The Importance of Effective Policies to Support Renewable Electric Power Generation in India

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ABSTRACT

To promote sustainable energy policies and business as well as industrial competitiveness for jobs and growth in the coming years, requires a strong and positive leadership, policies and technological innovation. Indian energy companies are also no exception to this global competitiveness. This paper focuses on a series of policies like Electricity Act 2003 and Tariff policy 2006, as well as the implementation of feed-in-tariffs and minimum quotas on clean electricity sourcing issued by the Indian government. It provides a systematic review on the current status including achievement and shortcomings. The main approaches of the policies and regulations in promoting the development of the Renewable energy (RE) electric power generation industry are discussed and the issues of current policies are analyzed. It also proposes a program for the implementation of RE business by investigating a case study of promoting solar energy in Rajasthan, India. Finally, the paper concludes by suggesting that if the state and national government implements effective policies to promote RE projects at all levels, then the existing big companies and financial organizations will start investing and there will be a greater participation of the private sector in promoting the development of RE in the power generation mix.

Introduction

The rising influence of the developing economies like India on the ongoing efforts to develop and market renewable energy, to fight climate change and to secure energy supply for the society are being increasingly scrutinized at an international level. With reason: latest data available suggest that India will be the second-largest contributor to the increase in global energy demand to 2035 (IEA 2010). Although per capita energy demand of India remains far lower than western countries, relative success in tackling global energy demand and global warming will highly depend on current and future policies in these emerging economies and Organization for Economic Co-operation and Development (OECD) countries. The low per-capita energy consumption level indicates that India's energy demand still has a long way to reach saturation. With a growing economy and a 1.3 billion population aspiring for a better life, India's energy demand growth is inevitable. In 2012, the total installed electricity generating capacity in India was 199 GW and the electricity generation (excluding renewable) in FY 2011/12 was 876 TWh (CEA 2012h). In the next 25 years, India's electricity demand is expected to grow at an average annual rate of 7.4% (World Bank 2010). To keep this pace, generation capacity will have to increase massively. In this context, renewable energy (RE) represents a "win-win" opportunity for India. Development of RE in India has witnessed various ups and downs. The following rationale explains the role of increasing RE in the energy mix with the help of national and state energy policies followed by benefits of increasing RE in the energy generation mix.

Rationale

Rising Energy Demand

The Integrated Energy Policy (IEP) Report, 2006, estimates that India will need to increase primary energy supply by three to four times and electricity generation by five to six times to meet the per capita consumption needs of the people and to sustain the current eight percent growth rate. The New Policies Scenario (NPS) and the central scenario of WEO 2011, shows that by 2020 India will require gross electricity generation of 2104 TWh and 2359 TWh under the 8% and 9% GDP growth rates respectively. As mentioned earlier, the electricity generation (excluding renewable) in FY 2011/12 was 876 TWh. The gap between supply and demand is likely to increase unless adequate measures are taken to bring on new generation capacity and improve operation efficiency.

Import of Conventional Energy

As the growth in demand increases, India's dependence on imported energy intensifies. From 1990 to 2009, the total energy imports increased from 34 Mtoe to 236 Mtoe (million tonnes oil equivalent) (WEO 2011). India's import dependence increased from 11 % to 35 %. India imports nearly 70 % of crude oil of the total energy demand, followed by coal, and then gas. Minimizing the dependence on import of conventional fuels and providing energy to all at affordable prices should be the main concern of India's energy policy.

