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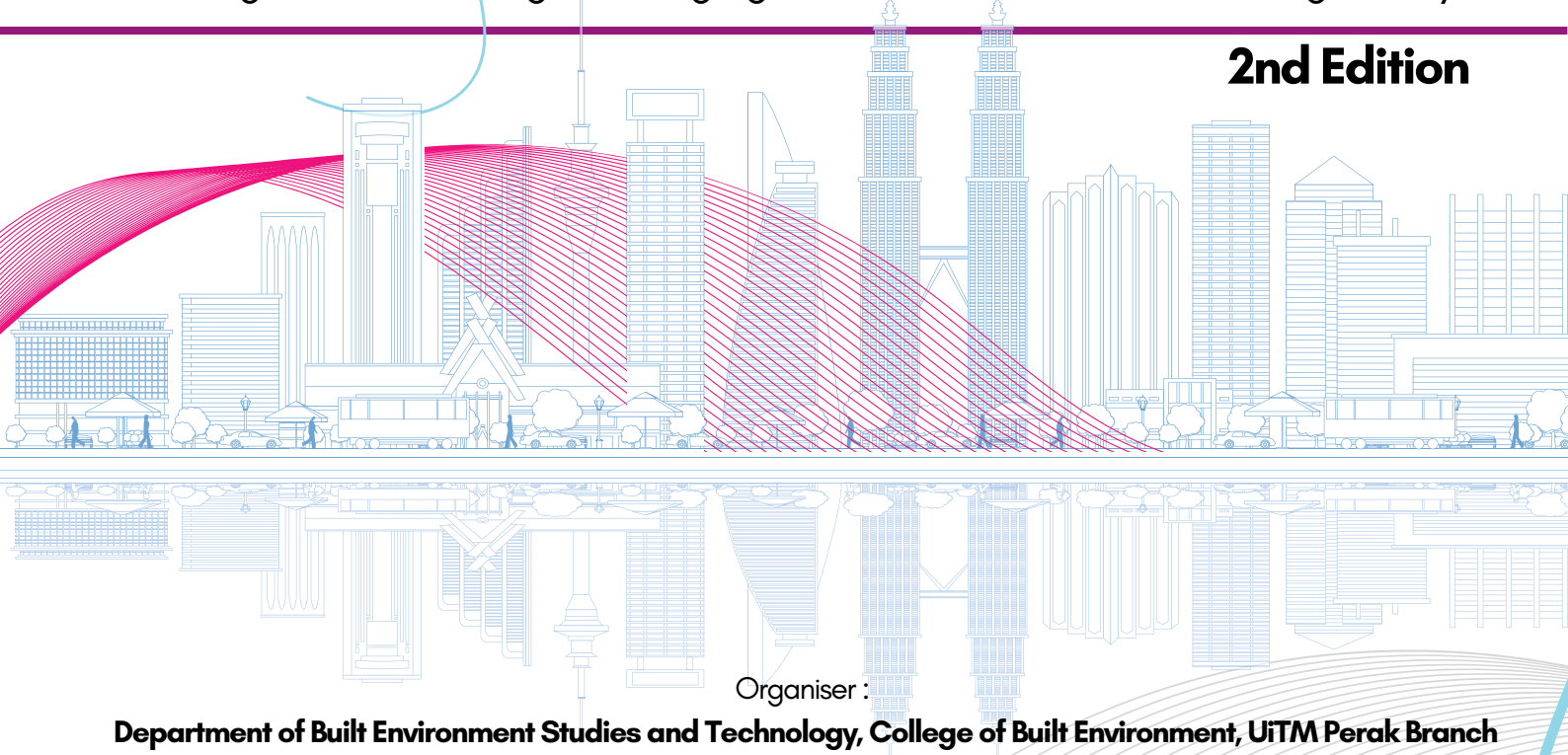
Cawangan Perak

e - Proceedings



Proceeding for International Undergraduates Get Together 2024 (IUGeT 2024)
“Undergraduates’ Digital Engagement Towards Global Ingenuity”

2nd Edition



Organiser :

Department of Built Environment Studies and Technology, College of Built Environment, UiTM Perak Branch

Co-organiser :

INSPIRED 2024. Office of Research, Industrial Linkages, Community & Alumni (PJIMA), UiTM Perak Branch

