



## PARTNERSHIP BETWEEN SCIENTIFIC INNOVATION AND ECONOMIC GROWTH: CASE STUDY OF SOLAR ENERGY IN INDIA

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### Abstract:

*Scientific advances and technological changes are new key partners of economic growth and development. Scientific innovation has become a new source of wealth creation, improvement in quality of life and social wellbeing. India as a developing nation is facing many economic growth and development challenges like unemployment, poverty, hunger, scarcity of resources, etc. To overcome these problems, new scientific innovations in the field of renewable energy can provide useful solutions. In the above context, economic analysis of Jawaharlal Nehru National Solar Mission (NSM) launched in 2010 by GOI is quite relevant. The NSM provide cheap and clean source of energy and job opportunities in India. The aim of this paper is to analysis NSM and other solar projects from various aspects of economic growth and to explore areas of investment for scientific innovation in such type of projects. This study is explanatory in nature. This study concludes positively that the development of solar energy can give solutions to many economic problems of rural electrification, unemployment, climate change, regional development, etc. Thus, India with its increasing population and limited natural resources needs to use solar energy innovatively to achieve all round development.*

**Keywords:** *Economic Growth; Solar Energy; National Solar Mission.*

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### 1. Introduction

India as a developing nation is facing many economic growth and development challenges like unemployment, poverty, and hunger, scarcity of resources and also energy scarcity which is restricting its growth. To overcome these problems, new scientific innovations in the field of renewable energy can provide useful solutions. India is the world's 4<sup>th</sup> largest consumer of energy after U.S., China and Russia.

Solar power a clean renewable resources with zero emission has a great potential of energy. Because of its location between the tropic of cancer and the equator, India has an average annual temperature between 25 degree C – 27 degree C. This means that India has huge solar potential.

India has vast potential for solar energy generation since about 58 % of the total land area receives annual average global insolation above 5 KWh/sq.m/day.

The primary objective of renewable energy is to provide clean energy, fulfill the demand of energy, create employment opportunities and promote economic development. The Eleventh Five Year Plan realized the significant role of new and renewable energy to enhance the domestic supply option as well as the need to diversify energy sources. India's government has begun to acknowledge the importance of solar energy to the country's economic growth. Shri Manmohan Singh, then Prime Minister has said solar energy will transform rural India, launched a National Solar Mission in 2010.

## **2. Jawaharlal Nehru National Solar Mission (JNNSM)**

Jawaharlal Nehru National Solar Mission is the major initiative of the Government of India with a significant participation of state to promote eco energy and sustainable energy growth. It plays a significant role towards contribution to fighting the global climate challenges issues. The JNNSM launched on 11 January 2010 by Prime Minister Dr. Manmohan Singh with the target of developing 22,000 (MW) of solar energy capacity by 2022.

## **3. Objective and Target**

The goal of JNNSM is to establish India as a global leader of solar energy by spreading awareness and promoting investment by the policies initiatives. The mission has set to generate 22,000 MW energy in three-phases. The first phase is between (2010-2013), 2nd phase is between (2013-2017) of the 12th plan and 3rd phase is between (2017-2022) of 13<sup>th</sup> plan. The first phase focus set upon two aspects likely promotion, the grid system, and the modest capacity of the grid. The second phase target on aggressive capacity addition and improving the solar penetration.

Primary goals are discussed below:

- To develop a policy for the generation of solar energy of 22,000 MW by 2022
- To create a friendly environment for solar manufacturing and capability particularly in solar thermal and market leadership
- This plan target is off-grid applications likely 1,000 Mw by 2017 and 2,000 Mw by 2022
- To achieve 15 million square meters solar thermal area by 2017 and 20 million area by 2022
- To deploy 20 million solar lighting in rural areas by 2022

## **4. Rural Electrification**

In 2014, the World Bank ranked India as home to the world's largest un-electrified population. Household electrification is a necessary condition for growth and development of any region. Access to power helps to boost household incomes, help students in studying, provide better

access to information via radio or TV, make possible use of mobiles and many more electrical gadgets can be used. Thus, access to solar power will improve quality of life for rural people.