Carbon Emissions

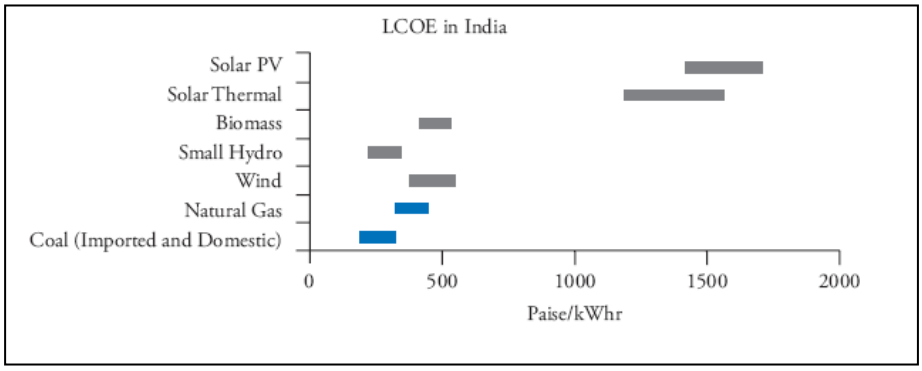
India is targeting an emissions intensity reduction of 20 % - 25 % on 2005 levels (IEA 2012). Though there are no targets sets for India (Non-Annex 1 countries), India's decision is an indication of its commitment for emission reductions. India's per capita emissions are now around 1.2 tonnes of CO_2 equivalent and are expected to be around 2 tonnes to 2.5 tonnes CO_2 by 2020, and 3 tonnes to 3.5 tonnes CO_2 equivalent by 2030. This will be majorly due to increased coal consumption, which represented 67 % of the emissions increase from 1990 to 2009 (IEA 2012). Therefore, multi-fold efforts are required to achieve emission reduction targets. Power sector being the major contributor to these emissions, infusion of RE in to the power sector in a bigger way will help to achieve these targets.

The Challenge of Grid Parity

India has a large domestic market that is readily available as testing ground for technologies at the inflection point of commercialization. Figure 1, shows that except solar technologies, the levelized cost of energy (LCOE) for all other RE technologies is comparable to the conventional power generation cost. Figure 1 show that the initial capital cost of all solar power generation technologies is still very high and it does not consider here transmission and storage costs. Various reports suggest that the prices are reducing for solar PV in the recent years, but still the goal of grid parity remains to be achieved. Most studies predict that the solar grid parity will be achieved around 2015-17 in most of the markets, due to rising conventional fuel prices and dropping PV prices, growing PV markets, and policies that favor the

implementation of clean energy. Implementing the right policies to bring down the cost of production of basic material, and providing financing to RE markets, together with regulatory initiatives for market expansion can help to accelerate grid parity to solar electricity in the Indian market.

Figure 1. LCOE for All RE Options Compared to Conventional Power Generation Cost



Source: (Indian Infrastructure Report) IIR, 2010

The Benefits

Energy Security

Secure energy supply is directly or indirectly related to the growth of any economy. Indian energy companies are being forced to import conventional resources from oil rich, but politically unstable countries to have good quality fuel and constant supply to the existing power plants. Therefore the Planning Commission of India has invited public participation for the discussion about the India's future energy security. Awareness is being created among local people via the advantages of RE through various initiatives like solar cooking and biogas cooking etc. A partial shift from conventional to clean sources will help reduce full dependence on imports and indirectly help achieve grid parity.

Foreign Exchange Savings

In 2010-11, India imported about 84 million tonnes of coal and in 2011-12 the import grew to 103 million tonnes (Coal India Report 2011-12). The landed cost of imported coal is almost double that of domestic coal. As per the projections, by 2015-16 India will have to import around 200 million tonnes at a price of Rs. 130,000 crore. Moving to RE based generation will help in saving significant amounts of foreign exchange.

The Green Market

RE technology is labor intensive and generate high employment in the market. World Institute of sustainable Energy (WISE), Pune, India estimates that by 2020 around 1.48 million to 1.66 million jobs would be created nationally, if effective labor policies in cohesion to the national policies for promoting RE technologies are defined.

