A Research on the Competitive Strategy of the Solar Photovoltaic Industry—With the View of Taiwan’s Renewable Energy Law

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Keywords: solar energy, solar photovoltaics, renewable energy law, Importance-Performance Analysis Model, competitive strategy

Abstract: Solar photovoltaics is a kind of emerging renewable energy used for power generation, which has no need for transportation and has lower environmental pollution, creating a kind of new life style for humans. Thus, people enter the energy-saving and pollution-reduction era. Moreover, while the global reserves of oil, gas, coal, and uranium ore are limited, solar energy is an inexhaustible natural energy that produces no environmental pollution (like CO2) during use. The Importance-Performance Analysis Model is a method often used to measure performance and analyze competitive strategy, thus, this research adopted the IPA method to analyze and investigate the performance of Taiwan’s solar energy industry, as well as its current industrial advantages and disadvantages, which will later be used as the basis to improve the performance of Taiwan’s solar energy industry and formulate competitive strategies.

1. Introduction

Recently, the global energy demand is rising year by year, and oil reserves are limited, thus, under the pressure of carbon reduction, it has become the trend to develop renewable energies, such as wind power, water power, biomass energy, and solar photovoltaics. Among them, the photovoltaic industry grows rapidly and monocrystalline and polycrystalline silicon cells have become the mainstream in the market.

Solar photovoltaics is a kind of emerging renewable energy used for power generation, and because it has no need for transportation and has lower environmental pollution, it creates a kind of new life style for humankind. Thus, people enter the energy-saving and pollution-reduction era. Solar photovoltaic (PV) panels can be made into different shapes. Photoelectric components can be installed on roofs, the surfaces of buildings, set into windows and skylights, and be equipped with a cloaking device, to become PV systems attached to buildings.

In 2015, driven by Chinese, American, and Japanese markets, as well as other emerging markets, the demand for solar PV continues to rise. According to the latest report of EnergyTrend, which is subordinate to TrendForce, the rankings of the top 5 global solar markets in the first half year were, respectively, China, Japan, the United States, England, and Germany. While the high-profile Indian market rouses itself to catch up, it failed to rank in the top 5, due to its late start. In the future, it is estimated that installations in England and Germany will level off, while China and the United States will enter the installation peak. Therefore, the overall demand continues to grow. In 2016, the global solar PV demand reached 58GW, and the demand in Asia and America continuously rises.

The Importance-Performance Analysis Model is a method often used to measure performance and analyze competitive strategy. This research adopts the IPA method to analyze and investigate the performance of Taiwan’s solar energy industry, as well as its current industrial advantages and disadvantages, which will later be used as the basis to improve the performance of Taiwan’s solar energy industry and formulate competitive strategies.

2. Literature Review

As published by Taiwan in November 2011, the concepts of “ensure nuclear safety, reduce nuclear
energy steadily, create green and low-carbon environments, and gradually build non-nuclear homes”, are used as the vision and major power promotion for overall energy development. In order to guarantee the balance and stability of short, medium, and long-term energy supply and demand, the “Energy Development Program” is especially formulated to standardize Taiwan’s energy policy, and will be used as the basis to plan overall national energy development. In order to achieve the policy of “energy, environmental protection, and economy”, the “sustainable energy policy program” is formulated. Among them, solar power generation is listed as a very important and sustainable development project.

While the global reserves of oil, gas, coal, and uranium ore are limited, solar energy is an inexhaustible natural energy and has no environmental pollution (like CO2) during the use process. Nuclear power generation has the risk of nuclear radiation and nuclear leaks, which will seriously endanger the ecosystem! Solar energy belongs to the low-voltage system, and thus, has no electromagnetic waves to jeopardize human health. Moreover, solar power generation belongs to static power generation, thus, the cost for manual maintenance is relatively lower; the peak power also reduces the huge costs for preparing power equipment.

