Renewable energy, the engineering soluton to energy security

Engineering

This is evident by several indicators of energy security. Firstly, reserves for crude oil and natural gas are reckoned to run out within 12 years and 42 years respectively. The declining amount of reserves indicates the restricted availability of energy supplies in future. Secondly, Indonesian government increased prices of gasoline by 44% and diesel by 22% in June 2013 in order to reduce the burden on its fuel subsidy budget. The rising cost of subsidies indicates the increasingly unaffordable and uneconomical energy prices.

Thirdly, Indonesian dependence on energy imports indicates its lack of energy security. It is estimated that Indonesia spent 1. Trillion Rapid per day to buy oil, and it was foreseen to increase to 2 trillion rapid in 201 7 or 2018. Such massive amount of expenditure indicates its huge dependence on foreign oil and the lack of steady energy supplies. Indonesian over-reliance on oil as a key energy source causes energy insecurity. Currently, non-renewable energy resources for instance oil, coal and gas constitutes 73% of the total energy consumption.

In particular, oil still makes up 36% of Indonesian total primary energy consumption in 2012, despite its declining significance over the years. With Indonesian current oil institution of about 1. 36 million barrels daily (bad) against oil production of only 826, 000 bad, Indonesia faces problems satisfying domestic energy demand. Moreover, Indonesian electricity network was developed in the past when oil was cheap and abundant, and currently still depends substantially on oil-fueled power plants to generate power.

Evidently, Indonesian massive reliance on oil results in the draining of fossil fuel reserves, rising energy prices and dependence on energy imports. Indonesian energy security becomes an increasingly worrying problem while its key energy source, oil, diminishes rapidly. Although Indonesia starts to shift its energy reliance to coal and natural gas, using only non-renewable resources to produce energy would be insufficient to keep pace with the domestic demand growth. Domestic energy consumption is predicted to triple from 201 0 to 2030.

With its energy supply capability still limited, Indonesia faces the unwanted prospect as a net energy importer in the future. Facing such an unfavorable situation, Indonesia attempts to reduce long term energy insecurity through the deployment of renewable energies. Geothermal, biomass and hydrophone has been identified as the three main amenable energy resources in Indonesia due to their huge potential. Currently geothermal makes up about 2% of the total generation capacity. Despite its immense potential, estimated to be about 29 AWG, it is barely exploited.

The current installed geothermal capacity is only about 1 1 96 MM, mainly in in Java, North Sumatra and North Salaries. Exploration risks may hamper the development of such geothermal plants. Although such costs have been alleviated with the help of current funding from World Wildlife Fund and other development agencies it is insufficient to fund for Indonesian ambitious plan of 10 AWG by 2025. Besides, nationally only 65% of the country territory is connected to the grid. Without fixing the grid system, geothermal energy expansion is likely to remain sub-optimal.

Nonetheless Indonesia has made some progress in expanding its transmission systems with a loan of USED 225 million from the World Bank . However in future where the demand for electricity is predicted to increase coupled with geothermal expansion, having a grid system will become increasingly costly especially when the site is situated at remote areas. Thus there is a need to find a better grid system or an alternative solution. The strategy aims to substitute petrol and diesel with biathlon and bodiless.

Recent breakthrough by Oil and Gas Institute (LEMMINGS) in developing a blending of bodiless with automotive diesel oil (ADO) in the ratio Of 30170 Indonesian government also introduced " Special Befoul Zone" which include befoul refueling stations planning in designated areas However, befoul production faces intense competition from food for land, labor and water resources The strategy intends to deploy biomass power plants with capacity up to MAW for local industries and to replace governments diesel power plants.

However in general these decentralized plants are incapable of supplying energy at a larger scale. Besides, rice residues, the primary source of biomass power, have low bulk density and thus incur high transport costs. Two main programs have been carried out to improve the usage of biomass for household energy. Firstly, the biogas program is an implementation of biogas digester to be utilized collectively by households. Secondly, in the cockatoo's program, coal and charcoal are substituted by biomass briquettes made from rice husk, basses and municipal waste.

However, these orgasm were ineffective as most households were uninterested due to the availability of cheaper kerosene and liquefied petroleum gas (LAP) . Currently hydrophone makes up about 1 1% of the total generation capacity Despite its immense potential of about 75, 000 MM, hydrophone is only utilized to a small extent , with its current installed capacity of just about 5700 MM. The development of a large hydrophone dam is extremely complex. Initial capital costs including the extensive construction works require huge investments.

It also requires long term planning and agreements with no immediate returns, which deters investors. Despite the constraints, the Indonesian government had some success in their implementation, such as the development of upper Caisson pumped-storage hydrophone project with an estimated capacity of 1, 040-MM The potential capacity is estimated of about 1 000 MM to 2000 MM, but currently only about 230 MM has been developed for power generation. Unfavorable framework conditions, lack of infrastructure, expertise and awareness have been the reasons for the lack of progress.

The solutions will focus on improving existing renewable energy measures in order to reduce energy insecurity in Indonesia. In general, renewable energy is clean and environmentally friendly. Utilizing renewable energy reduces the dependence on fossil fuels and helps to alleviate heavy energy subsidies. Furthermore it act as an economic protection against global energy price fluctuations. Due to the grid costs of building large power plants, one solution proposed is to deploy mini binary power plants at forested

geothermal locations especially at remote areas and high conservation value forests(HACK).

