



# Determinants of Chinese SMEs' Entry to Asean Renewable Energy Market

Luo, W.<sup>1,2</sup>, Tantranont, N.<sup>1</sup>, Rakwichian, W.<sup>3</sup>, and Setthapun, W\*.<sup>1</sup>

<sup>1</sup> Asian Development College for Community Economy and Technology, Chiang Mai Rajabhat University, Chiang Mai, Thailand, 50300

<sup>2</sup> Yunnan Academy of Scientific and Technical Information, Yunnan Province, P.R.China 650051

<sup>3</sup> School of Renewable Energy and Smart Grid Technology, Naresuan University, Phitsanulok, Thailand 65000.

## ARTICLE INFO

### Article History:

Received: July 30, 2019

Final Revision: November 25, 2019

Available Online: December 24, 2019

## KEYWORDS

Determinants of SMEs, Renewable Energy Market, ASEAN Market

## CORRESPONDING AUTHOR

\*E-mail: [worajit@cmru.ac.th](mailto:worajit@cmru.ac.th)

## ABSTRACT

ASEAN communities seek such resources as technologies and products from other countries to develop solar energy for sustainable development. In response to that, major renewable-utilization advanced countries including China has introduced funds, technology, and products into ASEAN. Despite the fact that China SMEs have a strong willingness to enter ASEAN solar energy market and ASEAN has demanded to develop the solar energy industry, only a few of them have succeeded in operation in the long-run. Introducing renewable energy technology and products from one place to another or bringing them from laboratory into community is not just a process of capital equipment supply from one firm to another but also includes the transfer of skills and know-how for operating and maintaining technology hardware, and knowledge for understanding this technology so that further independent innovation is possible by recipient. The purpose of this research was to determine the dynamic elements for China SMEs entering into the solar energy market of middle-income ASEAN member states. This participatory research collects data from both primary and secondary sources. Primary data sources include a questionnaire for 408 respondents of whom background across government officials, research personnel and industry, and interviews for 24 of them. Secondary data include reports from the Asian Development Bank, ASEAN Centre for Energy and other related documents from ASEAN governments. Data collected from the questionnaire were firstly analyzed through quantitative way: the value of Mean, Standard Error of Mean, Median, Standard Deviation (Std.) and Variance of each element were calculated. Information collected from interviews were then analyzed through the qualitative way. The results showed that policy environment, level of industrial and economic development, people's willingness to cooperate, correct policy interpretation, capacity building and the presence of a third-party intermediary agency are the determinants of Chinese SME's successful entry to ASEAN renewable energy market. The mature policy environment of the ASEAN, need of industrial upgrading and sound economic development would facilitate the development of renewable energy industry, meanwhile, the strong willingness to cooperate, correct policy interpretation on preferential policies, well capacity building of both cooperative sides and the presence of a third-party intermediary agency would promote the cooperation between Chinese SMEs and relevant partners of ASEAN and the sustainable operation of Chinese SMEs in ASEAN.

## 1. INTRODUCTION

### 1.1 Research Background

Over the past 20 years, the joint efforts of all parties from the United Nations Framework Convention on Climate Change (UNFCCC) have achieved a successful development progress of global actions on climate change. On the Paris Conference on Climate Change in December 2015, attended parties recalled the paramount importance of setting up incentive mechanisms to encourage countries to pursue green, circular and low-carbon development featuring both economic growth and an effective response to climate change. Apart from the concerns about climate change due to increasingly human-enhanced global warming effect, there is a clearly growing concern about how

energy can be used on a more sustainable basis. The fact is that rapid economic growth of the ASEAN countries since 2000 has been coupled with solid growth in energy consumption. According to Asian Development Bank's data, driven by economic and industrial development and higher living standards, electricity demand in Asia and the Pacific is projected to more than double between 2010 and 2035.

### 1.2 Literature Review on Renewable Energy Potential in ASEAN

International Renewable Energy Agency (IRENA) and ASEAN Centre for Energy (ACE) had issued a Renewable Energy Map (ReMap) in October 2015 for ASEAN based on the national energy plan and the development mission for new and renewable energy of each ASEAN member state respectively. Generally

speaking, the share of new and renewable energy in primary energy system for ASEAN should be 23.2% by 2025, and 29% by 2030. Current, the share of it was under 10% in 2014, and the share is projected to approximately 17% by 2025 according to the reference cases from 2005 to 2014. An additional 6% should be made to reach the ASEAN goal by the end of 2025. This Remap has been discussed and recognized by ASEAN Energy Ministers and Senior Officials in Nay Pyi Taw, Myanmar, in the occasion of the 34<sup>th</sup> ASEAN Ministers on Energy Meeting (AMEM).