Taiwan’s development of solar PV generation can promote industrial development, create employment opportunities in industrial chains, render energy more diversified, and ensure national energy safety. Solar PV has the characteristic of distributed generation, meaning it can effectively reduce loss during power transmission and distribution when it is combined with the construction of an “Intelligent Power Network”. Due to the innovative design of the “power generation scaffolding” of solar PV, spaces can be effectively used and buildings have the effect of heat insulation and heat control to carry out the policy of “energy conservation and emission reduction”; which will meet the challenge and responsibility of global citizens to achieve the goal of “reducing carbon and caring for the earth”.

Every year the Taiwanese government prepares a huge budget in the promotion of solar PV generation, commits itself to educational advocacy, demonstrates reward and subsidy for invention, and establishes a promotion office. However, as laws and decrees cannot advance with the times, people with vested interest and decision makers have different standard thoughts, and competent authorities standards for the “quota bidding” system, “carbon reduction”, and “renewable energy” are different, thus, such factors cause obstacles in Taiwan’s promotion of “solar PV generation”. This research formulates the 4 dimensions of “environmental awareness”, “return on investment”, “administrative convenience for people”, and “amendments to laws and decrees”, as well as 10 indicators, to analyze the competitive strategy of Taiwan’s solar PV industry.

The 4 dimensions and 10 indicators are explained, as follows:

(1) Environmental awareness: this dimension is a part of educational innovation and media marketing, and it means that nations should first advocate environment protection education, encourage people to participate in R&D and innovation, and use the communications media for public praise to affirm the values of environmental protection for lower carbon and green energy, in order to promote solar power generation works.

The dimensions of “environmental awareness” include: “educational advocacy”, “public praise”, and “innovation and R&D”.

(2) Return on investment: this refers to considering the expenditures, human costs, and actual revenues of power generation in equipment investment during the initial period; and equipment wear and tear, elimination, and maintenance during bulk purchasing when investing in the installation of solar power generation equipment and participating in application and bidding activities.

The dimension of “return on investment” includes: “bidding system”, “investment costs”, and “differential rate”.

(3) Administrative convenience to people: this means striving to achieve simplified administrative processes, more favorable bank financing, and positive cooperation degrees of public service units during the process of applying to install solar PV equipment.

The dimension of “administrative convenience for people” includes: “administrative attitude” and “simple and convenient financing”.

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(4) Amendment to laws and decrees: this refers to the relevant support facilities adopted by government to encourage people to install solar PV power generation equipment, including deregulation of construction management, penalty and reward, and relevant laws and decrees, which can timely cooperate with amendments.

The dimension of “Amendment to laws and decrees” include: “deregulation of construction management” and “penalty and reward”.

With the abovementioned 4 dimensions as the framework, this research puts forward 10 measurement indicators to discuss the performance of Taiwan’s photovoltaic industry and its competitive strategies.

3. Research Method

Martilla and James\textsuperscript{8} were the first to put forward the relevant basic framework of the Importance-Performance Analysis Model, and actually apply it. IPA draws the average scores of importance and performance of evaluation indicators in a two-dimensional diagram\textsuperscript{9-15}, where the vertical axis represents importance and the horizontal axis represents performance, as shown in Figure 1\textsuperscript{14-18}.

The 4 quadrants in the IPA method have their respective definitions\textsuperscript{19-24}:

(1) Concentrate here: customers think that the importance of a product or service indicator is higher, but the company’s performance is lower.

(2) Keep up the good work: customers think that both the importance of a product or service indicator and the company’s performance are higher.

(3) Low priority: customers think that both the importance of a product or service indicator and the company’s performance are lower.

(4) Possible overkill: customers think that the importance of a product or service indicator is lower, but the company’s performance is higher.

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{figure1.png}
\caption{Analysis diagram of importance and performance.}
\end{figure}

According to the division of different regions, managers can make the best use of limited resources, and provide an order of priorities for improvement to enhance performance or satisfaction\textsuperscript{25-28}.

4. Research Results and Discussion

This questionnaire adopts a Likert 7-point scale, with a total of 10 indicators. The questionnaire respondents include 10 professors, 12 industrial senior managers, and 3 government officials. A total of 25 formal questionnaires are distributed, and 22 valid questionnaires are retrieved, for an effective recovery rate of 88%.

