

DAYALBAGH EDUCATIONAL INSTITUTE, AGRA

# SOLAR, A NON-CONVENTIONAL SOURCE: STUDY OF CHALLENGES IN RESIDENTIAL SECTOR (MBM 441)



**Guide:**

**Dr. Purnima Bhatnagar**

**Dept. of Management**

**Faculty of Social Science**

**Submitted by:**

**Aradhya Raj Mehra**

**1903702**

**MBA (Regular)**

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Also, I thank my family for their constant blessings. Indeed very warm thanks to my friends and the respondents who supported directly or indirectly towards the completion of this research project.

# DECLARATION

I hereby declare that the research project entitled “ **Solar, a non-coventional Source: Study of challenges in residential Sector**” submitted to the Dayalbagh Educational Institute, is a record of an original work done by me under the guidance of Dr. Purnima Bhatnagar, Dept. Of Management, Faculty of Social Sciences, Dayalbagh Educational Institute, Agra. And this report is submitted in the fulfillment of the requirements for the reward in the course of Major Project-II. The results embodied in this report have not been submitted to any other University or Institute for the award of any degree/diploma.



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Aradhya Raj Mehra

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## **Abstract**

The factors and challenges that determine the buying behavior in residential sector of Solar Industry were studied. The study was divided into two parts. The first part dealt with the challenges faced by the common people who don't have a solar connection as well as who have it already. The second part of the study analyzed the challenges faced by an EPC company while handling a residential sector customer. An online experiment was conducted where the awareness level and factors affecting the behaviour were taken into consideration.

After analyzing the results, it was found that there were more than one factor or challenge that mainly affects the buying pattern of a customer or a user. The experiment results show that majority of respondents are likely to be aware of Solar and prefer it but the main challenge is the high capital cost and weak public policies offered by the government. Descriptive Statistics were used to drive results.

## **Section 1: INTRODUCTION**

### **1.1: Background of the Study**

Electrical energy is one of the most important building blocks in human development, it thus acts as a key factor in the economic development of all countries. To meet the needs of a developing nation, the energy sector is witnessing rapid growth. According to the World Bank in 2014, India had electricity consumption per capita equals 805.60 KWh (<https://www.worldbank.org/>, n.d.) which increased to 1018 KWh in 2019. The energy requirement is thereafter increasing, this puts a lot of pressure on conventional sources as they are limited in quantity and cause environmental pollution. Therefore, there is a need for sustainable energy sources. Thereby, Solar Photovoltaic Technology that makes use of Solar light to generate electrical energy.

Solar Energy is radiant light from the Sun that is harnessed using a range of evolving technology i.e. Solar Photovoltaic Technology.

As about 5000 trillion kWh per year energy is incident over India's land area with most parts receiving 4-7 KWh per sq. meter per day. India is blessed with abundant solar insulation for 300 clear, sunny days (<1300 KW/m<sup>2</sup>/year).

(<https://mnre.gov.in/file-manager/UserFiles/Statewise-Solar-Potential-NISE.pdf>)

National Institute of Solar Energy (NISE) carried out an exercise of calculating the state wise Solar potential in the country which resulted in giving 748.98 GWp total solar power.

This makes India a preferred location for installing Solar PV technology i.e. Solar modules/panels.

Initially, the Government had a target of installing solar PV technology of 100 GWp by 2022, but after Paris Agreement <sup>1</sup> now the government has altered the target to 175 GWp by 2022 to promote Sustainable source and reduce the dependency on conventional sources. However, only 33.730 GWp is the installed capacity by 31<sup>st</sup> December 2019.

**This makes India one of the fastest developing industries in terms of the Solar Industry.**

Being one of the fastest-growing industry India has 4.37 GWp installed capacity rooftop solar leaving short of the 2022 target of 40 GWp. This target comprises of the residential or domestic target which does not have a high sanctioned load i.e. they might be having a load less than 10 KWp.

A fundamental block of SPV (solar photovoltaic technology) is a solar cell, the device that converts sunlight into electricity.

These solar cells are connected so to form a solar module or a solar panel. This solar module acts as an individual power generator, but when these solar modules are created in series these make up a string, and these strings are connected in parallel which makes up a solar photovoltaic system that is capable of providing power to any utility grid or load.

(Solanki, Solar Photovoltaics Fundamentals, Technologies and Applications, 2015)

This PV system is classified into three categories: -

1. Standalone solar PV system- System which is not connected to the grid.
2. Grid-connected solar PV system- System which is connected to the grid.
3. Hybrid solar PV system- System with alternative source too other than a grid.

Consumer Categories: -

- Commercial / Industrial
- Domestic or residential
- Utility<sup>2</sup>

Now if we specifically consider the residential sector it is always advised by a technical person to go for a Grid-connected solar PV system because it is economically more beneficial and also allows one to be stay connected with the grid when the solar technology fails to deliver the appropriate power that drives the load.

This failure is caused when the sunlight lacks the intensity, this intensity is broadly termed measured as solar irradiance.

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<sup>1</sup>The Paris Agreement is an agreement within United Nations Framework Convention on Climate Change (UNFCCC), dealing with greenhouse gas emissions mitigation, adaptation, and finance, signed in 2016.

<sup>2</sup> Utility-scale solar refers to large scale electricity generation from solar <1MW.

Solar irradiance is the measure of solar power, defined as the power per unit area received from the Sun. This directly affects the solar power generation and efficiency of the system. Fortunately, India is blessed with an impactful amount of solar irradiance<sup>3</sup> with 4-5 sunshine hours per day on an average. Thereby a solar plant or SPV system can easily deliver sufficient power on a bright sunny day.

For instance, if a 1 KWp system is to be considered, if it is a residential system following facts should be considered-

- According to standards the land required for installing 1 KW is 10 m Sq.
- The tilt angle of the system of modules should be equal to the latitude of that location.

This system is installed according to standards must be producing 3 to 4 units (KWh) on an average considering the best possible scenarios and standards.

All types of residential buildings: -

2. Institutional: School health institutions including medical colleges & hospitals, universities, educational institutions, etc. including those registered under the Societies Registration Act 1860 and the Indian Trust Act 1882.

3. Social Sector Community centers, Welfare homes, old age homes, orphanages, common service centers, common workshops for artisans or craftsmen, facilities for use of the community. Trusts/ NGO voluntary organization /training institutions, any other establishments for common public use, etc. [including those registered under the Societies Registration Act 1860 and the Indian Trust Act 1882.1

However, a grid-connected system is advised to a residential customer just to absorb the condition of failure when sunshine is not available, a customer can easily switch to the grid in such a condition, and thereby it is economical as it also allows net metering.

To understand the net metering consider an example if there's an overproduction of electric power someday due to best possible scenario i.e. temperature is 25-30 degree Celcius and irradiation of about 1000 Watt/m<sup>2</sup> and considering the generation factor but the load does not achieve the parity, then in such a condition, the PV plant will deliver power to the grid.

Resulting in the DISCOM company who owns the grid will reimburse the amount that is applicable for the power drawn.

In such cases, the PV plant is a boon and reduce the dependency of an individual on the grid.

#### **Advantages of Grid-Connected Rooftop Solar System**

- i) Electricity generation at the consumption center and hence Savings in transmission and distribution losses
- ii) Low gestation time
- iii) No requirement of additional land
- iv) Improvement of tail-end grid voltages and reduction in system congestion with higher self-consumption of solar electricity.

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<sup>3</sup> Solar Irradiance to be considered at standard test conditions is 1000 Watt/m<sup>2</sup>.



### **Provision for availing loans for solar rooftop systems available**

Department of Financial services has already instructed all Public Sector Banks to encourage home loan/ home improvement loan seekers to install rooftop solar PV plants and include the cost of the system in their home loan proposals. So far, nine PSBs <sup>4</sup>have given instructions to extend the loan for Grid-Interactive Rooftop Solar PV Plants as a home loan/ home improvement loan.

(<http://upneda.org.in/faqs.aspx>, n.d.)

When Solar PV System is taken into consideration the major issue is the efficiency, the efficiency of a solar module is maximum 22% that is much less than a conventional source and cannot be neglected, but the impact on the carbon footprint is the major concern for shifting from conventional source of energy to sustainable source.

Stats about the environmental impact also comments that a 6.6 KW Solar Power Plant will produce 10,600 KWh a year will save around 10.6 tonnes of CO<sub>2</sub> emissions per year.

Also considering the life of a Solar PV System of about 25 years there are about 243 tonnes of CO<sub>2</sub> that can be saved from polluting the environment.

This study is an attempt to analyze the challenges faced by the companies while handling a residential customer, and what is the behavioral pattern of people (who falls in the category of residential sector/domestic sector).

