

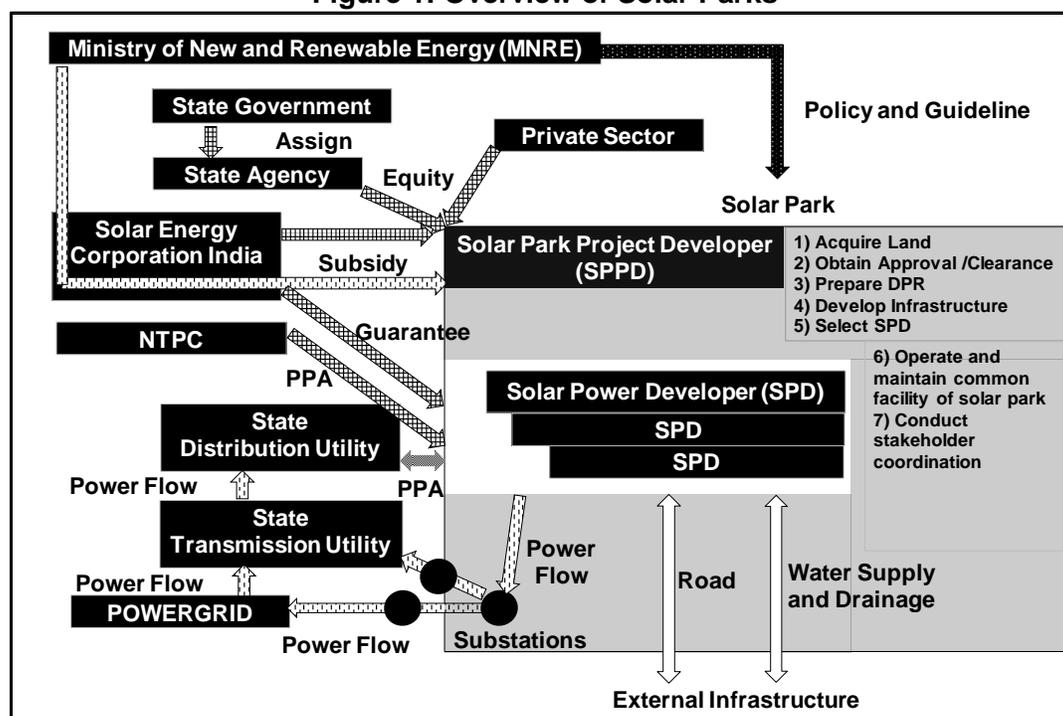
SOLAR PARK DEVELOPMENT AND BUSINESS STRUCTURE

1. Overview

1. India lies in the high solar insolation region, endowed with large solar energy potential with most of the country having about 300 days of sunshine per year with annual mean daily global solar radiation in the range of 4–6 kilowatt hour per square meter per day. Therefore, solar power projects can be set up anywhere in the country. However, the scattering of solar power projects leads to higher project cost per megawatt (MW) and higher transmission losses. Individual projects of smaller capacity incur significant expenses in site development, drawing separate transmission lines to nearest substation, procuring water and in creation of other necessary infrastructure. It also it takes a long time for project developers to acquire land, get change of land use and various permissions which tends to delay the project and is the perceived risk for project developers.

2. In order for the solar power generation project development to (i) mitigate upfront risks, (ii) reduce costs and time, and (iii) ensure coordination with various stakeholders, the Ministry of New and Renewable Energy (MNRE), the Government of India set out a scheme for solar park development in 2014.¹ MNRE has planned to set up 34 solar parks in 21 states to develop about 20 gigawatt (GW) of solar power generation capacity within 5 years towards 2022. Concept of solar parks is outlined in Figure 1 with concentrated zones of solar power generation projects. Relating to the subprojects for transmission to help supply solar power under the sector loan project, specific features and indicative status of six solar parks in the states of Gujarat, Karnataka, and Rajasthan are in Annex 1 (the status may be changed over the development progress).

Figure 1: Overview of Solar Parks



¹ Ministry of New and Renewable Energy, Government of India. 2014. *Implementation of a scheme for Development of Solar Parks and Ultra Mega Solar Power Projects*. New Delhi.

3. The prototypes of the solar park scheme were demonstrated by the Charanka Solar Park commissioned in Gujarat, and Bhadla Solar Park in Rajasthan, both of which the Asian Development Bank supported to develop with provision of common facilities and evacuation transmission lines. The Government of India recognizes the two solar parks as a relevant instrument for the rapid development of solar power projects in India. These solar parks have obtained their initial impetus from the Jawaharlal Nehru National Solar Mission (JNNSM), which provided the policy framework and roadmap for solar power development in the country. JNNSM allows solar project developers to have power purchase agreements with the National Thermal Power Corporation (NTPC) and Solar Energy Corporation India (SECI) to mitigate off-take risks.

