent toward cooking. No significant variations in monthly expenditure averages are observed across the provinces, except NWFP, which was lowest at Rs. 120 a month. While kerosene has, to some extent, been used for cooking in Sindh, NWFP and Balochistan, it has not been so in Punjab households.

LPG

As shown in Table 4.22, households consume LPG mainly for lighting, especially in NWFP (90 percent). LPG has been known to have become increasingly popular in the rural areas for its multiple and easy usage. For example, a single stove can be interchangeably used with an LPG for cooking, lighting and heating. While it is primarily used for lighting, and equally in cooking in Punjab and Sindh; in Balochistan, interestingly, its reported consumption is only for cooking (100 percent).

Cow-dung

Fuelwood is often supplemented by cow-dung in cooking or heating. However, cow-dung is most often used in cooking. Even across the region, it is a comparatively cheap fuel and, more often, free of cost, as most of the rural populace owns livestock.

Table 4.22: Percentage (response-based) of Households Using LPG by Purpose and Province

	Overall	*Punjab*	*Sindh*	*NWFP*	*Balochistan*
Total Households	274	60	67	65	82
Total					
LPG #	66	4	15	45	2
Row %	94	6	21	64	3
Average LPG Expenditure (in rupees)	250	437	348	202	282
LPG (%)					
Lighting	81	50	73	90	
Cooking	16	50	27	6	100
Heating	1			2	
Water Heating	1			2	

Source: AASA Consulting.

An average household's expenditure on cow-dung in a month has been found to be Rs. 96, that is, Re. 1/kg.[25] (Table 4.23). This average fluctuates regionally, due mainly to the fact that in places like Balochistan, cow-dung availability is not as easy as it is in Sindh or Punjab, which are characterized by more fertile lands in much greater stretches.

Cow-dung has its major use in cooking and to a certain extent, in space heating (Table 4.23). Its usage was high in Balochistan and Punjab, but it was also common in Sindh and NWFP. In Sindh, its usage in heating is high compared to the rest of the provinces. Households have cow-dung generally available at home from their livestock, but, in some cases, it is also purchased.

Summary

Energy consumption patterns of households varied across the regions. Differences were also sharp in terms of energy end uses.

Electricity, within the context of this study, served the basic purpose of lighting. Electricity was a major substitute for kerosene in electrified households in terms of lighting; but, that did not remove the need for electrified households to spend on kerosene, as evident by the

Table 4.23: Percentage (response-based) of Households Using Cow-dung by Purpose and Province

	Overall	*Punjab*	*Sindh*	*NWFP*	*Balochistan*
Total Households	274	60	67	65	82
Total					
Cow-dung #	107	48	34	16	9
Row %	95	42	30	14	8
Average Cow-dung Expenditure (in rupees)	96	106	49	53	176
Cow-dung					
Cooking	81	98	53	88	83
Heating	15	2	36	6	17
Water Heating	4		8	6	
Lighting	1		3		

Source: AASA Consulting.

[25] *Dung is a widely used a household fuel, particularly in rural areas. The Economics of Woodfuel for Individual Families in* Barani *(Rain-fed) Areas (PFI, 1989) showed that about 60 percent of the households visited, used on an average, 3.2 kg of dung per day. The current average market price of dung cake is Re. 0.95 per kg. Sources:* National Woodfuels and Wood Energy Information Analysis: *Muhammad Iqbal Sial* PhD *Director, Research and Development, NWFP Forest Department, Peshawar.*

fact that kerosene consumption was only slightly lower in electrified households. While a household's monthly expenditure on kerosene is less than that of electricity, the other benefits from electricity are not reflected in expenditure comparisons, such as the lumen effect of an electric bulb. Electricity, for example, has no transportation costs; also, other than lighting, with even moderate supply, electricity runs several basic household appliances. In this case, televisions and sound systems are examples, which have been found in most of the electrified households across the provinces.

Fuelwood was not found to be in major competition with electricity. However, it can be added that the availability of fuelwood pre-empted the use of electricity for heating, especially in places where electricity quality was found comparatively better so as to be used for heating purposes. LPG was primarily used for lighting in NWFP, where it is found to be used the most. In other provinces, however, though limitedly used, LPG showed other end uses, such as cooking.

Electricity Price and Poor Payment Tradition

One of the critical worries for a power utility is the cycle of irregular payments for electricity consumption by households. In rural areas, this problem is often aggravated. One of the reasons for this is the electricity price – as to how it is viewed by consumers – high or reasonable, and, to what extent, in turn, it discourages or encourages consumers to punctually pay for units consumed.

A common perception gathered from this study was respondents' expectation that the State should provide them subsidies on basic amenities – which, for them, also include electricity. Also, because income levels of rural households are generally lower compared to those of urban households,[26] a tendency to view necessities as being expensive was observed.

Table 4.24 shows respondents' perceptions about listed energy sources. Percentages have been calculated based on the users of each energy source. A greater majority of respondents viewed kerosene and LPG as expensive, compared to those who perceived electricity to be so. Also, the lumen effect produced by electricity is not taken into account when comparing the electricity price with that of kerosene or LPG. This is also confirmed by the findings of the focus group discussions (FGDs), when respondents were asked about the electricity price, a majority perceived electricity to be expensive. But, on further probing on the lumen effect of electricity, respondents suggested that no other energy source produced the same effect on a bulb as electricity.

[26] *HIES 2004-05, Table 2.3.A : Average monthly household consumption expenditure and average monthly income by quintiles and areas, 2004-05. Urban Rs. 13,371; Rural Rs. 7,929.*

Table 4.24: Percentage of Households Perceiving Energy Sources as Expensive, by Province

	Overall	*Punjab*	*Sindh*	*NWFP*	*Balochistan*
Total Households	500	123	122	127	128
Grid Electricity	63	60	85	49	57
LPG	97	89	94	100	86
Kerosene Oil	92	96	94	99	80
Diesel	83	100	67		100
Firewood	67	60	48	98	60
Charcoal and Coal	60		40		100
Cow-dung	35	52	46	11	19
Crop Waste	40	15	62		67
Wood Dust	33	50			
Wax (candles)	21		75	44	3

Note: All figures are percentages except base count. Percentage base is category total.

Most households believed kerosene, fuelwood and LPG to be expensive, compared to electricity. The notion that electricity is expensive was upheld by more electrified households than nonelectrified ones (Table 4.25). This was mainly due to the fact that nonelectrified households compared electricity with their existing energy sources, while electrified households were viewing electricity price more in comparison with the quality of supply. Hence, more nonelectrified households viewed their current energy sources – kerosene, fuelwood, LPG – as expensive, than did electrified households. Not only this, nonelectrified households that viewed fuelwood and kerosene as expensive were far greater in number than the nonelectrified ones who perceived electricity to be expensive. It is only logical to assume that nonelectrified households would want to switch to electricity to avoid excess expenditure on conventional energy sources. In addition, they not only view electricity as less expensive, but also as a more viable energy source in terms of the many unquantifiable benefits that it bestows upon its users.

Payment Traditions and Practices

Poor payment tradition is directly linked with the discretionary power of discontinuation of services for nonpayment. In Pakistan, where nonpayment leads to prompt discontinuation of service, and where the user is unable to acquire such service through

Table 4.25: Percentage of Households Perceiving Energy Sources as Expensive, by Household Electrification

	Overall	*Electrified*	*Nonelectrified*
Total Households	500	226	274
Grid Electricity	63	64	0
LPG	97	94	99
Kerosene Oil	92	88	93
Diesel	83	100	80
Firewood	67	51	80
Charcoal and Coal	60		60
Cow-dung	35	15	50
Crop Waste	40	23	59
Wood Dust	33	100	
Wax (candles)	21	11	31

Note: All figures are percentages except base count. Percentage base is category total.
Source: AASA Consulting.

other means, the payment tradition is strong. Over the last several years, in most public sector services, discontinuation has not been easy due to external interferences. Even where discontinuation takes place, the user manages to acquire a similar service through other, often illegal, means. This is why most public sector enterprises are faced with the tradition of poor payments.

Traditionally, power theft has been far more common in rural areas than urban, because monitoring of illegal connections in such areas is often difficult on a regular basis for reasons of remoteness and difficult accessibility.

Payment Practices by Type of Electricity Meters

Table 4.26 shows payment practices by types of electricity meters. From the 226 electrified households, 60 percent had independent meters; 36 percent shared/joint meters; and [illegible] ercent had no meters.

From the 91 percent households which paid on the basis of units consumed, 58 percent were those with independent meters and 32 percent with shared/joint meters. It was mostly the households with independent meters that paid bills at the bank or post office, and 32 percent households with shared/joint meters paid their relatives or neighbors (34 percent).

Table 4.26: Percentage of Households by Payment Practices of Electricity Charges by Type of Access to Electricity

	Overall	*Type of Electricity Meter*			
		Independent	*Shared – Joint Meter*	*No – Meter*	*Separate – Submeter*
Total Households	226	136	82	7	0
Row %	100	60	36	3	1
Basis of Paying Electricity Bill					
Units Consumed	91	58	32		0
Quantity of Electrical Appliances	2			2	
Flat Rate	5	0	4	0	
Don't Pay the Bill	2	2		0	
Total	**100**	**60**	**36**	**3**	**0**
Source of Paying Electricity Bill					
To Linemen	15	13	1		
To Relatives/Neighbors	40	4	34	3	0
Bank	40	40			
Don't Pay the Bill	2	2		0	
Post Office	2	1	0		
Others	1	0	1		
Total	**100**	**60**	**36**	**3**	**0**

Source: AASA Consulting.
Note: All figures are table percentages except base count and averages. Percentage base is all electrified households in each cell.

Only a very small percentage of households were not in the practice of paying for electricity consumed (2 percent) .

Payment Practices by Province

Table 4.27 shows the payment practices of households by province. In terms of the basis of payment, 91 percent households paid by units consumed. Even province-wise, paying by units consumed was a strong trend. Only 5 percent households paid on a flat rate basis, but this trend was strongest in Sindh where 13 percent households were used to paying a flat rate, which varied by village and district.

In terms of the source to whom bills were paid, 52 percent households paid their bills at the bank, and 28 percent paid to their neighbors or relatives. Very few (17 percent) households in Balochistan paid their bills at the bank. Simultaneously, Balochistan had a high percentage (59 percent) of households paying to neighbors or relatives. Fifteen percent of payments were made to power utility linemen.

Table 4.27: Percentage of Households by Type of Access to Electricity and Payment Practices of Electricity Charges, by Province

	Overall	*Punjab*	*Sindh*	*NWFP*	*Balochistan*
Total Households	226	63	55	62	46
Type of Electric Meter					
Independent	60	90	25	90	20
Shared – Joint Meter	36	10	71	8	70
No – Meter	3		2	2	11
Separate – Submeter	0		2		
Total	**100**	**100**	**100**	**100**	**100**
Basis of Paying Electricity Bill					
Units Consumed	91	98	84	94	85
Flat Rate	5	2	13		7
Quantity of Electrical Appliances	2		2		9
Don't Pay the Bill	2		2	6	
Total	**100**	**100**	**100**	**100**	**100**
Source of Paying Electricity Bill					
Bank	52	86	31	63	17
To Relatives/Neighbors	28	6	49	8	59
To Linemen	15	8	7	23	22
Don't Pay the Bill	2		2	6	
Post Office	2		7		
Others	1		4		2
Total	**100**	**100**	**100**	**100**	**100**

Source: AASA Consulting.
Note: All figures are percentages except base count and averages.Percentage base is all electrified households.

Bills paid on the basis of units consumed were either paid at the bank or post office. In the case of neighbors or relatives, payment was made on total units consumed divided between the households on mutually agreed terms. Flat rates were given mainly to power utility linemen.

Punjab fared better even in bill payments as 79 percent households paid bills at the banks or post office. In NWFP, while 55 percent households paid bills at the bank or post office, around a quarter paid to power utility linemen.

Summary

A larger majority of respondents viewed kerosene and LPG as expensive, than those who perceived electricity to be so. Also, the lumen effect produced by electricity is not taken into account when comparing electricity price with that of kerosene or LPG.

Sixty percent of households had independent meters, and it was mostly amongst these who paid on the basis of units consumed, at the bank or post office. This trend was also strong in Punjab and NWFP, but weak in Sindh and Balochistan.

A majority of the households paid their bills at the bank or post office, but Balochistan was one exception which had 59 percent households paying to neighbors or relatives.

However, the trend of shared/joint meters was also common, as 36 percent households had such meters. It was mainly these respondents who were paying their bill on the basis of units consumed to their neighbors/relatives through whom they indirectly received grid electricity.

Connection Fee

This section examines the extent to which the connection fee has an impact on encouraging or discouraging nonelectrified households to acquire electricity. The section also unveils, in the context of the connection fee, the willingness of nonelectrified households to acquire electricity, and their predisposition toward credit availability, which is meant to encourage their acquisition of an electricity connection.

It must be mentioned that most of the electrified households in the sample were those who had recently (within the last three years to minimize the recall error) been given connections. This was done for pre- and post-electrification analysis.

Table 4.28 presents average connection cost, average over-and-above charges, as well as source of financing an electricity connection, based on responses from 226 electrified households. The average connection fee was Rs. 2,978 which varied across the provinces. At least 45 percent households had paid over-and-above charges for an electricity connection. The over-and-above charges households reported paying were Rs. 2,098 on an average. These too were different for each province, with the lowest reported in Punjab.

A large majority of the households had managed to pay the connection cost from their own resources, and only 7 percent sought assistance from relatives and friends. This was also probably due to the fact that no official credit facility was available to them nor in their knowledge at that time.

Table 4.28: Average Connection Fee (in rupees) Paid by Electrified Households, by Province

	Overall	*Punjab*	*Sindh*	*NWFP*	*Balochistan*
Total Households	161	58	46	42	15
Initial Cost of Electricity Connection	2,974	3,402	2,522	3,937	1,633
Over-and-above Charges	2,098	677	7,707	1,541	1,645
Total Connection Cost	3,829	3,928	4,624	4,360	2,026
First Time Fitting and Lighting Cost (Rs.)	2,071	1,682	1,933	2,676	1,954
Ever Paid Over-and-above Charges for Electricity Connection					
Yes	45	84	22	21	27
No	32	16	13	71	47
Don't Know the Official Rate	23		65	7	27
Total	**100**	**100**	**100**	**100**	**100**
Source for Financing Connection Cost					
Own Resources	80	76	100	64	80
Personal Loans	10	19		10	7
Money Lenders	2	5			7
Relatives/Family/Friend	7			26	7
Total	**100**	**100**	**100**	**100**	**100**
Source for Financing Installation Cost					
Own Resources	91	88	100	83	93
Personal Loans	5	10		2	7
Money Lenders	1	2			
Relatives/Family	4			14	
Total	**100**	**100**	**100**	**100**	**100**

Source: AASA Consulting.
Note: All figures are percentages except base count. Multiple response question. Percentages may not add up to 100.

The initial cost of connection is reported to be the highest in NWFP followed by Punjab, but the over-and-above charges are particularly high in Sindh (Rs. 7,707). Although Punjab has the lowest average of over-and-above charges, it has many more households who paid over-and-above charges compared to the other provinces. It must be mentioned that information on over-and-above charges is based on limited responses, and cannot be assumed for the entire province.

Connection Fee and Over-and-above Charges by Income Levels

The connection cost, as well as the over-and-above charges paid by electrified households, were analyzed by their income levels, as shown in Table 4.29. The initial cost of connection, the over-and-above charges as well as the fitting costs, all increased from lower to upper income levels of the households. This suggested that, to some extent, leverage was given to

Table 4.29: Connection Cost, Over-and-above Charges by Income Level of Households

	Overall	*Income Status of Household*		
		Upper (Above Rs. 8,200)	*Middle (Rs. 5,001-8,200)*	*Lower (Up to Rs. 5,000)*
Total Households	161	42	34	85
Initial Cost of Electricity Connection				
Average (Rs.)	2,974	3,661	3,257	2,379
Over-and-above Charges Paid for Electricity Connection (Rs.)				
Average (Rs.)	2,098	3,544	1,728	1,000
Total Connection Cost				
Average (Rs.)	3,829	5,383	3,935	2,741
First Time Fitting and Lighting Cost (Rs.)				
Average (Rs.)	2,071	3,642	1,445	1,327
Ever Paid Over-and-above Charges for Electricity Connection				
Yes	45	48	53	40
No	32	33	38	29
Don't Know the Official Rate	23	19	9	31
Total	**100**	**100**	**100**	**100**
Source for Financing Connection Cost				
Own Resources	80	86	82	76
Personal Loans	10		12	14
Money Lenders	2		3	4
Relatives/Family	7	14	3	6
Total	**100**	**100**	**100**	**100**
Source for Financing Installation Cost				
Own Resources	91	98	97	85
Personal Loans	5			9
Money Lenders	1			1
Relatives/Family	4	2	3	5
Total	**100**	**100**	**100**	**100**

Source: AASA Consulting.

households based on their affordability of a connection. Also, over-and-above charges were sought keeping in view the household's ability to pay.

The incidence of paying over-and-above charges also increased with the increase in the income level of households. A larger number of households in the upper income level (48 percent) paid over-and-above charges compared to 40 percent in the lower income group.

Financing a connection, by and large, was done through the household's own resources, although with minor variations depending on income levels. The case with financing the installation cost was also quite similar.

WTP for a Connection

A nonelectrified household's WTP for an electricity connection was determined by the rupee amount they thought was affordable for them to pay for a connection. The responses were captured in different ranges of amounts. As shown in Table 4.30, a majority of the households put their affordability of the connection fee under Rs. 3,500. This was specially the case with the provinces, except Punjab, where affordability was at least Rs. 3,500. Some of the households also stretched their affordability to Rs. 6,500 and above, especially in Sindh.

The average affordability of a nonelectrified household came to around Rs. 3,714 for an electricity connection. This amount is close to the overall connection cost average of Rs. 3,829, which electrified households incurred for a connection.

Table 4.30: WTP for Electricity Connection by Nonelectrified Households, by Province

	Overall	*Punjab*	*Sindh*	*NWFP*	*Balochistan*
Total Nonelectrified Households	274	60	67	65	79
Affordable Connection Fee (Rs.)					
Below 3,500	39	13	48	26	63
3,500	30	65	6	26	28
4,500	8	7	6	17	5
5,500	5	7	3	11	
6,500	9	5	18	14	
Above 6,500	8	3	19	6	4
Total	**100**	**100**	**100**	**100**	**100**
Average Affordable Connection Fee (Rs)	3,714	3,883	4,166	4,468	2,547

Source: AASA Consulting.
Note: All figures are percentages except base count and averages. Percentage base is all nonelectrified households.

Is the Connection Fee a Hindrance?

During the course of the survey, not a single village was identified with partial electrification. The reason noted was that when a village gets electrified partially (through the grid), the households left unelectrified eventually manage to share electricity through the electrified ones by paying them a certain price for it – often it is based on units consumed. Only one case was reported where a house was left unelectrified due to a tribal feud. Hence, affordability of a connection fee was tested on households in the nonelectrified clusters.

Whether or not the connection fee is a hindrance to acquiring an electricity connection can be estimated by comparing the connection cost incurred by electrified households (Table 4.31) with the amount nonelectrified households are willing to pay for a connection. A comparison of the actual connection cost (Rs. 3,829) with the affordability of nonelectrified households (Rs. 3,714) may assist in the assumption that nonelectrified households, keen on acquiring an electricity connection, might be willing to stretch their affordability limit by a few hundred rupees or so, for a connection.

Table 4.31: Reasons for Not Being Connected to Electric Grid, by Province

	Overall	*Punjab*	*Sindh*	*NWFP*	*Balochistan*
Total Households	274	60	67	65	79
Willing to Get an Electricity Connection through National Grid	97	100	100	100	91
Applied for an Electricity Connection	37	12	52	17	58
Reasons for Not Applied					
Electricity is Not Available in My Area	35	85	10	37	18
Don't Know How to Apply	15	5	25	6	22
Our Household Can't Pay the Connection Fee	7	2	3	5	16
Our Household Cannot Afford the Monthly Payment	1				3
Our Household Cannot Afford to Buy Electrical Equipment	1		1		
Shared with Neighbor	11			37	6
Others	5		18	3	
Reasons for Delay in Connection					
Application Still Under Process	19	10	28	9	25
Distribution Network is Away from My Area/House	10	8	15	2	15
They Have Asked Illegitimate Payment	8	2	31		
Others	11	2	4	9	27

Source: AASA Consulting.
Note: All figures are percentages except base count. Percentage base is all nonelectrified households. Multiple response question. Percentages may not add up to 100.