### **1.2: Business models in India in Solar Power**

The entire solar business in India can be put into two jackets: -

#### **1. Independent Power Producer (IPP) Companies**

They are the key players in the field of solar power. They own the plants and supply the produced solar power to the third parties under an open access system or sell the power to various Discoms or other state agencies under the Power Purchase Agreement. The IPP business is further divided into –

- CAPEX (Capital Expenditure)<sup>5</sup>
- RESCO (Renewable Energy Service Company)<sup>6</sup>

#### **2. Engineering, Procurement, and Construction (EPC) Companies**

These companies are the system integrators who install and commission solar power plants. They work for IPP and RESCO companies on a contract basis. (Tyagi)

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<sup>4</sup> PSB's namely: Bank of India, Syndicate Bank, State Bank of India, Dena Bank, Central Bank of India, Punjab National Bank, Allahabad Bank, Indian Bank and Indian Overseas Bank

<sup>5</sup> In CAPEX mode the entire plant is funded and owned by the developer.

<sup>6</sup> In RESCO mode the owner may engage the solar company to install and run the plant in his premises and promises to buy the power at some pre-determined rates for the agreed period.

Inverter suppliers				Project developers			EPC contractors		
Current rank	Company Name	Previous year rank	Increase/ Decrease	Company Name	Previous year rank	Increase/ Decrease	Company Name	Previous year rank	Increase/ Decrease
1	Delta	1	↔	Cleantech Solar	1	↔	Tata Power Solar	1	↔
2	Solis	5	▲	Fourth Partner	-	▲	Prozeal Infra	-	▲
3	ABB	7	▲	CleanMax	2	▼	Sunsure	3	↔
4	Sungrow	-	▲	Azure	10	▲	Sunshot	-	▲
5	GoodWe	-	▲	SunSource	-	▲	Fourth Partner	2	▼
6	SMA (incl Zever)	2	▼	Renew Power	3	▼	Belectric	-	▲
7	Growatt	3	▼	Amplus	4	▼	Bosch	-	▲
8	K-star	4	▼	TEPSOL	-	▲	Orb Energy	6	▼
9	SolarEdge	10	▲	Jakson	8	▼	Solar Square	-	▲
10	Huawei	8	▼	Orb Energy	6	▼	Mahindra Susten	4	▼

**Figure 1.1: Top Players of the Solar Industry**

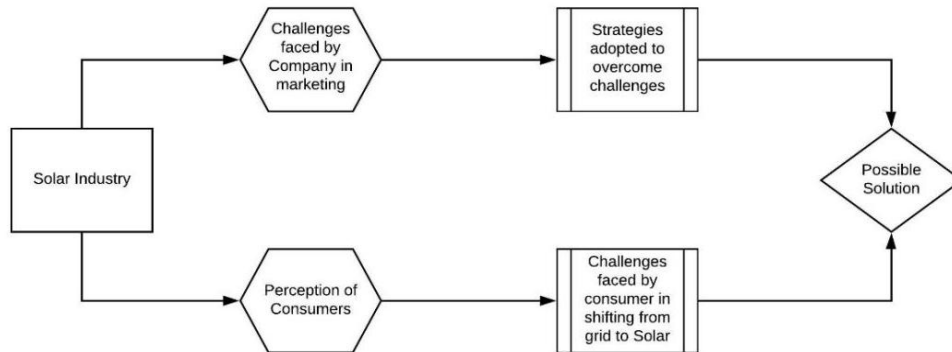
## **Section 2: REVIEW OF LITERATURE**

- ✧ **Environmental impacts of solar energy technologies (Energy Policy 33 289–29, 2005):** The author suggested that a unit of power generated through the Solar technology in use it can save upto 0.6 kg of CO<sub>2</sub> to be emitted in the atmosphere when using conventional fuels to generate electricity.
- ✧ **Consumer attitudes towards domestic solar (Energy Policy Volume 34, Issue 14, 2006 by Adam Fiers, Charles Neame):** They Distributed the residential solar sector into two groups: early adopters and the early majority. The ‘early majority’ demonstrated a positive perception of the environmental characteristics of solar power, however, its financial, economic, and aesthetic characteristics are limiting the adoption.
- ✧ **Solar Energy Fundamentals and Challenges in Indian restructured power sector (International Journal of Scientific and Research Publications, Volume 4, Issue 10, 2014):** It was observed that inspite of a positive side of Solar Power Generation on environment, technical barriers such as efficiency can not be neglected, which doesn’t allow solar to perform as it can in the Energy generation sector in India.
- ✧ **Solar Photovoltaics Fundamentals, Technologies, and Applications (PHI Learning PVT. LTD, 2015, by Chetan Singh Solanki):** The author discussed Technologies to fabricate solar cells such as monocrystalline, polycrystalline, amorphous and the applications of the technology in the real world, explained the pros and cons of the technology and the process of implementing following the guidelines to install a system at different levels such as utility, domestic and commercial.

- ✧ **Solar rooftop in India: Policies, challenges, and outlook (Green Energy & Environment Volume1, Issue2, 2016, by Malti Goel):** It was observed that the use of SPV technology is having a positive impact on environment, the change in policies and government initiative has led to India being one of the Country which involves lowest capital in terms of installation. The change in the goal as of installing from 100 GW to 175 GW by 2022 has led to more commitment, however, inspite of these actions the capital cost involved remains pretty high.
- ✧ **Design, Installation, and Operation of Solar PV plants ( Walnut Publications, 2019, by DK Tyagi):** The business models carried out in the field of Solar are IPP, EPC and developer each one differentiated in terms of revenue generation model.
- ✧ **Public perception towards the residential sector in Bahrain (Energy Reports Volume 5, 2019, by Maha Alsabagh):** Challenges like capital cost, lack of information, and maintenance required are identified among the people.
- ✧ **Beauty and the Budget: A segmentation of residential solar adopters ( Ecological Economies, 2019, by Beatrice Petrovich, Stefanie Lena Hille, Rolf Wustenhagen):** It was observed that the investment value of this technology is a weak point, therefore government incentives can make a difference in buying patterns.
- ✧ **Benchmark cost of Grid-connected Solar (Office Memorandum, MNRE, 2019, by Government of India):** Cost per watt depending on the size of a grid-connected residential plant example 54 INR/Watt up to 10 KW, 48 INR/ Watt from 10 KW to 100 KW and 45 INR/ Watt from 100 kW to 500 KW.
- ✧ **Operational Guidelines for Implementation of Grid-connected RTS (Office Memorandum, 2019, by Government of India, MNRE):** Norms of subsidy offered by the government in Residential Sector was identified such as upto 40% subsidy for first 3 kW installed, and 20% for next 7 kW making a total installation upto 10 kW that can avail for subsidy programme and no subsidy offered for greater than that.

## **Section 3: CONCEPTUAL FRAMEWORK**

### **Research model**



**Illustration 3.0: Research Model**

The above model gives a glimpse of the research objectives and research framework for this research as a process.

In this research, the researcher is curious to understand the challenges faced by solar companies and the perception of customers towards a sustainable source and to come to a possible solution.

### **3.1: Need for Research**

The solar industry is one of the fastest-growing industries in India. The government is taking initiatives to promote the industry.

Although the rapid growth of this sector is attracting more and more investors, even the residential sector is not able to cope up with the pace and is lacking to achieve the target in the given period.

Therefore, this research deals with the detailed study of the Government policies and analysis of the challenges from converting a solar lead to a potential customer.

### **3.2: Research Objectives**

1. To understand the perception of customers regarding solar energy installations.
2. To understand the challenges faced by solar companies in marketing their products.
3. To analyze the challenges faced by the customer is shifting from grid supply to solar power.

## **Section 4: RESEARCH METHODOLOGY**

### ***4.1: Problem Statement:***

Understanding the challenges faced by the customer and the company in adopting and selling solar energy installation, respectively.

### ***4.2: Research type:***

Descriptive

### ***4.3: Research Duration:***

3- 4 months

### ***4.4: Sampling Method***

Two sets of samples will be collected:

- ❖ Companies: Non-Probabilistic, Judgemental Sampling, Snowball Sampling.
- ❖ Customers: Non-Probabilistic, Convenient Sampling, Snowball Sampling.

### ***4.5: Research Framework***

The research took place in two parts:

- The first questionnaire was distributed discuss among 90 respondents and their responses were collected and analyzed, however, 5 of them were strikes off due to incomplete information.
- The second questionnaire dealt with the factors that a company considers as a challenge when converting a lead to a customer.
- The Following analysis was completely based on Descriptive Statistics.

Various measures was taken to control any kind of intrinsic and extrinsic variables that might affect the result.

