Infinite Energy Creates Better Life

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Abstract. As the world moves towards sustainability, renewable energy development is driven in most countries as an alternative offer to the use of non-renewable and polluting fossil fuels. One such alternative is solar energy, which is the versatile technology used to harness the sun’s energy and make it usable. It refers also to capturing the energy from the sun, collected elsewhere (i.e. the Earth) and subsequently converting it into electricity. Due to the non-constant nature of solar energy, collector and storage unit components are required to have a functional solar energy generator. The collector simply collects the radiation that falls on it and converts a fraction of it to other forms of energy (electricity or heat). The storage unit is required to store excess energy during the periods of maximum productivity and release it when the productivity drops. The proposed study is aimed to explore the feasibility of solar energy as an infinite energy to be restored and used as it needs. The merit of this study lies in the fact that solar energy creates better life (such as cost reduction, resource availability, eco-friendly, and sustainability) should it is harvested, stored and utilized considerably in a holistic way. Moreover, it may enhance independency of electricity supply, particularly in remote areas where access to power supply are limited. It is anticipated that the study will not only create a further interdisciplinary research platform for fundamental studies on solar energy harvesting, storage, and utilization, but also a research that leads to technology transfer to industry as it is lauded as a renewable and an inexhaustible fuel source, environmentally friendly due to its nature of pollution – and often noise – free.

Keywords: solar energy, solar energy storage, green economic development

1. Introduction
Low carbon economic growth approach as a model of green economic development has become the main focus in many states’ policies, particularly in anticipating the depletion of non-renewable natural resources. As non-renewable natural resources in particular fossil based oil is nearing its limit, alternative extraction method such as fracking might cause environmental damage and negative impacts of climate change.

Climate change studies as caused by global warming has been peer reviewed and agreed upon will negatively affect the world at large. Although the present state of knowledge regarding regional and
Local climate change does not allow scientists to identify precisely the most vulnerable areas, they are able to indicate the sort of area which will be most affected [1].

As fossil fuel dominates the world current energy requirement, how about energy for the future? If we continue to generate most of our energy from coal, oil and gas, do we have enough to keep us going? Current knowledge of proven recoverable reserves indicates that known reserves of fossil fuel will meet demand for the period up to 2020 [1].

Despite the development of modern solar energy over the past forty or fifty years, the technology still needs a higher profile and more involvement from scientists, engineers, environmentalists, entrepreneurs, financial experts, publishers, architects, politicians and civil servants. A new generation of solar energy pioneers has to be nurtured [2,3].

The formulation of the problem from the above-mentioned data are (1) how is the future of renewable energy, i.e. solar energy?; (2) what is the importance of solar harvesting and storage?; and (3) what is green economy’s contribution to the world?. The purpose of current study intends to determine the usage of solar energy as it found to be infinite, environmentally friendly, cost effective, and reachable to remote areas is under discussion in present study. Qualitative approach has been taken in study through a collection and analysis of data and information, including a causal analysis of innovation information contained in various journals and reference books and a series of focus group discussion among scholars in the Universitas Prof. Dr. Moestopo (Bergama) and the Materials Research Society Indonesia (MRS-INA), conducted in Jakarta during period January – March 2018.

2. Literature Review
Many countries today strategically pursue development and economic natural resources diversification to overcome the current circumstances. One of the focus is on solar energy. Solar energy is a renewable energy source that can generate electricity, provide hot water, heat and cool a house and provide lighting for buildings. The sun has produced energy for billions of years. Sunshine is an infinite resource and investment in the technology that harnesses its energy as a general-purpose technology for development and export could be a priority of a progressive government [4].

Solar energy is the solar radiation that reaches the earth and it has several major advantages when compared with other sources, as it is distributed, though unequally, to every location on the globe. The resource is abundant, to the extent that many countries already harvested it [5].

Solar energy offers solution to the problem of scarcity resources, as it still has 6.5 billion years of life according to NASA. Solar energy can potentially play a very important role in providing most of the heating, cooling and electricity needs of the world [6]. Indeed, in a rather less time, solar technology in several countries has evolved to compete with conventional power generation sources.

Today solar sources provide around 10% of the energy used worldwide, but in the developing countries their share is still of the order of 40%. This contribution could start growing again, thanks to progress in solar technology and the pressure of recurrent energy and environmental crises related to fossil fuels and nuclear power [2]. In just a few decades, this will be a major part of a sustainable energy system for the world. In a matter of speak, solar energy will never stop shining.