However, it is apparent from Table 4.31 that the connection fee does not preclude households from acquiring an electricity connection. As is shown in Table 4.31, almost all nonelectrified households were desirous of acquiring electricity through the national grid, and 37 percent had already applied for a connection. A majority of nonelectrified households cited reasons of nonavailability of electricity in their respective areas, and a small portion (15 percent) had not applied due to their lack of knowledge of the process.

What is important to note is that only 7 percent have not applied because of their inability to afford the connection fee. The percentage is smaller across all provinces except Balochistan, where 16 percent viewed the connection fee as a hindrance. The reason for delay in acquisition of a connection was mainly cited to be the "application in process" and distance of the distribution network. Even across the different income levels (Table 4.32), the connection fee has been cited mostly by the lower income group (12 percent) as a reason for not applying for a connection.

Demand for Credit Facility

A credit facility will be welcomed by around a half of the nonelectrified households desirous of an electricity connection (Table 4.33), although such a facility may not necessarily ensure

Table 4.32: Reasons for Not Being Connected to Electric Grid by Household Income

	Overall	*Income Status of Household*		
		Upper (Above Rs. 8,200)	*Middle (Rs. 5,001-8,200)*	*Lower (Up to Rs. 5,000)*
Total Households	274	98	100	73
Willing to Get Electricity Connection through National Grid	97	99	97	96
Applied for an Electricity Connection	37	43	37	27
Reasons for Non Application				
Electricity Is Not Available in My Area	35	37	34	36
Don't Know How to Apply	15	10	13	25
Our Household Can't Pay the Connection Fee	7	2	8	12
Our Household Cannot Afford the Monthly Payment	1			3
Our Household Cannot Afford to Buy Electrical Equipment	1		1	3
Shared with Neighbor	11	10	13	8
Others	5	4	8	3

Source: AASA Consulting.
Note: All figures are percentages except base count. Percentage base is all nonelectrified households. Multiple response question. Percentages may not add up to 100.

Table 4.33: Demand for Credit for Electricity Connection, by Province

	Overall	*Punjab*	*Sindh*	*NWFP*	*Balochistan*
Total Households	274	60	67	65	79
Would Like to Avail Institutional Credit Facility					
Yes	46	28	39	86	33
No	54	72	61	14	67
Total	**(100)**	**(100)**	**(100)**	**(100)**	**(100)**
Average Affordable Connection Fee (Rs.)	3,712	3,883	4,166	4,468	2,507
Average Expected Cost of Electric Fitting (Rs.)	3,186	5,650	3,068	2,142	2,158
Average Credit Required for Electric Connection and Fittings (Rs.)	6,740	7,888	7,555	6,608	5,638
Average Monthly Installment of Loan Repayment (Rs.)	535	238	361	559	838

Note: All figures are percentages except base count and averages. Percentage base is all nonelectrified households.

electricity access to nonelectrified households. This is because electricity access, more than affordability of a connection fee or a monthly electricity bill, is a matter of the ability and willingness of a power utility to extend its reach to nonelectrified households. As shown in Table 4.31, a majority of those who have applied for an electricity connection are still awaiting the processing of their applications.

Table 4.33 also reveals the credit requirement for an electricity connection for a household, which comes to around Rs. 6,740, with slight variations across the four provinces. The demand for a credit facility varied significantly by the electrification level of an area (Table 4.34). The demand was highest in low-electrified areas as around half of the total nonelectrified households desired a credit facility. On the other hand, it was minimal at 10 percent in a high-electrification area, which suggests higher costs involved in reaching out to the majority of nonelectrified households in a low-electrified area. This, in turn, means higher connection and installation costs are anticipated by households, hence a demand for a credit facility.

Summary

The connection fee does not preclude households from acquiring an electricity connection. The figures presented in Tables 4.31 to 4.34 make it evident that almost all nonelectrified households were desirous of acquiring electricity through the national grid, and 37 percent had already applied for a connection. What is important to note is that only 7 percent had not applied because of their inability to afford the connection fee, and most of these were in the

Table 4.34: Demand for Credit for Electricity Connection by Village Electrification Level

	Overall	*Electrification Level of Village*		
		Upper (Above 66% HHs)	*Middle (34-66% HHs)*	*Lower (Up to 33% HHs)*
Total Households	274	10	3	258
Would Like to Avail Institutional Credit Facility				
Yes	46	10	33	48
No	54	90	67	52
Total	**(100)**	**(100)**	**(100)**	**(100)**
Average Affordable Connection Fee (Rs.)	3,712	2,946	2,667	3,749
Average Expected Cost of Electric Fitting (Rs.)	3,186	1,625	2,000	3,252
Average Credit Required for Electric Connection and Fittings (Rs.)	6,740	.	3,000	6,773
Average Monthly Installment of Loan Repayment (Rs.)	535	.	500	535

Source: AASA Consulting.
Note: All figures are percentages except base count and averages. Percentage base is all nonelectrified households.

low-income groups. The common reason for delay in a connection was cited to be "application in process" and distance of the distribution network. Even across the different income levels, the connection fee was not a hindrance.

Close to half of the total electrified households reported paying amounts over-and-above the official connection fee. This incidence was, interestingly, highest in Punjab. Most electrified households generated the wherewithal for a connection fee through their own resources. This could be due to the absence of an official credit facility available to them or to a lack in their knowledge. However, a credit facility was welcomed by at least half of the total respondents.

Impact of Illegal Electricity Connections

As this study had selected limited areas in its sample survey, the findings pertaining to the extent of illegal connections, in particular, cannot be projected to the provincial level. In surveys of this nature, the number of illegal connections in a particular village or area is often difficult to determine. Households generally do not disclose if they are illegally connected. Such households usually receive indirect grid electricity from their neighbors. There are also households which pay a certain amount regularly to the power utility linemen, and, therefore, due to lack of knowledge and education, consider themselves legally connected despite not being so.

This is why there is a possibility that all households reporting to be legally connected may not actually be so. Therefore, to reach the closest estimate, this study has treated "legal households" as those that have independent meters or submeters and/or receive and pay their bills at banks or post offices. These criteria have been used mainly because this is the general practice of legally electrified households in the urban areas as well as in rural areas. However, there is a possibility that a negligible number of legally connected households may have fallen into the category of "illegally connected."

As Table 4.35 shows, out of 226 electrified households, 71 percent were receiving electricity legally, while 29 percent were receiving electricity through illegal means. The highest percentage of illegal connections is reported to be in Balochistan (67 percent). However, this high figure is attributable largely to the fact that the clusters selected in Lasbella for the study comprised mostly illegally connected households, as was later revealed, and may, therefore, not portray the actual situation of the entire province.

Table 4.35: Average Monthly Electricity Charges by WTP Additional Monthly Charges for Adequacy in Supply of Electricity by Legality of Connection, by Province

Additional Monthly Charges (Rs.) for Adequacy of Supply of Electricity	*Overall*	*Legal*	*Illegal*	*Punjab*		*Sindh*		*NWFP*		*Balochistan*	
				Legal	*Illegal*	*Legal*	*Illegal*	*Legal*	*Illegal*	*Legal*	*Illegal*
Total Households	226	161	65	58	5	46	9	42	20	15	31
Row %	100	71	29	92	8	83	17	68	32	32	67
Below 100 Average Current Bill	220	160	310	118	543	276	300	161	358	271	267
100-200 Average Current Bill	179	128	358	126	.	.	.	.	411	150	200
200-300 Average Current Bill	202	185	291	86	.	233	.	188	313	100	200
300-400 Average Current Bill	334	348	227	111	.	476	.	199	236	275	200
400-500 Average Current Bill	446	483	300	.	.	568	203	352	349	300	.
Above 500 Average Current Bill	56	56	.	.	.	56	.	.	.	.	

Source: AASA Consulting.
Note: All figures are averages except base count. Note: The term 'Legal' refers to households who have independent electric meters (or sub/joint meter) and are directly connected to the grid, and submit their bills at the bank/post office.

Willingness to Pay

Electrified households were assessed for their WTP for an additional price over their existing monthly bills in return for an uninterrupted power supply (Table 4.35). Current average bills for both legally and illegally electrified households are listed for comparisons. Households with higher monthly bills ranging from Rs. 179 to Rs. 446 were willing to pay an additional Rs.100-500 a month.

It may be noted that illegal households were found to be paying more than legally electrified households on a monthly basis, which indicates high demand for electricity. These were possibly households that are illegally connected not by choice but as a result of the long wait due to a lack of response on their applications by the power utility.

It is probable that legally connected households with low monthly bills were either satisfied with the quality of power supply, or simply indifferent to it. Their willingness appeared minimal. But the comparatively fewer households paying higher monthly bills were willing to go even higher for an uninterrupted supply. This may suggest that such households were deriving certain benefits, like income generation, from electricity. The study did not find any distinction between a commercial and domestic connection being used by respondents. Findings confirmed that most of the domestic connections were being used to some extent for income generation activities, such as water suction pumps for agricultural pursuits. Moreover, in the case of illegal connections, the tendency to use a domestic connection was high, as illegally connected households showed least concern for a difference between a domestic and a commercial connection.

Summary

Power theft is common, pointing to the many illegal connections which remain under cover in most rural areas due to the remoteness and inaccessibility of the areas. An accurate figure on this is difficult to ascertain.

Provincially, Balochistan (67 percent) had the highest numbers of illegally connected households, an occurrence attributable to the fact that clusters selected in Lasbella had mostly illegally connected households. Legally connected households were highest in Punjab. In order to get a legal electrification status, illegally connected households were willing to pay more, compared to legally connected households, for improved electricity.

Investments in Extension of Network

Table 4.36 presents the total expenditure involved in extending electricity to a household within a km radius from the grid. The rates and costs given in Table 4.36 are averaged out for all districts, and may be treated as close estimates of these actually incurred by the power utility.

Table 4.36: Cost of Extending Grid Electricity through HT Poles to a Village 1 km from Grid

	Unit/km	*Cost/km (Rs.)*	*Subtotal (Rs.)*	*Overall Cost (Rs.)*
Village				
Poles	17	14,000	238,000	
Hardware	17	7,000	119,000	
Wiring (ft)	3,280	122	400,160	
Total Cost				757,160
Cost Per Foot			231	
Household				
Cost of Extending Electricity to a Household			6,930	
Meter Installation Cost			3,070	
Cost to Electrify a Household				10,000
Total Cost to Electrify a Household 1 km away from Grid				767,160

Source: AASA Consulting.

The average connection fee ranges from Rs. 3,000 per household, as discussed in the previous section. In order to maintain this amount per household, the power utility will look for villages with at least 255 households so as to recover the total cost incurred in electrification. Villages with households less than 255 may not be a viable investment for electrification.

According to WAPDA, 17 high-tension (HT) poles are required to cover 1 km distance and each pole is separated by another by a distance of around 193 ft. The cost per pole is Rs. 14,000, and a four-wire set per ft costs Rs.122. Hardware (clamps, sockets and other extra items) were estimated to cost nearly Rs. 7,000. Hence the total cost to extend electricity for 1 km is approximately Rs. 75[illegible]0.

In order to take electricity further from one house to another, separated by 30 ft, in a village, requires an additional cost of around Rs. 230 per ft; the meter installation cost is approximately Rs. 3,000. The total cost of electrifying a household is, therefore, Rs10,000, from the HT pole to the household.

Hence, the overall cost of extending electricity from the grid to one household 1 km away is Rs. 767,160 (Table 4.36).

Table 4.36A shows the overall cost of electrifying a village of various sizes and distances. The cost of electrifying a household in a village with 100 households 1 km away would be Rs17,572. Similarly, as the distance increases, the costs tends to rise. However, the cost reduces if the number of households at 5 km distances increases to 500. The overall cost would be equal to Rs. 17,572. Hence, power utilities could go longer distances if the number of households exceeds the number of households near the grid.

Table 4.36A: Viability of Electrification of a Household by Distance and Number of Households

Kilometers	*HH Population*				
	100	*200*	*300*	*400*	*500*
1 km	17,572[27]	13,786	12,524	11,893	11,514
2 km	25,143	17,572	15,048	13,786	13,029
3 km	32,715	21,357	17,572	15,679	14,543
4 km	40,286	25,143	20,095	17,572	16,057
5 km	47,858	28,929	22,619	19,465	17,572

Source: AASA Consulting.

Summary

The overall cost of extending electricity is part of a decision which a power utility will take based on the viability of their investment. The cost recovery is possible at lower amounts, but to keep costs lower, the company must target villages with the maximum number of households.

Quality of Electricity Supply

There are several factors that come into play when it comes to the quality of supply of electricity. In rural areas, specially, the quality image of electricity is tarnished by excessive load-shedding, power failures and incessant voltage fluctuations. Preceding discussions thus far reveal that the kind of electricity available to the selected rural households does not go satisfactorily beyond the basic purpose of lighting. And, for some households, the quality of electricity leaves much to be desired even in terms of lighting.

The quality of electricity supply in the selected electrified households was evaluated through indicators such as the average duration of power supply during the day, frequency of load-shedding or power failures in a household in a month and variations by the season. Also brought within the scope of quality was billing, as well as the quality of service rendered by the power utility.

[27] *Total cost to extending electricity to a village 1 km from the grid Rs. 757,160*
A. For 100 households, per household cost Rs. 7,571.6
B. Cost to electrify a household in that village Rs. 10,000
C. Total cost of electrifying a households 1 km away in a village (A+B) Rs. 17,572

Power Supply and Breakdowns

As shown in Table 4.37, an electrified household, on average, received 15 hours of power supply in 24 hours in summers. Regionally, Punjab fared better as it received power supply almost round-the-clock (21 hours), followed by NWFP (20 hours). Power supply was limited to nine and 10 hours in Sindh and Balochistan, respectively, in the summer months. In winter, the average soared to 19 hours a day. While the average power supply hours remained the same in Punjab, it considerably increased in Sindh (17 hours), and no major difference was observed in Balochistan.

Breakdowns occurred six times in a month on an average but, in Sindh especially, breakdowns were the highest at 12 times in a month, and the lowest in Punjab (three times). The duration of a power breakdown ranged from a minimum of 2.6 hours to a maximum of around 22 hours in a day, on an average. Regionally, breakdowns averaged less than 10 hours in a day but, in Balochistan, the highest averaged 102.2 hours.

An analysis of power supply quality based on village electrification levels (Table 4.38) shows minor variations in the duration of the power supply across the three electrification levels. The high-electrification area was the worst in terms of duration of power supply in summer, receiving power only 12 hours a day, compared to 18 and 16 hours a day in the mid- and low-level electrification areas, respectively. This was due to the fact that the system meant for a limited number of households was unable to support a larger number. In winter, the duration of the power supply was almost equal. Interestingly, the longest duration of a breakdown also occurred in a high-electrification area of 32.6 hours.

Table 4.37: Average Electricity Supply (hrs/day) by Season, by Province

	Overall	*Punjab*	*Sindh*	*NWFP*	*Balochistan*
Total Households	226	63	55	62	46
Average Duration of Electricity Supply in Summer	15	21	9	20	10
Average Duration of Electricity Supply in Winter	19	21	17	22	13
Average Number of Breakdowns in Electricity Supply in a Month	6	3	12	5	7
Average Maximum Duration of Breakdown (hrs)	22.03	5.23	9.29	8.98	102.21
Average Minimum Duration of Breakdown (hrs)	2.63	0.59	3.73	1.55	9.11

Note: All figures are averages except base count.

Table 4.38: Average Electricity Supply (hrs/day) by Season, by Province

	Overall	*Electrification Level of Village*		
		Upper (Above 66% HHs)	*Middle (34-66% HHs)*	*Lower (Up to 33% HHs)*
Total Households	226	105	60	61
Average Duration of Electricity Supply in Summer (hrs/day)	15	12	18	16
Average Duration of Electricity Supply in Winter (hrs/day)	19	19	20	19
Average Number of Breakdowns in Electricity Supply during Last Month	6	5	4	12
Average Maximum Duration of Breakdown (hrs)	22.03	32.62	12.36	21.87
Average Minimum Duration of Breakdown (hrs)	2.63	3.41	0.90	3.85

Source: AASA Consulting.
Note: All figures are averages except base count.

It must be mentioned that the hours of power supply were not really carrying adequate voltage. Many a time, even a 24-hour power supply was often of low voltage and dotted by erratic voltage fluctuation.

Low voltage in stretches also points to power-sharing or power pilferage, depending on the situation. This fact was often not taken into account by households complaining of low voltage.

Load-shedding

For a normal household, the difference between load-shedding and a power breakdown was unknown – and, perhaps, of not much interest; because for most households, both meant the — the absence of electricity. An attempt was, however, made to apprise respondents of the difference so as to gauge the extent of load-shedding in their respective areas. Table 4.39 shows that over 50 percent of the electrified households reportedly faced load-shedding. However, a majority (89 percent) denied being informed by the power utility of an approaching load-shedding, which, on an average, lasts at least three hours a day. Regionally, Sindh and NWFP were the worst hit by load-shedding.

The incidence of load-shedding was highest in a high-electrification area (75 percent) compared to lower ones (Table 4.40). Also, the duration of a load-shedding spell in high-electrification areas was more than double (4.13 hours) the duration in the lower electrification areas. However, a majority of the households across the three electrification levels were never informed of the impending load-shedding.

Table 4.39: Load-shedding of Electric Power by Village Electrification Level

	Overall	*Punjab*	*Sindh*	*NWFP*	*Balochistan*
Total Households	226	63	55	62	46
Is there Any Load-shedding in the Village?					
Yes	52	38	64	69	33
No	43	48	35	29	65
Don't Know	5	14	2	2	2
Total	**100**	**100**	**100**	**100**	**100**
Are the Villagers Properly Informed about Load-shedding in the Village?					
Yes	11			19	36
No	89	100	100	81	64
Total	**100**	**100**	**100**	**100**	**100**
Average Duration of a Load-shedding Turn (hrs)	3.13	2.41	6.44	2.65	1.89
	N=94	N=31	N=16	N=36	N=11

Note: All figures are percentages except base count. Percentage base is total electrified households.

Table 4.40: Load-shedding of Electric Power by Village Electrification Level

	Overall	*Electrification Level of Village*		
		Upper (Above 66% HHs)	*Middle (34-66% HHs)*	*Lower (Up to 33% HHs)*
Total Households	226	105	60	61
Is There any Load-shedding in the Village?				
Yes	52	75	33	30
No	43	24	57	62
Don't Know	5	1	10	8
Total	**100**	**100**	**100**	**100**
Are the Villagers Properly Informed about Load-shedding in the Village?				
Yes	11	8	15	21
No	89	92	85	79
Total	**100**	**100**	**100**	**100**
Average Duration of a Load-shedding Turn (hrs)	3.13	4.13	2.09	1.53
	N=94	N=53	N=22	N=19

Note: All figures are percentages except base count. Percentage base is total electrified households.

Billing

The power utility is often under fire for the kind of billing services it renders to most rural households. In this study, 71 percent of the households were legally connected. These households were asked if they received bills on a regular basis. Analysis confirmed that 61 percent of the legally electrified households received bills on a regular basis, while around 40 percent did not (Table 4.41). Sindh was the lowest on this count, with only 26 percent reported to be receiving bills on a regular basis. Punjab, on the other hand, had very few cases (7 percent) of irregular billing.

Meter-reading is not commonly done in rural households, which was confirmed by the fact that 55 percent of households receiving the bills did not know if the bill was on the basis of the units consumed. This lack of awareness was highest in Sindh where as many as 87 percent households were not aware if their bills were according to actual meter-readings. Overall, only 33 percent households matched the bills with the actual meter-readings.

Summary

An electrified household, on average, received 15 hours of power supply in 24 hours in summer. Power supply was limited to nine and 10 hours in Sindh and Balochistan, respectively, during the summer months. In winter, the situation improved generally.

Breakdowns occurred six times in a month on an average, but in Sindh especially, breakdowns were the highest, at 12 times in a month, and lowest in Punjab (three times).