## Section 5: Findings

### 5.1: Customers Perception towards Solar Power Generation System and the factors influencing

A survey questionnaire was developed and distributed to the selected participants, modified to suit the objectives of this study. The first part of the questionnaire was used to gather information about the perception of the people regarding solar energy installations and the challenges they find to be a barrier from switching from conventional sources such as a grid to non-conventional sources such as PV modules. **The questionnaire had 3 sections** for 2 segment of people shown below:

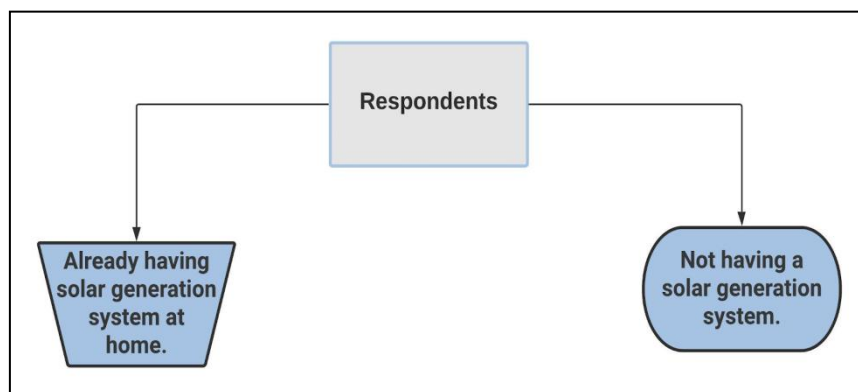
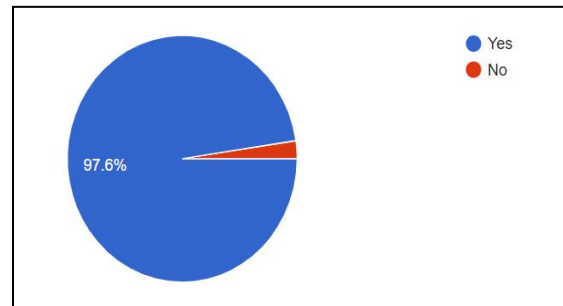


Figure 5.1: Segmentation of Respondent

Demographics Criteria	Responses																
➤ <b>Place</b>	<p>➤ 71.8% of respondents are from Agra itself.</p> <table border="1"> <caption>Place Distribution Data</caption> <thead> <tr> <th>Place</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Agra</td> <td>71.8%</td> </tr> <tr> <td>New Delhi</td> <td>3.6%</td> </tr> <tr> <td>Bihar Jamalpur</td> <td>2.4%</td> </tr> <tr> <td>Delhi</td> <td>2.4%</td> </tr> <tr> <td>Auralya</td> <td>1.2%</td> </tr> <tr> <td>Up hatharas</td> <td>1.2%</td> </tr> <tr> <td>Gurgaon</td> <td>1.2%</td> </tr> </tbody> </table>	Place	Percentage	Agra	71.8%	New Delhi	3.6%	Bihar Jamalpur	2.4%	Delhi	2.4%	Auralya	1.2%	Up hatharas	1.2%	Gurgaon	1.2%
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Delhi	2.4%																
Auralya	1.2%																
Up hatharas	1.2%																
Gurgaon	1.2%																
➤ <b>Age</b>	<p>➤ 95.3% of respondents aged between 21-20 and 31-40 between 1.2%.</p>																
➤ <b>Occupation</b>	<p>➤ 68.2% are student, 4.7% are business man</p>																
➤ <b>Annual Income</b>	<p>➤ 75.3% are not earning yet, 5.9% are earning more than 7 lakhs, 11.8% falls in 1-3 lakhs, and 4.7% in 5-7 lakhs.</p>																

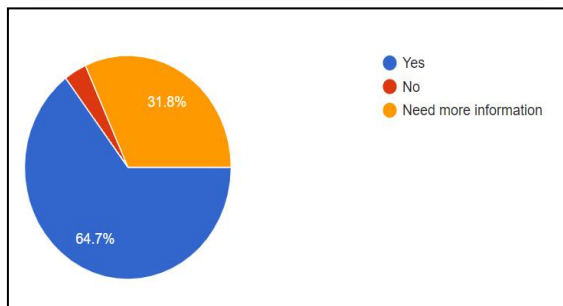
- Respondents were asked if they were a residential consumer of electricity, all the respondents agreed to that.

- The respondents were asked that if they are aware of an alternative source other than a grid such as solar, about 97.6% were already aware however 2.4% were not.



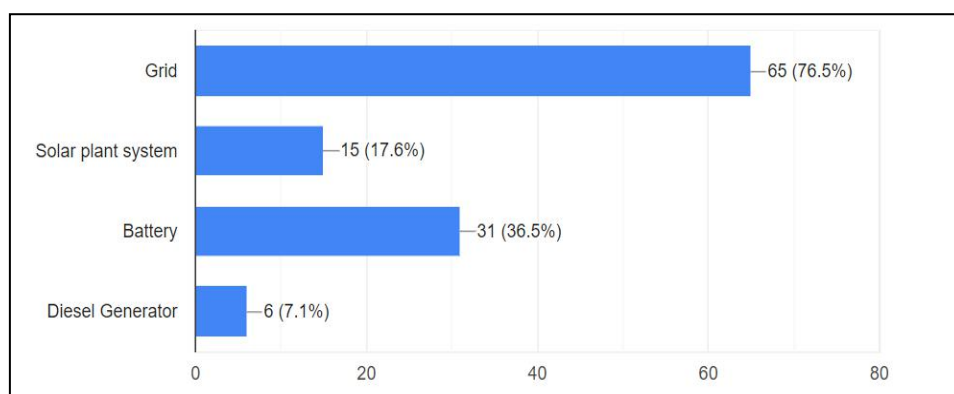
**Figure 5.2: Awareness Of Solar techno.**

- The respondents were asked about do they think, that they can shift to solar energy at the household level to meet the energy demand partially or completely. 64.7% agreed that they can, 31.8% responded that they needed more information, however, 3.5% disagreed that they don't think so.



**Figure 5.3: Do you think, You can shift from grid to Solar?**

- The respondents were asked do they have a solar power system installed at their home, 80% disagreed and 20% agreed that they do have a solar power system at their place.
- When asked about that they think solar energy-based technologies have a much lesser impact on biodiversity and the environment, 49.4% strongly agree, whereas 37.6% agree and 12.9% responded neutrally.
- When asked about the type of electric source used by them, most of the respondents responded that they rely upon on-grid and battery.

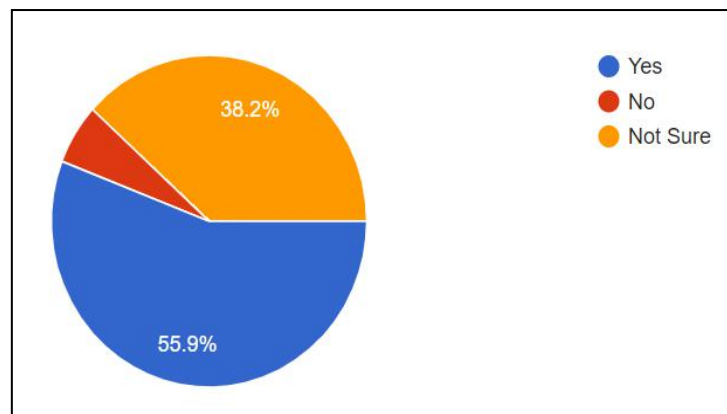


**Figure 5.4: Electric Sources Used**

- 71.8% of the respondents agreed that the energy generated from solar technology can replace the use of conventional fuels (like oil/coal/gas etc.), whereas 24.7% responded that to maybe and 3.5% disagreed with this statement.

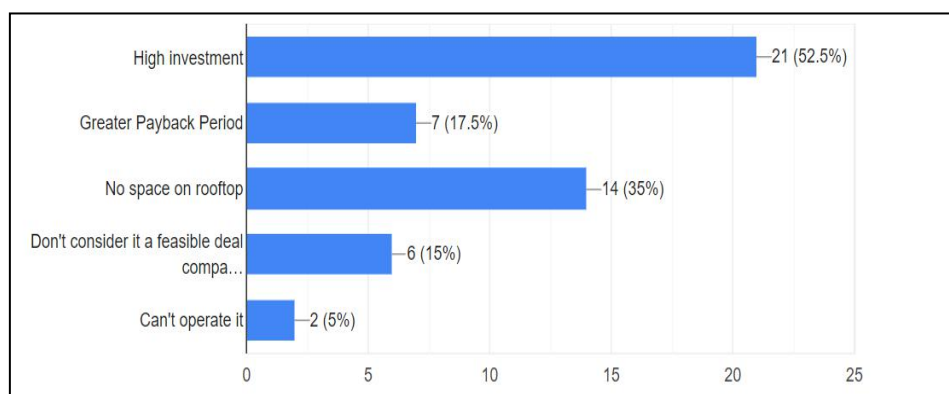
#### **5.1.A: Respondents without Solar Generation System Installed**

- ✓ A situation was given to the respondents, **who denied that they don't have a solar system installed at their home**, that if they have been told that "if you have to install 1 KW at your place you'll have to pay 54 thousand rupees which will be connected to the grid and you can switch between sources i.e. grid and solar, and also the payback period will be around 4 years and the plan will generate electricity for 25 years". To which 55.9% would agree to install, however, 38.2% were not sure and 5.9% disagreed.



*Figure 5.5: Situation 1 Responses*

- ✓ With reference to **Situation 1**, the respondents were asked if they are not sure or they disagreed to install what could be the reason for the same, 52.5% of respondents consider it as a high investment, 35% of respondents do not have enough space on the rooftop.



