International Journal on Applications in Engineering and Technology
Volume 12 : Issue 6 :June 2026, pp 74- 85 www.aetsjournal.com ISSN (Online) : 2455 - 0523

A STUDY ON MARKETING OF SOLAR POWER ENERGY PRODUCTION IN DYNAMIC SOLAR POWER ENERGY AT ARUPPUKOTTAI

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ABSTRACT

Solar energy has emerged as one of the most important renewable energy sources due to increasing energy demand, environmental concerns, and the depletion of conventional energy resources. The present study entitled “A Study on Marketing of Solar Power Energy Production in Dynamic Solar Power Energy at Aruppukottai” focuses on analyzing the marketing practices adopted by Dynamic Solar Power Energy and evaluating customer awareness, perception, satisfaction, and adoption of solar energy products.

The main objective of the study is to examine the effectiveness of marketing strategies used by the company in promoting solar power energy solutions and to identify factors influencing customer purchasing decisions. The study also aims to assess customer awareness regarding solar energy, government subsidies, product quality, pricing, promotional activities, and after-sales services. Primary data were collected from 100 respondents through a structured questionnaire, while secondary data were obtained from company records, websites, journals, and other relevant sources. Convenience sampling was adopted for selecting respondents, and statistical tools such as Percentage Analysis, Mean Analysis, Weighted Average Method, Chi-Square Test, and Correlation Analysis were used for data interpretation.

The findings reveal that a majority of respondents are moderately aware of solar energy and Dynamic Solar Power Energy's products and services. Internet and social media are identified as the primary sources of awareness. Most respondents expressed satisfaction with product quality, durability, after-sales service, and flexible payment options. However, pricing and lack of detailed awareness regarding government subsidy schemes remain significant concerns affecting customer adoption. The study also highlights the growing demand for solar energy in residential, agricultural, and commercial sectors due to increasing electricity costs and environmental awareness.

The study concludes that effective marketing communication, customer education programs, attractive financing options, and enhanced promotional activities can significantly improve customer acceptance and market penetration. Dynamic Solar Power Energy has strong growth potential in the renewable energy sector and can further strengthen its market position by focusing on customer-centric marketing strategies and continuous service improvement.

Keywords: Solar Energy, Renewable Energy, Marketing Strategies, Customer Awareness, Customer Satisfaction, Solar Power Production, Dynamic Solar Power Energy, Aruppukottai.

1.1 INTRODUCTION OF THE STUDY

India is a nation that has incredible solar energy probability. As the nation is fronting a snowballing demand - supply gap in energy, it is significant to harness the solar possibility to meet the fuel energy needs. This project investigates the Indian Solar industry, its foremost growth rationales, the tests, and the trials and tribulations it faces.

Solar energy is radiant light and heat from the Sun that is harnessed using an assortment of ever-evolving technologies such as solar heating, photo voltaics, solar thermal energy, solar architecture, molten salt power plants and artificial photosynthesis. Solar energy is a CO2- free renewable energy source. It is a limitless energy source. More energy from the sun hits the earth in one hour than the entire world uses in one year.

Humans have toyed with the idea of harnessing solar radiance for a long time. Ancient civilizations learned how to use construction techniques in a manner that would enable them to trap heat from the sun during the days to keep warm during cold nights. It was only in the 1950's that relevant know-how in the field finally became technologically advanced enough to convert the sun's radiation into current using distinct devices called photovoltaic cells Since then, innovative uses of solar have been invented to not only generate energy for homes and structures, but move individuals in solar cars, ships, and even aircraft.

Solar Power in India is a crucial industry. It is the world's third largest consumer of electricity. With 300 clear sunny days, India receives around 5,000 trillion KWh/year, which is far more than the total energy consumption of the country today. The solar power on the surface of the earth is 1016 W whereas the total worldwide power demand for all needs of civilization is 1013 W. Therefore, the sun gives us 1000 times more power than we actually need. Stars such as the Sun glow for as long as s ten ten billion years.

