



**SOLAR ENERGY MARKETS, POLICIES & POWER PURCHASES
AGGREMENTS**

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Further, I certify that the work is based on the investigation made, data collected and analyzed by him and it has not been submitted in any other University or Institution for award of any degree. In my opinion it is fully adequate, in scope and utility, as a dissertation towards partial fulfillment for the award of degree of MBA.



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Executive Summary / Abstract

This report showcases smart marketing strategies from clean energy programs and solar marketers from across the country that address how to overcome the barriers faced by solar technology markets and serves as a guide for states in pursuing their own market planning process.

In order for solar energy to make a sizeable contribution to jobs, a green economy, and greenhouse gas reductions, more solar technology deployment will be required. However, installing solar technologies is no simple task. The reality is that in order to drive more solar power installations, solar programs must address the key barriers to its market growth.

For marketing to be successful, it must create a desire for a product. A marketer, therefore, needs to understand: a) current consumer perceptions of the product and what must be overcome to improve those perceptions, b) what price/value equation will have the most appeal, c) who do consumers believe to be credible sources of product information, and d) where to place this key information in the form of promotion, advertising, etc., so that it will reach the right consumer target. When all of these elements are successfully integrated, marketing connects with the consumer and builds desire for the product, resulting in a sale.

Solar business is big market in India & most of leading company and investor showing interest in bidding process. So I chose these topics to understand the solar market, Policy & bidding process.

Chapter 1

Introduction

Solar power is undergoing a revolution. India today finds itself on the path of becoming one of the leading nations in solar energy by taking steps towards implementing large MW scale solar power projects and is poised to position itself as a one of the world's major solar producer as well as a manufacturing hub for solar power plants. The present power market is a vibrant market with both government and private players in the generation sector. The erstwhile State Electricity Boards have now unbundled into State Generation, Transmission and Distribution Companies. Apart from these, there are industrial/commercial/captive open access consumers also take interest for solar installation.

Solar power has grown massively in recent years and yet it still represents only about 2 % of Indian electricity generation. Whether solar power grows this significantly, and whether in the process it makes much environmental difference, will depend in large part on whether governments approach it with a new level of economic efficiency. Many of the solar policies that State has adopted thus far have been inefficient. They have achieved, to varying degrees, their stated goals of boosting domestic solar manufacturing or deployment in the near term, but often they have done so in ways that are unable to be sustained for political or economic reasons or both.

Jakson provides a wide range of solar products for retail and commercial users. Their objective is to provide customers with easy access to solar energy & reduce their dependency on traditional sources of energy. Jakson Solar products are manufactured using the most recent solar technologies to deliver optimal results.

Range of innovative solar products include on-grid solar power packs, off-grid solar power packs, solar street lights, solar water pumps, solar generator, module mounting structures amongst others

The power generated is being sold to state power utilities with long term power purchase agreements (PPAs). In the solar EPC segment, Jakson has engineering and execution teams for both land based as well as roof top based projects. The company has executed several prestigious solar land-based and rooftop solar EPC projects in the country. It is ranked amongst the top three utility scale solar EPC players and second in rooftop solar EPC segment in India.

1.1 Overview

In this chapter we find solar customer, market size of solar in India, approach with solar investor / developer for Mega-watts solar project installation, and understand the required document of Power sold and mode of power procurement.

Solar Customer:

Who?	Where are they? How many?	Motivation
House Owners / Apartment	Thousand of domestic roofs and developers / architects of new buildings.	<ol style="list-style-type: none"> 1. Reduce electricity costs through Net metering 2. Contribute to carbon emission reduction 3. Take advantage of other incentives 4. Subsidy/Support from Central Government through MNRE (upto 100 KWp) 5. Increase value of property
Councils	Many councils who own buildings with large roofs - schools, admin buildings etc.	<ol style="list-style-type: none"> 1. Reduce electricity costs 2. Subsidy/Support from Central Government through SECI (100 to 500 KWp) 3. Comply with carbon emission targets
Corporations	Many companies with large roofs	<ol style="list-style-type: none"> 1. Reduce electricity costs 2. Subsidy/Support from Central Government through SECI (100 to 500 KWp) 3. Display corporate social responsibility 4. Gain emission credits
Land Owners / Project Developers		<p>Sell electricity</p> <p>Sell carbon emission allowances</p>
Electricity Companies	Big companies, often globally operating.	<ol style="list-style-type: none"> 1. Spread energy mix 2. Comply with regulation 3. There is no subsidy available for utility-scale SPV plants. Various states offer a bouquet of incentives (such as exemption from Open Access charges, feed-in tariffs, tax benefits, accelerated depreciation etc.) to solar power projects that are set up under their state schemes. 4. Would otherwise have to buy carbon emission credits.

Consumer		Use solar powered lights or charges instead of oil lamps (especially in developing countries or remote areas) Use solar powered products for novelty value.
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Table: 1

Market size of solar in India

The Indian renewable energy sector is the fourth most attractive renewable energy market in the world. As of October 2018, India ranked 5th in installed renewable energy capacity. According to 2018 Climatescope report India ranked second among the emerging economies to lead to transition to clean energy.

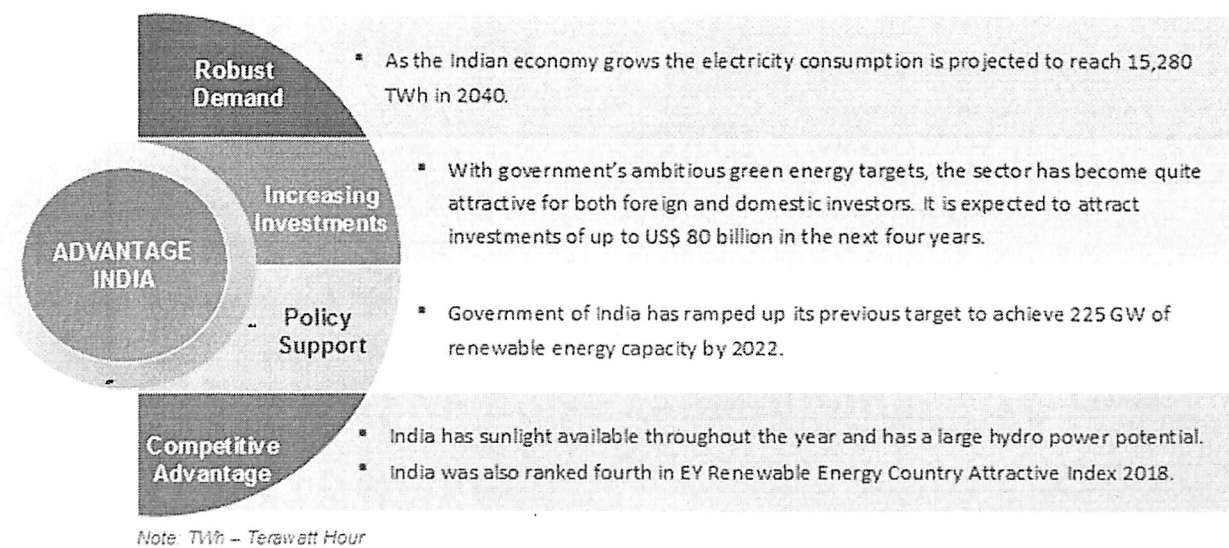


Figure: 1

Solar investor / developer for Mega-watts solar project installation:

According to data released by the Department for Promotion of Industry and Internal Trade (DPIIT), FDI inflows in the Indian non-conventional energy sector between April 2000 and December 2018 stood at US\$ 7.48 billion. More than US\$ 42 billion has been invested in India's renewable energy sector since 2014. New investments in clean energy in the country reached US\$ 11.1 billion in 2018. The Ministry of New and Renewable Energy (MNRE) has decided to provide custom and excise duty benefits to the solar rooftop sector, which in turn will lower the cost of setting up as well as generate power, thus boosting growth.

Some major investor and developer in the India in renewable energy sector are as follows:

- Prayagraj Power Generation Company Limited (PPGCL) .
- RamkyEnviro Engineers Limited.
- ReNew Power
- Adani Green Energy Pvt. Ltd
- Jakson
- Azure Power..
- M-Plus
- Sterling and Wilson