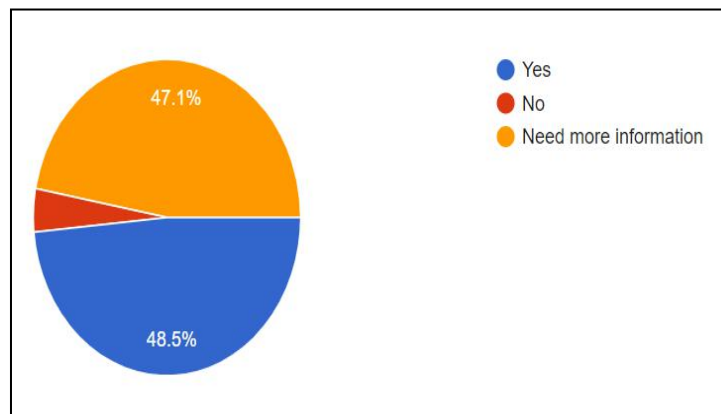
*Figure 5.6: Factors acting as a barrier*



✓ In order to analyze people's perception of government initiatives, 44.1% agreed, 17.6% disagreed and 38.2% consider they do but not enough.

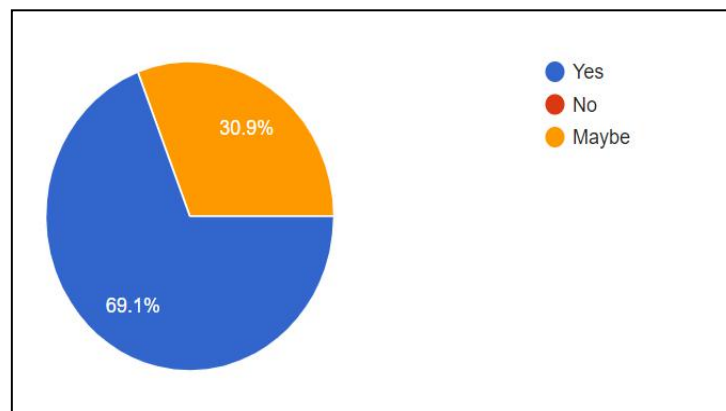
✓ Respondents were questioned that if they are aware of government subsidies offered on the purchase of solar energy generation system, 29.4% agreed that they were aware, 29.4% disagreed that they are not, however, 41.2% are aware but insufficient information.

✓ When respondents were then given a **Situation 2** as “if they are told for promoting solar power systems government is providing 40% up to your 3 kW plant and 20% above 3 kW up to 10 kW. Would they be interested in installing a system at their place”? 48.5% agreed, 47.1% want more information.



*Figure 5.7: Situation 2 Responses*

✓ 69.1% of total respondents wish to use a solar power system in the future however, 30.9% responded to maybe and there were 0% who absolutely disagreed.



*Figure 5.8: Will use solar in the future?*

### 5.1.B: Respondents with Installed Solar Power System

- ✓ When asked the respondents about the factors that drive them to install the power generation system, 70.6% responded that it was due to environmental concern, 41.2% responded that the government subsidy was the reason.

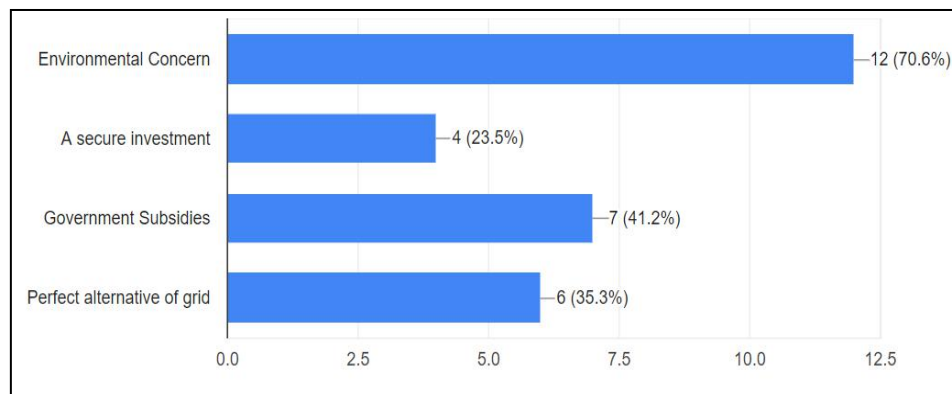


Figure 5.9: Factors that drive them install the SPV system

- ✓ The respondents were then asked to rate the challenges they considered were acting as the barrier when switching from grid to solar as a source of electricity generation. Most of the respondents faced High capital cost as a major barrier, followed by Insecurities related to Government Subsidies, Space constraint however the least faced challenge is Availability of feasible alternative i.e. grid.

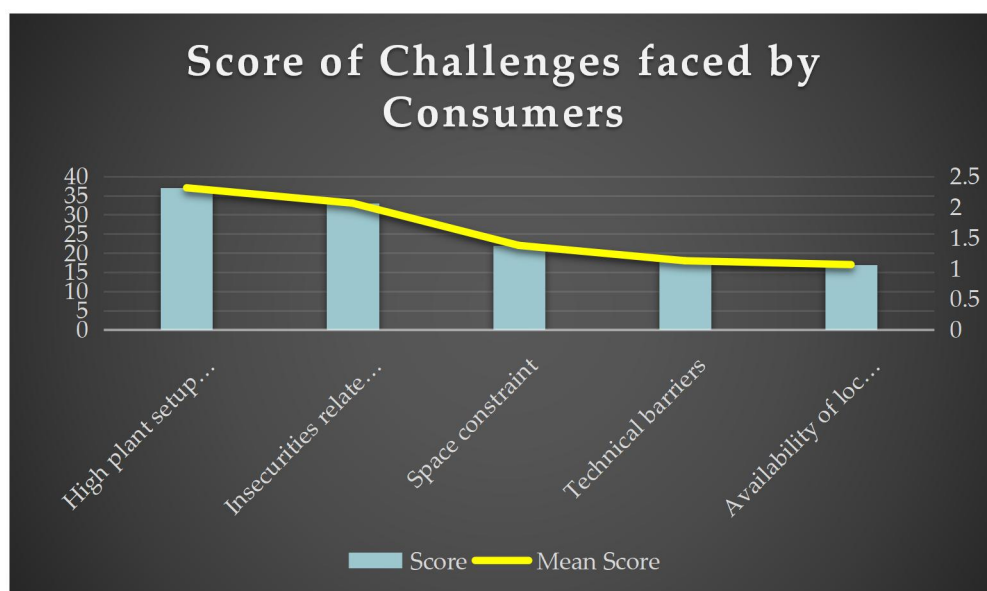
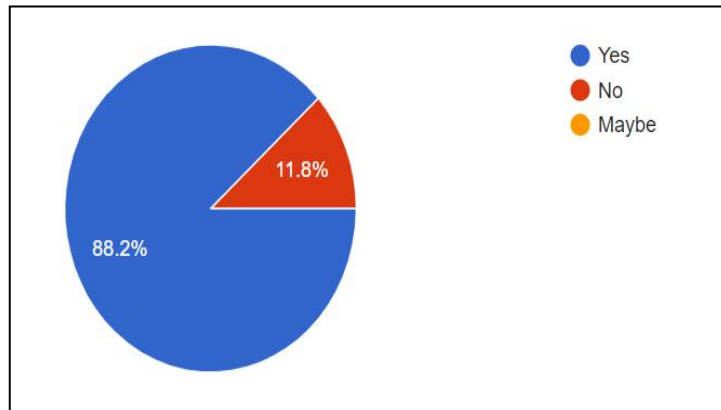


Figure 5.10: Challenges that act as a barrier for a consumer to switch from grid to solar

- ✓ When respondents were asked if the user will recommend this source of power generation to others. 88.2% agreed, however, 11.8% disagreed to recommend.

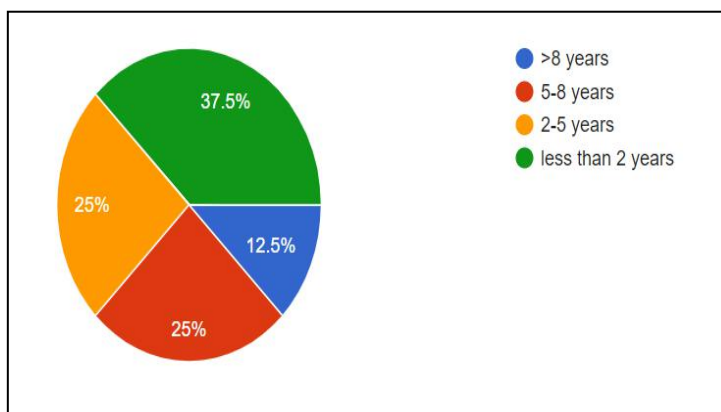


*Figure 5.11: Would you recommend Solar to peer?*

### **5.2: Companies Perception and Challenges faced by an EPC in the residential sector**

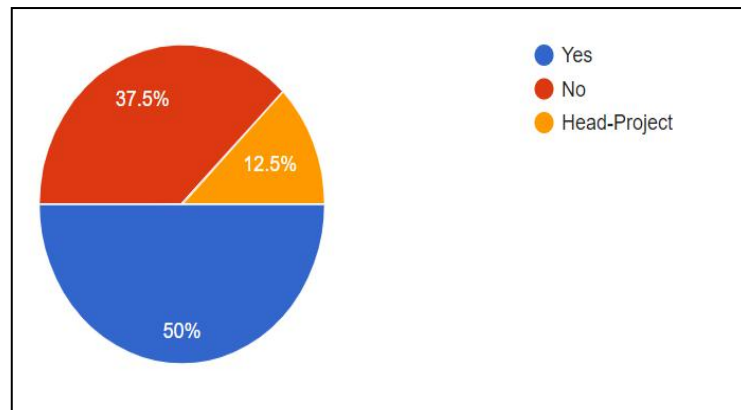
A questionnaire was developed and circulated to selective respondent companies through snowball sampling in order to analyze the challenges faced by an EPC company or a developer while converting a lead to a customer, what are the factors that they as a company considers that may be affecting the buying behavior of a consumer. After surveying 8 respondents all over India, the following results were found.

