Abstract- Energy is supplied in the form of electricity, heat or fuels and the energy supply system must guarantee sustainable energy supplies, production and distribution of energy. Rural Electrification of remote areas is based on renewable energy and grid connectivity which can satisfy the energy needs of an area in appropriate and sustainable manner. The basic needs of electricity in the remote areas for the homes for light and health care, schools for studying and getting access to information and for giving companies the opportunity to develop in that areas. It is mainly concentrated on also fast increasing the agriculture sector and industrial productivity reduces rural-urban migration, creates more jobs and significantly raises the overall quality of life in rural areas.

This paper reports comes from the literature review, survey of remote areas to supply electricity in sustainable manner. In this paper presents and discuss basic issues and challenges for the electrification of remote areas. Also discuss the technical and economic issues of rural areas. This paper is concerned with the role of electrification of rural areas connected either by grid and renewable energy sources in meeting is the issues and challenges.

Keywords- Rural Electrification, Issues, Challenges, Policy and Sustainable Development.

I. INTRODUCTION

The urban and suburban areas of the developing countries will depend on commercial fuels like coal, oil, natural gas, and nuclear. The total amount of such type of fuels consumed will steadily increase well into the twenty-first century. Rural and the remote areas, which entirely depends on the non-commercial fuels like firewood, agricultural wastes and animal wastes [3]. The large population of the world lives in remote rural areas that are geographically isolated and sparsely populated. Such type of areas has very low power demand and is not connected to the grid. In a developing country like India the majority of the population lives in remote rural areas with no utility grid and this seems to be the main obstacle to overall development. Electricity is one of the cleanest energy transfer option and is therefore the basis for the development of an area irrespective of the source of power [1]. The grid could not be extended in the rural areas due to its high cost, scattered nature of the area, low load factor, distribution and electricity losses [2].

Sustainable Development of the country which is included economic development, maintaining environmental quality and social equity. This would be ensuring that the development takes place to fulfill our present needs without compromising the needs of our future generations. The importance and relevance of power development for the remote areas are clean and green power is the most essential element. Such type of growth depends upon the particular choice of the appropriate technology for power generation either grid connectivity or renewable energy sources [6]. In recent years, from an environmental point of view the renewable energy resources are being looked at as unlimited, inexhaustible, environment friendly and sustainable sources. Direct and indirect benefits of the electricity generation by renewable sources in the rural areas/remote areas include irrigation, domestic, commercial, crop processing, cooling and small-scale industries, which help in improving the living standard of the people of remote areas. [1].

The main aim of this paper is to realize the condition of remote areas problems involving energy provision for poor people in rural areas of developing countries. The focus of this paper is on the issues and challenges of energy, access to electric connectivity and the reasons for low electrification rates in rural areas will be analyzed in order to show the urban-rural differences and the challenges for the government in rural areas. This paper is mainly concerned with the role of meeting the issues and challenge of electrifying the rural areas.

II. ISSUES AND CHALLENGES OF RURAL ELECTRIFICATION

Some major issues and challenges are concern of rural electrification after the literature survey of rural electrification are classified as [4, 9, 10-11].

2.1 Some Issues of the rural electrification are-

1. Economical issues are mainly include
   a. High capital cost
   b. Lack of financing/subsidies
   c. Lack of access of credit for the consumer
   d. No link with income generation
2. Legal and regulatory issues include inadequate legal frameworks for renewable energy power sources and the onerous requirement for the small power producers set by the utility.

3. Financial and institutional issues include
   a. A lack of access to credit for both the consumers and investors
   b. The lack of sufficient technical, geographical and commercial information by market participants to make sound economics decision.

4. Lack of policy and legal framework

5. Improper use of subsidies

6. Donor dependency

7. Unrealistic political commitments

8. Lack of institutional capacity

9. Lack of technical knowledge

10. Integrated Rural Development of the areas

11. Area-Coverage of remote location.

12. Maximizing the benefits and minimizing the costs.

2.2 Some challenges of the rural electrification are-

1. Need for a better regulatory system using existing state and central government infrastructures.

2. In remote areas the communication infrastructure is weak.

3. In remote areas the lack of proper level of education and knowledge.

4. Maintaining high quality and productivity of the land, hilly area for consistent output, need for efficient soil and water management system.

5. Agriculture residue used for construction, Small Industry, Pumping, Cottage industry.

6. Maintenance is limited due to unavailable spare equipment nearby.

III. POLICIES OF RURAL ELECTRIFICATION

3.1 National Electricity Policy, 2005

The National Electricity Policy aims at achieving the following objectives-

- Access to Electricity - Available for all households in next five years
- Availability of Power - Demand to be fully met by 2012. Energy and peaking shortages to be overcome and adequate spinning reserve to be available.
- Supply of Reliable and Quality Power of specified standards in an efficient manner and at reasonable rates.
- Per capita availability of electricity to be increased to over 1000 units by 2012.
- Minimum lifeline consumption of 1 unit/household/day as a merit good by year 2012.
- Financial Turnaround and Commercial Viability of Electricity Sector.
- Protection of consumers’ interests.

3.2 National Electricity Plan

The National Electricity Plan would be for a short-term framework of five years while giving a 15 year perspective and would include-

- Short-term and long term demand forecast for different regions
- Suggested areas/locations for capacity additions in generation and transmission keeping in view the economics of generation and transmission, losses in the system, load centre requirements, grid stability, security of supply, quality of power including voltage profile etc. and environmental considerations including rehabilitation and resettlement
- Integration of such possible locations with transmission system and development of national grid including type of transmission systems and requirement of redundancies
- Different technologies available for efficient generation, transmission and distribution.
- Fuel choices based on economy, energy security and environmental considerations.

3.3 National Rural Electrification Policies, 2006

1. The goals include provision of access to electricity to all households by the year 2009, quality and reliable power supply at reasonable rates and minimum lifeline consumption of 1 unit/household/day as a merit good by year 2012.

2. For villages/habitations where grid connectivity would not be feasible or not cost effective, off-grid solutions based on stand-alone systems may be taken up for supply of electricity.

3. State government should within 6 months, prepare and notify a rural electrification plan which should map and detail the electrification delivery mechanism.

4. Gram panchayat shall issue the first certificate at the time of the village becoming eligible for declaration as electrified. Subsequently, the Gram Panchayat shall certify and confirm the electrified status of the village as on 31st March each year.
5. The state government should set up a committee at
the district level within 3 months, under the
chairmanship of chairperson of the Zila Panchayat
and with representations from district level
agencies, consumer associations, and important
stakeholders with adequate representation of
women.

3.4 Tariff Policy

The objectives of this tariff policy are to-
(a) Ensure availability of electricity to consumers at
reasonable and competitive rates
(b) Ensure financial viability of the sector and attract
investments
(c) Promote transparency, consistency and
predictability in regulatory approaches across
jurisdictions and minimise perceptions of regulatory
risks
(d) Promote competition, efficiency in operations and
improvement in quality of supply

3.5 Electricity Act, 2003

The Electricity Act, 2003 has accorded renewed priority
to rural electrification and provision of electricity services
in order to bring about a change in the overall picture of the
state of rural electrification in the country.

And the other several policy initiatives have been taken
in the past they have failed to successfully address the
requirement on account of various impediments, including
poor revenue realisation by the state utilities in the rural
areas, high technical and commercial losses, low paying
capacity of the rural place.