1.2 STATEMENT OF THE PROBLEM

The increasing demand for clean and sustainable energy has created significant opportunities for the solar power industry. Despite the environmental and economic benefits of solar energy, many solar power companies face challenges in effectively marketing their products and services to potential customers. Factors such as lack of customer awareness, high initial installation costs, competition from conventional energy sources, and changing government policies influence consumer adoption of solar energy systems.

In the case of Dynamic Solar Power Energy at Aruppukottai, understanding the effectiveness of its marketing strategies is essential for improving customer reach, increasing sales, and promoting the use of renewable energy. There is a need to evaluate customer awareness, satisfaction, purchasing behaviour, and the impact of promotional activities undertaken by the company. Therefore, this study seeks to identify the marketing challenges faced by Dynamic Solar Power Energy and assess the effectiveness of its marketing practices in promoting solar power energy production and adoption in the region.

1.3 Objectives of the study

The objectives of the study help to identify the main purpose and direction of the research. In the context of marketing of solar power energy production, lack of awareness and high perceived cost are key issues because they directly affect customer adoption, market penetration, and overall growth of the solar energy sector. The following

objectives are formulated to understand the causes and effects of these barriers and to explore effective marketing strategies for solar power energy production offered by Dynamic Solar Power Energy at Aruppukottai.

Primary Objective:

- To analyze the marketing strategies employed by Dynamic Solar Power Energy at Aruppukottai for promoting solar power production and identify opportunities for enhancing market penetration and customer adoption in Tamil Nadu.

Secondary Objectives:

- To assess the current market position, customer awareness, and demand for solar energy products from Dynamic Solar Power Energy.

1.4 Scope of the study:

The scope of the study explains the area covered in the research and the extent to which the study is conducted. This project is titled "A Study on Marketing of Solar Power Energy Production in Dynamic Solar Power Energy at Aruppukottai" and focuses on understanding the lack of awareness and perceived high cost as key barriers to the adoption of solar power energy in the local market. The study aims to analyze how these factors influence customer attitudes, decision-making, and willingness to invest in solar energy systems.

The research is limited to customers, households, and small businesses in and around Aruppukottai who are potential or existing users of electricity and may consider solar power as an alternative. The scope includes examining the current level of awareness about solar energy benefits, government subsidies, and available schemes, as well as the perceived cost and financial concerns that discourage purchase. The study also covers the marketing strategies adopted by Dynamic Solar Power Energy, such as pricing models, promotional activities, demonstrations, financing options, and after-sales services.

1.5 Limitation of the study

The present study titled "A Study on Marketing of Solar Power Energy Production in Dynamic Solar Power Energy at Aruppukottai" has certain limitations, which may affect the overall findings and conclusions of the study. The limitations are as follows:

Limited Area of Study

- The study is confined only to Dynamic Solar Power Energy at Aruppukottai. Therefore, the findings may not be applicable to other solar power companies or different geographical locations.

Limited Time Period

- The study was conducted within a limited period, which restricted detailed analysis and data collection.

2. RESEARCH METHODOLOGY

Research methodology is a systematic process used to collect, analyze, and interpret data related to the research problem. It explains the research design, methods of data collection, sampling techniques, and statistical tools used in the study.

This study focuses on analyzing the marketing strategies, customer awareness, customer satisfaction, and purchase behaviour regarding solar power energy products offered by Dynamic Solar Power Energy.

Research Design

The study adopts a Descriptive Research Design because it helps in describing customer opinions, awareness levels, satisfaction, and marketing effectiveness regarding solar power energy products.

The study also uses analytical methods to identify relationships between marketing strategies and customer responses.

Nature of Research

The nature of the research includes:

- Descriptive Research
- Analytical Research

These research methods help in understanding customer behavior and evaluating the effectiveness of marketing activities.

Sources of Data

Primary Data

Primary data are collected directly from respondents through:

- Structured Questionnaire
- Personal Interview
- Direct Survey Method

Secondary Data

- Secondary data are collected from:
- Company records
- Company websites
- Journals and research articles
- Books and magazines
- Government reports
- Internet sources

Sampling Technique

The study uses the Convenience Sampling Method.

Respondents are selected based on their availability and willingness to participate in the survey.

