

Exploratory Trends in Renewable Energy in India

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Abstract: Renewable energy sources are indigenous and can contribute towards reduction in dependency on fossil fuels. Renewable energy sources assume special significance in India when viewed in the context of the geographic diversity and size of the country. India has a vast supply of renewable energy resources, and it has one of the largest programs in the world for deploying renewable energy products and systems. Renewable energy is one of the most important sources the energy and it leads to a multidimensional growth and development of the region and nation as a whole. The natural resources are considered more efficient and appropriate for necessary survey and investigation for the assessment, subsequent planning and implementation of various developmental programmes. The purpose of this study is to understand the structure of energy sources in India. To find out production and trend of energy sources i.e. Hydro power, Solar Energy, Wind Energy, Biomass energy in India. It is tried to find out viability in trend to estimate production of various energy sources in near future. It is help to provide a significant business opportunity and to find out trend of production energy resource in India.

Keywords: renewable energy, potential, Hydro power, Solar Energy, Wind Energy, Biomass energy.

1. INTRODUCTION

India has a vast supply of renewable energy resources, and it has one of the largest programs in the world for deploying renewable energy products and systems. Renewable energy is one of the most important source the energy and it leads to a multidimensional growth and development of the region and nation as a whole. The natural resources are considered more efficient and appropriate for necessary survey and investigation for the assessment, subsequent planning and implementation of various developmental programmes. The purpose of this study is to examine potential of various renewable energy sources as Hydro power, Solar Energy, Wind Energy, Biomass energy. The comparative potential of energy resource will also try to find out according to state wise. It will open a way to provide a significant business opportunity to establish a number of businesses.

Renewable energy also provides national energy security at a time when decreasing global reserves of fossil fuels threatens the long-term sustainability of the Indian economy. The energy security is an issue not only at the national level but also at the local level. This means that a remote hamlet or village will not need to depend on mostly erratic energy supply from far flung areas but will be in a position to meet its own demands through indigenous energy resources. The use of such technologies, which on the one hand enable users to use traditional fuel more efficiently and on the other hand utilize locally appropriate renewable energy resources provides a certain level of energy security to these users.

2. SOLAR ENERGY

India is endowed with rich solar energy resource. The average intensity of solar radiation received on India is 200 MW/km square (megawatt per kilometre square). With a geographical area of 3.287 million km square, this amounts to 657.4 million MW. However, 87.5% of the land is used for agriculture, forests, fallow lands, etc., 6.7% for housing, industry, etc., and 5.8% is either barren, snow bound, or generally inhabitable. Thus, only 12.5% of the land area amounting to 0.413 million km square can, in theory, be used for solar energy installations. Even if 10% of this area can be used, the available solar energy would be 8 million MW, which is equivalent to 5 909 mtoe (million tons of oil equivalent) per year. Solar energy is a dilute source. The energy collected by 1 m square of a solar collector in a day is approximately equal to that released by burning 1 kg of coal or 1/2 litre of kerosene. Thus, large areas are needed for collection. it is obvious that solar energy can be a good source of meeting energy demands.

3. WIND ENERGY

A small-scale and large-scale wind industry exists globally. The small-scale wind industry caters for urban settings where a wind farm is not feasible and also where there is a need for household electricity generation. The large-scale industry is directed towards contributing to countrywide energy supply. The wind resource assessment in India estimates the total wind potential to be around 45 000 MW (mega watt). This potential is distributed mainly in the states of Tamil Nadu, Andhra Pradesh, Karnataka, Gujarat, Maharashtra, and Rajasthan. The technical potential is based on the availability of infrastructure.

4. HYDRO ENERGY

The word hydro comes from a Greek word meaning water. The energy from water has been harnessed to produce electricity since long. It is the first renewable energy source to be tapped essentially to produce electricity. Hydro power currently suffices one fifth of the global electricity supply, also improving the electrical system reliability and stability throughout the world. It also substantially avoids the green house gas emissions, thus complimenting the measures taken towards the climate change issues.

5. BIOMASS ENERGY

Biomass has been one of the main energy sources for the mankind ever since the dawn of civilisation, although its importance dwindled after the expansion in use of oil and coal in the late 19th century. There has been a resurgence of interest in the recent years in biomass energy in many countries considering the benefits it offers. It is renewable, widely available, and carbon-neutral and has the potential to provide significant productive employment in the rural areas. For India, biomass has always been an important energy source. Although the energy scenario in India today indicates a growing dependence on the conventional forms of energy, about 32% of the total primary energy use in the country is still derived from biomass and more than 70% of the country's population depends upon it for its energy needs. India produces a huge quantity of biomass material in its agricultural, agro-industrial and forestry operations.

6. RESEARCH OBJECTIVES

The purpose of this study is to find out potential of renewable energy in India. The potential is measured on the basis of source wise and state wise. It will open a way to provide a significant business opportunity to establish a number of upstream and downstream businesses. It will help to develop the rich energy state and to find future possibility to explore more energy to meet with consumption and demand level.

- To find out the total available production of renewable energy in India,
- To find out correlation between various source of renewable resource of energy.

HYPOTHESIS:

In order to realize the above objectives, the following hypothesis has been formulated.

Hypothesis 1 there is sufficient availability of production (in comparison to target) of renewable energy sources in India.

Hypothesis 2 There is increasing trend in production of renewable energy sources in India

7. RESEARCH DESIGN & METHODOLOGY

The researcher, being an external analyst, is depend mainly upon secondary data for the purpose of studying the potential of natural resources and energy resources and evaluating trend of Natural Gas and oil and energy sector in India. The exploratory research techniques will have been used for this study and also the study is restricted only gas, oil and petroleum in India.