IV. PRESENT SCENARIO OF RURAL ELECTRIFICATION

In India, the latest census data show that only 53% of the
rural population has access to grid electricity and 43% still
use kerosene for lighting. The rural people to pay large
amount for kerosene. Due to this large amount, the rural
people are does not uses of power for mobile charging,
fans, TV, irrigation pumps, agriculture machinery,
computers in schools, and so on. This type of situation is
continuing in remote areas, where the power is providing
by diesel generator based just enough for lighting one CFL
bulb. A shopkeeper is also use a one compact fluorescent
lamp (CFL) bulb for few hours every night [17]. The
installed power generation is shown in Figure [1] and
Figure [2] renewable energy sources.

| Source: Central Electricity Authority | Figure [1] |
The pace of grid-electrification in India has increased, since the launch of the Rajeev Gandhi Gramin Vidyutikaran Yojana (RGGVY) scheme in 2005 by the Ministry of Power. As on April 2012, about 93.8% villages are electrified leaving some 36,700 villages un-electrified out of a total of 593,700 villages. These electrified villages receive power for as low as 2-6 hours a day or less than and to maximum of 8-10 hours a day. The timing of the power supply is also unscheduled and hence villagers are never able to plan their activities and suffer from electricity [17]. The villages are un-electrified are shown in Figure [3] and Figure [4].
V. SCHEME OF RURAL ELECTRIFICATION

5.1 Kutir Jyoti Program (KJP)

KJP was initiated in 1988-89 to provide single point light connection (60 w) to all Below Poverty Line (BPL) households in the country. KJP provides 100% grant for one time cost of internal wiring and service connection charges and builds in a proviso for 100% metering for release of grants. Nearly 5.1 million households have been covered under the scheme to date. The scheme was merged into the Accelerated Electrification of One Lakh Villages and One Crore Households in May 2004 and now into the RGGVY [7].

5.2 Pradhan Mantri Gramodaya Yojna (PMGY)

The PMGY launched in 2000-2001 provided additional financial assistance for minimum services by the central government to all states on a 90% loan and 10% grant basis. These included rural health, education, drinking water and rural electrification. The PMGY with an outlay of about Rs 1600 crores during the 10th Plan period was being coordinated and monitored by the Rural Development Division of the Planning Commission. Under PMGY states had the flexibility to decide on the inter-reallocation of funds amongst the 6 basic services. Thus states could enhance allocations to expedite the pace of rural electrification. The scheme has been discontinued from 2005 onwards [7].

5.3 Accelerated Rural Electrification Program (AREP)

The AREP operational since 2002, provides an interest subsidy of 4% to states for rural electrification (RE) programs. The AREP covers electrification of unelectrified villages and household electrification and has an approved outlay of Rs. 560 crore under the 10th Plan. The interest subsidy is available to state governments and electricity utilities on loans availed from approved financial institutions like the REC (Rural Electrification Corporation), PFC (Power Finance Corporation) under the Rural Infrastructure Development Fund (RIDF) [7].

5.4 Rural Electricity Supply Technology Mission (REST)

The REST was initiated on 11th 2002 [7]. REST proposes an integrated approach for rural electrification and its aims are-

1. To identify and adopt technological solutions
2. To review the current legal and institutional framework and make changes when necessary
3. To promote fund, finance and facilitate alternative approaches in rural electrification
4. To coordinate with various ministries, apex institutions and research organizations to facilitate meeting national objectives

Sources: Bharat Nirman- Rural Electrification

Figure [4]
5.5 Minimum Needs Program (MNP)

The MNP exclusively targeted states with less than 65% rural electrification (by the old definition) provides 100% loans for last mile connectivity. The program resources are drawn from the Central Plan Assistance. Rs. 775 crore was released during 2001-03 for rural electrification under the MNP. The scheme was discontinued in 2004-05 on account of difficulties in implementation [7].

5.6 The Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY)

Government of India, in April 2005, launched the scheme Rajiv Gandhi Grameen Vidyutikaran Yojana Scheme of Rural Electricity Infrastructure and Household Electrification for electrification of un-electrified villages and providing access to electricity to all rural households in the country, including electrification of un-electrified habitations with a population of above 100, providing free electricity connections to BPL households [4].