Sample Size

The total number of respondents selected for the study is:

Sample Size = 100 Respondents

The respondents may include:

- Customers
- Employees
- Dealers
- Solar product users

Area of the Study

The study is conducted in Dynamic Solar Power Energy located in Tamil Nadu.

The research focuses on customers and users of solar power energy products.

Data Collection Instrument

The main instrument used for collecting data is a Structured Questionnaire.

The questionnaire contains:

- Multiple choice questions
- Dichotomous questions
- Likert scale questions
- Opinion-based questions

Likert Scale Scale

1 Interpretation Strongly Disagree

2 Disagree

3 Neutral

4 Agree

5 Strongly Agree

Period of Study

The study may be conducted for:

4 Months the project duration.

Hypothesis of the Study

Null Hypothesis (H_0)

There is no significant relationship between marketing strategies and customer satisfaction.

Alternative Hypothesis (H_1)

There is a significant relationship between marketing strategies and customer satisfaction.

DATA ANALYSIS TOOLS

The collected data are classified, tabulated, analyzed, and interpreted using suitable statistical tools. The following statistical tools are used for this study.

1.Percentage Analysis

Meaning

Percentage analysis is used to classify respondents according to various categories and to identify the proportion of responses.

Formula

Percentage = (Number of Respondents / Total Respondents) × 100

Purpose of Using Percentage Analysis

- To analyze demographic details
- To measure awareness level
- To identify customer opinions
- To determine satisfaction level

Suitable Questionnaire Areas

- Gender
- Age

- Education
- Awareness level
- Purchase decision Satisfaction level

2.Mean Analysis

Meaning

Mean analysis is used to calculate the average response of respondents and identify the overall opinion level.

Formula

Mean = ΣX / N

Where:

ΣX = Sum of all values

N = Number of respondents

Purpose of Using Mean Analysis

- To identify average satisfaction level
- To evaluate service quality
- To analyze customer opinion
- To measure effectiveness of marketing strategies

Suitable Questionnaire Areas

- Product quality
- Service quality
- Advertising effectiveness
- Customer satisfaction

3. Weighted Average Method

Meaning

Weighted average method is used to rank different factors based on customer preferences and priorities.

Formula

Weighted Average = ΣWX / ΣW

Where:

- W = Weight assigned
- X = Number of responses

Purpose of Using Weighted Average Method

- To rank customer expectations
- To identify important purchasing factors
- To determine preferred marketing strategies

Suitable Questionnaire Areas

- Purchase influencing factors
- Improvement suggestions
- Marketing strategy evaluation

4. Chi-Square Test

Meaning

Chi-square test is used to identify the relationship between two variables.

Formula

$\chi^2 = \Sigma (O - E)^2 / E$

Where:

O = Observed frequency

E = Expected frequency

Purpose of Using Chi-Square Test

- To test hypothesis
- To identify association between variables
- To measure significance level

Suitable Variables

- Age and awareness
- Income and purchase decision
- Education and satisfaction
- Awareness and recommendation level

5. Correlation Analysis

Meaning

Correlation analysis measures the strength and direction of the relationship between two variables.

Formula $r = \Sigma[(X - \bar{X})(Y - \bar{Y})] / \sqrt{[\Sigma(X - \bar{X})^2 \Sigma(Y - \bar{Y})^2]}$

Purpose of Using Correlation Analysis

- To identify relationship strength
- To analyze marketing effectiveness
- To evaluate customer behavior patterns

WEIGHTED AVERAGE ANALYSIS

Introduction to Weighted Average Method

The Weighted Average Method is a statistical tool used to determine the relative importance or priority of each variable based on its frequency of occurrence and assigned weight. It is widely used in management research to convert qualitative survey data into quantitative scores for meaningful comparison.

Formula: Weighted Average (WA) = Σ(Weight × Frequency) / Total Respondents

The weights are assigned in descending order — the highest weight to the most favourable response and the lowest weight to the least favourable response. The resulting Weighted Average score is then compared across variables to establish a rank order of performance or perception.

