



INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X

Impact factor: 4.295

(Volume 4, Issue 1)

Available online at www.ijariit.com

Hong Kong: Obligatory Step into Renewable Energy Future

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ABSTRACT

One of the aims of this article is to explore various proponents of the energy scene in Hong Kong. However, the primary focus is at why Hong Kong should potentially move to a more sustainable and renewable energy model where they will be successful in minimizing costs and maximizing efficiency and utility, and how they could do it. Through analyzing Hong Kong's current sources of energy, we will be able to ascertain the efficiency of any given source and also determine the opportunity cost of the investment in these expensive energy sources. By critically thinking about the issue and the crux it's based out of, we can deter the fundamental need for this solid change, which will be highlighted by the advantages entailed and their deeper implications. By envisioning this future for Hong Kong, it is easy to see it as a foundation to a vision considered greater than realism - Earth running at 100% using sustainable energy.

Keywords: *Hong Kong, Renewable Energy Model, Future, Vision, Efficiency.*

1. INTRODUCTION

Coming to the aspect of Sustainable energy strategies, no country currently has even come close to a total abolishment of conservative sources of energy and establishment of a major strategic energy source plan for sustainable and renewable sources of energy. Though some countries and some cities have come close to initiating a strategy for slow, gradual growth towards the change in energy source the results are highly subjective and not on the verge of commercialisation. Thus for a country like Hong Kong, it's essential to understand that with lack of major domestic sources of mainstream energy like crude oil or natural gas they do not have a long term, sustainable and affordable energy generation source in place.

Hence, it's quintessential for Hong Kong to start its transition into a strategically sustainable energy nation, because with depleting non-renewable sources of energy and rising crude fuel prices, economy shall be affected and balance of exports of service sector would not be able to balance the ever increasing import for conservative energy sources.

2. CURRENT ENERGY STANDARDS

Hong Kong has no major domestic sources of mainstream energy like crude oil or natural gas. This implies that they have no internal sources of energy generation. Their sole reliance on external sources of power has made them vulnerable to global economic changes which have a direct relationship with the price level of conventional energy sources like crude oil and natural gas. This has also proven to be financially costly as well. If they are not importing the fuel in itself, they are importing fuel supplements that are critical for the refining and generation of this form of energy.

To explain the energy scene of Hong Kong, we first look at two major aggregate energy indicators: the "Primary Energy Requirements" (the equivalent of "Total Primary Energy Supply (TPS)" of other economies) and the "Final Energy Requirements" (the equivalent of "Total Final Energy Consumption (TFC)" of other economies). (EMSD, 2016)

The PER pertains to the total energy use/consumption in a particular geographic area. Taking an example, it can be understood that the total energy required for that area to transform the energy and push it in for final consumption. In Hong Kong's case, this metric can be computed by calculating the value of their net retained coal and oil supplies after adjustment for supply from their inventory. The FER is an indication of the final consumption stage of the cycle in terms of household usage for regular day activities like heating, cooking, etc.

Every nation has a fuel mix, which is a way of understanding the constituents of the total energy model of that nation. It is possible to ascertain what source of energy is used and in what proportion. Developing a fuel mix will assist in other matters like having more clarity about energy use and how to control the costs as well as usage proportions which are related to various other factors. Based on some secondarily procured data, the following can be identified as the current fuel mix/matrix of the country.

The nuclear power is imported the most from Mainland China, among other sources. The Daya Bay Nuclear Power Plant has been supplying nuclear power in the form of electricity for the last 24 years (1994). The use of this form of energy may have their own advantages but has to be understood as a very hazardous element. Coming to the highest source of energy, coal is imported from Indonesia as steam coal and other regular forms of coal. Their imports from Indonesia is almost 95% of their total coal consumption. The remaining 5% is imported in smaller quantities from countries with huge coal reserves. The concept of natural gas as an energy source came as late as 1996 to Hong Kong. Natural gas too is largely imported from Mainland China.

As inferable from the fuel schematics, it can be assured that Hong Kong has very small or no dependence on a natural, sustainable form of energy. Hence, the transition will be a long term financially smart decision and will augment growth and effectivity.