5.7 The Remote Village Electrification (RVE) Programme

Since 2005, the RVE programme of the Ministry of New and Renewable Energies (MNRE) has been supplementing the efforts of the Ministry of Power (MoP) through complementary measures for the provision of basic lighting/electricity facilities through renewable energy sources. The Remote Village Electrification programme (RVE) is responsible for electrifying un-electrified remote census villages and remote un-electrified hamlets of electrified census villages where grid connection is either not feasible or not economical (because they are located in forests, hills, deserts or islands) and where DDG projects are not implemented by the RGGVY of the Ministry of power [6].

5.8 The Jawaharlal Nehru National Solar Mission (JNNSM)

The Jawaharlal Nehru National Solar Mission was launched on 23 November 2009 in a statement to Parliament by the Union Minister for New and Renewable Energies. This mission is part of the 2008 Indian National Action Plan on Climate Change (NAPCC) which seeks to reduce India’s future reliance on non-renewable energy sources. The National Solar Mission is a major initiative of the Government of India and State Governments to promote ecologically sustainable growth while addressing India’s energy security challenge. It will also constitute a major contribution by India to the global effort to meet the challenges of climate change.

By the end of the 13th Five-Year Plan, in 2022, the JNNSM should have led to an installed capacity of 20000 MW and the deployment of 20 million solar lighting systems in rural areas [6].

VI. Benefits of Rural Electrification

The village electrification is a main step for improving the socio-economic conditions of rural areas and for the overall countries development, also concern environmental benefits and the costs of the rural electrification in developing countries. The rural electrification is substantially contributes to the development of rural and remote areas [18]. In remote areas the electricity is mainly used for powering of light bulbs, fans, television sets, computers and phones, when they are available [4]. The availability of electricity removes poverty and helps in development by fulfilling the health, education, information, communication and health care is facilitated by the powering of computers and phones, water supply (for drinking and irrigation) needs of the rural population [15]. When the electricity is used for powering home appliances, household chores tend to become less tedious, when it is used for lighting, the relative brightness of the light bulb as opposed to candle light allows children to read or study in the later hours of the day in remote areas, bringing obvious education and leisure benefits. Women and children benefit directly from these improvements but table or ceiling fans and television sets offer comfort during evening time, increasing the general welfare of all members of the family in the household [4].

Besides the social benefits, decision makers tend to give more importance to the economic impact of access to electricity as an income-generating process. Electricity use is expected to lead to more productive processes, the growth of businesses or farms using electricity will then increase demand for electricity leading to a virtuous growth cycle profitable to both electricity providers and rural communities. Such type of economic growth is obviously an important achievement of any rural electrification programme. The necessary conditions for such economic growth lie in the parallel or complementary development programmes for the newly electrified communities [4]. Such type of benefits can be achieved in irrigation, food preservation, rural markets, crop processing, agriculture and rural small-scale industries, rural businesses, farms or other small rural structures. It creates employment opportunities for the village’s youth and promotes a better standard of life [15].
The benefits of rural electrification either by grid or off-grid solution have been extensively realized. For individual households, the main advantage is the shift from traditional to modern lighting systems typically from kerosene lamps to the superior-quality electric lighting.

VII. CONCLUSION

In the past few years the developing countries will certainly need more commercial fuels and will have to explore and develop all of their conventional resources to meet their growing demands from urban and suburban areas and from their industrial sectors. Renewable energy systems appear to be viable in locations, where electrical grid supply has not yet reached, where commercial fuels are scarce due to their cost or unavailability or both and where even small amounts of energy can make a considerable impact on the living environment of local people.

The rural electrification is based on renewable energies in developing countries promises a cleaner, cheaper and more democratic way of improving the quality standard of life. It finally concluded that rural electrification presents different load patterns in relation to that of urban loads in terms of the daily variation expected and the yearly variation in rural patterns are smoother. Besides, in case of remote areas that present small incomes, the extension of utility grids is not feasible and the total dependence on imported fossil fuels is economically unaffordable, fuel transport costs become prohibitive, so that the aim is to be remote areas are electrified in sustainable manner. It conclude that the sustainable development of the rural electrification is based on providing the electricity to that areas for satisfying all the need or providing the electricity in maximum hours.

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