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# A Comparative Study and Analysis of Various Schemes for Rural Electrification through Renewables in Odisha

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***Abstract-***

***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 grim picture of the state of rural electrification in the country. While 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 realization by the State utilities in the rural areas, high technical and commercial losses, low paying capacity of the rural populace etc. In this paper we will discuss about the village electrification schemes continuing in Odisha. The detailed fund sharing and coverage is also discussed in details.***

***Keywords-Rural electrification, SHS, RVEP, RGGVY, Alternate energy sources***

## I. INTRODUCTION

Rural electrification is an integral component of poverty alleviation and rural growth of a nation. In India, electricity has not played effective role in the socio-economic growth of village. Government of India has ambitious target of providing electricity to all villages by 2008 and all rural households by 2012. Steps are initiated with Rural Electric Corporation, State Electricity Boards, Reforms in Power sector. Ever increasing demand of electrical energy is causing a large gap in generation and load demand. All the requirement of energy cannot be fully met with conventional grid supply so, an alternative energy source has to be found out for this purpose. Therefore it has become necessary to explore the applications of distributed energy sources which are inevitable to meet the energy requirements. An attempt has been made in this paper to assess the features of rural electrification in India and a simple cost comparison of Solar Home Systems (SHS) with grid supply in deep rural areas.

## II. RURAL ELECTRIFICATION STATUS IN ODISHA

Energy access is not only essential at the household level, but is also very critical to the provision of basic minimum infrastructure such as hospitals, schools and industries among others. For a state like Odisha, developmental goals and energy access are very closely linked and "Universal Energy Access" as a goal is necessary not just for each household but also for the associated sectors in the economy that will play an important role in economic development. The census 2011 report clarifies the status of percentage of electrified villages in all states are given below.

**Table-1: Status of Rural Electrification in India**

| Sl No | Percentage of Electrified Villages | Total Number of States | Names of the States |
|---|---|---|---|
| **1** | 100% | 9 | Andhra Pradesh, Delhi, Goa, Haryana, Karnataka, Kerala, Punjab, Sikkim and Tamil Nadu |
| **2** | 90-99% | 12 | Assam, Bihar, Gujarat, Himachal Pradesh, Jammu and Kashmir, Madhya Pradesh, Chhattisgarh, Maharashtra, Mizoram, Rajasthan, Uttaranchal and West Bengal |
| **3** | 81-90% | 4 | Jharkhand, Manipur, Meghalaya, Uttar Pradesh |
| **4** | 71-80% | 4 | Arunachal Pradesh, Nagaland, Orissa, Tripura |

The primary source of lightning in Odisha according to census 2011 is given below. For the first time the solar electricity source is included. So it is a great achievement for the Implementing agency OREDA for electrifying the rural areas through Renewable. The major source is still Kerosene which is to be great pollutants to the environment. The cooking procedure which is also a concern for Govt. in health aspect. The primary source of lightning is given below as per the census 2011 report.

**Table-2: Households by main source of lighting(Census 2011)**

| Area | No. of Household | Electricity | Kerosene | Solar energy | Other oil | Any other | No lighting |
|---|---|---|---|---|---|---|---|
| **Total** | 96,61,085 | 41,55,886 | 53,45,570 | 34,216 | 10,081 | 10,678 | 1,04,654 |
| **Rural** | 81,44,012 | 28,95,252 | 51,13,827 | 31,870 | 8,464 | 8,696 | 85,903 |
| **Urban** | 15,17,073 | 12,60,634 | 2,31,743 | 2,346 | 1,617 | 1,982 | 18,751 |

In Odisha, the energy consumption patterns in rural areas have been largely towards using firewood and other traditional biomass fuels such as chips, charcoal and dung cake. The demand for energy particularly in rural India consists mainly of energy for cooking and energy for lighting. Improving and extending access to energy services is one of the most urgent tasks that lies ahead since majority of the rural population in the country still has no access to electricity, and more than one-half rely on traditional biomass as their principal household fuel. The Rural and urban comparison of energy access in various districts of odisha is provided below according to census 2011.