4. The Charanka Solar Park commissioned in 2012 in Gujarat is a showcase envisioned as a pioneering first-of-its-kind large scale solar park in India with clear land and transmission connectivity. The project was set up in fully developed land along with transmission facilities and therefore it was promoted at rapid pace. The solar park has a capacity of 590 MW, out of which 224 MW has already been commissioned by 20 solar power developers (investors).

5. The solar parks in Gujarat and Rajasthan not only enable the states to meet their policy targets for solar power and renewable purchase obligations, they also contribute towards the national targets put in place by the JNNSM. In addition, the clean power generated by these solar projects will help the government play a role for reducing India's carbon footprint, promote high end technical investments and empower local communities. MNRE, through this scheme decided to target the development of similar solar parks across India.

6. The MNRE's scheme requires state governments to designate solar park project developers (SPPDs) as implementing agencies to lease suitable developed land to solar power developers (SPDs) as investors, based on SPPDs' support for government clearances, transmission evacuation system, water access, road connectivity, communication network, and other common facilities. MNRE provided capital subsidies through SECI to SPPDs in order to further bring down investment costs to SPDs and ultimately resultant solar power purchase tariffs.²

2. Roles of State Government

7. The state governments are mandated to identify the land for setting up solar parks unless SPPDs have their own land. The state governments are encouraged to utilize government waste and non-agricultural land to avoid private land acquisition, minimize safeguard issues, and thus, speed up development process. The price of the land is to be kept as low as possible to attract SPDs and therefore, the site should be selected in such a manner that inexpensive and large scale land can be made available.

8. All infrastructural requirements outside the solar parks, e.g., (i) connection of roads, (ii) provision of water supply, and (iii) provision for electricity will be the sole responsibility of the state governments or SPPDs.

² Solar project auctions for the solar parks at Gani-Sakunala in Andhra Pradesh and Bhadla Phase II in Rajasthan yielded successful low bid tariffs of 4.63 ₹/kWh and 4.34 ₹/kWh, respectively.

3. Roles of SPPD

9. SPPDs are the implementing agencies on behalf of state governments, that will develop and operate each solar park, and conduct stakeholder coordination. The roles of SPPDs are, among others, to (i) acquire, clean, and level land; (ii) obtain land related clearances; (iii) construct and maintain (a) approach road to each solar plant inside the park, (b) water supply and drainage system, and (c) internal power evacuation system; and (iv) arrange connection of internal system to the power grid system, i.e., intra state transmission system or state transmission networks.

10. SPPDs are also mandated to develop and manage coordination mechanism with SPDs in the solar parks, SECI, transmission utilities, and other relevant agencies.

11. In Karnataka and Rajasthan, SPPDs are joint ventures of the state owned renewable energy development agencies with the private developers or SECI while in Gujarat, the Gujarat Power Corporation Limited, the state owned utility is SPPD.

4. Roles of SPD

12. By renting a land and receiving services from SPPDs with affordable prices, SPDs can invest solar panels and facilities, generate solar power in the parks and sell it to central utilities (e.g., NTPC), state distribution utilities, third parties, and/or captive users, through power purchase agreements. The tariffs for the sale of solar power can be either (i) regulated prices set by the Central Electricity Regulatory Commission, or state electricity regulatory commissions; or (ii) determined prices through bidding processes. The SPD investment opportunities can come up under any central or state government schemes with their solar park projects.