The current study entails the exploration of energy alternative solutions, specifically solar energy to benefit most people in the world. Solar storage and harvesting have potentially been making contribution to alternative solution in providing energy for remote areas, anticipating the problem of non-renewable energy, pollution and highly cost. In addition, it is also a sustainable energy and can lead to a green economy.

3. Methodology
This study is a collection and analysis of data and information about solar energy harvesting, storage and utilization run by Universitas Prof. Dr. Moestopo (Beragama) in collaboration with MRS-INA parsed selected local and international literature. The study includes a causal analysis of innovation information contained in various journal and reference books.
The secondary data and a series of focus group discussion among scholars in the Universitas of Prof. Dr. Moestopo (Beragama) have also been extracted and implemented. The research was conducted in January – March 2019. Limited scholars and short time period of research is limitation of study; covers only among Universitas Prof. Dr. Moestopo (Beragama) and MRS-INA with limits the generalized findings.

4. Results and discussion

The New York Times on April 4, 1931 made the headline "Use of solar energy is near a solution", quoted the German solar energy scientist, Dr. Bruno Lange, as precursor that 80 years later electricity was supplied to millions of people in the world from renewable energy. Today, the whole world is aware of the limitations of fossil fuels and their effects on the environment as a cause of global warming. For this reason, the world states its readiness to accelerate the transition to a low-carbon economy.

The Government of Indonesia itself through the website of the Directorate General of New and Renewable Energy and Energy Conservation (EBTKE) launched the Low Carbon Economic Development Strategy on the occasion of the third annual meeting of the Low Carbon Emission Development Strategies (LEDS Forum) in Yogyakarta, attended by more than 250 forum participants consisting of government officials, experts, and representatives from international institutions, NGOs, and businesses identifying policies and activities that can increase economic growth, create jobs and other priorities in various countries in Asia, through a low carbon economic approach to leading green economic development.

Solar power as an energy is radiation from the sun that is converted into heat or electricity. It is also an energy that is always renewable and does not require fuel, is clean and environmentally friendly, and suitable for tropical regions such as Indonesia.

Solar energy creates clean, renewable power from the sun and benefits the environment. Generating electricity with solar power instead of fossil fuels can dramatically reduce greenhouse gas emissions, particularly carbon dioxide (CO₂). Greenhouse gases, which are produced when fossil fuels are burned, lead to rising global temperatures and climate change. Climate change already contributes to serious environmental and public health issues in some parts of the world, including extreme weather events rising sea levels. By going solar, we can reduce demand for fossil fuels, limit greenhouse gas emissions, and shrink our carbon footprint.

Moreover, solar energy results in very few air pollutants, reduce nitrous oxides, sulphur dioxide, and particulate matter emissions, all of which can cause health problems. In another word, solar power results in fewer cases of chronic bronchitis, respiratory and cardiovascular problems, and lost workdays related to health issues.

Individual off-grid Photovoltaics, solar application as a stand-alone power source for various applications such as CCTV and communication stations can also be implemented in public sector. For areas like flat lands, forests and islands, which do not receive power, owing to their remote location, solar power is certainly a blessing in disguise. Remote and rural areas can now take advantage of power to initiate different development projects in their areas. Consequently, education and medicinal facilities can also be increased in these areas by the introduction of solar power.

Street lighting, general lighting systems for roads, parks, red lights, can be upgraded using more advanced technology that use energy efficient LED lights with independent electricity sources from solar power as well as solar panel roads. The U.S. Department of Energy predicted in 2009 that by the year 2030, solar power would produce almost 0.5 percent of the grid electricity generated by renewable sources. In comparison, the department said that, in 2007, solar power provided only about 0.3 percent of the electricity from renewable sources. Overall, renewable sources—including solar power—were expected to account for about 15 percent of the electricity produced for the grid in 2030 [7].

Overall, the sun gives off far more energy than we will ever need. The only limitation is our ability to convert it to electricity in a cost-effective way and environmentally friendly for the benefit of human’s welfare.
Solar power is also scalable. This means that it can be deployed from industrial scale or it can be used to power a single household. When it is used on a small scale, extra electricity can be stored in a battery or fed back into the electricity grid.

