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Green Energy Community with Smart Society for Sustainable Living

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Abstract

We propose the conceptual model of incorporative energies and technologies, which they are designed for a smart society that can be established under the use of green energy concept for sustainable living. Basically, the use of natural resource with green environment and sustainability has become the critical issue of the world society, where the sustainable energy resources such as solar cells, wind energy and wave energy have been the promising target requirements. The smart society with green energy suppliers can give the modern society living facilities, where the sustainable life is the advantage. In this paper, the incorporative appliance between green energy and smart society is designed and the conceptual model discussed. This proposed concept can be planned, implemented and realized in the near future.

Keywords: Information management; Green energy community; Energy management; Sustainable energy; Energy policy

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1. INTRODUCTION

Energy consumption has been the essential factor for the world society, where the power consumption of the world has been increased and caused the energy crisis since the last few decades (Madan, Pant, Kumar & Arora, 2012; Oliveira & Fernandes, 2011; Rio & Burguillo, 2008), in which the fossil fuel cost violation was affected to the world economy violation. Till date, the economical collapses have been occurred in many countries due to the energy crisis around the world (Chard, Caton, Rana & Bubendorfer, 2009; Frid, Andonegi, Depestele, Judd, Rihan, Rogers & Kenchington, 2011).

Since, the use of fossil fuel has become the problem of the world economy (Cada, Ahlgrimm, Bahleda, Bigford, Stavrakas, Hall, Moursund & Sale, 2007; Frid, Andonegi, Depestele, Judd, Rihan, Rogers & Kenchington, 2011), where the alternative and renewable energy have been the targets for sustainable energy resources. Solar cells have shown the promising indication that can be supplied to the world demand, in which the high performance solar cells device has shown the positive response to the world (Bochlert, McMurray, & Tortorici, 2008; Lovich, & Ennen, 2013; Srithanachai, Ueamanapong, Niemcharoen & Yupapin, 2012).). Moreover, the use of wind and wave energy has also been increased and reported the convincing applications (Frid, Andonegi, Depestele, Judd, Rihan, Rogers & Kenchington, 2011; Smeets, Faaij, & Lewandowski, 2005; Kahraman, 2005; Zongrui, Yuanxiong, Dapeng & Yuguang, 2013).

The searching for new energy resources and systems that can be used with environmental friendly and sustainable consumption is the interesting task. In this paper, we present the use of green energy concept that the sustainable energy consumption without world environmental damage is the required target, in which solar energy, wind energy and wave energy are proposed incorporating the modern city environments. The hybrid energy system is the key concept for sustainable consumption and environment. By using the solar cells incorporating the alternative resources, for instance, wind and wave energy, all electrical power supplies can be operated for the society demand, where the information technology facility can be coverage, which will be described and discussed in details in the following sections.

2. SUSTAIABLE ENERGY CONCEPT

Merging Solar-Wind and Wave Energies

Green energy such as wind, solar and wave energies have become the sport light for using as the backup power systems because they have shown the unique characters as shown in Figures 1-4, the wave energy generation is as shown in Figure 1, where wind generation is described by the weather characteristics as shown in Figure 2, the street lamps supplied by solar cells are as shown in Figure 3. The solar system can produce energy from sun light for street lamps as shown in Figure 3, which is suitable for the area that has long sun light period. Limit of solar system is that it cannot generate the energy in the shade areas, for instant, at night time or raining season, in which the other energy resources are required. Meanwhile, win energy is suitable for the area such as sea side or cooling zone, so win energy always uses with solar system as an alternative energy system (Frid, Andonegi, Depestele, Judd, Rihan, Rogers & Kenchington, 2011). Another energy resource is the wave energy system which uses the benefit form wave in the ocean to create the energy (Frid, Andonegi, Depestele, Judd, Rihan, Rogers & Kenchington, 2011), which can be used both with sea land and island areas.

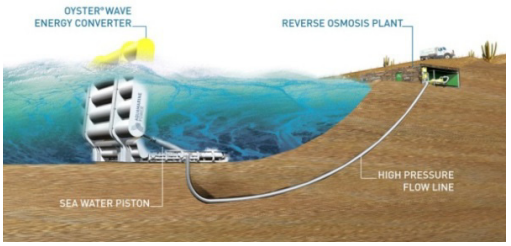

Figure 1: Wave energy generator using oyster wave energy system connected to land power system

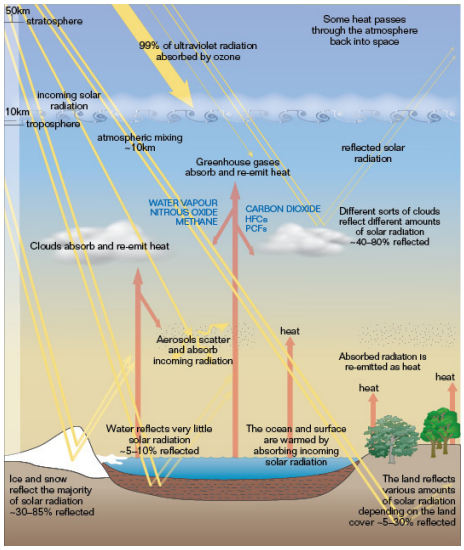

Figure 2: Weather characteristics and wind generation

Figure 3: Street lamps supplied by solar energy (Cells)

Sea-Land-Island Power Station

Based on the characteristics of each energy system, which is shown that most of suitable areas that the sustainable energy systems are sea land or island areas because the sea land has the geographic character for energy system (Cada, Ahlgrimm, Bahleda, Bigford, Stavrakas, Hall, Moursund, & Sale, 2007). Moreover, the industrial sector near the sea port area is recommended to use for the investment cost reduction, or the island that hard to supply the electricity cable with the main land. Therefore, the sustainable electricity turbine system can be used to substitute the limitation of wire electricity system from the main grid.

Figure 4: Power system which is combined by wave wind and solar energy generators

Moreover, the characteristic area of sea land and island is suitable for sustainable energy, in which the weather characteristics are suitable for wind generation. The combined power system using wind and solar systems is as shown in Figure 4, which is suitable for sea land and island power supply. Figure 5 shows that wind from sea to land is generated by weather circulation cycle, which can be used for wind energy generation (Bochlert, McMurray, & Tortorici, 2008). From the characteristics of sea land and island show that it is suitable to use the sustainable energy for seashore location.

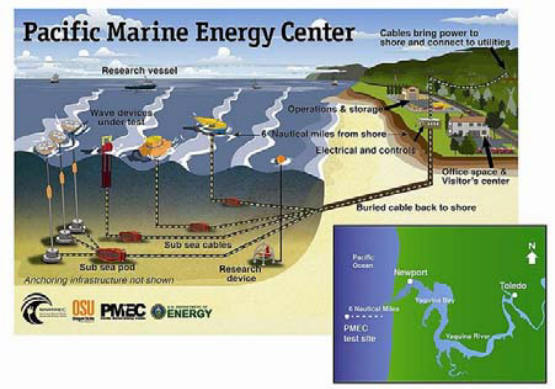

Figure 5: Pacific marine energy center model

3. SMART HOME AND GREEN COMMUNITY

Green energy for each society is recommended to use as the power supply which can reduce the energy usage from main grid and the pollution from the main grid and society, respectively. Therefore, many technologies have been used and involved for green society power generation, which can offer the green society concept and give as the following details.

Smart Home based Solar Energy Consumption

Smart home has become the interesting concept which can be used to serve the modern life requirements as shown in figure 6, where the solar, energy can be used as the electrical power supply and controlled by computing control system, in which the electricity usage quality and energy consumption cost balance can be controlled and managed. Moreover, house can be monitored and controlled by using the computing system via internet connection, in which the energy saving and house security can be established by the same system, which is supplied by solar energy. Meanwhile, house can be controlled by computer via internet to control on-off timer of every machine and lamp. For example, light and air condition can be switched on fifteen minute before arriving or off air conditioner fifteen minute after sleeping, which can make the most utilization on energy usage.

Figure 6: Smart home model supplied by solar energy

Lamp and Non-Lamp Light Distribution Concept

In modern society, electricity lamp is the one of necessary equipment that uses in every place, especially, on the street, where the safety environment is required. In order to reduce the cost with sustainable energy supply, solar energy is suitable for this requirement. The solar energy technology may not reduce the investment cost but it can reduce the maintenance cost and officer to use in the isolated area, which is hard to construct the wiring power system as shown in Figure 7. The concept of new type solar cells can also offer the non-lamp light distribution as shown in Figure 8 (Srithanachai, Ueamanapong, Niemcharoen, & Yupapin, 2012), where in this case a thin film device can be operated and supplied by solar cell battery and give power distribution and use in any dark location, which can offer the low power consumption and good looking requirements.