This research takes the average (5.92) of importance and the average (5.76) of performance, as counted in the questionnaire, as the standard coordinates to judge whether the performance of each indicator is good or poor. Please see Table 1 for details.
Table 1. Measurement of online banking service quality and the competitive strategy.

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Items</th>
<th>Importance</th>
<th>Performance</th>
<th>Competitive strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Educational advocacy</td>
<td>5.6</td>
<td>5.5</td>
<td>Low priority</td>
</tr>
<tr>
<td>2.</td>
<td>Public praise</td>
<td>5.6</td>
<td>5.9</td>
<td>Possible overkill</td>
</tr>
<tr>
<td>3.</td>
<td>Innovation and research &amp;</td>
<td>6.1</td>
<td>5.9</td>
<td>Keep up the good work</td>
</tr>
<tr>
<td></td>
<td>development</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Bidding system</td>
<td>5.7</td>
<td>5.6</td>
<td>Low priority</td>
</tr>
<tr>
<td>5.</td>
<td>Investment cost</td>
<td>6.3</td>
<td>6.0</td>
<td>Keep up the good work</td>
</tr>
<tr>
<td>6.</td>
<td>Differential rate</td>
<td>6.1</td>
<td>5.9</td>
<td>Keep up the good work</td>
</tr>
<tr>
<td>7.</td>
<td>Administrative attitude</td>
<td>5.9</td>
<td>6.2</td>
<td>Keep up the good work</td>
</tr>
<tr>
<td>8.</td>
<td>Simple and convenient financing</td>
<td>5.9</td>
<td>5.6</td>
<td>Concentrate here</td>
</tr>
<tr>
<td>9.</td>
<td>Deregulation of construction</td>
<td>6.0</td>
<td>5.5</td>
<td>Concentrate here</td>
</tr>
<tr>
<td></td>
<td>management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Penalty and reward</td>
<td>6.0</td>
<td>5.5</td>
<td>Concentrate here</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>5.92</td>
<td>5.76</td>
<td></td>
</tr>
</tbody>
</table>

According to the IPA analysis results, the performance of Taiwan’s photovoltaic industry and its competitive strategies are analyzed, as follows:

Higher Importance and higher Performance: the 4 indicators of (3) “innovation and R&D”, (5) “investment cost”, (6) “differential rate”, and (7) “administrative attitude” belong to “Keep up the good work”. This is also the advantage of Taiwan’s photovoltaic industry, and it must maintain this good performance.

Higher Importance and lower Performance: the 3 indicators of (8) “simple and convenient financing”, (9) “deregulation of construction management”, and (10) “penalty and reward” belong to “Concentrate here”. More resources must be invested in Taiwan’s photovoltaic industry to improve the service performance and competitive power of the 3 indicators, in order to improve its competitive performance.

Lower Importance and lower Performance: the 2 indicators of (1) “educational advocacy” and (4) “bidding system” belong to “Low priority”. These 2 indicators can be placed in the last ranking order. When Taiwan’s photovoltaic industry has additional resources, improvements can be made.

Lower Importance and higher Performance: the indicator of (2) “public praise” belongs to “Possible overkill”. The performance of Taiwan’s photovoltaic industry is good, but it cannot bring more performance to the industry, and people should consider transforming their industrial resources to other competitive indicators.

5. Conclusion

This research formulated the 4 dimensions of “environmental awareness”, “return on investment”, “administrative convenience for people”, and “amendment to laws and decrees”, as well as 10 indicators, in order to analyze the competitive strategies of Taiwan’s photovoltaic industry.

According to the IPA analysis results, Taiwan’s photovoltaic industry belongs to “Keep up the good work” in the 4 indicators of (3) “innovation and R&D”, (5) “investment cost”, (6) “differential rate”, and (7) “administrative attitude”. This is the advantage of Taiwan’s photovoltaic industry, and it must maintain such good performance. However, the 3 indicators of (8) “simple and convenient financing”, (9) “deregulation of construction management”, and (10) “penalty and reward” belong to “Concentrate here”. More resources must be invested in Taiwan’s photovoltaic industry to improve the service performance and competitive power of the 3 indicators, in order to improve its competitive performance.

References:


