

Rural Energy Scenario in India: A Case Study of District Sirsa (Haryana)

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Abstract:

Energy is required for every aspect of our daily life. Access to safe modern sources of energy is key for development but often missing. Hundreds of millions of households in rural areas have no access to electric grids or modern cooking fuels. This situation leaves them without the benefits of convenient, safe and reliable energy services. Energy use in rural areas has distinctive characteristics and may be regarded as a separate entity from that of urban scene, because more than 80 per cent of the present energy consumption in rural areas consists of non-commercial (firewood, cow-dung and agricultural waste) energy sources. According to 66th round of NSSO survey 29.50kg of fuel wood and chips (per capita per month) are consumed in rural areas as compared to about 2.31 kg of LPG per capita for cooking purpose. Traditional fuels used at present, have inherent disadvantages. Collection is arduous and time consuming. Combustion is difficult to control and cooking methods captures only a fraction of fuel's available energy. Accessibility to and availability of fuels for domestic purposes is becoming more difficult day by day for poor people, many of whom are outside the modern energy system. Also, most of energy consumed in rural areas does not enter the organized market place; we therefore have no accurate data on pattern of supply and consumption of energy in rural areas. Since even the collection of free firewood involves enormous drudgery, the supply of minimum amount of energy for every household is important objective for participatory development. With this background,

the paper attempts to discuss the energy issue in general and rural energy scenario in particular.

Keywords: Rural areas; rural household; rural energy

SECTION-1

Introduction

For millennia of human existence, mankind took energy for granted, because near about 200 years ago all human needs for energy were fully met by renewable sources i.e. by harnessing natural energy flows. But as a result of industrial revolution the pattern of energy use shifted from renewable to non-renewable (i.e. commercial fuels like coal, oil and natural gas). Currently, more than 80 per cent of world energy consumption comes from fossil fuels, a finite and non-renewable source. The advantage was that fossil fuel-based energy sources, primarily coal and oil, followed by natural gas, made mass scale production in manufacturing possible but with the growing pace of industrialization, especially in developing countries which constitute more than 80 per cent of the world's population, energy has become the major concern for sustainable development, environmental protection and a decent standard of living.

In India constituting 15% of world population, there is voracious appetite for energy. But the country lacks sufficient domestic energy resources particularly petroleum and natural gas and have to depend on imports for meeting its growing energy



requirements. India is the world's fourth largest consumer of energy and by 2030 it is expected to become the third largest, overtaking Japan and Russia. The country's demand for oil is expected to increase at an average rate of 2.9 percent annually over the next quarter century, yet India has only 0.4 percent of the world's proven oil reserves, and domestic production is expected to remain constant, if not decline. If consumption follows the current trajectory, India is also projected to run out of coal, its primary source of energy. The bulk of India's hydro potential is located in northeastern regions and northern parts in the Himalaya's. The distribution of energy resources is much skewed which causes problem in availability. Thus there is wide gap in demand and supply of energy resources in India. In rural areas the picture is grimmer. Hundreds of millions of households in rural areas have no access to electric grids or modern cooking fuels. This situation leaves them without the benefits of convenient, safe and reliable energy services. People are worried about the forthcoming energy crisis which is inevitable if current consumption standard is maintained, but it is a matter of concern mainly for elite class because the rural poor are already in grip of crisis for decades which is not recognized. Major share of rural population is energy poor. Energy poverty is indicated by the lack of access to modern energy services. The "un-affordability" due to poverty and "inaccessibility" due to inadequate infrastructure is the root causes of the lack of access to modern energy. It is a vicious cycle of linked events, one leading to another and finally getting back to the original positions of "poor individual" and "poor country. Energy use in rural areas has distinctive characteristics and may be regarded as a separate entity from that of urban scene, because more than 80 per cent of the present energy consumption in rural areas consists of non-

commercial (firewood, cow-dung and agricultural waste) energy sources.

