



# The emergence of the largest Solar Power Plant in Karnataka – a Microscopic Analysis

S. Rajendran

Department of Economics, Gandhigram Rural Institute, Dindigul, TN, India

Received: 18.11.2018 Accepted: 02.12.2018 Published: 30-03-2019

\*srajendran@gmail.com

## ABSTRACT

In this paper, with a specific focus on the largest solar producing plant, many inter-related issues at the field level were explored. This project, unlike many other developmental projects, did not attract resistance from the local communities. Every effort was made to convince the landholders to agree to a long-term contract termed to be successful models, particularly in the solar energy sector. At the same time, the field-level investigation has revealed that farmers have some apprehension over the long-term contract. It was not an exaggeration to reveal that the project brought out significant economic security and ultimately reduced outmigration. On the other hand, there were chances for negative environmental impacts on local biodiversity. Also, a few farmers who leased out the land parcels expressed the fear that at times of emergency during financial requirements, the land cannot be either sold or mortgaged; also, there were apprehensions that the local socio-cultural milieu is likely to be affected and dismantled in the long run. After careful examination, a few points have been suggested for both the policymakers and the farmer households to have conflict-free contracts in the project zone.

**Keywords:** Solar power plant; Renewal energy; Environment.

## 1. INTRODUCTION

Across the globe, attention is being made to go in for green energy production owing to its positive environmental implications. In general, due to the fast-growing nature of economics, including India and China, the demand for power is increasing manifold, and many countries cannot meet out the demand. In countries like India, more than 90 percent of energy is produced based on coal. Due to its adverse environmental reasons, such countries are moving towards green energy sources like solar, wind and bio-fuel. Tropical countries have the advantage of generating energy from solar, and India has been making all its efforts to produce solar energy on a large scale. However, there are certain impediments like poor research and lack of scientific innovation in developing cost-effective solar accessories.

Both the unions and provinces have been consistently trying to increase the green energy source. Incentives and differential rates of tariffs have been in place to encourage the energy producers; unfortunately, the results are not so encouraging. An attempt has been made in this work to unfold various issues on the largest solar plant located in one of the south India states of Karnataka, with field-level exploration.

## 2. ANALYSIS AND DISCUSSION

Once the severely power-starved state of Karnataka is to produce excess power through a successful Public-Private Partnership Solar Power Plant

in Pavagada taluk of Tumkur district, equally, it has vast scope for adverse environmental implications. This project has been taken up under the Government of India's Ministry of New and Renewable Energy (MNRE) initiative for developing solar farms under Ultra Mega Solar Power Plant. First of its kind, this mega joint venture development project is a model for other states, where the solar power radiation is found abundant in the semi-arid tropical region of the Tumkur district.

Being a massive project with collective participation of farmers, this has taken up a shape now, and shortly full potential is to be harvested. The Karnataka Energy Development Ltd. (KREDL) and the Solar Energy Corporation of India (SECI) formed a joint venture company *viz.* Karnataka Solar Power Development Corporation Limited (KSPDCL) in March 2015 and work began from October 2016. KSPDCL followed 'pluck and play' model to implement the project, whereby the company arranged leased inland from farmers and obtained necessary approvals for power generation.

The Karnataka state-owned KSPDCL successfully convinced local farmers to lease in the farmlands for a long duration from 25 to 35 years with an annual lease of Rs. 21000/- per acre during 2015-2016, and the compensation was worked out to be Rs. 23-25 crores per annum. The lease can be extended on mutually agreeable terms and conditions. After five years of the project implementation, 5 percent of increment will be given every two years.

Later, on behalf of KSPDCL, National Thermal Power Corporation Limited (NTPCL) sub-leased six solar power players through auctions for commissioning of solar power farms. The estimated tariff ranges between Rs 4.78 and 4.80 per unit, and the price of solar energy is steadily falling<sup>1</sup>, due to advancement in science and technology and research and development.

With its natural endowments, India is poised to generate 100 GW of solar energy by 2022 to increase the share of renewable energy in power generation to 18.9 percent from the present level of 7 percent (MNRE, 2015). The United Nations Millennium Development Goal 7 also emphasizes ensuring solar energy production owing to its green and sustainable nature.