In this study, Weighted Average analysis is applied to 14 survey questions that involve rating scales or Likert-type responses, covering Product, Price, Place (Distribution), Promotion, and Customer Satisfaction dimensions of the marketing mix at Dynamic Solar Power Energy.

TABLE 4.2.14: RATING OF SOLAR PRODUCT QUALITY

H₀: Respondents do not significantly favour any particular response category.

Scale / Response	**Weight (W)**	**No. of Respondents (F)**	**Weighted Score (W×F)**	**Weighted Average**	**Rank**
Excellent	4	24	96	**2.840** (71%) Max: 4	**6**
Good	3	42	126		
Average	2	28	56		
Poor	1	6	6		
TOTAL	**—**	**100**	**284**	**WA = 2.84**	**—**

Weighted Average Score: 2.84 out of 4 (71%) — Rank: 6 out of 14

Interpretation:

The weighted average score of 2.84 out of 4 (71%) indicates a Good to Above-average perception of solar product quality. Respondents largely rated the product as Good or Excellent, reflecting confidence in the quality of products offered by Dynamic Solar Power Energy. This is a positive indicator for the company's product positioning strategy.

TABLE 4.2.16: SATISFACTION WITH DURABILITY / LIFESPAN OF SOLAR PRODUCTS

H₀: Respondents do not significantly favour any particular response category.

Scale / Response	**Weight (W)**	**No. of Respondents (F)**	**Weighted Score (W×F)**	**Weighted Average**	**Rank**
Highly Satisfied	4	18	72	**2.770** (69.2%)	**10**
Satisfied	3	53	159		

Neutral	2	17	34	Max: 4	
Dissatisfied	1	12	12		
TOTAL	**—**	**100**	**277**	**WA = 2.77**	**—**

Weighted Average Score: 2.77 out of 4 (69.2%) — Rank: 10 out of 14

Interpretation:

The weighted average of 2.77 out of 4 (69.2%) reflects Satisfactory levels of customer satisfaction with product durability and lifespan. A majority of respondents expressed satisfaction, validating the long-term reliability of solar products. Addressing the dissatisfied segment through better warranty terms and proactive maintenance can improve this score further.

TABLE 4.2.17: RATING OF PRODUCT VARIETY

H_0: Respondents do not significantly favour any particular response category.

Scale / Response	**Weight (W)**	**No. of Respondents (F)**	**Weighted Score (W×F)**	**Weighted Average**	**Rank**
Excellent	4	14	56	**2.560** (64%) Max: 4	**13**
Good	3	36	108		
Average	2	42	84		
Poor	1	8	8		
TOTAL	**—**	**100**	**256**	**WA = 2.56**	**—**

Weighted Average Score: 2.56 out of 4 (64%) — Rank: 13 out of 14

Interpretation:

The weighted average of 2.56 out of 4 (64%) is the lowest among product-related indicators, suggesting that product variety is a weak area. Customers perceive the range as Average, indicating a need for product diversification — introducing hybrid systems, agri-solar solutions, and home automation products could significantly improve this score.

TABLE 4.2.18: RATING OF AFTER-SALES SERVICE

H_0: Respondents do not significantly favour any particular response category.

Scale / Response	**Weight (W)**	**No. of Respondents (F)**	**Weighted Score (W×F)**	**Weighted Average**	**Rank**
Excellent	4	23	92	**2.860** (71.5%)	**2**
Good	3	47	141		

Average	2	23	46	Max: 4	
Poor	1	7	7		
TOTAL	**—**	**100**	**286**	**WA = 2.86**	**—**

Weighted Average Score: 2.86 out of 4 (71.5%) — Rank: 2 out of 14

Interpretation:

The weighted average of 2.86 out of 4 (71.5%) reflects a Good level of satisfaction with after-sales service. The combined Good and Excellent ratings dominate, indicating that the company maintains a reliable service framework post-purchase. Continued investment in trained service personnel and faster response times can elevate this to Excellent.

TABLE 4.3.1 GENDER OF THE RESPONDENTS

Null Hypothesis (H_0): There is no significant correlation between category rank and frequency.

Alternate Hypothesis (H_1): There is a significant correlation between category rank and frequency.

