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AN OVERVIEW OF RENEWABLE ENERGY'S POTENTIAL CONTRIBUTION

PRAMILA SINGH SIKERWAR
RESEARCH SCHOLAR SINGHANIA UNIVERSITY
RAJKUMAR SHARMA
ASST.PROFESSOR

ABSTRACT

Growing emphasis on mitigating climate change and adapting to its impacts has further contributed to the momentum. Renewable energy's contribution to the global heat, power and transport sectors has increased steadily. While growth in renewal's share of total energy use has been moderated by increases in both population and world energy demand—most notably in developing and emerging economies—renewable energy markets and technology developments have accelerated quickly, even when compared to other rapidly developing technologies such as mobile phones. Although the last decade has seen tremendous advances in the electricity sector, the renewable heating and cooling sector has lagged behind. This is despite the marked growth since 2004 in the use of geothermal, solar thermal, and biomass heating technologies for water and space heating, process heat, and cooling. Given that the share of heating and cooling in final energy demand is much larger than that of electricity, fostering growth of renewable energy in this sector is crucial. In the transport sector, the use of renewable energy in the form of bio fuels grew at a rapid pace for much of the past decade. Biodiesel production increased twelve-fold, ethanol production, already at a higher starting point, grew three-fold. Over the same period, a small but growing use of gaseous biofuels in transport emerged, as well as initiatives to link renewable energy with electric transport.

KEYWORDS: Growing emphasis, Renewable energy's, contribution, global heat, power, technology, developments.

INTRODUCTION

Energy is a critical input for economic growth and sustaining developmentprocesses. Over one-third of the world's population, largely consisting of thepoor in rural areas of developing countries does not have access to electricity.It is estimated that a new power plant would need to be added every two daysto meet the increasing global energy demand. This, however, is clearly anunsustainable proposition, and only emphasizes the urgent necessity fordeveloping energy technologies that are environmentally sound, sociallyacceptable, and economically viable.Lack of access to affordable energy is an important factor contributing to therelatively poor quality of life in rural areas of developing countries. Thepotential markets of the rural poor are characterized by a high demand forenergy for purposes such as lighting, cooking, space heating in the domesticsector; water lifting and transportation in agriculture; and small and mediumenterprises.

Biomass energy is the local energy available for meeting the minimum ruralneeds of cooking. Though the contribution of biomass sources in the overallenergy scenario is gradually decreasing, it still contributes over 40% of theenergy supply in the country. Sixty-five per cent of the biomass energy in therural areas is apportioned to fuelwood, 20% to agricultural waste and 15% tocow dung. With the increasing use of commercial sources of energy there hasrecently been a substantial shift towards commercial sources.As such, the future projections for energy in India do not show aproportionate increase in the fuelwood consumption with the risingpopulation. It is difficult at this stage to predict the shift in the fuel-mix but itis clear that shift is taking place. Also, in view of global energy policyconsiderations, the final form of energy is more important than the primaryform. Therefore, there has been a major thrust on how fuelwood and othersources of energy can be converted into desirable form, thereby making theprimary sources of energy of secondary importance. This change is gradualbut quite perceptible.

The Government of India has focused attention on governance at the rurallevel through Panchayats, the body of elected members of the public. ThePanchayats have also been assigned certain development tasks as laid downin the Eleventh Schedule of the Constitution of India. Social forestry andfarm forestry, along with land improvement, implementation of land reforms,land consolidation and soil conservation, fuel and fodder, and nonconventionalenergy sources are the responsibility of the Panchayats.It is necessary to have a look at the energy policy and rural energy planningefforts made in India, as well as the ongoing programs, to consider how thebiomass production can be better managed and regularized through localgovernance systems.