This ground-mounted solar power plant is to produce 2700 MW from 13000 acres with a huge budget of Rs. 16,500 crores, and in January 2018, 600 MW power was commissioned and by December 2018, this park will attain a full capacity of 2700 MW. Power generated is connected to power grid station at Madhugiri, 75 km from the Pavagada solar farm. Karnataka for its initiative towards promoting renewable energy was bestowed with Excellence in Renewable Energy award by the Government of India in 2018. Once the full capacity is realized, this project will be the largest in the world.

This is a fitting development as India launched Solar Technology Mission, which helps health centers, educational institutions, boreholes, power plants, street lights and drinking water supply, particularly in rural areas. The Indian Prime Minister announced a whopping \$ 1.4 billion as part of its Line of Credit for 27 solar projects in 15 developing countries (Kumaraswami, 2018) on 11.3.2018. Unfortunately, there are some inherent difficulties in taking forward this eco-friendly sustainable solar energy power plant in India due to various issues, including low power price, slow growth in installing rooftop solar plants, consolidation of land, financing, off-take of power, lack of storage facility and higher (Ann, 2018) goods and services tax.

For instance, grid-connected energy storage from non-conventional sources like solar and wind is a challenging task as the problems remain that the peak supply of intermittent renewable energy does not always meet demand (Jebraj, 2018). Due to reasons unknown according to industry players, at least nine tenders for grid storage in 2017 have been canceled by SECI, NTPC

and NLC. It is justified that the cost will escalate for creating a storage facility, which may be unattractive to distributors. Added to this, presently, the lithium-ion cells needed for battery storage are not manufactured in India. The Pavagada solar farm also requires creating a storage facility.

On one hand, the Indian Government imposed 70 percent safeguard duty on imported solar modules and panels to protect domestic industry, and on the other, due to competition among solar power developers, tariff has been declining owing to other proactive policies by the government. Anguished with this, the EU and Japan criticized this move and China and Malaysia are the major exporter of solar equipment to India (Sen, 2018).

### 3. LOCATIONAL ADVANTAGE

Though there are legal disputes and opposition to the acquisition of land for development projects like solar farms, the locals here welcomed this project. A tiny town, Pavagada has undulated terrain with a meager annual rainfall of less than 400 mm on 45 rainy days and grows crops under rain-fed conditions. Many farmers and agricultural laborers eke out income from rearing small ruminants and to supplement farm income. Besides high average solar radiation of 5.35 kWh per square meter per day, availability of large tracts of barren and temporary fallow land and elevated plateau surrounded by rocky hills, this area has been selected.

The state government declared this area as drought-hit 54 times during the past 6 decades, which demonstrates the fragile nature of the local environment, albeit suitable for solar power plants. According to Central Ground Water Board (GOI, 2011), this region is declared as groundwater over-exploited, and water contains nitrate, chloride and fluoride. As a semi-arid tropical zone with deficit rainfall, less remunerative crops like castor, pulses, minor millets and groundnut are grown only during *mungaru* (kharif) season to get below subsistence income normally. If the rain is erratic (as is the case many times), even the seed cost cannot be recovered. The condition of small, marginal farmers and farm laborers is still worse. Due to poor agriculture income and unemployment, around 1000 youths from this taluk alone migrate to Bangalore and Hyderabad for their livelihood.

Traditionally land-owning communities – Vokkaligas, SCs and STs form major social groups as

<sup>1</sup>Invited Paper presented at the International Conference on Advanced Materials Chemistry at the Interfaces of Energy, Environment and Medicine, organized by the Department of Chemistry, Manonmaniam Sundaranar University, Tirunelveli held during 30-31 January 2019. Acknowledgments are due to Jayasheela, Former Vice-Chancellor, Tumkur University, Tumakuru, Karnataka, for the field support.

<sup>2</sup>Per unit price of solar power in India is declining, and grid-connected large solar plants have decreased below Rs. 5/- (Sharma, 2015). Now it has gone down to less than Rs. 3/- per unit.

inhabitants here. While the upper caste – Vokkaligas – conventionally possesses vast tracts of farmlands, STs do have some portions of land, and SCs have lesser magnitude. SCs normally work as farm laborers besides rearing sheep and goats. The marginalized communities (SCs and STs) form 40 percent of the total population in all five project villages.

#### 4. PROJECT IMPACT

Money received against leased out lands helps the locals and transforms the entire lifestyle and consumeristic culture found in the project area. Farmers understood that instead of keeping the land barren and taking up unviable cultivation, it is wise to lease it out. Farmers numbering 629 from Balasamudra, Vallur, Rayacharlu, Kyataganacharlu and Thirumani in Nagamdka Hobli of Pavagada taluk collectively leased it out to KSPDCL. This company also pays as compensation of Rs 2.20 lakhs and 1.20 lakhs for installing high and medium-size power transmitting pillars respectively on the farmlands. For installing substations, the land was also out rightly purchased by the KSPDCL at the rate of Rs 6.6 lakhs per acre from the farmers.