Secondary Research:

This research would more be based on qualitative factors and procedures for data gathering rather than numbers and quantifiable values. There are loopholes of this procedure such as:

- a) Extensive complexity associated to analyzing the qualitative data, because comprehension of qualitative data and its judgment depends on the nature and knowledge of the individual analyzing it.

- b) There are no standardized data categories or collection mechanisms within the predefined methods and techniques of data collection.

8. METHODS OF DATA COLLECTION

For the study in hand, both the primary and secondary data was collected. The sources of collecting both the data is as follows:

Sources of Primary Data: The primary data for the study was collected directly from target respondents through structured questionnaire. The questions asked to respondents were about production of various energy sources.

Sources of Secondary Data: present study is mainly based on secondary data which were collected from the corporate annual audited reports, company database, published research reports by various industries, related websites, and annual report of different companies of different industry and research organizations.

SELECTION OF PERIOD:

The present study is mainly intended to find the trend of renewable energy sources. The comparative production of energy sector is examined in the period up to 2014-15.

9. RESULT & DISCUSSION

RESEARCH TECHNIQUE APPLIED:

Table 1: Physical Progress of renewable energy in 2014-15

Sector	FY- 2014-15		cumulative
	target	Achievements	achievement
			(as on 31.12.2014)

I. GRID-INTERACTIVE POWER (CAPACITIES IN MW)

Wind Power	2000	1333.2	22465.03
Small Hydro Power	250	187.22	3990.83
Biomass Power & Gasification	100	0	1365.2
Bagasse Cogeneration	300	152	2800.35
Waste to Power	20	1	107.58
Solar Power	1100	430.67	3062.68
Total	3770	2104.09	33791.74

II. OFF-GRID/ CAPTIVE POWER (CAPACITIES IN MWEQ)

Waste to Energy	10	8.54	141.27
Biomass(non-bagasse) Cogeneration	80	34.32	561.64
Biomass Gasifiers			
-Rural			
-Industrial	0.8	0.75	18.23
8	6.2	153.4	
Aero-Genrators/Hybrid systems	0.5	0.13	2.38
SPV Systems	60	52.77	227.12
Water mills/micro hydel	4	2	15.21
Bio-gas based energy system	0	0.3	4.07
Total	163.3	105.01	1123.32

III. OTHER RENEWABLE ENERGY SYSTEMS

Family Biogas Plants (numbers in lakh)	1.1	0.42	47.95
Solar Water Heating – Coll. Areas(million m2)	0.5	0.53	8.63

Source: Ministry of New & Renewable Energy

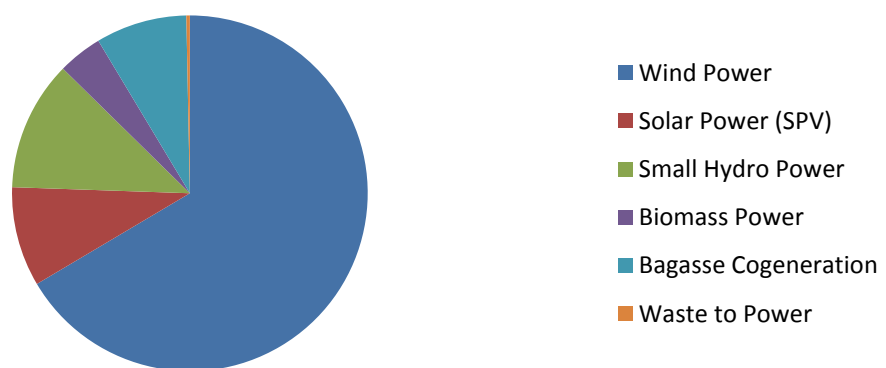
Table 2: Total Renewable Energy Installed Capacity (31 Dec 2014)[3]

Source	Total Installed Capacity (MW)
Wind Power	22,465.03
Solar Power (SPV)	3,062.68
Small Hydro Power	3,990.83
Biomass Power	1,365.20
Bagasse Cogeneration	2,800.35
Waste to Power	107.58
Total	33,791.74

Table 3

Sector	Target	Achieved	% Achieved
Wind Power	2000	1333.2	66.66
Small Hydro Power	250	187.22	74.888
Biomass Power & Gasification	100	0	0
Bagasse Cogeneration	300	152	50.6666667
Waste to Power	20	1	5
Solar Power	1100	430.67	39.1518182
Total	3770	2104.09	55.8114058

**Total Renewable Energy Installed Capacity
 (31 Dec 2014)[3] Total Installed Capacity
 (MW)**



10. ANALYSIS

It is found that wind energy is available very highly in India in compare of other renewable energy source which is 22,465.03 MW on an average from last 40 years. Hydro power is generated 3,990.83 MW. Production of solar energy is 3,062.68, Production of bagasse is 2800 ME, Production of biomass is 13650.2,

In Comparison to target of renewable energy to available production of Hydro power, Solar Energy, Wind Energy, Biomass energy high variation is found. By analyzing the table-3, it is found that the highest target 74.89% is achieved by small hydro power. Wind power is second with 66.66%. Lowest target got by biomass and waste to management.

There is not produced appropriate level of source of energy. It is found that huge potential is available but used average capacity is 55.81%. It is suggested to improved production and generation should enhance.

11. CONCLUSION

Requirement of new energy resources is an integral part of the development process. It is dominating as a major prerequisite in the present era where development is industry and technology based which is mainly energy dependent. The compulsion of global connectivity and exploring the space in view of shrinking earth resources further emphasize focus on new energy resources. Growth of a country and GDP are always related to such new exploration of energy resources.

The present paper well considers and analyses the trend in production of Hydro power, Solar Energy, Wind Energy, Biomass energy in India. The study is presenting some factual inputs, which are useful in planning the related development process. The finding of energy resources will substantially add to self-reliance of the country in the energy sector.

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