Benefits to Other States

RE development is an important step for regional economic development within India. Many of the states endowed with rich renewable potential lag behind in economic development. Developing RE technologies in these states can provide secure electricity supply to foster industrial development, attract new investments, create employment, and generate additional state income by allowing the states to sell RE certificates which represents the attributes of electricity generated from renewable energy sources to other states. The 13th Finance Commission has recommended a grant as an incentive to the states that increase the share of electricity generated from RE sources. The grant is to the tune of Rs. 5000 crore for states generating grid-connected electricity between FY-2010-11 to FY 2013-14.

The national and state governments are assessing the status for decentralized RE power generation projects in the states to help them availing the benefits of the incentives and will help villages, towns and cities create infrastructure and developing community facilities. This will also allow massive investment inflows to these areas benefitting in the overall development. (Balachandra. 2011)

Policy Framework

The current electricity generation capacity in India is approximately 206,000 MW and it ranks sixth in the world in terms of electricity generation, coming behind the US, China, Japan, Russia and Canada. India's power sector had been a monolithic system that was tightly regulated and dominated by vertically-integrated state utilities until economic reforms began in 1991. Until 1990, the entire electricity chain was controlled by the State Electricity Boards (SEBs), which were later deregulated by introducing the Central Electricity Regulatory Commission (CERC) and State Electricity Regulatory Commission (SERC) and by a series of policies, of which a few are explained below which is helping the introduction of RE energy generation and increasing its share in the total energy generation mix.

Electricity Act 2003 (EA 2003)

The NAPCC study suggests that as much as 15% of India's energy could come from RE sources by 2020. To achieve this target this act created a consolidated policy framework for generation, transmission, distribution trading and consumption of electricity based on market-based mechanisms. Its main features are; it encouraged more competition in the sector by unbundling SEBs into generation, transmission and distribution utilities. Second, thermal and captive generation was de-licensed. Third, fair transmission open access was granted to all the generators. Fourth, mandatory metering, stringent punishment of electricity theft and multi-year tariffs were introduced to regain financial losses of SEBs. Finally, a Power Purchase Agreement (PPA) was made mandatory for RE based electricity. A key feature of EA 2003 is that it empowers the SERCs to specify the terms and conditions for the determination of the tariffs, and by doing so they should be guided by "*the promotion of co-generation and generation of electricity from renewable energy sources of energy*", (EA 2003, Section 61(h)).

National Tariff Policy 2006 (NTP 2006)

This policy further elaborates the role of regulatory commissions, the mechanisms for promoting RE, the time frame for implementation etc. It aimed at strengthening the financial viability of the sector and to attract investments. It guaranteed a 16% rate of return on investment (ROI) from 2001 to 2004 and 14% return for 2004 onwards (CERC, 2008). This framework helped at minimizing risks for utilities and consumers and reducing the system losses. Also the Policy required state governments to implement the Available Based Tariff (ABT), to promote transparent and efficient performance in the power sector. However, only some states implemented this ABT.

In sum, the EA 2003 created a favorable environment at the national level for states to unleash the Renewable Energy Potential (REP) by recognizing this new source of electricity as a priority and the NTP 2006 provided more precision on the timetable for the implementation of support measures (Schmid 2012). The significant effect of the NTP 2006 is due to the fact that this policy sets a deadline to the SERCs for the implementation of Renewable Purchase Obligation (RPO). It insists that the distribution companies should procure at preferential tariffs set by the SERC or through a competitive bidding process. It also promotes more competition in the electricity market by encouraging SERCs to open access in distribution which help reduce risks for utilities and consumers. Also in 2006, the Government of India (GoI) released the Integrated Energy Policy (IEP) which states that incentives for RE sources should be linked to the energy generated and not just the installed capacity.