Unlike other development projects, here farmlands have been leased in by the project authorities without major hassle, and officials noted that farmers have joined with the government as partners, beneficiaries, stakeholders and shareholders. As revealed by Nathan (2015), leasing reduces the solar power cost and makes the affected farmers as partners in development. It is surprising that this project was executed in a record time of two years with the full cooperation of local farmers.

After commissioning of this project, as in the case of wind farms in the neighboring state of Tamil Nadu, the land value has increased manifold. Complete transformation<sup>2</sup> has been witnessed in the standard of living. Majority of the farmers invested in purchasing transport vehicles and JCB (earthmovers) machines for hiring them out. There is a greater demand for them in

<sup>3</sup>There is a possibility that when local farmers, especially in urban fringes, get compensation for the land, money is spent on unproductive consumption expenditure and in a short time, they become a pauper. Contrary to this, locals in project areas are wise in investing their money for productive purpose.

<sup>4</sup> Two are larger in size of more than 450 acres, and others are less than 250 acres each and receive water from neighboring reserve forests and hillocks.

<sup>5</sup> Penna river tributaries facilitate rainwater drains into local tanks, which pass through blocks 31, 34, 37 and 38

the solar project farms for carrying out development works. An unskilled worker is paid Rs. 250/- to Rs. 300/- as wage depending upon the nature of work. A rough estimate shows that 400 technical manpower and around 1000 semi-skilled jobs are required to upkeep and for the maintenance of solar farms. A few local youths are employed in the construction and installation of solar power plants and as security guards. Farm households rent out their machineries like tractors, water tankers and JCB machines to level the project sites and cleaning the stones, grass, bushes and grubbing. Nevertheless, once the project gets completed, they will become jobless.

#### 5. CHALLENGES AHEAD

Many villagers fear that they are alienated from farm plots, and in the long run, it may bring adverse development than economic benefits. Farm laborers and tiny farmers' class in all the five villages are likely to be affected by the project as the grazing land is shrinking and sustainable employment is bleak. There are five irrigation tanks in these villages that provide irrigation facilities<sup>3</sup>.

Fear is compounding among the villagers that a large quantum of water will be drawn from the local irrigation tanks for regularly cleaning the solar panels and other domestic needs.

The Environmental Impact Assessment (EIA, 2016) on the project area estimated that 7 crore liters of water are required once a fortnight to wash the solar photovoltaic panels every time. Moreover, the local *nallahs*<sup>4</sup> (forest channels) which are facilitated to natural flow of water into irrigation tanks have been either closed or diverted inside the project areas<sup>5</sup> during grubbing and laying approach roads, which will deprive inflow of rainwater. Another issue is that pits of 3 m depth are dug at regular intervals to install the iron rods for fixing the panels, and after the lease period, it may be difficult<sup>6</sup> to clear the concrete from the farm plots and land may become unfit for cultivation as farmers feared.

Fear has gripped among people as many become unemployed as entire land has been leased in some

inside the project site. Since the free flow of rainwater is affected, the irrigation tanks will not get their full capacity.

<sup>6</sup> As the EIA admits, "the reduction/alteration of surface water runoff and extraction of groundwater are considered as the significant adverse impact from the proposed project and permanent in nature".

<sup>7</sup> According to the EIA, there is a safeguard mechanism that the solar farm developing companies should clear the debris, but many farmers are suspicious about this.

households. According to shepherds in Thirumani village, the project restricts the movement of livestock for grazing as the entire site has been completely fenced and animals were sold out for throw-away prices. A young farmer from ST community from Vallur, who leased out 1.5 acres, concurred that 'we feel like alienated from our land' and the aged ones became idle, as they do not know any other work except farming and rearing of livestock.

Farmers are worried that a contract for lease is a long period, and there is a possibility for legal dispute within the household when there is division in the joint family which will lead to conflicts. The conflict between different groups and misunderstanding with solar power players may lead to the breakage of SPVs; the disposal of debris is yet another environmental problem.