This is ideal since Indonesia is blessed with many low temperature geothermal attention sites, mostly at remote areas Mini binary plants have an installed capacity of around 100 kowtow 1 MM in size. Their average load factor are over 90%. One example is the SKEW binary plant in Thailand, which has operated since 1989. It is greener than flash plant as it does not release geothermal fluids into the environment. This makes it a sustainable and reliable energy source. It can be implemented at plenty low temperature geothermal sites and is scalable, making it economical for mass-scale energy production.

For HACK, the locals would be less affected by these binary plants. Mini binary plants have less environmental costs and occupy less space compared to the typical large power plants. However unlike large power plants, mini binary plants receive little funding for exploration costs. Furthermore, mini binary plants have small and limited capacities. Despite the limitations, mini binary plants remains feasible. It is simpler to implement due to its smaller size and better reception from conservation groups and local people. With smoother implementation, geothermal potential can finally be exploited without long delays.

Biomass energy remains one of the most stable renewable energies as it is to dependent on intermittent sources unlike solar and wind energy. Although burning biomass generates carbon dioxide, the emission is much lower compared with fossil fuels. Given the limitation of engine functionality and

the huge availability of blissful in Indonesia, optimization though OFF could be a better biomass solution. OFF accommodates larger proportion of blissful blending and consequently operate with 100% blissful. It reduces the proportion of oil, as it runs on a blend of 85% ethanol with 15% gasoline.

Considering the transition to blissful, minimal construction costs are uncured in transforming existing stations into blissful stations Besides OFF, implementation of biotechnology could enhance the production rate of blissful and reduces biomass energy production cost. The main cost of bodiless is the price of crude palm oil (COOP) which constitutes 80% of overall cost. In Malaysia, with advanced biotechnology such as recombinant DNA, genetic engineering and gene analysis, palm oil yield is doubled and this further lower the cost for blissful.

Japan's conversion technology of elocutionists biomass into biathlon also lowered the processing cost by up to 60% due to larger economies of scale. As a results of lower production cost, blissful are obtained at an affordable price, which could contribute to the energy security in Indonesia. However the major drawback of biomass optimization is the lack of existing technology in Indonesia. Nevertheless with such technology adapted from Japan or United States, it is believed that biomass can contribute significantly to the energy mix in Indonesia and hence reducing the reliance on oil.

Hydrophone remains one of the most reliable forms of renewable energies. In the long run, it generates low cost electricity with insignificant amount of roundhouse gases. Besides, it has a very high efficiency rate of 90%

compared to other renewable energy sources . Instead of building large hydrophone dams which requires huge investments, Indonesia could make a compromise by deploying MAP and developing small hydroelectric projects. For Indonesia as a large archipelago with numerous large rivers, development of MAP could play a significant role in Indonesian energy mix .

MAP requires smaller investments and these hydrophone plants are easier to construct and execute due to less complex designs. The location of MM? Plants has little impact on the local environment as most installations are run-of-river schemes. By utilizing the local potential, MAP supports independent energy supply and contributes to regional development. However it is not so practical in urban areas and its operation depends much on the river condition. Considering the limited financial capabilities of the government, MAP could be the better hydrophone solution for Indonesia.

However, the major drawback is that MM? Has a small generating capacity. MM? Will not be able to solve energy insecurity alone but by compromising large hydrophone, it can love the problem of opportunity cost versus other renewable energies. The extra funding can be used for the deployment of geothermal and biomass energy. Renewable energy solutions, after optimization, are capable in solving energy insecurity by promoting self-reliance and reducing the dependence on fossil fuels. Ender the government's renewable energy scheme, the share of renewable energy production is predicted to increase to 17% in 2025 . However this goal is only attainable when more emphasis and efforts have been placed on renewable energy. Considering the various constraints, amenable energies would not be

able to develop appropriately. Nevertheless, by analyzing the case studies of foreign countries, Indonesia could learn how to optimize its renewable resources. Besides, one can be optimistic that with technological advancements, future renewable energies can be deployed at a larger and more economical scale.

By addressing the limitations of current measures and cause of problem, these improved solutions together will form a key role in solving Indonesian long term energy insecurity. (1892 words) Lack of energy security in Indonesia availability of energy sources at affordable prices" (International Energy Agency, 2014). Currently Indonesia faces the lack of long term energy security. This is evident by several indicators of energy security (Bade, 2010). 12 years and 42 years respectively (Hungary, 2013).

The declining amount Of reserves indicates the restricted availability of energy supplies in future. Budget (International Energy Agency, 2013). The rising cost of subsidies indicates the increasingly unaffordable and uneconomical energy prices. Security. It is estimated that Indonesia spent 1. 4 trillion Rapid per today buy IL, and it was foreseen to increase to 2 trillion rapid in 2017 or 201 8 (" Indonesia aims to reduce dependence on imported oil," 2013). Such massive amount of expenditure indicates its huge dependence on foreign oil and the lack of steady energy supplies.

Major cause of energy insecurity and gas constitutes 73% of the total energy consumption (Energy Information Administration, 2014). In particular, oil still makes up 36% of Indonesian total primary energy consumption in 201 2, despite its declining significance over the years (Energy Information

Administration, 2014). With Indonesian current IL consumption of about 1. 36 million barrels daily (bad) against oil production of only 826, 000 bad, Indonesia faces problems satisfying domestic energy demand (Sustain, 2013).