Other Initiatives, Practices and Regulations in India

In terms of RE, India is currently ranked fifth in the world with 15,691.4 MW grid-connected and 367.9 MW off grid connected RE based power capacity. Indian Ministry of New Renewable Energy (MNRE), National Thermal Power Corporation Vidyut Vypar Nigam Ltd., (NVVNL) and the Indian Renewable Energy Development Agency Limited (IREDA) are jointly administering the development of RE. The Government of India's National Action Plan on Climate Change (NAPCC) identifies eight critical missions, including Nation Solar Mission, National Mission for Enhanced Energy Efficiency, and National Mission for Green India and Rural Electrification Policy 2006. Among these, the Solar Mission would be completed in three stages deploying 20,000 MW Grid connected Power plants, and generating 2000 MW of off grid solar power. Other incentives for RE by the Central and the State governments like Capital subsidy, Solar Photovoltaic Manufacturing under Semiconductor Policy, Generation based incentives, Customs Duty Exemption, Foreign Direct Investment etc. along with EA 2003 and NTP 2006, overall aims to reduce the mismatch between availability of RE sources in state and the requirement of the obligated entities to meet the RPO in other states. This has resulted in overall faster growth of RE sector in the last two years in India. This will improve in the coming years as India has one of the largest programs in the world for developing RE based products and systems.

A brief case study of the state of Rajasthan as described below will help understand how the above mentioned policy initiatives and some other actions taken at state and regional levels helped grow the solar PV business in the state, and the overall development of the state.

Success of RE in Rajasthan

Rajasthan is the largest state of India constituting about 10.4% of geographical area of India. It receives the highest annual global radiation (≥2400 kWh⁄m^2). It receives solar radiation of 6.0-7.0 kWh⁄m^2 per day (S Pandey et al. 2012). As the area as low rainfall, about 325 days have good sunshine in a year, and in western areas in Thar desert it may extend up to 345-355 days as rains occur only for 10.4-20.5 days in a year (Singh H, Singh AK, Chaurasia PBL, Singh A 2005). This climate is favorable for setting up RE in the state. Out of a total of 1100 MW new project allocations, Rajasthan received the maximum share of 873 MW (i.e., 79.36% of the nation allocation) through competitive bidding via Jawaharlal Nehru National Solar Mission (JNNSM). The question to be asked is why is Rajasthan more favored by businessmen and investors compared to the other states with almost similar climatic conditions.

Below are some of the factors which describe the accelerated development of solar energy in Rajasthan.

Solar and Renewable Policy

To promote RE and especially solar energy power generation, the first important driving factor which the state promoted was the policy. To begin with "Policy for Promoting Generation of Power through Non-Conventional Energy Sources" was enacted on 11 March 1999, which was updated in 2000, 2003 and 2004. Also, the state government issued Rajasthan Solar Energy Policy on 19 April 2011 to promote solar energy. The highlights of this policy include (Sharma, Tiwari & Sood 2012)

Objectives:

- Develop as Global Solar hub: In the next 10-12 years
- Productive use of desert land
- Creation of employment opportunities
- Establish a manufacturing base
- Creation of solar park(s)

Strategy:

- Leveraging maximum benefit from policies of National Solar Mission
- Develop Solar Power Plants
- Meeting RPO of Rajasthan
- Meeting RPO of other states
    - Direct sale through open access
    - Through National Solar Mission

The state of Rajasthan in its defined policies also provides measures and incentives for the promotion of private sector investment for setting up power generation projects which are explained below and it also reflects some insights of the initial results what the state of Rajasthan is visioning through the implementation of these strategies.

According to Department of Energy, Government of Rajasthan, the following concession and assistance will be provided to the private entrepreneurs setting up electricity generation projects of 125 MW and above capacity within the state (except captive power plants).

Program to Achieve the Objectives through Various Strategies

Facilities and Incentives for Private Entrepreneurs for Setting Up Electricity Generation Projects in the State of Rajasthan