Renewable energy sources are abundant in most of the ASEAN member countries. Among them solar energy is the most widely applied one. Considering all ASEAN countries locate in the tropical region, they have relatively long radiation time all year around and receive high daily solar radiation, which is more than 4.5 kWh/m<sup>2</sup> on average. Solar technologies are more widely adopted in Indonesia, Thailand, Philippines, and Vietnam compared to other ASEAN countries [1].

Asian Institute of Technology also indicated that there is a clear gap between abundant solar energy resources and their utilization in the ASEAN countries. ASEAN countries have not utilized the renewable energy resources anywhere near to the potential [2]. To move towards the application of solar energy technology, it is necessary to identify and analyze the barriers which caused the potential-utilization gap in ASEAN countries. A lot of previous research had revealed that lack of sufficient funding, lack of technology improve efficiency of transferring renewable resources into actual products, lack of experience and know-how to maintain renewable energy products and projects working for a long-period of time and incomplete political frameworks are some of the most common reasons [2]. Hence, there is a need to improve capacity building in each ASEAN member country to address these barriers and to finally promote solar energy technology and relevant products being well utilized in ASEAN.

Coincidentally, IRENA and ACE suggested that solar photovoltaic requires the most efforts to ramp up capacity installations because it had the largest gap between current installation rates referencing with the data from 2006 to 2015 and the potential deployment identified in the future ReMap (Figure 1.1) [3]. In the past decade, the largest rate of annual installations occurred in Thailand, with about 175 MW per year, while the rate of installations in the Philippines and Malaysia have averaged about 15-20 MW per year. According to the reference data, Malaysia needs to increase its efforts by an element of six and triple this further and Thailand needs to double this trend if they realize their potential mentioned in Renewable Energy Map, yet Indonesia faces the biggest challenge ever.

In these years, the annual installation rates were just around 1 MW per year. IRENA and ACE have foreseen an ambitious rate of 500 MW per year between 2015 and 2025 to fulfill the mission of developing renewable energy and constructing flexible energy system for each ASEAN member state. Renewable Energy Map suggested that the potential of solar energy is significantly higher at 2,500 MW per year, especially the paramount potential of island and off-grid solar PV systems

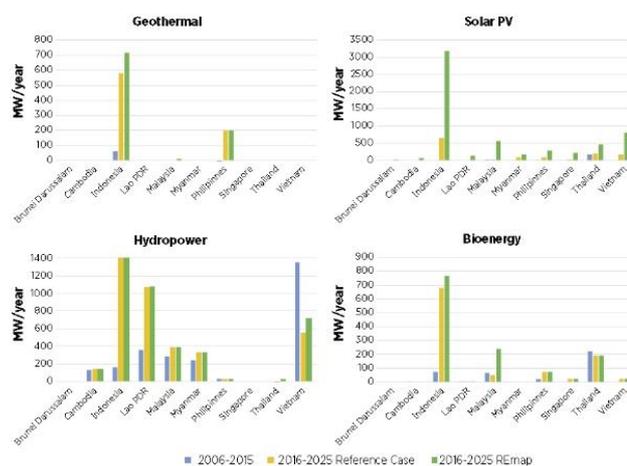


Figure 1. Solar PV utilization in ASEAN Countries  
Source: IRENA and ACE [3]

### 1.3 Research Objective

Renewable energy sources are abundantly available in most of the ASEAN member countries. Among them solar energy is the most widely applied one. To develop solar energy and re-shape the existing energy structure under today's dynamic global economy and environment, ASEAN communities seek such resources as technologies and products from other countries. In response to that, major renewable-utilization advanced countries, such as United States, Germany, Australia, China, Japan, are keen to introduce their fund, technology and products into ASEAN [3,4]. Among all companies who strive to enter into ASEAN market, the cost-sensitive Small-to-Medium Enterprises (SMEs) take a big proportion. Therefore, the purpose of this research was to determine the dynamic elements for China SMEs entering into solar energy market of middle-income ASEAN member states.