S.No.	Category	Rank (X)	Observed Frequency (Y)	Percentage (%)	Rank of X (Rx)	Rank of Y (Ry)	d = Rx– Ry	d^2
1	Male	1	74	74.0%	1	2	−1	1
2	Female	2	26	26.0%	2	1	1	1
	Total		**100**	**100%**				**Σd^2 = 2**

Calculation:

$r_s = 1 - [6 \times 2] / [2(2^2 - 1)] = 1 - [12] / [6] = -1.0000$

Pearson r = -1.0000, p = 1.0000

Spearman's ρ (rs)	p-value	Significance Level	Result
-1.0000	N/A*	α = 0.05	H_0 Not Rejected — Not Significant

Note: * With only 2 pairs, Spearman ρ = −1.000 by definition (perfectly monotone). Statistical significance cannot be computed for n = 2. Interpretation is descriptive only.

Interpretation:

The rank correlation ρ = −1.000 indicates a perfect negative relationship — Male respondents (rank 1) have the highest frequency (74) and Female (rank 2) the lowest (26). Since n = 2, formal significance testing is not applicable. The strong gender imbalance is, however, confirmed by the Chi-Square test ($\chi^2 = 23.04$, $p < 0.05$)

TABLE 4.3.2 AGE GROUP OF THE RESPONDENTS

Null Hypothesis (H_0): There is no significant correlation between age group rank and response frequency. Alternate Hypothesis (H_1): There is a significant correlation between age group rank and response frequency.

S.No.	Category	Rank (X)	Observed Frequency (Y)	Percentage (%)	Rank of X (Rx)	Rank of Y (Ry)	d = Rx–Ry	d^2
1	Below 25 years	1	22	22.0%	1	3	−2	4
2	25–35 years	2	36	36.0%	2	4	−2	4
3	36–45 years	3	18	18.0%	3	1	2	4
4	Above 45 years	4	24	24.0%	4	2	2	4
	Total		**100**	**100%**				**$\Sigma d^2 = 16$**

Calculation:

$rs = 1 - [6 \times 16] / [4(4^2 - 1)] = 1 - [96] / [60] = 0.0000$

Pearson r = -0.2000, p = 0.8000

Spearman's ρ (rs)	p-value	Significance Level	Result
0.0000	1.0000	α = 0.05	H_0 Not Rejected — Not Significant

Interpretation:

Spearman ρ = 0.000 (p = 1.000) indicates no monotonic trend between age group rank and frequency. The 25–35 years group dominates (36%), but the pattern is not linearly ordered — the youngest and oldest groups do not follow a clear ascending or descending frequency pattern. No significant correlation exists.

TABLE 4.3.3 EDUCATIONAL QUALIFICATION OF THE RESPONDENTS

Null Hypothesis (H_0): There is no significant correlation between education level rank and response frequency.

Alternate Hypothesis (H_1): There is a significant correlation between education level rank and response frequency.

S.No.	Category	Rank (X)	Observed Frequency (Y)	Percentage (%)	Rank of X (Rx)	Rank of Y (Ry)	d = Rx–Ry	d^2
1	Below SSLC	1	18	18.0%	1	3	−2	4

S.No.	Category	Rank (X)	Observed Frequency (Y)	Percentage (%)	Rank of X (Rx)	Rank of Y (Ry)	d = Rx–Ry	d^2
2	HSC / Diploma	2	39	39.0%	2	4	−2	4
3	UG Degree	3	27	27.0%	3	2	1	1
4	PG & Above	4	16	16.0%	4	1	3	9
	Total		**100**	**100%**				**Σd^2= 18**

Calculation:

$rs = 1 - [6 \times 18] / [4(4^2 - 1)] = 1 - [108] / [60] = -0.4000$

Pearson r = -0.2216, p = 0.7784

Spearman'sρ(rs)	p-value	Significance Level	Result
-0.4000	0.6000	α = 0.05	H_0 Not Rejected — Not Significant

Interpretation:

Spearman ρ = −0.400 (p = 0.600) suggests a weak negative tendency — higher education levels correspond to slightly lower frequencies — but this is not statistically significant. HSC/Diploma respondents dominate (39%), while PG & Above have the fewest (16%), reflecting the educational profile of the survey area rather than a systematic trend.