Somehow, the issue of rural energy supply has in the past been deemed to be a part of the problem of rural electrification, which has always been a 'residual' investment in the power sector. Rural electrification is only one element among the possible sources of energy for the rural population and we should take a look at the possibilities of supply of cheap energy, available from local resources, for the rural population. The bulk of the energy consumed in the rural areas is today obtained from traditional sources, like fuel wood (obtained by long hours of search by women and children), agricultural residues and animal wastes (converted into dung cakes). The requirements of energy for household consumption are primarily for cooking and lighting. A major portion of the household consumptions in the rural areas is secured by the private effort of individuals at a low private cost but at a high social cost in terms of the denudation of the already fast depleting tree cover in most parts of the country.. Fiscal and administrative measures as well as controls and other measures relating to energy supply therefore make little impact on the bulk of the rural population. Even though commercial energy by way of electricity, kerosene oil and diesel oil are increasingly making inroads in the rural areas, their consumption is largely confined to the more affluent households, though kerosene oil is used by many low income rural households also, chiefly for lighting purposes. A large proportion of rural households cannot afford to pay for commercial fuels. At the same time, electricity is made available for the energizing irrigation pump sets at highly subsidized rates to a few large farmers. Nor have all the rural households' equal access to traditional or non-commercial sources of energy. There has been a growing scarcity of fuel wood for low income households in the rural areas. Many rural households

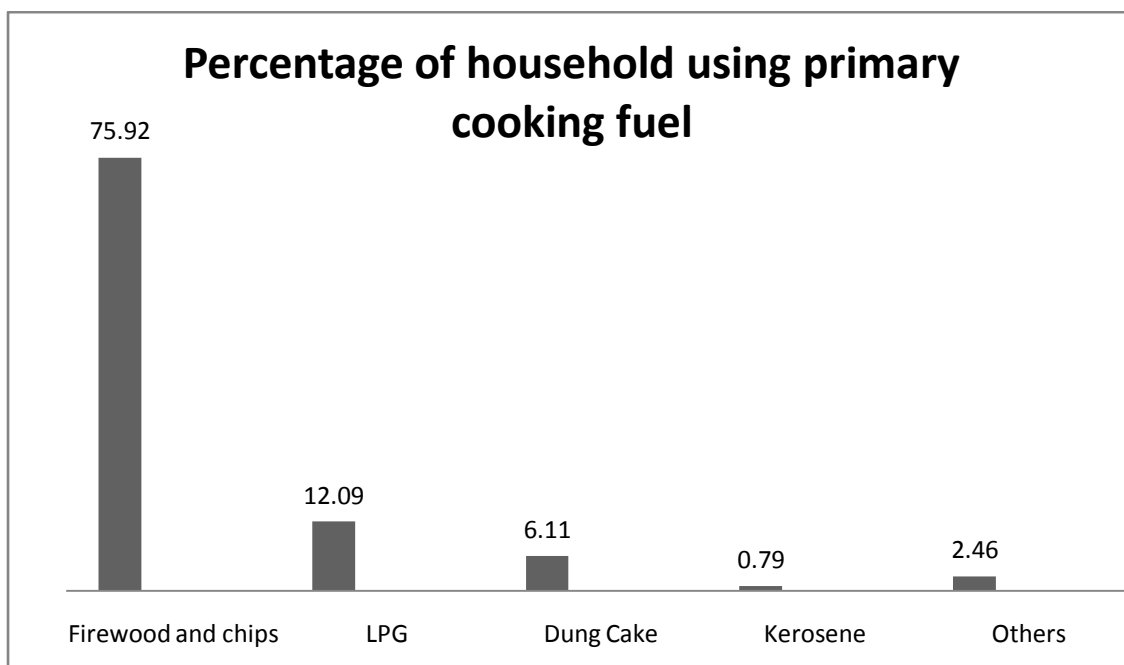
are reduced to doing their cooking only once a day. Thus the nature of rural energy is quite distinct and is deprived of appropriate and deserved emphasis. Demography of rural areas differ fundamentally from that of urban towns, cities and metropolis.

SECTION-2

RURAL ENERGY SCENARIO IN INDIA

India is facing a formidable challenge as it works to ensure the availability of a reliable source of modern energy carriers to the large majority of its predominantly rural population. The findings of the National Sample Survey Organization (NSSO, 2007) indicate that although 74% of the Indian villages were electrified as of 2005; only 54.9% of the households had access to electricity and the remaining depended on kerosene lamps for lighting.