Renewable energy capacity in India

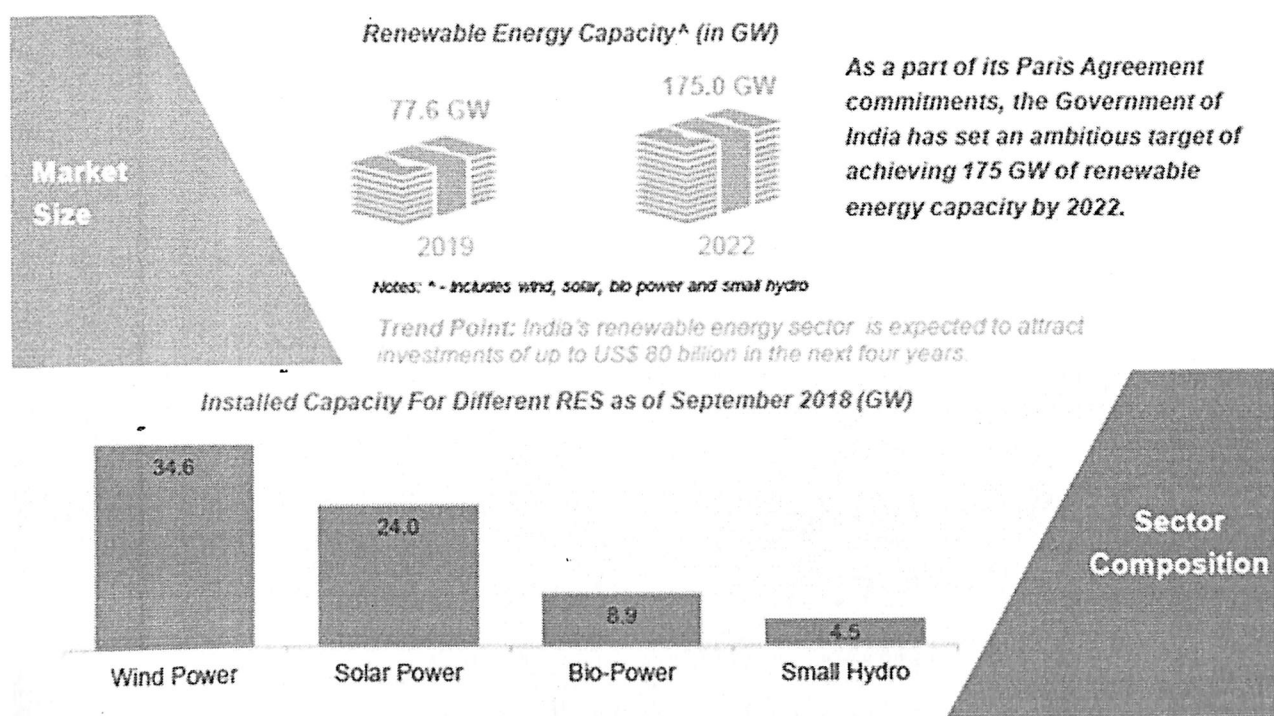


Figure 2

Modes of Power Procurement

Power procurement by Discoms(State Electricity Board) can be classified as long, medium or short term based on the duration for purchase of power. Further, they can be classified as PPAs (bilateral or competitive bidding) and procurement from traders or power exchanges (short term, day ahead or contingency).

The usual mode of procurement of power is through long term PPAs of 12 or 25 years, where tariffs are determined based on rates discovered through reverse auctions. Typically, long term PPAs are the most preferred mode since they provide long term certainty and reduce risks to both generators as well as Discoms. For the generators, the risk is reduced due to certainty of revenue for 12/25 years and for Discoms, the risk is reduced in terms of constant source of power supply and less risk exposure to volatility in fuel prices.

1.2 Background

In this report we meet to solar project developers & understand complete solar bidding process, Government policies, Tariff rate, site selection till Commissioning Process.

For setting up grid-connected systems in select cities/states that are being covered under SECI Large-scale Grid-connected Ground mounted / Rooftop PV programme, consumers may contact any of the developers selected by SECI (developer name given above) or State Nodal Agencies to find out if the same is permitted in their area.

Site Selection & Process of Solar Project installation

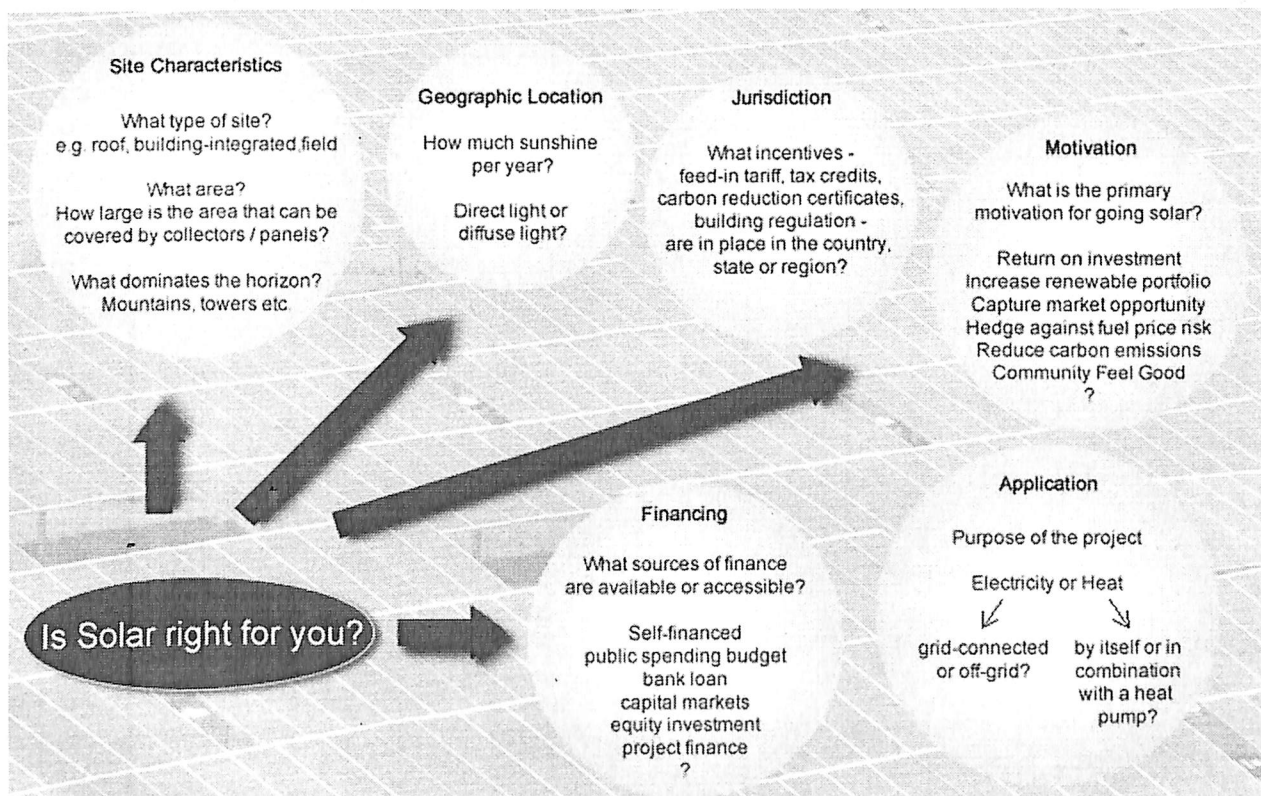


Figure: 3

The present power market is a vibrant market with both government and private players in the generation sector. The usual mode of procurement of power is through long term PPAs, where tariffs are determined based on rates discovered through reverse auctions.

The emerging trends in Indian solar market as increasing production of solar PV products in the country, growing demand for on grid / off grid PV installation etc. are well exhibited.

The report highlights the industry performance and future outlook of solar power sector with in-depth analysis of both solar photovoltaic and solar thermal. A section includes various solar product systems, such as solar cooker, street lightening systems, home lightening systems, lanterns, power plants, PV pumps, solar powered telecom towers, and solar rooftops. From our research, we anticipate that solar generation & street lighting systems will exhibit the highest growth among the solar products.

Many customers with a financial focus are now motivated beyond environmental attributes to look at solar power for the first time. However, with an uncertain economy and financial resources stretched for both commercial and residential customers, the need to market solar effectively is more critical than ever.

1.3 Purpose of the Study

Solar energy is a major renewable energy source with the potential to meet many of the challenges facing the world. There are many reasons to promote its share in the energy market. This power source is increasing in popularity because it is versatile with many benefits to people and the environment.

We concentrate on the use of grid-connected solar-powered generators to replace conventional sources of electricity. For the more than 10 thousand of institutional sector in the developing India who lack access to a reliable electric grid, the cost of small-scale Solar-PV generation is often outweighed by the very high value of access to electricity for lighting and charging mobile telephone and radio batteries. In addition, in some Public sector (e.g: NTPC, IOCL) it may be economic to use solar generation to reduce reliance on imported Coal & oil, particularly if that Coal must be moved by truck to remote generator sites. A companion working paper discusses both these valuable roles for solar energy in the developing India.

Proposed of Study:

1.3.1 Develop an outreach plan.

1.3.2 Customer: homeowners and commercial customers.

Financial Solution: Identify the range of financial options currently available to customers within your market, lease arrangements, PPA's and other monthly financing strategies available

1.4 Research Hypotheses

The Hypotheses of study are,

1. There is long run and short run relationship between the energy consumption and GDP in developing countries.
2. Energy consumption, family income and family size are positively related in households of India.
3. Increase in renewable energy consumption fosters higher economic growth.

In India, electricity sector has faced many issues to the problem of energy crisis and demand, supply for energy. They are,

- Due to the major shortage of coal, oil, and gas production of Electricity is insufficient.
- Energy shortage is found during transmission, distribution and management (Including Thermal power).
- Consumers are faced with load shedding problem of electricity. Because of less power Generation and Management.
- Distribution of free electricity to farmers and to the BPL Cardholders has caused financial losses.
- Environmental Hazards are eradicated due to the burning of coal, firewood, oil and natural gas.

Chapter 2:

Literature Review

In study, we have meet to Jakson Group officers it is one solar leading company. Jakson Provide integrated project development, EPC, financing and O&M services without involving multiple third-party services. This approach has allowed Jakson Group to generate efficiencies of scale that further drive down system costs. A low cost structure allows us to bid for auctions strategically, which supports our high auction win rate and helps preserve our market leading position, which further reduces costs. This in turn improves our cost and capital structure, which benefits our bid win rate.

Marketing & Strategic Plan:



Figure: 4

For lower the levelized cost of energy through our three-pronged approach as follows:

1. **Value engineering.** Our in-house EPC allows us to enhance our system design expertise with each successive project, be flexible with our choice of technology and source from top-tier suppliers that optimizes both the system cost and power yield of the total solar block.
2. **Operational performance monitoring.** We operate a National Operating Control Center, or NOCC, that allows us to monitor project performance in real-time and allows us to respond rapidly to potential generation anomalies. Feedback from our operating projects also serves to further enhance our project designs, resulting in enhancements for current and new plants.
3. **Financial strategy.** We are able to offset project equity requirements through economic benefits generated by our EPC and O&M businesses. Coupled with our asset financing strategy we are able to optimize the overall cost of capital leading to enhanced economics for our customers and shareholders.