Bauchemic (Malaysia) Sdn Bhd

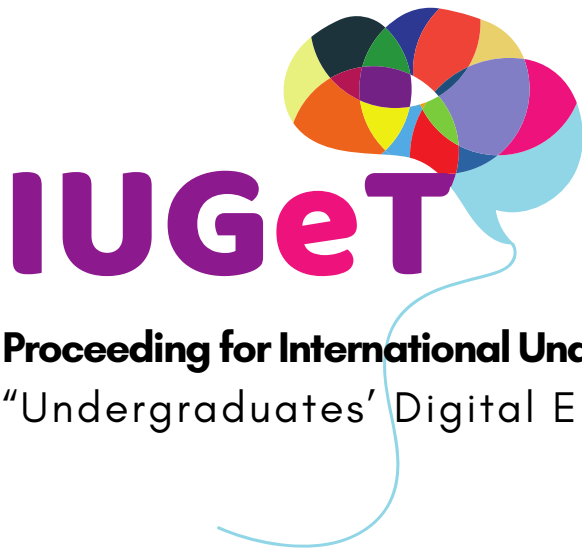
Universitas Sebelas Maret

Universitas Tridianti (UNANTI)

Publication date :

November 2024

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Perpustakaan Negara Malaysia

Cataloguing in Publication Data

No e- ISBN: 978-967-2776-42-0

Cover Design: Muhammad Anas Othman

Typesetting : Arial

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HYNERGY PROVIDER

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Abstract

Hynergy Provider focuses on replacing conventional electricity sources with eco-friendly alternatives involving strategic planning and support. These days, the majority of buildings experience high energy bills, circuit breaker tripping, and short circuit issues related to either the building's wiring system or the users themselves. We developed the Hynergy Provider, which prioritizes user safety and can supply energy more efficiently, in order to address these challenges. The objectives of this innovation include maximising the use of renewable energy, saving electricity and water usage costs, improving the quality of people's daily lives, and preparing in advance to face future supply disruptions. Our methodology entails an in-depth analysis of solar energy systems and dammed water turbines that have been extensively used on a variety of objects. Thus, in order to enhance the design, detailed sketches are drawn up. Our findings indicate The Hynergy Provider is highly helpful and may even be beneficial for the community because of its capability to adapt to Malaysia's unpredictable weather. In conclusion, the establishment and initiation of the Hynergy Provider can demonstrate how implementing advanced technologies can significantly increase the amount, quality, and effectiveness of energy and water available for use in modern buildings.

Keywords: *electricity, solar, water, turbine, energy*

1. INTRODUCTION

Hynergy Provider focuses on replacing conventional electricity sources with eco-friendly alternatives involving strategic planning and support. Firstly, identifying these suppliers involves research into local or regional initiatives that promote renewable energy. This may include identifying businesses or individuals engaged in small-scale hydroelectric projects, often situated near natural water sources. Understanding their motivations and challenges is crucial; many are driven by environmental concerns, seeking to reduce carbon footprints or achieve energy independence. Secondly, supporting these suppliers entails creating an enabling environment. This can involve regulatory frameworks that incentivize renewable energy adoption, such as subsidies for installation or favourable feed-in tariffs. Additionally, providing technical and financial assistance can help overcome initial investment barriers and ensure reliable operations. Collaboration with local communities and environmental groups can further strengthen these initiatives, fostering grassroots support and awareness.

Furthermore, integrating these suppliers into the broader energy ecosystem involves grid compatibility and management. Ensuring seamless integration of decentralized hydroelectric systems requires infrastructure investments in smart grid technologies. This enables efficient distribution and utilization of renewable energy, maximizing its environmental and economic benefits. Moreover, fostering innovation in energy storage solutions can mitigate intermittency issues associated with renewable sources, enhancing reliability and grid stability. By targeting and supporting home hydro energy suppliers, communities can advance sustainable energy transitions while contributing to global climate goals.

2. MATERIALS

Materials

1. Solar panel



2. Battery storage and charge



control

3. Water tank with reverse osmosis filter



Uses

- Transfer sunlight/solar energy into electrical energy
 - Supporting water turbine to produce kinetic energy
-
- Store energy and control electrical energy
 - Ensure that the energy is neither overused nor underused.
-
- Remove sediment and chlorine form water
 - Store rainwater that flows through water drainage
 - Transfer filtered water into normal water tank

4. 2 water tanks



- 1 water tank; store water supply and filtered rainwater
- 1 water tank; store rainwater flow through water drainage

5. 4-blade designated water



turbine

- Made of aluminium alloy
- The rotating turbine produces kinetic energy
- Lightweight

6. Water drainage



- Ensure that rainwater falls into the water tank
- Water channels are made of aluminium
- Not easy to break

7. Generator



- Hydroelectric turbine uses the force of moving water to spin turbine blades to power the generator.
- The generator, in turn, converts the kinetic energy of the rotor to electrical energy.