- ✓ 3 of the respondents i.e. companies were located in Agra, 3 of them in New Delhi, 1 from Gurgaon, and 1 from Trichy, TamilNadu.
- ✓ 37.5% of respondents were working as an EPC for the last 2 years, 25% ranged from 2-5 years, 25% for 5-8 years, and 12.5% were working for more than 8 years.



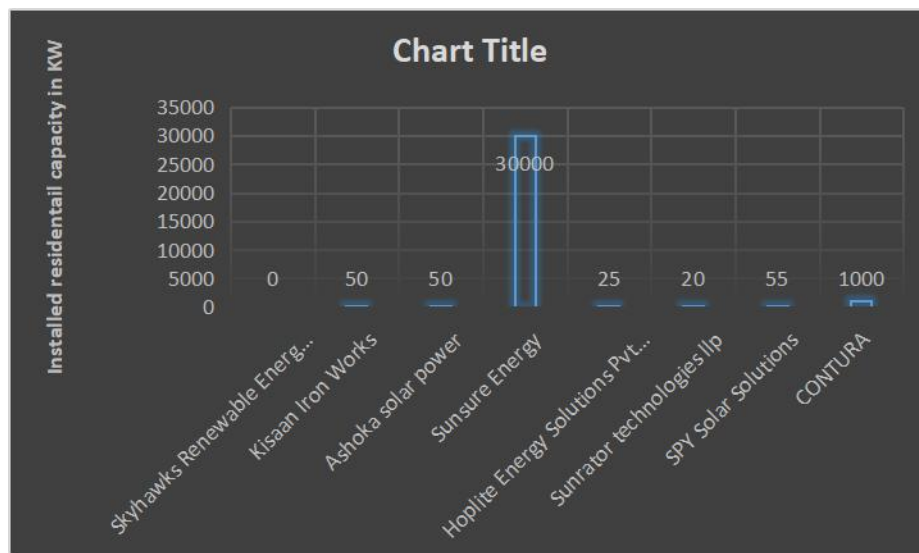
*Figure 5.12: Company Incorporated*

- ✓ When asked about the representative of the respondent i.e. an executive about his/her role in the organization following were the results.



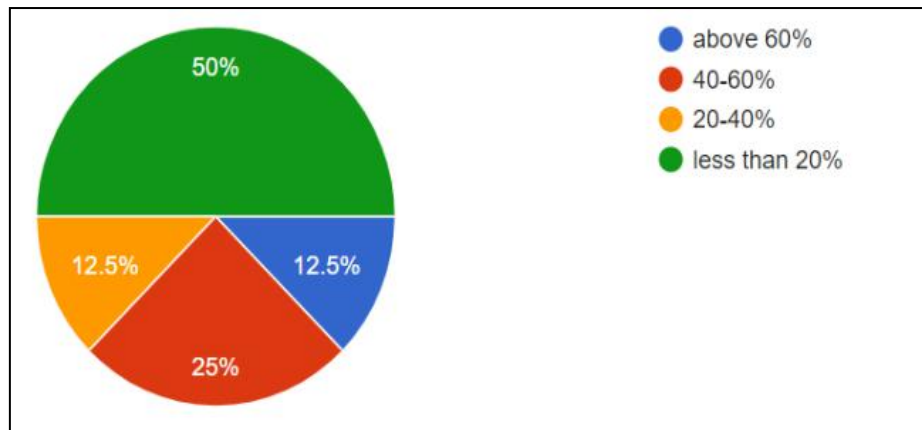
*Figure 5.13: Role of the representative*

- ✓ When asked about the tentative capacity installed in the residential sector, the following were the results.



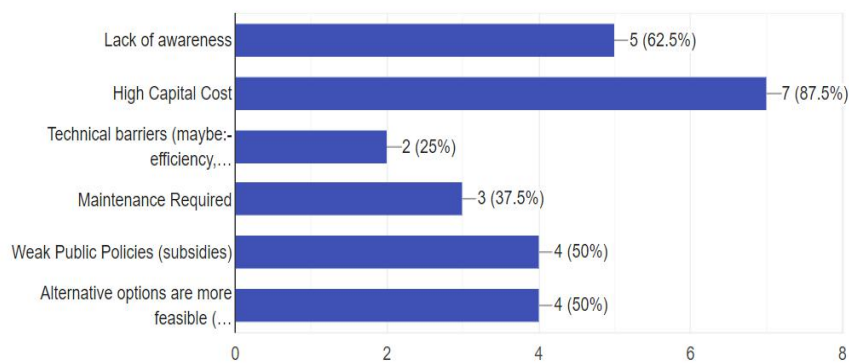
*Figure 5.14: Tentative Installed Capacity in the Residential Sector*

- ✓ 50% of the companies claimed that less than 20% of leads get converted into a customer and following shows the trend.



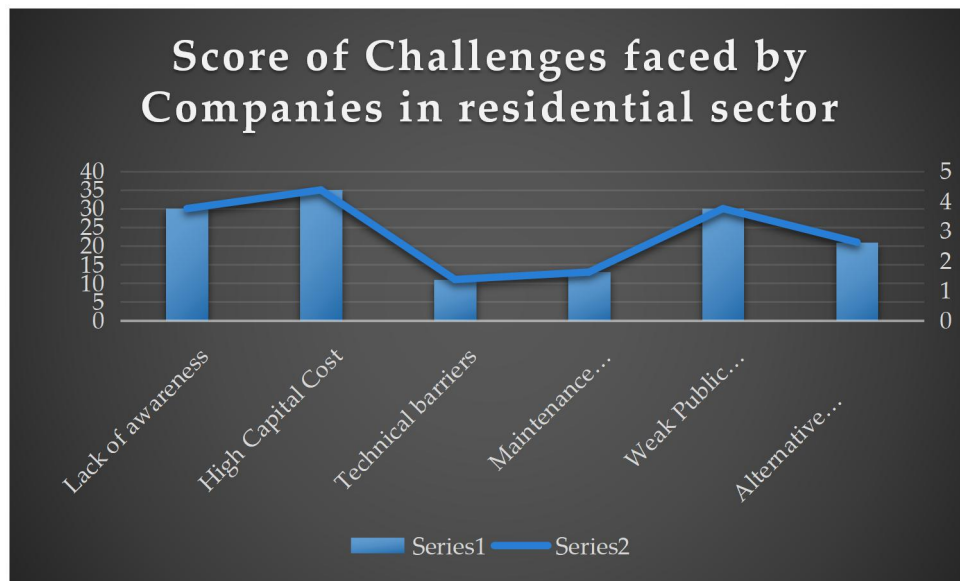
*Figure 5.15: : Lead to Customer Conversion*

- ✓
- ✓ 87.5% of respondents consider that the high capital cost is the main factor that affects buying behavior, 62.5% responds that lack of awareness is also a major factor, 50% responds to the weak public policies are affecting the behavior. The following are the complete results.



*Figure 5.16: Factors affecting the buying behavior*

- ✓ Most of the companies face that high capital cost while handling a residential customer, followed by a lack of awareness and weak public policies.



*Figure 5.17: Challenges in the residential sector according to the companies*

- ✓ When the respondents were asked about any other challenge that they think not mentioned. Some respondents added as follows:-
  - ✧ “Delay from client-side, State Policies, Pitching the right customer” (**Skyhawks Renewable Energy Pvt. Ltd.**)
  - ✧ “Dirty prices due to market penetration strategy” (**Kisaan Iron Works**)
  - ✧ “One of the major challenges which we face is relying on these sources. As many of the consumers don’t want to disrupt the source of supply, and solar provide powers only when the sun is all around. So reliability is also a major factor.” (**Ashoka solar power**)
  - ✧ “Clients are worried about the subsidy. The major one.” (**Sunsure Energy Pvt. Ltd.**)

## **Section 6: Conclusion**

The study clearly presents the favorable case scenario for Solar adoption and expansion. Over 97% of respondents were aware of this technology and quite a great amount of individuals agreed that solar technology has a lesser impact on the environment as compared to conventional sources. Respondents have a positive outlook towards solar technology, that can replace fossil fuel. About 70% are willing to adopt renewables in the future.

Despite a positive way for solar, there are various challenges ahead that need to be addressed and deployed in future actions. The most common of them for a respondent who doesn't own an SPV System is the high capital cost, however, for an owner, the barrier faced was either high capital cost followed by weak public policies (i.e. Subsidies). The biggest challenge according to an EPC company while handling a residential potential customer, is also the costs related and policies by the government followed by the lack of awareness proving to be the biggest challenge for SPV technology providers.