1. Banaskantha Solar Park (Gujarat)		
Name of SPPD	Gujarat Power Corporation Limited (GPCL)	
Nature of SPPD	State Own Enterprise	
Land size	1,400 ha	Expected Generation Capacity 700 MW (1,226 MUs)
Relevance to ADB subproject	Transmission subproject to help power supply of 700 MW.	
Location	Radhanesda, Vav Tehsil, District Banaskantha, Gujarat	
Land	Location of the land is near Radhanesda, Vav Tehsil, District Banaskantha, Gujarat. The entire land is government land and the possession of this land has been handed over to GPCL. The entire land is barren, saline and low lying land and has been chosen by using satellite imagery. The measurement process is going on and the final demarcation of the land will be completed after this process is over.	
Approval and clearance	Presently there is no requirement of any clearances as the land is entirely barren.	
SPD	The process of identification of SPD is in process. However, the National Thermal Power Corporation may be the single developer for the project.	
PPA by SPD	The Government of Gujarat has principally agreed to purchase around 20% of the power generated from the project in line with the policy.	
Payment by SPD to SPPD	GPCL has presently not finalized the model for recovery of the investments; however it can include options like upfront recovery of investment cost from the SPDs.	
Solar park development schedule	The project development is in the initial phase and common infrastructure is expected to be developed by December 2017. It is expected to be commissioned by 2019.	
2. Tumkur (Pavagada) Solar park (Karnataka)		
Name of SPPD	Karnataka Solar Power Development Corporation Limited (KSPDCL) – joint venture of SECI and Karnataka Renewable Energy Development Limited (KREDL)	
Nature of SPPD	State Own Enterprises	
Land size	4,400 ha	Expected Generation Capacity 2,000 MW (3,328 MUs)
Relevance to ADB subproject	Transmission subproject to help power supply of 1,000 MW out of 2,000 MW.	
Location	Pavagada, Tumkur, Karnataka	
Land	4,400 ha of land is identified and acquired by SPPD. The site is essentially barren land and comprises scattered vegetation mainly scrubs of dry agro area. The site is free of habitation. The land belongs to farmers and landlords. Land lease period has been fixed at 25–30 years. Land is fairly flat and requires little bit of levelling and grading. Most of the land is stable and there is no loose soil on top surface.	
Approval and clearance	Approvals and clearances required are listed below: <ul style="list-style-type: none"> • Under Section 68 and Section 164 of Electricity Act, government approval is required for laying transmission lines. • Forest no objection certificate has been obtained. • Consent to establish from State Pollution Control Board. 	
SPD	Private Developers, the National Thermal Power Corporation (NTPC), and KREDL	
PPA by SPD	It is proposed that the government of Karnataka will purchase 600 MW through Jawarhalal Nehru National Solar Mission (JNNSM) route. Of this, 500 MW capacity is already decided and awarded through competitive bidding. The government of Karnataka will also purchase 1,000 MW to be developed by NTPC, through direct purchase power agreement (PPA). The balance of 400 MW is for sale to the neighboring states. Of the 400 MW, SECI will develop 200 MW and another 200 MW will be developed by KREDL.	
Payment by SPD to SPPD	SPDs need to pay following charges to SPPD: <ul style="list-style-type: none"> • One time development charges: ₹2.727 million/MW • Annual operations and maintenance charges: ₹0.265 million/MW (Escalated at 5% every year) • Annual land lease rent per MW: ₹0.120 million (5 acres/MW will be allotted to SPD) (with 5% escalation once in every 2 years) • Local area development fund: ₹5 lakh/MW in 5 equal installments at ₹0.1 million/MW/year after the commission of the date for 5 years, assuming the project cost as ₹50 million/MW • Non-refundable facilitation fee: ₹0.01 million/MW as per the government of Karnataka solar policy. 	
Additional features	Tumkur (Pavagada) Solar Park would provide additional facilities e.g., housing, medical	

and value added services	facilities, basic operations and maintenance of the park and value added services e.g., rain water harvesting, solarification of the hospitals, street lighting and computer facilities in the school. The solar park would also contain a training center which would provide vocational training on security and computer systems.		
Solar park development schedule	KSPDCL has initiated the tendering process for establishing 220/33kV stations on a turnkey basis. Solar power developers of 500 MW have been awarded. The entire park is expected to be commissioned by 2019.		
3. Essel Saurya 750 MW (Rajasthan)			
Name of SPPD	M/s Essel Sauraya Urja Company of Rajasthan Limited		
Nature of SPPD	Joint venture between Essel Infra Projects Limited and Government of Rajasthan		
Land Size	1,643 ha	Expected Generation Capacity	750 MW (1,248 MUs)
Relevance to ADB subproject	Transmission subproject to help power supply of 750 MW.		
Location	(450 MW) Teshil Phalodi Dist. Jodhpur and (300 MW) Pokharan Dist. Jaisalmer, Rajasthan		
Land	Public land (acquisition is under process).		
Approval and clearance	Pre-allotment approvals such as forest clearance, national park clearance, mining clearance, revenue clearance obtained but post allotment clearance such as right-of-way is still to be obtained.		
SPD	Partial by Essel Infra and partial allocation to private players (tentative approval is awaiting).		
PPA by SPD	Project allocation is ongoing.		
Payment by SPD to SPPD	The scheme is being developed.		
Additional features and value added services	Provisions for operations and maintenance, panel cleaning, and commercial complex offices. Provision for residential complex may be provided but subject to the approval.		
Solar park development schedule	Original completion date was June 2017, but the commissioning schedule is dependent on finalization of evacuation system. It is expected that the park will be commissioned within six months of the finalization of the evacuation system. It is expected to be commissioned by 2019.		
4. Adani 500 MW- Bhadla Phase IV (Rajasthan)			
Name of SPPD	M/S Adani Renewable Energy Park Rajasthan Limited (AREPRL)		
Nature of SPPD	Joint venture of AREPRL and Government of Rajasthan		
Land size	1,330 ha	Expected Generation Capacity	500 MW (832 MUs)
Relevance to ADB subproject	Subproject to help power supply of 250 MW out of 500 MW.		
Location	Bhadla Jodhpur, Rajasthan		
Land	Public land and is under possession. No major issues have been identified.		
Approval and clearance	All pre-allotment clearances (forest, national park, mine, revenue clearances) and post allotment clearances (right of way under 68/164 of EA 2003) have been obtained.		
SPD	Discussions with the Solar Energy Corporation of India and other central public sector undertakings are on for allotment of projects.		
PPA by SPD	Project allocation is being prepared.		
Payment by SPD to SPPD	The scheme is being developed.		
Additional features and value added services	Operations and maintenance, panel cleaning, commercial complex, offices, conference hall, residential complex, etc. will be provided.		
Solar park development schedule	Tenders for pooling station, internal transmission evacuation system and boundary wall awarded. Tenders for roads and water supply under process. It is expected to be commissioned by 2019.		
5. Adani 1,500MW (Rajasthan)			
Name of SPPD	Adani Renewable Energy Park Rajasthan Limited (AREPRL)		
Nature of SPPD	Joint venture of AREPRL and Government of Rajasthan		
Land size	4,000 ha	Expected Generation Capacity	1,500 MW (2,496 MUs)
Relevance to ADB subproject	Subproject to help power supply of 1,500 MW.		