Table 4.41: Respondents Satisfied with Electricity Billing, by Province

	Overall	*Punjab*	*Sindh*	*NWFP*	*Balochistan*
Total Legally Electrified HH	161	58	46	42	15
%	71	92	83	68	32
Is Bill Received Regularly?					
Yes	61	93	26	60	47
No	39	7	74	40	53
Total	**100**	**100**	**100**	**100**	**100**
Is Bill According to Actual Reading?					
Yes	33	62		24	47
No	12	3	13	26	
Don't Know	55	34	87	50	53
Total	**100**	**100**	**100**	**100**	**100**

Note: All figures are percentages except base count.

The duration of a power breakdown ranged from a minimum of 2.6 hours to a maximum of around 22 hours in a day, on an average.

An average household in the rural area can seldom differentiate between load-shedding and a power breakdown. Over 50 percent of the electrified households reportedly faced load-shedding. A majority of the households were never informed of the impending load-shedding, which, on an average, lasted three hours a day. Regionally, Sindh and NWFP were the worst hit by load-shedding.

At least, 61 percent of the legally connected households received bills regularly. But very few households (33 percent) could tell if the bill was according to the actual units consumed. This was mainly due to the fact that most rural households were not used to having meters read.

WTP and Affordability

A consumer's WTP for a product depends largely on the value they expect to derive from it. The measure of the expected value is often gauged by observing others' experiences of the desired product. In the case of rural electrification, the WTP of the selected households for electricity reflects the extent of their knowledge of the quality of supply being received by electrified households. It must be reiterated that nonelectrified households were generally located in close proximity to the electrified ones. As a result, not only was the demonstration effect in place – discussed in a later section – but several issues pertaining to the quality of electricity supply were also within the knowledge of nonelectrified households. Therefore, their WTP is not founded on unrealistic expectations of the quality, but on a judgment that verges more on the negative.

CV method (Annex 2) was used to determine the WTP of nonelectrified households to pay for an electricity connection as well as the monthly bill. This was done by comparing nonelectrified households with electrified ones (both having similar socioeconomic backgrounds) for determining the affordability of nonelectrified households.

Through these comparisons, it was discovered that the WTP of nonelectrified households was higher than their affordability to pay for a connection as well as the monthly bills.

Since the basic household profile of the electrified and the nonelectrified households was similar, the actual cost incurred by electrified households was assumed to be the affordability of nonelectrified households. Comparisons were then made between actual connection cost (incurred by electrified households) – inclusive of over-and-above charges – and WTP of nonelectrified households. The comparison reveals that nonelectrified households are willing to pay almost as much as they can afford for a connection (Table 4.42).

Table 4.42 further shows that nonelectrified households, on average, are willing to pay around double the average monthly bill that electrified households are currently paying.

Table 4.42: WTP and Affordability for Electricity, by Province

	WTP for Monthly Bill of Nonelectrified HH	*Average Monthly Bill Paid by Electrified HH*	*Average Connection Fee Nonelectrified HH Willing to Pay for Connection*	*Cost of Connection Incurred by Electrified HH*[28]
Overall Average	547	269	3,714	3,829
Punjab	358	152	3,883	3,928
Sindh	887	409	4,166	4,624
NWFP	515	255	4,468	4,360
Balochistan	431	259	2,547	2,026

Source: AASA Consulting.

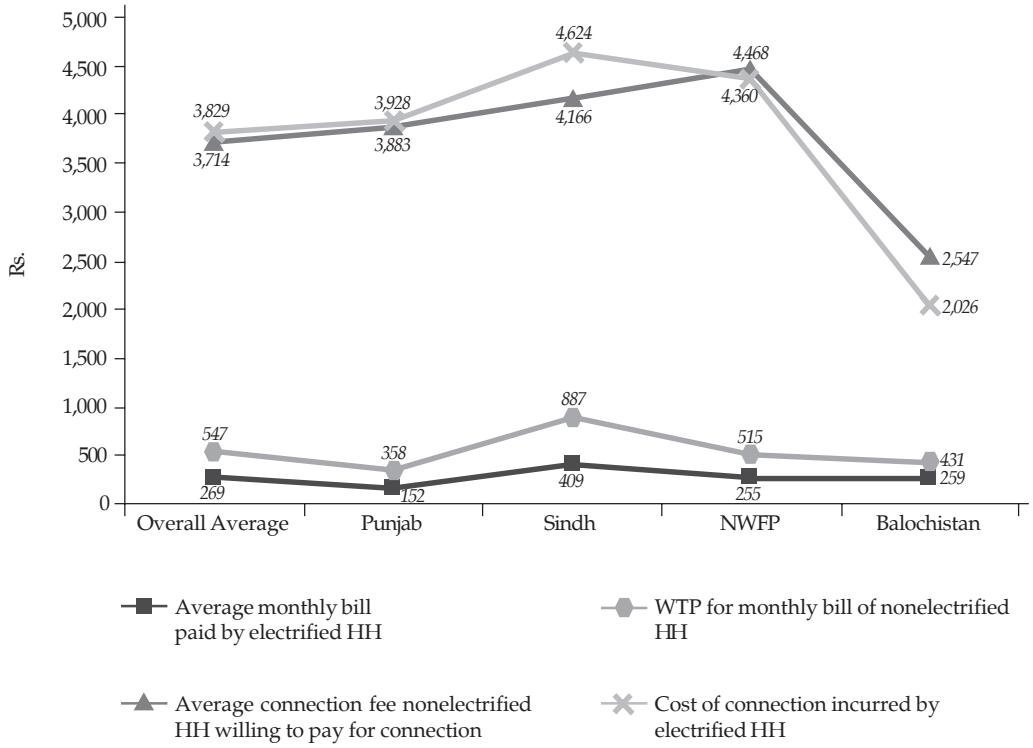
Even provincially, the average monthly bills nonelectrified households are willing to pay are all higher than the average monthly bills being incurred by electrified households in each of the four provinces. What is interesting is that the willing-to-pay amounts are higher by a particular proportion than the actual average in each of the provinces. For instance, if the actual average monthly bill in Punjab is Rs. 152, the WTP is for slightly more than double this amount. Similarly, in Sindh, the actual average monthly bill is reported to be Rs. 409, and the WTP is again double (Rs. 887).

This trend clearly shows that the WTP of nonelectrified households is based on some expectation of a monthly bill being incurred by an electrified household in each of the provinces. The fact that WTP amounts are almost twice the actual averages should be seen more as their eagerness to be connected to the grid.

The connection fee, on the other hand, does not show a similar trend. However, what is again noteworthy is the minimal difference between the actual connection cost averages and the average price nonelectrified households are willing to pay. It may be observed that whatever the actual connection cost charges, the WTP is closer to that amount. The minor variation is possibly due to the fact that nonelectrified households are aware of the prevalent connection rates as well as the over-and-above charges. However, variations exist between provinces. Willingness of nonelectrified households is, therefore, high, so much so that they are even prepared to pay over-and-above charges for a connection.

[28] *Cost of connection is the sum of connection fee and the over-and-above charges paid by an electrified household for obtaining an electricity connection (shown in detail in Table 4.43).*

Figure 4.1: WTP and Affordability for Electricity, by Province



By income level, it is clear from Table 4.43, that while the WTP amounts are almost twice the actual monthly average bills, the connection costs actually incurred are generally lower in most cases than the costs nonelectrified households are willing to pay. This is the case with the overall average, as well as in the upper-income and the middle-income groups. The lower-income group is almost equal. On a different angle, connection cost decreases from the upper- to the lower-income group.

Summary

Nonelectrified households were found to be willing to pay almost the same as their affordability for a connection. They were found to be willing to pay around double the average monthly bill that electrified households pay.

Even provincially, the average monthly bills nonelectrified households are willing to pay are all higher than the average monthly bill being incurred by electrified households in each of the four provinces.

As regards the connection fee, nonelectrified households come close to what electrified households paid for electrification. However, the amounts of nonelectrified households do not incorporate the over-and-above charges paid to power utility officials.

Table 4.43: WTP and Affordability for Electricity, by Income

	WTP for Monthly Bill of Nonelectrified HH	*Average Monthly Bill Paid by Electrified HH*	*Average Connection Fee of Nonelectrified HH Willing to Pay for Connection*	*Cost of Connection Incurred by Electrified HH*
Overall	547	269	3,714	3,829
Upper Income Group (Rs. 8,200 and above)	607	314	4,765	5,383
Mid-income Group (Rs. 5,001-8,200)	487	212	3,350	3,935
Low-income Group (Rs. 5,000 and below)	546	253	2,817	2,741

Source: AASA Consulting.

Overall, the WTP is high amongst the nonelectrified households not withstanding poor quality, of which the households seemed aware. This is not merely evident through the data shown above, but also by the fact that the households have taken into account some of the key aspects of being electrified. While taking into consideration the quality of supply that would be given to them, nonelectrified households seem also to show equal awareness of the connection fee, as well as the prevailing rates of over-and-above charges in their districts and provinces.

Demonstration Effect on WTP

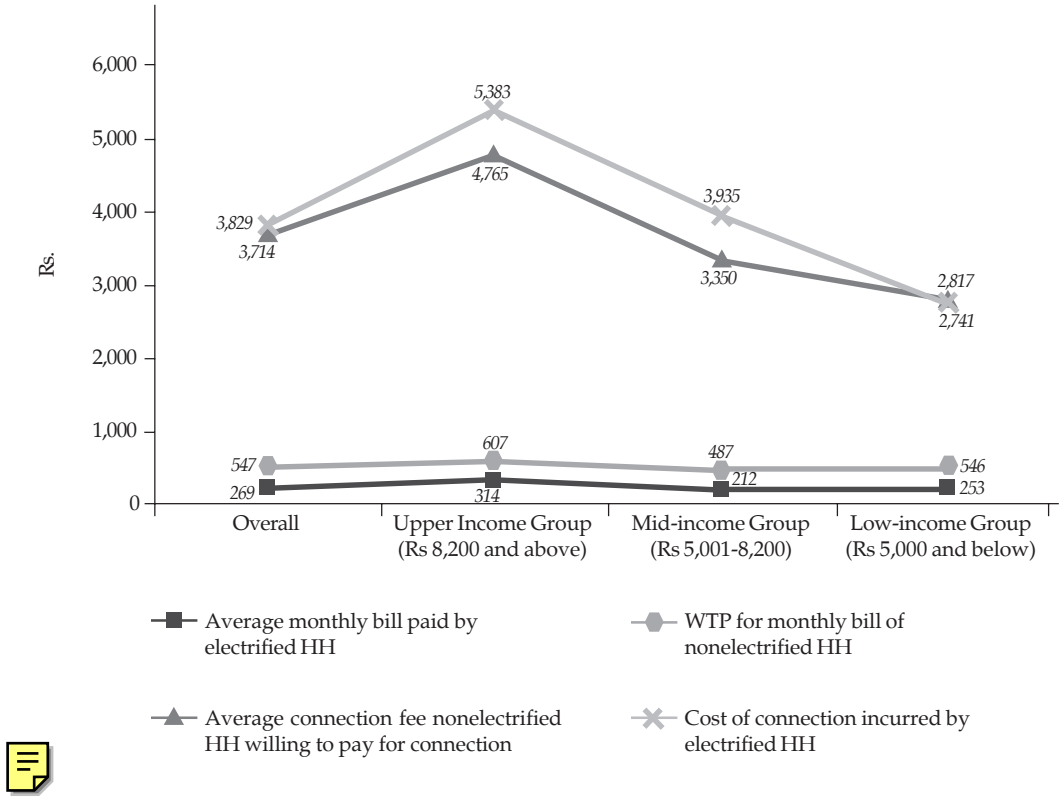
The demonstration effect plays a significant role in creating a demand for a product or service. A focus of this study has also been to measure the extent to which a demonstration effect influences the willingness of nonelectrified households to acquire electricity. A demonstration effect is normally high for nonelectrified households in close vicinity to the electrified ones.

Earlier, in the WTP section, Table 4.42 presented the WTP of nonelectrified households. The WTP was reflected in the fact that nonelectrified households were willing to pay close to the price they can afford.

The willingness of these households was high due to the fact that most of them were situated close to the electrified areas, and were influenced by the demonstration effect.

In this section, the impact of the demonstration effect on the WTP is observed by a comparison of the WTP of nonelectrified households with electrical appliances, to nonelectrified households without any electrical appliances.

Figure 4.2: WTP and Affordability for Electricity, by Income



Findings reveal that 33 households (12 percent) from the 274 nonelectrified ones were in possession of one or the other form of household electrical appliances. These appliances came into these households as gifts, dowry or were sent by a family member working abroad. As shown in Table 4.10 in the occupational profile of the household members, more nonelectrified households had members working abroad, which may suggest a tendency to bring home gifts which are quite often small household electrical appliances. The willingness of such households is often higher than nonelectrified households without electrical appliances, which reaffirms the theory of supply creating its own demand.

A majority of the households with electrical appliances stretched their affordability to as high as Rs. 4,500 for a connection fee (Table 4.44). Their average connection fee was Rs. 4,237.

When the nonelectrified households, without electrical appliances (Table 4.45), were evaluated for their WTP for electricity connections, a majority of them were willing to pay only as much as Rs. 3,500 for an electricity connection. Very small percentages were found willing to pay above this amount. The average amount such households were willing to pay for a connection was Rs. 3,647.

Table 4.44: WTP for Electricity Connection of Nonelectrified Households with Electrical Appliances, by Province

	Overall	*Punjab*	*Sindh*	*NWFP*	*Balochistan*
Total Households	33	12	8	1	12
Affordable Connection Fee (Rs.)					
Below 3,500	33	8	50	100	42
3,500	27	42			33
4,500	21	25	25		17
5,500	6	17			
Above 6,500	12	8	25		8
Total	**100**	**100**	**100**	**100**	**100**
Minimum Affordable Connection Fee (Rs.)	2,138	3,000	1,650	.	2,500
Maximum Affordable Connection Fee (Rs.)	9,000	10,000	8,000	.	10,000
Average Affordable Connection Fee (Rs.)	4,237	4,583	3,950	.	4,050

Note: All figures are percentages except base count and averages. Percentage base is all nonelectrified households.

Table 4.45: WTP for Electricity Connection by Nonelectrified Households without any Electrical Equipment, by Province

	Overall	*Punjab*	*Sindh*	*NWFP*	*Balochistan*
Total Households	241	48	59	64	70
Affordable Connection Fee (Rs.)					
Below 3,500	40	15	47	25	66
3,500	31	71	7	27	27
4,500	7	2	3	17	4
5,500	5	4	3	11	
6,500	10	6	20	14	
Above 6,500	7	2	19	6	3
Total	**100**	**100**	**100**	**100**	**100**
Minimum Affordable Connection Fee (Rs.)	1,508	2,000	1,376	2,267	1,232
Maximum Affordable Connection Fee (Rs.)	8,500	10,000	8,455	7,500	10,000
Average Affordable Connection Fee (Rs.)	3,647	3,708	4,196	4,468	2,316

Source: AASA Consulting.
Note: All figures are percentages except base count and averages. Percentage base is all nonelectrified households.

This confirms the observation that nonelectrified households that own electrical appliances have a much greater WTP in terms of the amount they are willing to pay for an electricity connection, compared to nonelectrified households without any electrical appliances.

Regional variations were significant. More households in Punjab and Balochistan, and barely a few in NWFP, possessed electrical appliances. In NWFP, none of the households were willing to pay beyond Rs. 3,500.

Summary

It is clear from the data given in Tables 4.44 and 4.45, that households undergoing a demonstration effect have a greater willingness to acquire electricity compared to those nonelectrified households which did not have any electrical appliances.

The demonstration effect was also in place when nonelectrified households, found generally in close vicinity of the electrified ones, wanted electricity more eagerly as they watched their close neighbors drawing the benefits of better lighting.

Impact of Electrification on Economic Activities and Social Uplift

A general impression gathered from the respondents of this study suggests that people believe that electricity bestows certain benefits that are not possible with conventional energy sources. For example, electric lighting enables people to undertake a range of additional activities in the evening hours at home.

Also, it was a general perception by households that overall economic improvement will occur, leading to an overall improvement in the quality of life. These views also emanated from FGDs.

Some of the benefits of electrification cited by respondents include economic prosperity, better education of children and improved security, an impression gathered from outdoor lighting.

Respondents also believed that electricity for radio and television would give people access to the mass media not only for entertainment, but also for information and education. Hence, the educational attainment of rural people is poised to be positively affected.

Electric gadgets, such as electric irons, can also relieve household labor, compared to pre-electrification alternatives. Respondents agreed that electric light is brighter and steadier, even at low voltage, and may enable people to spend the evenings more productively.

Furthermore, it is healthier, reduces energy costs, reduces fire hazards and gives a feeling of more security. Notably, through TV and radio, awareness of environmental issues would improve with relatively greater ease.

Boost to Commercial and Agricultural Activities

It was a general view of the respondents that electrification will stimulate different kinds of economic activities ranging from small trade to improvement in agricultural outputs through better water supply from electric tube wells.

Further, improved lighting and electric appliances such as sewing and knitting machines, may promote home businesses and improve the socioeconomic position of women.

Sewing is stimulated by the post-electrification option of electric sewing machines. One of the approaches to evaluating the impact of electrification on households was to observe the daily activities of womenfolk in a post-electrification scenario and comparing them with pre-electrification situations. This has been achieved by observing the routine of females in electrified households and comparing them with the routine of the females of nonelectrified households.

Noteworthy in Table 4.46 are activities such as sewing and stitching, cultivation and income generation and entertainment that have been positively affected.

The average time consumed in sewing in a nonelectrified household is 2.65 hours as against 4.70 hours in an electrified household. The greater amount of time in an electrified household points to the presence of electric sewing machines and, resultantly, a greater usage due to convenience. Due to space cooling, rest takes up more time (around 10 hours) compared to around eight hours in a nonelectrified household.

Income generation is given twice the amount of time in electrified households. Income generation activities by womenfolk in rural areas get an impetus with electrification. This often results from their sewing hobby, which becomes more productive and efficient with the availability of electricity.

Watching TV and listening to radio increased substantially in electrified households. The 1.88 hours in nonelectrified household points to the radio usage. Time for shopping and visiting relatives increased in post-electrification households, mainly due to time saving from other household chores. As a result of the above, time for cooking, reading, bathing and beautification reduced in electrified households, and was spent in other activities.

Table 4.46: Time Allocation (daily hours) by Females in Different Household Chores by Household Electrification

	Electrified	*Nonelectrified*
Total Households	226	274
Cooking	2.48	2.74
Sewing/Stitching	4.70	2.65
Rest	10.03	8.19
Taking Care of Children	2.44	2.42
Looking after Livestock, Animal Husbandry & Grassing	2.72	2.32
Cleaning the House	1.74	1.76
Washing Clothes	3.88	2.91
Watching TV/Listening Radio	3.28	1.88
Visiting Relatives/Neighbors/Socializing	2.02	2.68
Cultivation Activities, Farming and Gardening	6.33	5.74
Water Fetching	1.14	1.55
Religious Practices such as Praying, Reading	1.55	1.76
Reading/Studying	1.58	1.94
Shopping/Visiting Markets	2.81	1.66
Bathing and Beautification	0.69	0.88
Income-earning Activities	4.97	2.00

Source: AASA Consulting.
Note: All figures are averages except base count.

Summary

Overall, a comparison of the daily activities of females between pre- and post-electrification reveals a positive impact. Time-saving, entertainment, information and, generally, greater awareness are key indicators to improved female performance as in post-electrification.

Income generation shows a remarkable increase mainly due to improved sewing and stitching with electric machines.

Their overall time-saving is reflected in greater hours for rest, more time to go out shopping or meeting relatives, more time spent in entertainment as well as more time in cultivation, farming and gardening.

5. Findings from Focus Group Discussions

FGDs with male and female members of both electrified and nonelectrified households were conducted to collect information pertaining to willingness of potential consumers to pay, costs and benefits, expected power consumption and shortcomings with existing system of energy of both types of households (Table 5.1).

Participant Profile

Of the 24 FGDs conducted, eight were conducted with participants from electrified households, and 16 with those from nonelectrified households. Also, of the 24 FGDs, 12 were conducted with female participants.