Figure 1: Household Using Primary Cooking Fuel



Source: National Sample Survey Organization (NSSO), 66th Round 2009-2010

With respect to access to modern fuels for cooking in 2010 as from the figure above only 12.09% of the rural households had access to liquefied petroleum gas (LPG) and about 76% were still depending on biomass for their cooking energy needs, with only 0.79% having access to kerosene. Thus, bridging the access gap in modern energy services for cooking and lighting is a major challenge for India. However, to enable the government to effectively address this challenge, it is essential to gain a deeper insight into the prevailing scenario of energy access in India. The rural energy scenario in India continues to be characterized by the dominance of biomass-based fuels (wood, animal dung and crop

residues) despite several initiatives by the government to bring about a ‘fuel switch’ by promoting more widespread use of liquid (kerosene) and gaseous (LPG) fuels and electricity. The household sector accounts for nearly 75% of rural energy consumption. Within this sector, cooking is the largest energy consuming end use, accounting for almost 90% of household energy. Biomass fuels meet 85–90% of the domestic energy demand and 75% of all rural energy demand. Rather than diminishing, the dependence on fuel wood is increasing in the rural areas. This dependence on biomass-based fuels, in conjunction with the conversion of forest to agricultural land, extraction for timber and other

commercial purposes and increasing population pressure, has led to over-exploitation and degradation of the natural resource base. As a consequence, local communities find it increasingly difficult to meet their energy requirements in a sustainable manner. Where the land is already degraded, fuel wood extraction has worsened the situation. The burden this scenario constitutes for the rural population is tremendous. Future predictions present no relief for the people, the situation of degradation and fuel insufficiency will continue to plague the rural population. The Ministry of Environment and Forests estimates that the consumption of fuel wood is about five times higher than what can be sustainably removed from the forests. From the rural energy scenario in India following major issues emerge.

- a) Private companies have shown little interest in extending electricity supply to rural areas. As a result it remains confined to urban areas and there is non-availability of electricity in rural areas.
- b) Lack of data availability on rural energy production and consumption.
- c) Energy crisis of the rural areas that have not been using the modern energy carriers for long time have no longer been recognized.
- d) In various rural energy programmes, staff member are male, who are unaware about role of women in rural energy. The role of women is envisaged solely as that of information provider and rural women are often labeled as beneficiaries of programme rather than partners in development.
- e) Energy governance is always biased towards “supply-side” and suggested solutions always revolve around “hardware” aspects. The “demand-side” aspects of energy have always been neglected. Energy service for sustainable development has never been the focus of energy planning. The focus of energy sector is usually on expanding electricity generation and oil refinery

capacities on transmission and distribution lines and on maintaining a steady supply of fossil fuels.

Studies have shown that provision of better energy services in rural areas and reduction in energy poverty tends to improve Human Development Index (HDI). So a radical approach is needed that makes the rural poor financially sound and capable of using and afford clean and efficient energy.

SECTION-3

Government Responses to Demand of Rural Energy

Over the past decades, in an effort to meet household domestic energy needs, the Government of India has initiated several rural energy programmes. The first efforts began in the early 1970s when several advisory groups (for example, the Fuel Policy Committee (1974), Working Group on Energy Policy (1979), Advisory Board on Energy (1985), and Energy Demand Screening Group (1986) were constituted to review, estimate, forecast and suggest alternatives to meet the growing energy needs of the rural population. Technology specific programmes, largely based on energy conservation and promotion of renewable energy, were launched in the 1980s. These included programmes for dissemination of clean technologies, such as bio gas, improved cook stoves, and solar cookers and programmes to enhance the supply of conventional energy sources, such as social forestry, agro forestry, and rural electrification. The commitment of the government towards the mitigation of rural energy problems is highlighted by the fact that India has one of the world’s largest rural energy programmes and was the first country in the world with a separate ministry- Ministry of Non-Conventional Energy Sources (MNES). Programmes in the cooking sector, which have a direct bearing on the women of rural India, constitute the largest programmes in terms of outreach and investment. These programmes are the National Project on Biogas Development (NPBD) and the National Programme on Improved Chulas (NPIC), launched in