## 2. MATERIALS AND METHODS

This research was conducted through surveys by studying how the elements, such as current policies/regulations context for renewable energy and cooperation, level of industrial and economic development, people's attitudes to cooperate, as well as the presence of third-party intermediary agency and other dynamic elements would affect the development of solar energy industry in ASEAN member states and the China's SMEs successful entry to ASEAN market.

### 2.1 Research Scope

There were ten countries in ASEAN area, and the market of renewable energy may differ from each other significantly. Therefore, in order to narrow down the research scope, a top-down approach was taken. After taking assessment to theoretical potential, technical and economic of ASEAN, we would only focus on determinants for Chinese SMEs entering into five ASEAN middle-income countries, namely Indonesia, Malaysia, Philippines, Thailand and Vietnam.

### 2.2 Population and Sample Scope

After using the top-down methods, the research would only focus on 5 ASEAN member states which are Indonesia, Malaysia, Philippines, Thailand and Vietnam. Gathering data from all population in ASEAN member states was not appropriate for this

research because not all population have contact with renewable industry. Therefore, an appropriate and applicable sampling method was chosen.

To determine the sample size, the Taro Yamane (Formula 3.1) method was used based on the total population of which is 548.46 million in ASEAN and was 1.42 billion in China by the end of 2018. Given the N was 548.46 million and the acceptable error is 5%, the number of sampling should be no less than 400.

$$n = \frac{N}{1 + N * (e)^2}$$

Participants of questionnaire came from a random sample of relevant officials, personnel in R&D institutes and private sector in the field of renewable energy of the 5 ASEAN member states and China respectively. Career background (governmental official, research staff and entrepreneur) of respondent of each country was designed to be as equal as possible.

**2.3 Research Procedure**

638 questionnaires were sent to political officials, research personnel and entrepreneurs during international conferences such as The China-ASEAN New Energy Forum and SNEC 2019 PV Power Expo, and through email. Finally, 408 questionnaires were returned and found valid for this research.

**2.4 Data Analysis**

There were 22 questions in the questionnaire used as direct resources of determining whether policy environment, level of industrial development, level of economic development, people’s willingness to cooperate, cultural and educational difference, difficulties in partner selection, correct policy interpretation, intellectual property protection, capacity building and the presence of third-party intermediary agency had impacts on the successful entry of China’s SMEs into ASEAN solar energy market.

- Analysis the impact of current policy environment on successful entry: Q1-1, Q1-2, Q1-3, Q1-4 and Q1-7 of Section 1, and Q5-1 of Section 5
- Analysis the impact of current level of industrial development on successful entry: Q2-1, Q2-2 and Q2-3 of Section 2

- Analysis the impact of current level of economic development on successful entry:Q2-4, Q2-5 and Q2-6of Section 2
- Analysis the impact of people’s willingness to cooperate on successful entry:Q3-1, Q3-2, Q3-3 and Q3-4 of Section 3
- Analysis the impact of different cultural and educational on successful entry:Q5-2 of Section 5
- Analysis the impact of difficulties of partner selection on successful entry: Q5-3 of Section 5
- Analysis the impact of correct policy interpretation on successful entry:Q5-4 of Section 5
- Analysis the impact of intellectual property protection on successful entry:Q5-5 of Section 5
- Analysis the impact of capacity building of both collaborative parties on successful entry: Q5-6 of Section 5
- Analysis the impact of presence of third-party intermediary agency on successful entry: Q6-1 and Q6-2 of Section 6

Value of Mean, Standard Error of Mean, Median, Standard Deviation (Std.) and Variance (Var.) of each one of 10 elements were grouped and calculated to determine whether they are the determinants for Chinese SMEs successful entry to renewable energy market of ASEAN.

Low scores of Q2-1 and high scores of Q2-2 and Q2-3 represented current industrial development played role in deciding successful entry, and similarly, low scores of Q2-4 and high scores of Q2-5 and Q2-6 represented the economic development played role in deciding successful entry. Apart from them, the higher the mean score was, the more importance this element was to successful entry. One element would be considered as “Has obvious influence” when the mean value is greater than 3.

