

RENEWABLE ENERGY AND ECONOMIC GROWTH IN INDIA

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ABSTRACT

Energy is the major source for the economic development of any country. In recent years, due to population growth and economic development India energy consumption has been increasing at a relatively fast rate. Energy plays substantial role in economic, hence relationship between energy consumption and economic growth is an important issue for economists. Renewable Energy (RE) has been identified as a key tool to counter climate change and enhance energy security. In India growth of the economy places heavy demand of electric power, Presently Coal-based power generation is characterized by local and regional environmental degradation as well as greenhouse gas emissions, leading to climate change. Thus, there is need for enhance energy security along with reducing greenhouse gas emissions. Renewable energy is one of the environmentally friendly sources of energy and effectiveness of growth economic, in this article will be show that an effects of RE for economy in India.

Keywords: Renewable energy, Sustainable, Electricity, Nuclear power, Country

INTRODUCTION

Over the years, renewable energy sector in India has emerged as a significant player in the power generation capacity. Power is one of the most crucial components for the economic growth and welfare of nations. The existence and the development of adequate power sector is essential for sustainable growth of the Indian economy. India's power sector is one of the most diversified in the world. Sources of power generation range from conventional sources such as coal, lignite, natural gas, oil, hydro and nuclear power to viable non- conventional sources such as wind, solar, agricultural and domestic waste. The demand for the electricity in the country has increased rapidly and is expected to grow further in the coming years. In order to meet this increasing demand for electricity in the country, massive addition to the installed generating capacity is required

Without heat, light and power we cannot build or run the factories and cities that provide goods, jobs and homes, nor enjoy the amenities that make life more comfortable and enjoyable. In this document we will discuss how renewable energy can help to create jobs, increase opportunities

and essentially can provide us better economy. Introduction in times of economic turbulence, the focus quite rightly falls on jobs.

Energy Generation Market Renewable energy in 2010 supplied an estimated 16.7% of global final energy consumption. Of this total, an estimated 8.2% came from modern renewable energy counting hydropower, wind, solar, geothermal, biofuels, and modern biomass

As Jean-Marie Chevalier describes in his contribution, *Energy and the Economy in Europe*, the European Union has set particularly ambitious goals of obtaining 20% of energy from renewable by 2020. He further states, "Europe's main energy priority is to build a single energy market through market liberalization and competition. Achieving this goal involves balancing three core priorities: maintaining economic competitiveness, transitioning to a low-carbon economy and ensuring security of supply." (Chevalier Jean-Marie, *European Review of Energy*, 2012)

Environmental Impact One of the most important benefits of renewable energy is the fact that it's non-polluting. And of course as the name tells us it is renewable and does not use resources that can never be replaced. Renewable energy has a much lower environmental impact than conventional sources of energy. But there are other advantages to using renewable sources of energy.

Job Creation, the benefits of renewable energy extend to stimulating the economy and creating job opportunities. The money that is invested in renewable energy is typically spent on materials and staff that build and maintain equipment instead of importing energy. The money spent on renewable energy stays in the country for the most part, often within the same demographic.

Trade Deficit Renewable energy, that is made and developed in any country is being sold to overseas countries. This means that the producing country trade deficit is being improved. This has an impact on energy.

Today, energy production and benefit accounting for two third of the world's greenhouse-gas emissions GHG, there has been global works towards shifting the available fossil fuel based energy systems to low-carbon technologies, including renewable energy technologies (RET) like solar, wind, hydro and biomass. International Energy Agency (IEA) has measured that towards limiting the temperature rise to two degree centigrade (450 ppm, or, ppm scenario by 2050) [32], the total installed capacity of renewable energy sources for electricity production needs to be augmented 3770 GW by 2035. This shall require annual investments of over US \$550 billion in climate change mitigation and adjustment technology.

India is the fourth largest energy consumer in the world after the United States, China and Russia. As of March 2013, the per capita total electricity waster in India was 917.2 kWh. Electricity waster in India is expected to rise to around 2280 Bkwh by 2021–22 and around

4500BkWh by 2031–32. India's energy waster has been increasing comparatively fast rate due to increase in population and living standard as well. Current centralized energy planning of India is mainly dependent on thermal power plant for energy need and its percentage share is near about 70% of total installed capacity of power plant. The reasons for according renewable energy may vary in case of developed and developing economies. Developed nations are promoting clean energy technologies due to their heightened sensitivity towards the environment and being mandated under the various international climate conventions like the United Nations Framework on Climate Change, or, UNFCCC. On the other hand, the reasons for developing economies to advocate renew able energy technologies include enhancement of their energy security (reduction in energy imports), besides bridging the energy deficit and enabling energy access to the masses through decentralized systems in form of lifeline energy services like cleaner forms of basic lighting devices (solar lanterns) and cooking systems (biogas plants).

