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Kelly DeAngelis

kelly_deangelis@yahoo.com

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Kelly DeAngelis

Hong Kong and the Future of Green Energy

Hong Kong is China's central economic trading post, and a hub of international business and stock exchange. In 1997, Hong Kong rejoined mainland China after 99 years of British rule as one of two Special Administrative Regions of China. China and Hong Kong now function as "one country, two systems;" the People's Republic of China operates under a socialist system and Hong Kong under a capitalist system. Although the two systems differ, Hong Kong maintains close economic ties with mainland China, especially Guangdong Province, its neighbor to the north.

A dynamic city, Hong Kong attracts millions of tourists and investors each year from mainland China and around the world. As Hong Kong pushes ever forward in modernization and urbanization, this Special Administrative Region and the world are facing new environmental challenges. Hong Kong's population of more than seven million people attests to its intrigue as an international city,¹ similar to the more than eight million people in New York City.² With a high population density and a small land area of about 1,100 square kilometers, Hong Kong must efficiently manage its land usage very carefully.

Therefore, Hong Kong's urban development scheme has followed the path of the modern "compact city." High-rise residences and office buildings allow for the centralization of urban life. Still, home and office buildings require a majority of Hong Kong's power capacity for electricity for lighting and air conditioning systems. In the late 1990s and into the 2000s, Hong Kong introduced and promoted the use of Building Energy Codes (BEC) to comply with

¹ Li Mu, "Hong Kong Population Tops 7 Million," *People's Daily Online* (English), <http://english.peopledaily.com.cn/90001/90776/90882/7107576.html>, (August 17, 2010), Accessed April 2011.

² "Population," *New York City: Department of City Planning*, <http://www.nyc.gov/html/dcp/html/census/popdiv.shtml> (2011), Accessed April 2011.

“minimum energy performance standards” (MEPS) for lighting, air conditioning, electrical use, and elevators.³ Though these standards are optional, many designers choose to comply with the regulations to earn the “Energy Efficient Building Logo.”⁴ With most structures clustered in city centers, much of Hong Kong’s land area is reserved for green space. According to the Hong Kong Environmental Protection Department, over 40% of Hong Kong’s land area is protected!⁵ The design of the compact city is ideal for preserving natural landscapes and terrain, but it also means that the effects of pollution and bad energy practices can be damaging to a majority of the population concentrated in a small space.

The compact design of Hong Kong means shorter commutes for city-dwellers, and less energy consumed in daily transit. The Hong Kong government encourages the use of mass transportation, like buses and subways as an integral step in lessening pollution and fuel consumption from individual vehicles on the roads. Stricter fuel emissions standards and goals for higher air quality are other means of administering ecological improvements to ensure the safety and well-being of the people and environment in Hong Kong. In a partnership to improve air quality, the Environmental Protection Department of Hong Kong and the Provincial Environmental Monitoring Centre of Guangdong Province have established the Pearl River Delta Monitoring Network. Controlling air quality in Hong Kong is a high priority to lessen the smog and pollution from traditional fuels, such as oil.

³ “HK Energy Efficiency Registration Scheme for Buildings,” *Electrical and Mechanical Services Department*, <http://www.emsd.gov.hk/emsd/eng/pee/eersb.shtml>, (2008). Accessed March 2011.

⁴ See above.

⁵ “Hong Kong’s Environment: Conservation,” *Environmental Protection Department*, http://www.epd.gov.hk/epd/english/environmentinhk/conservation/conservation_maincontent.html, (November 3, 2008), Accessed March 2011.

Hong Kong's dependence on foreign oil represents a global problem concerning the procurement of gasoline. On April 27, 2011, the price of OPEC oil was \$119.34 per barrel.⁶ Rising prices and instability in oil-producing nations has lead to spikes in gas prices at the pumps. On April 10, 2011, gas prices at Shell stations in Hong Kong were 16.47 HK\$/ liter for FuelSave gasoline, which converts to roughly \$8.50.⁷ Scientists predict that fuel prices will continue to increase, so Hong Kong and the rest of the world are investing in cleaner technologies today to reap the environmental and financial benefits in the future.