Awareness with respect to government subsidies and policies on Solar accounted to be low. It is very important to supply information for common people in an easy-to-understand manner.

Lastly, there is a need for a shared vision, and the call to action for both governments, both at center and state to promote more people to install their independent system.

## **Section 7: Suggestions, Limitations, and Scope for Future Study**

Mostly the respondents were not earning yet. However, for a better understanding of the perception and challenges, the respondents must have been further segmented on the basis of income. However, if the suggestions are to be made considering the challenges in residential sector government can sign up more PPA ( plant is installed on the land of the customer and he just pays for the amount of units consumed), under the guidance of government, companies can segregate an area into several societies and that particular society is supplied solar electricity and they pay only for the amount of units consumed because the main issue is the high capital cost.

Further, most of the respondents are not well aware of the functioning of Solar technology and it's guidelines that may have varied the results. A future study could involve respondents with prior knowledge about the technology and guideline in their geographic location.

A future study could involve the challenges in Utility sector also what can be possible solution to the challenges in adoption of solar technology, also the post challenges after the sudden outbreak of COVID-19 that almost crashed the economy and the business sector.

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## Annexures (Questionnaire)

### Consumer Perception towards Solar Energy

The questionnaire is meant for academic use only.

\* Required

1. Name \*

---

2. State your City. \*

---

3. Age \*

*Mark only one oval.*

☐ 21-30

☐ 30-40

☐ 40-50

☐ >50

4. Occupation \*

---

5. Annual Income \*

*Mark only one oval.*

☐ 1-3 Lakh

☐ 3-5 Lakh

☐ 5-7 Lakh

☐ >7 Lakh

☐ Not earning yet

6. Are you a residential consumer of electricity? \*

*Mark only one oval.*

☐ Yes

☐ No

7. Are you aware of an alternative source other than a grid such as solar? \*

*Mark only one oval.*

☐ Yes

☐ No

8. Do you think you can shift to solar energy at the household level to meet the energy demand partially or completely? \*

*Mark only one oval.*

☐ Yes

☐ No

☐ Need more information

9. Do you have a solar power system installed at your place? \*

*Mark only one oval.*

☐ Yes    *Skip to question 19*

☐ No    *Skip to question 13*

10. Type of electric source you use. \*

(You can opt for more than one in checkbox)

*Check all that apply.*

- ☐ Grid
- ☐ Solar plant system
- ☐ Battery
- ☐ Diesel Generator

11. Do you agree that the energy generated from solar technology can replace the use of conventional fuels (like oil/coal/gas etc.) \*

*Mark only one oval.*

- ☐ Agree
- ☐ Disagree
- ☐ Maybe

12. Compared to fossil fuel do you think solar energy-based technologies have a much lesser impact on biodiversity and the environment? \*

*Mark only one oval.*

- ☐ Strongly Agree
- ☐ Agree
- ☐ Neutral
- ☐ Disagree
- ☐ Strongly Disagree

13. Situation: If I tell you that if you have to install 1 KW at your place you'll have to pay 54 thousand rupees which will be connected to the grid and you can switch between sources i.e. grid and solar, and also the payback period will be around 4 years and the plan will generate electricity for 25 years. Now, will you opt for Solar plants to be installed at your place? \*

*Mark only one oval.*

- ☐ Yes
- ☐ No
- ☐ Not Sure

14. If No or not sure what might be the reason for your disapproval.  
(You can opt for more than one checkbox)

*Check all that apply.*

- ☐ High investment
- ☐ Greater Payback Period
- ☐ No space on rooftop
- ☐ Don't consider it a feasible deal compared to grid
- ☐ Can't operate it

15. Do you think the government is taking initiatives to help you switch to the solar source? \*

*Mark only one oval.*

- ☐ Yes
- ☐ No
- ☐ To an extent but not enough

16. Are you aware of government subsidies to purchase solar energy generation? \*

Mark only one oval.

- ☐ Yes
- ☐ No
- ☐ Yes aware, but insufficient information for availing these subsidies

[https://docs.google.com/forms/d/18IS6LbPz2Jer3TkQnzzeNVupiMRtYM4sK902\\_gJ6cho/edit](https://docs.google.com/forms/d/18IS6LbPz2Jer3TkQnzzeNVupiMRtYM4sK902_gJ6cho/edit)

4/6

5/12/2020

Consumer Perception towards Solar Energy

17. Situation: If, I tell you, for promoting solar power systems government is providing 40% up to your 3 kW plant and 20% above 3 kW up to 10 kW. Would you install solar at your place? \*

Mark only one oval.

- ☐ Yes
- ☐ No
- ☐ Need more information

18. Do you plan to use a solar power system in the future? \*

Mark only one oval.

- ☐ Yes
- ☐ No
- ☐ Maybe

19. What drive you to install a solar power plant? \*  
(You can opt for more than one checkbox)

Check all that apply.

- ☐ Environmental Concern  
☐ A secure investment  
☐ Government Subsidies  
☐ Perfect alternative of grid

20. What are the main challenges that you consider as barriers when switching from the grid? (Rank them such that 1 being the least faced challenge and, 5 being the most faced, however, opt for 0 if you don't consider it as a challenge) \*

Check all that apply.

	0(not a challenge)	1(least faced challenge)	2	3	4	5(most faced challenge)
High plant setup cost	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Space constraint	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Technical barriers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Availability of local utility grid	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Insecurities related to government subsidies.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

21. Would you recommend others to install a solar power plant? \*

Mark only one oval.

- ☐ Yes  
☐ No  
☐ Maybe

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## Industrial Questionnaire

### Industrial Survey

This survey is being done for academic use.

In order to identify the challenges faced by the Solar EPC companies while dealing with a residential customer.

**\* Required**

1. Company Name \*

---

2. Where is your Company located? \*

(State and City)

---

3. Tenure of the company working in the field as an EPC. \*

*Mark only one oval.*

- ☐ >8 years
- ☐ 5-8 years
- ☐ 2-5 years
- ☐ less than 2 years

4. Are you working in the Business Development Department? \*

*Mark only one oval.*

- ☐ Yes
- ☐ No
- ☐ Other: 

---

5. Tentative total installed capacity by your company. \*

(example- 50 KW, 1 MW etc. mention units)

---

6. Tentative capacity installed in Residential Sector. \*

(example- 50 KW, 1 MW etc.)

---

7. Approximate percent of leads that gets converted in to a deal. \*

(only residential sector)

*Mark only one oval.*

- ☐ above 60%
- ☐ 40-60%
- ☐ 20-40%
- ☐ less than 20%

8. Factors that you consider as challenges that affect the buying behavior. \*

(You can choose more than one.)

*Check all that apply.*

- ☐ Lack of awareness
- ☐ High Capital Cost
- ☐ Technical barriers (maybe:- efficiency, space required, etc.)
- ☐ Maintenance Required
- ☐ Weak Public Policies (subsidies)
- ☐ Alternative options are more feasible (Grid)



9. Rate the challenges such that 6 is the most faced challenge and 1 being the least. (However, opt for 0 you don't consider it as a challenge) \*

Mark only one oval per row.

	0 - Not considered a challenge	1 -Least faced challenge	2	3	4	5	6 - Highly faced challenge
Lack of awareness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
High Capital Cost	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Technical barriers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Maintenance Required	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Weak Public Policies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Alternative options are more feasible	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

10. Any other challenge that you have faced while making a deal?

---



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## Responses (Without Solar connection)

Name	State your City.	Age	Occupation	Annual Income	Are you a residential	Are you aware of an	Do you think you car	Do you have a solar
Shivam Kapoor	Agra	25-30	Business	5-7 Lakh	Yes	Yes	Need more information	No
Nitin kardam	Gurgaon	21-30	Operation associate head	1-3 Lakh	Yes	Yes	Yes	No
Kratika	Uttar Pradesh	21-30	Assistant Fashion Mercha	1-3 Lakh	Yes	Yes	Need more information	No
Anshu baghel	Dholpur	21-30	Student	Not earning yet	Yes	Yes	Yes	No
Avi Vats	Agra	21-30	Student	Not earning yet	Yes	Yes	Yes	No
Ananya	Agra	21-30	Student	Not earning yet	Yes	Yes	Yes	No
Atibhi Chaudhary	Lucknow	21-30	Student	Not earning yet	Yes	Yes	Need more information	No
Natasha Sharma	Agra	21-30	Student	Not earning yet	Yes	Yes	Yes	No
Vishal Mehra	agra	21-30	engineer	>7 Lakh	Yes	Yes	Yes	No
Ajit yadav	Uttar pradesh	21-30	Student	Not earning yet	Yes	Yes	Yes	No
Tanya	New Delhi	21-30	Student	Not earning yet	Yes	Yes	Need more information	No
Rajat Upadhyay	Agra	21-30	Entrepreneur	Not earning yet	Yes	Yes	Yes	No
Saurabh saxena	Agra	21-30	Student	Not earning yet	Yes	Yes	Need more information	No
Saurav Gautam	Agra	21-30	Student	Not earning yet	Yes	Yes	Yes	No
Krati	Agra	21-30	Studying	Not earning yet	Yes	Yes	Yes	No
Saurabh Singh	Agra, Uttar Pradesh hu	21-30	Student	Not earning yet	Yes	Yes	Need more information	No
Raushan Kumar	Chhapra (Bihar)	21-30	Student	Not earning yet	Yes	Yes	Need more information	No
Rohan sharma	Agra	>50	Student	Not earning yet	Yes	Yes	Yes	No
Poonam Saraswat	Agra Uttar Pradesh	21-30	Student	>7 Lakh	Yes	Yes	Yes	No
AKASH MALIK	AGRA	21-30	Student	Not earning yet	Yes	Yes	No	No
Akaash Mehra	Agra	21-30	Business	3-5 Lakh	Yes	Yes	Yes	No
Bhanu Parashar	Agra	21-30	Student	Not earning yet	Yes	Yes	Yes	No
Pragati kulshreshtha	Agra	21-30	Student	Not earning yet	Yes	Yes	Need more information	No
unnati khatri	agra	21-30	College student	Not earning yet	Yes	Yes	Need more information	No
Mohammed Aaqib Qureshi	Agra	21-30	Student	1-3 Lakh	Yes	Yes	Yes	No

