OVERSEAS EXPANSION OF RENEWABLE ENERGY FIRMS IN INDIA: STATUS AND BARRIERS

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ABSTRACT

The objectives of this study are to investigate the current status and barriers to the overseas expansion of Indian renewable energy firms. Renewable Energy in Indiahas received considerable attention in recent years due to environmental issues and fossil fuels elevated cost. This renewable energy growth has resulted largely from India's feed-intariff system, since the government has supported expansion of renewable energy in the country. The barriers found in renewable firms are how to remove these are discussed in this paper. Initial investment cost, limitation of space, transmission problem, Market mechanisms, lack of awareness, the role of public agencies, and stringent government policies are the essential factors to affect the generation of renewable energies. In overcoming these barriers in expanding into developing countries, the role of government and especially the role of public agencies is essential.The Indian island receives one of the maximum levels of solar radiation in the world, which still remains unutilized. Thus it's a challenge to improve, expand and facilitate access to renewable energy education and training.

Keywords – barriers; market entry; training gaps; power quality; solar energy

I. INTRODUCTION

Fossil fuels were the main form of global conventional energy with the consumption of 13,147.3 million tonnes oil equivalent [1].The dependence on the importation of fossil fuels for electricity generation and transportation has continued to influence the inception of alternative energy sources in Caribbean SIDS. However, efforts are underway to reduce fossil fuel usage through renewable energy technologies such as solar, wind, geothermal and biomass energy. To date, the Caribbean has a total installed capacity of 2435 MWe of renewable energy, of which solar energy accounts for 433.5 MWe. [2] From one statistical survey, it is set up that as renewable energy is environmentally friendly, it is used as an alternative energy source. They also presented that renewable energy accounted for 2.8% of global energy consumption [3]. Ghimire et al. identified Twenty-two barriers from project reports, policy documents, as well as through site visits and interactions with stakeholders. They categorized all Twenty-two barriers into six types of barriers i.e. social, policy and political, technical, economic, administrative, and geographic using analytical hierarchical process (AHP) methodology for estimating and ranking the barriers. They also concluded economic and policy and political are most important barrier categories. [4]

Frangou et al. while investigating on Renewable energy performanceStandardization to overcome barriers in Greece, found the major obstacles was a combination of economic stagnation and limited investors' confidence, leading to low investment. They mainly focussed on efficient mechanism advances to overcome non-technical barriers and how to the increase renewable energy applications in buildings, such as Energy Performance Contracting (EPC) [5]. While researching about Education and training gaps in the renewable energy sector, Lucas et al. concluded that critical skill and workforce deficits remains changing in intensity across different sectors and regions. Divergence relationship also found between the offered education and the industry demand for qualified workers [6]. There is an imbalance between the increasing production of renewable power and weaker demand growth for efficient utilization of renewable power in China. The Contract market and the wholesale market together should remove the administrative barriers across regions and coordinating the benefits of both renewable and thermal power. There should be smooth transaction between technical advances and declining costs of renewable energy for energy transition in future [7]. The main hurdles for the expansion of renewable energy in South Korea are political barriers operating business, collection of reliable information by public agencies, lack of experts who can accurately evaluate the proposed business and a strong network involving the governments [8]. While inspecting New business models for renewable energy cooperatives three significant barriers were found i.e. first, risk aversion on the part of both members and management; second, concerns about the environmental impacts finally, the lack of competencies and time of the mostly unsalaried Renewable Energy Cooperatives (REC) management[9]. Tamilnadu being highest contributes 35% of India's installed capacity of wind energy. The barriers of renewable sources are higher electricity price comparing to conventional energies, less investors for wind energy due to poor evacuation facilities, a range of technical, regulatory and financial problems [10].

II. BARRIERS TO RENEWABLE ENERGY TECHNOLOGIES

For a sustainable economic development every society needs a secure energy supply in an economical way which should have low environmental impacts and low greenhouse gas emissions. In today's world, with technological advancements and positive support from governments with supporting strategies, renewable energy forms are rising to meet energy demands in an efficient way. The most relevant sources of renewable energy are wind, solar, biomass, hydro, wave, tidal and geothermal energy. The use of renewable energy is viable because it will never come to an end. Renewable energy requires less maintenance than traditional energy generators as their fuel input is derived from nature and available resources reduces the costs of operation. Renewable energy has overcome numerous barriers to become competitive with coal, natural gas, and nuclear power, but renewable energy still faces major difficulties.