TABLE 4.3.4 OCCUPATION OF THE RESPONDENTS

Null Hypothesis (H_0): There is no significant correlation between occupation rank and response frequency.

Alternate Hypothesis (H_1): There is a significant correlation between occupation rank and response frequency.

S. No	Category	Rank (X)	Observed Frequency (Y)	Percentage (%)	Rank of X (Rx)	Rank of Y (Ry)	d = Rx–Ry	d^2
1	Govt. Employee	1	23	23.0%	2	2	0	0
2	Private Employee	2	56	56.0%	3	3	0	0
3	Business/Self-employed	3	21	21.0%	1	1	0	0
	Total		**100**	**100%**				**Σd^2 = 0**

Calculation:
rs = 1 − [6 × 0] / [3(3² − 1)] = 1 − [0] / [24] = -0.5000
Pearson r = -0.0509, p = 0.9676

Spearman's ρ (rs)	p-value	Significance Level	Result
-0.5000	0.6667	α = 0.05	H_0 Not Rejected — Not Significant

Interpretation:

Spearman ρ = −0.500 (p = 0.667) indicates no statistically significant correlation between occupation rank and frequency. Private employees dominate (56%), followed by Government employees (23%) and Business/Self-employed (21%). The non-significance confirms occupation type alone does not produce a systematic trend in participation frequency.

5.1 Summary of Findings

1.Gender and Demographics: Male respondents (74%) dominate the survey, with the 25–35 age group forming the largest segment. Most respondents are private employees with middle-level income.

2.Location and Establishment: 56% of respondents are from rural areas and 35% use solar energy for residential purposes, confirming strong rural and residential demand for solar products.

3.Awareness: 82% of respondents are moderately to highly aware of solar energy. Internet and social media (63%) is the primary source of awareness, followed by newspapers (16%).

4.Brand Awareness: 84% of respondents are aware of Dynamic Solar Power Energy, with 32% very well acquainted with the brand — reflecting good local market presence.

5.Product: Solar Panels (PV) dominate product familiarity (74%). Product quality is rated Good or Excellent by 66%, and 82% agree that products meet their energy requirements.

6.Price: 42% find pricing slightly high compared to competitors, yet 70% believe prices justify the quality. Government subsidies (46%) are the top purchase motivator, making subsidy communication critical.

5.2 Suggestions

1.Strengthen Digital Marketing: Invest in social media platforms (Facebook, Instagram, YouTube) to build awareness, engage customers, and generate leads. Only 11% currently rate social media usage as very effective.

2.Highlight Government Subsidies: Develop dedicated marketing materials that clearly explain subsidy schemes, eligibility, and application steps, as 46% cite government subsidies as the top purchase driver.

3.Expand Rural Outreach: 56% of respondents are from rural areas. Organizing community demonstrations, solar melas, and village-level awareness campaigns can significantly boost rural adoption.

4.Introduce Annual Maintenance Contracts (AMC): 37% of customers want long-term maintenance support. Offering affordable AMC plans can reduce maintenance concerns and build recurring revenue.

5.3 Conclusion

The study on marketing of solar power energy at Dynamic Solar Power Energy, Aruppukottai reveals that the company has established a reasonably strong market presence, particularly in rural and residential segments. The analysis of 100 respondents highlights that

government subsidies, cost savings, and environmental concerns are the primary motivators for solar adoption. While the company performs well in product quality, installation, and doorstep service delivery, significant opportunities exist in digital marketing, social media engagement, and rural expansion.

The high recommendation rate (75%) and purchase rate (68%) demonstrate solid customer satisfaction and brand loyalty. Key areas requiring immediate attention include improving social media utilization, enhancing complaint response times, introducing maintenance contracts, and communicating government subsidy benefits more effectively. By addressing these gaps, Dynamic Solar Power Energy can strengthen its competitive positioning and significantly accelerate solar energy adoption in and around Aruppukottai.