Figure 7: Street lamp using new type solar cells

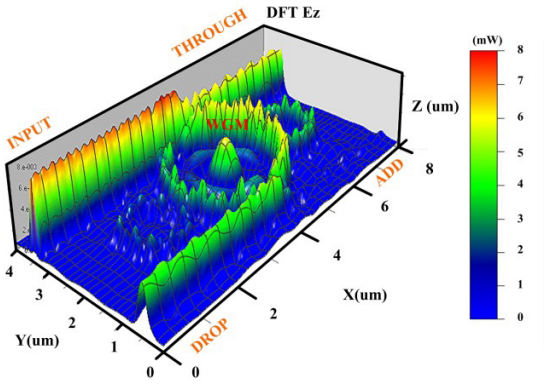

Figure 8: Light distribution using thin film, which is supplied by solar cells for non-lamp light distribution concept

Wave Energy to Home

Wave energy is the absolute clean energy that uses wave power to produce the electricity. It can generate the electricity in both of surface and at the undersea by using the benefit of tidal water to generate the electricity via turbine as shown in Figure 9. The surface wave energy can produce the electricity by construct the turbo-generator under the sea to generate the electricity from under water stream, while the buoyancy is used to keep the energy from wave surface. And all generated electricity will send to sea shore by using the underground electricity cable (Bochlert, McMurray, & Tortorici, 2008; Cada, Ahlgrimm, Bahleda, Bigford, Stavrakas, Hall, Moursund, & Sale, 2007; Frid, Andonegi, Depestele, Judd, Rihan, Rogers & Kenchington, 2011).

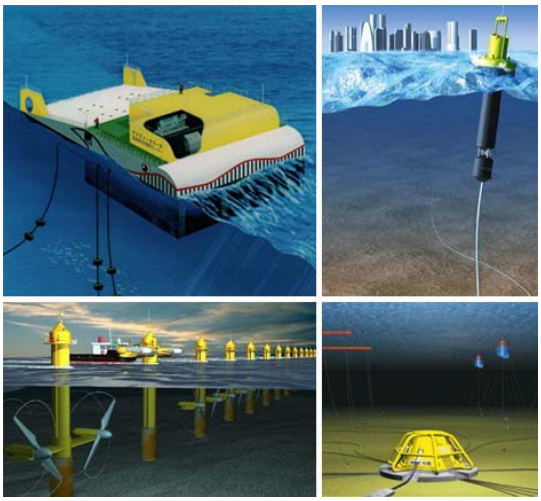

Figure 9: Wave energy and cabling system

However, both turbo-generator and floating device can give the sea environmental effects and the change in environments, which can give the change in ocean environment and sea life cycle. Moreover, the installation instrument may be caused the travelling obstruction and accident.

In Figure 10, the other form of wave energy which is constructed near the sea shore by using benefit from tidal water. They can also be constructed in the electrical power dam location, which is located between river and sea or bottleneck places, and then the water from high tidal will move to low tidal by passing the power generator to generate the electricity. Therefore, the tidal wave generator can generate the electricity based on rise-ebb tide, so it can produce the electricity all day (Hammons, 2009).

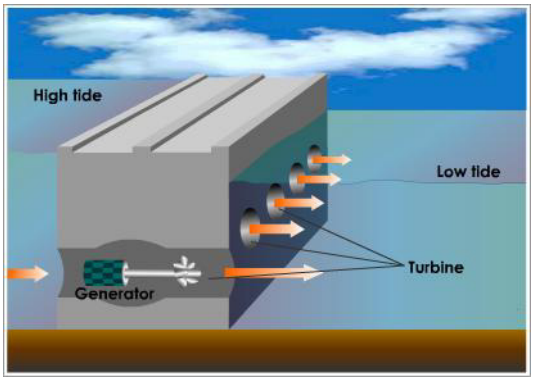

Figure10: Tidal wave generator

New Vehicle for Transportation

Other energy generator is interested the hydrogen-cells engine that uses the hydrogen to generate the power. Hydrogen can fine generally on earth, especially in water (H_2O), which is included two hydrogen molecules combined with an oxygen molecule per molecular structure. The hydrogen engine is as shown in Figure 11. So, the water can be used as fuel for this kind of engine, the hydrogen molecule is separated from oxygen molecule, where the output of this process is oxygen. This idea seem to make benefit for the society because it can reduce the number cars which use fossil fuel, in which carbon monoxide (CO) is the penetrated into the air, on the other hand, hydrogen-cell engine give the oxygen (O_2) into the air (Kahraman, 2005). In smart society, the business like rental electric vehicle(EV) battery station has been suggested to use because people can rent the battery for EV car and change them in anywhere, and can use power for solar and wind that can construct on every electrical lamp to charge the battery everywhere.

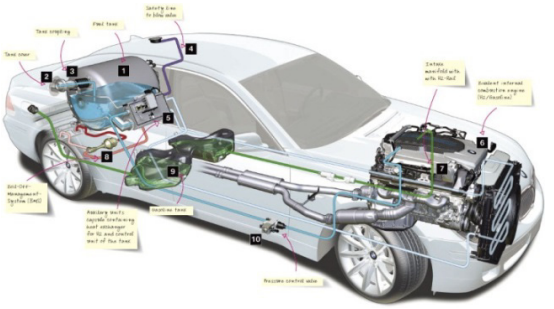

Figure 11: Hydrogen engine system

Today, vehicle like car, train or airplane become an important parts of people life because it can help to save the travelling time. However, many organizations in many country have claimed that cued oil and natural gas are the limited resource that people can use for only next fifty years, and it make the air pollution. Therefore, they claimed that people need to find other energy to use with any vehicle. They develop new type of energy not only the hybrid system but also the hydrogen-based system and magnetic-based power system (Smeets, Faaij, & Lewandowski, 2005). The hybrid system is the combination between oil and electrical engine. In Figure 12, the EV car charger is required to construct along the travelling routes.

Figure 12: Charger station for EV car

Community Networks

For information communication technology (ICT) side, the cloud computing technology is needed to make the energy saving requirement. People in society can store their information on the server which provides by information technology's provider. This server is provided the storage size and operating system for user. In Figure 13, the link of communication system is provided by satellite and distributed to an office and a single house, where the solar energy is applied as an energy resource.

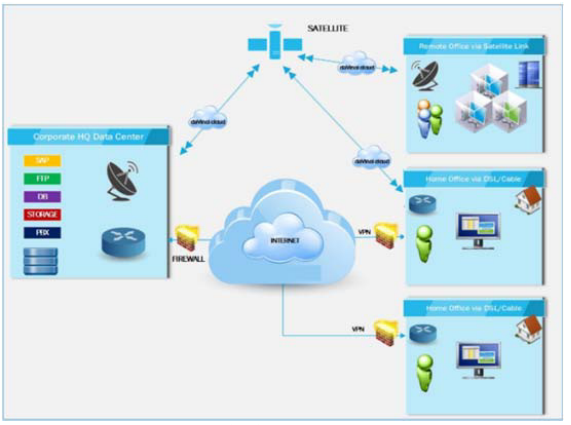

Figure 13: Smart home link with central computing network

For low energy consumption, it seem that people in society can gain the benefit by saving their cost to replace their personal computer and save cost to update the software, while they can use small case of computer such as zero desktop computer, which have only computer screen, mouse and keyboard while connect to its operating system (OS) on the server via internet, to run the high performance program (Madan, Pant, Kumar & Arora, 2012). Therefore, it can support every person in the society in order to reduce an investment cost for their gadget and extended write-off time for each technology. Moreover, the research of E-world magazine (2013) claim that by use cloud technology in office can reduce the electricity cost because it provide the small computer which produce less heat to save the air condition power per hours (Chard, Caton, Rana, & Bubendorfer, 2009) .

Central DIY

In smart society, green technology needs to maintenance on schedule because it is the main energy system. However, some technologies need carefully maintenance and specially skill staff. So, the idea is constructed the central DIY that stores the necessary mechanical tools for repairing purpose, especially, for solar cells or other

generators. The central DIY is as shown in Figure 14. In this case every household can request the service any time to avoid the bad situation such as solar cells cannot generate the electricity. Moreover, the central DIY center can reduce the expense cost of each household in the case of storing unnecessary tools, and support the urban people by increasing the repairing ability.

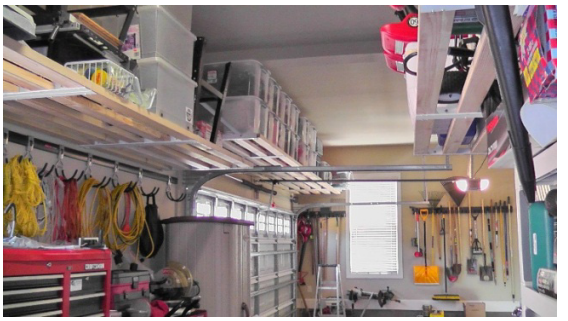

Figure 14: Central DIY at the village

Central Cool Room

By using the underground location, we can construct the natural cooling power to keep their food cool, if the system is combined with the energy from another system, then it can help any people in community to save the usage power because cool from underground can reduce the energy per hours in order to use for cooling system. The samples of cooling locations are as shown in Figures 15 and 16.

Moreover, the underground central cooling room can reduce the electricity usage from refrigerator in each household, and improve the freezing time for each food materials, and it can also use as the cool warehouse to keep the agricultural products such as fruit and vegetable to extend the expiring time before transporting to the end users.

Figure 15: Original cooling system in cold area

Figure 16: Central cool room

Self Sufficient Economy

In green society, people can create the green agriculture product like non-season fruits by using benefit from green energy. They can produce green agricultural product in agricultural dome which people can control the temperature and water in that dome as shown in Figure 17. It can help farmer to plant the products in any season.

The energy resources such as solar and wind energy systems can give the electricity to agriculture dome by using computing control system. It shows the ability to support the people who live in far land area like snowy area to produce the food ingredient in the dome and uses the electricity from win generation system (Oliveira & Fernandes, 2011). Therefore, this can expand the opportunity of farmer in order to produce more quality of food, while the risk on lose the food from outside environment such as weather and temperature can be reduced.

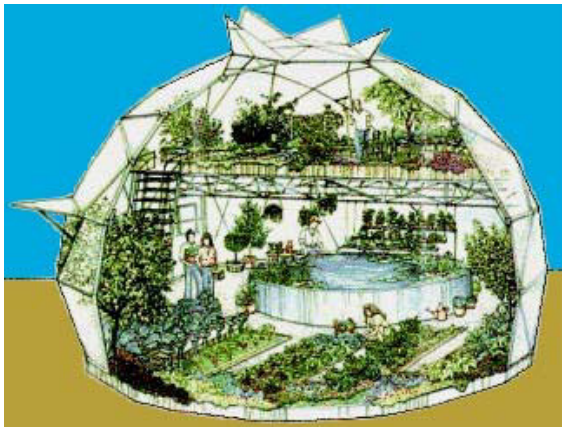

Figure 17: Agriculture dome

Figure 18: Organic product

Self Sufficient Agriculture

By using the green energy resources, we can produce the agricultural products in any time by using the agriculture dome, in which light and temperature can be controlled suitably. So, we can produce enough agricultural products to serve society demand and distribute to the other societies. Therefore, the agriculture product quality can be improved and served to the society demand. Finally, the large products will change the agricultural production cost, where the prize will drop down. So, customer can get required agriculture products as the lower cost to serve their requirements. In Figures 18 and 19, the organic product and green garden are required in city society because they can give fresh air and good health for the society.

Figure 19: Green community

Public Mind and Religion based Activities

By using the clean energy farm, it can create many things that impact to the society, for instant, good intelligence, good health, good environment, which can be useful for sustainable living. The sustainable life cannot be completed if there is the public mind involved, therefore, the public mind is required to involve in the society. The route that can bring society to reach the public mind thinking is religion ways, which can keep society in peace, where finally, the sustainable living is succeed. The main benefit of clean energy is to reduce the money expense per month for each person or family, and reduce the electricity usage per hours for each household (Bochlert, McMurray, & Tortorici, 2008).

4. CONCLUSION

Things in nature have shown the good candidate for world society, particularly, energy resources. Green and sustainable energy resources in nature have been the good future energy for the world society, where they can be the permanent energies and have many advantages, especially, for environmental saving and better life. The power resources from solar, wind and wave have been the good things for green and sustainable power energy generators, which can be used to supply the society requirements with sustainable living. In addition, people morality is also important for sustainable living, in which the concept of self-efficient economy and agriculture, and religion based activities are also the good things, which they are required to include for sustainable living within the smart society.

5. ACKNOWLEDGMENT

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