A. Capital costs

Many operation costs are involved in the generation of renewable energy which raises the total production expenses. The important factors for adoption of renewable energy technology are Initial capital cost, transaction costs, economic position, and accessibility of incentives. Initial capital cost of renewable energy is comparatively higher than conventional sources of energy, which in turn is the primary reason for the cost of renewable energy generation. Generally many investors prefer to keep initial investment costs low and want to maximize profit. They perceive renewable energy investment risky, and make it harder for its utilization or developers to justify the investment. So high cost of investment remain a significant barrier for implementation of renewable energy.

B. Transmission

Conventional sources of energies are all highly centralized sources of power which means they depend on relatively few high output power plants. Wind and solar, on the other hand, offer a decentralized model, in which smaller generating power stations, spread across a large area to provide power. Renewables need a precise and dedicated transmission network system as they are intermittent by nature. Transmission refers to the power lines to move electricity from where it is generated to where it is consumed. The limited capability of power transmission constrains the efficient utilization of renewable power. As wind and solar sources aren't present near conventional power plants in order to take advantage of these resources, new transmission setup is to be developed. Both the financing and the transmission can be significant barriers for developers and customers, even when they're eager for more renewables.

C. Market Entry

The growing renewable energy infrastructure in India presents profitable business opportunities for foreign and international companies to enter the Indian renewable energy market. But, the complexity and the dynamic nature of the Indian market pose a challenge to develop a successful strategy. Report author and Climate Commissioner, the University of New South Wales' Professor Veena Sahajwalla, told that global investment in renewable energy reached almost $250 billion in 2011 but still the barrier remains.The lower marginal costs of renewable energy has not been given fully play due to the absence of spot market. The government is still implementing conventional generation and consumption plans for managing electricity, and there are not enough market-based policies and associated price features to encourage transmission of renewable power across provinces or regions. Large changes are required in infrastructure as the industry rapidly transforming to clean energy generation from thousands of wind generators and millions of rooftop PV systems. Thesensitivity of the higher cost remains major obstacles to wider acceptance of renewable energy solutions. In the meantimethere is continuation of testing new technologies, new designs, new systemic approaches, and even new financial schemes. We are not lacking ideas or entrepreneurs but we are lacking investors that may be private or public sector investors, who are willing to take risks and invest for a better world.

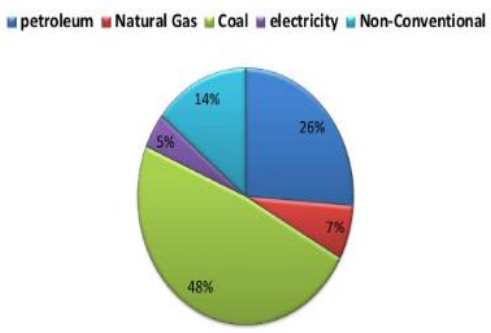

Fig.1: Energy consumption in India

D. Education And Training Gaps

A conversion from traditional energy to renewable energy is not only the advance of energy generation technology, but the development of new methodologies to energy production as well as consumption with fresh skills. Though traditional engineering incorporate modules on sustainability and renewable energies, these are too superficial and lack required details. Though these concepts of engineering remain important but they are not sufficient. Additional to specific skills, professionals from renewable energies are expected to possess other sector coverings, experiences, such as environmental and sustainability of concepts. Current professionals should extend their knowledge in order for the industry to be able to fill the gap, and simultaneously to train the younger generations how to adopt the new requirements.Another important point is the link between the education system/training centres and the related industries. Sufficient cooperation between the industry and education system can bridge the gap between skill and knowledge for current and new professionals, which is extremely important. One way of satisfying this cooperation would be through practically orientated programme at the under graduate or post graduate level [6].

E. Wind Power Barriers

Generation of power means use of land. How land is used will have implications for wildlife, plant life and other activities. If we are using some land then it must counterbalance with alternative use of resources without any environmental damage. It is therefore of great concern, from an general viewpoint, to analyse how much area is used per kWh produced energy, and at the same time how much land should be used to produce that much of power to replace fossil energy sources. From literature survey it is found that kWh/m^2 of generated energy for fossil fuels is greater than wind power. The average wind speed is always linked to the average annual electricity production. It is assumed that every band has the same load factor in every country and that these factors will not i.e. they are time independent. [11]. The possible power production per m^2 can be analysed using the existing projects. To generate power from Wind requires a large sitting area. In actual practice the existing area for wind energy is not limited by technical factors but by non-technical factors like public resistance. From Noord (2004) it is decided that setting wind energy is calculated whether it is economically viable or not, specifically geographical distance to the landmass and transmission costs. The availability of wind fluctuates from places to places. Wind resources can only be exploited where wind power density is at least 400 W/m^2 at 30 m above the ground.