Table 5.1: Number of FGDs, by Province, Status of Electrification and Gender

Province	*Type of Household(HH)*	*District with Electrification*		*District without Electrification*		*Total*		*Overall*
		M	*F*	*M*	*F*	*M*	*F*	
Punjab	Electrified	1	1	–	–	1	1	6
	Nonelectrified	1	1	1	1	2	2	
Sindh	Electrified	1	1	–	–	1	1	6
	Nonelectrified	1	1	1	1	2	2	
NWFP	Electrified	1	1	–	–	1	1	6
	Nonelectrified	1	1	1	1	2	2	
Balochistan	Electrified	1	1	–	–	1	1	6
	Nonelectrified	1	1	1	1	2	2	
Total	**Electrified**	**4**	**4**	**–**	**–**	**4**	**4**	**24**
	Nonelectrified	4	4	4	4	8	8	

Male FGD

The occupational representation in the FGDs was based on the actual occupational stratification in the rural areas of Pakistan. Pakistan, being an agriculture-based economy, has a substantial proportion of its rural population employed or self-employed as small landowners or tenant farmers, who cultivate small portions of agricultural land for a meagre existence. These form more than half of the total labor force of around 40 million[29] in the country.

In the FGD in both electrified and nonelectrified areas, most participants, by occupation, were small landowners and tenant farmers – confirmed also by the quantitative component of the study. Livestock traders, shopkeepers and masons were few. The occupational profile of FGD participants was made similar to the occupational profile of the place where the FGD was conducted. Participants fell generally in the age bracket of 25-50 years. In their households, these were either decision makers, influencers or actively involved in household financial matters.

The small landowners and tenant farmers earned their living through the biannual produce from small portions of lands that they cultivated, supplementing their incomes also through local livestock trade or small businesses such as running shops or selling dairy products. Most of the laborers earned either by working on agricultural lands or through masonry.

Provincially, FGDs in Sindh, Balochistan and Punjab consisted mainly of small landowners, tenant farmers, or livestock traders, whereas in NWFP, FGDs also included masons.

Female FGD

Female participants were mostly housewives, involved in indoor household affairs, in the age bracket of 20-50 years. However, they would also cultivate crops and support their menfolk in agricultural activities. Such assistance by a female member of the household was not quoted as an occupation, but as a routine household chore. This was observed mostly in Sindh and Punjab FGDs. But, in NWFP and Balochistan, females spent their time mainly looking after their indoor households affairs.

Fuel and Energy in Households

The prime sources of energy or fuel being used by participants in their households were electricity, wood, coal, kerosene, natural gas, cow-dung, and wax (candles). These were

[29] *The employed workforce is defined as all persons of 10 years and above, who worked at least one hour during the reference period and were either "paid employees" or "self-employed." Based on this definition, the total number of employed workforce in 2004 is estimated at 41.32 million. Rural employment increased from 27.36 million in 2003 to 27.91 million in 2004. The agriculture sector absorbs 17.4 million or 42.1 percent of the total workforce as of 2004 (Pakistan Economic Survey – 2003-04).*

common amongst all the provinces although with a certain degree of variation in their usage, resulting from climatic differences, purposes, availability, quality and price. Electricity remained the differential advantage for households that were electrified.

Electrified Households

It must be reiterated here that an electrified household, for the purposes of this report, was defined as one that received electricity irrespective of whether the connection was meter-based or illegally drawn from a nearest electricity point. In this context, it was observed that electrified households were either connected to the grid with meters installed, or hooked themselves to electricity by way of a connection with neighboring households or electricity poles in the vicinity.

Most FGDs in electrified areas had received electricity connections within the last three years or so. But there were also few that had been electrified only a few months ago from the date of the start of the survey.

Participants viewed electricity as useful and beneficial in many respects, although a majority of them agreed that its role was limited to lighting due to its poor quality. Wood was a prime fuel for cooking and for keeping warm during winter. Supplementing it was coal for cooking, which, though not extensively popular, was being used at places.

Kerosene usage, however, had become minimal in the post-electrification scenario. Households which were electrified would keep only limited amounts of kerosene which would be used in lanterns and lamps during power outages – which were frequent. Candles were also common in all households. LPG was available in cylinders for lighting, as was reported by only a few groups. Cow-dung and crop waste were convenient free fuels for many groups, especially for the landowners and tenant farmers, who would, at times, even prioritize these over wood – which, for many households, was not available without a price. Cow-dung and crop waste were excessively used in Sindh and Punjab, and, to a certain extent, in Balochistan.

Nonelectrified Households

Wood and kerosene were the major energy sources for households which were nonelectrified. Such households supplemented their energy requirements through cow-dung and crop residue which, for many, were free home-generated and inexpensive fuels in comparison to wood. Wood, on the other hand, if not chopped from the forest, had to be purchased for a price.

Kerosene played a significant role in lighting the house through lanterns and lamps, and, to a very negligible extent, in cooking – through kerosene oil stoves which were reported by a few FGDs in Punjab. Similarly, LPG in cylinders was also said to be used for cooking and lighting by a limited number of households in Punjab.

Energy Cost and Expenditure

Questions were asked of participants on expenditures they incurred on cooking and lighting, as well as on keeping warm during winter and cool in the sizzling temperatures (Table 5.2).

The expenditure meant cost of electric power, kerosene and wood, which most participants were able to identify due to the very fact that these fuels – except wood, which is also chopped directly from the forests – were normally purchased from the market. Most respondents, however, found it difficult to determine the costs they incurred on cow-dung and crop waste, as these fuels were often home-generated through livestock and self-owned lands, and not purchased for a price from the market; participants, therefore, seemed not to have taken into account their contribution to the overall household expenses.

Fuelwood

While some differences in views on monthly expenditure on wood were observed across the provinces, between districts and also, on occasion, amongst participants in a particular FGD, the differences were captured in range of expenditures and then averaged out into one value, as shown in Table 5.3.

Table 5.2: Average Household Energy Consumption per Month

Energy Sources	*Qty*	*Unit Price (Rs.)*	*Expenditure (Rs.)*
Grid Electricity (units)	73	3.34	246
Kerosene Oil (lt)	5.73	32.8	188
Firewood (kg)	242	3	725

Note: All figures are averages except base count. Figures in parentheses are number of valid (nonzero) observations.

Table 5.3: Consumption of Fuelwood per Household

Province	*District*	*Qty (kg)*	*Unit Cost (Rs.)*	*Average Monthly Expenditure (Rs.)*
NWFP	Buner	334	3	1,000
	Kohat	125	4	500
Punjab	Faisalabad	400	2	800
	Khushab	300	3	900
Sindh	Larkana	240	2.5	600
	Sanghar	167	3	500
Balochistan	Lasbella	175	4	700
	Jaffarabad	267	3	800

Kerosene

Kerosene oil was chiefly used, either through lanterns or lamps, for lighting at night. Views on its monthly expenditure differed between provinces but between districts of a province, opinions were almost the same (Table 5.4).

Electricity

Electricity was available to respondents in eight FGDs. As mentioned earlier, households with electricity were of two kinds: those that were receiving electricity through the grid (meter-based) and those that were drawing power either from neighboring households and villages, or from electricity poles in the vicinity.

Questions were asked pertaining to the amount the users of electricity paid for using electricity. While responses varied from participant to participant, cost ranges were, however, determined based on the overall responses. Table 5.5 shows electricity bill amounts participants with meters paid monthly.

Table 5.4: Kerosene Consumption per Household

Province	*District*	*Qty (kg)*	*Unit Cost (Rs.)*	*Average Monthly Expenditure (Rs.)*
NWFP	Buner	6	32.8	200
	Kohat	4.5	32.8	150
Punjab	Faisalabad	9	32.8	300
	Khushab	6	32.8	200
Sindh	Larkana	4.5	32.8	150
	Sanghar	3.6	32.8	120
Balochistan	Lasbella	9	32.8	300
	Jaffarabad	3.3	32.8	110

Table 5.5: Electricity Consumption per Household

Province	*District*	*Monthly Expenditure (Rs.)*	*Average Expenditure (Rs.)*
NWFP	Buner	300-500	400
	Kohat	300-400	350
Punjab	Faisalabad	100-300	200
	Khushab	50-200	125
Sindh	Larkana	150-250	200
	Sanghar	200-300	250
Balochistan	Lasbella	150-250	200
	Jaffarabad	200-300	250

Cost and Benefit Analysis

Electricity

There seemed to be no denying the fact that electricity had bestowed several differential benefits on people in villages recently electrified. This was a general notion of respondents in all the electrified FGDs. However, these views were not without a barrage of complaints and criticism over the quality of power supply, which are discussed in later sections.

Most of the electrified households used in the FGDs had been electrified within the last three years and, therefore, were not only more appropriate for giving a vivid account of the pre-electrification scenario, but were also capable of distinctly acknowledging the benefits – or losses – accruing from electrification.

In general, participants believed they acquired electricity primarily for the purpose of better lighting at night, space cooling in summers and, especially, for income generation through modest new initiatives that involved electric power – whether it was better irrigation of lands, running shops, eateries, flour machines, or stitching and sewing work. Such commercial initiatives were being pursued without any distinction between a commercial and a domestic connection.

In reality, however, the kind of electricity participants received barely extended beyond the scope of lighting and space cooling and the use of appliances such as TV and radios, for a majority of the households. Even the need for lighting and space cooling seemed only partially fulfilled, the quality of power supply being in question in many instances. Frequent power outages and faint power supply did not allow households to go beyond fans and lights to experience the advantages of other electrical appliances.

Nevertheless, despite the limited lighting and space cooling, participants were able to enjoy advantages, such as time-saving, inflow of information and entertainment through TV and ease in study. A majority of the FGDs listed education of their children as a priority benefit. That children were able to study better, and also at night, a fact which was viewed as another key benefit from having electricity by many FGDs. Most respondents also agreed that the lumen effect from electricity is not produced by any other energy source. Therefore, electricity was comparatively a cheaper energy source for lighting.

Income generation as an activity seemed more a result of better lighting than a direct outcome of electric power supply which may run different kinds of machinery or equipment. Some FGDs found electricity to be useful in facilitating better water supply to irrigate lands, while many participants had started small shops where TV seemed to be a prime attraction for customers. Other advantages cited were cleanliness and easy ironing.

Most participants also had plans to install other machinery or equipment such as flour machines, tube wells, or small businesses that are dependent on electricity. In places where

quality seemed reasonable, the resulting benefits were apparent. For example, FGDs in Khushab reported benefiting from powered water supply through tube wells.

There have been lots of benefits from electricity. Children can study properly and time is not wasted. It has facilitated us in water supply for us and for our cattle. We can use the fridge, TV and machinery.

– A housewife from Khushab, Punjab

A majority of the FGDs encapsulated benefits from electricity in statements such as "general comfort in life." This was reflected through responses such as "going to *masjid* through street lighting and back has become easy," or "have got rid of mosquitoes (with fans)."

We get to enjoy cool air because of fans. We have entertainment now (radio, TV). We can also rest during the day under the fan.

– A housewife from Lasbella, Balochistan

There is comfort; life has become better.

– A female from Larkana, Sindh.

The benefits derived differed considerably amongst the provinces depending chiefly on the quality of power supply. In Sanghar, for example, electric power supply was characterized by frequent load-shedding and "dim light" for days on end, which is why the resulting benefits were smaller than those drawn by participants in Punjab, where fridge and other machinery were also in use, indicating fewer power outages in a month and a more stable power supply.

The voltage is so low that only bulbs are usable. Fans, heaters, and so on, and so forth, can't work at such low voltage. We rely only on natural air.

– A livestock trader from Sanghar

First we used to have lanterns, and would use them whenever needed. But with electricity, there is not only proper lighting, but many other things also we can do with it. For example, our children's education. Our children used to fail in exams as there was no electricity at night when they could study. But, now, they fare better. Expenses have come down. Not that we don't pay the bills. We remain abreast of the latest happenings in the country through news. Through electricity we can also start a business, like a flour machine. But, due to low voltage, the main benefit has been lighting.

– A laborer from Buner, NWFP

Wood, Cow-dung and Coal

Regardless of whether households were electrified or nonelectrified, wood continued to be the prime fuel for cooking. Wood was expended beyond normal capacity during winter for keeping warm, and its consumption soared in the northern areas where temperatures plunged below normal, such as in Kohat and Buner. In all FGDs, because electricity was not directly facilitating cooking, wood was the major source for cooking; and no visible difference was observed in its consumption between electrified and nonelectrified households.

The benefit of wood, as cited by some of the participants in FGDs, was that it was without a direct cost – as many were chopping wood themselves from nearby forests and incurred no expenditure in transportation as well.

As a substitute for the purpose, households were also using cow-dung, which was popular mostly in Sindh, Balochistan and Punjab. Coal was reportedly used by very few households.

Kerosene, Gas and Wax

The primary purpose of using kerosene was lighting. And, unlike wood, kerosene created a substantial difference between electrified and nonelectrified households. Although kerosene was also kept in store in electrified households, it was only to the extent of being used during power outages and load-shedding. In very few instances, kerosene was reportedly used to ignite fire with wood. A considerable expenditure on kerosene was incurred by nonelectrified households, for whom kerosene was a prime fuel for lighting a household. Most FGDs subscribed to this notion.

FGDs in Buner and Kohat, NWFP, also reported using LPG cylinders for lighting purposes, although this was a local choice and was not found in FGDs in other provinces. Wax (candles) was not entirely a substitute for kerosene; rather, it was to supplement lanterns (using kerosene) for lighting.

Electricity Supply: Quality Concerns

This section discusses the quality issues in electricity supply raised by participants in FGDs who had electricity. All such participants, except for one in Kohat, expressed varying levels of dissatisfaction with the quality of power being supplied to them, in response to the question as to whether they were satisfied with the existing power quality.

Participants highlighted an array of issues ranging from voltage problems, load-shedding and power outages to billing anomalies and officials' attitudes, which seemed to be detracting from the overall good that electrification promised to provide.

Load-shedding and Power Outages

The duration of power supply varied across the provinces and even between districts. Except for Faisalabad, where a 24-hour power supply was reported, none of the districts in any of the provinces reported a round-the-day supply of power. This was a clear manifestation of the load-shedding or power failures that remain rampant in most rural districts.

Some FGDs in Larkana and Khushab were coping with limited power supply that did not last even half the day. The duration of electric supply also conspicuously changed with the seasons. Summer was notoriously characterized by continual load-shedding and power

failures. Participants reported more frequent power failures in summer than in winter. In Khushab, the duration of the power supply in 24 hours shrunk to merely two hours in the hotter months of May, June and July. Similarly, in other districts, power supply was reported to be severely disrupted by load-shedding. In all cases, households were not kept informed prior to any impending power outage. But because this had become a routine, households had gradually attuned themselves to such erratic power behavior.

There is hardly any uninterrupted supply of electricity, especially during the day. Power failures are frequent, yet, the bills are exorbitantly high. It seems WAPDA has favored us by providing us electricity.

– A female from Larkana, Sindh

The electricity supply is not at all satisfactory. There is excessive load-shedding.

– A female household member from Khushab

Power supply is always inadequate. Because wiring is not sound, much of the power is lost to the feeble wiring. If a household does not pay the bill, the officials cut electricity from all houses. But, when the wires are damaged, we don't have electricity for weeks.

– A peasant from Sanghar

Whether it was load-shedding or power failure, most participants never knew the difference, as, for them, the electricity was off. Nevertheless, most participants seemed acquainted with both terminologies and would use them interchangeably. In some cases, however, a distinction was made between the two when power outage seemed to have a fixed pattern for a certain period of time. Only in some cases were participants able to call up WAPDA officials to inquire about resumption of power supply. This convenience often happened to be linked to personal cordial ties with a lower-level staff at the power utility office in the region.

There appeared to be enough realization that power outages occurred mainly due to a strain on the network caused by excess load, which suggested that more households than officially registered were drawing electric power. This often occurred when a household with grid electricity shared electricity with its neighbor on certain agreed terms. Such power-sharing is common not only between households in a village, but also between villages within a radius of almost half a kilometer (km), especially in Sindh. This practice, on a wider scale, decreased the already poor power supply to the area.

While participants believed this was happening, they would absolve themselves of the blame. They rather believed that it was their moral obligation to share electricity with their neighbors who, in some cases, were from their own clan.

Only last month, we did not have electricity for three days. When the wires are broken, there is a problem.

– A housewife from Lasbella, Balochistan

Electricity is also consumed in factories but there is no load-shedding there. Why here?

– A laborer from Buner

For most electrified households, it appears to be a matter of ethics to share electric power, just as they would share food, with their neighbors. This is because, historically, when villages apply for electricity, they apply as an entire big family. If, in the first instance, only a certain number of households get meters installed, they feel morally bound to share even the limited electricity with their close ones to ensure that everyone benefits. This tendency gains further strength when households, recalling electrification experiences of nearby villages, suspect that the next phase of meter installation would take months or even years, for various reasons. As a result, the increasing temptation of nonelectrified households to be connected, receives a wholehearted support from the electrified ones, pushing the electrification level of the village close to 100 percent. The very few households, often left in the dark, are mainly due to specific reasons, one of which is enmity between relatives or communities residing within a village.

It is for this reason that the saturation level in villages comes very close to 100 percent. This becomes a debatable matter when seen through official statistics, which seldom reflects this situation.

The blame was occasionally shifted to the power utility for not providing ample load or kilo watt (s) (kW) to properly illuminate households in the region.

They also blamed WAPDA for their venal acts that went unchecked in most districts. Because of this, the power load meant for a limited number of households, was being distributed illegally to other households that exercised influence through political support. The overall result was low voltage to their households.

Participants questioned the concept of uninterrupted power supply to factories in the region – where consumption level is exponentially higher – while keeping rural households, who consume minimal amounts, under the constant pain of load-shedding. They went on to suggest that power supply should be distributed fairly between factories and residential areas. In a FGD in Sanghar, Sindh, participants who were sharing power illegally with neighboring households, suggested transformer kilo volt (kV) should be increased to ensure adequate supply to all households. Some also suggested better wiring and poles to solidify the network so that fewer power outages occur.

Voltage Woes

Many participants also assailed WAPDA for its inefficiency, as they faced unending periods of low voltage and irregular fluctuations.

The voltage is so low, that, let alone heaters or fridge, we can't even use fans to beat the heat…for us, electricity means only bulbs, which are most of the time, dim…if there was adequate electricity, our

businesses would prosper. We would have used flour machines, stitching and sewing machines, fodder cutter.

– A dissatisfied landowner from Sanghar

In Sanghar, for example, participants said they were severely affected by extremely low voltage that did not even allow them to use fans in summers. When asked what they used to keep their households cool in summers, the response was "natural air." Even though theirs was the village that had recently been electrified, Buner participants said that the supply was just enough to light all bulbs properly.

Billing Anomalies

"There can be no one who is happy with the existing billing system."

Perhaps this statement sums up the several complaints and grievances participants shared at the FGDs across all provinces and districts.

Billing issues were common to all provinces and focused on households that had electricity meters. The views emanating from the several FGDs seemed to be converging on key issues like incorrect billing, late billings, unnecessary penalties and official apathy on redressing billing complaints.

Bills were received with doubt and scepticism over the amount charged and the units shown. In most cases, participants vehemently denied having consumed the extra units they were charged for. They believed that all the problems and inconsistencies were symptomatic of a larger malaise – corruption – that governed the power utility. A majority of FGD participants thought that falsification and late billing were intentionally done to extort money from the poor areas with a view to favoring a certain influential class or quarters with better power supply.

FGDs voiced resentment over the exorbitant charges billed to them. The FGD in Faisalabad cited instances of overbilling.

Actual meter-reading differs from reading in the bill. The bill is exorbitant. The meter-reader doesn't come. We don't get bills directly.

– A peasant from Buner

Bills are received generally after the due date has passed, and we end up paying the penalty.

– A laborer from Buner

The bills are exorbitant. We live hand-to-mouth and cannot pay the huge bills.

– A housewife in Larkana

They charge huge bills, specially when there is excessive load-shedding. The meter-reading is hardly taken.

– A peasant from Jaffarabad

Participants also contended that the units shown in the bills are not what their meters revealed. They complained that meter-readers were not meticulous in reading the actual units consumed, allowing the possibility of an erroneous bill to find its way to the user.

Some of the participants also complained they did not receive bills for months, although it cannot be implied that participants ever approached the power utility for this anomaly. Some participants reported that bills were issued, but delivery was a problem; and, finally, when the bill arrived, it showed a collective amount of the past months – which was a strain on the pockets. In Buner, participants expressed concern over the delay in bills to reach their households. They said that the burden of paying collectively for the preceding few months further increased with the penalties that came attached with the bills, although for no fault of theirs.

We haven't received bills for the last four months. Billing is flawed and wrong bills are sent to the wrong people.