**3. RESULT AND DISCUSSION**

**3.1 Research Results**

Questions were grouped by element and considered as an entity to decide the impacts. Descriptive statistics of each element were shown below:

**Table 2.** Descriptive Statistics of Questions by Element

| Elements                            | N           |         | Mean | Std. Error of Mean | Median | Std. | Var. | Percentiles |    |    |   |
|-------------------------------------|-------------|---------|------|--------------------|--------|------|------|-------------|----|----|---|
|                                     | Valid       | Missing |      |                    |        |      |      | 25          | 50 | 75 |   |
| Policy Environment                  | 2448        | 0       | 3.89 | .0166              | 4.00   | .819 | .671 | 3           | 4  | 4  |   |
| Industrial Development              | Q2-1        | 408     | 0    | 3.35               | .043   | 3.00 | .870 | .757        | 3  | 3  | 4 |
|                                     | Q2-2 & Q2-3 | 816     | 0    | 3.41               | .034   | 3.00 | .958 | .918        | 3  | 3  | 4 |
| Economic Development                | Q2-4        | 408     | 0    | 3.23               | .041   | 3.00 | .819 | .671        | 3  | 3  | 4 |
|                                     | Q2-5 & Q2-6 | 816     | 0    | 3.75               | .028   | 4.00 | .805 | .648        | 3  | 4  | 4 |
| People’s Willingness to Cooperate   | 1082        | 0       | 3.87 | .023               | 4.00   | .752 | .566 | 3           | 4  | 4  |   |
| Cultural and Educational Difference | 408         | 0       | 3.38 | .038               | 3.00   | .764 | .584 | 3           | 3  | 4  |   |
| Difficulties of Partner Selection   | 408         | 0       | 3.64 | .036               | 4.00   | .725 | .526 | 3           | 4  | 4  |   |
| Correct Policy Interpretation       | 408         | 0       | 3.76 | .036               | 4.00   | .732 | .535 | 3           | 4  | 4  |   |
| IP Protection                       | 408         | 0       | 3.55 | .044               | 3.00   | .888 | .788 | 3           | 3  | 4  |   |
| Capacity Building                   | 408         | 0       | 3.98 | .034               | 4.00   | .688 | .474 | 4           | 4  | 4  |   |
| Presence of Intermediary Agency     | 816         | 0       | 3.74 | .025               | 4.00   | .726 | .527 | 3           | 4  | 4  |   |

The Frequency and percent of each element by “Has obvious influence” and “No obvious influence” is shown in Table 3.

**Table 3** Descriptive Statistics of Questions by Element

| Element                             | Influence   | Frequency | Percent (%) |
|-------------------------------------|-------------|-----------|-------------|
| Policy Environment                  | YES         | 1682      | 68.71       |
|                                     | NO          | 667       | 31.29       |
| Industrial Development              | Q2-1        | YES       | 249         |
|                                     |             | NO        | 159         |
|                                     | Q2-2 & Q2-3 | YES       | 397         |
|                                     |             | NO        | 419         |
| Economic Development                | Q2-4        | YES       | 259         |
|                                     |             | NO        | 149         |
|                                     | Q2-5 & Q2-6 | YES       | 514         |
|                                     |             | NO        | 302         |
| People's Willingness to Cooperate   | YES         | 775       |             |
|                                     | NO          | 307       |             |
| Cultural and Educational Difference | YES         | 164       |             |
|                                     | NO          | 244       |             |
| Difficulties of Partner Selection   | YES         | 231       |             |
|                                     | NO          | 177       |             |
| Correct Policy Interpretation       | YES         | 265       |             |
|                                     | NO          | 143       |             |
| IP Protection                       | YES         | 203       |             |
|                                     | NO          | 205       |             |
| Capacity Building                   | YES         | 313       |             |
|                                     | NO          | 95        |             |
| Presence of Intermediary Agency     | YES         | 528       |             |
|                                     | NO          | 286       |             |

The mean value of rating the impact of policy environment was 3.89, and the median value of these 2448 valid counts was 4. Results implied that the majority of respondents thought current policy environment of their country can help the development of renewable energy industry.

Q2-1 presented the satisfaction of current power infrastructure. Although the mean value of this question was 3.35, more than two thirds (61%) participants rated score less than or equal to 3. And Q2-2 and Q2-3 presented whether there is a need of industrial upgrading. The mean of this sub-section was 3.41, and nearly half (48.6%) of respondents thought there was a need of industrial upgrading in their country.