Business Strategy of Jakson.

Key elements of our business strategy include the following.

1. **Continue to drive project cost reductions.** We will continue to reduce costs by leveraging our in-house EPC and O&M capabilities and by improving our negotiating power with technology providers and project lenders. We expect to further innovate our financing solutions to reduce the cost of energy for our customers and achieve grid parity with local alternatives in the utility market in the next few years.
2. **Rapidly grow our project portfolio to achieve scale benefits.** We intend to rapidly grow our project portfolio, which will enable us to achieve further economies of scale. We plan to significantly expand our presence in commercial and micro-grid applications. In order to continue this growth, we plan to reinvest our operating cash flow into new project development and construction.
3. **Maintain position as a top Indian solar company.** We are the longest tenured solar power producer in India and we believe we have the largest portfolio of operating projects under the NSM and one of the largest portfolios of operating projects in India. We have developed critical operational expertise and regional knowledge that improves project performance and expedites project execution, all of which should help us preserve our market leading position.
4. **Leverage track record and management relationships to shape policy.** We have petitioned governments at the local, state and central levels for substantial changes to solar policy that are essential to the advancement of the solar industry. We plan to leverage our track record, together with our management's long-running relationships with policy-makers, to influence policy at all governmental levels.
5. **Expand into new locations.** We participate in both national and state level renewable energy auctions. We intend to continue to expand our presence into other states in India and other emerging markets with underserved electricity markets.

2.1 Review Area Broad

2.1.1 Solar Market in India

1. The Rural Electrification Program governed by the Indian Government or Rural Customer.

It is importance of solar market & gave guidelines for the implementation of off-grid solar applications. This primarily included solar lanterns, solar pumps, home lighting systems, street lighting systems and solar home systems.

2. Government promoted grid connected solar power plant under scheme National Solar Mission (NSM) or JNNSM.

3. State nodal agencies, like Karnataka, Andhra Pradesh and Rajasthan have followed suit in developing solar power development programs.

4. Private Industries, Residential apartment& shop complex.

2.1.2 Solar Policy& Bidding

We have tried to collate and curate all the information about the solar policies at one place. Here in the section of Rooftop Solar Policies, you will not only find the state-wise solar policies including net metering, but you will also find these segregated based on consumer category. So, whether you are a residential user, a commercial user or an industrial user, the solar policies of the state of your interest are curated for you individually. We have also comprehensively listed down the financing options such as subsidy, accelerated depreciation, custom duty exemptions as well as loan availability options in all the states of the country to help you gather all the information that you may need before going solar from one place. You can also find information on the ownership models are it **CAPEX or RESCO** statewise, so that you can make an informed choice, whether you should buy solar system or just buy solar power. In short, the **State wise solar policy** page is a comprehensive collection of nationwide solar policies put together statewise and category-wise for you, so you are well aware of all the solar policies and related information across India.

National Policies:

1. National Solar Mission – renamed Jawaharlal Nehru National Solar Mission (JNNSM)
2. National Mission for Enhanced Energy Efficiency
3. National Mission on Sustainable Habitat
4. National Water Mission
5. National Mission for Sustaining the Himalayan Ecosystem
6. National Mission for a Green India
7. National Mission for Sustainable Agriculture
8. National Mission on Strategic Knowledge for Climate Change

Jawaharlal Nehru National Solar Mission (JNNSM)

The National Solar Mission was framed to promote the use of solar energy for power generation and other application; also promoting the integration of other renewable energy technologies like biomass and wind with solar energy options. The Solar Energy can be tapped via two routes solar thermal and solar photovoltaic. Thus the framework is targeted to achieve Solar energy utilization via these routes:

Tax Incentives, Subsidies and Incentives under JNNSM

Various tax exemptions, capital subsidies and incentives are available for several components and sub-components of solar energy value chain. JNNSM promotes the assembly of solar modules after import of cells which is free from import taxes. Some steps to avails subsidy can be summarized as shown:

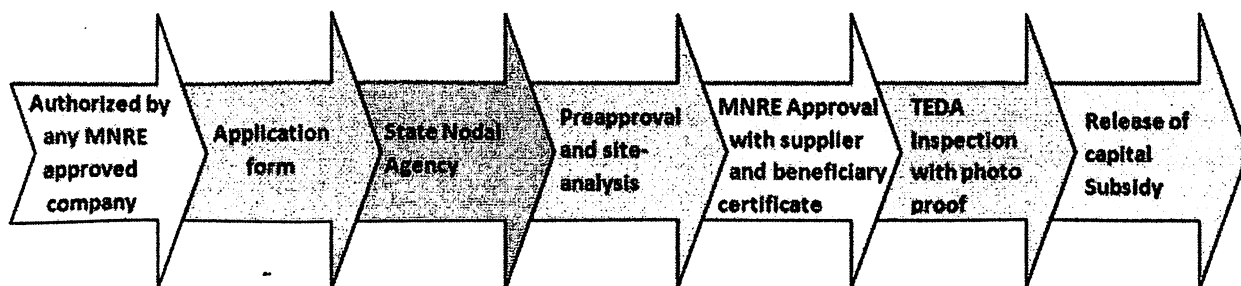


Figure: 5

Other benefits like Generation based incentives (GBI), 80% accelerated depreciation income tax benefits on renewable energy products including solar. Several products like Solar lanterns,

street lights, blinkers and traffic signals are to be manufactured under specifications laid down by MNRE to avail capital subsidy benefits. Also the Generation based incentives.

Policies supporting Grid-interactive Renewable Power National Rural Electrification Policy 2006

1. Rural Electrification is high time need for India where still 45 million households are un-electrified. Several goals are set under this policy:
2. Access to quality and reliable electricity at reliable rates and minimum lifeline consumption of 1 unit/household/day by year 2012.
3. For remote villages where grid electrification is not feasible, off-grid based solutions based on standalone systems to be taken up for supply of electricity.
4. Every state to come up with rural electrification plan mapping details of electricity delivery mechanism that may be linked to district development plans and this has to be intimated to appropriate commission.

Policies supporting Off-grid renewable power

This project covers all those villages that are not under RGGVY scheme. The decision for choosing particular technology for power generation in such remote areas is taken by state implementation agency after examination of technical feasibility and resource availability. The projects are eligible for central financial assistance and developers can propose projects under the format specified in the policy document.

Renewable Energy Supply for Rural Areas

This scheme was framed with the objective of developing and demonstrating commercially viable models for de-centralized energy supply in rural areas from renewable sources. The implementation partners for the programme are: Ministry of New and Renewable Energy (MNRE), National Thermal Power Corporation Limited (NTPC Limited) and Kirloskar Oil Engines Limited (KOEL). The partners are to frame out the business, governance and revenue models for target areas. The project is under demonstration mode for 30 target villages in Chhattisgarh.

Renewable Energy for Urban, Industrial and Commercial Applications

The programmes implemented under this scheme are working for developing: Solar energy systems and devices (including solar thermal and solar photovoltaic systems); Energy recovery from urban, industrial and commercial wastes; and Bioenergy and cogeneration in industry.

STATE SOLAR POLICIES

Three state governments: Rajasthan, Gujarat and Karnataka have come up with their separate solar policy. Summary of three state's solar policy is given here

1. GUJARAT SOLAR POLICY (Solar Power Policy – 2009)

Gujarat Energy Development Agency (GEDA) and Gujarat Power Corporation Limited (GPCL) Gujarat is the first state to launch its own solar policy in 2009. The Gujarat solar policy was in place a year before the NSM was announced.

Operative Period: From the date of issuance to March 31, 2014

The initial target is to achieve 500 MW of installed capacity by the end of this period.

Gujarat Energy Development Agency (GEDA) and Gujarat Power Corporation Limited (GPCL) have been appointed as nodal agencies for the facilitation and implementation of the policy. Gujarat Solar Power Policy is the only policy, which has awarded projects with a fixed FiT, on a first-come-first serve basis. This has resulted in the allocation of a number of projects to in-experienced or unknown developers.

2. KARNATAKA SOLAR POLICY (Solar Policy 2011 – 16)

The Karnataka Renewable Energy Development Limited (KREDL)

Karnataka, a south-western state of India, announced its solar policy on July 1, 2011. Under the solar policy 2011-16, the Karnataka Government proposes to promote solar power as part of renewable energy generation policy in the state.

Operative Period: July 1, 2011 to March 31, 2016.

3. RAJASTHAN SOLAR POLICY (Rajasthan Solar Energy Policy, 2011)

Rajasthan Renewable Energy Corporation Limited (RRECL)

On April 19th 2011, Government of Rajasthan issued Rajasthan Solar Energy Policy, 2011 to promote solar energy in the state. The policy aims to help Rajasthan, develop as a global hub of solar power for 10000-12000 MW capacity over the next 10 to 12 years to meet energy requirements of Rajasthan and other states of India.

2.1.3 PPA

A power purchase agreement (PPA), or electricity power agreement, is a contract between two parties, one which generates electricity (the seller) and one which is looking to purchase electricity (the buyer).

The PPA defines all of the commercial terms for the sale of electricity between the two parties, including when the project will begin commercial operation, schedule for delivery of electricity, penalties for under delivery, payment terms, and termination. A PPA is the principal agreement that defines the revenue and credit quality of a generating project and is thus a key instrument of project finance. There are many forms of PPA in use today and they vary according to the needs of buyer, seller, and financing counter parties.