Storage on batteries will reduce electricity costs, increase efficiency, and support the green economy and can also be considered as a business growth opportunity.

The advantages of batteries as storage is due to their ability to store large amounts of solar energy in a cheap and efficient manner. A study in the Journal of Sustainable Finance & Investment predicts that a combination of battery storage and renewable energy can make fossil fuels obsolete.

The breakthrough in battery technology came from Professor John Goodenough of the Cockrell School of Engineering at the University of Texas at Austin, who helped create lithium-ion batteries. Goodenough’s lithium battery technology is said to have energy density three times higher than the current battery market. That means: higher energy density, extra long-lasting power, longer life, and reduced overall costs [8].

Lithium ion battery has become the basis of the huge market for cellular phones and laptop computers, and these mobile communication market continues to grow at a rapid rate, supported by the demand all over the world [9]. Even so, intensive efforts are still under way to further improve battery technology. The main target of the effort is not only the automobile industry by achieving higher energy density, but also the energy storage market supplementing environmentally friendly power source such as solar energy and wind turbine [10].

At present batteries are produced to fulfil the increasing demand as more and more mobile electronic and electric devices ranging from mobile phones to electric vehicles are entering into our life [11]. A national consortium of lithium ion battery has been started since 2016 to develop the lithium ion battery modules for solar street lamp [12, 13].

To simplify our daily life, there are several things we can benefit with solar energy. Solar battery charger, calculator and watch with natural sunlight to power itself. Indoor lighting through LEDs (light emitting diodes) which are highly energy efficient, can be connected to a battery charged with solar generation system. Outdoor lighting and heating water for domestic, commercial or industrial use, water pumps, air pumps, water heaters, generators, refrigerators, air conditioners, fans, gas stoves, and many other appliances can benefit from solar energy produced power.

Consumers are not interested in intricacies of battery technology. The proliferation of battery technologies comes from widespread usage of electricity consuming devices. Past battery technology such as nickel cadmium make way for lithium because of the higher energy density it offers compared to nickel based battery. As such, due to higher energy density thus electricity capacity from lithium battery, technology vendors are now able to create handheld computers that have telephony ability we now call smartphones. A bright future in science and technology relating to advanced batteries can only be expected through continuing basic and applied research on lithium material its uses [10].

Not just consumers, purchasers of battery are also international agencies, governments and their agencies, and companies. This market will continue to expand as decision makers in these institutions become convinced of the reliability and cost-effectiveness of photovoltaics compared to the alternatives in an increasing number of applications [14].

The main applications include systems for lighting, refrigeration, radio and TV, water pumping and general village electrification, includes all applications where the individual is both purchaser and user, e.g. in a remote home or farm, caravans, boats or the leisure industry.

In June 2001, the European Council of Gothenburg (Sweden) added an environmental dimension to the Lisbon Agenda, constituting the European plan for sustainable development. Under this new framework, public policies in Europe should adopt a long-term vision to deal with issues such as ratification of the Kyoto Protocol and promotion of renewable energies. In this regard, the European Union (EU) has set a binding target for renewable energy at 20% of the EU’s total energy needs by 2020 [15].
5. Conclusions
The study found very interesting findings that majority advanced countries have considered solar energy usage as part of their domestic policy towards sustainable and green economy due to its less polluted nature. The result of the current study also verify that through a proper system of solar storage and harvesting, one can reach a better life in terms of the availability, easy access, cost effective, abundant, sustainable and green.

Further, solar energy can be regarded as an abundant near infinite energy resource and is on the verge of a massive boom. Together with wind energy, it directly challenges the incumbent dominant forms of traded energy, fossil and nuclear. We are already seeing the beginnings of divestment of fossil fuelled energy by influential investors, as fears grow about stranded assets. Humanity needed alternative energy resources which the solar energy makes it possible. We need battery as energy storage and conversion of solar energy as an infinite energy to make our live better, reduce electricity costs, increase efficiency, and support the clean environment.

Researchers has come up with interesting findings of current study which includes 1) impact of solar energy usage for a better life, 2) strong positive impact of cost effectiveness has been found in study, 3) as an infinite energy, solar storage can be used to remote areas, 4) environmentally friendly as it is non-polluted energy. As for practical implication, the innovative and better storage system of solar energy is expected by many countries to cover widely energy needs. The right storage system is necessary as it can bring a better life.

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