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Browning the Green Agenda

Understanding Indian Solar Policy through Local Sustainability Perspective

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ABSTRACT

Dynamics of change in Indian energy sector is marked by policy mediated scaling up of renewable energy technologies (RETs) for power generation. The existing paradigm for RET scale up in India is targeted to conform with global green agenda of rapid renewable energy capacity scale up aimed at climate change mitigation efforts hence showing no differentiation for various socio economic, political and infrastructural concerns existing under Indian panorama i.e. the brown agenda's. Being a tropical country India is endowed with high solar insolation ideal for solar based energy generation therefore Government of India has recently launched an ambitious program i.e. Jawaharlal Nehru National Solar Mission (JNSSM) targeted at massive scaling up of solar based power generation capacities (20 Giga watts by the year 2022) in the country. The prevailing conditions of energy poverty, climate change vulnerabilities and high population growth rates in India warrant that policy incentives for scaling up solar installations fulfill multiple goals. Thus, the current trend of steep reduction in solar installation costs and rapid increase in efficiencies of solar power generation may not be enough for attaining effective energy sustainability transitions in a country where power supply is an inextricable socio-political issue. This article systematically analyses current solar policy implementation in India under triple bottom line of economic, social and environmental implications emphasizing on a need for inclusiveness in terms of local concerns and feasibility while formulating renewable energy policies in developing countries.

Keywords: *Solar Policy, Local Sustainability, Global Agendas*

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Globally endorsed green agenda of climate change mitigation has led to rapid scale up of renewable energy technologies (RETs) worldwide. The scale and speed of technology scale up are being primarily determined by the emerging global innovation system undermining the local or brown agendas associated with energy generation or energy technology scale up in emerging economies.

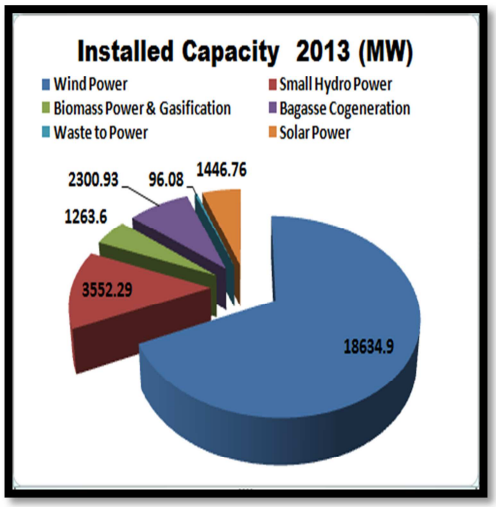
The dynamics of renewable scale up in India encompasses multiple dimensions of development i.e. economic, social and environmental. India as an emerging economy has incessantly growing energy needs along with mounting challenge of sustainably providing clean and affordable energy to a population of 1.25 billion. In order to circumvent prevailing conditions of growing energy insecurity and climate change vulnerability India has proactively taken policy measures to shift its energy base towards renewable sources of energy generation like wind , solar and biomass .

Being a tropical country, India has immense potential for solar power generation. Country enjoys over 300 sunny days annually with theoretical solar power reception on land area of about 5 Peta watt-hours per year. The daily average solar energy incident over India varies from 4 to 7 kWh/m^2 with about 1500–2000 sunshine hours per year (Indian Energy portal (2010), Garud and Purohit, (2007)).

A favorable international solar technology landscape, high climate change vulnerability risk and growing energy security concerns have led to initiation of an ambitious solar policy in India implemented through Jawaharlal National Solar Mission. The country mandates massive scale up of its solar power generation capacities from less than 1 MW in the year 2009 to 20,000 MW by 2030 (Ministry of New & Renewable Energy, MNRE, 2010). The prevailing conditions of energy poverty, climate change vulnerabilities and high population growth rates warrants that policy incentives for scaling up solar installations fulfill multiple goals.

The existing power service system in the country is characterized by heavily subsidized power to many provisioned through a system incurring substantial transmission and distribution losses. Therefore, the current trend of steep reduction in solar installation costs and rapid increase in efficiencies of solar power effectiveness in solar promotion. The current policy integrates wide umbrella of policy mechanisms ie Financial incentives, public financing and regulatory policies in form of lucrative feed in tariffs (FIT) and power purchase agreements, renewable energy credits (REC), portfolio standards for solar generation, indirect subsidies for infrastructural set up along with strong policy protection provided to indigenous manufacturing through mandatory inclusion of domestic content criteria. This has led to rapid scaling up of grid connected solar power in India.

The performance of economic incentives has been heterogeneous for India with ground mounted grid connected power plants mushrooming in states like Gujarat and Rajasthan promoted through interplay of both central and state led solar policies. These states are witnessing rapid land diversion in rural areas towards solar generation. The overall welfare impacts



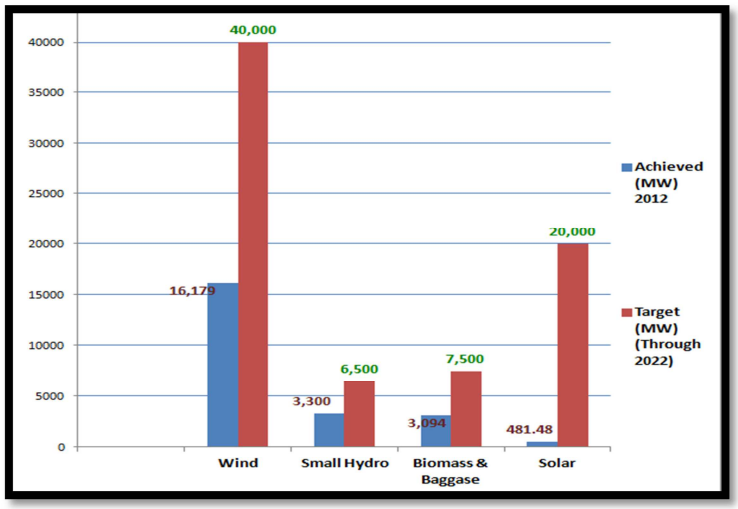


Fig1: Break up for Installed RET Capacity in India: 2013 ; Fig 2: Policy Mediated Growth Path for Renewable Energy Development In India

Source: (MNRE, Reports 2013, 2011)

generation brought through the green regime may not be enough for attaining effective energy sustainability transition in a country where power supply is an inextricable socio-political issue. Assessing policy effectiveness using the lens of energy sustainability mandates that the current solar policy is reviewed through a triple bottom line of economic, social and environmental efficiencies.