3. RENEWABLE SOURCES WITH POTENTIAL

Hong Kong's energy generators and utility controllers must build up a consultative procedure that viably figures the contending objectives of the city's power prerequisites versus ecological maintainability. In Hong Kong, a promise to natural assurance and air contamination diminishment is one of the fundamental destinations of the city's vitality arrangements. It involves four vitality strategy goals: security; unwavering quality; moderateness; and ecological execution.

With a worldwide growing demand for cleaner and renewable energy, a consultancy study commissioned by EMSD to investigate the viability of using RE Technologies in Hong Kong. The Study found out various, potential sources of renewable energy for not only commercial but also local use and the related legal, institutional and promotional issues. Reviewing the current technological statistics and considering Hong Kong's local characteristics. Potentially viable renewable energy types which are feasible in Hong Kong include,

1. Solar Power
2. Wind Power
3. Solid Waste Energy

Other sources like biomass energy, geothermal energy, and hydro-power are feasible but may be limited potential for development in Hong Kong.

• Solar Energy Development Potential in Hong Kong

These systems are majorly divided into two categorical parts

- a. BIPV Types: Majorly mounted on rooftops, facades and external walls of building
- b. Non-BIPV Types: Built and set along highway noise barriers and slopes

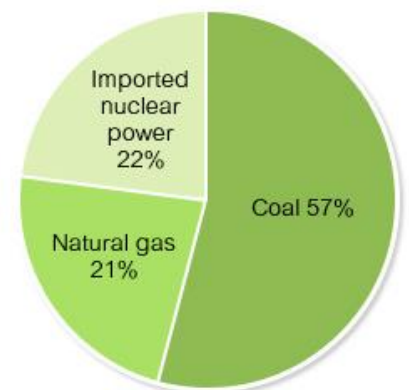
Sun powered vitality energy in Hong Kong is respectively rich in Hong Kong and has a "yearly normal worldwide level sun based irradiance" of 1,290 kWh/m². Agreeing to the consultancy contemplate, the capability of sun based vitality in Hong Kong is 5,944 GWh/year, which is proportionate to around 16% of the 2002 power utilization in Hong Kong. This was determined by accepting that all achievable land territories for sun oriented vitality application were concealed by both BIPV and non-BIPV frameworks. The by and large transformation productivity of PV framework was minimalistically expected as 9.3%. The offers of vitality potential for BIPV what's more, non-BIPV are 5,383 and 561 GWh/year individually

• Wind Energy Potential in Hong Kong

Wind farms can be ordered chiefly into land based wind farms and marine-based wind ranches. Largescale wind turbines are normally appraised more than 1 MW with a "center point stature" of 50 to 70 m and the aggregate tallness (counting the sharp edge) of more than 100 m. The breeze vitality possibilities in Hong Kong are evaluated at 2,630 GWh/year for rustic breeze ranches, 3,000 GWh/year for little urban breeze turbines and 8,058 GWh/year for marine wind farms, again under the presumption that every attainable area is utilized for introducing wind turbines. High breeze asset zones in H.K. are essentially situated at peaks on the eastern side of Hong Kong and most of the seaward marine territories. Notwithstanding, the vast majority of these peak territories are inside nation parks, which may not be appropriate for building wind ranches. Additional promising areas for wind ranches give off an impression of being peripheral islands and seaward marine zones, despite the fact that power age and transmission costs are higher.

4. TRANSITION: A PRE REQUISITE TO FUTURE

In 2017, fuel-blend counsel, the administration evaluated that the cost of power in Hong Kong was set to twofold, as we put resources into a gas age plant, and supplant shoddy coal with costly gas. This will align our energy costs more with nations that are putting confinements on coal utilize. Late abroad experience proposes that sustainable power source, in the correct arrangement condition, gets less expensive as it develops. Costs of coastal breeze in Brazil and Europe are presently like those of non-renewable energy sources; the cost of huge scale sun based power in Britain's current power sell off was only 25 for each penny more than its gas-let go power. In Hong Kong, the sunlight based



yield is magnificently reliable, topping exactly when we require it, on sweltering summer days. Additionally, renewables are a protection approach to unpredictable non-renewable energy source costs. Over the previous decade, petroleum gas costs in Asia have quadrupled.

