Connecting Solar Generated Electricity during Flood Disaster in the FELDA Communities of Malaysia: The Public Perception

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Connecting Solar Generated Electricity during Flood Disaster in the FELDA Communities of Malaysia: The Public Perception

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Abstract. Solar electrification is a significant solution for supplying electricity at the evacuation centre during power shortage or blackouts in a flood disaster situation. However, it is a challenge to connect this technology to the local communities, especially for the rural people due to the limited accessibility of the technology. Strong support from the Government is needed in disseminating this technology for the locals, especially during a flood disaster where victims need the power aid relief during the power interruption. By using solar technology, the power can be generated and stored ahead of time at the flood relief centre. This paper will investigate on the perception of rural communities in Malaysia; focusing FELDA communities, in connecting the solar electrification during a flood disaster. The significant approaches for connecting FELDA communities with solar electrification need to be explored strategically. In order to investigate the acceptance of FELDA communities in connecting solar electrification in the flood evacuation centre, survey research through questionnaires has been obtained from the respondents. Interestingly, the result shows that the back-up electricity supply system is needed in order to accommodate the electricity supply at the evacuation centre when flood occurs. The research found that the local people are ready to use the solar electrification as a supportive electricity system during flood disaster. This paper has elaborated on the significance approaches towards connecting people with the technology.

1. Introduction

Malaysia has a full advantage to utilise the solar energy as an additional energy sources since this nation receives abundant solar energy all the year which allowing better benefit in energy resources perspective. Malaysia receives an average solar radiation of 1643 kWh / m^2 per year with 4500Wh/m^2 of the average solar radiation per day [1],[2]. Hence, this climate is suitable to utilise renewable energy, particularly solar energy [3],[4],[5]. By looking on the sunray data, Malaysia has the potential to apply the solar energy through PV panel generation [6],[7].

PV electrification can be used in any situation, including natural disaster. Flood disaster, for instance, can occur without signal. When these situations happen, the components of electricity system will be disrupted or shut down. In fact, most of the flood victims depend on the electricity during these emergencies moments. They needs the electricity to operate the electricity appliances such as refrigerator, lighting, radio or medical equipment [8]. During a normal practice, flood victims use gasoline or diesel generator to supplement or back up the power energy. However, this practice can link to a hazard situation since the fuels needed for generating the generator can also spark fire. In

addition, the generators also produce noise and can leads to traumatic stress [8]. The body parts of the generators are also heavy and bulky which may cause hassle during the evacuation process. Therefore, it is significant to have a solution that is applicable to all parties. Using the renewable energy; through solar photovoltaic; it can acts as a back-up electricity supply during a flood disaster [9], [10]. By using this technology, the electric power can be supplied to the people immediately without delay.
During rainy season, the solar PV system is capable to generate electricity with the aid of energy storage gained during daylight time. According to [11], the benefits of solar PV systems are clean and pollution-free energy, reliable and flexible. By using the solar PV, the important system can be operated during flood seasons such (i) the multi-purpose portable system, (ii) emergency lightings for passageways, (iii) transportation, (iv) communication support and (v) additional energy in the shelters during the emergency [12]. For this reason, it is significant to investigate on the perception of communities on the solar engagement in order to measure the importance of introducing the ability of the system to meet the critical power needs during flood disaster, especially on the strategic approaches needed.

2. Strategic approaches towards public engagement for solar electrification

Strategic approaches are crucial in engaging the solar technology with the rural communities. The communities; whether the urban or rural communities, should directly involve, interact and have the opportunity to give the feedback of the technology to the Government [13].
Many form of engagement approaches can be applied to the public in order to build the relationships and trust between the Government, stakeholders and the people [13] (See Figure 2). By using the engagement approaches shown in Figure 2, the quantity and quality of communities information available can be improved especially during emergencies or natural disaster [14]. The aim of this engagement spectrum is to connect people, especially the targeted population (e.g rural communities) through various levels of strategic approaches. From the first stage of disseminating information, to the consultation, involvement, collaboration and the empowering level of the solar technology in the communities. Therefore, this research is significant in investigating the public perception towards engaging the technology through these various spectrums of engagement.
It is widely known that in other developed countries, for instance like Japan and Germany, the solar energy communities' programmes are highly supported by the technology implementers [15] [16]. However, in Malaysia, this scenario is still in growth and under gradual development [17]. The various type of community engagement approaches such as information gathering, public thinking, information dissemination, consultation, advice, counselling and etc. [18] can be implemented in order to attract the local people to involve directly within the solar energy projects. Therefore, through this study, the aim of achieving the phases of (i) information gathering and (ii) public thinking as highlighted by [18] can be gained through the survey research presented in section 4 and 5. This is important in finding a significant mechanism that can help the people in facing power interruption during flood disaster.