2.2 Review Area Narrow

India has a great potential to generate electricity from solar energy and the Country is on course to emerge as a solar energy hub. The techno-commercial potential of photo-voltaic in India is enormous. With GDP growing in excess of 8%, the energy 'gap' between supply and demand will only widen. Solar PV is a renewable energy resource capable of bridging this 'gap'.

Most parts of India have 300 – 330 sunny days in a year, which is equivalent to over 5000 trillion kWh per year – more than India's total energy consumption per year.

Average solar incidence stands at a robust 4 – 7 kWh/ Sq-meter/day.

Establishing manufacturing units at Export Oriented Units, SEZs or under the SIPS programme presents a good opportunity for firms which can leverage India's cost advantage to export solar modules at competitive prices to markets in Europe and the United States.

The developer can choose any established and operational technology from India or abroad. The draft also gives clear parameters for setting up evacuation infrastructure from the plant to the nearest substation. This has been an issue between the distribution utility and developers in other solar policies. For solar PV and Solar Thermal projects, if the power plant lies within 15km of the nearest substation, the cost will be borne by the distribution company (DISCOM). For any length above 15km, the cost will be borne by the developer.

For rooftop projects, the cost will be borne by the DISCOM but the developer will need to take permission from the DISCOM before finalizing the location of the project. The policy has taken up lessons from forerunners like the NSM and the Gujarat solar policy – it declined to have the 5MW limit on individual projects that made the NSM less attractive to large players but, unlike the Gujarat policy, it has placed fixed limits on overall capacity allocation. The policy also addresses the concerns of the developers, with regards to the allocation of land and water, availability of an evacuation network and the localized supply chain. Finding the right location and acquiring land is one of the major bottlenecks so far for projects in India. To solve this problem, the policy looks to create land banks from government land. Some of these land banks are situated near cities like Bikaner and Barmer. Under the policy, after the 12/ 25 years of the PPA, the developer can use the land for commercial.

2.3 Factors critical to success of study

Project Development

Jakson participate in central- and state-level renewable energy auctions to build our utility scale portfolio. Jakson in-house EPC and O&M capabilities and pan-India presence provide it with greater visibility into competitive metrics, which allows us to bid strategically to maintain a high win rate while preserving good project economics.

The major stages of project sourcing, development and operation:

1. **Bidding.** We have a well-organized process to effectively track all the policies and bid updates in the market. Once a tender is tracked, relevant information sourced from the request for proposal document is discussed with the finance and technical teams and approved by the relevant committees before a strategic decision is made to participate in the bid. We also have an in-house project development information database which help us predict and bid the most effective tariff in the market. Once the bid is won, a letter of intent is issued and all the departments initiate their activities. Afterwards, the PPA is signed, which reflects the commercial operation date before which a plant should be commissioned.
2. **Land acquisition.** Generally once the letter of intent is received, we obtain the relevant land permits depending on whether the land is government-owned or private. When the land is privately owned, we identify the appropriate parcels of land and due diligence is conducted by a local legal counsel. We also undertake certain compliance measures, including technical diligence, soil testing, local advertisement, stakeholder consultation and land registration after which acquisition is complete. When the land is government-owned, we identify the suitable parcels of land from the responsible agency and obtain approval from the relevant authority
3. **Financing.** The projects are generally financed with 75:25 debt-to-equity ratio. To enable rapid operation of our projects, we use short term credit facilities that are refinanced with long term project finance facilities. We invest equity from internal accruals and new financings to help growth and lower financing costs.
4. **Material Delivery and Installation.** Our procurement and construction teams work very closely to construct and deliver the plant in the most efficient manner. A detailed project

plan is made and the progress tracker on the delivery and construction is reviewed very closely. Accordingly, we have consistently commissioned our projects before the commercial operation date

5. **Monitoring and Maintenance.** Our operations team monitors performance of all the projects near real time from the NOCC, which allow us to respond rapidly to potential generation anomalies. They also perform scheduled preventive maintenance tasks on daily, weekly, monthly, and annual intervals to ensure our plants run smoothly and at high efficiency.

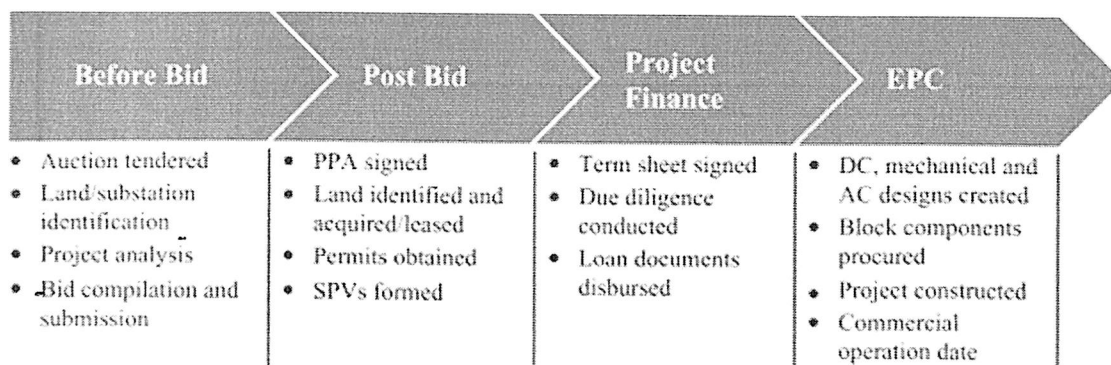


Figure: 6

Critical success factors for solar business & marketing.

1. **Support of the government in main markets:** This Critical Success Factor is influenced by the governmental subsidy politics in the main market the awareness of limited fossil fuels, ecologic forms of energy).
2. **Economy of scales:** Solar module producers are very dependent on the quantity of sales. Using effects of the learning curve helps to improve the production processes, decreases the failure rate and helps to increase the efficiency of the plants. This helps to decrease the production cost and finally to reduce the costs of the installed product.
3. **Financial Background:** The solar branch is consolidating on global level. To have a weak financial background might threat the long-term survival of the company. The need for high investments in R&D and the introduction of new technologies also requires a well situated financial background.
4. **Power to innovation/innovation leadership:** Customers have a high focus on effectiveness of their investment. This means, access or the possibility to develop new, innovative technologies is one of the most important Critical Success Factor.

5. **Access to new markets:** Companies should be able to increase sales by entering new markets. This is also related to the economy of scales. Part of the result for this Critical Success Factor is also the ability of a company to transfer technologies to other business, i.e. solar cars, solar rickshaw (E-rickshaw), etc.

6. **Strong brand:** Even if the brand awareness in the solar branch is very low, a weak brand can affect the business. The quality of the product should especially be recognized as good because customers see investments in solar technology as a long-term investment. A strong brand also increases the value of a company in the case of alliances, mergers & acquisitions. Even if it is very difficult to measure a brand, the financial background, failure rate and rate of effectiveness influence the rating.

2.4 Summary

In this study we understand the different solar policy of central and State government contracted for 12 to 25 year PPAs. Mainly understand the customer and solar developers. Bidding process and factor critical of solar project.

Mainly we have taken all data from Jakson Ground and it is solar EPC company and did all EPC work for Pinnacle Renewable energy Pvt. Ltd . Jakson Group has executed 5 MW solar plant in Sitapur UP. This project was under UPNEDA and PPA signed by Pinnacle Renewable energy Pvt. Ltd.

In next chapter we understand case study from market (Customer- Pinnacle Renewable energy Pvt. Ltd) , UP State policies, Bidding process & PPA agreement for 5 MW solar plant.

Chapter 3:
Research Design, Methodology and Plan
(Case study of Bidding, Tariff rate, UP State Policies and PPA agreements for
5 MW solar plant executed in Sitapur UP)

3.1 Data Sources

For market research we can use generally 2-Sources.

Primary Sources of Data:

Search the customer & consumer (retails) from various sources eg. Marketing survey & marketing Portal.

Secondary Sources of Data:

- a. Various service provider groups
eg: EPC contactor
- b. Government agencies, or extracted from other publicly available sources.
eg: Government e-marketing (Gem), Government bidder,

We have collect data about Solar Customer, Bidding Process, Solar Policy & PPA agreement between Supplier & Consumer from below site.

Site: M/s Pinnacle Ltd, Sitapur UP (5 MW Solar Plant)

1. **Power Purchaser:** Uttar Pradesh New and Renewable Energy Development Agency, (UPNEDA)
2. **Solar Scheme Details:**

This 5 MW Solar Plant executed under UPNEDA tender & project allotted to M/s Pinnacle Ltd at traffic rate 9.33 / Kwh under 12 years PPAs.

Time Table for Bid Process		
SN	Event	Elapsed Time from Zero date
1	Date of issue of RFP	Zero date
2	Bid clarification, conferences etc. & revision of RFP	**
3	RFP Bid submission	45 days
4	Evaluation of bids and issue of LOI	90 days
5	PPA becomes effective: Signing of Agreements: i) Power purchase agreement, escrow agreement, hypothecation agreement and any other agreement as applicable. ii) Signing of share purchase agreement and transfer of SPV, if applicable.	120 days

Table: 2

Tender Details:

Request for Proposal (RFP) For Procurement of 215 MW Power From Grid Connect Solar PV Power Projects Through Tariff Based Competitive Bidding Process
RFP No: 01/UPNEDS/GRID Connect/RFP/2015 Dated:31.01.2015

In this Scheme UPNEDA will support setting up of Grid connected 215 MW Solar PV Power stations if established in Uttar Pradesh for the direct sale of power to UPPCL. UPNEDA on behalf of UPPCL, will select solar power producer for setting up of minimum 5 MW capacity Solar PV Power Plants (total capacity 215 MW) and the maximum capacity of the Project shall be up to 100 MW. The plant capacity shall remain in multiples of 5 MW.