3. FUNCTIONS

a) Roof Drainage:

- Usually, it is responsible for directing water away from the roof and into the gutter system, keeping the house dry and protected from water damage. The system includes the gutters, downspouts, and other drainage components that work together to ensure water is properly channelled away from the house. In this case, roof drainage will act as a penstock as soon as we apply the water turbine in the dam concept. This will ensure that the water flows through the drainage and exerts force on the blade in the gutter.

b) Solar Panel:

- Solar panels, sometimes also called photovoltaics collect energy from the Sun in the form of sunlight and convert it into electricity that can be used to power homes or businesses. These panels can be used to supplement a building's electricity or provide power at remote locations.
- For information, for the **Average Annual Temperature** for Malaysia, the mean annual temperature hovers around **25.4°C**. There's relatively little seasonal variation, with the minimum temperature occurring in January (around **24.9°C**) and the maximum in May (reaching **25.9°C**).
- The use of solar panels is very effective for conserving electricity by harnessing solar energy. In this case, solar panels serve as a backup for water turbine applications and help to save energy daily, whether it is day or night.

c) Water Tank:

- Water storage tanks are used to store water and provide faster access to a water supply. Atmospheric and pressurized water storage tanks are available, and atmospheric tanks are more commonly used for outdoor, large-scale applications, while pressurized tanks are used for indoor applications
- We use two water tank which is water tank with reverse osmosis filter and water tank storage
- Reverse osmosis systems utilize pressurized tanks to store purified water until the demand for the water is initiated. Reverse osmosis storage tanks also keep the RO system efficient by turning the system on and off as the tank fills with water and pressure increases.
- In this case, we use a reverse osmosis water tank to purify rainwater from the drainage and transfer it to a separate storage water tank that will be used for daily purposes.

d) Water Turbine:

- A turbine is a machine that plays a key role in transforming fluid or air energy into usable work or electricity. With a rotor system at its core, a turbine harnesses the rotational energy generated by the fluid to produce a wide range of applications.
- We use it because Malaysia receives substantial annual rainfall, ranging from 2000 mm (78.74 inches) to 2500 mm (98.43 inches). This consistent rainfall pattern means there is no distinct dry season.
- Monsoon Influence in Malaysia is affected by two monsoons:
 - Northeast Monsoon (October to January): The east coast of Peninsular Malaysia experiences heavy rains during this period, with up to 500 mm (20 inches) of rainfall per month².
 - Southwest Monsoon (June to September): This monsoon has weaker effects in Malaysia but still contributes to the overall rainfall pattern

In this case, we apply the water turbine concept to the drainage by placing a blade in the drainage. Its function is the same as that of a water turbine, providing electricity.

e) Battery Storage:

- Battery storage can be used for short-term peak power and ancillary services, such as providing operating reserve and frequency control to minimize the chance of power outages. They are often installed at, or close to, other active or disused power stations and may share the same grid connection to reduce costs.
- Batteries give you much more control over your energy because they reduce your vulnerability to energy price hikes. Instead of wasting your excess power, it is now stored in the solar battery system. Batteries are particularly helpful when panel output is reduced on cloudy days in the evenings, and at night time.
- In this case, we use battery storage in buildings to capture all the energy transferred from the solar panels and to serve as a backup for daily use.

f) Charge Controller:

- The main function of solar charge controllers is regulating battery charge, but they can also provide electrical protection by switching off the battery when it reaches an excessively low voltage, preventing reverse current from the battery to the solar panels when they are not generating power.
- We use a charge controller to manage power usage on a daily basis, including power input and output, to ensure safe operation and prevent exceeding the limits of the solar panels.

g) Generator

- **Electricity Generation:** Generators convert mechanical energy (from sources like turbines, engines, or wind) into electrical energy. They play a vital role in power plants, whether it is hydroelectric, thermal, or wind-based.
- **Backup Power:** Generators provide backup power during outages. Residential, commercial, and industrial buildings often have standby generators to ensure continuity of essential services
- **Renewable Energy:** In hybrid systems (e.g., solar/wind with battery backup), generators serve as backup when renewable sources are insufficient.
- In our case, the generator is used to produce electricity from the water turbine and then transferred to the battery storage.