3. Case study: felda jengka 6 in pahang, malaysia

FELDA is the rural settlement area provided by the Government of Malaysia since the early 1960s in order to help rural people to have basic housing necessities and source of income through agricultural projects subsidised by the Government [19]. For this study, one of the FELDA settlements that have experienced flood disaster has been chosen to obtain the public perception on the solar energy usage during a natural disaster. The study area is a FELDA Jengka 6 in Bandar Tun Razak in the Pahang state, Malaysia. This settlement has own administrative building which is to cater the society and operational management. For the settlers, the FELDA management provides public amenities such as school, public hall, community hall, mosque, field, futsal court, Tomoi sport court and shoplot.

4. Methodology

The survey research was used for this study in order to gain public perception in the implementation of solar generated electricity during a flood disaster. During the survey section, the structured questionnaires were given to the FELDA residents as respondents at the study area. Door-to-door questionnaires survey was conducted through snowball sampling. Only 25 respondents were chosen to answer the questionnaires based on the specific criteria which involves i) residents that have experienced flood in the case study, ii) FELDA settlers that lived in the area for more than 5 years and iii) has chosen the FELDA hall as an evacuation shelter during the flood disaster. The survey was conducted for 2 months. The respondents were asked about (i) the experience during the flood, (ii) the impact of electricity supply system during flood, (iii) the opinion on the back-up electricity supply system provided during flood and (iv) the readiness of the people to accept the option of back-up electricity system during flood. This survey also involved questions about the engagement approach of solar electricity supply and the method to approach the solar electricity supply system to the FELDA community in order to identify the public thinking as highlighted by [18]. The data were analysed through descriptive statistics data analysis where by the percentage and frequency of the question can be identified.

5. Result

From the 25 selected respondents, 23 respondents have given effective answers for the distributed questionnaires. Therefore, the study has used the 23 respondents' opinion to have an overview and perception on the solar technology application during flood. 20 (87%) respondents out of 23 agree that the needs of back-up electric supply system to accommodate the electricity supply at the flood relief centre. Only 3 respondents or 13% disagree with the back-up electric supply system at the flood relief centre. 22% respondents not ready to use the solar generated electricity supply system as a back-up electricity system during flood. However, the rest of the respondents 78% ready to use the solar electricity system as a back-up electric energy when floods occur.

From Figure 1, it is shown that most of the respondents; 22 people (96%), agree that brochures, pamphlets and newsletters are the suitable mechanism to engage the knowledge on the solar power technology application within the local people. 17 respondents stated that the local information centre from government/NGO are the suitable mechanism to engage the solar power technology application with them. It is followed by the community service, 16 (70%) respondents. Only 1 (4%) respondent picks the focus group as a suitable mechanism to engage with the solar power technology application during flood.