The total capacity of Solar PV Projects to be allocated to a Company including its Parent, Affiliate or Ultimate Parent or any Group Company shall be limited to 100 MW. UPNEDA on behalf of UPPCL Lucknow UP– a Company incorporated in India and registered under the Companies Act, 1956 will select the Solar PV Power Project Developers, and UPPCL will sign the Power Purchase Agreement (PPA) with the Successful Bidder.

3. Tariff

PPA will be signed between Procurer and Successful Bidder(s). The Procurer shall pay to the Seller(s) the Quoted Tariff which has been arrived from the single tariff quoted by the successful bidder in the price bid, as per the terms and conditions of the PPA enclosed as Enclosure 1 of Format 4.10. The bidder should quote a tariff below the UPNEDA approved ceiling tariff of Rs. 9.33/kWh. The tariff quoted above the ceiling tariff shall not be accepted. The tariff shall be payable by the Procurer in Indian Rupees.

4. Participate list of bidder

1. SudhakarInfratech Pvt. Ltd.
2. Technical Associates Limited
3. M/s Sahasradhara Energy Pvt. Ltd.
4. M/s Pinnacle Ltd.
5. M/s Adani Green Energy
6. Avadh Rubber Prop Madras Elastomers ltd.

5. Engineering , Procurement & Construction (EPC)

Jakson has done all EPC job for M/s Pinnacle Ltd. & taken 12 year operation & maintenance services & make a agreement as unit wise generation.

3.2 Research Design

Government & corporate procurement only done on tender base for bid any tender we have to analysis the Policy of Government, Bidding Terms & condition. Prior to bidding we have to calculate our cost after that we quote to customer.

After submission of tender, Customer tendering Department shortlists the bidder as L1, L2, L3 as bidder cost wise. The lowest of these offers (L1) is selected and awarded the tender.

The bidding process for PPP (promoting Public Private Partnership) projects is typically divided into two stages.

1. Eligible and prospective bidders are shortlisted. This stage is generally referred to as Request for Qualification (RFQ) or Expression of Interest (EoI).
2. Request for Proposal (RFP) or invitation of financial bids, the bidders engage in a comprehensive scrutiny of the project before submitting their financial offer

The Guidelines were issued by the Ministry of Finance in May 2007. Since then, the Model RFQ document has been used by several ministries, state governments and other project authorities for pre-qualification and short-listing of bidders for their respective PPP projects.

Bidder will decided the bidding Tariff according to project capital cost, Bank interest, tenure of return money & any subsidiary.

Capital / Material Cost for Bidding					
SN	Particulars	Cost Breakup (Rs Lakh/MW)	% age of Total	GST	Capital Cost with GST (Rs Lakh/MW)
1	SPV Module @ 30 Rs / Watts	300	54%	5%	315
2	Land Cost (6 Acre / MWp)	29	5%	0%	30.74
3	Civil & General Works	38	7%	5%	39.9
4	Mounting Structures	26	5%	5%	27.3
5	Power Conditioning Units-Invertor	26	5%	5%	27.3
	Electricals – cables, transformers, etc.	34	6%	5%	35.7
	Grid extension and bay extension	26	5%	5%	27.3
6	Exacuation Cost upto interconnection Points (Cables & Transformer etc)	60	11%	5%	63

7	Miss. Cost	21	4%	..	21
Total Cost		560			587.24
	Insurance (0.15 % of Total Project Cost)		0.15%		0.89
	Grand Total				588.13

Table: 3

Fund for Project / Debt Service

Debt service includes both principal and interest payments made to the lender. The lender can be any of the following: Banks (either domestic or foreign) NBFCs (Non-Banking Financial Company) Renewable Energy Development Agencies (like IREDA)

The rate of interest on the loan availed depends on the financial institution that provides it.

1. Domestic Financing comes at a rate of interest between 11-13%
2. International Financing charges an interest rate between 8-10%. But if you go for international financing you should take into account the hedging costs against currency fluctuations. Also it may take a long time for processing, up to nine months which may delay the project execution.
3. IREDA provides lower interest loans; around 10-11.5%. They require only a collateral security of 10-33% of the loan taken. But the catch here is that they usually fund only large scale projects.

Financing Options Available for MW Solar Plants

1. Equity is just a fancy word for having to fund from your own resources or from other investors.
2. Debt financing is usually available with recourse, i.e., the investor will have to submit a collateral security against the loan he plans to take. Debt financing without recourse is an option only for big players with large scale solar installations and with a good track record. MW solar plants, in India, are financed by a debt-equity mix. The chart below gives an understanding of the solar financing options for a MW solar plant in India.

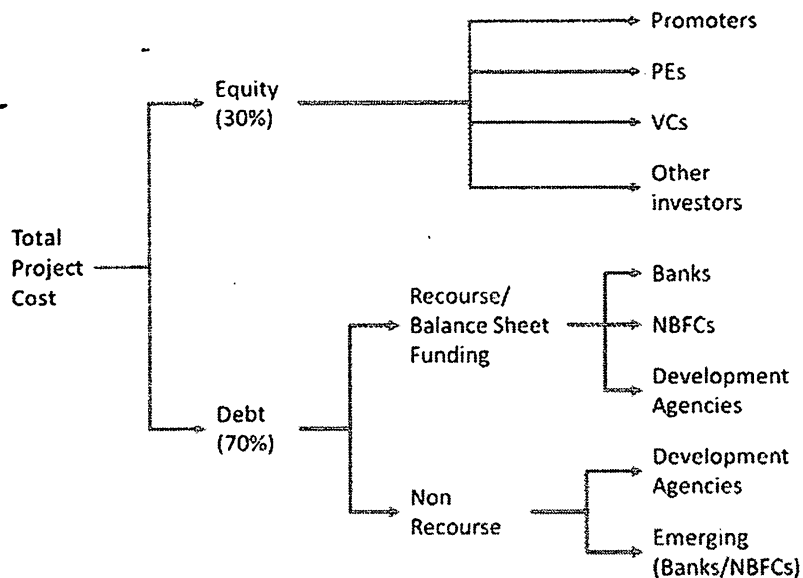


Table: 4

Project Evaluation Criteria by Customer

The criteria for short-listing of bidders should be divided into technical and financial parameters as stated below:

Technical Capacity

The applicant should have acquired sufficient experience and capacity in building Solar projects. Eligibility conditions, as necessary, may also be stipulated in respect of O&M experience. The technical capacity of a bidder can be assessed on the following parameters:

- (a) Project experience on BOT (Build–operate–transfer) projects in the specified sector.
- (b) Project experience on BOT Projects in the core sector.
- (c) Construction experience in the specified sector.
- (d) Construction experience in the core sector.
- (e) O&M Experience:

The consortium may include a member with at least ten per cent equity participation and having relevant experience in operation and maintenance (O&M). Alternatively, the successful bidder may be required to enter into an operation & maintenance (O&M) agreement with an entity having equivalent experience. While suggesting this arrangement, it is proposed to provide sufficient flexibility for modifying these requirements to suit the needs of individual sectors/projects. For an Applicant to be pre-qualified, it must have

undertaken projects having a weighted capital cost/ revenues equal to twice the Estimated Project Cost.

Financial-Capacity

Applicants should have a minimum net worth equivalent to 25% of the estimated capital cost of the project for which bids are to be invited. This would ensure that pre-qualified applicants have sufficient financial strength to undertake the project.

Solar Policy:

The Ministry of New and Renewable Energy (MNRE), through a letter, has directed NTPC and Solar Energy Corporation of India (SECI) to release performance bank guarantee (PBGs) for the solar power projects that have been commissioned. According to the letter PBGs may be released within 45 days from COD (Commercial Operation Date), subject to fulfillment of requirements of submission of all the requisite documents.

Further, MNRE also mentioned that in case any developer finds delays in release of PBGs, it should be brought to the notice of the MNRE and the managing director of the concerned intermediary procurer.

The letter was approved by the secretary of the MNRE.

A PBG is an irrevocable unconditional bank guarantee deposited by wind or solar power developers to SECI/NTPC after 30 days from the date of issuance of the letter of intent, which is issued when they successfully bid for projects.

Typically, a PBG is released immediately after the successful commissioning of a renewable energy project after taking into account any liquidated damages or penalties due to delays in commissioning as per provisions stipulated mentioned in a power purchase agreement.

However, it seems like developers have been facing issues concerning the timely release of bank guarantees. The delay in the release of PBGs can result in financial losses for developers as their funds get blocked.

Power Purchase Agreement:

This AGREEMENT is entered into on this theday of, 2019 BETWEEN State Bank of India, constituted under the State Bank of India Act, 1955 having its Corporate Centre and Central Office at State Bank Bhavan, Madame Cama Road, Nariman Point, Mumbai-21 and through its Department..... herein after called "Procurer", which terms, shall mean and include its successors in one part

AND Limited, a company incorporated under the provisions of the Companies Act, 1956 / 2013 and having its registered office at, (hereinafter referred to as the “Seller” which expression shall, unless repugnant to the context or meaning thereof, include its successors and permitted assigns and substitutes) of the Second Part.