In today's push for economically viable transportation, Hong Kong's government encourages the use of environmentally friendly personal vehicles and offers tax incentives for greener cars. This includes the promotion of gasoline-burning automobiles with high fuel efficiency and low emissions. The emissions from vehicles is such a massive pollutant in Beijing, that in order to reduce the number of vehicles on the road the government enforces a 13-week rotating schedule when cars cannot drive depending on the last digit of their license plates.⁸ To avoid these measures, Hong Kong is also making strides in the development and distribution of electric vehicles, which will cut down on the oil burned as car fuel and the resulting pollution. As Hong Kong develops ways to lessen its dependence on oil, it turns to coal-fired plants for electricity generation.

Most of the world, including Hong Kong, relies on non-renewable fossil fuels such as coal as a main source of power. According to the Energyland website, Hong Kong relies on coal

⁶ "Hong Kong, China, Biofuels Activities," *APEC Biofuels*, http://www.biofuels.apec.org/me_hong_kong.html, (June 2, 2008), Accessed April 2011.

⁷ "Current Oil Price." *Shell: Shell Hong Kong*. http://www.shell.com.hk/home/content/hkg-en/products_services/on_the_road/fuels/price_board/. April 10, 2011. Accessed April 10, 2011.

⁸ Beijing Traffic Management Bureau. "Circular on Rotation of Tail Number Plate of No-Driving Vehicles." *Beijing International: Government Bulletin* (English). <http://www.ebeijing.gov.cn/Government/GovernmentBulletin/t1163983.htm>. April 26, 2011. Accessed April 2011.

for more than 50 % of its electricity generation.⁹ Scientists are researching new techniques to improve drastically emissions using “clean coal.” Instituting green energy will ease Hong Kong’s reliance on coal, but many clean technologies will require coal-burning plants as interim solutions.

Hong Kong consumes 23% of its total energy from electricity generated by nuclear power imported from mainland China.¹⁰ The China Guangdong Nuclear Power Group routes 70% of the power that they generate to facilitate Hong Kong.¹¹ Although nuclear power is an advanced technology that offers an alternative to traditional fuels, the recent tragedy in Japan reminds us that accidents at nuclear plants can be almost unmanageable by humans. The onset of a natural disaster and human error can damage reactors and cause harmful radiation to escape, threatening the wellbeing of all living creatures as well as crops in the surrounding areas. However, the downsides of nuclear energy generation will perhaps clear a path for newer, safer clean energy sources.

One of the alternative energy sources that are coming to the forefront of clean technology is wind energy. The many small islands of Hong Kong are potential sites for electricity-generating wind farms. The media has questioned the efficiency of wind turbines, noting that the changes in wind speed and density generate at times too much power, and at times not enough. This is because the output capacity of a wind turbine depends on the speed and density of the wind, which varies dramatically from day to day. However, there are mechanisms to manage the flow of electricity. Reservoirs can hold water, pumped full by excess power, to be used later by hydroelectric generators. Battery banks can also store energy to be released into the energy grid

⁹ Electrical and Mechanical Services Department, HKSARG., “Energy,” *EMSD EnergyLand*, <http://www.energyland.emsd.gov.hk/en/energy/principle/index.html>, (March 11, 2011,) Accessed April 2011.

¹⁰ See above.