The administration last analyzed sustainable power in 2002. As indicated by its first-stage provide details regarding the potential utilizations of the sustainable power source in Hong Kong, our city could meet 17 for every penny of its power request if an extent of created land and open space (streets and airplane terminals) had sunlight based boards introduced. A further seven for each penny of the power request could be met by 1,000 all around arranged breeze turbines.

Notwithstanding, the report reasons that the degree of development is constrained - maybe achieving two for each penny in 2017, and three for every penny by 2022. In any case, these numbers now appear to be obsolete. In light of the call for greener vitality and quick world advancement, CLP Power is researching the attainability of a 200MW seaward breeze cultivate in Hong Kong's southeastern waters. HK Electric has additionally investigated seaward breeze ranches. Plainly, it's the ideal opportunity for the legislature to refresh its examination about the potential for renewables.

The plan of control understandings, inked between the administration and the city's two power providers, were produced in view of non-renewable energy sources. The power organizations are remunerated on what number of advantages they manufacture. Changing it for renewables won't be the best method to begin. In the last understanding, the administration urged the power organizations to change to renewables by giving an additional one for every penny in their allowed rate of return in return for an interest in these elective sources, yet advance has been unsatisfying. Just around 0.1 for each penny of the power they create is from renewables.

Different spots don't pay an arrival on how much capital is contributed. Inexhaustible engineers go up against or join with, vitality organizations to deliver sustainable power. They are remunerated through an anticipated and typically sponsored cost for the power they create. The value paid to generators of the sustainable power source in Europe is around HK\$0.70 per kWh. This contrasts and the retail value we pay for power in Hong Kong of around HK\$1.10 per kWh. One of the greatest obstructions to advancing sustainable power source improvement is for pariah engineers to get to the power framework, the course to the market. Hong Kong has no law to direct costs and contract terms for this. Over the previous decade, the development in worldwide sustainable power source sending has been shocking - a 20-overlap development in a twist since 2000, and a 30-crease development in sunlight based power since 2005, basically in Europe and the US. As Asian economies stand up to the issues of rising gas costs, ecological concerns and solid, long haul vitality sources, they are starting to set out strategies to advance sustainable power source. Their encounters and examples of overcoming adversity could give us a superior comprehension of how to empower the utilization of renewables in Hong Kong.

Taiwan intends to act naturally adequate in vitality. In 2009, its administration passed the Renewable Energy Development Act, intending to grow sustainable power source age to 16 for every penny of the aggregate limit by 2025. Sponsorships are paid as encouraging in taxes with various levels of help for sun oriented power, inland breeze ranches, seaward breeze homesteads, biomass and hydro control. Taiwan right now has 530MW of coastal breeze vitality. The administration is arranging another 450 coastal and 600 seaward turbines so that, by 2030, wind age limit could achieve 4,200MW.

The administration has set outflow focuses to decrease ozone depleting substance emanations, yet at the same time does not have the forward-looking strategies to create and advance sustainable power source. Sustainable power sources are capital escalated. The plan of control's present outline isn't the correct one to build up a sustainable industry.

By differentiating, we gauge that a nourish in-duty bolster system used to create five for every penny of Hong Kong's power and sponsored at European levels would add around 2.5 for every penny to client bills. As power organizations meet the air quality emanation diminishment targets, they may not put resources into the most proper long haul answers for Hong Kong. Somewhere else in Asia, nations are advancing a broadened vitality approach, which incorporates renewables. Hong Kong most likely needs to get up to speed.

Additional energizing still are activities that welcome us to reconsider what a cutting edge, the brilliant city should hope for. One case is Masdar, in Abu Dhabi. It has coordinated low-discharge electric transport, sun powered boards and a town format to decrease overheating, which together have greatly cut the requirement for outside vitality.