Factor	Measures
Land and Water	• Land bank for Solar Power Plant • Allotment of Government land wherever available at 10% of market rate • Purchase of private land in excess of ceiling limit • Conversion to industrial use at 10% of charges leviable for other industries • 1600 liters per sec from Indira Gandhi Canal Project (IGNP) Canal for Solar Power Plants
Evacuation system	• Clear mandate to identify and develop an adequate transmission system for the evacuation of power from such projects. • Projects under evacuation:42 Million € • Creation of Rajasthan Renewable Energy Infrastructure Development Fund (RREIDF) for Transmission network, roads etc. • Entrepreneurs would be free to create their own dedicated transmission lines subject to approval
Single Window	• Ensure single point interface between investors and Government departments • Rajasthan Renewable Energy Corporation Limited (RRECL) as a single window for overall coordination and for creating awareness among people towards conservation of energy through projects demonstration.
Factor	**Incentives**
Electricity Duty	On electricity generated, the distribution companies of the state will purchase electricity at the tariff fixed as per prevailing GoI/Rajasthan Electricity Regulatory Commission guidelines.
Entry tax	Exemption for entry tax into the local area, from any place outside that local area on all capital goods, plants and machinery and spare parts except fuel required for the project
VAT	Reduction in VAT on all solar products from 14% to 4%
Land and Power	For a period of 7 years, 50% exemption will be given on the stamp and land duty for execution of deed related to land, financing procedure document and lease documents etc.
Investment	An investment subsidy of 30% of the tax deposited will be provided.
Employment	An employment subsidy of 20% of the tax deposited will be provided
State Government Guarantee	Purchase of power by the distribution companies of the state government will be supported by the state government guarantee.

In addition to above policies, the state government has categorized industries, projects and processes in Red, Orange and Green categories with Red as “maximum” and Green as “minimum” impacts on the environment. This new classification system is in coherence with the Central Pollution Control Board, New Delhi with the core aim to improve environmental

compliance and enforcement of larger benefit of people. Entrepreneurs for application of the projects need not go to the office to visit the officials and can apply online in respect of grant of consents and authorizations. The responsibility in respect of grant of consent in solar energy projects have been delegated to the regional offices. This helps in ease of the process and follow-up. (S Pandey et al. 2012)

Although current policies consider solar energy as the cleanest and safest source of energy with tremendous environmental benefits, the question of effectively capturing and storing the energy, in an environmentally friendly manner is of great concern. Hence the state government is providing science based policies and experiential knowledge of the developed nations to strategize effective solar systems installations without affecting land use, biodiversity and climate. The healthy experience of the developed nations in this field is being used with the help of local esteem technical institutions' like Indian Institute of Technologies (IITs), and The Energy and Resources Institute (TERI) etc. to help develop technical and good manufacturing database for the international and national companies who wish to invest in the projects.

To promote regional level businesses, the state government has committed to enact a fiscal responsibility and budget management legislation, to improve government's fiscal position. To promote manufacturing sector by further developing of selected existing industries, revitalization of other poor performing industries and attracting foreign companies there is a setup of Public Private Partnership which provides guidelines and forms to invest with clearly defined policies, databases for contacts and case studies to help business competitiveness.

In the light of these attractive features and proactive initiatives of the state government, a big installation project of large share of 583 MW, including 3 projects of 100 MW each and 2 projects of 50 MW based on Solar Thermal technologies were received. The total allocation as on December 2011 amounting to 873 MW out of 1100 MW in overall India was sanctioned. Thus, 722 reputed companies have already registered their interest for setting up of solar power plants amounting to a total capacity of 16,900 MW in Rajasthan under RE policy 2004 and Solar Energy Policy 2011. (S Pandey et al. 2012)

Also, the first ever solar park in Jodhpur area of Rajasthan has been identified and sanctioned. Clinton foundation has signed a memorandum of understanding (MoU) with the Rajasthan Government in January 2010 for setting up 3000 MW Solar Parks In this project, 10000 hectares of government land was identified for the project for manufacturing and generation. The master plan for phase I has already been developed by the consultant appointed by Asian Development Bank. Soil testing and survey of 3000 hectares is completed with survey and soil testing work for the second phase of 5000 hectares is underway. The state government has provided some common infrastructure for generation and manufacturing plants such as water reserve of 58 cusecs of water from IGNP, new grid planning and construction of 132/33 kV and 33/11 kV lines. Plus the proximity of a National Highway NH-15 is an added advantage to the solar industry business.