WHEREAS

- a. The Procurer had resolved to procure electricity from a solar power developer on a competitive basis and in accordance with the terms and conditions set forth in this Agreement.
- b. The Procurer had accordingly invited proposals by its Request for Proposal dated (the “Request for Proposal” or “RFP”) for meeting its power requirements at two of its premises in Lucknow UP.
- c. Pursuant to the said bidding process, the Procurer has accepted the Bid of the successful Bidder and issued its Letter of Intent No. ____ dated _____ (hereinafter called the “LOI”) to the successful Bidder requiring, inter alia, the execution of this Power Purchase Agreement within 15 (thirty) days of the date of issue thereof.
- d. In pursuance of the LOI, the Parties have agreed to enter into this Power Purchase Agreement on the terms and conditions set forth hereinafter.
- e. The Solar Power Developer shall achieve Commercial Operation Date as per the timelines stipulated in this Agreement, in the default of which, the Solar Power Developer’s Performance Bank Guarantee (BG) will be liable for forfeiture and agreement will also be liable for termination as per provisions of the agreement.
- f. The PPA will continue to be in force for a period of 15 years from the Date of Commercial Operation (COD).
- g. It has been agreed that the Project will be designed, engineered and constructed and operated by or on behalf of the Solar Power Developer or its successors with reasonable diligence subject to all applicable Indian laws, rules, regulations and orders having the force of law from time to time.

h. The terms and conditions of this Agreement are subject to the provisions of the Electricity Act/Rules and also subject to relevant regulations, if any, issued by the TSERC from time to time.

This Agreement shall come into force subject to the parties meeting the following pre-conditions...

i. Receipt of NoC or signing of open access agreement with SLDC/Discom

ii. The Solar Power Developer shall have achieved COD and executed wheeling and banking agreement with transmission/ distribution licensee for transmission or/and wheeling of power from the injection point to the delivery point.

iii. SBI shall have installed the ABT compliant Metering system as per the requirements of DISCOM at the respective Delivery Points of its premises for accurately recording the receipt of electricity at the delivery point.

NOW, THEREFORE, in consideration of the foregoing and the respective covenants and agreements set forth in this Power Purchase Agreement, the receipt and sufficiency of which is hereby acknowledged, and intending to be legally bound hereby, the Parties agree as follows:

3.3 Project Analysis Quarries.

1. How we can search the solar customer?

We can search the customer & consumer (retails) from various sources eg. Marketing, survey & marketing Portal, Government e-marketing (Gem).

2. Identify the range of financial options currently available to customers within your market. –

Are lease arrangements, PPA's and other monthly financing strategies available? - What new approaches, if any, should you offer?

3. "How to pay for solar." –

Ensure that workshops and other solar seminars highlight financing as a key component, remembering that this is the biggest barrier to broader adoption.

4. Host special solar financing events/workshops.

Identify target groups such as business associations, municipal and institutional customers, and developers.

5. Educate homeowners and commercial customers.

Work with local utilities to promote the value of combining solar with energy efficiency for optimum financial effectiveness

6. What are the tax exemptions/duty exemptions for solar plants?

Several tax/duty exemptions are available for solar plants depending on the respective state solar policies where the plants are located. You may contact the respective SNAs for more details.

7. - How much does a 1 MW solar PV plant cost?

Central Electricity Regulatory Commission has given the benchmark capital cost for solar PV projects as 691 lakhs/ MW. Actual cost would depend on site location, components selection, contractor hired etc.

8. Who will be the Implementing Agency for Solar Park, what are possible modes for the same?

States applying under the scheme will have to designate an agency for the development & Management of Solar Park, as per the modes envisaged below..

- (i) State designated Nodal Agency (SDNA), a SPSU or SPV of the state Government.
 - (ii) A JV Company (Joint Venture) between SDNA & SECI with 50-50 % equity participation from SECI & SDNA. State government may also allow more than one agency provided total equity participation from State Government remains 50 %.
 - (iii) State may designate SECI as the Nodal Agency on mutually agreed terms.
 - (iv) Private entrepreneurs without any equity participation from SECI, but may have equity Participation from State Government or its agency.
9. What is Solar Power Policy of Uttar Pradesh?

The Government of Uttar Pradesh, in order to promote grid connected solar energy generation, had come out with Uttar Pradesh Solar Energy Policy-2013. As per the policy, energy generated from solar power Projects that are commissioned during the policy period may be sold to Distribution Utilities of UPPCL or to a third party or be used for captive purpose. Project Developers interested in selling energy generated from Solar Power Plants to Distribution Utilities of UPPCL will have to compulsorily participate in competitive bidding for the total megawatt capacity they wish to offer at the tariff discovered by bidding, subject to approval by UPERC. UPPCL will sign PPA with successful bidders for a period of 12 years.

10. For the plants installed in Solar Parks who will sign the PPA.

Solar Power Developers would have to arrange for their own buyer of power for Projects that are set up within the Solar Park, either by participating in some competitive bidding process, or through mutual negotiations or on nomination basis or for captive use or any other means

11. How the tariff for the power generated in Solar Parks will be determined?

Tariff shall be determined either through CERC/SERC Regulations or competitive bidding.

3.4 Data Analysis & work carried out before any solar project execution.

1. Site Assessment

For execution of any solar project site assessment is necessary part eg: Site Location, Land Rate, and Area of land & locality of load.

2. Climate data (Sitapur UP).

After selection of land climate is also important part of solar project.

Month	Wind Speed (m/s)	Ambient Temperature (°C)	Relative Humidity (%)
Jan.	1.8	13.7	67
Feb.	1.9	17.7	60
March	2	23.6	48
April	2.2	29.9	33
May	2.5	33	38
June	2.3	32.8	52
July	2.2	31.4	68
Aug.	2	30.5	71
Sep.	1.6	29.3	67
Oct.	1.1	25.9	57
Nov.	1	20.3	58
-Dec.	1.3	15.4	64

Table: 5

3. Connectivity

The connectivity should be also good for any solar project.

- a. By Air
- b. By Train
- c. By Road

4. Shading Aspects

Shading Analysis is one of the most essential steps in Solar Energy System. While designing a PV system, it is important to analyses shadings caused by surrounding objects and/or vegetation or due to adjacent rows of Solar Module Arrays. The solar array layout is planned and optimized in such a way that minimum shadow is created by the PV arrays during effective sunshine hours.

5. Water availability

Water availability is must for cleaning of the solar PV panel. Underground water through Bore holes shall be used during construction and O&M stage. Alternatively, water can be procured from adjoining villages through tankers for plant construction and cleaning purposes.

6. Power Evacuation

The power generated from the Solar PV Project is proposed to be evacuated through the nearest 10 MVA, 33/11 kV ESS-II Sub-station-cum-Switching Station. This is around 3 KM from the Project site.

7. Approval & Clearance required for the solar project execution. This approval required to start any solar power project.

Sr. No.	List of Contents	Authority	Approval Stag
1	Power Purchase Agreement		Shall be signed between UPPCL and Project develop
2	Deeds of land/lease agreement		Land owned by Jakson
3	Registration & Establishment (Factory License)	Chief Inspector of Factories of State Government	Prior to Construction
4	Consent to Establish	State Pollution Control Board.	Prior to Construction
5	Consent to Operate.	State Pollution Control Board.	Prior to Commissioning
6	No objection from Local Panchayats.		Private land
7	License under Section-12 of CLRA	Labour Department State Govt.	Prior to Construction
8	Permission of Bore well for Construction Water Requirement	Sub-District Administration	Prior to Construction
9	Power Evacuation		Shall be signed between UPPCL and Project developer
10	Approval from the Electrical Inspectorate for synchronization of the Project	Electrical Inspectorate of State Govt	Post Commissioning
11	Plant Commissioning Certificates		Shall be provided by UPPCL to Project developer after Commissioning

Table: 6

Chapter 4

Findings and Analysis

The following chapter discusses our major findings resulting from the research done on behalf of the Jakson. Specifically, we speak towards the barriers and opportunities particular to the adoption of solar PV, the current installed capacity of solar PV, and approaches to the promotion of solar PV on Jakson. We then detail the results of our public survey, stakeholder interviews, and database research to present an overall generalization on the current status of PV on Jakson from which we can begin to make recommendations and conclusions to aid the Jakson Office in the promotion of PV on the Rural & urban area.

1. Payback Period

Payback period is the amount of time needed to pay off the total cost of the system. A low payback period generally correlates to a better investment. Of the solar PV owners we interviewed, the Jakson average estimated payback period is 10 years. Their estimates were based on the time given to them by their installers and the current data extrapolated from the production of their solar array. This is comparable with the national average of 10-11 years. Over the past decade, the cost per watt has decreased significantly, with Jakson 3.5 per watt in 2018.

2. Cost of Systems

The average cost of grid connected rooftop solar systems is about Rs. 60 per watt or Rs. 6 to 7 crore per MWp capacity.

Methods and Tools

In the chapters approaches, methods and tools are presented that support policy and design decisions on solar energy and daylight access in the design stages, relevant when designing existing and new environments as well as dealing with sensitive landscapes. Focus is on approaches, methods and tools that give visual or technical information directly to the problem-solving aspects when passive and active solar meets spatial planning and design. In the first chapter, the complexity of dealing with solar aspects in regard to these three focus environments, existing and new rural/urban environments and sensitive landscape environments, is highlighted. There is also a need for a closer relation between the traditional urban planning and energy planning, and a general focus on synergies instead of conflicts when dealing with the challenges

at stake when planning an increase of renewable energy systems, as in this report with focus on energy efficiency, daylight harvesting and use of active solar energy

Solar Energy Market

All buildings of the Government, PSUs, Commercial establishments, hospitals, cold storages, warehouses, industries and educational institutions and large scale gated communities.

