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THE IMPLICATIONS OF SOLAR PANELS TOWARDS CRIME PREVENTION IN THE UNIVERSITY OF LIMPOPO

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Abstract

The purpose of this paper is to conceptually analyse and demonstrate the implications of solar panels towards crime prevention in the University of Limpopo. It argues that the development of solar panels as a strategy for the University of Limpopo can increase and reduce criminal incidents, and for the campus to save costs and supply renewable energy sources to the community of Mankweng. Crime in South Africa has been an issue of contention in institutions of higher learning, businesses, and the society at large. This article examines the factors behind the implications of solar panels towards crime prevention, role of solar panels in crime deterrence and implementation of solar panels influences safety and control. Furthermore, the paper underscores the potential outcomes of this trend on student-staff safety and the environment. The concern is great deal on criminal incidents within the University of Limpopo that occur at night during loadshedding. This leads to robbery, break-ins, rape and other criminal activities that occurs at night during power cuts. As a result, it is not a shock that most students on campus struggle to keep up with their academic workload during loadshedding at night and leaves student accommodation vulnerable in dark hours. It is evident that solar panels offer a clean and abundant source of power. This is a conceptual paper that depends heavily on qualitative approach to conceptually demonstrate the implications of solar panels towards crime prevention in the University of Limpopo which ultimately threatens student-staff safety. Hence, this paper recommends that the installation of solar panels in all institutions of higher learning would ultimately assist in curbing some of the criminal elements not only in the University of Limpopo.

Keywords: ***Solar Panels; Crime Prevention; Student-Staff Safety; University of Limpopo***

1. INTRODUCTION

In the contemporary era, the surge in global energy consumption is primarily attributed to the rapid expansion of populations, industrialization, and the progress of developing nations (Muhammad, Tabassum, Muscat, Molla, Ashraf & Ahmed, 2020). As the world grapples with the challenges of climate change and the depletion of traditional energy sources, the adoption of solar panels becomes imperative. Solar panels offer a clean and abundant source of power. To put it into the context of this paper, solar panel contributes to crime prevention, sustainable practices and leads to a greener future. Solar-powered lighting systems can improve visibility in and around campus buildings, parking lots, walkways, and other outdoor spaces (Blowers & Evan, 2014:61). Well-lit areas can discourage criminal activity and improve the performance of surveillance and security cameras. Solar panels can offer a dependable power source for security equipment, such as alarms, access control systems, and emergency communication devices (National Renewable Energy Laboratory, 2011). These systems must have a steady power source in order to function amid blackouts or intentional attempts to interfere with the electrical grid. Power outages can occur on campuses that are dependent on conventional power grids as a result of malicious acts, natural disasters, or equipment problems. When solar panels are combined with battery storage, they can act as a backup power source, keeping vital security systems operational in case of emergency. According to Lister (2012), educational institutions show their dedication to environmental stewardship and sustainability by making solar energy investments. Students, teachers, and staff may feel more connected to one another and adopt a vigilante culture as a result, which may raise

awareness and motivate preventative measures against crime. Heubergur (2018), suggests that solar panels are key drivers which can help maximize the earth's resources and conserve energy. The purpose of the paper is to assess the implications of solar panels in crime prevention at the University of Limpopo. This paper argues that the current development of solar panels as a strategy for the University of Limpopo can increase security and reduce criminal incidents, and for the campus to save costs and supply renewable energy to the community. This paper does not undo traditional energy sources, which are mostly physical. However, it seeks to provide another perspective of renewable energy sources in the University of Limpopo. This is a conceptual paper which shows that solar panels are cautious to venture into crime prevention and safety. It concludes and recommends maximizing the benefits of solar panels in enhancing safety and security at the University of Limpopo.