Location	Fatehgarh and Pokaran, Jaisalmer District, Rajasthan		
Land	Public land has been identified and allotment under process.		
Approval and clearance	Pre allotment clearances under process.		
SPD	The scheme is being developed.		
PPA by SPD	The scheme is being developed.		
Payment by SPD to SPPD	The scheme is being developed.		
Additional features and value added services	Not yet decided but it is likely to be the same but as provided in Bhadla IV.		
Solar park development schedule	Under planning, but the solar park is expected to be commissioned by 2019.		
6. Bhadla Phase III Solar Park (Rajasthan)			
Name of SPPD	Saurya Urja Company of Rajasthan Limited- Joint venture of Government of Rajasthan and IL&FS Energy Limited		
Nature of SPPD	Public Private partnership (Joint Venture)		
Land size	2,470 ha	Expected Generation Capacity	1,000 MW (MUs)
Relevance to ADB subproject	Subproject to help power supply of 500 MW out of 1,000 MW.		
Location	Bhadla village, Bap Tehsil, District Jodhpur		
Land	Acquisition of private land is not involved in the solar park site. Total of 2,470 ha of government land have been acquired. However, 330 ha of land, which is surrounded by the solar park site, are occupied by 50 families. This will make them difficult to access to roads and services. SPPD plans to construct separate houses for these families in alternate allotment provided from the government, along with access to basic infrastructure facilities like water, road etc. being created for the solar park.		
Approval and clearance	Bhadla III Solar Park has obtained the following clearances: <ul style="list-style-type: none"> • Under Sections 68 and 164 of the Electricity Act approvals have been obtained for laying of transmission lines. • Forest no objection certificate) (As per the information on the web site of KSPDCL this has also been obtained.) • Clearance from Pollution Control Board (PCB) was sought in December 2015. 		
SPD	Implementation arrangements are yet to be developed, but it is being planned to be developed on the similar lines to Andhra Pradesh Solar Park.		
PPA by SPD	PPA document is yet to be finalized, however these are standard documents and readily available.		
Payment by SPD to SPPD	The project cost, the operational and the maintenance cost will be recovered from the Solar Project Developers through various charges are as mentioned below: <ul style="list-style-type: none"> • One time charges (at the time of allotment of the project)-2.4 million/MW • Annual charges-0.41 million/MW • Lease rental charges-0.045 million/MW • Operations and maintenance charges-0.2 million/ MW 		
Additional features and value added Services	Bhadla III Solar Park would provide additional facilities like security, basic operations and maintenance (O&M) of the park and value added services like forecasting, scheduling, weather monitoring station, energy storage facility, waterless cleaning system and control center. The solar park would also contain a training center which would provide vocational training on security, O&M and construction. Skill development program called "Surya Mitra" is conducted to provide training on various topics related to basic electricals, renewable energy, solar technology, inverters, batteries etc.		
Solar park development schedule	SPPD has floated bids for 2 pooling stations to be built by them. They are about to float tenders for other facilities to be built by them in the solar park. The solar park is expected to be commissioned by 2019 by which the transmission evacuation of the state transmission utility is expected to be commissioned.		

ADB = Asian Development Bank, ha = hectare, JNNSM = Jawarhalal Nehru National Solar Mission, MU = million units, MW = megawatt, PPA = power purchase agreement, SPD = solar power developer, SECI = Solar Energy Corporation of India Limited, SPPD = solar park project developer.