India has its own sets of reasons for pursuing a low-carbon growth direction. This includes largeshare of fossils in its energy supply chain (over 80% share of coal based power in the grid) , leading to high levels of greenhouse gas (GHG) emissions, making it the fourth largest emitter globally. It is also promoting renewable energy in decentralized formats to enable energy access to the un-electrified/ under-electrified rural masses.

It has envisioned 15% of electricity contribution from renewable energy sources by 2020 as against the present share of 6% , advocated under the National Acton Plan on Climate Change (NAPCC). The electricity requirement is projected to increase to 1900 Billion units (BU) by the year 2022, from the present levels of about 1100 BU. Hence, over 300 BU of green power would be required as against the present levels of 60 BU, (fivefold increase). This shall necessitate significant scaling up of RE capacity in similar terms.

Renewable Energy projects are associated with high opposite (capital) cost and lower levels of energy generation (due to limited availability of natural resources like solar radiation and wind velocity), leading to higher cost of energy generation. Besides, they lack the ability to reach economies of scale (due to limited availability of contiguous land area in resource rich regions); most wind and solar projects are limited to not more than few hundred megawatts of capacity.

The developing economies, there are constraints in terms of availability of monetary resources at competitive terms due to competing demands from other sectors like education, healthcare, agriculture and infrastructure. As such, it is of paramount importance that utilization of scare resources is done in the most prudential manner.

As the economy grows in coming years the electricity demand will further rise as there is strong correlation between rise in energy consumption and economic growth. India has been putting steady efforts at increasing its energy generation capacity. However, the demand for energy has

been continuously out stripping supply. The table given below indicates the region wise installation capacity of different sources of electricity. State- owned and privately owned companies are significant players in India's electricity sector, with the private sector growing at a faster rate. India's central government and state governments jointly regulate electricity sector in India.

The Indian power sector is one of the most diversified in the world. The sector has been continuously progressing in generation capacity addition through conventional like Coal, lignite, gas, hydro and nuclear power as well as non-conventional sources like Wind, solar, small hydro and biomass. Renewable energy is derived from natural processes that are replenished constantly. India is blessed with a variety of renewable energy sources, the main ones being biomass, biogas, sun, wind, geothermal, tidal and small hydro power. (Large hydro power is also renewable energy in nature, but has been utilized all over the world for many decades, and is generally not included in term new and renewable source of energy). India's electricity sector is amongst the world's most active players in renewable energy utilization, especially wind energy.

NEED OF RENEWABLE ENERGY

Climate change is one of the primary concerns to go with renewable energy. The current and foreseeable coal crisis at the domestic front, coupled with greenhouse gas emission such as CO₂, CH₄, CFCs, halons, N₂O, ozone and proxy acetyl nitrate [4], which are responsible in the atmosphere for trapping heat radiated from Earth's surface and ultimately raising the surface temperature rethinking and restructuring not only India's but world's.

The increasing global temperature and energy requirement in the end shift India's need to sustainable and economically efficient renewable energy resources along with improved energy efficiency measures. There are huge amount of potential available in the renewable energy system which can be explored and harnessed to meet the energy demand. The potentially most important environmental problem India is facing alarming challenges to build up its energy infrastructure to meet its economic and social targets due to increasing demand of electricity.

1) Wind Energy:

In terms of wind power installed capacity, India is ranked 5th in the World. The present total installed capacity stands at 21136.40 MW (MNRE). It contributes to around 75% of the grid-connected renewable energy power installed capacity. Today India is a major player in the global wind energy market. Tamil Nadu, Maharashtra, Karnataka, Rajasthan, Gujarat are the key states which have been focusing on wind energy development in India. Initial cost for wind turbines is greater than that of conventional fossil fuel generators per MW installed. Despite the high installed capacity, the actual utilization of wind power in India is low because policy

incentives are geared towards installation rather than operation of the plants. This is why only 1.6% of actual power production in India comes from wind although the installed capacity is 8.6% . Lack of wind or high speed of wind affects variability of power generation through wind.