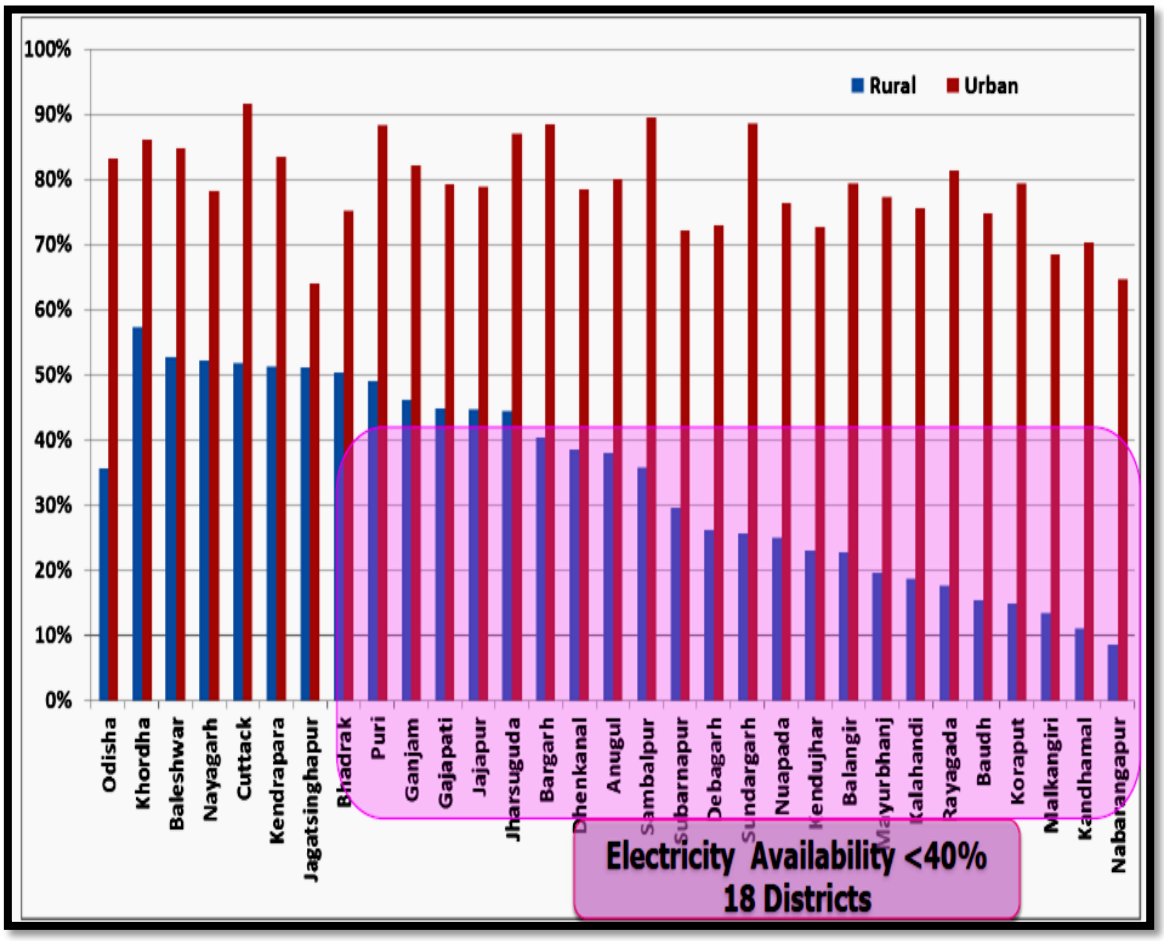


Figure-1: Odisha – Electricity Access (2011 Census)(Source: SunMoksha, OREDA)

The assest possession in Odisha according to census 2011 shows 84 % of total people live in villages and prevails acute poverty level. There energy is very much required for the overall development. The data table is given below.