1981–82 and 1983 respectively. The main objectives of these programmes have been to conserve fuel wood, reduce kitchen smoke levels, improve health and sanitation, and reduce women's drudgery from fuel collection. The government implements the programmes through state nodal agencies, block level functionaries and village extension workers. These are technology driven, target based programmes that are centrally planned and include a government subsidy on the capital cost. The annual performance of the programmes is measured by Ministry of Non-Conventional Energy Sources (MNES) in terms of the number of devices disseminated, on the basis of which the targets for the next financial year are fixed. Thus initiatives are taken by government on large scale to promote rural energy and make it accessible to large fraction population but failed to meet objective the government sponsored cooking energy programmes have made a limited impact on the rural energy situation, especially considering the magnitude and seriousness of the problem. The biogas and improved chulas programmes are estimated to together save about 10–11 million tonnes of fuel wood. The scale of operation and the dissemination rates are very low; so far, these programmes have covered only nine percent of the total rural households. By the end of March 1999, 2.9 million biogas plants had been installed under National Project on Bio-Gas Development (NPBD) across the country. National Programme on Improved Chulas (NPIC) has installed an impressive total of 30.9 million improved chulas. However, a 1993 evaluation of National Programme on Improved Chulas (NPIC) by the National Council of Applied Economic Research (NCAER) reported that only 55.6% of these cook stoves are actually in use. NCAER evaluations of National Project on Bio-Gas Development (NPBD) and National Programme on Improved Chulas (NPIC) highlight issues of limited outreach, structural and functional failures, lack of quality control, poor maintenance, limited capacity building, and insensitivity to people's needs and socio-cultural backgrounds are instrumental to the

limited success of different programmes. In spite of existence of large number of programmes their impact on rural energy has been as emphasis has only on targets ignoring issues that requires coordinated approach. The mixed performance of rural energy programmes can also be attributed to a large extent, to the poor involvement of women. There are two main barriers to participation of women in government planned energy programs: (a) lack of sensitivity to the need for facilitating such participation, (b) lack of appropriate tools/methods. In most of the implementing agencies of energy programmes, male staff members, who are largely unaware of the role of women in rural energy systems, are responsible for programme planning and execution. At the user level, the role of women is envisaged solely as that of information providers and rural women are often labeled as 'beneficiaries' of the programme rather than partners in development. The programmes thus lack women's perspective on the spectrum of rural energy issues.

SECTION-4

Rural Energy Scenario in Haryana

Haryana state has limited availability of natural sources of energy. There is no hydro-generation potential in the state. Even coal mines are located far away from the state. There is very limited forest area. Wind velocity prevailing in the state is also not sufficient to exploit the power generation. Although, solar intensity is relatively higher but the land area limitation does not encourage big scale harnessing of the resource as well. Therefore, state has been depending on the limited thermal generation capacity installed within the state and hydro power from the jointly owned project.

Like other states of India, energy system in rural parts of Haryana is also predominantly based on biomass-based fuels (or bio fuels). Coupled with their easy use, availability of bio fuels such as wood, agricultural residues and dung cakes have resulted in their wide spread use in rural domestic sector. The

fast depleting biomass resource base is, however, posing a strain on the rural natural resources, further exacerbated by the inability of the people to shift to commercial fuels such as electricity, Liquefied Petroleum Gas (LPG) and kerosene because of high cost and unreliable and irregular supply of commercial fuels in the rural areas. Given that per capita income in Haryana is higher than in other states of the country and all villages have been electrified, only about 4.1% of the energy consumption is met from these commercial fuels. It is generally observed that villagers prefer to use fuels that are easier and cleaner to use and have high efficiency. This suggests that more and more people want to move up the fuel ladder towards fossil fuels, in spite of the fact that their availability is becoming difficult. Typically half of the energy consumed in a rural household is for cooking and over 90% of this is

from non-conventional energy sources such as fuel wood and dung cakes. Villagers try to meet the shortfall in their energy requirements by substituting one energy resource by another (for instance fuel wood by agricultural waste). The fuel wood in shape of logs is so scarce that it is available mostly to the rich and affluent households. When fuel wood availability is difficult, rural people tend to switch from using logs to little twigs and branches, and when even twigs and branches are not available they move towards crop residues, cow dung and even dry leaves. The high cost of electric power, as well as of cooking gas Liquefied Petroleum Gas (LPG), coal, and kerosene, precludes their use as a source of domestic fuel especially for the rural poor and disadvantaged groups. The per-capita consumption of various energy resources in rural areas of Haryana is shown below in the table.