Q2-4 presented whether current economic condition constrain the community from purchasing and using relevant renewable energy products. Although the mean value of this question was 3.23, more than two thirds (63.5%) participants rated score less than or equal to 3, and most of them gave score 3 to this question. And Q2-5 and Q2-6 presented the rating of actual demand of using renewable energy products. The mean value of this sub-section was 3.75, implying current economic position allows the communities to purchase renewable energy products. The mean value of rating people's willingness to cooperate was 3.87, the variance of these 1082 data was 0.556. 71.62% of respondents from China and ASEAN countries had strong willingness to cooperate in forms such as jointly research and business operation. It indicated that current people's attitudes are facilitating Chinese SMEs who want to expand business in ASEAN renewable energy market.

The mean value of rating the impact of cultural and education difference was 3.38, however, the median value (3) presented nearly two thirds (59.80%) participants thought the cultural and educational difference between their country and those of China would not have influence on Chinese SMEs successful entry. The mean value of rating the impact of partner selection was 3.64, indicating that selecting an appropriate partner was difficult and the difficulties had impacts on successful entry.

The mean value of rating the impact of correct policy interpretation was 3.76 and the median value of this element was 4. It implied that a correct interpretation on policies, regulations and laws played important role in deciding China's SMEs successful entry.

Although the value of mean (3.55) indicates IP protection had influence on successful entry, the value of median (3) indicates the to the contrary. More than half (50.25%) participants thought the IP can be well protected would not have influence on China's SMEs successful entry so this should not become an issue for Chinese SMEs successful entry.

The mean value of rating the impact of capacity building was 3.98, and the median value of this question was 4. More than three fourths (76.71%) respondents gave score 4 or above. It indicated that capacity building had influence on successful entry.

The mean value of rating the impact of intermediary agency presence was 3.74, and more than three fifths (64.71%) respondents gave score 4 or above. It presented that a large proportion of respondents appreciated the presence of a third-party intermediary agency and it had positive influence on the successful entry and long-term sustainable operation for Chinese SMEs in the renewable energy market of ASEAN middle-income countries.

### 3.2 Discussion

Despite of the fact that China SMEs have strong willingness to enter ASEAN solar energy market and ASEAN have demands to develop solar energy industry, only a few of them has succeed in operation in a long-run in the past decade. It is well recognized that ASEAN has abundant renewable energy resources, however, one should realize that introducing renewable energy technology and products from one place to another or bringing them from laboratory into community is not just a process of capital equipment supply from one firm to another but also includes the transfer of skills and know-how for operating and maintaining technology hardware, and knowledge for understanding this technology so that further independent innovation is possible by recipient. SMEs successful entry and sustainable operation requires the consideration of more dynamic elements other than of unexploited renewable energy in the area of Southeast Asia.

## 4. CONCLUSION

From the quantitative analysis of 408 survey sample, we concluded that policy environment, level of industrial development, level of economic development, people's willingness to cooperate, correct policy interpretation, capacity building and the presence of third-party intermediary agency are the determinants for China's SMEs successful entry to renewable energy market of ASEAN middle-income countries. However, the cultural and educational difference and IP protection had no significant impacts on Chinese SMEs' successful entry.

## REFERENCE

- [1] COGEN—Energy Field of study—AIT (2015)., Boost to Sustainable Energy in ASEAN Countries. Press Release.
- [2] Lidula, N.W.A et. al (2006)., "ASEAN towards clean and sustainable energy: Potentials, utilization and barriers", Renewable Energy, Vol. 32 (2007), pp. 1441-1452.

- [3] IRENA and ACE (2016)., Renewable Energy Outlook for ASEAN: a REmap Analysis. International Renewable Energy Agency (IRENA), Abu Dhabi and ASEAN Centre for Energy (ACE), Jakarta.
- [4] ASEAN Secretariat (2015)., ASEAN Statistical Yearbook.
- [5] ACE (2015). The 4th ASEAN Energy Outlook 2013-2035. ASEAN Centre for Energy. Retrieved from <http://www.aseanenergy.org/resources/publications/the-4th-asean-energy-outlook/>