RESEARCH PROBLEM

The concern is criminal incidents within the University of Limpopo that occur at night during load shedding. The problems are assault, rape, robbery and other crime incidents at occur at night during load shedding (Mankweng Police Records Crime Stats, 2023). Students and staff become victims of crime during disruption of power mostly at night. There is limited access to back-up on student accommodation which gives criminals an opportunity. Many students struggle to keep up with their academic workload during load shedding. Loadshedding leaves student accommodation vulnerable in dark hours. The current backup generators do not cover all the student residences at night during load shedding. The problem is loadshedding at night which gives criminals an opportunity to do their criminal activities and by promoting the installation of solar panels on university rooftops will help campus security to deter criminal activity.

LITERATURE REVIEW

This section focuses on discussing what other scholar have found in their studies, identifies the research gap and attempt to close it. This is the engine and the backbone of this study. Williamson (2010:3) understands that renewable energy and crime prevention are key to safety in remote indigenous communities. The study by Johnson (2020), was not only focusing on the effects of solar panels, however, their study also explores the impact of upgrading informal settlements on crime and security in South Africa. It is evident that the solar panels are effective because they are implemented in the private and public organisations such as in Pholoso Hospital in Polokwane to save lives by using solar energy to be able operate effectively daily and not much emphasis is on load shedding. This paper commences by discussing different scenarios of solar systems in Higher Educations' Institutions (HEIs), the anticipated challenges of solar panels installation in the University of Limpopo, the anticipated benefits of solar panels installation, the role of solar panels in crime deterrence, Implementation of solar panels towards safety and control and implications of solar panels towards crime prevention.

1. Delving into Different Scenarios of Solar Systems in Higher Educations' institutions

The implementation of solar panels is not new in HEIs; however, it would be necessary and new in the University of Limpopo. This paper seeks to demonstrate that although solar panels could assist in providing power to academic and administrative premises, it could also be helpful in reducing crime through providing sufficient lighting to the entire campus. Be that as it may, this theme briefly explores different institutions that have implemented the installation of solar panels. One such institution is the University of Johannesburg wherein, the University of Johannesburg (UJ) is on track to achieve a 'grid-positive' status, achieved by the installation of 4,450 solar panels on the rooftops of various on-campus structures and carports, a project that began in 2020 (University of Johannesburg, 2021). This initiative underscores the university's dedication to environmental sustainability as it diminishes the demand for electricity from the national power grid (University of Johannesburg, 2021). The University of the Free State is no exception when it comes to solar panels. The University of the Free State (UFS) has implemented a variety of strategies to promote energy efficiency. In addition to having solar installations on all its campuses,

one of them features a self-contained microgrid, and energy-efficient LED lighting illuminates its sports fields (Universities South Africa, 2023). The university is currently piloting the use of cluster pumps in its residential areas to provide hot water, as part of its ongoing energy-saving initiatives (Universities South Africa, 2023; Luthuli, 2023). Below is an illustration of solar installation in the University of the Free State, Bloemfontein Campus.

The solar plant on the UFS's Bloemfontein Campus, part of the university's commitment to combatting loadshedding and embracing sustainable energy.

Figure 1: Example of solar plant in the University of the Free State
Source: (Luthuli, 2023)

2. The Anticipated Challenges of Solar Panels Installation in The University of Limpopo

Solar energy generation relies on sunlight, which is subject to changes based on weather conditions and the time of day. This variability can result in fluctuations in energy output, diminishing its dependability as the exclusive energy source unless complemented by energy storage solutions such as batteries (Best & Nepal, 2022). It would cost the University of Limpopo a lot of money for solar installations, hence, the initial expense associated with the acquisition and installation of solar panels can be significant. Despite the existence of different incentives and rebates aimed at mitigating these expenses, the upfront investment would be required and if not taken as an apex priority it could continue to pose a hindrance for the institution. Moreover, solar panels necessitate a considerable amount of space, particularly when it comes to larger setups (Hayat, Ali, Monyake, Alagha & Ahmed, 2019; Al-Shahri, Ismail, Hannan, Lipu, Al-Shetwi, Begum, Al-Muhsen & Soujeri, 2021). In densely populated institution such as the University of Limpopo, locating appropriate areas for solar arrays can present a formidable challenge. However, every challenge must be mitigated, thus, the solar panels could easily be installed at the rooftops of the university premises to circumvent using huge spaces, just like in the University of Johannesburg and the University of the Free State (University of Johannesburg, 2021; Luthuli, 2023).