2) Solar Energy:

Among the various renewable energy resources, solar energy potential is the highest in the country. The equivalent energy potential is about 6000 million GWh of energy per year. India lies in the sunny regions of the world. Most parts of India receive 4–7 kWh of solar radiation per square meter per day with 250–300 sunny days in a year . The National Solar Mission targeting 20,000MW grid solar Power, 2000MW of off-grid capacity including 20 million solar lighting systems and 20 million square meters solar thermal collector area by 2022 is under implementation .

3) Small hydro Energy:

Hydro projects in India, which are under 25MW incapacity, are classified as “small hydropower” and considered as a “renewable” energy source. The sector has been growing rapidly for the last decade. SHP is by far the oldest renewable energy technology used to generate electricity in India. The current total installed capacity of small hydro power plants is 3803.68MW. The energy of running water has been exploited for many years. However, Hydro projects can be unreliable during prolonged droughts and dry seasons when rivers dry up or reduce in volume.

4) Bio Mas Energy:

Renewable source of energy other than hydro power energy, solar, wind and geothermal sources, currently provide only a small fraction of global energy use. The most prevalent source of energy is bio mass. Bio mass is biological material derived from living, or recently living organisms. It most often refers to plants or plant-based materials which are specifically called lignocellulosic bio-mass [24]. Biomass include wood, logging wastes and sawdust, animal dung and vegetable matter consisting of leave, crop residues and agricultural waste. According to the CEA, India had at least 3.4GW of utility-based installed capacity in biomass power and bagasse-based cogeneration plants as of mid-2013. India's Ministry of New and Renewable Energy reports the country has 18GW of potential biomass electricity generation capacity and 5 GW of potential bagasse-based generation. A large amount of biomass used for electricity generation comes from bagasse (cru- shed sugarcane or sorghum stalks), which can be used in combustion-powered generators. In India, the bio mass programmes are mainly targeted to meet the needs of rural and remote areas and have helped in reaching electricity to the interior un-reached section of the population. Globally, bio mass fuels accounts for 13% of total energy requirements. Bio mass is one such source that can be used to provide sustainable supply of the required energy through bio

gas, vegetable oil, bio diesel, producer gas, and by directly burning the bio mass. Bio mass can be converted in to suitable form of energy through different conversion technology. Bio mass power generation in India is an industry that attracts investments of over Rs.600 crores every year, generating more than 5000 million units of electricity and yearly employment of more than 10 million man-days in the rural areas.

RENEWABLE ENERGY POLICY

International Renewable Energy Agency (IRENA) has defined the following mechanisms as key policy instruments which have been adopted across the globe in varying formats. Each of them has been tagged with the applicable policy/regulation as valid in the case of India.

A) Grant/subsidy

It is the monetary assistance that helps in reducing the initial investment in a project to enhance its viability and the same is not required to be paid back. The Government of India provides subsidy under various schemes to promote the use of renewable technologies till they attain commercial status.

B) Accelerated depreciation

Allows investments in renewable projects to be fully or partially deducted from tax obligations or income; it is a kind of production tax credit. Depreciation up to 80% can be claimed in lieu of investments made in solar and wind energy projects in India .

C) Tax concessions/exemptions

Enables reduction in tax outgo on profits earned from renewable projects. Infrastructure projects (including conventional power and renewable power sectors) are exempted from payment of Income tax for 10 consecutive years within the first 15 years of their commissioning. However, they are required to pay Minimum Alternate Tax MAT (present rate of MAT is 20.81%). For remaining years, the company has to pay corporate tax (present rate is 33.99%) .

D) Preferential tariff

Utilities are bound to purchase power generated from RE projects at a fixed price for a specified number of years. In case of India, the price is determined by the respective state electricity regulatory commission (SERC), or central electricity regulatory commission (CERC) as the case may be .

E) Renewable purchase obligations

Designated consumers (distribution utilities and large power consumers) are required to procure a certain percentage of their total power consumption from RE sources. This can be in terms of actual purchase of RE power, or by way of tradable green certificates.

In India, the renewable energy certificates (REC) can be sold and purchased through the energy exchanges.

ECONOMIC VIABILITY OF RENEWABLE ENERGY

The initial capital cost of installation is higher in most of the renewable sources except hydro. But the cost of operation and maintenance is comparatively cheaper than thermal or nuclear power plants. Also since the cost of fuel is none for renewable energy sources. With increase in prices of coal, gas and other fossil fuels renewable sources will become comparable or cheaper than conventional power sources and will thus become economically viable. Levelized cost of electricity production (LCOE) of renewable energy technologies varies by technology, country and project, based on the renewable energy resource, capital and operating costs and the efficiency/performance of the technology.