Rajasthan is also well-positioned to facilitate the RPO of other states through the renewable energy certificate (REC) mechanism if other states so desire. In fact, Rajasthan was the first state to allow open access for wheeling (i.e., power transmission from a seller to a buyer through the network owned by a third party) of solar power to areas beyond Rajasthan. To meet the state specific RPO, Rajasthan is committed to identify and approve more projects through the competitive bidding route. Several collaborations in this direction are already underway. (http://www.rrecl.com)

Future Work: Steps to Remove Policy Barriers and to Promote Competitiveness

With this initial success by the existing policies with defined objectives and strategies, and by studying a case study in the state of Rajasthan, still there are several areas of concern that must be addressed to continue with the same rate of growth creating conducive environment for the companies to invest. Even though many policies have been defined, India lacks a comprehensive policy statement for RE and a legal framework. Different policy documents, old and new, continue to exist creating tremendous confusion at national, state and regional levels for implementers and investors. Following explains the barriers and possible remedies to achieve the goals set by Government of India.

Need for Cohesion

The major clauses defined under NAPCC, the Integrated Energy Policy(IEP) and the interim report on 'Low Carbon Strategy for Inclusive Growth in India' highlights the need for bringing cohesion in the policy of the Government of India (GoI) with regard to the share of RE in the fuel mix over the period of 2010-2020. The clauses defined should align the same with the NAPCC objectives of achieving 15% RE by 2020. (WISE 2011)

Preparing a New Integrated Energy Policy (IEP)

The Government of India approved and published its IEP in August 2006. It assesses the energy security for the period till 2032. It also makes two assumptions as, (a) renewable may account only for 5 % to 6 % of India's energy mix by 2031/32; and (b) renewable would be critical to India's energy independence only beyond 2050. These suggested points are not coordinating with the NAPCC defined targets. This has to be revised and re-written.

Aligning the Low Carbon Strategy with NAPCC

A committee which was appointed by GoI to present cross-sector study and recommendations on critical low carbon initiatives to be undertaken submitted its report in May 2011. The report analyses projection of fuel mix and emissions under different scenarios for 8% and 9% average GDP growth rate up to 2020. The report favors more fossil fuels and while recommending the fuel mix projections for year 2020, the report did not consider RE targets as defined under NAPCC. Under the scenarios developed for 8 % and 9 % GDP growth, the share of RE ranges from 35 GW to 54 GW with maximum contribution from wind (30 GW), solar (20 GW), followed by biomass and others (0.4 GW). The projections show RE penetration only up to 5 % in the energy mix by 2020. Also, the report has considered the clauses related to solar power as per JNNSM, but has totally ignored the biomass and co-generation technologies. It is necessary to rectify such lapses in the final report of the expert committee and align with the NAPCC targets.

Abolishing Subsidies to Fossil Fuels

Fossil fuels continue to enjoy various hidden subsidies. A report published by WISE has revealed that conventional power projects in India receive subsidies to the extent of 150 % of their capital cost over their lifetime. Besides, India still continues to subsidize petroleum products, coal mining and transportation to keep prices low compared to international prices. In a world facing climate change threat, shifting such subsidies to the RE would be appropriate, and this requires a strong and positive leadership.

Creating a Manufacturing Base for CSP

Concentrating Solar Power (CSP) holds immense potential for India. But the biggest barrier realizing this potential is absence of a manufacturing base. Ideas and struggles can be heard and seen, but a strong commercial solution is still far away. This needs to be looked urgently. Some foreign companies like Abengoa Solar from Spain and Infinia Corporation of USA, have opened offices in India, but still not ventured into local manufacturing (WISE 2011). GoI should take steps to create a local manufacturing base and should invite national and international companies to set up manufacturing bases, so that indigenous manufacturing is possible to lower CSP costs.