3. The Anticipated Benefits of Solar Panels Installation

Kalogirou (2004) investigated the benefits of using solar systems on environmental aspect and thus, in the findings, the author indicated that by harnessing solar energy, substantial quantities of greenhouse gas emissions are prevented. The energy conservation advantage arises from the decreased use of conventional electricity and/or Diesel to generate power. This advantage can be directly converted into monetary terms based on the corresponding production or the capital

expenditure saved by not purchasing imported fossil fuels (Kalogirou, 2004). Moreover, the study by Rizk and Chaiko (2008) indicates that solar energy is currently undergoing extensive research, and the costs of harnessing solar power have now dwindled to just a few cents per kilowatt-hour. On the same breath, Leaman (2015) contends that solar energy allows individuals to break free from large corporations and enjoy the assurance of generating their own sustainable power. Nevertheless, solar energy frequently generates an excess of energy beyond the requirements of a residence or business.

The primary advantage of solar systems lies in the reduction of environmental pollution. This is accomplished by diminishing air emissions through the replacement of electricity and conventional fuels (Kalogirou, 2004). The predominant consequences of air pollutants on both the human and natural environment include their influence on public health, agriculture, architectural structures, historical landmarks, and forests, as well as ecosystems (Kalogirou, 2004). The study by Al-Shahri, Ismail, Hannan, Lipu, Al-Shetwi, Begum, Al-Muhsen and Soujeri (2021) finds that the utilization of a solar energy system plays a pivotal role in improving the efficiency of power conversion. This can be ascribed to the comparatively elevated expense of solar cells and their limited conversion efficiency. Meanwhile, another study conducted by Abul, Muhammad, Tabassum, Muscat, Molla, Ashraf and Ahmed (2020) show that presently, solar photovoltaic (PV) systems are primarily employed in Malaysia to supply electricity to rural regions, as well as for street and garden lighting, and telecommunications. Meanwhile, recently installed solar PV system at Cloetesville Primary School in Stellenbosch has the potential to result in annual savings of around R20,000 for the school (Omarjee, 2022).

Graham, Wang, Braslavsky and Reedman (2018) anticipate that Western Australia is expected to witness the most substantial increase in customer numbers and the highest residential rooftop solar PV capacity growth rate in the country, reaching 4.8 GW by 2025. Therefore, given all these viewpoints from different scholars, it is clear that the use of solar energy or system has significant contribution when it comes to energy saving and consumption. In light of these assertions by different authors, this paper seeks to establish that one of the significances of using a solar system is to have constant lighting in the context of HEIs, particularly in the University of Limpopo in order to deter criminal activities at night or during loadshedding. The installation of solar panels in the University of Limpopo would also improve safety of students and the staff members.

4. The Role of Solar Panels in Crime Deterrence

The presence of solar panels may lead to increased human activity and foot traffic in an area, making it less attractive for criminals to engage in illegal activities (Dowell, 2017). Jacobson (2017) understands that Crime Prevention through Environmental Design (CPTED) principles suggested that well-lit and maintained areas can deter criminal activity. Guardians of the night (solar panels) can deter crime and, be equipped with addition measures for security purposes such as streets lights with motion sensors and surveillance cameras that can effectively allow campus security to monitor and promote response to incredulous activities. This paper aims to investigate the implications of solar panels towards crime prevention in the University of Limpopo. The paper suggests that by using renewable energy sources such solar panels, can be helpful in curbing some of the criminal activities at night during load shedding, since the University has only 4 standby generators which do not cover the campus residents. Therefore, the paper focuses on the role of solar panels in preventing crime with the corridors of the university and the surrounding areas of Mankweng with solar powered streetlights.

5. Implementation of Solar Panels Towards Safety and Control

Scholars such as Wright and Bennett (2014), believe that solar powered lighting and infrastructure can improve the perception of safety among residents. Khalvati (2023) believes that through concentrated solar powered light poles can ensure campus safety which is of paramount importance for universities to create a secure environment for faculty, staff and students. Additionally, by using renewable energy such as solar energy, universities can reduce their carbon

footprint and contribute to a more sustainable environment. Solar panels are significant since they can lower air pollution levels and reduce electricity expenses. Authors such as Suzuki and Hosokawa (2022) in their study imply that universities have the responsibility to protect students from suspicious persons when leaving school at night, and to maintain and operate a campus where they can study with peace of mind by ensuring safety. The solar panels will be implemented on the campus control building to priorities the surveillance and highest student accommodation whereby access to the rooftops by students is strictly limited. The solar streets light will within and outside the campus will promote community empowerment and participation. Farley and Santos (2020) suggested that residents of the campus such staff, professors and students are at risk of injury due to inadequate lighting, and more extensive lighting might be installed through the power of solar panels to increase visibility at night which consequently result in safety. Solar panels operate autonomously from the grid, ensuring that security systems and lighting remain functional even in the event of power failures (Gajbhiye, Nikam, Kaliappan, Patil, Dhal & Pandian,2023).

This guarantee of uninterrupted operation is vital for essential crime prevention measures. Solar panels generate electricity consistently in the presence of daylight, establishing them as a self-sufficient energy origin (Best, Burke & Nishitateno, 2019). Any surplus energy can be stored in batteries to be utilized during nighttime or overcast conditions, thus, bolstering autonomy in energy supply. Solar panels act as a potent instrument in attaining self-reliance in energy, granting the capability to produce, store, and utilize environmentally friendly, sustainable power (Alsabbagh, 2019). Solar panels enable individuals, communities, and entire nations to assert authority over their energy requirements, all the while diminishing their ecological footprint and bolstering their capacity to withstand energy related challenges (Best et al., 2019). However, certain solar systems feature sensors and timers that modify brightness levels based on the time of day or triggered by motion. This adaptive lighting method would ensure adequate illumination within the University of Limpopo premises when required, preserving energy while upholding safety.

6. Implications of Solar Panels Towards Crime Prevention

Solar panels foster social interaction and community cohesion (Schlachtberger, 2016). Social factors can indirectly contribute to crime reduction by creating networks of residents who are willing to report crime. It is evident that there is a pressuring issue of solar panels being targeted by criminals. As Wheeler (2023) points out that solar streets' lights are crucial since they offer a cost-effective solution for crime prevention and eliminate the need for costly electricity bills. Additionally, the solar panels have a long lifespan which requires low maintenance requires of solar streets lights. Solar powered streets lights have a critical role in illuminating dimly area on campus such as parking lots, ponds, streets and that are procumbent to criminal activities. The solar powered lights help assist to eliminate hiding spots for criminals at night during load shedding. Wheeler (2023) observed that the effort of solar panels generating power faces a serious problem of solar panel theft in South Africa and suggested the use of Security Spikes as a new security trend that can effectively way to deter criminals, and that physical barriers, GPS, security cameras can help protect solar panels.

Increased and Constant Lighting

Solar-powered outdoor lighting solutions can be set up in locations susceptible to criminal activities, including parking lots, pathways, and residential communities. These lighting installations discourage wrongdoers by illuminating the surroundings, creating a less favourable environment for their covert operations. Additionally, enhanced lighting contributes to the safety and protection of both residents and pedestrians (Papakonstantinou, Portnoi & Debije, 2021). Because of solar panels, proper lighting stands as a well-established approach to prevent crime, with a primary objective of lighting up both public areas and private premises to discourage illicit actions and elevate overall safety. However, the places that are well-lit promote a feeling of transparency and diminish the ability of potential criminal syndicates to remain unnoticed (Alani, Zheng, Fayad & Lei, 2023). For that reason, criminals tend to be deterred from engaging in