4. METHODOLOGY

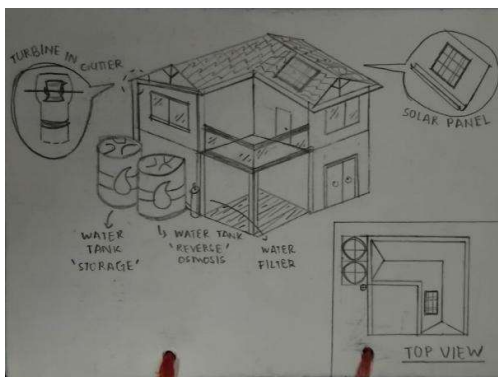


Photo 1: sketch of Hydro Provider on house

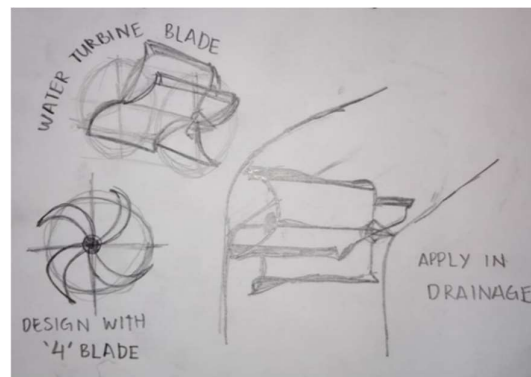


Photo 2: sketch of turbine on drainage

- a) In this project, relying solely on turbines for energy may not be sufficient. This is because, in Malaysia, the rainy season generally takes place from November to February, while the dry season typically occurs from May to September. As a result, it might be challenging to generate energy throughout the year.
- Hence, we consider adding a solar panel as a backup energy source. One reason we choose solar panels is to increase product value, as products with solar panels are often seen as more desirable and can have higher resale values. Many buyers are attracted to the idea of lower energy costs and environmentally friendly features. Additionally, solar panels have low maintenance requirements, with few moving parts and generally high durability. Once installed, they require minimal maintenance, typically involving only occasional cleaning and inspections. Solar energy is a clean, renewable resource that reduces greenhouse gas emissions and other pollutants. Using solar power helps combat climate change and reduces your carbon footprint.
- b) We encountered challenges in selecting the material for the turbine blades. There are multiple factors to consider to ensure the durability of the blades, including rust resistance, weight, and water resistance. Additionally, we need the blades to be cost-effective without compromising on quality.
- The material that will be used to make turbine blades is aluminium alloy. We chose aluminium alloy because it is much lighter than many other metals, such as steel or copper. This makes it ideal for applications that require load shedding, as we will put these blades in the drainage. Aluminium forms a natural oxide layer that protects against corrosion in an environment that is not too aggressive. In addition, the anodization process can increase corrosion resistance. Aluminium alloy is easily formed and processed, either by machining, forming, or casting methods. This enables the manufacture of parts with complex designs and high precision. Aluminium alloy can work well in a wide temperature range. Some alloys are designed to remain stable at high temperatures, while others are still effective at low temperatures. Aluminium can be recycled without losing its quality. Additionally, although the price of aluminium can vary, many aluminium alloys offer a combination of cost efficiency and good performance, especially in large quantities
- c) We are also facing difficulties in deciding where to place the water tank and the water tank with a reverse osmosis filter. Initially, we considered putting them on the roof of the house or constructing a separate water tank tower. Placing the water tank on the roof could potentially exceed the roof's weight capacity, necessitating modifications to the roof to support the tank's weight and incurring additional costs. Alternatively, building a separate water tank tower would also increase the overall estimated cost due to the need to purchase materials for its construction.
- After discussing the costs and assessing the needs of the user, we have decided to install a water tank and a reverse osmosis filter next to or behind the user's house. This will make it easier to maintain the water tank and provide other related services.