– A farmer from Sanghar

We have only recently received electricity, so as such we have no complaints on billing.

– A female from Lasbella

If compared to the reading, the bill is very high generally. Many times, bills are sent without the reading. The bill is so high that the poor cannot afford to pay such amounts.

– A housewife from Khushab

For five units, Rs. 160, but a bill of Rs. 800 came without any meter-reading. For six units, the bill was Rs. 435. They give wrong bills to people. WAPDA doesn't respond to such anomalies.

– A livestock dealer from Faisalabad

Incorrect billing. Meter-reading is not correct. The bill for electricity in school is taken from children and through self-service. The bill is normally high.

– A Faisalabad landowner

When we go to the bank to pay the bills, they don't treat us properly. Readings are generally wrong, varying from 50 units to suddenly 550 units.

– A laborer from Buner

There can be no one who is happy with the existing billing system.

– A driver from Buner

If a household does not pay the bill, the officials cut electricity from all houses. But when the wires are damaged, we don't have electricity for weeks.

– A landowner from Jaffarabad

It is pertinent to argue that rural households may be unaware of the units they consume, and may not be able to correctly relate the bill charged to the units consumed, even from the meters. But their silent outrage at being overbilled seems justified considering the majority of the households barely had any heavy electrical appliances, or an uninterrupted power supply that may be pushing power consumption to high levels.

Also, households suspected that in trying to achieve a certain revenue target from a village, WAPDA officials often charged households for units not consumed by them.

Several participants proposed that bills should, in any case, be reduced and meter-readers do a better job of accurately noting down the reading and reflecting the actual consumption in the bills. In Sanghar, participants suggested that WAPDA officials come for discussions to churn out solutions to billing problems they faced.

A dedicated person for two-three villages who supplies bills regularly on time. Meters should be installed. If the bills come keeping in view we are poor, we will be able to pay the bills.

– A housewife from Larkana

Participants stressed that monthly reading should be done and officials should themselves come to check the meters.

Meter-readers should also become punctual and should not come after two-three months. They should at least do the work they are paid for.

– A peasant from Buner

Official Apathy

Whether it was power outages, voltage fluctuations or bloated bills, all problems pointed to the one single source – corruption – that participants saw as the root cause of most of the ills that corroded the working of the power utility. Corruption manifested itself mostly in the way officials dealt with users. Their attitudes and willingness to tackle customer issues were oriented toward monetary gains. In Larkana, a female FGD revealed the despicable attitude that WAPDA meted out to customers as they approached them for resolution of their problems: "It seems WADPA is favoring us by giving us supply of electricity." It was clear from discussions that officials seemed least bothered by the problems people faced and tried to exploit situations as and when it suited them. In places like Sindh and Balochistan or even Punjab, villages that are without electricity generally suggest:

We need new meters. New poles. WAPDA has not been able to erect poles entirely. Some houses gave Rs, 6,500 and some Rs. 3,200. Plus WAPDA also took Rs. 500-700 for wiring. Also took Rs. 200 per meter. In failing to pay, WAPDA did not install the meters.

– A shopowner from Faisalabad.

*If there is a problem, officials don't act promptly, rather they come after two-three days, that too after many phone calls and "*sifarish."

– A laborer from Buner

Monthly reading should be done and officials should themselves come. Honest people from WAPDA should come and discuss our problems with us.

– A laborer from Sanghar

Respondents said that one way of solving the problems was that the WAPDA personnel come and discuss the problems with them so that a mutually viable solution could be found. Some were also of the opinion that complaint centers should be created at accessible locations and somebody should monitor them to check if staff is present on duty.

Willingness to Acquire Electricity

This section evaluates the willingness of households which are nonelectrified to acquire electricity, based on responses to select questions ranging from perceived benefits of electricity, WTP a certain price, to shortcomings from existing energy sources and willingness to avail a loan to acquire an electricity connection.

The questions elicited responses on willingness to purchase electricity, which centered chiefly on the electricity benefits perceived by nonelectrified households and their dissatisfaction – or satisfaction – with existing fuels or sources of energy. Also, an attempt was made to gauge their level of enthusiasm in acquiring electricity against the costs involved in acquiring the connection and the bills required to be paid monthly.

Participants in almost all FGDs answered in the affirmative when asked if they would be willing to acquire an electricity connection. Their willingness rose mainly from the perceived benefits that seemed to be creating the demand for electricity. In the same breath, participants expressed their dissatisfaction with the existing fuel or energy they were expending, but with much inconvenience and reportedly at higher costs. As most were keen on acquiring electricity, they displayed a positive attitude toward managing the initial wherewithal for the connection, as well as coping with the monthly electricity charges.

For most FGDs, electricity had been a much-awaited facility. These views from the participants of nonelectrified households also reflected issues being faced by electrified households, which have been discussed in the preceding section. Despite such knowledge, there seemed to be a strong desire and readiness to obtain electric power.

Inadequacy of Existing Sources of Energy

The inadequacy of the existing sources of energy – wood, kerosene, gas, diesel, cow-dung, crop waste and coal – appeared more glaring when compared to the advantages of having electricity. This comparison was natural and perhaps inevitable. In districts, nonelectrified

households were not situated very far from electrified clusters. In fact, in some cases, nonelectrified households were found within clusters of electrified villages. Such small proximities (demonstration effect) gave rise to comparisons, the corollary of which was an overwhelming sense of deprivation by nonelectrified households as they saw power benefits – to whatever extent they might be – being reaped by neighbors not too far away.

This led to dissatisfaction with the existing fuels and energy, which, in turn, was a logical manifestation of a desire to acquire electricity – whether legally or illegally.

The demand for electricity arose mainly for fulfilling three basic purposes: lighting, space conditioning and use of electrical appliances. The need for lighting was fulfilled by lamps and lanterns which consumed kerosene. Natural gas and candles were also used but for brief periods – on occasions when lanterns ran short of kerosene or for occasionally supplementing the existing light.

As such, kerosene and gas were not reported to have any critical disadvantages, except that they were considered expensive when expended for continuous lighting at night as reported by some of the participants.

"No (not satisfied). The expenses are more than the revenue. Diesel and kerosene oil are expensive.

– A peasant from Faisalabad

One shortcoming common to kerosene, gas or wax was that the lighting it created through lamps or lanterns compared to one normal electric bulb was not adequate. Several participants were concerned that poor lighting severely affected eyesight and that their children were unable to study in limited light. In addition, these fuels could not be consumed endlessly round-the-clock. Unlike electricity, which powered innumerable appliances, kerosene or gas ran only a few.

It was mainly lighting through which electricity had created a major difference in the lives of the participants. Electricity facilitated cooking in two respects: allowing the use of appliances such as juicers and grinders; and facilitating culinary activities through significantly better lighting and space cooling (fans), due to which people not only functioned more comfortably but also more efficiently. The time that electricity saved was otherwise usually lost to the inconveniences involved in conventional fuel.

For cooking purposes, wood topped the list. However, several FGDs, mostly in Sindh, Punjab and Balochistan, also reported utilizing cow-dung and crop waste for cooking. Unlike fuels used in lighting, wood and cow-dung had several problems attached to their consumption. Most critically, it was the smoke that people unanimously complained about. Wood was considered expensive and difficult to fetch and burn.

It is very time-consuming …. It is hazardous to health. Causes eye diseases.

– A female from Khushab

Wood or cow-dung caused excessive smoke on burning. The smoke, participants felt, was hazardous and often caused eye diseases and excessive coughing. While a majority of women were used to cooking on wood stoves, and people in general also enjoyed wood fires in winter, they were cautious about their own and, especially their children's, eyesight, which they feared was severely affected by the smoke. Smoke never allowed people to settle comfortably.

There are lots of eye diseases in our area, caused by wood fire.

– A peasant from Buner

Also, it generates a lot of smoke which causes cough. Wood is difficult to burn.

– A female from Lasbella

Smoke causes illnesses. Due to illiteracy, people do not take precautions – they normally remain ill. Women are more prone to illnesses.

– A peasant from Faisalabad

In some FGDs, mainly Lasbella and Larkana, participants complained that just to light up fire with wood was time-consuming. Participants raised concerns over wood quality, saying wood was often damp and difficult to burn, especially during rainy days.

Participants also feared wood prices were rising mainly due to a scarcity of forests that were fast approaching depletion due to excessive consumption.

Wood is becoming scarce by the day due to excessive use, which is why its prices are going up, becoming gradually unaffordable.

– A livestock trader from Sanghar

Participants in Larkana and Lasbella FGDs believed that wood had not only become expensive, its transportation too was a cumbersome task. This stood to reason as most forests in these districts have vanished over time, and people travel to far away forests to chop wood. In such a case, fetching wood was not easy considering that the only transportation available was animal carts or bicycles. The latter were not an easy ride on the uneven, ploughed land from where wood was normally fetched.

Difficulty bringing, quality is bad, especially during rainy days. Accessibility is also difficult.

– A peasant from Larkana

It is difficult to burn; there is a risk of fire; transportation problem. Is expensive and produces excessive smoke.

– Landowners from Lasbella

And if all these disadvantages are combined, the overall costs comes to be very high.

– A laborer from Buner

Lack of electricity has caused us lots of illnesses and problems. People who had skills and talents have migrated from this village. Due to a huge population, the wood is getting scarcer by the day. It's all an agriculture land. If it doesn't rain, poverty creeps in and, on the other hand, things are already getting expensive. Kerosene is for Rs. 40 and petrol for Rs. 70. How do we fulfill our requirements?

– A peasant from Khushab

Perceived Benefits

Despite being accustomed to their existing energy sources, nonelectrified households wanted electricity for the benefits it entailed.

Participants said they would use electric power for lighting their houses, for ease and comfort, cooling, entertainment, running business and better irrigation. It is likely, and perhaps natural, that these benefits were what they had been seeing in their neighboring electrified villages. All they were to do once electricity arrived was to emulate what was a natural outcome of electrification.

There were participants in some of the FGDs who believed that many other benefits would accrue.

We will have greater maturity and consciousness.

– A peasant from Larkana

Income Generation

The notion that electricity facilitates income generation was strongly upheld by participants who had no electricity. While this could be due to a compelling eagerness to avail of electricity, it also indicated their confidence in electricity as a means of positive change in their lives, even if it was of poor quality. This was their perception, gained chiefly from their observation of other electrified households in the vicinity.

For some participants, income generation did not merely mean the initiation of a new venture, but also meant the ability to capitalize on the time saved through electricity. In Buner, for instance, participants expected that the time spent on fetching wood would instead be used in earning money through labor.

The time spent on fetching wood will be spent on earning more money through labor….We'll be able to work day and night.

– Buner laborer

In other FGDs, participants said they would start flour machines, tube wells, and, through a better water supply alone, better agriculture yield would result in greater income.

Yes. Oil expenditure will reduce. Oil is very expensive these days. Cotton and wheat crops will be better. If adequate supply of water is available, per acre production will increase.

– A landowner from Faisalabad

Yes. We use tube wells and diesel engines which costs Rs. 1,000 to supply water to one acre land. When we have electricity, we'll have a tube well, which will save this expense. We'll save by not using kerosene oil any more for lighting.

– A housewife from Faisalabad

After electricity, people will be able to cultivate vegetables and fruits, as well as start small businesses. Lots of work will be generated such as motor, welding, plumbing. Car workshop as well.

– A peasant from Khushab

Females, on the other hand, had other ideas regarding income generation. For example, female participants in Khushab revealed: "*It will promote new businesses and reduce unemployment, such as sewing and stitching. Shopping centers will be developed. And private schools will be established which will improve the educational standard here.*"

Price Factor: Connection Charges and Monthly Bills

For most participants, who are desperate for electricity, the price of an electricity connection and the monthly bills was secondary compared to the benefits they anticipated. However, it is probable that participants at least had a vague idea of the price they would have to pay for electricity. They were willing to pay connection charges ranging from Rs. 500 to Rs. 6,000. However, most had quoted amounts in the vicinity of Rs. 3,000. As regards monthly bills, participants were willing to pay anything under Rs.1,000. The bill amount was quoted below Rs.1,000 mainly because they knew that their power consumption would only be limited to a few appliances such as bulbs, fans and household tube wells. Also, they seemed to have taken into account the quality of electricity that would be supplied to them – a fair idea of the quality of electricity supplied seemed to have been taken from distant electrified counterparts.

Overall, they believed merely by having electricity, regardless of its quality, they would fare much better.

If we sum up these costs, the bill would only amount to one-fourth of it.

– A peasant from Buner

A huge majority of the participants, when quoting electricity connection charges, took into account the money they would have to pay to WAPDA as over-and-above charges, without which WAPDA would not budge.

Electricity Connection through Loans

There was clear willingness amongst the participants to avail of a loan facility for an electricity connection, provided that the installments were easy. However, almost half of the respondents

were also confident they would manage the wherewithal without any institutional support, as also revealed in the quantitative section discussed earlier.

Participants who wanted a loan for a connection said they would also like to avail of a loan for purchasing electrical fittings or other electrical appliances or machines that would help them generate income.

If we are given an option for loan, we shall avail of it. And try also to save from it to return. This will be good to us. Certainly we will have to avail of that loan.

– A peasant from Buner

Yes, we will go for loans on easy installments. Besides this, we'll seek loans for acquiring electrical appliances and machinery.

– Khushab females

Yes. We will go and even ask for loan, for the sake of electricity. Our homes and businesses are being ruined just because we don't have electricity, as water is difficult to draw without electricity. People have started leaving this village due to drought from lack of water. Electricity is required to get water.

– Male participants from Lasbella

Access and Availability

While there seemed to be a growing desire amongst participants to acquire electricity, it appeared that only a failure on the part of the power providers and a lack of local political will were responsible for keeping nonelectrified households in the dark.

Nearest Electricity Point

Even though many participants saw electricity pass by only a km away from their households, they could hardly fathom the amount of time, the resulting frustration and money that would be required before they actually saw a bulb illuminate their house.

Most villages where FGDs were conducted were not far from the nearest electricity pole or another electrified village. These villages were not located in areas that were overly remote or inaccessible. What was inaccessible was the power supplier itself.

It transpired that most participants had been given indications by authorities of the arrival of electricity in their villages. In several instances, participants anxiously awaited a response to the connection requests they had long submitted to WAPDA, and the wait seemed to be never-ending. There was general resentment over WAPDA's ineptitude – or vested motives – as regards providing electricity to applicants who had long paid the due price for it.

The officials don't want to give us electricity. And when we meet them, they don't even consider our request for electricity. Other than that, none in our village understands the official documentation

which is why the officials disregard us. We ourselves are ready to labor if the government is willing to provide us wires and poles. So far, no poles are in sight; and neither any infrastructure for electricity, which is why we haven't received it yet.

– Buner participants

Vested Political Interests

In this day and age, electricity is a common basic need. Such basic needs are often exploited by politicians for their vested interests. In rural areas, specially, politicians often exploit low-income groups promising them fulfillment of their basic needs in return for votes. However, not all politicians are able to keep their word. Small politicians usually fail due to their limited clout, but the bigger ones are often able to live up to their promises. Politicians are nonetheless viewed with cynicism.

What came out clearly in several FGDs was a strong disbelief in political will. Participants lamented that their local leaders had failed to provide them electricity despite earnest promises made during the elections. This complaint was common across all provinces. At the same time, there was no denying the fact that political leaders act as catalysts in obtaining and expediting electricity connections to villages.

Politicians come for votes and give hopes of electricity but none has been able to provide an electricity connection to us. They just talk and do nothing else. Waderas want to keep us below them. They don't want us to progress or step forward in life.

– Sanghar participants

Considering that local political leaders have occasionally exploited people and manipulated them for their votes, participants believed it was possible that by not assisting them with the provision of electricity, political leaders were trying to keep them under their influence. This feeling was common in Sindh and even in Punjab.

Because political individuals do not want this to happen. They want to keep us under their control. Whatever grants or funds come, they devour them amongst themselves. This is why this area is undeveloped.

– Khushab females

WAPDA has got grant money to provide electricity. The government should properly conduct a survey. This is a very fertile area and there is more need. The landowners should get some facilities to produce even better. The political people here do not want us to get electricity.

– Faisalabad males

Political leaders were generally believed to be having connections with officials in WAPDA with whom they had a mutually beneficial relationship. While participants viewed the politicians with severe scepticism, they had no other choice but to rely on them, as, without political backing, electricity was only a dream. At times, when people would refuse to support

the local leader due to his dubious role in the past, they would be inviting greater pains for themselves.

As some of our menfolk did not vote far a particular politician, that political group used its influence on WAPDA officials and ensured that we did not get electricity. They even went to the extent that they uprooted some of the poles that had been erected already. Hence, electricity passes very close from us and we don't have it – for political reasons.

– Faisalabad females

Our nazims, khans, do not convey our woes to the concerned. At every election, we are made promises which have never materialized. A lot of people have applied but no action has been taken by the authorities/officials. All measurements have been taken but, so far, no electricity has come to us.

– Peasants from Buner

Over-and-above Charges

There appeared to be a general impression that without any over-and-above money, WAPDA officials would do nothing for the common man. No matter at what stage the application is, at any point WAPDA had the ways and means – and policies – to prevent a connection from reaching its due applicant.

It appeared that WAPDA extorted money with impunity, and people had no place to go to lodge a complaint and receive justice or a concrete justification from WAPDA.

We have submitted the application, but the government has so far done nothing on that. Also, because we have not paid over-and-above charges. Others have paid over-and-above the official rates, which is why they got it. Plus, we don't even have anyone who is influential.

– Jaffarabad males

We have tried, but maybe haven't tried enough. We don't have the money and can't afford it.

– Jaffarabad females

Electricity was approved for our village/area during Zia's tenure. Now they say there is no budget.

– Lasbella peasants

Cannot afford the huge over-and-above charges that authorities/ officials demand for a connection.

– Jaffarabad males

Power Thefts

What seemed to be an obvious outcome of WAPDA's apathy and corruption was an increase in power thefts. Participants, in most cases, were comfortably connecting themselves to their neighbors – with a meter – and there was an amicable understanding on sharing monthly bills and other related expenditures. In fact, as mentioned earlier, neighbors often felt it a moral obligation to share power with their neighbor within a village or cluster of households.

6. Conclusions and Recommendations

Findings of this study safely suggest that the demand for electricity is high in the rural areas of Pakistan. Rural households feel that electricity is as much a necessity for them as it is for their urban counterparts. Due to this, they feel it is their right to have electricity.

Willingness to Pay

This finding has its foundation on a strong WTP for electricity in the nonelectrified rural households. It is amply evident that the willingness of nonelectrified households to pay for electricity is high, and their strong desire to obtain electric power has compelled them to be willing to give much more beyond their affordability. This is not merely evident through statistical data, but also by the fact that the households had taken into account some of the key aspects involved in being electrified, such as the overall improvement in quality of life, perceived by income generation, and the fact that electricity had no substitute in terms of quality of lighting.

Consumption Patterns

Rural areas are becoming increasingly conscious about the fact that conventional energy or fuel used for the basic purposes of life – cooking, lighting and space conditioning – are being fast overtaken by new energy sources. And, even in the remotest of areas, people seem to be fully aware of the benefits of electricity. This is despite the knowledge that the quality of electricity being provided to the rural areas is generally poor.

It is not that with the arrival of electricity rural households would cease to expend on energy sources that compete with electricity. Kerosene perhaps will continue to remain a regular fuel even in electrified households, in view of the inconsistent power supply. But households agree that the lumen effect of an electric bulb will never be matched by kerosene. Also, electricity has no transportation costs; and, other than lighting, even with moderate supply, it runs several basic household appliances which its conventional substitutes do not.

Connection Costs

In view of a strong WTP for a connection, connection costs do not appear to be a reason households would not go for electric power. Connection costs are not without over-and-above charges that are injected to expedite the process of connection. But households are willing to bear even such undesired costs. Yet, they continue to wait for a connection for longer periods. This pushes them to opt for illegal means of getting connection – either through their neighbors, or hooking up directly with the grid.

A credit facility has been welcomed, but may not be worthwhile as households have, by and large, expressed their desire to manage the connection costs from their own resources.

Impact of Illegal Connections

The study discovered at least approximately 30 percent households illegally connected to the grid, and many reported reasons that only suggested that legal connections were difficult to obtain.

There is no statistical evidence that may support in highlighting questionable practices by power utility personnel directly interacting with consumers. But perceptions gathered from FGDs reveal that power utility personnel are often involved in venal practices. This trend discourages legal connections, and favors the illegal.