The economic bottom line of solar integration in Indian energy mix can be sketched through available policy mediated solar incentives and their of these plants are still abyss considering overall socio technological efficiency of solar inclusion in Indian power sector. The current paradigm of solar scale up totally overlooks key features of demand side socioeconomic dynamics in India like house hold level energy accessibility and affordability along with efficiency of transmission and distribution infrastructure in the country. Thus rapid increase in generation of solar power may not lead to conditions defining sustainability of solar promotion. Further the socio economic fabric of policy analysis need to augment environmental bottom line sketched through

Balance of System (BOS) and resource through put in order to qualify as a policy mediated sustainable energy transition.

Indian renewable sector has grown rapidly with cumulative grid interactive renewable energy generation capacity of about 28,184 MW (12.32% of total energy mix) as of September 2013 (MoP, 2013). Figure 1 illustrates the break up for installed cumulative grid connected renewable capacities in India (MNRE, 2013). The long term policy targets for renewable scale up in India are illustrated in figure 2. The targets show an immense thrust on promoting wind and solar generation in India.

For effective integration of renewable energy in the power generation mix Indian power sector went through a series of sectoral reform through the entire chain of value creation. The country has a separate dedicated ministry for facilitating renewable energy integration in the energy mix i.e. Ministry of new and renewable energy (MNRE). With power sector reforms facilitating independent power producers (IPP) to enter renewable energy generation, the renewable market in India is predominantly controlled by private players.

Conventionally throughout the world solar installations are promoted as an effective demand side countermeasure for climate change mitigation (Kraines, Ishida & Wallace, 2010).Contrastingly the Indian solar policy predominantly promotes a unique supply side model for solar scale up in the country. As policy provisions lucrative incentives and subsidies for grid connected MW scale solar power utilities this scale up need to be critically analyzed under the criteria of system resource throughput or sustainability under the persisting socio technological system of electricity provisioning in the country.

According to Kumbaroglu et al (2008) the new renewable energy technologies (RET) (PV & Wind power systems) have contrasting character. On one hand they have attractive low risk characteristics, like short planning and construction lead times, no or low fuel costs, low related greenhouse gas or pollutant emissions coupled with low operating and maintenance cost. On the other hand they are relatively capital intensive because the technologies are still fairly high up in the learning curve and partly also because they have to concentrate a dispersed energy source. Therefore, prospects for diffusion of RETs are affected by high level of uncertainties. As the cost of solar generation is dynamically changing internationally, the policy level uncertainties are perceived to be very high for solar power plant set up in India (World Bank, 2010). While dealing with investments in physical assets an option to delay usually pays, this 'value of waiting' becomes particularly important in the context of new RET, as these are often modular, requires relatively short construction times and exhibit steep learning curves.

The Indian power grid is characterized by very high transmission and distribution losses i.e. over 34.54% in the year 2005. (MoP, 2013) compared to international average of close to 10%. Further the quality of power supply through grid is poor with frequent instances of voltage fluctuation, frequency variation, spikes, black outs making the supply highly unpredictable for industrial, commercial and residential customers (Mathur & Murwah, 2006). Thus, overall efficiency of delivering clean energy to the end user would be significantly low from grid connected utility scale power plants. Further, research studies for utility scale solar power generations have shown that a short fluctuation of irradiance and cloud cover play an important role for in determining the performance of low-voltage distribution grids with high penetration of PV. Grids with renewable inputs are characterized by power quality issues. According to a study, annual cost of wastage caused by poor power quality for European Union -25 exceeds Euro 150 billion in the year 2010 (Khadem et al, 2010)

Characteristically, PV installations are necessarily distributed energy systems with vital value generation coming from its modular, on the site generation capabilities (Borenstein, 2008). Further, power from central station generation requires significant investment in transmission and distribution infrastructure that could potentially be reduced if more power were generated on site.

There has been growing debate on fuel vs. food security in the bio fuel circles where diverting land for bio diesel production has been criticized. This concern is much more relevant in Indian context where the population will reach 1.5 billion by 2050 and according to the Stern Report (Stern, 2006) is at a geographic disadvantage with respect to climate change phenomenon. The poorest of the strata are heavily dependent on agriculture in India which would be, the most climate-sensitive of all economic sectors, further their low incomes and vulnerabilities make adaptation to climate change particularly difficult. Therefore, the nature of land use change becomes vitally important.

Thus, there is a possibility of a situation where a technology with greater environmental impacts among clean energy technology peers is promoted through a socio technological configuration of low

eco efficiencies providing a sub optimal result for climate change mitigation.

The power structures promoted through the green agenda thus fail to internalize the heterogeneous conditions prevailing in developing countries where energy availability and accessibility is purely a socio economic issue defining the quality of life for the people and wellbeing of society there by interfacing with sustainability bottom line thus the browning the green agenda becomes critically essential while formulating policies for renewable energy promotion in developing countries.

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