F. Solar Power Barriers

Solar energy is the sufficient permanent energy resource on earth and it is available for use in its direct (solar radiation) and indirect (wind, biomass, hydro, ocean, etc.) forms. A prosperous growth rate of over 20% has been achieved, mainly by introduction of grid connected PV in the built environment (IEA 2002).The sun emits radiation at a rate of $3.8x10^{23}$ kW/second. Of this total radiation, approximately $1.8x10^{14}$ kW is captured by earth, which is nearly about 150 million km from the sun. About 60% of this amount reaches the surface of the earth. Even if only 0.1% of this energy could be converted it would be four times the world's total generating capacity of about 3000 GW at an efficiency of only 10%.[12]. By the year 2050 and 2100 The German Advisory Council on Global Change (WBGU) has already strategies of future renewable energy uses. This indicates a major contribution by solar energy to global energy. The initial cost of purchasing a solar systemincludes solar panels, inverter, batteries, wiring and switches making the installation fairly high. The installation of solar panel may not be a limiting factor but focus should be on technological improvement to intensify efficiency of photovoltaic cells, as well as the feasibility in the coming years. Other barriers to use solar power are cost, weather dependent, storage is expensive etc.

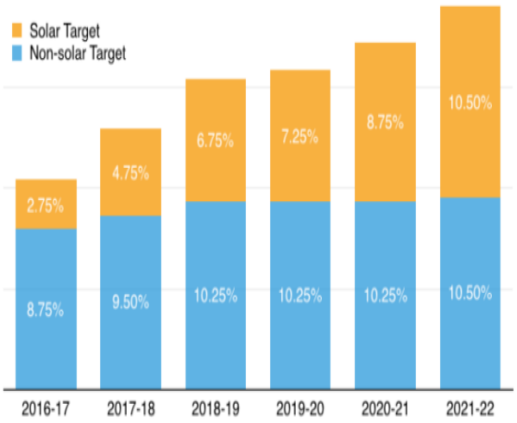

Fig.2: Solar and non-solar target in India

G. Hydro Power Barriers

According to World Energy Resources Hydropower (2016), Hydropower is the leading renewable source for electricity generation globally, contributing 71% of all renewable electricity. It generated 16.4% of the electricity globally i.e. 1,064 GW of

installed capacity in 2016 from all sources. On the other hand environmental barriers edge a further spread of hydro power. According to the IEA, total hydro- power's part of global demand will be compact towards 2030. The construction of hydro power developments frequently causes major infringement on nature and wildlife.The construction of a new reservoir floods large areas of land, so people are to be displaced. For example, in China for the construction of the Three Gorges Dam on the Yangtze River led 1.5 million people being resettled. The construction of a hydropower also has major impacts on the economic activity, particularly farming in that region. In these cases both upstream when creating the reservoir and downstream by bordering the river dry out are affected. Another issue is that the obstruction also preserves silt carried by the river water that supplies the reservoir. Such case was found in the construction of the Aswan Dam on the Nile in Egypt in 1960. Approximately hundreds of kilometer from the dam, the river delta taking place to recede. Farmers had to use more fertilizer to maintain crop yields due to the lack of silt. Consequently, the social concerns of this project are terrific.

III. CONCLUSION AND FUTURE SCOPES OF RENEWABLE ENERGY IN INDIA

Renewable energies are to compete with major market players like coal, gas, and nuclear energies. To prove their value, it must exhibita balance between conventional and renewable (non-conventional) energies, as most investors want adequate quantities of energy, at times when wind and solar aren't available i.e. in rainy or cloudy days. As this situation is difficult to achieve, it is a foremost reason why new renewable technologies suffer high rates of failure.In order to promote clean energy production government should investin the form of subsidies, loan assistance, research and development.For decades, the fossil fuel industry has used its effect to spread misleading information about climate change which is a strong motivation for choosing low-carbon energy sources like wind or solar. Despite widespread scientific consensus, climate action is now a major issue in country, complicating efforts to move from fossil fuels to clean energy. Finally there should be proper methodologies to energy production as well as consumption. Current professionals should extend their knowledge in order for the industry to be able to fill the gap, and simultaneously to train the younger generations how to adopt the new technologies. A number of government and private organizations such as MNRE, Centre for Wind Energy Technology, IITs, Nits, Indian Oil Corporation Ltd. (IOCL) and Energy Resource Institutes should actively participate in R&D of renewable energy sources.

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