Revisions/Improvement at the State Level Policies

So far only inconsistencies and lack of comprehension of the need of RE sector has prevailed in the state level policies. They have set lofty objectives, but are lacking in details. The national policies have not been considered to the extent which is needed, leading to uncertainties and confusion. Development of RE largely depends on how the policies are defined by multiple institutions empowered under different laws. Although national level policies gives a defined structure for the implementation of RE in the energy mix, the actual implementation starts at the ground level and hence policies defined at the state level by the energy/power department and the state nodal agencies plays a vital role. Most of the states have declared their respective RE policies in technology-specific or fragmented forms. High level of interventions by the government officials and discrepancies in transmission charges and cross subsidy charges in case of third party transaction of RE have been observed. The RE targets set by many states are not in line with the national targets. The state governments should be persuaded to prepare integrated RE policies, covering all RE technologies aimed towards a common goal of achieving RE capacity additions.

Single-window Clearance for RE Projects (as far as possible)

As per the policies and procedures set out by the state governments, companies and/or entrepreneurs who wish to start a project are required to take number of permissions/approvals from the various departments/agencies prior to the start/commissioning of the project, which leads to delay in implementation. For example, more than 60% of project cycle time in small hydropower projects is spent getting various government clearances. All the states must be persuaded to create a single point contact empowered by a single committee for clearing all respective RE projects at the state level. Even though some states have set-up such single

window, in practice it doesn't happen. There is a need to institutionalize single-window clearance system to the extent possible.

Power Purchase Agreement (PPA)

In case of RE projects, the terms of the PPA and tariff period should be harmonized. At least 12-15 year PPAs would be required to provide confidence to developers and financers. Mandating such PPAs would reduce regulatory uncertainty, create appropriate incentives for location and operation, and allow for efficient system operation.

Financing and Other Barriers

The requirement of debt for the proposed RE capacity addition is massive and banks in general are reluctant to lend to the sector business because of some real and some imagined risks. The financing hurdle faced by the projects under the JNNSM is a good example. Risk mitigation measures are necessary if lenders' perceptions are to improve. Current policies are working to bring down the interest rates to 8 % - 9 % level to achieve the national target. Establishment and proper governance of Green Bank, effective utilization of the National Clean Energy Fund (NCEF) and creation of state-level clean energy funds requires strong and willing leadership not only at national but also at state and regional levels. These financing options will also directly and/or indirectly help other barriers like human resources (HR), institutional barriers, technological, market and information barriers.

The absence and inadequacy of supply chain in terms of components for technologies like wind and solar are problematic. The technical and market barriers for manufacturing equipment suppliers for PV and CSP are already being realized and the financial steps needed are being formulated, but it is still a long run.

The quality of manpower required to achieve the NAPCC targets requires appropriate policy, regulatory framework and adequate funding. The government should include RE topics in the curriculum of educational and training schools to try to reduce huge gaps between these institutions and the market. Policies should be defined to create awareness about green jobs to attract the best talent to this sector and to encourage students to undertake courses related to RE eventually leading to the overall growth of the sector.

Conclusion

Indian energy sector is facing a massive energy problem at all levels, internally and externally. Risks such as import dependence and climate change are demanding strong policies at national, state and regional levels through powerful leadership. India, as a country should assess the RE potential and the respective state policies should be defined and effectively implemented. More and more national and international energy companies should be motivated to participate in RE projects to achieve one national goal as declared by NAPCC that as much as 15% of India's energy should come from RE sources by 2020. The studied case of Rajasthan shows that 722 reputed companies have applied for investing in solar projects because of simplified policy framework. If the discussed barriers are timely identified and addressed, then it would result in a win-win situation for all the participating stakeholders like the national government, state nodal agencies, and the entrepreneurs. For a country with plenty of natural resources, India would be

able to enjoy the benefits of modern energy carriers with correct policies and good governance. The country would also see effective energy distribution to energy poor states and would be able to foster effective industrial development and will help mitigate the global question of climate change.

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