Type of electric source	Do you	Compared to fo	Situation: If I tell you	If No or not sure what	Do you think the gov	Are you aware of gov	Situation: If, I tell you	Do you plan to use a
Grid, Battery, Diesel Generator	Maybe	Agree	Not Sure	High investment, No space	No	Yes aware, but insufficient	Yes	Maybe
Grid	Agree	Neutral	Yes	High investment	Yes	Yes	Yes	Maybe
Grid, Diesel Generator	Maybe	Neutral	Not Sure	Don't consider it a feasible	No	Yes aware, but insufficient	Need more information	Maybe
Grid	Agree	Strongly Agree	Yes		Yes	Yes	Yes	Yes
Grid	Agree	Strongly Agree	Yes		To an extent but not enough	Yes	Yes	Yes
Grid	Agree	Strongly Agree	Not Sure	High investment	To an extent but not enough	No	Yes	Maybe
Battery, Diesel Generator	Maybe	Strongly Agree	Yes		To an extent but not enough	No	Need more information	Yes
Grid	Agree	Agree	Yes		To an extent but not enough	Yes	Need more information	Maybe
Grid	Agree	Strongly Agree	Not Sure	High investment	To an extent but not enough	No	Yes	Yes
Grid, Battery, Diesel Generator	Agree	Strongly Agree	Not Sure	High investment	Yes	Yes	No	Yes
Battery	Agree	Strongly Agree	Yes	No	No	No	Yes	Yes
Grid	Maybe	Neutral	No	High investment	To an extent but not enough	Yes	Yes	Yes
Grid	Maybe	Neutral	Yes	Yes	No	No	Yes	Yes
Solar plant system, Battery	Agree	Agree	Yes	No space on rooftop	Yes	Yes	Yes	Yes
Grid	Maybe	Agree	Yes	High investment	To an extent but not enough	No	Need more information	Yes
Grid	Agree	Strongly Agree	Yes	Don't consider it a feasible	To an extent but not enough	Yes	Yes	Yes
Grid	Maybe	Neutral	No	No space on rooftop	Yes	Yes aware, but insufficient	Yes	Yes
Grid	Agree	Agree	Yes	High investment	Yes	Yes	Yes	Yes
Grid	Agree	Agree	Yes	High investment	Yes	Yes	Yes	Yes
Grid, Battery	Agree	Strongly Agree	Yes		To an extent but not enough	Yes	Yes	Yes
Grid, Battery	Agree	Strongly Agree	Not Sure	No space on rooftop	No	No	Need more information	Yes
Grid	Agree	Strongly Agree	Yes		Yes	Yes aware, but insufficient	Yes	Yes
Grid, Battery	Agree	Agree	Yes		To an extent but not enough	Yes aware, but insufficient	Need more information	Maybe
Battery	Agree	Strongly Agree	Not Sure	High investment, Greater	Yes	No	Yes	Yes
Grid	Agree	Strongly Agree	Not Sure	High investment	Yes	Yes aware, but insufficient	Need more information	Yes

Timestamp	Name	State your City.	Age	Occupation	Annual Income	Are you a residential	Are you aware of an	Do you think you car	Do you have a solar
4/17/2020 16:43:38	Rudransh Gupta	Agra	21-30	Student	Not earning yet	Yes	Yes	Need more information	No
4/17/2020 16:53:09	Piyush Agarwal	Agra	21-30	Student	Not earning yet	Yes	Yes	Yes	No
4/17/2020 17:00:17	Tanu Sharma	Agra	21-30	Student	Not earning yet	Yes	Yes	Need more information	No
4/17/2020 17:03:44	Vijay Kumar	Agra	21-30	Student	Not earning yet	Yes	Yes	Yes	No
4/17/2020 17:23:25	Astika Srivastava	Agra	21-30	Student	Not earning yet	Yes	Yes	Yes	No
4/17/2020 17:36:08	Rahul yadav	Agra	21-30	Student	Not earning yet	Yes	Yes	Yes	No
4/17/2020 17:39:06	Ankit shandilya	New Delhi	21-30	Project Engineer	5-7 Lakh	Yes	Yes	Yes	No
4/17/2020 17:41:52	Ritika Agarwal	Agra	21-30	Student	Not earning yet	Yes	Yes	No	No
4/17/2020 17:42:19	Janvhi	Agra	21-30	Student	Not earning yet	Yes	Yes	Yes	No
4/17/2020 17:57:28	Abhishek kumar singh	agra	21-30	education	Not earning yet	Yes	Yes	Yes	No
4/17/2020 18:10:04	Sagar Gupta	Uttarpradesh Agra	21-30	Student	Not earning yet	Yes	Yes	No	No
4/17/2020 18:12:48	Aanchal Singh	Kanpur	21-30	Student	Not earning yet	Yes	Yes	Yes	No
4/17/2020 18:27:59	Mohit	Agra	21-30	Student	Not earning yet	Yes	Yes	Yes	No
4/17/2020 18:30:50	Ayush Sharma	Agra	21-30	Renewable engineer	1-3 Lakh	Yes	Yes	Yes	No
4/17/2020 18:31:25	Manaswi Swami	Agra	21-30	Student	Not earning yet	Yes	Yes	Yes	No
4/17/2020 18:36:39	Shriya	Agra	21-30	Fashion designer	1-3 Lakh	Yes	Yes	Yes	No
4/17/2020 18:47:40	Shubh	Agra	21-30	Student	Not earning yet	Yes	Yes	Need more information	No
4/17/2020 19:02:37	Tanya jain	Agra	21-30	Student	Not earning yet	Yes	Yes	Yes	No
4/17/2020 19:46:08	Vyomkesh verma	Uttar pradesh	21-30	Student leader	Not earning yet	Yes	Yes	Yes	No
4/17/2020 19:51:47	Stuti	Agra	21-30	Student	Not earning yet	Yes	Yes	Yes	No
4/17/2020 19:57:27	Minakshi Bharti	Muzaffarpur	21-30	Student	Not earning yet	Yes	Yes	Need more information	No
4/17/2020 20:23:18	Vanshita	Agra	21-30	Student	Not earning yet	Yes	Yes	Yes	No
4/17/2020 20:54:38	Yash sharma	Ratlam	21-30	Studing	Not earning yet	Yes	Yes	Yes	No
4/17/2020 21:00:22	Yogesh	Agra	21-30	Student	Not earning yet	Yes	Yes	Need more information	No
4/17/2020 21:03:23	Harish Chand	Agra	21-30	Nothing	Not earning yet	Yes	Yes	Yes	No