¹¹ “Nuclear Power Plant Operation,” *China Guangdong Nuclear Power Group*, <http://www.cgnpc.com.cn/n1093/n463576/n463613/index.html>, (2006-2007). Accessed March 2011.

during peak demands. Wind turbines and coal-burning power plants each produce electrical energy at about 35% efficiency.¹²

As the cost of electricity rises in large cities, people turn to less expensive alternatives for utilities. New York City has a program called NYC °CoolRoofs, which encourages businesses and private homeowners to paint their roofs with a white, reflective coating that can help reduce energy consumption, and therefore the cost of electricity and greenhouse gas emissions.¹³ Hong Kong is taking a similar, yet more technologically advanced approach. Fortunately, the sub-tropical climate of Hong Kong affords many sunny days throughout the year to harness energy from the sun. Solar Thermal Energy, the capture of heat from sunlight, offers an unconventional, renewable alternative to traditional energy sources. The government encourages the people of Hong Kong to replace old water heaters with solar hot water heating systems that are mounted to the roofs of residential buildings. Another type of solar panel produces electricity directly from the sun. Newer generation double thick solar electrical panels produce almost twice the electricity as single layer versions by using the non-visible energy that passes unused through the first layer. Moreover, as scientists predict a lengthening in the life expectancy of solar panels, they also anticipate a decrease in the cost.¹⁴ With China as the world's leading producer of solar panels, the allure of solar energy has made its way to the Hong Kong metropolitan area.

Biofuels are another component to the clean energy revolution. Biodiesel, biomass, and waste-to-energy are three major categories of biofuels. APEC cites Hong Kong's available

¹² Electrical and Mechanical Services Department, HKSARG, "Energy: New and Renewable Energy," *EMSD EnergyLand*. <http://www.energyland.emsd.gov.hk/en/energy/renewable/index.html>, (March 11, 2011), Accessed April 2011.

¹³ "About NYC °CoolRoofs," *NYC.Gov: NYC °CoolRoofs*, <http://www.nyc.gov/html/coolroofs/html/home/home.shtml>, (2011), Accessed April 2011.

¹⁴ "Long Life Span for Solar Panels Equals Extra Low Cost," *CalFinder*. <http://solar.calfinder.com/blog/solar-research/long-life-span-for-solar-panels-equals-extra-low-cost/>, (December 4, 2009,) [Harrabin, Roger. "Solar Panel Costs 'Set to Fall.'" *BBC News*. <http://news.bbc.co.uk/2/hi/science/nature/8386460.stm>. Nov 30, 2009,] Accessed March, 2011.

biodiesel fuels as waste cooking oil and animal fats. Most diesel vehicles can accommodate fuels containing about 5% biofuel.¹⁵ To increase this percentage, car manufacturers and biodiesel producers must collaborate. Fuels infused with biodiesel are cleaner burning than traditional diesel. As an incentive, Hong Kong provides biodiesel duty free.

On the other hand, producing biomass energy from organic materials poses a threat to the crops that countries otherwise use as food sources around the world. Although ethanol-generating sources, such as corn produce clean fuels, they pit environmental practices against food security and cause controversy.

Waste-to-energy is another prospective solution for maintaining renewable energy sources in Hong Kong. The heat generated from burning solid waste is used to create steam that generates electricity. Burning municipal solid waste reduces the garbage that goes into landfills,¹⁶ which preserves the precious available land space in Hong Kong. Installing scrubbers and filters on the smokestacks in Energy-from-Waste Plants lessens the amount of pollutants released into the air. Hence, waste-to-energy can provide clean power while reducing garbage.

As a major economic capital of China and the world, Hong Kong is leading the way toward the green revolution. While relying on fossil fuels for much of its energy needs, Hong Kong is also investing in clean technologies and practices to conserve its land space, protect the environment, and lessen emissions. Green technology has brought new life to Hong Kong, and made the future look even brighter.

¹⁵ "Hong Kong, China, Biofuels Activities," *APEC Biofuels*, http://www.biofuels.apec.org/me_hong_kong.html, (June 2, 2008,) Accessed April 2011.

¹⁶ Electrical and Mechanical Services Department, HKSARG. "Energy: New and Renewable Energy."

For more information, please check out my website, currently under construction:

kellygreen.yolasite.com

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