5. RESULT AND DISCUSSION

No	Component	Properties	Function
1	Solar Panel	High absorption coefficient, good electrical conductivity, stable and durable	The solar panel converts sunlight into electrical energy using photovoltaic cells. The generated energy can be stored in batteries or used to power the water turbine, thereby producing electricity.
2	Battery Storage & Charge Controller	High capacity, sustainable, minimal space, easy setting, long life	Solar energy can be stored and released when needed most due to battery storage. The charge controller regulates the current flowing into and out of the batteries, protecting them from damage caused by overcharging and over-discharging.
3	Osmosis Filter with Water Tank	Sustainable materials, corrosion resistance, large capacity, low maintenance	A pre-filter is used in the reverse osmosis filter to remove sediment and chlorine from the water before the water is forced through a semipermeable membrane to remove dissolved solids. Water flows through a postfilter to refine its quality before it enters a designated water tank following its removal from the RO membrane.
4	Water Turbine	Stable and durable, sustainable material, high efficiency, good electrical conductivity	Water turbines are used to transform the kinetic or potential energy found in water into electrical energy. To rotate the runner, the water flow creates pressure between the front and rear of the blades, reverse reaction force, and rotation torque.
5	Water Drainage	Sustainable material, stable and durable, lightweight	Rainwater that fall is directed into the drainage system and then sent directly to the osmosis-filtered water tank.

Innovation Concept Development

Developing an innovative Hynergy Provider for construction entails combining modern-day materials and technologies to improve drainage feasibility and optimise the efficient use of renewable energy sources. The main component of this invention is an aluminium alloy water turbine that will be installed in the drainage system as this alloy is lighter than other metals. The key to these innovations is the use of rainwater directed towards a water tank as a natural water supply and a water turbine to generate kinetic energy. Being able to adapt to Malaysia's erratic weather makes the Hynergy Provider very useful and potentially beneficial to the community. Although it may be relatively expensive to implement, it can save costs in the long run and is also simple to maintain and keep operational. This innovation aims to convert all available renewable energy sources into electrical energy that can be used to power buildings. In the meantime, the rain falls into the water drainage system, where it is immediately routed to an osmosis-filtered water tank before being transferred to a regular water tank. The primary advantage of this invention is that it lowers the rising costs associated with using water and electricity supplies.

6. CONCLUSION

The establishment and implementation of the Hynergy Provider has shown how incorporating advanced innovations like solar panels, water filtration, and water turbines can greatly improve the quantity, quality, and efficiency of energy and water available for use in contemporary buildings.

The findings suggest that proactive design factors, including the type of material used, the viability of each component, and the efficient use of renewable energy, are essential for enhancing building energy consumption overall and natural environment productivity on a daily basis. In order to encourage the widespread use of innovative green building technologies, recommendations include further study and development to enhance the turbine's features, the use of energy derived from nature, and the standard of living for people. Furthermore, long-term environmental care can benefit from the storage and management of energy produced from renewable sources. In summary, the Hynergy Provider represents a significant step forward in addressing the intermittency challenges in sustainable constructions. This innovation not only reduces the cost of energy consumption but also contributes to sustainable, energy-efficient, and environmentally friendly buildings by combining advanced materials, better design, and additional features.

7. ACKNOWLEDGEMENT

We would like to extend our sincere gratitude to everyone who helped to develop this innovative concept and provided support. First and foremost, we would like to express our gratitude to Madam Nur Afifah Binti Lop Ahmad, Universiti Teknologi MARA's lecturer for Building Materials (DBT172), whose advice and insight have been extremely helpful to us during this journey. Extremely appreciative of all team members, whose commitment and collaborative spirit have made this idea a reality. The effort and inventiveness have really paid off. We would especially like to thank Universiti Teknologi MARA for providing the tools and setting that encouraged innovation. This project has been built on their steadfast support. Finally, we would like to thank our friends and family for their unwavering support and faith in our mission. Their encouragement has given us courage and drive. We are grateful to everyone who has supported this innovation and contributed. We have made progress as a group towards a more inventive and promising future.

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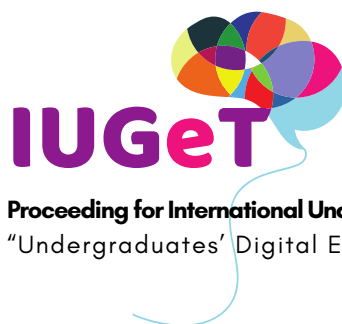
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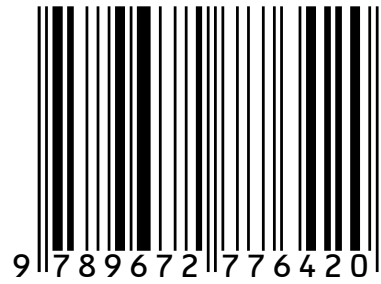
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