Cost and Benefits and Social Uplift

Women showed a high level of awareness, and some of their perceived benefits from electricity included those related to greater comfort in life, better education for their children and economic well-being. Despite several quality concerns, households believe that electricity gives them a sense of advantage, indicated through time-saving, inflow of information and entertainment through television, and ease in study.

The impact of electrification on income was not captured, but perceptions suggest that an indirect outcome of electrification, caused more as a result of better lighting rather than a direct outcome of electric power, could be increased employment.

The conclusions of this study have led to certain recommendations for consideration. These are technical and administrative in nature, with implications on policy:

Technical

To reduce distribution losses, the following steps are suggested:

- Insulated copper wire should be introduced. This will automatically reduce the possibility of power theft directly from the grid;

- As far as possible, wiring should be placed underground, which may significantly reduce power losses;
- Prepaid meters should be introduced so that billing distribution and connection delays could be minimized;
- Automatic circuit breakers should be installed on pole-mounted transformers so that excess load being consumed could be controlled;
- Check meters should be placed across the distribution network to monitor the electricity supply and consumption; and
- Due to the poor quality of meters, electric meters should be replaced every four or five years for consistent reading as per consumption.

Policy

Several policy measures were taken in order to provide electricity connections to householders in a smooth and transparent manner. Some of those measures include:

- Findings show that households want electricity even if they have to go beyond their affordability. Provision of electricity to every rural household should be made mandatory, regardless of their affordability to pay for a connection fee. The initial cost should be borne by the power utility which should recover it from households in their monthly electricity charges. This is possible because households revealed their WTP monthly bills higher than their affordability. The purpose of doing so is to ensure that no monetary transaction is involved so as to lead to over-and-above charges;
- Political influence on and within power utilities should be curtailed;
- There should be no bank charges or any sorts of hidden charges during bill payments;
- Formalities and unnecessary bureaucratic hurdles should be removed for easier application for a connection, and consumers should have a one-window facility where they could fulfill the documentation requirements of the power utility;
- Public awareness campaigns should be held in order to educate the people about installation of quality electrical fittings, such as wiring that matches the power load, switch panels and boards. Using quality fittings according to the power load will also reduce electricity consumption by 5-10 percent within a household. As a result, excess expenditure in the future can be pre-empted;
- The government should focus on expanding the grid network while ensuring that the electricity supplied is meaningful for a household, and not characterized by frequent power failures and low voltages; and

- Power generation plants installed in urban areas should be shifted to the rural areas, where they will still have the strength and capacity to cater to several villages in a district. The cities will, in turn, get new power plants to meet their power demand. This practice has also been adopted in India, where power generation plants in Mumbai were shifted to the suburbs of Gujarat.

Administrative

Administrative suggestions are focused on reducing losses accruing from certain administrative practices. These include:

- Free units given to power utility employees should be replaced with an equivalent addition in their salaries and wages. This will help curb the practice of misusing units which, too, leads to overall administrative losses; and

- Also, electricity meter production and supply should be increased to remove the possibility of electricity being provided without meters. Also, there is a need to critically review and investigate the billing and collection practices of power utilities.

Annex I

Terms of Reference

Terms of Reference and Scope of Work

A study based on the HIES 2001, and limited survey/focus interviews, is proposed to be conducted with the following objectives:

1. A quantification of financial and economic benefits and costs of providing access to a rural or peri-urban community; and

2. Willingness of potential consumers to pay, and their expected consumption.

HIES data have been used in the past by the World Bank in conjunction with utility statistics on household consumption by slabs, for different regions and each month, and per capita expenditure deciles developed. Barring a few exceptions, the overlay of HIES and utility statistics has provided a fairly rigorous base for quantifying financial benefits, and for undertaking economic analysis, such as the one proposed under this study.

Scope of Services

Based on the above-mentioned terms of reference (ToR), the following scope of services are proposed for this project:

1. Identification of two categories of households and ascertaining their socioeconomic profiles, for example, income level, social status, geography, and so on, and so forth:

   – Already connected with electricity; and

   – Currently not connected with electricity but could be connected to the national grid.

2. Development of a framework for assessing the willingness to pay based on the following:

   – Gross benefits due to relative cost of alternative energy (kerosene for lighting) – used as a basis in an earlier rural electrification project in Pakistan;

   – Enhanced income/benefits from using electricity, using the netback approach;

- Net benefit (cost of alternative energy, less cost of grid/off-grid electricity); and
- Foregone benefits due to not being connected to electricity network.

3. To undertake a cost-benefit and financial analysis of a few possible projects for the two categories, for example:
   - Already connected households benefiting from improved quality of access; and
   - Household currently not connected benefiting from extension of the grid and switching to improved lighting, space cooling and use of appliances.

Accordingly, quantitative and qualitative information will be collected on motivation for households to get connected to the electricity network, barriers to connection, alternatives and options, consumption quantity and expenditure for different end uses (lighting, space conditioning and appliances), perceptions regarding quality of electricity supply and effects of electricity prices on household budget. Method of information includes a survey, FGDs and available data from secondary sources.

Based on the sampling scheme, 500 households will be covered in eight districts and 24 focus group interviews will be conducted besides review of existing publications/studies.

The information gathered would, among other things, consider the following factors into account:

A. Electricity consumption by different end users: Electricity consumption is envisaged for lighting, space cooling (fans, coolers, air conditioners, heaters) and appliances (TV, washing machine, iron). These consumption patterns will be calculated by different classes, and based on a monthly budget. For households not connected to electricity network, consumption of kerosene (lighting) and other fuels (heating), and the consequent expenditure would be measured.

B. Electricity price and poor payment tradition in selected areas: It is popularly believed that the electricity tariff for households in Pakistan is "excessive," and, yet, one does not observe this phenomenon reflected in improved electrical appliances or behavioral changes for efficient electricity consumption. At the same time, pilferage of electricity is a known practice in several areas – even where electricity consumption is recorded and billed – the payment tradition is weak (Federally Administered Tribal Areas, Karachi area). Through this study, the impact of this practice on nonelectrified households will be measured.

C. Connection fee: Electricity is generally cheaper than kerosene for lighting for a given amount of lumen, but a one-time connection fee may be a barrier for poor households. The study will first address the extent to which the connection fee prevents households from becoming electricity consumers, and, secondly, the relationship between electricity access and availability of credit.

D. Impact of illegal electricity connection: Although no official statistics exist, there are reports that some poor households in "*kutchi abadis*" (nonconcrete habitations) are illegally connected to electricity network, and are actually paying a lot to those from whom they "buy" electricity. By definition, such consumers would be willing to pay for legal connections much greater amounts than what may be generally assumed. The study would attempt to quantify the generalized cost of illegal connection, and the willingness of such households to pay for legal connection.

E. Investments in extension of network by the utilities: Electric utilities have historically embarked on rural electrification/extension of network, based on two criteria: (a) proximity to the existing network; and (b) number of potential customers along with an assumed minimum consumption. There have been occasions when economic criteria may have been moderated by political considerations. The study will also capture the possibility where public-owned electric utilities were to extend the network beyond economic considerations; in such a scenario, and try to assess whether those households with lower WTP would get access to electricity.

F. Quality of supply: Existing rural consumers, and peri-urban areas, are known to be bearing the major brunt of electricity load-shedding in the shortage months, and the quality of supply (voltage level) is generally poorer than that in urban areas. The study in this connection will look into the quality and reliability of supply in different areas in recent years, its impact on unconnected consumers who have applied for an electricity connection. It also includes the impact on payment discipline among connected consumers.

G. Climatic conditions: There are many regions where major use of electricity includes use for lighting and amenity appliances (without the need for space conditioning). Another purpose of this study is to see the impact of these conditions on WTP for electricity connection.

H. Demonstration effect and availability of credit: Pakistan has witnessed the inflow of remittances from overseas Pakistanis, and appliances are allowed to be imported freely. Similarly, there has been easy credit available to urban households in recent years, which is generally used for acquiring electrical appliances. Agriculture credit has often been used for nonagricultural pursuits (such as acquiring electrical appliances). The study would measure the impact of these phenomena on WTP for an electricity connection.

I. Impact of electrification on economic activities and social uplift of households: It is generally understood that electrification of households leads households to pursue economic activities (which results in additional income generation) and expenditure on priority social needs (education and health services). The study will attempt to quantify these for different household categories.

Annex 2

Methodology and Approach

An Overview of the Contingent Valuation Method

The analysts usually rely on people's revealed preference (RP) for the commodity or service, using behavioral data to estimate parameters of demand and simulate coverage rate. Unfortunately, this approach often does not work for such service where no historical data exist in the context where the plans are being made. By definition, new government policies and improved products are beyond the range of historical experience. In this setting, the analyst typically has to rely on Stated Preference (SP) approaches such as contingent valuation surveys (also called WTP surveys) that directly elicit willingness (and ability) to pay statements from respondents. In other words, respondents are directly asked about their WTP. The method involves the development of a hypothetical market in the context of in-person surveys. In the hypothetical market, respondents are informed about the current problem, and the policy designed to mitigate the problem. The state of the environment before and after the policy is described. Other contextual details about the policy are provided such as the policy implementation rules (for example, majority rule) and the payment vehicles (for example, increased taxes or utility bills). Finally, a hypothetical question is presented that confronts respondents with a choice about improved environmental quality and increased costs versus the status quo. Respondents can be presented with multiple scenarios and make multiple choices.

In addition to solving the problem of missing "behavioral data," consider two advantages of conducting WTP surveys in this context. First, seeking households' opinions and preferences during the planning and design stage (participation) is widely viewed as an important ingredient of the economic development process. Second, the typical WTP survey presents an important form of experimentation which lies somewhere along the spectrum of laboratory experiments and observational studies. Such survey-based "field experiments" represent a practical mix of control and realism. Control comes from the design of the survey sample and the structure of the survey instrument. Contrasted to the laboratory settings of experimental economics, realism comes from interviewing people in their homes about goods and services that are important to their daily life, and considering the infrastructure programs that are familiar to respondents.

Although CV methods are gaining favor with researchers, several potential problems have been identified. These problems can be categorized as potential "biases," strategic behavior and the embedding effect. The potential biases identified in the literature are: the composition of the sample, the payment vehicle, levels of information, the "hypotheticalness" of many valuation scenarios and starting point bias. All of these biases can potentially influence a respondent's WTP for provision of a public good and may, thus, impair the final results of the analysis. These factors are discussed below.

Sample Bias

Sampling bias is a problem common to all surveys and questionnaires. It refers to the potential for the sample used in a study to not reflect the true population of concern. It is possible, however, to remove this bias with proper research design and management. These designs and procedures were incorporated into this study to the best of our ability.

Starting Point Bias

Starting point bias is a problem of the iterative bidding method commonly used in personal interviews. This bidding method involves providing respondents with a value which they are asked they would be willing to pay. Following their response, additional values are provided until the individual's maximum willingness to pay is provided. The bias is a consequence of using a constant starting point bid, and the direction of incremental changes used to arrive at a final value. For example, if the method used starts with a constant low amount and the incremental changes in the bids work upwards, the final WTP value will be biased downwards. The bias will be reversed if bids start high and work downwards. This study uses different starting points (iterative bidding) to remove this bias.

Hypothetical Bias

Because the CV method uses a hypothetical market situation, the method can be biased by its own design. Hypothetical bias is due to the weak penalties (no true payment) for inaccurate information. The respondent may not take the valuation process seriously and, therefore, may not convey a true value for the described goods. To mitigate the effects of this lack of realism, this study provides a realistic market situation to the respondent.

Information Bias

Information bias can occur during the respondents' value formulation stage. It has been found that the levels and type of information provided will influence WTP amounts. Our field team did not feel this was a problem as the information provided accuracy and completeness in defining the commodity being valued.

Strategic Behavior

It has been suggested that optimizing individuals could pursue policies of extreme misstatement, or, in other words, respond to CV method questions strategically rather than responding to them as market questions. Such individuals may grossly over/underestimate WTP values depending on the strategies employed for the given situation. For example, if individuals are prone to "free riding," they may understate WTP if they assume others will pay for a service that they want to use. The process of strategic behavior occurs during the value statement stage where the respondents revealed WTP is not equal to their true WTP value. Little empirical evidence of strategic behavior, however, has been found in WTP studies to date.

Using guidelines set out in the literature of the CV method, the following attributes were incorporated into the WTP question for this study. First, a brief description of the good and associated trade-offs were provided prior to the WTP question. Within the question, a base population number was given as was the expected gain contingent on the program's implementation.

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Sampling

Sample size estimation requires a blend of mathematics and judgment. The mathematics is straightforward, and it is possible to make reasoned judgments (for example, judgments about expected costs, time and precision requirements) for those values that the mathematics cannot determine. The literature on sample size estimation suggests factors indicating appropriate use of large and small samples. Accordingly, large sample size is recommended when:

- Decisions based on the data will have very serious or costly consequences;
- The sponsors (decision makers) demand a high level of confidence;
- The important measures have high variance;
- Analyses will require the dividing of the total sample into small subsamples;
- Increasing the sample size has a negligible effect on the cost and timing; and
- Time and resources are available to cover the cost of data collection.

A small sample size is accepted when:

- The data will determine few major commitments or decisions;
- The sponsors (decision makers) require only rough estimates;
- The important measures have low variance;
- Analyses will use the entire sample, or just a few relatively large subsamples;
- Costs increase dramatically with sample size; and
- Budget constraints or time limitations limit the amount of data.

Due to budgetary and time constraint, and assuming the low variance in the responses, the present study is based on the survey of 500 households from all over Pakistan. Nonetheless, to strengthen the confidence in the estimates, and to increase the creditability, 24 FGDs was also executed.

Three-stage sampling design was adopted for the survey, which allows independent estimates for the electrified and nonelectrified households. At the first stage, districts were selected with the probability proportional to the number of households with and without electricity connection recorded in the 1998 District Census Reports (DCRs). Districts were grouped into two categories; districts with more than 80 percent households reported electricity connection and with less than 80 percent electrified households. During this stage, eight districts (two from each province: one from each category) were selected as Primary Sampling Units (PSUs). In the second stage of sampling, villages were selected randomly from each district. Finally interviewers (households) were selected using the random walk method. About 62 households were enumerated from each district. At this stage, the sample was further disaggregated in terms of electrified and nonelectrified households. Some villages were not large enough to provide nonoverlapping clusters. In these cases, an adjacent enumeration area in the same location was identified for enumeration. Only one male and one female respondent were selected from each household for enumeration.

Thus, information were collected via various modules of structured questions from a targeted sample of household from 32 villages in eight districts (Larkana and Sanghar in Sindh; Lasbella and Jaffarabad in Balochistan; Faisalabad and Khushab in Punjab; and Buner and Kohat in NWFP) of Pakistan. A schematic view of disaggregated sample is furnished in Table A2.1:

Table A2.1: A Schematic View of Disaggregated Sample

Province	*District*	*Electrified Household (in Nos)*	*Nonelectrified Household (in Nos)*	*Subtotal*	*Grand Total*
Punjab	Faisalabad	50	12	62	125
	Khushab	13	50	63	
Sindh	Larkana	50	12	62	125
	Sanghar	13	50	63	
Balochistan	Jaffarabad	50	12	62	125
	Lasbella	13	50	63	
NWFP	Kohat	50	12	62	125
	Buner	13	50	63	
Total		**252**	**248**	**500**	**500**

The analysis, however, may not be disaggregated beyond the province level due to higher sampling errors. According to the standard formula[30] for sampling error, provincial level results (with 125 observations) would have a sampling error of 9 percent, while overall estimates would have an error of 4 percent approximately. The district sample of 62 would yield 12 percent sampling error approximately.

[30] *Sampling Error (d) = $[Z^2 * S^2] / n$*
Where value of normal variable (Z) is 1.96 at 95 percent confidence level, and S is the standard deviation of the variable of interest. The variance (S^2) is unknown and is assumed at 0.25 (theoretically maximum).

Methodology and Approach

Based on the scope of work provided in TOR and on our experience and understanding of the nature and the scope of work, a case study approach was suggested. The following methodology was suggested for this study.

An overview of the proposed methodology is represented in Tables A2.2 to A2.4 with a detailed description of each step:

Quantitative and qualitative data collection techniques were adopted. Quantitative data collection was undertaken through an in-person survey administered to selected households. The questionnaire was primarily targeted at the male members of the household, but also had questions addressed to female household members. This was done to assess some of the impact of quality of life issues with which the females may be more familiar. It was also important to obtain the views and insights of the female population of the household. For this purpose, the survey team comprised a male and a female enumerator to administer the survey in each household.

Quantitative Data Collection Methodology

Locations of electrified and nonelectrified villages were identified through a literature review. The requisite sample size for each was determined and data collection began subsequently.

The area sample was selected from the area surrounding randomly selected survey blocks. Ten households were selected within each survey block, from which complete interviews were conducted. After completion of one survey block, the enumerator moved on to the next selected survey block, again consisting of 10 households, and repeated the procedure.

The survey coordinator had accompanied a team of enumerators throughout the fieldwork to provide guidance for selection of area and survey block.

Finalization of Sample Frame

Determination of Optimal Sample Size

A sample size is always a compromise between the ideal size needed to give representative and reliable results and the size, which can be realistically and accurately covered in practice. Two important parameters are vital for deciding the statistically desirable sample size: the confidence level and sampling error. The confidence level is expressed as a percentage and represents how often the true percentage of the population who would pick an answer lies within the confidence level. On the other hand, all samples are subject to sampling error, which is the difference between the results obtained from the survey sample and those that would have been obtained had the entire area surveyed.

In a purposive targeted sampling strategy, however, the districts and villages within each district are selected randomly. Similarly, within each selected village, households were selected randomly.

To achieve the objectives described in the ToR, a two-pronged strategy was adopted to target a sample of 500 households for a quantitative survey. First, a survey of 252 households connected with the existing national grid electricity supply was carried out. This part of the research provided estimates of expenditure, and consumption of electricity and household costs and benefit for accessing electricity.

Second, a survey of 248 households in nonelectrified areas was conducted, and was spread over two villages in each district. This analysis had assessed alternative costs of energy (kerosene for lighting and wood/coal for heating) quality differentials, satisfaction level with the existing energy system and willingness to acquire electricity connections from electrification schemes. However, a sample distribution was finalized in accordance with current distribution of villages connected with the national grid, off-grid and for those not connected to the grid.

Overall, from a sample of 500 households, 252 households were surveyed with electricity and 248 households without electricity. In most household surveys, a tolerated sampling error of 5 percent with 95 percent confidence level is generally considered acceptable.

Sample Selection Category-wise

Two districts were selected from each of the four provinces with the following break up:

- One district for electrified areas from each province (an attempt was made to divide the sample between 80 percent of households with electricity and 20 percent without electricity); and

- One district for the nonelectrified area in each province (an attempt was made to divide the sample into 80 percent of households without electricity and 20 percent with electricity).

From each district, two villages were selected within a range of 50-100 km from the district headquarters. One village was electrified and one was nonelectrified from the district that is electrified. In the district that was not electrified, both the selected villages were, obviously, without electricity. The ratio for the selection of households from the electrified district was taken as 80:20 for the electrified district, where 80 percent households were in the village that had electricity and 20 percent households without electricity. In all, as shown in Table A2.2, there was a distribution of 50:50 households electrified and nonelectrified in the sample.

SAMPLE HOUSEHOLD SELECTION

Ideally, sample households should be selected by creating a list or sampling frame of all households located within each village, and by choosing a sample of units using either simple or systematic sampling. Creating such lists of households is likely to be time-consuming. In this case, households were selected using "segmentation" and the "random-walk" method using the right hand rule in peri-urban areas.

By using the random-walk method, the enumerator had always contacted household positioned on his/her right hand side. After one successful completed interview, the

Table A2.2: Sample Selection

Province	*District*	*Electrified HH*	*Nonelectrified HH*	*Subtotal*	*Grand Total*
Punjab	Faisalabad	50	12	62	125
	Khushab	13	50	63	
Sindh	Larkana	50	12	62	125
	Sanghar	13	50	63	
Balochistan	Jaffarabad	50	12	62	125
	Lasbella	13	50	63	
NWFP	Kohat	50	12	62	125
	Buner	13	50	63	
Total		**252**	**248**	**500**	**500**

enumerator would leave four households and try to establish contact with the fifth household. The enumerator repeated this process until the required sample in each particular block was achieved.