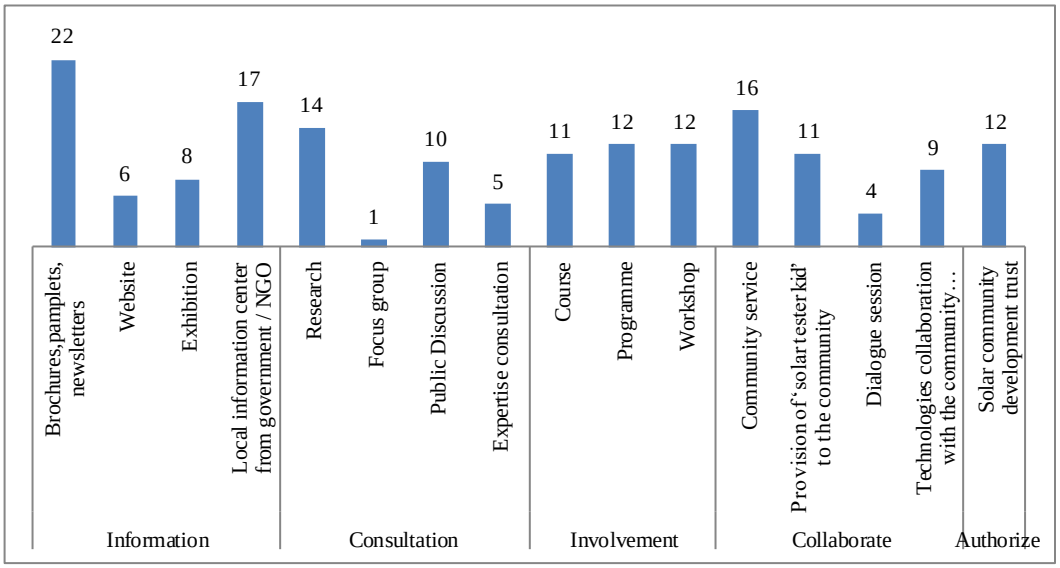

Figure 1. The Solar Engagement Approaches

Figure 2 shows data on how technologists can approach the respondents to use solar generated electricity during the occurrence of flood. Technologist can be defined as the expertise on the technical area of RE field which includes solar technology project [20]. The 21 (91%) respondents stated that the announcement through mass media from television, radio and printed media are the better mechanism where the technologist can engage the community. However, 15 (65%) respondents mentioned that the demonstration of technology is the mechanism needed to engage the respondents to use solar electrification during the flood. However, only 9 respondents agree that infografic sessions is the needed mechanism that the technologist can engage the people with solar technologies.

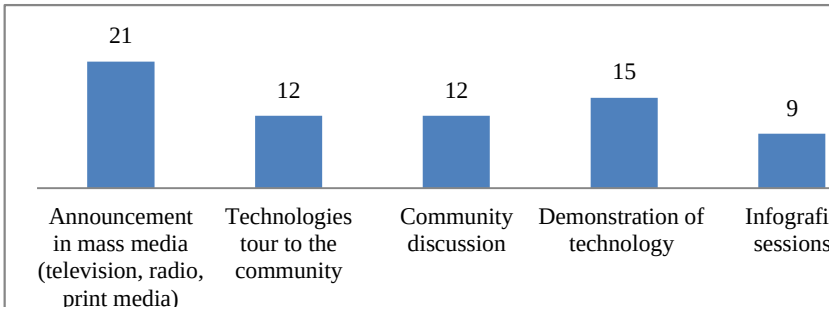

Figure 2. Solar engagement approaches through a technologist

Among the respondents, 21 (91%) respondents agree if FELDA can provide solar electricity aid programs during floods to overcome local electricity supply disruption. Only 2 (9%) respondents were disagree with the statement.

6. Discussion

The back-up electricity system is very important to enhance communities' resilience after the flood happen [10]. From the analysis, it shows 87% respondents agree that they need a back-up electricity to accommodate the electrical supply at the flood relief centre. On top of that, 78% respondents are ready to use the solar electricity supply system as back-up electricity systems during flood occurrence. Solar electricity is one of the renewable energy (RE) that meets the criteria of green technology under the Malaysia National Green Technology Policy [11].

Through the 11th Malaysia Plan, the enforcement of the Renewable Energy Act (2011) and the introduction of Fit in Tariff (FiT) have led towards the RE development [11]. It shows that the Malaysia government supports the use of solar technology. In the Budget Speech Year 2017, the Malaysian government give full supports through the national budgetary incentives to expand the program of solar technology development [11]. The mechanism of engagement is very crucial to make sure the success of technologies' usage. From the survey, 22 (96%) respondents identify that brochures, pamphlets and newsletters are the suitable mechanism to engage the solar electricity with local people. However 21 (91%) respondents mentioned that the announcement through mass media such from television, radio and printed media will give better direction to the technologies to engage the local people with the solar technology. Among the respondents, 21 (91%) respondents agree if FELDA can provide solar electricity aid programs during flood to overcome local electricity supply disruptions. This may improve the evacuation aid facilities and improve the quality of life of FELDA communities.

7. Conclusion

Connecting FELDA communities with the solar electrification technology during flood disaster is essential to help the FELDA communities to continue daily life at the flood relief center. By using the questionnaire, 23 respondants meet the criterias to collabrate in the survey. Most of the respondant agree that mass media for instance television, radio and printed media is the better public engagement

approach where the technologist can engage the local people. The stakeholders from the government or non government organization should link together to help the FELDA communities to engage the solar electrification at the FELDA evacuation center. For the success of electricification in FELDA specially during flood disaster, the solar technology can implement as a relief mechanism in FELDA.

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