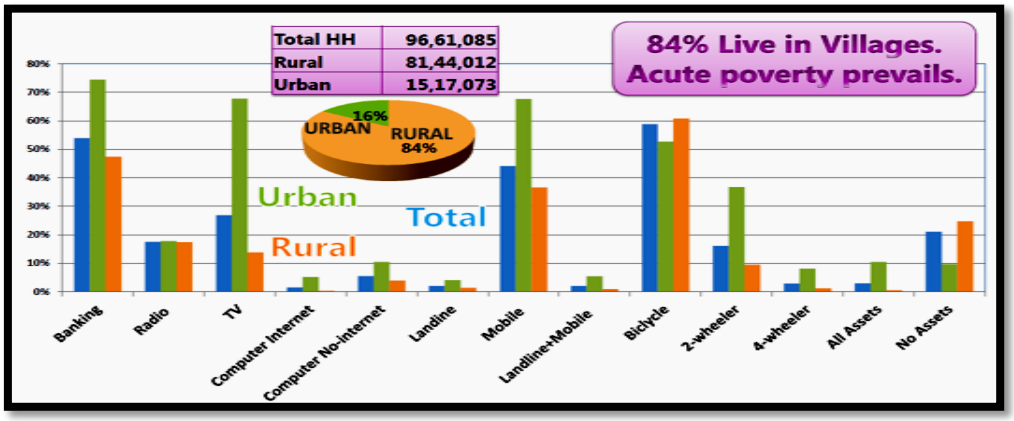


Figure-2: Odisha – Asset Possessions (2011 Census) Source: SunMoksha,OREDA)

Compared to 2000-01, the State's total consumption of power has increased by 115 percent by the end of 2011-12 but rural urban disparity in consumption remains high. By the end of March, 2012, out of 47,529
Inhabited villages, 39,347 villages were electrified. Nearly 17 percent of villages are yet to be electrified. During 2011-12, out of a total power consumption of 13,054 MU in the State, 2,974 MU (22.8 percent) was consumed in rural Odisha, while out of a total 39.25 lakh consumers, 27.66 lakhs (70.5%) were from rural areas. Further, out of a total 2,974 MU power consumed in rural Odisha, 73 percent was used by domestic consumers. District-wise village electrification data by the end of March, 2013 is presented below. Village electrification rates in districts like Malkangiri, Koraput, Rayagada, Boudh, Kandhamal and Nawarangpur are very low. In Jharsuguda and Nuapada districts, 100 percent village electrification has been done

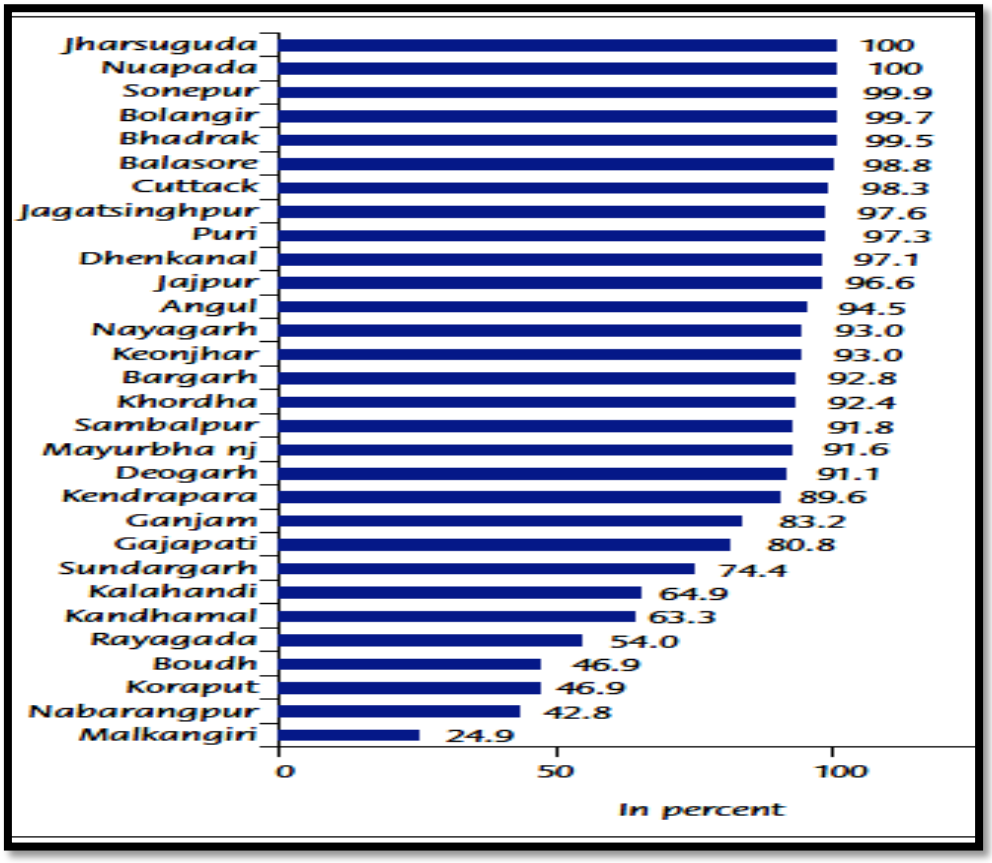


Figure-3: District wise Percentage of villages Electrified, 2012-13

Both the Government of India and the State Government have stressed the urgent need for expeditious electrification in rural areas. As per the MoU signed with Govt of india, the State Government is committed to electrify each household by 2013. A state-level monitoring committee has been constituted for the purpose. There are various schemes are being used by Govt. of Odisha for village electrification, which are discussed below in details.