The segmentation method involves dividing sampling clusters into smaller segments of approximately equal size. For rural areas, clusters of villages were selected within the varying radius from the central place of the "district." From each cluster, one or two villages were enumerated.

Site Selection and Verification

DISTRICT SELECTION CRITERIA

In order to capture the national socioeconomic and demographic profile and its diversification and rural electric distribution network, the selection criteria for districts and their respective villages is given as follows:

The approach adopted for the district and village selection for the household survey was based on three steps.

First, a complete list of districts in Pakistan on the basis of percentage of households with electricity was prepared. All districts were then divided into four provinces.

Second, a province-wise mean of the household with electricity was considered. A list of districts was then arranged in ascending order for further bifurcation. Based on provincial average electrification, each province was divided into two quartiles, namely upper and lower quartiles. The upper quartile consisted of those districts in which the household electrification rate was higher than the provincial average. Similarly, a lower quartile consisted of districts in which the household electrification rate was lower than the overall provincial electrification rate.

Third, from each quartile, the median rank district was selected from each province. By adopting the aforesaid approach to cover geographical spread, from 105 districts of Pakistan, the following eight districts in Table A2.3 have been selected for the study.

Focus Group Discussion Methodology

A total of 24 FGDs were conducted for the study to get opinions regarding benefits and costs, problems, advantages of accessing electricity in the area. Out of these, separate FGD sessions were held for females. The FGD checklist was finalized in close consultation with the project team and the World Bank before the commencement of this activity.

Table A2.3: Selected Districts

No.	*Province*	*Selected Districts* *Districts Selected*
1	Punjab	Faisalabad Khushab
2	Sindh	Larkana Sanghar
3	NWFP	Kohat Buner*
4	Balochistan	Jaffarabad Lasbella

** Originally, Balakot was selected through the suggested approach. But, due to the devastation caused by a recent earthquake, the district has been rendered unfeasible for this study. We have, therefore, replaced it with Buner, based on the nearest percentile.*

The recruiters were briefed on the FGD objectives and purpose in a session so that the quality of the participants recruited could be assured. The trained and experienced male/female moderators had conducted their respective FGD.

The participants were male/female members of society who were primary decision makers in rural settings. Homogeneity in groups was maintained through ensuring that each group belonged to the same socioeconomic background and has the same connection status. It was envisaged to conduct six groups per province. Table A2.4 depicts the sample frame of FDGs by province and by gender.

Recruitment of Participants for Focus Group

The participants for the focus groups were recruited through a recruiter with the help of a screening questionnaire in the specified localities of the target districts. Recruiters were required to go to selected households in the selected localities in order to recruit the participants for the focus group. A screening questionnaire was designed to select participating households.

Table A2.4: Number of FGDs, by Province and Gender

Province	*Type of Household(HH)*	*District with Electrification*		*District without Electrification*		*Total*		*Overall*
		M	*F*	*M*	*F*	*M*	*F*	
Punjab	Electrified	1	1	–	–	1	1	6
	Nonelectrified	1	1	1	1	2	2	
Sindh	Electrified	1	1	–	–	1	1	6
	Nonelectrified	1	1	1	1	2	2	
NWFP	Electrified	1	1	–	–	1	1	6
	Nonelectrified	1	1	1	1	2	2	
Balochistan	Electrified	1	1	–	–	1	1	6
	Nonelectrified	1	1	1	1	2	2	
Total	Electrified	4	4	–	–	4	4	24
	Nonelectrified	4	4	4	4	8	8	
Overall		**16**		**8**		**24**		

Annex 3

Village Profiles

Table A3.1: Site Profile: Faisalabad

Particulars	*Province*	*District*	*Village 1*	*Village 2*
Name	Punjab	Faisalabad	502 GB (Mamon Kanjan), Tandlian Wala	Ahmad ka Thatta (moza jalle fatyana)
Population	73,621,290	5,429,547	1,310	200-240
Household Population	12,129,856	775,649	240	40
Urban/Rural Distribution	**(37%)** 29,280,721/ **(63%)** 50,148,980	**(42.7%)** 2,318,416/ **(57.3%)** 3,111,131	**100%**	**100%**
Level of Electrification	GWh 36,246 (Overall)	86.60%	50%	NA
No. of Districts	34	–	–	–
Date of Electrification	–	–	2 Months	NA
Nearest Big City	–	–	Mamon Kanjan	Garh Fatah Shah
Distance from Nearest Big City	–	–	15 km	20 km
Distance from District Headquarters	–	–	125 km	150 km
Distance from Main/National Highway	–	–	25 km	50 km
Electricity Connection Charges (domestic)	–	Rs. 5,000	–	–
Electricity Connection Charges (commercial)	–	NA	–	–
Average Household Monthly Electricity Bill	–	–	Rs. 300	NA
Major Economic Activities	–	–	Agri/Wage Labor	Agri/Wage Labor

Note: NA = Not applicable.

Table A3.2: Site Profile: Khushab

Particulars	*Province*	*District*	*Village 1*	*Village 2*
Name	Punjab	Khushab	Kaka	Obhal (Ahmadabad South)
Population	73,621,290	905,711	2,000	4,000
Household Population	12,129,856	129,387	300	800
Urban/Rural Distribution	**(37%)** 29,280,721/ **(63%)** 50,148,980	**(25.3%)** 229,144/ **(74.7%)** 676,566	Rural	Rural
Level of Electrification	GWh 36,246 (Overall)	58.10%	95%	Nil
No. of Districts	34	–	–	–
Date of Electrification	Main/	–	3 Years	NA
Nearest Big City	–	–	Noor Pur Thal	Noor Pur Thal
Distance from Nearest Big City	–	–	20 km	25 km
Distance from District Headquarters	–	–	65 km	70 km
Distance from Main/National Highway	–	–	Few Yards	Few Yards
Electricity Connection Charges (domestic)	–	Rs. 5,000	–	–
Electricity Connection Charges (commercial)	–	Nil	–	–
Average Household Monthly Electricity Bill	–	–	Rs. 50 to 100	NA
Major Economic Activities	–	–	Agriculture	Agriculture

Note: NA = Not applicable.

Table A3.3: Site Profile: Kohat

Particulars	*Province*	*District*	*Village 1*	*Village 2*
Name	NWFP	Kohat	Parshai, UC Khushal Garh	Katta Kanay, UC Sudal
Population	17,743,645	562,644	900	800
Household Population	2,408,625	80,377	105	80
Urban/Rural Distribution	**(16%)** 3,153,455 / **(84%)** 16,189,787	**(27%)** 151,913/ **(73%)** 410,731	Rural	Rural
Level of Electrification	GWh 7,230 (Overall)	86.17%	30%	NA
No. of Districts	24	–	–	–
Date of Electrification	–	–	2005	NA
Nearest Big City	–	–	Kohat	Kohat
Distance from Nearest Big City	–	–	35 km	25 km
Distance from District Headquarters	–	–	35 km	25 km
Distance from Main/National Highway	–	–	5 km	20 km
Electricity Connection Charges (domestic)	–	Rs. 3,200	–	–
Electricity Connection Charges (commercial)	–	NA	–	–
Average Household Monthly Electricity Bill	–	–	Rs. 750	NA
Major Economic Activities	–	–	Agriculture	Agriculture/ Wage Labor

Note: NA = Not applicable.

Table A3.4: Site Profile: Buner

Particulars	*Province*	*District*	*Village 1*	*Village 2*
Name	NWFP	Buner	Nawa Kalay, UC Allai, Tehsil Daggar	Mula Banda, Malik Pur, Tehsil Daggar
Population	17,743,645	506,048	900	800
Household Population	2,408,625	72,292	103	150
Urban/Rural Distribution	**(16%)** 3,153,455/ **(84%)** 16,189,787	0%/100% Rural	Rural	Rural
Level of Electrification	GWh 7,230 (Overall)	51.10%	85%	NA
No. of Districts	24	–	–	–
Date of Electrification	–	–	2004	NA
Nearest Big City	–	–	Sawaria	Sawaria
Distance from Nearest Big City	–	–	18 km	17 km
Distance from District Headquarters	–	–	15 km	14 km
Distance from Main/National Highway	–	–	45 km	55 km
Electricity Connection Charges (domestic)	–	Rs. 4,500	–	–
Electricity Connection Charges (commercial)	–	NA	–	–
Average Household Monthly Electricity Bill	–	–	Rs. 900	NA
Major Economic Activities	–	–	Agriculture	Agriculture

Note: NA = Not applicable.

Table A3.5: Site Profile: Larkana

Particulars	*Province*	*District*	*Village 1*	*Village 2*
Name	Sindh	Larkana	Gajidero	Mitho Arijo
Population	30,439,893	1,927,066	700	200
Household Population	4,811,007	275,295	90	22
Urban/Rural Distribution	**(47%)** 15,543,849/ **(53%)** 17,494,924	**(29%)** 557,012/ **(71%)** 1,370,054	100%	100%
Level of Electrification	GWh 12,573 (Overall)	83.97%	25%	33%
No. of Districts	21	–	–	–
Date of Electrification	–	–	Jul-05	Sep-05
Nearest Big City	–	–	Larkana	Dokri
Distance from Nearest Big City	–	–	31km	4
Distance from District Headquarters	–	–	31km	29 km
Distance from Main/National Highway	–	–	4 km	3 km
Electricity Connection Charges (domestic)	–	Rs. 3,000	–	–
Electricity Connection Charges (commercial)	–	NA	–	–
Average Household Monthly Electricity Bill	–	–	Rs. 300	Rs .250
Major Economic Activities	–	–	Agriculture	Agriculture

Note: NA = Not applicable.

Table A3.6: Site Profile: Sanghar

Particulars	*Province*	*District*	*Village 1*	*Village 2*
Name	Sindh	Sanghar	Chak # 23, 24, 32	Geo Rajar
Population	30,439,893	1,453,028	2,000	1,050
Household Population	4,811,007	207,575	300	80
Urban/Rural Distribution	**(47%)** 15,543,849/ **(53%)** 17,494,924	**(23%)** 331,316/ **(77%)** 1,121,712	100%	100%
Level of Electrification	GWh 12,573 (Overall)	52%	35%	20%
No. of Districts	21	–	–	–
Date of Electrification	–	–	April 2005	July 2005
Nearest Big City	–	–	Workshop	Hathango
Distance from Nearest Big City	–	–	20 km	60 km
Distance from District Headquarters	–	–	55 km	75 km
Distance from Main/National Highway	–	–	35 km	150 km
Electricity Connection Charges (domestic)	–	Rs. 3,200	–	–
Electricity Connection Charges (commercial)	–	Rs. 3,390	–	–
Average Household Monthly Electricity Bill	–	–	Rs. 350	Rs. 400
Major Economic Activities	–	–	Agriculture, Teachers, Private Jobs	Agriculture, Teachers, Private Jobs

Table A3.7: Site Profile: Jaffarabad

Particulars	*Province*	*District*	*Village 1*	*Village 2*
Name	Balochistan	Jaffarabad	Haji Murad Khan Jamali	Fazal Muhammad
Population	6,565,885	432,817	900	1,000
Household Population	1,025,481	61,831	80	90
Urban/Rural Distribution	1,568,780 (23.89%)/ 4,997,105 (76.11%)	**(19.8%)** 85,698/ **(80.2%)** 347,119	100%	100%
Level of Electrification	**(46.6%)** GWh 3,267 Consumption (overall) 354 kWh Consumption (domestic)	64.70%	70%	Nil
No. of Districts	26	–	–	–
Date of Electrification	–	–	July 2005	July 2005
Nearest Big City	–	–	Usta Muhammad	Sohbat Pur
Distance from Nearest Big City	–	–	35 km	37 km
Distance from District Headquarters	–	–	55 km	70 km
Distance from Main/National Highway	–	–	26 km	70 km
Electricity Connection Charges (domestic)	–	Rs. 3,200	–	–
Electricity Connection Charges (commercial)	–	Rs. 3,770	–	–
Average Household Monthly Electricity Bill	–	–	Rs. 400	Rs. 450
Major Economic Activities	–	–	Agriculture, Labor, Teacher, Private Jobs	Agriculture, Labor, Teacher, Private Jobs

Table A3.8: Site Profile: Lasbella

Particulars	*Province*	*District*	*Village 1*	*Village 2*
Name	Balochistan	Lasbella	Qambar	Layari
Population	6,565,885	312,695	1,000	5,000
Household Population	1,025,481	50,730	120	500
Urban/Rural Distribution	1,568,780 (23.89%)/ 4,997,105 (76.11%)	**(36.9%)** 115,384/ **(63.1%)** 197,311	100%	100%
Level of Electrification	**(46.6%)** GWh 3,267 Consumption (overall) 354 kWh Consumption (domestic)	28.90%	5%	Nil
No. of Districts	26	–	–	–
Date of Electrification	–	–	2005	Nonelectrified
Nearest Big City	–	–	Lakra	Uthal
Distance from Nearest Big City	–	–	8 km	25 km
Distance from District Headquarters	–	–	70 km	65 km
Distance from Main/National Highway	–	–	30 km	25 km
Electricity Connection Charges (domestic)	–	Rs. 4,200	–	–
Electricity Connection Charges (commercial)	–	Rs. 5,000	-	–
Average Household Monthly Electricity Bill	–	–	400	
Major Economic Activities	–	–	Agriculture & Cattle Farming	Agriculture & Cattle Farming

Annex 4

List of FGD Participants

Sindh

Sanghar: Electrified (male)

	Cluster: Chak (23, 24, 32)	*HH: 450*	*Pop: 3,600*
#	*Participants*	*Age*	*Occupation*
1.	Moid Khan	45	Landowner
2.	Ata Mohammed	32	Livestock Trader
3.	Amir Hamza	36	Teacher
4.	Mohammed Akbar	26	Trader
5.	Mohammed Yusuf	36	Trader
6.	Haq Nawaz	34	Landowner
7.	Ghulam Asghar	32	Army
8.	Mohammed Javed	24	Landowner

Sanghar: Nonelectrified (male)

	Cluster: Chak 9B	*HH: 105*	*Pop: 1,100*
#	*Participants*	*Age*	*Occupation*
1.	Vilayat Ali	64	Landowner
2.	Safdar Ali	40	Landowner
3.	Munir Ahmed	50	Landowner
4.	Shahid Javed	46	Retired Army
5.	Abdul Majeed	38	Landowner
6.	Mohammed Siddique	38	Livestock Trader
7.	Mohammed Hanif	60	Landowner
8.	Asghar Ali	58	Landowner

Sanghar: Nonelectrified (female)

	Cluster: Chak 9B	*HH: 105*	*Pop: 1,100*
#	*Participants*	*Age*	*Occupation*
1.	Naat Bibi	35	Housewife
2.	Rasheeda	40	Housewife
3.	Naeem	35	Housewife
4.	Shamshad	30	Housewife
5.	Bushra	35	Housewife
6.	Khalida	30	Housewife
7.	Shaista	35	Housewife
8.	Nasreen	35	Housewife
9.	Alia Bibi	30	Housewife
10.	Hameeda	40	Housewife

Larkana: Electrified (female)

#	*Participants*	*Age*	*Occupation*
1.	Rahmina	25	Housewife
2.	Marium	44	Housewife
3.	Naveeda	27	Housewife
4.	Rashna	46	Housewife
5.	Roshni	31	Housewife
6.	Bibi Shabnam	48	Housewife
7.	Wahidna	49	Housewife
8.	Soomal	26	Housewife
9.	Nusrat	33	Housewife

Larkana: Electrified (male)

#	*Participants*	*Age*	*Occupation*
1.	Ajmal	30	Peasant
2.	Rasool Bux	26	Peasant
3.	Khan Waraio	44	Peasant
4.	Mushtaq	34	Peasant
5.	Jumbal	52	Peasant
6.	AllaDino	44	Laborer
7.	Juman	25	Peasant
8.	Majid	31	Peasant
9.	Sarwar	32	Laborer

Larkana: Nonelectrified (male)

#	*Participants*	*Age*	*Occupation*
1.	Wahid Bux	35	Mechanic
2.	Shamsuddin	60	Peasant
3.	Ai Sher	25	Peasant
4.	Huzoor Bux	18	Peasant
5.	Sadiq Mohammed	25	Peasant
6.	Qadir Bux	25	Peasant
7.	Paman	23	Laborer
8.	Pahalwan	40	Peasant
9.	Abdur Rasool	32	Tradesman
10.	Mumtaz	30	Tradesman

Punjab

Faisalabad: Electrified (male)

#	*Cluster: 502JB* *Participants*	*HH: 240* *Age*	*Pop:1,310* *Occupation*
1.	Ghulam Qadir	38	Landowner
2.	Mohammed Bashir	48	Shopowner
3.	Mohammed Irshad	26	Landowner
4.	Mohammed Ali	55	Laborer
5.	Wali Sher	19	Livestock
6.	Niaz Ahmed	40	Laborer
7.	Bashir Ahmed	30	Laborer
8.	Mohammed Yar	22	Landowner
9.	Khurram Shehzad	23	Landowner
10	Mohammed Iqbal	37	Teacher

Faisalabad: Nonelectrified (male)

#	*Cluster: 502JB* *Participants*	*HH: 240* *Age*	*Pop: 1,310* *Occupation*
1.	Bashir Ahmed	47	Landowner
2.	Adil	60	Landowner
3.	Azmat Ali	35	Landowner
4.	Mohram	50	Landowner
5.	Imdad Khan	22	Landowner
6.	Shahid	25	Landowner
7.	Mohammed Iqbal	36	Landowner
8.	Amir Ali	55	Landowner
9.	Mohammed Jalal Khan	30	Landowner

Faisalabad: (Nonelectrified (female)

#	*Cluster: 502JB* *Participants*	*HH: 240* *Age*	*Pop: 1,310* *Occupation*
1.	Gulzar Bibi	30	Housewife
2.	Waldan Bibi	45	Housewife
3.	Anwar Bibi	40	Housewife
4.	Kulsoom	25	Housewife
5.	Zarina	17	Housewife
6.	Parveen	35	Housewife
7.	Bahadur Bibi	48	Housewife
8.	Hajira	45	Housewife
9.	Aqeela	25	Housewife
10.	Halima	22	Housewife

Khushab: Electrified (female)

#	*Cluster: Kaka Village* *Participants*	*HH: 400* *Age*	*Pop: 3,000* *Occupation*
1.	Shehzadi	45	Housewife
2.	Kishwar	28	Housewife
3.	Bushra Bibi	20	Housewife
4.	Aisha Rehman	20	Housewife
5.	Naseem Akhtar	40	Housewife
6.	Aslam Bibi	45	Housewife
7.	Zakia Bibi	28	Housewife
8.	Yasmin	30	Housewife
9.	Allah Siwaii	60	Housewife
10	Kausar	50	Housewife
11	Ghulam Bibi	40	Housewife

Khushab: Nonelectrified (male)

#	*Cluster: Ahmedabad East Obhal* *Participants*	*HH: 2,500* *Age*	*Pop: 5,000* *Occupation*
1.	Nazar Mohd Bilal	68	Landowner
2.	Mumtaz Hussain	65	Shopkeeper
3.	Mohammed Hanif	50	Landowner
4.	Ejaz Hussain	42	Landowner
5.	Mohammed Latif	52	Landowner
6.	Jabir Mohammed	55	Trader
7.	Mazhar Abbas	35	Trader
8.	Ghulam Qadir Shah	45	Landowner
9.	Mohammed Ahmed Iqbal	29	Soldier

Khushab: Nonelectrified (female)

#	*Cluster: Ahmedabad East Obhal* *Participants*	*HH: 2,500* *Age*	*Pop: 5,000* *Occupation*
1.	Amber Jokhar	25	Landowner
2.	Kausar Khan Jokhar	50	Landowner
3.	Mumtaz Begum	45	Landowner
4.	Alia Bibi	50	Landowner
5.	Aziz Fatima	50	Landowner
6.	Bushra Begum	60	Landowner
7.	Sakina Bibi	30	Shopowner
8.	Rehana Yasmin	30	Employment
9.	Bushra Fatima	40	Landowner
10.	Hansavera Shehzad	25	Business
11.	Bushra Bibi	40	Landowner

Balochistan

Jaffarabad: Electrified (male)