5. ADVANTAGES OF THE TRANSITION

Energy conservation and optimum utilization is key to efficient progress in any nation or economy. However, as times and circumstances change, the imminent need for this transition is evident and acting upon the same is of critical importance. To analyze the feasibility of this major potential move we need to evaluate the advantages and limitations and draw up a conclusion on the final plan of action. The limitations of this move are largely focused on how the costs involved are extensive and the further underlying implications pertaining to the direct impact it will have on the economy and certain sectors of the economy. The advantages are far more in number and will bear fruit in the long term perspective. Some of the prominent advantages are -

- Minimizing effects of global warming - Global warming is not an unfamiliar phenomenon. We have been plagued by this issue for decades now with no alternatives to solve the problem. The trends in the temperature levels of Hong Kong are entering a critical zone. The annual mean temperature is rising at an exponential rate of 0.12°C per decade and according to recent projections, this figure is likely to reach 4.8°C per decade. Apart from just temperature, even the number of the very high temperature days are projected to double from 11 days a year to around 24 days a year.

- With the current trend of growing effects of global warming, Hong Kong has also become prone to frequent storms. These changes in both, weather and climate will add to the existing level of pressure and strength on building and infrastructure. There will be imminent changes in the patterns of weather, climate, visibility and other demographic variables. All of this arises from the effects of global warming. The depletion of the ozone layer is one of them. Bringing in a renewable energy model will help to overcome such issues since there is only the use of clean sources of energy like sunlight and tidal strength. There is no exploitation or detrimental effect when it comes to using clean, sustainable and renewable energy. This way we can help in restoring balance in the world ecosystem.
- Improved public health - Hong Kong is a nation that uses coal and natural gas at the crux of its fuel matrix. The level of pollution that occurs in processing and then using these forms of energy is alarming. Large quantities of industrial residue and waste are disposed in water and this results in the overall quality of water to take a plunge. Air pollution also has the similar implications as problems like breathing ailments, neurological damage, cancer, etc, are results of air pollution. A large number of power plants and diesel vehicles are the major sources of the air pollution in Hong Kong. The Pearl River Delta region adds on to the pollution levels in Hong Kong. Harmful gases like Carbon Monoxide, Nitrogen Dioxide, Sulphur Dioxide, etc are being spewed into the air of Hong Kong. Taking on the move to using more renewable energy will help in great measures to fight this growing problem. There will be no more emissions or harmful effects of processing and then use energy sources. This will save millions of lives from disease and death.
- Inexhaustible energy - Unlike the current possibility of the draining out of energy sources like crude oil and natural gas, there is no such advent if Hong Kong makes this transition. Hong Kong has a very negligible amount of energy that they generate using their own resources. To complete the rest of their requirement, they are forced to import from other countries. Transitioning to the sustainable energy model will prove to be expensive in the short term but is the best financial investment in the long term if they build effective apparatuses with lower maintenance costs. This adds an economic advantage too.
- Stable energy prices - World energy prices are in constant turmoil due to the direct effect the political, legal, economic, social and technological factors on supply and demand for any given energy source. On moving to renewable energy this issue can be combated. In countries like the United States of America renewable energy is providing electricity to multiple cities across the country. The investments involved may be high, but the operations costs are very low and this is another factor that will greatly augment the level of stability in the energy market. The costs of renewable energy technology have declined over steadily and are projected to maintain the same trend. In a period of 7 years (2010 - 2017), the total cost fell by 70%. The cost of generating energy from wind has fallen by 66%. These trends are hoped to be kept up considering that the energy giants take advantage of the economies of scale and ripen the market. Fossil fuel energy is prone to extreme price swings and the best example to give are the events of 2008 in which the United States of America was the epicenter.

6. CONCLUSION

Therefore it is essential to understand that Hong Kong has a significant scope of renewable energy commercialization, considering the local environment of Hong Kong and natural resources that are already existing in the country. Looking at the future prospective of energy change, Hong Kong needs to slowly transition into a renewable energy fuel mix before going widespread with the commercialization and major development into the new fuel mix at the same time coming up with widespread policy changes and plant developments in the country.

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