INDIAN RENEWABLE ENERGY SITUATION

In this section, Indian Renewable situation is examined with respect to itsscope, potential, achievements and economics of renewable energy resources.Further this section deals with the rural energy policy issues with the help ofnumerical and theoretical experiences

Renewable Energy Scope

Today most of the world's energy is derived from conventional sources-fossil fuels as coal, oil, and natural gases. Electricity generated from fossil fuels such as coal and crude oil has led to high concentration of harmful gases as carbon-di-oxide, carbon-mono-oxide, sulphur-di-oxide etc in the atmosphere. Also the sources of fossil fuel in the earth are finite and will be depleted in few years. Most recent method to generate electric power is an atomic reactor. All these conventional sources of energy has caused more environmental damage than any other human activity.Therefore, alternative sources of energy have become more important for thefuture world. The alternative sources of energy are called Renewable EnergySystem. A Renewable Energy System converts the energy found in Sunlight, Wind, Falling-water, Sea-waves, geothermal heat, or Biomass into a form wecan use such as heat or electricity. Most of the Renewable energy comeseither directly or indirectly from Sun and Wind and can never be exhausted, therefore they called Renewable.

RENEWABLE ENERGY POTENTIAL

With a strong industrial base and successful commercialization oftechnologies in wind, SPV, solar, thermal, small hydel, biogas and improvedbiomass stoves, India is in a position today to offer "state-of-the-art"technology to other developing countries and play a leading role in the globalmovement towards sustainable energy development. India has a large potential for utilization of renewable energy. The scale overwhich potential can be economically exploited will depend largely on thetechnologies, financing and the strategies of implementation of renewableenergy projects. According to the Ministry of Non-Conventional Energysources, there exists a potential exploitation of the order of 80,000 MW.Break of this potential is presented in the table 1.

Sl. No	Sources / Technologies	Units	Approx. Potential	Achieved so far
1	Wind Power	MW	45,000	1,267
2	Small Hydro (upto 50 MW)	MW	15,000	**1,341**
3	Biomass Power	MW	19,500	35
4	Biomass Gasifiers	MW		~
5	Biomass Cogeneration	MW		273
6	Urban and Industrial Waste	MW	1,700	15.20
7	Solar Photovoltaics	MW	Not Known	65
8	Solar Thermal Applications	MW/Sq.	35	0.55
9	Solar Water Heating Systems	Sqm.	Not Known	5,25,000
10	Solar Cookers	Numbers	Not Known	4,96,000

The Middle East Conflict of 1973 resulted in sharp increase in the prices ofthe vital inputs of agriculture that is energy and fertilizer thereby adverselyaffecting the economy of developing and developed nations. The onlyapparent benefit form this unfortunate conflict has been the creation ofawareness, in both developing and developed countries of the value oforganic wastes as inexpensive sources of energy and plant nutrients.Sometimes a dark could have a silver lining. So the present man-madeenergy crisis created by the action of a few countries is a blessing in disguise.It should be considered as an amber light - a warning prior to the real danger.

NEED FOR RURAL ENERGY POLICY IN INDIA

India is the second most populous nation in the world and has extremeecological diversity. 70% of the population in India, close to 700 million,still lives in the rural areas. Meeting their energy requirements in asustainable manner continues to be a major challenge for the country. Allmost 75% of the total rural energy consumption is in domestic sector. Formeeting their cooking energy requirements, villagers depend predominantlyon biomass fuels like wood, animal dung and agricultural residues, oftenburnt inefficient traditional cook stoves.

The main fuel for lighting in therural households is kerosene and electricity. Irrigation is mainly throughelectrical and diesel pump sets, while the rural industries and the transportsectors rely primarily on animal power and to some extent on commercialsources of energy like diesel and electricity.In the short term, the effort is to maximize returns from the assets alreadycreated in the energy sector, improving efficiency in production,transmission and end use; reducing energy intensity of different consumingsectors and initiating steps for meeting fully the basic energy needs of urbanand rural households.

In the medium term, progressive substitution of petroleum products by coal,natural gas and electricity, accelerated development of renewable andpromotion of R&D efforts on decentralized energy technologies based onrenewable resources have been suggested. In the long term, promotion ofenergy supply systems based largely on renewable and promotion oftechnologies of production, transportation and end use of energy, that areenvironmentally benign and cost effective, have been suggested though fuelwood, agro-residue.Given the geographical and ecological diversity in the country, theconsumption pattern varies quite considerably as well; for example, the percapita consumption of fuel wood, for instance, ranges from 0.14 kg per dayin Haryana to 1.31 kg per day in forest-rich Himachal Pradesh. The fuel-mixalso varies from region to region depending on the resource endowments.Fuel wood consumption is high in states (for instance, all the North- Easternstates) where there is considerable foreste over, whereas dung cakes play animportant role in states like Punjab and Haryana, which have little biomasscover. Crop residue is used in most areas as a backup fuel when other fuelsare in shortage, such as West Bengal and Punjab.The Planning Commission estimates the fuel wood requirement at 180million tonnes in 2001, a substantial increase from the actual consumption of162 million tonnes in 1996 (Ninth Five-Year Plan: 1997-2002). Kerosene isused mainly for lighting. Considering that only a third of households even inelectrified villages have electricity connections, it is estimated that there are70-80 million households in the country that are not served by grid electricity.