#	*Cluster: Dauran Khan* *Participants*	*HH: 90* *Age*	*Pop:350* *Occupation*
1.	Shah Zeb	40	Peasant
2.	Purdil Sher	30	Peasant
3.	Najib	65	Peasant
4.	Qasm	25	Peasant
5.	Ali Khan	18	Peasant
6.	Rahim Bhugio	19	Peasant
7.	Ghulam Ali	35	Peasant
8.	Amir Shah	40	Peasant
9.	Adnan	30	Peasant
10.	Javed	18	Peasant
11.	Rasool		Peasant

Jaffarabad: Nonelectrified (male)

#	*Cluster: Dauran Khan* *Participants*	*HH: 30* *Age*	*Pop: 400* *Occupation*
1.	Ashiq Ali	27	Peasant
2.	Fida Husain	20	Peasant
3.	Ghulam Husain	50	Peasant/Shop
4.	Pahalwan Khan	78	Peasant
5.	Ghulam Mustafa	35	Crop Dealer
6.	Khadim Hussain	80	Peasant
7.	Wali Mohammed	60	Peasant/Hakim
8.	Mohammed	20	Peasant
9.	Shahnawaz Khan	30	Peasant
10.	Shaukat Ali	25	Peasant

Jaffarabad: Nonelectrified (female)

	Cluster: Dauran Khan	*HH: 50*	*Pop: 130*
#	*Participants*	*Age*	*Occupation*
1.	Rahmat	25	Housewife
2.	Khanum	18	Housewife
3.	Zainab	40	Housewife
4.	Shamshad	25	Housewife
5.	Fateh Khanum	35	Housewife
6.	Bushra	30	Housewife
7.	Sassi	25	Housewife
8.	Halima	35	Housewife
9.	Zulekha	15	Housewife
10.	Dilshad	20	Housewife

Lasbella: Electrified (female)

	Cluster:	*HH:*	*Pop:*
#	*Participants*	*Age*	*Occupation*
1.	Gohar Jan	45	Housewife
2.	Numair	40	Housewife
3.	Khair bibi	50	Housewife
4.	Fehmida	18	Housewife
5.	Safra	24	Housewife
6.	Shama	25	Housewife
7.	Saima	20	Housewife
8.	Nabeela	30	Housewife

Lasbella: Nonelectrified (male)

#	*Cluster: Lyari* *Participants*	*HH: 300* *Age*	*Pop: 3,500* *Occupation*
1.	Siddique	55	Landowner
2.	Mohammed Siddique	45	Landowner
3.	Habibullah	35	Landowner
4.	Ghulam Qadir	40	Landowner
5.	Mohammed Yusuf	50	Landowner
6.	Mohammed Hasan	40	Landowner
7.	Saleem	30	Landowner
8.	Mohammed Ameen	40	Landowner

Lasbella: Nonelectrified (female)

#	*Cluster: Kambar* *Participants*	*HH:* *Age*	*Pop:* *Occupation*
1.	Zehra	25	Housewife
2.	Aziza	20	Housewife
3.	Beeba	40	Housewife
4.	Rabia	35	Housewife
5.	Azra	35	Housewife
6.	Naureen	60	Housewife
7.	Fatima	18	Housewife
8.	Rahat	41	Housewife
9.	Alani	35	Housewife

NWFP

Kohat: Electrified (female)

#	*Cluster: Dhok* Mohammed *Khan (Pershai)* *Participants*	*HH: 11* *Age*	*Pop: 130* *Occupation*
1.	Arifa	65	Housewife
2.	Nazeera	41	Housewife
3.	Shabana	35	Health Worker
4.	Shaheen	23	Teacher
5.	Rahmana	40	Housewife
6.	Zarina	35	Housewife
7.	Gul Meer	45	Housewife
8.	Suneri	45	Housewife
9.	Bagh Bibi	38	Housewife
10.	Zughran Bibi	40	Housewife

Kohat: Nonelectrified (female)

#	*Cluster: Dhok Mir Hasan* *Participants*	*HH: 30* *Age*	*Pop: 450* *Occupation*
1.	Kishwar Jan	40	Housewife
2.	Nurdana	49	Housewife
3.	Wal Khanum	50	Housewife
4.	Sun Pari	50	Housewife
5.	Maii Bibi	45	Housewife
6.	Lal Khanum	47	Housewife
7.	Khalida	25	Housewife
8.	Umro Bibi	30	Housewife
9.	Sameen	40	Housewife
10.	Shamim	30	Housewife

Buner: Electrified (male)

	Cluster: Talibabad (Nawan Kalay)	*HH: 180*	*Pop:1,700*
#	*Participants*	*Age*	*Occupation*
1.	Baroz Khan	26	Laborer
2.	Sher Rehman	25	Laborer
3.	Gul Khan	25	Driver
4.	Ibrahim Khan	25	Student
5.	Shad Gul	25	Agriculture
6.	Amroz Khan	28	Laborer
7.	Naseeb Gul	25	Laborer
8.	Mian Gul	26	Trade
9.	Faramosh Khan	38	Laborer

Buner: Nonelectrified (male)

	Cluster: Mulla Banda	*HH: 200*	*Pop: 2,500*
#	*Participants*	*Age*	*Occupation*
1.	Sultan Zeb	36	Peasant
2.	Pir Samad Khan	35	Laborer
3.	Syed Irshad	30	Laborer
4.	Mohd Amin	30	Laborer
5.	Rehmat Shah	31	Laborer
6.	Syed Baz Khan	25	Peasant
7.	Fazal Raziq	24	Laborer
8.	Akbar Ali Khan	24	Peasant
9.	Raz Mohd Khan	23	Livestock Trader
10.	Sardar Ali khan	25	Laborer
11.	Sabz Ali Khan	24	Laborer/Peasant

Buner: Nonelectrified (male)

	Cluster: Mulla Banda	*HH: 200*	*Pop: 2,000*
#	*Participants*	*Age*	*Occupation*
1.	Qayum Khan	25	Landowner
2.	Dawar Khan	26	Laborer
3.	Rishad	27	Landowner
4.	Sajid	22	Temporary Laborer
5.	Amjad Ali	24	Landowner
6.	Faiz Jalil	26	Landowner
7.	Fazal Ghani	25	Landowner
8.	Munir Khan	27	Landowner
9.	Mahal Khan	31	Laborer
10.	Sajjad	30	Landowner
11.	Hasan Ali	27	Unemployed

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List of Technical Reports

Region/Country	Activity/Report Title	Date	Number
	SUB-SAHARAN AFRICA (AFR)		
Regional	Power Trade in Nile Basin Initiative Phase II (CD Only): Part I: Minutes of the High-level Power Experts Meeting; and Part II: Minutes of the First Meeting of the Nile Basin Ministers Responsible for Electricity	04/05	067/05
	Introducing Low-cost Methods in Electricity Distribution Networks	10/06	104/06
	Second Steering Committee: The Road Ahead. Clean Air Initiative In Sub-Saharan African Cities. Paris, March 13-14, 2003	12/03	045/03
	Lead Elimination from Gasoline in Sub-Saharan Africa. Sub-regional Conference of the West-Africa group. Dakar, Senegal March 26-27, 2002 (Deuxième comité directeur : La route à suivre - L'initiative sur l'assainissement de l'air. Paris, le 13-14 mars 2003)	12/03	046/03
	1998-2002 Progress Report. The World Bank Clean Air Initiative in Sub-Saharan African Cities. Working Paper #10 (Clean Air Initiative/ESMAP)	02/02	048/04
	Landfill Gas Capture Opportunity in Sub Saharan Africa	06/05	074/05
	The Evolution of Enterprise Reform in Africa: From State-owned Enterprises to Private Participation in Infrastructure-and Back?	11/05	084/05
	Market Development	12/01	017/01
Cameroon	Decentralized Rural Electrification Project in Cameroon	01/05	087/05
Chad	Revenue Management Seminar. Oslo, June 25-26, 2003. (CD Only)	06/05	075/05
Côte d'Ivoire	Workshop on Rural Energy and Sustainable Development, January 30-31, 2002. *(Atelier sur l'Energie en régions rurales et le Développement durable 30-31, janvier 2002)*	04/05	068/05
Ethiopia	Phase-Out of Leaded Gasoline in Oil Importing Countries of Sub-Saharan Africa: The Case of Ethiopia - Action Plan	12/03	038/03
	Sub-Saharan Petroleum Products Transportation Corridor: Analysis and Case Studies	03/03	033/03
	Phase-Out of Leaded Gasoline in Sub-Saharan Africa	04/02	028/02
	Energy and Poverty: How can Modern Energy Services Contribute to Poverty Reduction	03/03	032/03
East Africa	Sub-Regional Conference on the Phase-out Leaded Gasoline in East Africa. June 5-7, 2002	11/03	044/03
Ghana	Poverty and Social Impact Analysis of Electricity Tariffs	12/05	088/05
	Women Enterprise Study: Developing a Model for Mainstreaming Gender into Modern Energy Service Delivery	03/06	096/06
	Sector Reform and the Poor: Energy Use and Supply in Ghana	03/06	097/06
Kenya	Field Performance Evaluation of Amorphous Silicon (a-Si) Photovoltaic Systems in Kenya: Methods and Measurement in Support of a Sustainable Commercial Solar Energy Industry	08/00	005/00

Region/Country	Activity/Report Title	Date	Number
	The Kenya Portable Battery Pack Experience: Test Marketing an Alternative for Low-Income Rural Household Electrification	12/01	05/01
Malawi	Rural Energy and Institutional Development	04/05	069/05
Mali	Phase-Out of Leaded Gasoline in Oil Importing Countries of Sub-Saharan Africa: The Case of Mali - Action Plan *(Elimination progressive de l'essence au plomb dans les pays importateurs de pétrole en Afrique subsaharienne Le cas du Mali — Mali Plan d'action)*	12/03	041/03
Mauritania	Phase-Out of Leaded Gasoline in Oil Importing Countries of Sub-Saharan Africa: The Case of Mauritania - Action Plan *(Elimination progressive de l'essence au plomb dans les pays importateurs de pétrole en Afrique subsaharienne Le cas de la Mauritanie – Plan d'action.)*	12/03	040/03
Nigeria	Phase-Out of Leaded Gasoline in Nigeria	11/02	029/02
	Nigerian LP Gas Sector Improvement Study	03/04	056/04
	Taxation and State Participation in Nigeria's Oil and Gas Sector	08/04	057/04
Senegal	Regional Conference on the Phase-Out of Leaded Gasoline in Sub-Saharan Africa *(Elimination du plomb dans l'essence en Afrique subsaharienne Conference sous regionales du Groupe Afrique de l'Ouest Dakar, Sénégal. March 26-27, 2002.)*	03/02	022/02
	Alleviating Fuel Adulteration Practices in the Downstream Oil Sector in Senegal	12/03	046/03
		09/05	079/05
South Africa	South Africa Workshop: People's Power Workshop.	12/04	064/04
Swaziland	Solar Electrification Program 2001 2010: Phase 1: 2001 2002 (Solar Energy in the Pilot Area)	12/01	019/01
Tanzania	Mini Hydropower Development Case Studies on the Malagarasi, Muhuwesi, and Kikuletwa Rivers Volumes I, II, and III	04/02	024/02
	Phase-Out of Leaded Gasoline in Oil Importing Countries of Sub-Saharan Africa: The Case of Tanzania - Action Plan	12/03	039/03
Uganda	Report on the Uganda Power Sector Reform and Regulation Strategy Workshop	08/00	004/00
	EAST ASIA AND PACIFIC (EAP)		
Cambodia	Efficiency Improvement for Commercialization of the Power Sector	10/02	031/02
	TA For Capacity Building of the Electricity Authority	09/05	076/05
China	Assessing Markets for Renewable Energy in Rural Areas of Northwestern China	08/00	003/00
	Technology Assessment of Clean Coal Technologies for China Volume I-Electric Power Production	05/01	011/01
	Technology Assessment of Clean Coal Technologies for China Volume II-Environmental and Energy Efficiency Improvements for Non-power Uses of Coal	05/01	011/01
	Technology Assessment of Clean Coal Technologies for China Volume III-Environmental Compliance in the Energy Sector: Methodological Approach and Least-Cost Strategies	12/01	011/01
	Policy Advice on Implementation of Clean Coal Technology	09/06	104/06
	Scoping Study for Voluntary Green Electricity Schemes in Beijing and Shanghai	09/06	105/06
Papua New Guinea	Energy Sector and Rural Electrification Background Note	03/06	102/06
Philippines	Rural Electrification Regulation Framework. (CD Only)	10/05	080/05
Thailand	DSM in Thailand: A Case Study	10/00	008/00
	Development of a Regional Power Market in the Greater Mekong Sub-Region (GMS)	12/01	015/01
	Greater Mekong Sub-region Options for the Structure of the GMS Power Trade Market A First Overview of Issues and Possible Options	12/06	108/06
Vietnam	Options for Renewable Energy in Vietnam	07/00	001/00
	Renewable Energy Action Plan	03/02	021/02

Region/Country	Activity/Report Title	Date	Number
	Vietnam's Petroleum Sector: Technical Assistance for the Revision of the Existing Legal and Regulatory Framework	03/04	053/04
	Vietnam Policy Dialogue Seminar and New Mining Code	03/06	098/06
	SOUTH ASIA (SAS)		
Bangladesh	Workshop on Bangladesh Power Sector Reform	12/01	018/01
	Integrating Gender in Energy Provision: The Case of Bangladesh	04/04	054/04
	Opportunities for Women in Renewable Energy Technology Use In Bangladesh, Phase I	04/04	055/04
Bhutan	Hydropower Sector Study: Opportunities and Strategic Options	10/07	119/07
	EUROPE AND CENTRAL ASIA (ECA)		
Azerbaijan	Natural Gas Sector Re-structuring and Regulatory Reform	03/06	099/06
Macedonia	Elements of Energy and Environment Strategy in Macedonia	03/06	100/06
Poland	Poland (URE): Assistance for the Implementation of the New Tariff Regulatory System: Volume I, Economic Report, Volume II, Legal Report	03/06	101/06
Russia	Russia Pipeline Oil Spill Study	03/03	034/03
Uzbekistan	Energy Efficiency in Urban Water Utilities in Central Asia	10/05	082/05
	MIDDLE EASTERN AND NORTH AFRICA REGION (MENA)		
Regional	Roundtable on Opportunities and Challenges in the Water, Sanitation And Power Sectors in the Middle East and North Africa Region. Summary Proceedings, May 26-28, 2003. Beit Mary, Lebanon. (CD)	02/04	049/04
Turkey	Gas Sector Strategy	05/07	114/07
Morocco	Amélioration de d´Efficacité Energie: Environnement de la Zone Industrielle de Sidi Bernoussi, Casablanca	12/05	085/05
	LATIN AMERICA AND THE CARIBBEAN REGION (LCR)		
Regional	Regional Electricity Markets Interconnections - Phase I Identification of Issues for the Development of Regional Power Markets in South America	12/01	016/01
	Regional Electricity Markets Interconnections - Phase II Proposals to Facilitate Increased Energy Exchanges in South America	04/02	016/01
	Population, Energy and Environment Program (PEA) Comparative Analysis on the Distribution of Oil Rents (English and Spanish)	02/02	020/02
	Estudio Comparativo sobre la Distribución de la Renta Petrolera Estudio de Casos: Bolivia, Colombia, Ecuador y Perú	03/02	023/02
	Latin American and Caribbean Refinery Sector Development Report - Volumes I and II	08/02	026/02
	The Population, Energy and Environmental Program (EAP) (English and Spanish)	08/02	027/02
	Bank Experience in Non-energy Projects with Rural Electrification Components: A Review of Integration Issues in LCR	02/04	052/04
	Supporting Gender and Sustainable Energy Initiatives in Central America	12/04	061/04
	Energy from Landfill Gas for the LCR Region: Best Practice and Social Issues (CD Only)	01/05	065/05
	Study on Investment and Private Sector Participation in Power Distribution in Latin America and the Caribbean Region	12/05	089/05
	Strengthening Energy Security in Uruguay	05/07	116/07
Brazil	Background Study for a National Rural Electrification Strategy: Aiming for Universal Access	03/05	066/05

Region/Country	Activity/Report Title	Date	Number
	How do Peri-Urban Poor Meet their Energy Needs: A Case Study of Caju Shantytown, Rio de Janeiro	02/06	094/06
	Integration Strategy for the Southern Cone Gas Networks	05/07	113/07
Bolivia	Country Program Phase II: Rural Energy and Energy Efficiency Report on Operational Activities	05/05	072/05
	Bolivia: National Biomass Program. Report on Operational Activities	05/07	115/07
Chile	Desafíos de la Electrificación Rural	10/05	082/05
Colombia	Desarrollo Económico Reciente en Infraestructura: Balanceando las necesidades sociales y productivas de la infraestructura	03/07	325/05
Ecuador	Programa de Entrenamiento a Representantes de Nacionalidades Amazónicas en Temas Hidrocarburíferos	08/02	025/02
	Stimulating the Picohydropower Market for Low-Income Households in Ecuador	12/05	090/05
Guatemala	Evaluation of Improved Stove Programs: Final Report of Project Case Studies	12/04	060/04
Haiti	Strategy to Alleviate the Pressure of Fuel Demand on National Woodfuel Resources (English) *(Stratégie pour l'allègement de la Pression sur les Ressources Ligneuses Nationales par la Demande en Combustibles)*	04/07	112/07
Honduras	Remote Energy Systems and Rural Connectivity: Technical Assistance to the Aldeas Solares Program of Honduras	12/05	092/05
Mexico	Energy Policies and the Mexican Economy	01/04	047/04
	Technical Assistance for Long-Term Program for Renewable Energy Development	02/06	093/06
Nicaragua	Aid-Memoir from the Rural Electrification Workshop (Spanish only)	03/03	030/04
	Sustainable Charcoal Production in the Chinandega Region	04/05	071/05
Perú	Extending the Use of Natural Gas to Inland Perú (Spanish/English)	04/06	103/06
	Solar-diesel Hybrid Options for the Peruvian Amazon Lessons Learned from Padre Cocha	04/07	111/07
	GLOBAL		
	Impact of Power Sector Reform on the Poor: A Review of Issues and the Literature	07/00	002/00
	Best Practices for Sustainable Development of Micro Hydro Power in Developing Countries	08/00	006/00
	Mini-Grid Design Manual	09/00	007/00
	Photovoltaic Applications in Rural Areas of the Developing World	11/00	009/00
	Subsidies and Sustainable Rural Energy Services: Can we Create Incentives Without Distorting Markets?	12/00	010/00
	Sustainable Woodfuel Supplies from the Dry Tropical Woodlands	06/01	013/01
	Key Factors for Private Sector Investment in Power Distribution	08/01	014/01
	Cross-Border Oil and Gas Pipelines: Problems and Prospects	06/03	035/03
	Monitoring and Evaluation in Rural Electrification Projects: A Demand-Oriented Approach	07/03	037/03
	Household Energy Use in Developing Countries: A Multicountry Study	10/03	042/03
	Knowledge Exchange: Online Consultation and Project Profile from South Asia Practitioners Workshop. Colombo, Sri Lanka, June 2-4, 2003	12/03	043/03
	Energy & Environmental Health: A Literature Review and Recommendations	03/04	050/04
	Petroleum Revenue Management Workshop	03/04	051/04
	Operating Utility DSM Programs in a Restructuring Electricity Sector	12/05	058/04
	Evaluation of ESMAP Regional Power Trade Portfolio (TAG Report)	12/04	059/04
	Gender in Sustainable Energy Regional Workshop Series: Mesoamerican Network on Gender in Sustainable Energy (GENES) Winrock and ESMAP	12/04	062/04

Region/Country	Activity/Report Title	Date	Number
	Women in Mining Voices for a Change Conference (CD Only)	12/04	063/04
	Renewable Energy Potential in Selected Countries: Volume I: North Africa, Central Europe, and the Former Soviet Union, Volume II: Latin America	04/05	070/05
	Renewable Energy Toolkit Needs Assessment	08/05	077/05
	Portable Solar Photovoltaic Lanterns: Performance and Certification Specification and Type Approval	08/05	078/05
	Crude Oil Prices Differentials and Differences in Oil Qualities: A Statistical Analysis	10/05	081/05
	Operating Utility DSM Programs in a Restructuring Electricity Sector	12/05	086/05
	Sector Reform and the Poor: Energy Use and Supply in Four Countries: Botswana, Ghana, Honduras and Senegal	03/06	095/06
	Meeting the Energy Needs of the Urban Poor: Lessons from Electrification Practitioners	06/07	118/07

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