K	L	M	N	O	P	Q	R	S
Type of electric source	Do you	Compared to fo	Situation: If I tell you	If No or not sure wha	Do you think the gov	Are you aware of gov	Situation: If, I tell you	Do you plan to use a
Grid, Battery	Agree	Strongly Agree	Yes	Greater Payback Period	Yes	No	Yes	Maybe
Grid, Battery	Maybe	Agree	Yes		To an extent but not enou	Yes aware, but insufficien	Need more information	Yes
Grid	Agree	Strongly Agree	Yes	No space on rooftop	Yes	Yes aware, but insufficien	Need more information	Yes
Grid, Solar plant system, I	Agree	Agree	Not Sure	High investment	Yes	Yes aware, but insufficien	Yes	Yes
Grid	Agree	Agree	Yes	No space on rooftop	To an extent but not enou	Yes aware, but insufficien	Need more information	Yes
Grid	Maybe	Strongly Agree	Yes		Yes	Yes aware, but insufficien	Need more information	Maybe
Grid	Agree	Strongly Agree	Yes	High investment	To an extent but not enou	Yes aware, but insufficien	Yes	Yes
Grid	Agree	Strongly Agree	Not Sure	High investment, Greater	To an extent but not enou	Yes aware, but insufficien	Need more information	Maybe
Grid, Battery	Agree	Agree	Not Sure	No space on rooftop	To an extent but not enou	Yes aware, but insufficien	Need more information	Yes
Grid	Agree	Strongly Agree	Yes	High investment	No	No	Yes	Yes
Grid, Battery	Agree	Strongly Agree	Not Sure	No space on rooftop	Yes	Yes aware, but insufficien	No	Maybe
Grid, Battery	Maybe	Strongly Agree	Not Sure	High investment	No	Yes aware, but insufficien	Need more information	Maybe
Grid	Agree	Strongly Agree	Yes		Yes	Yes aware, but insufficien	Yes	Yes
Grid	Agree	Strongly Agree	No	Greater Payback Period	Yes	Yes aware, but insufficien	Need more information	Yes
Grid	Agree	Strongly Agree	Not Sure	High investment	To an extent but not enou	Yes aware, but insufficien	Need more information	Yes
Grid, Battery, Diesel Gen	Maybe	Agree	Not Sure	High investment, Don't co	To an extent but not enou	Yes aware, but insufficien	Need more information	Yes
Grid	Maybe	Strongly Agree	Yes		No	No	Need more information	Maybe
Grid	Agree	Strongly Agree	Not Sure	Don't consider it a feasibl	To an extent but not enou	No	Yes	Maybe
Grid	Agree	Strongly Agree	Yes		Yes	Yes	Yes	Yes
Grid, Battery	Agree	Agree	Yes		To an extent but not enou	Yes	Yes	Maybe
Grid	Agree	Agree	Yes		No	No	Yes	Yes
Battery, Diesel Generator	Maybe	Agree	Yes		Yes	No	Need more information	Maybe
Battery	Agree	Agree	Yes		No	Yes aware, but insufficien	Yes	Maybe
Grid	Agree	Agree	No	Greater Payback Period	Yes	No	Yes	Yes
Grid	Agree	Strongly Agree	Yes	High investment	No	No	Yes	Yes

## Responses (With Solar Connection)

A	B	C	D	E	F	G	H	I	J
Timestamp	Name	State your City.	Age	Occupation	Annual Income	Are you a residential	Are you aware of an	Do you think you car	Do you h
4/17/2020 15:39:01	Deep Prakash	Auraiya Uttar Pradesh	21-30	Solar is very clean and gr	3-5 Lakh	Yes	Yes	Yes	Yes
4/17/2020 15:41:46	Vaibhav Gupta	Agra	21-30	Student	Not earning yet	Yes	Yes	Need more information	Yes
4/17/2020 15:56:08	PRASHANT PACHAURI	Agra	21-30	Student	Not earning yet	Yes	Yes	Yes	Yes
4/17/2020 15:56:22	Shruti Sharma	Agra	21-30	Student	Not earning yet	Yes	Yes	Yes	Yes
4/17/2020 15:56:48	Anurag	Agra	21-30	Student	Not earning yet	Yes	Yes	Need more information	Yes
4/17/2020 16:19:14	Ruby yadav	Agar	21-30	Student	Not earning yet	Yes	Yes	Need more information	Yes
4/17/2020 16:55:31	Abhishek Pandey	Puranpur	21-30	Student	Not earning yet	Yes	Yes	Yes	Yes
4/17/2020 16:56:37	Nikhil pal	Agra	21-30	Student	Not earning yet	Yes	Yes	Yes	Yes
4/17/2020 17:01:27	Nipun Dixit	Delhi	21-30	Businessman	1-3 Lakh	Yes	Yes	Yes	Yes
4/17/2020 20:25:15	Naveen Kumar	Up hatharas	21-30	Teaching	5-7 Lakh	Yes	Yes	Yes	Yes
4/17/2020 20:45:58	Amardip	Uttar pradesh	21-30	Work	1-3 Lakh	Yes	Yes	Yes	Yes
4/17/2020 20:46:08	Amardip	Uttar pradesh	21-30	Work	1-3 Lakh	Yes	Yes	Yes	Yes
4/17/2020 21:05:02	Ayushi Gulati	Agra	21-30	Student	Not earning yet	Yes	Yes	Yes	Yes
4/17/2020 22:23:39	Pushpak	Agra	21-30	Student	Not earning yet	Yes	Yes	Yes	Yes
4/17/2020 22:25:57	Anshul varshney	Etah	21-30	Student	Not earning yet	Yes	Yes	Yes	Yes
5/2/2020 10:59:17	Sujin Ferdinand	Trichy, Tamilnadu	21-30	Business	>7 Lakh	Yes	Yes	Yes	Yes

V	W	X	Y	Z
What are the main ch	What are the main ch	What are the main ch	What are the main ch	Would you recomm
0(not a challenge)	0(not a challenge)	0(not a challenge)	0(not a challenge)	No
2 0(not a challenge), 1(least	1(least faced challenge), 2	0(not a challenge)	0(not a challenge)	Yes
1(least faced challenge)	1(least faced challenge)	0(not a challenge)	1(least faced challenge)	Yes
0(not a challenge)	0(not a challenge)	0(not a challenge)	0(not a challenge)	Yes
1(least faced challenge)	1(least faced challenge)	1(least faced challenge)	2	Yes
0(not a challenge)	1(least faced challenge)	1(least faced challenge)	5(most faced challenge)	Yes
5(most faced challenge)	5(most faced challenge)	5(most faced challenge)	5(most faced challenge)	Yes
1(least faced challenge)	0(not a challenge)	0(not a challenge)	0(not a challenge)	Yes
1(least faced challenge)	1(least faced challenge)	0(not a challenge)	5(most faced challenge)	Yes
3 1(least faced challenge)	1(least faced challenge)	1(least faced challenge)	4	Yes
2, 3, 4, 5(most faced chall	2, 3, 4, 5(most faced chall	2, 3, 4, 5(most faced chall	2, 3, 4, 5(most faced chall	Yes
1(least faced challenge)	2	0(not a challenge)	0(not a challenge)	Yes
1(least faced challenge)	2	0(not a challenge)	0(not a challenge)	Yes
1(least faced challenge)	2	1(least faced challenge)	1(least faced challenge)	Yes
0(not a challenge)	0(not a challenge)	0(not a challenge)	0(not a challenge)	No
1(least faced challenge)	1(least faced challenge)	1(least faced challenge)	0(not a challenge)	Yes
0(not a challenge)	0(not a challenge)	4	4	Yes



## Responses (Industrial Survey)

Timestamp							
A	B	C	D	E	F	G	H
Timestamp	Company Name	Where is you Compa	Tenure of the compa	Are you working in ti	Tentative total install	Tentative capacity in	Approximate percent
3/26/2020 16:47:40	Skyhawks Renewable En	Delhi	less than 2 years	Yes	120 KW	0	less than 20%
4/27/2020 12:11:48	Kisaan Iron Works	Agra	2.5 years	Yes	150	50	less than 20%
4/28/2020 14:41:08	Ashoka solar power	New delhi	less than 2 years	Yes	3 Mw	50Kw	40-60%
5/1/2020 14:08:34	Sunsure Energy	Gurugram, Haryana	5-8 years	No	89MW	30MW	40-60%
5/1/2020 15:48:43	Hoplite Energy Solutions	Agra, UP	2-5 years	Head-Project	7.5MW	25KW	less than 20%
5/1/2020 16:15:27	Sunrator technologies llp	New delhi	5-8 years	No	5 MW	20 KW	above 60%
5/1/2020 17:16:08	SPY Solar Solutions	Agra , uttar pradesh	less than 2 years	No	55 KW	55 kw	20-40%
5/2/2020 11:03:58	CONTURA	Trichy,Tamilnadu	>8 years	Yes	>1MV	<1MV	less than 20%

Factors that you consider as challenges that affect the buying behavior.

I	J	K	L	M	N	O
Factors that you consi	Rate the challeng	Rate the challenge	Rate the challen	Rate the challeng	Rate the challe	Rate the challer
Lack of awareness, High Ca	5	1	0	4	3	2
Lack of awareness, High Ca	4	6 - Highly faced challer	2	3	6 - Highly faced cha	0 - Not considered a
Lack of awareness	5	4	3	1 -Least faced challen	3	1 -Least faced chall
High Capital Cost, Maintena	3	2	1 -Least faced challe	3	3	5
High Capital Cost, Technical	3	6 - Highly faced challer	2	0 - Not considered a c	6 - Highly faced cha	6 - Highly faced chall
High Capital Cost, Alternativ	2	4	1 -Least faced challe	1 -Least faced challen	2	3
Lack of awareness, High Ca	4	6 - Highly faced challer	2	1 -Least faced challen	1 -Least faced chall	0 - Not considered a
Lack of awareness, High Ca	4	6 - Highly faced challer	0 - Not considered a	0 - Not considered a c	6 - Highly faced cha	4

P	Q	R	S	T
Any other challenge				
Delay from client side, State Policies, Pitching the right customer				
Dirty prices due to market penetration strategy				
No				
One of the major challenge which we face is reliability on these sources. As many of the consumer doesn't want disrupt source of supply ,				
illenge				
Clients are worried about the subsidy. The major one.				
a challenge				