Table 1- Per-capita Consumption of Various Energy Resources for Different Activities In Villages Of Haryana.

Sr. No	Energy Resources	Cooking	Heating	Others*	Total
1	Cow Dung, kg/day	0.40	0.32	0.15	0.87
2	Agriculture Residues, kg/day	0.34	0.26	0.06	0.66
3	Fuel Wood, kg/day	0.35	0.20	0.02	0.57
4	Kerosene, litres/day	0.05	0.02	0.09	0.16
5	LPG Cylinder/day	0.04	0.01	0.01	0.06

Source: Community Environment Management Study in Haryana Villages, HCFP (Haryana Community Forest Project), Haryana.

*indicates activities like lighting, space heating etc.

It is clear from table above that per capita consumption of dung cakes is maximum followed by agricultural residues and fuel wood. Higher preference for dung cakes is due to its availability near the house and low cost. Thus it is primary fuel used by rural areas and agriculture residues and fuel wood are secondary and the commercial sources of energy constitutes a very small proportion which shows that modern energy carriers are yet not in the access of the rural people.

SECTION-5

Review of Literature

Although a vast amount of research exists on energy in India but rural energy in particular has not achieved the emphasis it deserves. Although there are certain limitation as discussed unavailability of data on production and consumption of rural energy, also difference in demography and physical conditions of different rural areas. So, there is need to design a different strategy for the rural areas as the same solution of urban areas cannot work. Also the shifting to modern carriers those are sustainable and renewable then only the permanent change in standard of living of the poor can be realized and their participation on

development can be observed. In this regard a few studies are reviewed as follows.

Rangarao B.V (1974): The author in this study highlights the energy crisis being faced by the world, specially the developing countries. He emphasizes on need for other alternatives than fossil fuels and developing countries have to sought out different set of solution to meet their crisis than developed countries as their (developing countries) consumption and production habits are different from the developed countries. The developing countries should not became a mere a watchdog and wait for the developed countries for cooperation in designing the energy strategy, but the developing countries should built in their own mechanism as the developed countries have exploited almost all the resources and developing countries have to yet pursue the path of industrialization. By preaching the users and raising the prices will not increase the efficiency of energy use, rather there is need to design such technology that can make best use of the renewable resources as they are available in plenty in countries like India.

Pendse D.R (1980):The author in this study states that the energy crisis had long been there but it has been recognized later and its effect have been traumatic for all the sectors of economy, specially for the developing countries like India. In this study two solutions are presented for developing countries to overcome the crisis i.e. the hard path and the soft path. The former is to continue with the fossil fuels and make earnest efforts to meet their growing demand for energy and the latter is to shift from non-renewable resources to renewable resources and conserve the fossil fuels. The author says that the soft path is far better option for future sustainability. The industrialized countries have become accustomed to energy intensive life style, so it is very painful for them to leave this road but developing countries have just started walking on the road, so it is easy for them to shift to the renewable sources of energy. The problem for the developing countries is that they lack

the technology, research and development for pursuing the soft path, for this the author suggest that the developed world should extend help in developing the techniques and for research and development so that the shifting became easy for the developing countries and fruitful for both the developed and the developing countries. Apart from this the cooperation of public, help from government and consumer organization is needed to fulfill this task.

Ghosh A (1991): The study focuses on the various challenges and the opportunities of overall energy scenario. After the first 'oil shock' of November 1973, most of the developed countries have succeeded in significantly reducing the elasticities of energy demand to GDP growth. Unfortunately this elasticity of energy demand to GDP is quite high in India. The reason for this is that the oil prices in 1988-89 had dropped to extremely low level, but the real price of oil being nearly same as prevailed before the first oil shock and the illusion that the prices had decreased led to increased dependency on oil and led to path of development that is highly energy intensive. To resolve this Ghosh(1991) points out that there is need to shift to renewable energy sources and conserve the non-renewable sources to promote the growth of economy on sustainable basis. The South-South cooperation is needed i.e. the South Countries which depend on other countries for oil import should cooperate each other and develop technologies to harness the renewable sources of energy.