About 75% of families are connected to grid power in rural areas but still 230 million people in India have no access to electricity in rural areas according to world energy outlook, 2015. India has the potential to produce nearly 750,000MW of solar energy, according to the ministry of New and Renewable Energy, so one MW can power about 1500 rural households.

## 5. Employment Generation

About 64% of India's population is expected to be in the working age-group of 15-59 years by 2026. The green sector could absorb a significant part of population. Over 3 lakh may get green jobs by 2022 if India achieves target of 160 GW. The industry employed over 21,000 people in 2016-17 and 25,000 in 2017-18 according to an analysis by the council on Energy, Environment and water (CEEW), a NGO in New Delhi.

Jobs in off-grid solar PV can result from different applications, ranging from stand-alone installations (e.g. solar lanterns and solar home systems) to mini-grids. India has also been successful in creating employment opportunities along the off-grid solar PV value chain, which accounts for 73,000 jobs according to the last available estimates (MNRE and CII, 2010).

In India, the solar and wind markets are active, as the ambitious renewable energy targets are translated into concrete policy frameworks. Central and state auctions for solar PV, for instance, have resulted in the installation of 1.9 GW in 2015 and an impressive pipeline of 23 GW. Solar PV employs an estimated 103,000 people in grid-connected (31,000 jobs) and off-grid applications (72,000 jobs). With increasing domestic demand, local companies are utilizing their production capabilities and several foreign companies are interested in investing. In reaching the government's goal of 100 GW PV by 2022 could generate 1.1 million jobs in construction, project commissioning and design, business development, and operations and maintenance. However, meeting skills requirements (30% of these jobs would be highly skilled) requires stepping up training and educational initiatives (CEEW and NRDC, 2016).

## 6. Scarcity of Resources

Energy is the basic requirement for growth of a country. India is largely dependent on coal to meet its energy needs. Coal meets more than 50 percent of the current commercial energy needs and generates more than 70 percent of our electricity. But the energy from coal comes at huge environmental and health costs. Renewable energy offers an alternative solution for meeting these needs. Renewable energy based mini grids can manage the local households and commercial electricity demand efficiency by generating power at the source of consumption. Thus, renewable energy projects in India can play an important role in addressing energy issues in the country i.e. energy deficit and energy access problems.

## **7. Less Global Warming**

All traditional sources of energy generate CO<sub>2</sub> and other global warming emissions. In contrast most renewable energy sources produce little to no global warming emissions. Coal emits between 1.4 and 3.6 pounds of CO<sub>2</sub> E/KWh whereas solar emits .07 to .2 pounds/KWh.

## **8. Improved Public Health**

The air and water pollution emitted by coal and natural gas plants is linked with breathing problems, cancer, premature death, etc. and other serious problems. One Harvard University study estimated the public health effects of coal to be estimated \$ 74.6 billion every year. Renewable energy like solar, wind, etc. do not causes any health problems as no gas is released and no water is required to operate and thus do not pollute water resources.

## **9. Other Economic Benefits**

The Renewable energy industry is more labor intensive. Solar panels needs human to install. More jobs are created for each of electricity generated from renewable sources than from traditional sources.

Also growth in the renewable energy can create positive economic “ripple” effects. For example, industries in the renewable energy will benefit local businesses from increased household incomes and local job creations. In future, this will help in equitable regional development in states and country as well.

## **10. Conclusion**

It can be concluded positively that the development of solar energy can give solutions to many economic problems of rural electrification, unemployment, climate change, regional development, etc. and helps in economic growth of country. Thus, India with its increasing population and limited natural resources needs to use solar energy innovatively to achieve all round development. Therefore most investment is advocated in solar energy projects.

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