It has been observed that there will be a huge gap between demand andsupply of electrical energy by the year 2045 and in the (BAU) scenario. Thepredicted gap increases from 7.4% in the year 2005 to 40% in the year2045.Another problem that is faced by the Indian energy scenario is theemission of greenhouse gases (GHG) due to dominating fossil fuel basedelectricity production.Fig. 1 shows the contribution of various energysources towards India’s power needs.

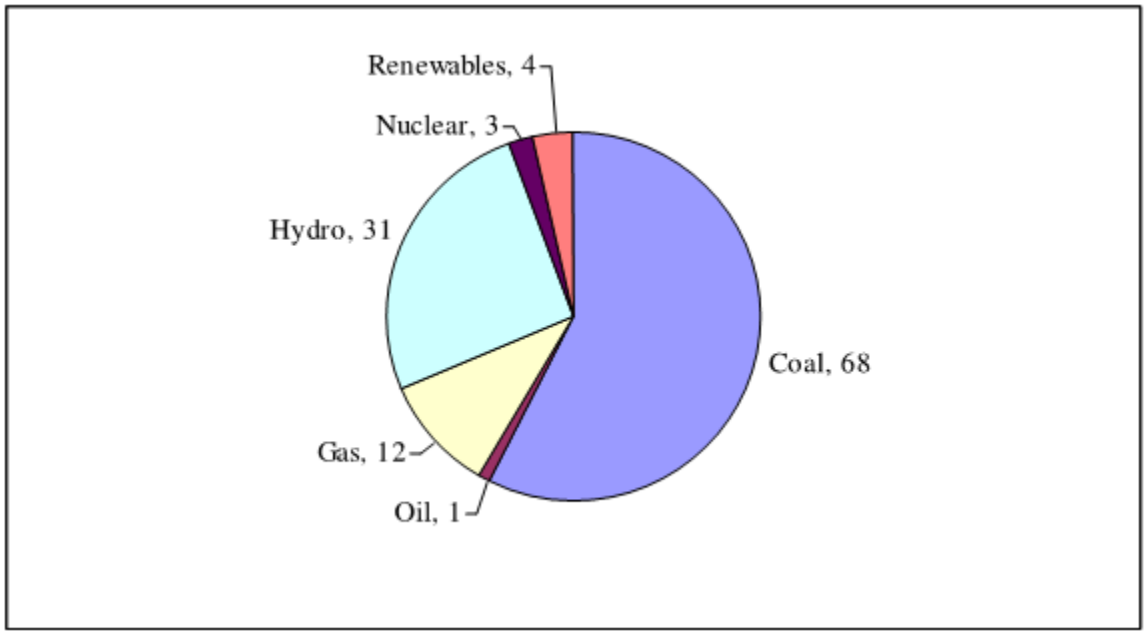

Fig.1: Resource wise installed electrical generation capacity (in GW) in India

In order to fill present and future electrical energy demand and supply gap, itis necessary to look for various options for either reducing demand or tointroduce alternate energy sources or both. Most economic option obviouslyis to introduce energy conservation measures. In an integrated energypolicy report by Planning Commission [2] only new fossil fuel andrenewable energy technologies have been considered for future supplyoptions. In a national energy map for India technology vision 2030 preparedby TERI [3], supply scenarios have been developed for new and renewableenergy sources. These two reports have not taken into account the energysaving potential in various sectors of economy. We feel that it is necessary totake a holistic approach to introduce energy saving potentials in varioussectors of economy. Considering the vast potential of energy savings andbenefits of energy efficiency, the Government of India enacted the EnergyConservation Act, 2001[4]. The Act provides for a legal framework,institutional arrangement and a regulatory mechanism at the Central andState level to embark upon energy efficiency drive in the country [5]. EnergyEfficiency improvements not only reduce the energy consumed per unitproducts and services made available but also improve energy security of thecountry to ensure sustained availability of energy resources at affordableprice. Estimated energy saving potential in various sectors is given in Table 2