Mitra N (1992): The present study focuses on the different energy planning exercise done by government of India. The author says that the most of the models used by developing countries are traditional models which are used by developed countries, but as the nature and aim of developing countries are different there is need to be sought out different set of solution. No doubt the models of developed countries can be used in the modern sectors but there exist in large number the low and middle sector which needs different set of solution. The

energy policy exercise should be done coherently i.e. bringing together both the demand and supply sectors together within planning framework. Energy supply and demand growth should promote structural changes and induce technological developments which will substantially increase productivity in low productive areas. There is need of energy accounting that can help in knowing the overall utilization of energy in various sectors and rethinking of present technologies how much they are suitable taking into consideration present and future availabilities and social prices of different energy forms. The substitution between different energy forms should be done keeping in view the comparative advantage of different energy sources i.e. for e.g. matching the investment on exploration of oil with exploration and production of better quality of coal. Goldemberg et.al(2001):In this article the author says that 20 years ago the issue of energy was considered as growth oriented supply side perspective and main stress was laid on how to meet the rising demand. But later on as the environmental impacts were discovered and the concern shifted towards demand side management of energy i.e. through energy efficiency. The industrialized countries had vastly exploited the energy resources to achieve the current rate of growth, but the developing countries need not to follow the same conventional and dirty technology path as they can shift to the modern technologies which are less energy intensive and environment friendly. No doubt there exist certain kind of barriers in developing countries for e.g. technological constraints, financial constraints and human capabilities, but they should adopt the technology in which they have the comparative advantage and which the domestic resources permit. As there exist a vast potential in the developing countries like India of non renewable resources, so there is need to further develop their own unique combination of resources-human, natural and technological so that they can create energy system appropriate to their own circumstances.

P. Balachandra (2010) In this study the author has presented a very detailed analysis of rural energy access in India. The access to energy is limited to cooking and lighting as these two are traditionally regarded as important measure of rural energy access. The access to rural energy is analyzed from multiple perspectives. The monthly per capita consumption expenditure is taken of rural households to classify them on basis of income and energy access. The temporal dynamics are covered through the study of energy access over the time period. The regional dynamics are covered by analyzing the status of energy access in selected states across India. The results indicate that there exist wide discrepancies in the status of rural and urban energy access. The energy deprivations are highest for the households belonging to the poorest strata.

Ramji, et.al (2012) In this paper the data of NSSO from 1999 to 2009-2010 is analyzed for studying the rural energy transition over the time period. The paper also analyzes the trend of use of energy sources for cooking and lighting among the rural households in India. It also presents a view of rural –urban energy consumption patterns profile and the gap in energy use among various income groups of rural areas. Energy consumption pattern differs not only among different income groups, but also varies across regions in rural areas.

Thus the focus of the most of studies renewable sources of energy and efficiency in energy use is best option in India for making the development path sustainable. Regarding the rural energy scenario they are dependent on the non-commercial sources of energy which has its own implications but among the rural areas also the worst sufferers are the people belonging to the lowest strata of income which indicates somewhere energy poverty is linked to income poverty.

SECTION -6

Data Sources and Objectives of The Study

The present study seeks to examine the energy consumption pattern of rural area to analyze the energy access in India.

For this purpose two villages of district Sirsa in Haryana are selected and to analyze further whether the energy consumption pattern are related to the income level the villages selected are one is developed village and other is underdeveloped. The sample comprised of 100 household selected through stratified random sampling, covering 50 household from each village. The household surveyed covered heterogeneous population belonging to different income groups and education groups. A well structured interview schedule was constructed to assess profile and domestic activity wise energy consumption pattern.

SECTION-7

Domestic Energy Consumption Pattern of District Sirsa (Haryana)-A Case Study of Selected Village

To analyze whether the energy resource use in rural areas is related with level of development, a primary survey of two villages in Dabwali block in district Sirsa of Haryana was undertaken in July 2012. Sirsa is supposed to be the oldest place of north India and north western most district of Haryana. Its former name used to be Sairishaka. Sirsa is spread in area of 4277 Sq km with population 11, 16,649 (as on 2001 Census). Its administrative set up constitute of 7 blocks and 325 villages. The two villages selected are:

1. Kaluana
2. Ahmedpur Darewala

Kaluana is among the developed village of district Sirsa, located 60km from Sirsa. It possess all the facilities of developed village i.e. Government Senior Secondary School, Public Health Care Centre,

Bank, Bijli Ghar, two water works, veterinary hospital and better transport facility. Kaluana was selected as the best village in Haryana State in 2011. On the other hand Ahmedpur Darewala is one of the less developed village, lacking the modern basic facilities of education and health. It is located 52 km from Sirsa. The sample comprised of 100 household selected through stratified random sampling, covering 50 household from each village. The household surveyed covered heterogeneous population belonging to different income groups and education groups. A well structured interview schedule was constructed to assess profile and domestic activity wise energy consumption pattern. Only energy use for cooking, lighting and heating is taken as these are the basic needs and typically it is only after satisfying these basic needs there is hope for graduating other end uses of energy.