In addition, the migratory pattern of fauna will be restricted due to the establishment of a massive solar power structure in the water perched Nagamdka Hobli. Close proximity to this zone at a distance of just 2 kms there is a reserve forest – Ramagiri West Forest Range belongs to neighboring Andhra Pradesh. A cross-section of villagers cautioned that local biodiversity and ecosystem would be affected as already local wild animals like hogs, jackals, deer, wolves, rabbit, monitors, chameleons, peacocks, bats, snakes and monkeys are distressed and disappearing due to shrinking of habitat. Similarly, local plants like broomstick, fruit-bearing *Hunashe hannu* (tamarind), *Nerale hannu* (rose apple), *Seetha pala* (custard apple) and *Yelleche hannu* (wild ber) have been uprooted during vegetation clearing and grubbing of filed plots inside the project areas. In the process of commissioning the project, many local medicinal plants<sup>7</sup> and grass once found inside has been completely cleared now.

The Pavagada solar power plant also creates uneasiness among the farmers on social gatherings and ritual offerings. Earlier, whenever there was a bumper harvest (before one week), domestic animals<sup>8</sup> were sacrificed as there is a belief that it prevents major pests and diseases on crops, animals and human beings. Moreover, community assembling during *Sankranti* (harvest festival) and *Ugadi* (Kannada New Year) to plan and sort out local development issues becomes rare now, 75-year-old Narayanappa from Tirumani worried. After the entry of KSPDCL, the land became costlier as it rose to Rs 7 lakhs per acre. The real estate business is entering here, hoping that there will be greater demand for solar power generation in the future, which may result in the consolidation of land from the farmers by real estate entrepreneurs.

<sup>8</sup> Local shepherds revealed that a few rare plants cure the diseases and digestive system of domestic animals.

## 6. CONCLUSION AND SUGGESTIONS

Villagers close to cities where farmers are cautious in investing their money. The local farmers, albeit given decent tariffs for their leased outlands, fear that they will be deprived of their farmlands in the long run. Also, there is difficulty for a farmer who wants to sell his land on contingency needs. Now villagers have given up farming and livestock rearing. Therefore, employment opportunities may be given to local youths depending upon their age and qualifications by the establishment of skill academy based on the needs of solar power farms.

Local villagers, including farmers who leased out the land, should form welfare associations to bargain with the solar power players during critical times. Frequent meetings by officials with such association would remove the fear among the locals and build confidence. There are successful models of community-initiated solar power plants elsewhere in India. The first solar pump irrigation cooperative enterprise has completed two years of functioning in Central Gujarat (Shah and Others, 2017). Confidence-building will certainly sustain the eco-friendly solar power farms in the energy-deprived Karnataka state.

## FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

## CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.

## COPYRIGHT

This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC-BY) license (<http://creativecommons.org/licenses/by/4.0/>).



## REFERENCES

Ann, Power Play (Editorial), *Business Line*, Madurai, March 13, 8(2018).

<sup>9</sup> Normally, poultry and sometimes sheep were cut and the blood was spread on the field plots as thanksgiving to God.

- GOI, Dynamic Ground Water Resources of India (as on March 2009), *Central Ground Water Board, Ministry of Water Resources*, Government of India, New Delhi (2011).
- Jebraj Priscilla, Draft Mission to Kick Start Renewable Energy Storage, *The Hindu*, April 29, page 9(2018).
- Knight Frank, Environmental Impact Assessment – Solar PV Park, Nagalamadike Hobli, Pavagada Taluk, Tumkur, *Knight Frank (India) Private Limited* appointed by World Bank, February(2016) .
- Kumaraswami, K., PM Lights Up the World, *Deccan Chronicle*, Bangalore, March 12(2018).
- MNRE, Updates on Solar Developments in India, *Ministry of New and Renewable Energy*, Government of India, New Delhi, 15 June (2015).
- Nathan, H. S. K, Solar Energy for Rural Electricity in India: A Misplaced Emphasis, *Economic and Political Weekly*, 49(50), 60–67(2014).
- Sen Amiti, Solar Cell Imports: EU and Japan Question Safeguard Duties Recommended by India, *Business line*, Madurai (2018).
- Sharma, S., Sun Edison’s Bid Brings Solar Power Tariff to Record Low, *Livemint*, 5 November (2015).
- Tushaar Shah, Neha Durga, Gyan Prakash Rai, Shilp Verma and Rahul Rathod, Promoting Solar Power as a Remunerative Crop, *Economic and Political Weekly*, 52(45), 14-19(2017).