unlawful activities in well-lit environments, given the heightened risk of detection by witnesses or surveillance systems. This deterrent impact is especially potent in curbing spontaneous crimes like vandalism, theft, and physical assaults in the university. One understands that the University of Limpopo has surveillance cameras as other method of detecting and combating crime, the solar panels come handy in enhancing lighting and the efficiency of monitoring systems. In occasion where there is loadshedding, the heightened visibility allows these cameras to record sharper images, simplifying the process of identifying potential culprits and collecting evidence in case of criminal incidents. Surveillance serves a dual role as both a discouragement factor and a valuable instrument for law enforcement. Adequately illuminated public areas frequently in the university foster a sense of unity among students and staff members. Engagements like evening strolls, open-air gatherings, or neighbourhood surveillance initiatives become more viable and attractive. Communities that actively utilize well-lit spaces typically experience a heightened sense of togetherness, which can dissuade criminal activities (Joshi & Yenneti, 2020).

2. IMPLEMENTATION METHOD

This paper had relied on the use of a qualitative approach to critique the ideals and the nature of the implications of solar panels towards crime prevention in the University of Limpopo. This type of methodology depends on literature-based information to critique notions (Johnson, 2020). Selelo (2023) posits that this type of a methodology seeks to give meaning, explanations and descriptions of different phenomenon. Therefore, through this approach, the researchers gave gist, explained the context of the study.

Data Collection

This paper used a literature review as part of data collection. This method is also known as secondary data. Authors collected information from the journal articles, internet sources, books and the report amongst others. Hence, authors reviewed the existing academic papers or studies on the relationship between solar panels and crime prevention.

Data Analysis

Due to the nature of the study, data was analyzed through document analysis. Document analysis is a tool of analysis that allows the researcher to give meaning, explanations, identification and justification of the themes (Selelo, 2023). This method allows the researchers to develop themes with regard to the subject matter under scrutiny. Therefore, the themes were developed critically and gave the essence of the themes under concern.

3. RESULTS AND DISCUSSION

Solar panels can power streetlights in areas with limited access to electricity, enhancing visibility and reducing dark spots. Well-lit areas can deter criminal activity (Hough,2023). Scholars such as Wright and Bennett (1994), believed that solar powered lighting and infrastructure can improve the perception of safety among residents. Solar panels can deter crime activities; however, they alone cannot protect and safeguard residents without support from campus security since illegal crime activities occurred long before load shedding started to become a major concern. Crime statistics which are obtained data from the University of Limpopo's Campus Security and Mankweng law enforcement, collected information on the types of crimes, their locations, and the period before and after the installation of solar panels. Contact crime at Mankweng station is at 123,1% with count diff of 314 from other stations from 2017-2022 (Police Records Crime Stats RSA, 2022). Mampa, who is the Director of Safety and Security at UL heads the Crime awareness tips to combat crime and highlights that campus forum will identify notorious activities that affect students. "Due to youth addicted to drugs like nyaope, students are victims of robbery, burglary, rape and assault in Mankweng" (Mampa,2018). Therefore, it is very crucial to protect students from danger posed by criminals through solar panels during load shedding at night whereby the whole campus is well lit and campus security can deter criminal activities clearly. This paper is in line with the project by UL Campus Security, whereby the safety of students is a key priority.

4. CONCLUSION

The analysis from the literature above simply indicates that the issue of safety and security in the University premises needs serious and urgent attention. Particularly during the night when there is loadshedding on campus. The paper recommends that due to the high number of criminal activities in the University of Limpopo which are happening as result of darkness during load shedding, solar panels and lighting are of paramount importance to reduce such misfortunes. Hence, the installation of solar panels would ultimately assist in curbing some of the criminal elements in the University of Limpopo, although installation of solar panels can be expensive, however, once they are installed, they will benefit forever.

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