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SELF-ENERGY GENERATION BUILDING: PORTABLE E-STORAGE DEVELOPED VIA RENEWABLE ENERGY (RE)

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Highlights: Portable energy storage (E-Storage) is developed based on the supercapacitor (SC) concept that's applied in electric transports generated by renewable energy (RE). The reason Portable E-Storage was developed based on the people's needs for electricity during natural disasters, unstable weather sometimes affected by cutoff electricity supply, and resolution of environmentally friendly building energy efficiency. The advantages of the Portable E-Storage such as saving consumer money, improving reliability and resilience, integrating RE generation sources and helping reduce environmental impact. Benefits for the education field and consumers are that product development promotes environmentally friendly products for current and future generations in terms of usability and its application. Green Hydrogen (H2) is used as the main material and cell to create and generate electricity, it's made the electric generation process free from carbon footprint and environmentally friendly. In short, the smart grid for electric distribution connected to every building, residential buildings and other needs such as for transportation and industry.

Key words: *electricity, energy efficiency, energy storage, portability, renewable energy, self-energy building*

Introduction

Portable energy storage (E-Storage) is developed based on the supercapacitor (SC) concept that's applied in electric transports generated by renewable energy (RE). The reason Portable E-Storage was developed based on the people's needs of the electricity during natural disasters, unstable weather sometimes it's affected of cutoff electricity supply, and resolution of environmentally friendly building energy efficient. The advantages of the Portable E-Storage such as it's can save consumer money, improve reliability and resilience, integrate RE generation sources and help reduce environmental impact. Benefits for the education field and consumers are the product development promotes environmentally friendly product for current and future generation in term of usability and its application. As used Green Hydrogen (H2) as main material and cell to create and generate electricity, it's made the electric generation process free from carbon footprint and environmentally friendly. In short, the smart grid for electric distribution connected to every building, residential buildings other needs such as for transportation and industry.

Content

Current issues of climate change are a hot topic addressed by many voices. The Paris Agreement stated an emergency on carbon footprint to be controlled by 2050. The Paris Agreement's long-term temperature goal is to keep the rise in global average temperature to well below 2 °C (3.6 °F) above pre-industrial levels, and to pursue efforts to limit the increase to 1.5 °C (2.7 °F), recognizing that this would substantially reduce the impacts of climate change. This should be done by reducing emissions as soon as possible and achieving a net-zero emissions in the second half of the 21st century. The Paris Agreement speaks of the vision of fully realizing technology development and transfer for both improving resilience to climate change and reducing Greenhouse gas (GHG) emissions. It establishes a technology framework to provide overarching guidance to the well-functioning Technology Mechanism. The mechanism is accelerating technology development and transfer through it's policy and implementation arms (United Nations; Climate Change).

With global emissions are reaching record levels and showing no sign of peaking, UN Secretary-General António Guterres called on all leaders to come to New York on 23 September 2019 for the Climate Action Summit with concrete, realistic plans to enhance their nationally determined contributions by 2020, in line with reducing greenhouse gas emissions by 45 per cent over the next decade, and to net zero emissions by 2050 (United Nations).

New approach and application of new clean energy such as so-called renewable energy (RE) for power generation to produce electricity is hope for the future backup as current and conventional power generation uses non-renewable energy (NRE) sources such as fossil fuel, natural gas and coal combustion. This NRE will be depleted until a certain time, which is unknown but promising. By 2030, zero-carbon solutions could be competitive in sectors representing over 70% of global emissions.

Portable Energy Storage

Portable energy storage (E-Storage) is developed based on capacitor or supercapacitor (SC) concept such as applied in electric transports that's generated by RE. Self-energy generation building refers to a building that can sustain its electric supply of the building by the established power generation of resources available locally. The reason Portable E-Storage developed as based the people needs of electricity during natural disasters, unstable weather sometimes its affected cut-off electricity supply, and resolution of environmentally friendly building energy efficient. The advantaged of the Portable E-Storage such as it's can the save consumer money, improve reliability and resilience, integrate RE generation sources and help reduce environmental impact. The potential of product marketability is promising as the product developed based on the person's needs and potential for application of RE power generation for self-energy building to reduce environmental impact.

Product Description (Pictures/Data/Result/Discussion)

Portable energy storage (E-Storage) is developed based on capacitor or supercapacitor (SC) concept such as applied in electric transports that's generated by renewable energy sources (RE). Supercapacitors are a new type of capacitor, also known as ultra-capacitors. The characteristics of supercapacitors give them a higher capacitance than conventional capacitors. Self-energy generation building referred to a building that's can sustain its electric supply of the building by the established power generation of RE sources available locally. Portable E Storage developed based on the concept of using Green Hydrogen (H2) to produce electricity and generated electricity stored in the Portable Capacitor and Supercapacitor (as electric energy storage) in every building or home based on different power needs and electric capacity. A supercapacitor's lifetime spans 10 to 20 years, and the capacity might reduce from 100% to 80% after 10 or so years. Electric power generations deployed from renewable energy sources. As used Green Hydrogen (H2) as main material and cell to create and generate electricity, it's made the electric generation process free from carbon footprint and environmentally friendly. In short, the smart grid for electric distribution connected to every building, residential buildings other needs such as for transportation and industry. Figure 1.0 shows a smart grid system deployed renewable energy sources to generate electricity.

Figure 1.0: A smart grid system deployed renewable energy sources to generate electricity

Product Advantages

The advantages of the Portable E-Storage such as it can save the consumer money (save energy and low cost), improve reliability and resilience, integrate RE generation sources and help reduce environmental impact. Benefits for the education field are that product development promotes environmentally friendly products for current and future generations in terms of usability and its application. At the same time Portable E-Storage based on RE plays an important role for e-learning activities, work from home (WFH) and especially for the buildings in remote areas that need most of electric supply and power production during cutoff of electricity because of unstable weather or by the natural disasters. The Portable E-Storage provides flexibility for the grid, to ensure uninterrupted power to consumers. Other than that, application of Portable E-Storage for self-energy generation building may control electric usage, improve reliability at times of unexpected failures or disasters and it can maintain and improve power quality in terms of frequency and voltage.

Product Novelty/Inventiveness

The potential of product marketability is promising as the product developed based on the person's needs and potential for application of RE power generation for self-energy building to reduce environmental impact. The on-going research & development (RD) of supercapacitor technology by the researchers may impact to the society as needs of it and needs more development of electric energy storage for current and the future in order to recover the Earth from carbon footprint (total greenhouse gas emissions).

Commercialisation

The potential of product marketability is promising as the product developed based on the person's needs and potential for application of RE power generation for self-energy building to reduce environmental impact. Portable E-Storage may be used by every house owner or building owner. Other than that, the researchers encourage developer also may apply the Portable E-Storage as one of must have item for sustainable project development. Overalls idea proposed by the researchers of a smart grid system deployed from RE to produce electricity may be used and apply for national scale in order to achieve zero-emission target in the future.

Others (Publication/Intelectual Property/Industry)

This innovative design is owned by the researchers and can't be reproduced without permission by the researchers. The project title is extracted from an on-going PhD thesis of Salmiah Aziz that's she currently studied her PhD in Universiti Sultan Zainal Abidin (Unisza).

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