The response of the household was different in the developed and less developed village. In the developed village i.e. Kaluana the government has introduced the solar energy in form of street lights, electric bulbs are replaced with CFL and bijli board is set up in the village. When asked about suggestions and comments the villagers want that there should be proper maintenance of solar street lights, the use of solar energy should be promoted at large scale for domestic use also. The supply of LPG and electricity is not proper and prices are too high.

In contrast in the less developed village i.e. Ahmedpur Darewala the government has introduced the solar street light in limited manner that too does not work properly due to lack of maintenance, the transformers do not work properly and no attention is paid by government regarding the accessibility and availability of energy resources in the village. After the analysis of the schedule it was found that the energy use differed not only between the two villages but also among the different income groups of same village. The energy resources used in both villages

(Kaluana and Ahmedpur Darewala) for domestic use are shown below in the tables given below.

Table 2: Energy used for domestic purpose for Kaluana

Fuel Type	End Use		
	Cooking	Lighting	Heating
LPG	52%	NA	30%
Kerosene	8%	6%	NA
Fuel wood	36%	NA	38%
Cow dung	NA	NA	32%
Electricity	NA	94%	NA
Others	4%	NA	NA

Source: Self computed from the Schedule

From the above table we have that in Kaluana for cooking, the dominant fuel is LPG followed by fuel wood and kerosene. More than 50% people are using LPG for cooking which shows the LPG is accessible and available to the people of Kaluana. Also the table shows that inspite of the fact that kerosene is available at subsidies and at public distribution system (PDS) it failed to occupy place in the primary fuel for cooking, which shows the

preference for the clean fuel. In lighting 94% of people uses electricity as a major source and only 6% uses kerosene which shows a success of rural electrification programme of government. Thus somewhere development is linked to the access to modern energy carriers as the results of Kaluana village reveals. In the less developed village we have different pattern of energy use for different end use activities as below:

Table 2.1: Energy used for domestic purpose in Ahmedpur Darewala

Fuel Type	End Use		
	Cooking	Lighting	Heating
L.P.G	20%	NA	NA
Kerosene	2%	16%	NA
Fuel wood	72%	NA	14%
Cow dung	4%	NA	80%
Electricity	NA	84%	NA
Others	2%	NA	6%

Source: Self computed from the schedule

From the table above we see that in Ahmedpur Darewala in contrast to Kaluana just 20% of population is using L.P.G and more than 70% of population depends on fuel wood as a primary source of cooking. In case of lighting electricity is accessible to more than 80% of the population. In case of heating again cow dung and fuel wood is the

dominant fuels. This shows the vast difference in the usage of fuels in two villages. The modern energy carriers are not accessible, affordable and available in the less developed village in comparison to the developed village. Now if we further segregate the fuel type used for different end uses income wise the results are below in the table.

Table 3: Energy Usage by different income group of village Kaluana

END USE	INCOME GROUP	FUEL TYPE	PERCENTAGE OF PEOPLE USING
COOKING	Poor**	LPG	2
	Rich*	LPG	26
	Poor	Fuelwood	22
	Rich	Fuelwood	None
HEATING	Poor	Cowdung	24
	Rich	Cowdung	6

Note:*(the household whose income is 3 lacs and above)

** (the household whose income is below 1 lac)

Source: Self computed from the schedule

From the above table which shows the fuel type used by rich and poor household for purpose of cooking and heating we see that for cooking LPG is used by 26% rich household out of the sample whereas it is just 2% by poor household. In case of fuel wood it is used for cooking by 22% poor household whereas it is not used at all by the rich household. It reveals that usage differ not only due to non-availability but also due to income variations. Similarly for purpose of heating cow dung is used by 24% poor household whereas it is used by just 6%

rich household. Thus poor have to still depend on the non-commercial energy resources because of non-affordability. In spite of the initiatives taken by government to promote energy resources in developed village, the poor because of low income cannot even avail the available resources.