The Setting up of the Solar Energy Corporation of India:

The mandate of the SECI allows wide-ranging activities to be undertaken with an overall view to facilitate the implementation of the National Solar Mission and the achievement of targets set therein. The SECI has the objective of developing renewable energy (RE) technologies and ensuring inclusive RE power development throughout India.

National Offshore Wind Energy Policy, 2015:

Under this Policy, the Ministry of New & Renewable Energy (MNRE) has been authorized to explore and promote deployment of offshore wind farms in the Exclusive Economic Zone (EEZ) of the country and the National Institute of Wind Energy (NIWE) has been authorized as the Nodal Agency for development of offshore wind energy in the country and to carry out allocation of offshore wind energy blocks, coordination and allied functions with related ministries and agencies. It would pave the way for offshore wind energy development including, setting up of offshore wind power projects and research and development activities, in waters, in or adjacent to the country, up to the seaward distance of 200 Nautical Miles (EEZ of the country) from the base line. The policy will provide a level playing field to all investors/beneficiaries, domestic and international. It is planned to set up the first offshore wind power project off the Gujarat coast soon.

The Policy for Grid connected Solar Roof-top Projects:

Joint Electricity Regulatory Commission (JERC)/State Electricity Regulatory Commissions (SERC) of 29 States/UTs namely Andhra Pradesh, Assam, Bihar, Chhattisgarh, Goa, Gujarat, Haryana, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Maharashtra, Madhya Pradesh, Meghalaya, Odisha, Punjab, Rajasthan, Sikkim, Tamil Nadu, Uttar Pradesh, Uttarakhand, West Bengal, Andaman & Nicobar and Lakshadweep Islands, Chandigarh, Dadra & Nagar Haveli, Daman & Diu, Delhi and Pondicherry have notified regulations/tariff order for grid connected solar rooftop projects.

State Initiatives:

State Electricity Regulatory Commissions in Andhra Pradesh, Haryana, Punjab, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu, Gujarat, Kerala, Punjab, Orissa and West Bengal have announced preferential tariffs for purchase of power from wind power projects.

a) Future of Renewable Energy:

India, with its increasing population and limited natural resources for full fill its energy requirements, needs to maintain its momentum of growth and this can be made possible only by opting available energy options. Renewable energy is the best option. Shortage of fossils fuel and awareness towards global warming enhance the clean energy production. Therefore use of renewable sources increasing gradually in coming years.

b) Financing and fiscal incentives:

Renewable energy technologies require large initial capital investments, making the levelized cost of generation higher than it is for many conventional sources. The availability of financing options shall play an important role in increasing the share of renewable energy in India. The MNRE provides financial incentives for various renewable energy programmes. These include interest and capital subsidies. In addition, soft loans are provided through IREDA and also through some of the nationalized banks and other financial institutions for identified technology [31].

c) Promotional centre in Renewable energy:

The Ministry of New and Renewable Energy (MNRE) is the nodal Ministry of the Government of India for the development of new and renewable energy. The broad aim of the Ministry is to develop and deploy new and renewable energy for supplementing the energy requirements of the country. India is one of the first countries to establish a separate Ministry for New and Renewable Energy (i.e. MNRE) at the central level.

A number of institutions have been created in India for promotion of renewable energy. Institutions like Solar Energy Centre, Indian Renewable Energy Development Agency (IREDA),

Centre for Wind Energy Technology (C-WET), Alternate Hydro Energy Centre (AHEC), Sardar Swaran Singh National Institute of Renewable Energy (SSS-NIRE) have been playing a critical role for facilitating the installation of renewable energy in the country. At the State level, State Nodal Agencies (SNAs) were set up to carry out MNRE's mandate and implement projects/programmes.

CONCLUSIONS

Developing economies have set ambitious Renewable Energy capacity addition targets to reduce energy exportation on estimate of their growing and developing economy.

It was estimated that the emissions of greenhouse gas can be reduced from 4% to 45% in the upcoming years of 2020. These include up to 14% by replacing coal with renewable energy.

India has sufficient potential of renewable energy but combination of the right technology and correct human behavior is needed because every technology have their own limitation, then having peoples readiness to accept of Renewable Energy.

India will can be use many of these tools innovatively to achieve an impressive growth in its Renewable Energy sector with a high impact on the ground (green power generation) and a low dependency upon financial support.

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