### III. RAJIV GANDHI GRAMEEN VIDYUTIKARAN YOJANA(RGGVY)

Launched in April 2005, this Central Scheme aims to provide electricity to all villages which have a population of 100 and more in five years. It envisages 90 percent as capital subsidy and 10 percent as loan to the State Government. The scheme has been executed in Odisha by Central PSUs such as NTPC, NHPC, NESCL and PGCIL. By the end of 31.12.2011, GoI released a sum of Rs.3,098.35 crores through REC in favour of CPSUs, of which an amount of Rs.2,549.49 crores has been utilised. The target of RGGVY is to electrify 14,697 un-electrified/de-electrified villages, 29,420 partly electrified villages and 32,27,152 BPL households in all the districts. Against this, 34,008 villages, 25,97,683 nos. of BPL kits have been installed and 10,65,039 BPL houses have been electrified.

**Table-3: Details of Approved Projects under XII Plan of RGGVY as on 31.3.2014(Sorce:-Ministry of Power,GOI)**

| IMPLEMENTING AGENCY | COVERAGE OF VILLAGES | | | COVERAGE OF HABITATIONS | | | HOUSEHOLDS | | SANCTIONED PROJECT COST (RS. LAKHS) |
|---|---|---|---|---|---|---|---|---|---|
| | UE | PE | TOTAL VILLAGE | UE | PE | TOTAL HABITATION | RURAL hh | BPL hh | |
| **NESCL** | 1017 | 14091 | 15108 | 6738 | 27995 | 34733 | 1680020 | 544101 | 132769 |
| **NHPC** | 891 | 6249 | 7140 | 3108 | 11438 | 14546 | 416090 | 253663 | 58328 |
| **PGCIL** | 1205 | 17958 | 19163 | 8970 | 44421 | 53391 | 1431754 | 716834 | 146231 |
| **TOTAL ODISHA** | **3113** | **38298** | **41411** | **18816** | **83854** | **102670** | **3527864** | **1514598** | **337328** |

### IV. BIJU GRAM JYOTI YOJANA

In order to ensure Electricity to All, the State Government has launched the above flagship scheme in 2007-08 with a target to cover during the11th Plan period, 10,000 habitations with population less than 100 and BPL households in these habitations, which are not covered under the RGGVY scheme. The State has launched the Biju Gram Jyoti Programme of Village Electrification from its own funds because of the inordinate delay in sanctioning projects under RGGVY by Government of India. Against this target, 9,732 habitations have been electrified and electrification works in 2,692 habitations are in progress at an expenditure of Rs.235 crores by the end of 31st January 2012. The State Government has also made a provision of **Rs 120** crore under the Biju KBK Yojana for providing electricity, road and drinking water to villages.The coverage of this scheme till 30.4.2013 is given below

**Table-4: Biju Gram Jyoti Yojana Achievement up to 30.04.2013(Source: OREDA)**

| Total No. of Villages Covered in Odisha | Total no. of Habs taken up under the scheme (Nos) | Total no. of Habs. Electrified till 30.04.13 (Nos) | Total no. of BPL households charged (Nos) | Total fund allotted till date in (Rs) in lakh |
|---|---|---|---|---|
| **Grand Total** | **16611** | **13120** | **156070** | **50375.31** |

### V. REMOTE VILLAGE ELECTRIFICATION PROGRAMME(RVEP)

This programme targets electrification un-electrified hamlets of electrified villages where grid connectivity is neither feasible nor cost effective. Financial assistance is provided by both the Centre and the State for this programme. Projects should intend to cover all the households in the village/hamlets, including those in the dalit bastis of the village, and creation of capability for availability of electricity as laid down in the National Electricity Policy, 2005, i.e., a minimum of 1 kWh/household/day. The identification of such remote villages has been broadly entrusted to the Rural Electrification Corporation. The state governments shortlist unelectrified villages in their states which are not likely to be

electrified through grid and send their names to **MNRE** for verification by **REC**. The current eligibility of villages/hamlets will be as follows:

i. All census unelectrified villages and their hamlets not covered under Rajiv Gandhi Grameen Vidyutikaran Yojana, as confirmed by REC.

ii. Unelectrified hamlets of electrified census villages having population of **less than 100** subject to following certifications:

a. A certificate from the local revenue authorities that the hamlet is in permanent existence and certifying its total population, number of total households showing number of **SC/ST** households, number of **BPL** households if any, and the census code of the parent electrified village.

b. A certificate from the implementing agency that the hamlet is unelectrified and is not being taken up for electrification under state/Central programmes in near future.

iii. Unelectrified hamlets of electrified census villages having population **above 100 but less than 300** which have not been covered for grid connectivity under RGGVY as endorsed by REC.