Sector	Electricity Saving Potential (%)
Industrial	25
Agricultural	30
Domestic	20
Commercial	20
Transport	20
Other	23

Table 2: Maximum Electricity Saving Potential in different sectors in India

Though full exploitation of energy saving potential will reduce the demand and supply gap considerably, still there will be a need for more electricity production. Most of the environmental friendly options available so far are the renewable energy technologies. Harnessing renewable energy sources for electrical energy supply has the dual benefit of GHG mitigation as well as resulting in development of local capabilities and infrastructure. India has a major programme for renewable power. The aim of the present study is to establish a model that can project theelectricity demand up to 2045 under the hypothesis of renewable electricityand energy savings. For this purpose the econometric model developed has been used to forecast the sectorial electricity demand exploitingfull energy saving potential. The remaining demand-supply gap has beennarrowed and finally calculated to be filled by renewable energytechnologies mainly hydro, wind and bio power.

RURAL ENERGY DEVELOPMENT IN INDIA

Rural Development purse has never figured in the stated Energy Policy.Rural electrification is mainly perceived in the context of energyrequirements to meet the irrigation needs of agriculture as part of the overallfood security policy. Therefore, Rural Electrification PRIORITY was toprovide assistance for transmitting energy to agricultural pump sets toincrease the productivity of land. Household electrification came as asecondary or incidental issue. The whole definition of rural energy in the pastwas to provide one connection to a village which was primarily used toelectrify agricultural pump sets. The Government of India changed thedefinition of village electrification recently to state that a village isconsidered as electrified if it provides electricity/power to all the habitationsin the village. They consider the village as electrified if al least 10 to 20% ofthe inhabitants in the villages is provided with energy for lighting.Consequently, the emphasis is not on energy and its use for ruraldevelopment, but availability of electricity for certain segment of households,in the villages and hamlets.The main issue is how do we bring rural development and bridge the gapbetween the power requirements for rural development and the energypolicies of the government.

The Rural Electric Supply Technology (REST) mission launched by theGovernment of India hopes to make power available for the rural

householdsbut even the stated policy objectives do not cover the strategies to provideenergy to the poorest of poor households in the rural areas. If we need toachieve sustainability in rural development with emphasis on livelihoods andthe means of enhancing the economic well-being of the poor households, it isnecessary that affordable access to energy is provided to these households.The primary need is an integrated development strategy to use energy toimprove health, education, nutrition and economic activities of the rural households. As such gender issues need to be addressed with adequate focusin the context of energy use. It is difficult to bring any meaningfulintegration between energy and rural development unless we take aintegrated approach to development and energy end use.

CONCLUSION

In parallel with development in business sectors and speculations, 2015 sawproceeded with advances in renewable vitality advances, continuous vitalityproductivity enhancements, expanded utilization of savvy lattice innovationsand huge advance in equipment and programming to bolster the combinationof renewable vitality, and also advance in vitality stockpiling improvementand commercialization. The year additionally observed extended utilizationof warmth pumps, which can be a vitality productive answer for warmingand cooling. Work in the renewable vitality segment (excluding extensivescale hydropower) expanded in 2015 to an expected 8.1 million occupations (immediate and backhanded). Sunlight based PV and biofuels gave thebiggest quantities of renewable vitality occupations. Extensive scalehydropower represented an extra a great many employments. Considering allrenewable vitality advancements, the main managers in 2015 were China,Brazil, the United States and India. Private financial specialists ventured uptheir responsibilities to renewable vitality essentially amid 2015. The yearsaw both an expansion in the quantity of extensive banks dynamic in therenewable division and an expansion in credit measure, with major newduties from global speculation firms to renewable and vitality productivity.New venture vehicles – including green securities, swarm financing andyieldcos – extended amid the year. Standard financing and securitizationstructures likewise kept on moving into creating nation advertises asorganizations (especially sun oriented PV) and speculators looked for higher yield, even to the detriment of higher hazard.

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