The situation is graver in case of less developed village taken in the study. The following table shows the fuel type used by different income groups for cooking and heating.

Table 3.1: Energy Usage by different income groups of village Ahmedpur Darewala

END USE	INCOME GROUP	FUEL TYPE	PERCENTAGE OF PEOPLE USING
COOKING	POOR	LPG	NONE
	RICH	LPG	16%
	POOR	FUELWOOD	50%
	RICH	FUELWOOD	2%
HEATING	POOR	COWDUNG	50%
	RICH	COWDUNG	NONE

Note:*(the household whose income is 3 lacs and above)

** (the household whose income is below 1 lac)

Source: Self computed from the schedule

The table shows that the rural energy scenario differs not only among the developed and less developed village, but also the energy usage pattern is divergent among the different income classes. For cooking LPG used by rich class is 16% but it is not

used by the poor. In case of fuel wood also percentage of usage is more among the poor than rich. In case of cow dung it is not used at all by the rich but most of poor rely on the cow dung as main fuel, because among the extremely poor people can't

afford fuel wood even as they didn't own land. Thus there is difference in fuel use among the non-commercial sources of energy also due to unaffordability and unavailability.

SECTION-8

Conclusion and Suggestions

In India constituting 15% of world population, there is voracious appetite for energy. But the country lacks sufficient domestic energy resources particularly petroleum and natural gas and have to depend on imports for meeting its growing energy requirements. If consumption follows the current trajectory, India is also projected to run out of coal, its primary source of energy. The bulk of India's hydro potential is located in northeastern regions and northern parts in the Himalayas'. Thus the distribution of energy resources is much skewed which causes problem in its availability. In the rural areas the picture is more grim as there is dominance of biomass-based fuels (wood, animal dung and crop residues) despite several initiatives by the government to bring about a 'fuel switch' by promoting more widespread use of liquid (kerosene) and gaseous (LPG) fuels and electricity. Biomass fuels meet 85–90% of the domestic energy demand and 75% of all rural energy demand. Like other states of India, energy system in rural parts of Haryana is also predominantly based on biomass-based fuels (or bio fuels). Coupled with their easy use, availability of bio fuels such as wood, agricultural residues and dung cakes have resulted in their wide spread use in rural domestic sector. The fast depleting biomass resource base is, however, posing a strain on the rural natural resources, further exacerbated by the inability of the people to shift to commercial fuels such as electricity, Liquefied Petroleum Gas (LPG) and kerosene because of high cost and unreliable and irregular supply of commercial fuels in the rural areas. As it is clear from the case study of villages that still a large segment of population lack the access

to commercial energy sources for domestic use. Also the usage differs among the different income groups because of non-affordability. The people do have the desire to shift to modern sources, they want to shift from traditional energy sources to commercial fuels but because of irregular supply and high prices of commercial fuels and low income they remain accustomed to non-commercial fuels. The government has taken several steps time to time to promote rural energy; it has promoted the use of clean technologies like improved cook stoves, solar cookers and bio-gas plants. The government also subsidies the various schemes for promoting use of renewable energy. Thus there is no dearth of rural energy programmes but even then their use is not so widespread and people rely on traditions fuels. The need is to link rural development programmes with the rural energy provision. There is need to reduce arduous human labour, modernization of biomass as modern energy resource in efficient devices, provision of safe water, electrification of all homes and provision of energy for income generating activities in households, farms and village industries for over all rural development. But the question is who is provider of the services as government is inefficient and regarding market the issues of equity and environmental concerns are there .So the third option encouraging individual initiative subject to local community control is more effective than government and market acting alone. Moreover if rural areas policies aim at sustainable rural development will have implication on major social problems-as would result in improvement in HDI, poverty alleviation, improvement in quality of life of women and children. Also reason is lack of awareness on the part of people. So to encourage the use of cleaner fuels and meet the rural energy deficiency, there is need to motivate the people and encourage them to use the modern technologies at large scale only then the problem of rural energy access can be solved.

SECTION-9

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