A marketing plan must address core customer segments that are important to the solar program, such as low-income housing, schools and institutions, large commercial customers, and installers. The process of developing an effective plan includes the following steps.

1. **Market Analysis** Begin by assessing past successes and failures. Identify what has worked and what has not. Which customer bases are responding and which are under delivering? Are there geographic issues to be addressed within your plan?
2. **Customer Research** If there are questions about the motivations and attitudes that core customer groups have about solar power, a customer research project and market analysis will identify the opportunities and barriers that must be addressed in the marketing plan. Solar programs may want to rely on an outside resource such as an advertising agency or marketing consulting group to help with this aspect of the plan.
3. **Establish Marketing Objectives** What will the marketing plan accomplish? What are the goals? A marketing objective might include a percentage increase or megawatt goal for specific customer segments, such as commercial and industrial, residential, or institutional solar installations.
4. **Marketing Strategies** How will the solar program reach its objectives? This report suggests that Cost, Reliability, Complexity, Inertia and Message all must be addressed in an effective marketing plan. There may be other strategies relevant to your specific market that should be included or receive priority. A marketing strategy that addresses value, for example, might include offering financial tools that reduce the high out-of-pocket costs for solar installations. A marketing strategy to address reliability may include raising visibility of solar in the marketplace.
5. **Tactics/Implementation** Tactics are the specific programs and initiatives that address the marketing strategy. The examples cited in this report from solar stakeholders across the country are examples of marketing tactics. The rest of the marketing plan includes a

budget and timeline, as well as an approach to evaluate the success of specific tactics. There may be other resource needs required by the solar program. All key stakeholders across the organization should review the marketing plan while in development to ensure that it is addressing the right issues and to ensure buy-in. It is also critical that implementation challenges be coordinated with appropriate personnel to ensure that adequate resources and timeframes are accounted for.

4.1 Economic and Financial Evaluation

This evaluation should include the following:

- An outline of the related business assumptions, including land availability, wholesale power cost, operating management, regulatory environment, internal capital rate of return, escalation rate, etc.
- Analysis of financials and economics, including the following examples:
 1. Initial financial screening to assess and compare the composite cost per unit of generation (i.e. 1/MWH) for various financing options.
 2. An economic analysis over the project life to determine net present value, internal rate of return, and payback years
 3. A financial forecast integrated with community solar financials to determine the impacts to key financial ratios and financial statements
- Case scenarios to assess how key cost drivers and options impact economics. Example case scenarios include the following:
 1. Sensitivity analysis on the economics with the varying scale of the project
 2. Variability in net capacity factor – seasonally, annually, and with project age
 3. Projected seasonal and on/off-peak market value of solar energy
 4. Changes in equipment prices and related revenue requirements
 5. Model financial impact of subscriptions, including a low-level subscription scenario and identification of a break-even subscription point
 6. Impacts of renewable credits recovery
 - 7. Variability in land costs

Financial Data

To conduct an informed economic evaluation and structure a model recommendation, relevant financial data will need to be collected. These data should include the following:

- Capital infrastructure investment (with Project Manager)
 - Engineering design, hardware, site preparation, construction, installation, and interconnections

- Land cost
- CIS/billing interface modifications
- Operating and maintenance costs (with Project Manager)
 - Costs for managing and operating/maintaining the system
 - Member-consumer support and care
- Internal and/or outsourcing resource costs
- Possible incentives, including ITCs (state and federal), accelerated depreciation, property tax exemptions, RECs (if available), grants, and rebates, etc. (with legal counsel)
- Information on financing alternatives and PPA scenarios

4.2 Regulatory, Policy and Governance Approaches

In these topics we discussed about regulatory measures as well as policy and governance approaches to enhance active and passive solar will be presented. Some of these approaches and methods are already in use in some countries or regions and some are developed and discussed within a research discourse.

Plant & Location

1. The capacity of the plant shall be based on the need of a person intending to establish a Captive Generating Plant. The location, fuel linkage and other required resources may be in conformity with the National Electricity Policy and National Electricity Plan.
2. Captive Generating Plant owner shall clearly mention the fuel linkages in the project report and ensure that Government of India/State Government Draft UPERC - CRE Regulations, 2014 Uttar Pradesh Electricity Regulatory Commission 12 guidelines regarding use of fuel are complied with.

Environmental Clearance

1. The Captive Generating Plant owner shall abide by the emission standards set by the Union/State Government. The Captive Generating Plant shall obtain all the required environmental and pollution clearances from the Central / State pollution control authorities and submit copies of Clearance Certificates to the Commission.
2. The Generating Plant shall obtain necessary clearances from Nonconventional Energy Development Agency, U.P.

Duties of Renewable Energy based Generating Plants

1. The Generating Plant shall:

- a. Submit the technical details regarding its Generating Stations to the Appropriate Commission and the Authority;
 - b. Submit the information to the Commission in respect to generation, demand met, capacity availability, plant load factor, auxiliary consumption, specific heat rate and specific oil consumption and other information as specified under Annexure 2 and Annexure 3 of these Regulations;
 - c. Co-ordinate with SLDC and / or State Transmission Utility for scheduling and dispatch of electricity.
2. The Plant shall be under obligation to comply with the directions issued to it by SLDC and shall pay fee and charges payable to SLDC as specified by the Commission from time to time by order.
 3. The Generating Plant shall not be required to obtain license under the Act for establishing, operating or maintaining a dedicated transmission line.
 3. The Generating Plant shall ensure compliance of all general or specific direction, Rules or Regulations made by the Commission for the generating companies.
 4. The Generating Plant shall ensure that the Distribution Licensee has submitted Power Purchase Agreement to the Commission as mentioned in Regulation 28(2) of these Regulations for approval.

4.3 Sale of Power

1. All RE source based generating plants shall be allowed to sell power, to the Distribution Licensee in whose area the plant is located at the rate specified in as Schedule .

Provided that purchases under these Regulations, may be referred to as Renewable Purchase Obligation 'RPO', shall be restricted to quantum as specified under terms and conditions of the UPERC (Promotion of Green Energy through Renewable Purchase Obligation) Regulations,2010.

The Distribution Licensee on an offer made by the said plants for entering into a PPA, the same shall be signed by such Licensee. In case of any difficulty the Generating Company may approach the commission for suitable remedy.

Provided further that the plant shall be allowed to sell the power available after sale to the concerned Distribution Licensee to any other Licensee or a consumer at mutually agreed rate: Provided further that supply to any Distribution Licensee other than the Distribution Licensee of the area in which the plant is located or to any consumer shall be subject to provisions of Open Access Regulations.

2. Notwithstanding any other provisions of these Regulations, a Distribution Licensee may require emergency assistance following an extensive failure in the system. Subject to technical feasibility, the Generating Plant may, on a request from the Licensee, extend power supply from its Generating Station to the Licensee's system. Under such circumstances, the tariff for supply shall be mutually agreed.

4.4 Tariff

The tariff for supply of electricity by the RE source based generating plant to a Distribution Licensee shall be as per Schedule II of these Regulations.

Note:

1. The tariff for supply of electricity from the plant, having more than one unit commissioned in different years, shall be based on weighted average of the contracted capacities of the units commissioned in different years.
2. The tariff for supply of electricity during the period of synchronization and the commissioning of the unit shall be equal to the variable cost.
3. However, in case of small hydro plants and other renewable energy based plants, the tariff for supply of electricity during the period of synchronization and the commissioning of unit shall be equal to the 50 percent of the tariff.
4. "Plant Load Factor" shall mean the total sent out energy corresponding to generation during the period expressed as a percentage of sent out energy corresponding to contracted capacity in that period.

$$PLF = \frac{ES \times 1000}{CC \times (100 - AUX) \times 8760}$$

Where,

ES: Energy sold in MU during the year,

CC: Contracted capacity in MW,

AUX: Normative Auxiliary Consumption (i.e. 8.5% for Cogeneration).

4.5 Delay in Commissioning of Power Plant

In case of failure to achieve Commissioning / Schedule Delivery Date, provision of RfP / PPA as mentioned below shall apply:

Upto 10 MW Solar PV Projects

a. Delay up to One (1) month:

In case the commissioning of project is delayed or the developer is not able to meet the timelines as mentioned above then the Project Developer shall pay to UPNEDA the Liquidated Damages (LD) at the rate of Rs. 50,000/- per MW per day of delay. LD shall be payable on weekly basis and in advance before commencement of the week starting on Monday and shall be paid in the form of DD/Pay order payable to UPNEDA at Lucknow.

On non-submission of the above mentioned amount UPNEDA shall have the right to invoke the Bank Guarantees submitted by the developer.

b. Delay above One (1) month

For not achieving Commissioning / Schedule Delivery Date UPNEDA / Procurer(s) shall encash the Bank Guarantee (BG) in the following manner:

- i. Delay up to two (2) months - 20% of the total Performance bank guarantee.
- ii. Delay of more than two (2) months and up to three (3) months - 40% of the total Performance Bank Guarantee in addition to BG.
- iii. Delay of more than three (3) months and up to four (4) months - the remaining Performance Bank Guarantees in addition to BG.

Delay in the timelines for over and above four (4) months from respective task will lead to create the necessary grounds for UPNEDA / UPPCL for termination of LoI / PPA

4.6 Power Purchases Agreements (PPA)-Analysis

1. The plant shall be responsible for construction of the evacuation system for connecting its plant with the substation of the Distribution Licensee or STU / any Transmission Licensee, as per the scheme approved by the Commission in PPA, of its own or through any other agency engaged for that purpose. The cost of laying the dedicated transmission line to the substation, the required bays, associated terminal equipment and synchronization equipment shall be borne by the Generating Plant and such works shall

be undertaken under approval and supervision of the Licensee / STU or any Transmission Licensee of the area in which the plant is located: Provided that above construction of evacuation system shall be carried out under the approval and supervision of the STU or any Transmission Licensee or Distribution Licensee as the case may be: Provided further that the land for extending the bay (s) shall be provided by the owner (the Distribution Licensee or STU / any Transmission Licensee) of the sub-station free of cost.