**Activities taken up**

The schemes executed through many process as described below

- Survey of villages
- Preparation of Detailed Project Reports
- Constitution of Village Energy Committees
- Installation of approved solar Lighting systems in households, streets and for community uses.
- Capacity building and development of repair & maintenance infrastructure, etc.

The most commonly used model for village electrification in RVEP is

*A. Solar Home Lighting Systems*

Each Household is provided with 2 bulbs ( 9 watt compact fluorescent lamp) for 4 hours a day either through an individual Solar Home Lighting System or a Centralized Power Plant depending upon the size of the village.

*B. Solar Street Lighting Systems*

One Street Light (11 watt compact fluorescent lamp) is provided for every 10 houses.

Places of common use like schools, clubs, places of worship, Aganwadi centers etc. are also provided with two lights (9 watt compact fluorescent lamp) each for 4 hours a day.

The Cost and fund sharing occurs as

**Table-5 : Cost Comparison of SHS,SLS**

| Systems | Cost (Rs) | Central Financial assistance (Rs) | State Share (Rs) |
|---|---|---|---|
| **Solar Home Lighting Systems** | 13,163 | 11,250 | 1,913 |
| **Solar Street Lighting Systems** | 25,989 | 19,602 | 6,387 |

Above costs include supply, installation, commissioning and maintenance for a period of 5 years

*C. Solar Power Plant*

Centralized Solar Power Plants of different capacities are installed in villages with more than 50 households having compact habitation. Central Financial Assistance @ Rs 3,150/- per household is also available for erection of power distribution lines, service connections, house wiring etc. The Power plant capacity may varies from 4 KWp to 6 KWp depending upon the load required. The Cost and fund sharing occurs as

**Table-6: Cost Comparison of Solar Power Plant**

| Capacity | Cost | Central Financial Assistance (Rs) | State Share (Rs) |
|---|---|---|---|
| **4 Kilowatt peak** | **15,50,980** | **12,60,000** | **3,10,980** |
| **5 Kilowatt peak** | **19,31,712** | **15,75,000** | **3,56,712** |
| **6kilowatt peak** | **21,93,103** | **18,90,000** | **3,03,103** |

This scheme is doing extraordinary in the sector of village electrification. The Year wise Progress is Tabulated below.

**Table-7: Year- wise Progress of RVEP.(Source: OREDA)**

| FY | No. of villages sanctioned | No. of villages dropped due to grid connectivity and other reasons | No. of villages completed | Villages under progress |
|---|---|---|---|---|
| **2006-07** | 197 | 5 | 192 | 0 |
| **2007-08** | 0 | 0 | 0 | 0 |
| **2008-09** | 91 | 4 | 87 | 0 |
| **2009-10** | 371 | 52 | 319 | 0 |
| **2010-11** | 770 | 20 | 304 | 446 |
| **2011-12** | 296 | 0 | 0 | 296 |
| **2012-13** | 384 | 0 | 0 | 384 |
| **Total** | **2109** | **81** | **902** | **826** |

## VI. CONCLUSION

Rural electrification is a 'selective catalyst' to improve agricultural productivity through mechanization and is essential for many rural activities. It works best when it is complemented by social and economic infrastructure development. There is a vast scope for utilizing of solar photovoltaic energy in India. With continuing research and development and cost reduction it can become the most potential energy source. With a clear renewable energy policy in place, India is the forerunner in this sector. There is room for manufacturers, foreign investors, local financial and institutional agencies and others. Solar energy can be one of the thrust areas due to its accessibility through the country in sufficient quantity. For we owe it to ourselves and our children to provide for sustainable development with due regard to our ecology. Renewable energy is nature's resource and we must use it for human kind in consonance and harmony with nature. Being self-involved, self invested, self maintained and self managed system it is more efficient and self- reliant.

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