2. The Generating Plant shall supply power to the Distribution Licensee of its area through a 33 KV or higher voltage line terminating at the nearest 132 KV Sub-station as per the voltage and capacity as given below:
 - i. Installed capacity upto 1 MW on 11 KV.
 - ii. installed capacity upto 10 MW on 33 KV;
 - iii. installed capacity above 10 MW on 132 KV;

The Distribution Licensee or State Transmission Utility shall ensure that the plant is allowed to be connected to the nearest substation in order to control length of line subject to technical feasibility:

Provided that in case of existing plants, the connectivity shall be the same as existing on the date of these Regulations coming into effect:

Provided also that in case of plants where the scheme for connectivity has already been approved by the Commission in PPA and the same are commissioned after the date of these Regulations coming into effect, the connectivity as per that approved scheme shall be allowed.

Chapter 5

Conclusion and scope for future work.

5.1 Building a Marketing Action Plan

The low market penetration of green energy pricing products and solar technology suggests that customers, whether they are residential or commercial, have concerns about solar power that are barriers to market growth. Understanding what consumers believe both rationally and emotionally about solar technology will help shape the direction of a solar marketing plan.

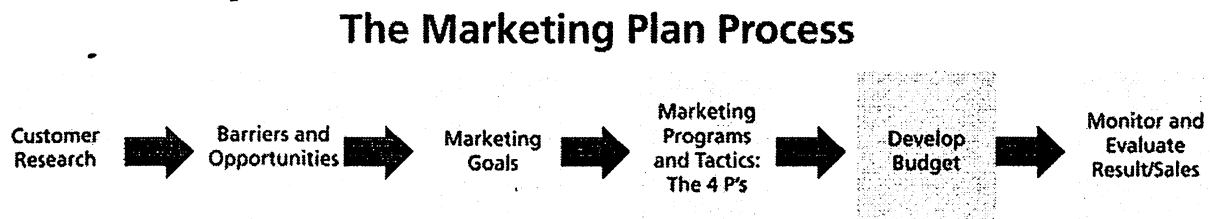


Figure: 7

Reinforce the Reliability of Solar.

1. Evaluate customer concerns about solar reliability in your market.
2. Find opportunities to increase visibility of solar installations in high traffic locations.
3. Identify strategic partnerships with sports teams, local celebrities and media to create positive solar images and increase presence of solar installations in the public eye and in the marketplace.
4. Offer educational seminars for specific targeted segments (chambers of commerce, solar seminars for homeowners, workshops for municipalities) to build confidence in solar technologies.
5. Create campaigns built around positive testimonials from corporations, businesses, and institutions who have installed solar power.
6. Participate in or increase awareness of annual solar home tours to broaden attendance. Create special VIP tours for target groups.
7. Create a speakers' bureau of homeowners and business leaders who will speak about the effectiveness of solar power to meet their energy and financial needs.

5.2 Reduce the Complexity

1. Work with installers to reduce time delays in the process of providing estimates to solar prospects.
2. Evaluate opportunities to create a solar ambassador program that connects existing solar customers with prospective customers to provide information during the complex decision-making process.
3. Consider offering free estimates and/or an energy advisor program to guide prospects through the solar incentive application process.

Help Customers Overcome Inertia

1. Create a database of interested solar prospects and develop a communications strategy that continues to engage these prospective customers during the long decision-making process.
2. Use promotional incentives and prospect mailings to encourage forward progress and sales.
3. Raise the level of visibility of solar in the marketplace to keep solar in mind.
4. Consider implementing a declining incentive program that encourages customers to act now.

Smart Solar Marketing Strategies

Effective marketing guides how, when, and where product information is presented to consumers, with the ultimate goal of persuading consumers to purchase solar energy systems. Therefore, state solar program managers must view themselves as a critical part of the solar sales process. Understanding what problems need solving and how best to address them is at the heart of the Solar Marketing Plan. Messages that connect on a financial or value level are most likely to succeed.

As solar programs begin to think like marketers, they can assess “how they’re doing” by asking a series of questions to determine whether solar marketing efforts are on the right track, including:

1. How are new customers learning about solar? Should we do more to help? Where are our best opportunities?
2. Are we providing consumers with value-oriented financial offerings that make solar more affordable?
3. Are consumers aware of the new financial approaches that we offer? Are we adequately promoting the value and affordability of solar? Is it prominently displayed on our website?

4. Are we targeting the right audiences in our market to achieve our objectives? Have we left any core audiences untouched?
5. Do we understand the consumer barriers to purchasing solar that are specific to our market? Should we initiate research to advance our understanding and the effectiveness of our activities?
6. Have we done an inventory of communications materials to ensure that we are speaking with one voice, promoting one brand, and hitting the right messages?
7. Are stakeholders in our market that we should be aligning with to advance our goals and leverage our investment? How do we overcome inertia and help push interested customers to act?
8. How do we create more visibility for solar in our market? Are there high visibility locations, personalities or opportunities that will increase penetration?
9. Do we have a sufficient group of installers in place? Will we need more? How can we attract them?
10. Do realtors understand the value of solar and know how to speak about it effectively?
11. Is there a role for traditional and new media in our marketing mix to build awareness?
12. Are there innovative ways to utilize earned media beyond press releases and ribbon cuttings to increase interest in solar?
13. Are there other solar partners (utilities, trades, chambers, cities and towns, sports venues, etc) that we should be working with to increase interest in solar power?
14. Are we cross promoting energy efficiency and solar energy to maximize interest in both?
15. Are we creating a database of consumers and are we using that database effectively?

As states increasingly compete with each other for green jobs and clean economies, being savvy solar marketers becomes more important than ever. By asking these questions, and by creating a plan that provides a comprehensive approach to solar marketing, solar programs will maximize their investment in solar incentives, and expand the customer base for solar energy throughout their markets.

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Appendix: Interviewer Script

1. What is the payback period for solar PV on Nantucket?
Average payback period of a system on Jackson is around 10 years. This means that on average the solar PV system will pay for itself in, on average, around 10 years
2. How long do warranties last?
The solar panels themselves have a manufacturer warranty generally around 20-25 years, while installers have a labor warranty around 5 years. Both of these warranties are dependent on manufacturer and installer and need to be taken into consideration when investing in a solar PV system
3. How easy is it to monitor my system's electrical generation?
Many installers use smart apps that communicate to your solar PV system through wifi or internet that allow you to manage and track your system output in real time.
4. For the plants installed in Solar Parks who will sign the PPA.
Solar Power Developers would have to arrange for their own buyer of power for Projects that are set up within the Solar Park, either by participating in some competitive bidding process, or through mutual negotiations or on nomination basis or for captive use or any other means.
5. How much does a 1 MW solar PV plant cost?
Central Electricity Regulatory Commission has given the benchmark capital cost for solar PV projects as 691 lakhs/ MW. Actual cost would depend on site location, components selection, contractor hired etc.
6. How much land required for 1 MW solar PV?
Around 5 acres of land is required for setting up a 1 MW SPV plant with crystalline Silicon technology. With Thin Film technology, land requirement is slightly higher.
7. What is the responsibility of Solar Park Implementing Agency?

Following are the responsibilities of Implementing Agency

- i. Plan, finance, develop, operate & maintain Solar Parks.
- ii. Identify Potential site and acquire /leasehold/possess land of the Solar Park.
- iii. Carry out site related studies/investigations.
- iv. Obtain statutory & Non-statutory clearances.
- v. Design Plan for sharing development cost between the developers.
- vi. Creation of necessary infrastructure like water, transmission lines, roads, drainage etc.

- vii. Frame out transparent Plot allotment Policy & specify procedures pursuant to relevant State policies and their amendments thereof.
- viii. Provide directives for Technology specific land requirements.
- ix. Engage services of National agencies/ global experts/consultants to promote Solar Park and related activities.
- x. Facilitate the State Government to establish educational institution / training facilities within the Solar Park for manpower skill development. Include any other activity related to Solar Power Park, such as manufacturing Unit as per directions of MNRE & State Government

8. With whom would the PPAs be signed under this scheme?

The projects under this scheme may be set up in one of the following modes:

- i. The participating PSUs/Govt. organizations would have to participate in various central/state sector tendered for sale of power to state utilities/discoms or any other organization.
- ii. The participating entities may also sign PPAs with State utilities/discoms at CERC/SERC determined tariffs
- iii. Participating entities may also set up projects for own use of power/third party sale of power at mutually negotiated rate

9. Which organizations are setting up the projects for end users?

The programme is being implemented through multiple agencies for rapid up-scaling in an inclusive mode. These agencies are:

- (i) State Nodal Agencies(SNAs)
- (ii) Solar Energy Corporation of India (SECI)
- (iii) Channel Partners:
 - a) Renewable Energy Service Providing Companies (RESCOs)
 - b) System Integrators
 - c) Manufacturers of any component of the Solar Plants
 - d) Project developers
 - e) Vendors/ suppliers of solar equipment
 - f) Reputed and relevant NGOs of National level

10. Name of Financial Institutions/Financial Integrators for Solar installation?

The Financial Institutions like NABARD, National Housing Banks, Other Banks, IREDA, SECI etc.